FINAL
FEASIBILITY STUDY
FOR
DEPOT-WIDE REMEDIAL INVESTIGATION/FEASIBILITY STUDY FOR ARSENIC AND MANGANESE IN SOIL AT THE FORMER CURTIS BAY ORDNANCE DEPOT ANNE ARUNDEL COUNTY, MARYLAND

Contract No.: [redacted], **Delivery Order** [redacted]

Prepared for:

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FINAL
FEASIBILITY STUDY

Depot-Wide Remedial Investigation/Feasibility Study for Arsenic and Manganese in Soil at the Former Curtis Bay Ordnance Depot

Anne Arundel County, Maryland

Prepared for:
U.S. Army Corps of Engineers

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COMPLETION OF SENIOR TECHNICAL REVIEW

This document has been produced within the framework of the ERT, Inc. (ERT) quality management system. As such, a senior technical review has been conducted. This included review of all elements addressed within the document, proposed or utilized technologies and alternatives and their applications with respect to project objectives and framework of U.S. Army Corps of Engineers regulatory constraints under the current project, within which this work has been completed.

[redacted]
ELECTRONIC SIGNATURE

11/06/2020

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Senior Technical Reviewer

COMPLETION OF INDEPENDENT TECHNICAL REVIEW

This document has been produced within the framework of ERT's quality management system. As such, an independent technical review, appropriate to the level of risk and complexity inherent in the project, has been conducted. This included a review of assumptions; alternatives evaluated; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the project objectives. Comments and concerns resulting from review of the document have been addressed and corrected as necessary.

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11/12/20

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Independent Technical Reviewer

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ACRONYMS AND ABBREVIATIONS

AOC	area of concern
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
CEHNC	U.S. Army Engineering and Support Center Huntsville
CENAB	U.S. Army Corps of Engineers, Baltimore District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	constituent of concern
COEC	constituent of environmental concern
COMAR	Code of Maryland Regulations
COPC	constituent of potential concern
CSM	conceptual site model
CY	cubic yards
DERP	Defense Environmental Restoration Program
DLA	Defense Logistics Agency
DNSC	Defense National Stockpile Center
DoD	Department of Defense
DOT	Department of Transportation
DU	decision unit
EA	EA Engineering, Science, and Technology, Inc.
EC	environmental concern
EPC	exposure point concentration
ERT	ERT, Inc.
ESAR	Environmental Survey and Analysis Report
ESI	Expanded Site Inspection
°F	Fahrenheit
FS	Feasibility Study
FSI	Focused Site Inspection
ft	foot/feet
GRA	General Response Action
GSA	General Services Administration
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	hazard quotient
IA	Institutional Analysis
IRP	Installation Restoration Program
ITRC	Interstate Technology and Regulatory Council
LUC	land use control
LUCIP	Land Use Control Implementation Plan
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
mg/g	milligrams per gram
mg/kg	milligrams per kilogram
mm	millimeter
MMRP	Military Munitions Response Program
NCP	National Oil and Hazardous Substances Pollution Contingency Plan

NTCRA	Non-Time Critical Removal Action
NWI	National Wetlands Inventory
O&M	operation and maintenance
pH	potential of Hydrogen
PRG	Preliminary Remedial Goal
PSL	project screening level
RACER	Remedial Action Cost Engineering Requirements
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RME	reasonable maximum exposure
SLERA	Screening Level Ecological Risk Assessment
SU	sampling unit
TBC	to be considered
TBD	to be determined
THQ	target hazard quotient
TR	target (carcinogenic) risk level
TSDF	treatment, storage and disposal facility
UECA	Uniform Environmental Covenants Act
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UU/UE	unlimited use/unrestricted exposure
yd^2	square yards

EXECUTIVE SUMMARY

This Feasibility Study was prepared to develop, screen, and provide a detailed analysis of remedial alternatives to mitigate potential unacceptable risks to human health and/or the environment that may remain within the Depot due to arsenic and/or manganese in site soil. It is based on historical information, site characterization, analytical data, and potential risks or hazards to human health or the environment as determined by the Remedial Investigation (RI), and the conclusions documented in the *Final Remedial Investigation Report for Depot-Wide Remedial Investigation/Feasibility Study for Arsenic and Manganese in Soil at the Former Curtis Bay Ordnance Depot, Anne Arundel County, Maryland, September, 2021*.

The Depot is in Curtis Bay, Anne Arundel County, Maryland, approximately one mile southeast of Baltimore, Maryland. Through various property transfers, the Depot now covers approximately 435 acres and is bordered on the east by Curtis Creek and on the south by Furnace Creek (Appendix A, Figure 1).

The original U.S. Army Ordnance Depot was built in 1918 on farmland and became fully operational in 1920 with a total operational area to 815 acres. Following multiple reassignments to the U.S. Army Reserve totaling 37 acres, and several land transfers to Anne Arundel County and the Maryland Department of Transportation, the remaining 435 acres were transferred to the General Services Administration as excess property in the late 1950s. A map of the existing property (435 acres) is shown on Appendix A, Figure 2. There are currently no active uses of the Depot. The Depot is zoned for industrial use (W2 Industrial – Light) and future land use is expected to remain industrial.

The RI investigation approach was based on the discrete soil sampling results for arsenic and manganese collected during previous investigations. The Project Delivery Team developed decision units (DUs) as the primary basis of investigation for the RI. The DU configurations considered the soil sampling results from previous investigations, resulting in three DUs that formed the basis of the RI. The RI field work was conducted in April and May 2019, and the Remedial Investigation Report was completed in September 2021.

The determination of the nature and extent of arsenic and manganese contaminations for the Depot is based on the soil sampling results for each DU. Arsenic and/or manganese concentrations were greater than the project screening levels throughout the investigation area (DU 1, DU 2, and DU 3). The Human Health Risk Assessment determined that unacceptable risks to resident child and/or resident adults were present at all three DUs and unacceptable risks to the likely human receptors (maintenance workers and construction workers) were present in DU 3 (only). The Screening Level Ecological Risk Assessment (SLERA) determined that unacceptable risks to ecological receptors due to arsenic in soil were unlikely in all DUs. The SLERA determined that unacceptable risks to ecological receptors due to manganese in DU 1 and DU 2 soil were unlikely. However, MDE noted several sampling units (SUs) within DUs 1 and 2 that exhibited high concentrations of manganese that may represent an unacceptable risk to ecological receptors. The SLERA determined that unacceptable risks to ecological receptors due to manganese in DU 3 soil were likely.

Remedial Action Objectives

The remedial action objective (RAO) for this site is to prevent direct contact (ingestion and/or dermal contact) with constituents of concern (COCs) in surface and subsurface soil that cause an unacceptable risk to an exposed human or ecological receptor.

Based on the COCs, constituents of ecological concern, affected media, exposure pathways, and the preliminary remediation goals, the Depot remedial action objectives include:

- Prevent direct contact with arsenic and/or manganese contaminated soil having a non-carcinogenic Hazard Index greater than 1.
- Prevent direct contact with arsenic and/or manganese contaminated soil having a carcinogenic risk greater than $1x10^{-5}$.
- Reduce ecological risks to no more than a moderate risk level (Hazard Quotient < 100).

Development of Preliminary Remedial Goals

Preliminary remedial goals (PRGs) were developed for COCs in total soil based on the RAOs. Unacceptable carcinogenic risks to human receptors were primarily due to arsenic concentrations in soil and unacceptable non-carcinogenic risks to human receptors were due primarily to manganese concentrations in soil. Unacceptable risks to ecological receptors were due to manganese concentrations in soil. Although the current and future use of the site is industrial, the PRGs were developed for the hypothetical resident child as this gives the most conservative human health PRGs. Table ES-1 presents the PRGs for arsenic and manganese in soil for each DU.

Table ES-1. Summary of Human Health Preliminary Remedial Goals for Total Soil at the Former Curtis Bay Ordnance Depot

Decision Unit	EPC (mg/kg)	Maximum (mg/kg)	PRG (mg/kg)
DU 1			
Arsenic	18.62	55.1	18.62
Manganese	6,153	27,700	2,255
DU 2			
Arsenic	55.6	137.1	18.65
Manganese	2,764	7,010	2,169
DU 3			
Arsenic	24.5	108.11	18.81
Manganese	29,584	48,800	2,227

EPC – Exposure Point Concentration
mg/kg – milligrams per kilogram

Development and Screening of Alternatives

Based on the risk mitigation technologies reviewed, six remedial alternatives were identified to mitigate the potential unacceptable risks that may remain in DU1, DU 2, and/or DU 3 soil:

- Alternative 1: No Action
- Alternative 2: Land Use Controls (LUCs)
- Alternative 3: Partial Soil Removal with LUCs

- Alternative 4: Complete Soil Removal to Unlimited Use/Unrestricted Exposure (UU/UE)
- Alternative 5: Capping with LUCs
- Alternative 6: Phytoextraction to UU/UE

These alternatives were screened against effectiveness, implementability, and cost. Each of these alternatives were evaluated for each of the three DUs at the Depot. For DU 1 and DU 2, Alternatives 2 and 3 met key elements of the effectiveness and implementability criteria and were retained for the detailed comparative analysis. Alternatives 4, 5 and 6 did not meet these criteria for DU1 or DU 2 and were not retained for further analysis. For DU 3, Alternatives 3 and 5 met key elements of the effectiveness and implementability criteria and they were retained for the detailed comparative analysis. Alternatives 2, 4, and 6 did not meet these criteria for DU 3 and were not retained for further analysis. Alternative 1 was retained as a baseline for all three DUs.

Analysis of Remedial Alternatives – Human Health and Environmental Risks

Each of the retained remedial alternatives was first screened against the nine Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) evaluation criteria, and then they were screened against each other.

Three remedial alternatives were evaluated for DU 1: No Action, Land Use Controls, and Partial Soil Removal with Land Use Controls. Table 5.1 presents the summary of the detailed analysis of the remedial alternatives. Alternative 2 (LUCs) was assessed as having the highest number of favorable rankings for the CERCLA criteria. Alternative 3 (Partial Soil Removal with LUCs) was also at least moderately favorable for all CERCLA criteria and would reduce human health and ecological risks in SUs with high manganese concentrations. Alternative 1 (No Action) is not protective of human health and the environment.

Three remedial alternatives were evaluated for DU 2: No Action, Land Use Controls, and Partial Soil Removal with Land Use Controls. Table 5.2 presents the summary of the detailed analysis of the remedial alternatives. Alternative 2 (LUCs) was assessed as having the highest number of favorable rankings for the CERCLA criteria. Alternative 3 (Partial Soil Removal with LUCs) was also at least moderately favorable for all CERCLA criteria and would reduce human health and ecological risks in SUs with high manganese concentrations. Alternative 1 (No Action) is not protective of human health and the environment.

Three remedial alternatives were evaluated for DU 3: No Action, Partial Soil Removal with Land Use Controls, and Capping with Land Use Controls. Table 5.3 presents the summary of the detailed analysis of the remedial alternatives. Alternative 3 (Partial Soil Removal with LUCs) was assessed as having the highest number of favorable rankings for the CERCLA criteria. Alternative 5 (Capping) was also at least moderately favorable for all CERCLA criteria and is the alternative with the highest cost. Alternative 1 (No Action) is not protective of human health and the environment.

Final selection of a preferred alternative for each DU will be presented in the Proposed Plan and documented in the Decision Document.

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1.0 INTRODUCTION

ERT, Inc., (ERT) was tasked with drafting a Feasibility Study (FS) report for the U.S. Army Corps of Engineers (USACE), for the Former Curtis Bay Ordnance Depot, Curtis Bay, Maryland (herein after referred to as "the Depot"), focusing on potential depot-wide arsenic and manganese contamination in depot-wide soil under USACE Baltimore District (CENAB) contract [redacted], Delivery Order [redacted].

This FS is based on historical information, site characterization, analytical data, and potential risks or hazards to human health or the environment as determined by the conclusions documented in the *Revised Final Remedial Investigation Report for Depot-Wide Remedial Investigation/Feasibility Study for Arsenic and Manganese in Soil at the Former Curtis Bay Ordnance Depot, Anne Arundel County, Maryland,* (ERT, 2021).

1.1 Purpose of the FS

The purpose of a FS is "to provide decision makers with an assessment of the remedial alternatives, including their relative strengths and weaknesses, and trade-offs in selecting one alternative over another (U.S. Environmental Protection Agency [USEPA], 1988)."

The intention of this FS is to develop, screen, and provide a detailed analysis of the remedial alternatives required to mitigate potential human health and/or environmental risks due to arsenic and/or manganese contamination in soil that may remain within the Depot.

1.2 Report Organization

The organization of this FS follows both the USEPA's *Guidance for Conducting RI/FS Studies Under CERCLA* (USEPA, 1988) and the *US Army Munitions Response RI/FS Guidance* (USACE, 2009). However, it most closely aligns with the suggested FS Report format provided by Table 6-5 of the USEPA Guidance. It is organized into six sections and four appendices:

- Section 1.0: Introduction
- Section 2.0: Remedial Action Objectives
- Section 3.0: Identification and Screening of Technologies
- Section 4.0: Development and Screening of Alternatives
- Section 5.0: Detailed Analysis of Alternatives
- Section 6.0: References
- Appendix A: Figures
- Appendix B: Institutional Analysis
- Appendix C: ProUCL Output
- Appendix D: Costing Detail

1.3 Background Information

This section presents a brief description of the Depot location, history, surface features, hydrogeology, climate, geology, demography and land use, ecology, sensitive habitats, and endangered, threatened or special concern species. Additional information may be found in the Remedial Investigation (RI) Report (ERT, 2021).

1.3.1 Site Description

The Depot is in Curtis Bay, Anne Arundel County, Maryland, approximately one mile southeast of Baltimore, Maryland. Through various property transfers, the Depot now covers approximately 435 acres and is bordered on the east by Curtis Creek and on the south by Furnace Creek (Appendix A, Figure 1).

1.3.2 Site History

The original U.S. Army Ordnance Depot was built in 1918 on farmland and became fully operational in 1920 with a total operational area to 815 acres. Following multiple reassignments to the U.S. Army Reserve totaling 37 acres, and several land transfers to Anne Arundel County and the Maryland Department of Transportation (DOT), the remaining 435 acres were transferred to the General Services Administration (GSA) as excess property in the late 1950s. A map of the existing property (435 acres) is shown on Appendix A, Figure 2.

The former U.S. Army Ordnance Depot's mission, from approximately the 1920s through the 1950s, included receipt, storage, maintenance, and demilitarization of ammunition of domestic and overseas supplies. During this time, the property was designated as the Curtis Bay Ordnance Depot. Among the original facilities constructed in 1918 were docks, pump houses, 33 standard magazines, eight standard high explosive magazines, 57 smokeless magazines, nine fuze and primer magazines, barracks, mess halls, a medical building, an engine house, a machine shop, a repacking house, a guard house, a fire engine house, and two general warehouses. Ordnance-related operations at the Depot included a renovation plant which transferred 75-millimeter (mm) shrapnel to metal containers (Green, n.d.).

A 1928 fire within a smokeless powder magazine that contained 630,000 pounds of 9.2 howitzer powder and the ensuing public protest prompted the removal of 155 mm high explosive ammunition from the Depot to the Savanna Illinois Ordnance Depot. The remaining high explosive ammunition stored at the Depot consisted of 75mm shells (Green, n.d.). In 1932, bonderizing plant operations began in a section of Building 1022. Operations at the bonderizing plant included the breakdown of 75mm shrapnel, inspection of the powder, and re-priming. From 1938 to 1942, a different section of Building 1022 was used as a bag loading plant for manufacturing propelling charges for 155mm howitzers and guns (Green, n.d.).

Facilities at the Depot underwent renovations and rehabilitation, primarily through the Works Progress Administration between 1939 and 1940. The function of the Depot then evolved in 1942 to include its use as a small arms packing plant, a transshipment depot for Hawkins Point Pier, and facility for personnel training, particularly in bag loading. Operations at the small arms packing plant began in 1951 and included belting, linking, and clipping .30- and .50-caliber cartridges.

Following World War II and the Korean War, the Depot's mission involved sorting, processing and decommissioning munitions returning from overseas. This operation was known as Operation Brass and Steel (Miduski, circa 1952-1953 and Green, n.d.). An ammunition-popping plant located in Warehouse 1022 was built in the 1950s. The operations in the ammunition popping plant included disarming and dismantling small brass ammunition returning from overseas (Miduski, circa 1952-1953).

The Depot's mission once again evolved in the 1950s to include: the inspection, maintenance, and storage of small arms ammunition, inert ammunition, ammunition packing materials and smokeless powder (Class 2 only); the demilitarization of unsafe and surplus small arms

ammunition, components, and smokeless powder; the storage of general supplies; the receipt, inspection, demilitarization, and shipment of mixed metals, such as fired artillery shells, containers, brass, and projectile plugs; the winterization of equipment; and the receipt and storage of ore for the GSA (Miduski, circa 1952-1953).

In 1952, GSA delegated a new strategic and critical materials stockpile program to its own newly established Emergency Procurement Service. A portion of the Depot was set aside for the storage of strategic and critical materials by the Emergency Procurement Service.

Munitions related activities at the Depot were placed on inactive status in 1958, except for the strategic and critical materials activity. During this time, the 435.46 acres of the Depot, including the critical materials storage area, were transferred to GSA as excess property.

In 1992, the Defense Logistics Agency (DLA) established the Defense National Stockpile Center (DNSC) to manage the stockpile program after DLA was assigned responsibility over the program in 1992. The DNSC no longer conducts operations at the Depot; all stockpiles have been removed from the Depot.

The GSA owns the land currently occupied by the Depot. The Depot was declared as excess property in 2005. GSA delegated the responsibilities for environmental investigations and possible remedial actions to the DLA, who acts as executor for the GSA for the Depot environmental activities.

1.3.3 Surface Features

Elevations at the Depot range from approximately 10 feet (ft) above mean sea level in the south to approximately 50 ft above mean sea level to the north (U.S. Geological Survey [USGS], 2011). The land surface generally slopes south-southeast (EA Engineering, Science, and Technology, Inc. [EA], 2011).

Surface features of the Depot have been significantly impacted by anthropogenic activities throughout the years. The original U.S. Army Ordnance Depot was originally built in 1918 on 789 acres of farmland and surface features changed drastically up until the early 1990's. As a Depot, the property's main purpose was the receipt, storage, and maintenance of supplies both foreign and domestic.

To accommodate the storage and stockpiling of large quantities of materials, many miles of railroad tracks were built, interconnecting nearly all areas of the Depot-wide property. Large warehouses were located throughout the property, many of which are collapsed or have been demolished. Many revetments and berms were created to facilitate the demilitarization of ammunition and prevent train cars from over-running tracks. In 1952, GSA's new strategic and critical materials stockpile program started and much of the Depot was used for stockpiling large quantities of materials – such as various internationally sourced mineral and metal ores. Most of these stockpile areas were paved, graveled, and/or concrete pads were poured. Like the miles of intertwined railroad connecting nearly every acre of the property, an intricate network of roads exists to expedite the efficient transfer of materials and personnel throughout the Depot.

1.3.4 Hydrogeology

The Depot groundwater is part of the Patuxent Formation, which is confined by the Arundel clay formation. The Patuxent Formation, near Baltimore, is known to yield high supplies of groundwater ranging from 400 to 600 gallons per minute. As part of prior investigations, driller's logs have demonstrated varying degrees of thickness within the sand and gravel units, suggesting

that the hydrologic properties of the Patuxent formation may not be uniform (USACE St. Louis, 1993).

Approximately one half of the Depot's perimeter is bounded by creeks. An unnamed tributary, located in the center of the Depot, drains approximately one half of the Depot's surface water to Back Creek. From Back Creek, the water flows east to Furnace Creek then to Curtis Creek, eventually flowing into Curtis Bay and the Patapsco River, within the Chesapeake Bay. It is possible that the Depot may experience flooding from the unnamed tributary, or in the case of storm surges, from the Chesapeake Bay backwater (USACE St. Louis, 1993). Portions of the Depot are within areas identified by the Federal Emergency Management Agency as having a 0.2% chance or a 1% chance of flooding (Appendix A, Figure 2).

The Depot is supplied with drinking water by the Glen Burnie public water supply system. Baltimore City supplies the drinking water for the properties surrounding the Depot.

1.3.5 Climate

Curtis Bay is located within the Mid-Atlantic U.S. with weather consisting of four distinct seasons. The average temperatures in the summer and winter are in the mid-80s [Fahrenheit (°F)] and mid-30s (°F), respectively. July is the warmest month of the year with an average high temperature of 90°F; January is the coldest with an average low temperature of 29°F. Daily temperature variations between night and day in the summer may reach up to 18°F in difference, while daily temperature variations in the winter average approximately 15°F in difference (U.S. Army Engineering and Support Center Huntsville [CEHNC], 2011).

The annual average precipitation is 43.59 inches. Rainfall is evenly distributed throughout the year. The wettest month of the year is May with an average rainfall of 4.18 inches (EA, 2011).

1.3.6 Geology

The Depot lies within the Atlantic Coastal Plain physiographic province, which is characterized by soft, unconsolidated sediment dating from the lower Cretaceous to the Pleistocene age. This soft, unconsolidated sediment generally overlies crystalline bedrock, which is predominately composed of gneiss, schist, and gabbroic rocks from the Pre-Cambrian and Paleozoic eras.

The Pre-Cambrian-Paleozoic age crystalline bedrock has been affected greatly by intrusions, pressure from folding, and periods of erosion. Characteristic of the Coastal Plain depositional environment during the Cretaceous age, the younger, overlying, unconsolidated sediments comprise non-marine, irregularly bedded, and lenticular sediments due to their down gradient location from the Piedmont Plateau. The three formations deposited during the Cretaceous age are the Patuxent, the Arundel clay, and the Patapsco. The oldest Cretaceous age formation, the Patuxent, is defined by a series of lenticular beds of sands, gravels, and clays. The Patuxent is further defined as being unfossilerous, lacking in a characteristic color, and ranging in thickness from 200 to 300 ft. The depositional environment of the Arundel Clay is swamp-like, as evidenced by lignitic material and organic matter such as tree trunks and roots. The Arundel clay, ranging in thickness from 25 to 200 ft in the Baltimore area, is characterized by gray and red clay containing geodes and nodules of limonitic material. The Arundel clay formation is a confining layer (USACE St. Louis, 1993). The Patapsco Formation is at the surface, and it consists of "gray, brown, and red variegated silts and clays; lenticular, cross-bedded, argillaceous, subrounded sands; and minor gravels" (Cleaves, et al., 1968).

1.3.7 Demography and Land Use

There are currently no active uses of the Depot. The property is zoned for "W2 - Industrial Light" (Anne Arundel County, 2019) use and the future land use is expected to remain industrial. Ownership of the property is expected to be transferred once all environmental investigations and any associated restoration are complete. Once transferred, the property will likely be developed for industrial uses.

1.3.8 Ecology

Since the Depot was declared as excess property in 2005, surface features of the Depot have been influenced by ecological succession. The invasive Bradford Pear (*Pyrus calleryanan*) is widespread throughout the property (ERT, 2020). The Depot has been filled, drained, graded and otherwise altered to the point that there are no natural areas remaining. Currently, the site features consist of warehouses in various stages of disrepair, concrete pads where warehouses once stood, a network of paved and gravel roads, numerous revetments and large piles of spoil, and abandoned railroad tracks and railroad beds.

A large central drainage ditch and numerous shallow ditches convey surface water to discharge into adjacent open water bodies, with very little surface water retained on site. Most of the ditches draining the site are small, intermittent, and support wetland species like cattail and giant reed. Most of the area outside the project boundary and within a half-mile radius is urban land or open water.

1.3.9 Sensitive Habitats

Based on a review of the National Wetlands Inventory (NWI) (2019), approximately 10 acres of wetlands were identified within the Depot boundary, primarily along the edges of the Depot adjacent to Back Creek and Furnace Creek, as well as along the unnamed tributary. These areas were part of the investigation area for this project.

The nearby Curtis Bay Channel, Patapsco River, and Stoney Creek have been identified as Historic Waterfowl Staging and Concentration Areas. Portions of the Depot are within the Chesapeake Bay Critical Area Buffer (Anne Arundel County, Maryland, 2007).

NWI wetlands and the Chesapeake Bay Critical Area Buffer are shown on Appendix A, Figure 2.

1.3.10 Endangered, Threatened, or Special Concern Species

No rare, threatened, or endangered species or rare habitats have been documented at the Depot (EA, 2011; Parsons, 2006; CEHNC ,2011, ERT, 2020). Sensitive bird species, such as the formerly federally-endangered peregrine falcon (*Falco peregrinus*), the formerly state-threatened and formerly federally-threatened bald eagle (*Haliaeetus leucocephalus*), and the osprey (*Pandion haliaetus*) have been recorded breeding in the vicinity (two to four miles) of the Depot (Parsons, 2006; CEHNC, 2011). Many pairs of ospreys (*P. haliaetus)* were observed during the arsenic and manganese RI activities (ERT, 2021), exhibiting nesting and breeding behaviors.

The Depot is not within the recorded range of most rare, threatened, or endangered fish, reptile, or amphibian species in Maryland (Maryland Department of Natural Resources [MDNR] 2007; MDNR, 2010). Additionally, the Depot does not contain suitable habitat for species of interest that do occur within Anne Arundel County, such as the state-endangered eastern tiger salamander (*Ambystoma tigrinum*) and the state-rare northern scarletsnake (*Cemophora coccinea copei*).

1.4 Previous Investigation Activities

Numerous historical investigations have occurred at the Depot. Although many historical reports exist, only those reports directly relevant to the purposes of the RI and this FS are detailed below.

1.4.1 Focused Site Investigation and Final Expanded SI , Parsons

A Focused Site Investigation (FSI) was conducted at the Depot in 1999 to determine whether hazardous substances had been released in the environment by the Depot's ore stockpiles, and, if a released had occurred, to determine the likelihood that the hazardous substances had migrated off-site and impacted human or environmental receptors (Parsons, 2000). Parsons collected soil, sediment, groundwater, and surface water samples from four areas of concern (AOCs), focused on the ore stockpiles.

The objective of the environmental sampling was to determine whether specific media contained concentrations of contaminants above background and regulatory standards. Upon evaluation of each medium, Parsons recommended additional field sampling and investigations for three of the four AOCs to further characterize the groundwater, surface water, and soil pathways.

In 2003, an Expanded Site Investigation (ESI)was conducted as a follow-up to the FSI for the three AOCs recommended for further investigation. The Final ESI intended to further define the nature and extent of contamination in the groundwater, surface water, and soil pathways of the three AOCs. Additional environmental sampling was performed, and samples were analyzed and screened against applicable standards.

Based on the sampling, sediment, surface water, surface soil, and subsurface soil samples had results for some metals that were greater than either the background values or 2008 Maryland Department of the Environment (MDE) non-residential soil cleanup standard (Parsons, 2003). Based on these results, Parsons recommended further environmental sampling of the groundwater, surface water, and soil pathways to determine the nature and extent of the reported contamination.

1.4.2 Final Revised DSNC Focused RI, Parsons

In 2005, a Focused RI FRI was conducted to delineate the nature and extent of contamination within specific AOCs identified during their previous FSI and ESI activities, and within areas of known Department of Defense (DoD) activity not previously investigated. AOCs associated with known DLA/DNSC activities were designated, including four ore stockpile areas, a medical supplies burial area, and areas identified by MDE as requiring further investigation. Ore stockpiles included (but were not limited to) ferromanganese and manganese ores. A Human Health Risk Assessment (HHRA) and an Ecological Screening Level Risk Assessment were conducted to evaluate the human health and environmental risks associated with Depot activities. Parsons collected more than 200 surface/subsurface soil (using discrete sampling methodology), sediment, surface water, and groundwater samples from AOCs designated within the property. The HHRA and the Ecological Screening Level Risk Assessment did not identify any contaminants of concern for any receptors, determined there was no risk to human health or the environment, and concluded that no further evaluation was warranted for the Depot associated with the AOCs that were investigated (Parsons, 2006).

1.4.3 Environmental Survey and Analysis Report (ESAR), EA

In 2011, a Final Environmental Survey and Analysis Report (ESAR) was developed for the Depot. The ESAR documented areas of potential environmental concern (ECs) and whether potential ECs may have impacted the soil or groundwater as a result of past or current uses of the Depot. Past

uses may have involved hazardous materials, hazardous substances, hazardous wastes, or petroleum products. To prepare the ESAR, EA reviewed previously developed documentation, and performed on-site reconnaissance and interviews. The ESAR summarizes the environmental suitability of the Depot by identifying and characterizing potential ECs.

The ESAR classified each of the 63 identified ECs into one of seven categories; each category provides the environmental condition of the EC and whether additional investigations were required. The categories were based on the current or former presence of operations that involved hazardous materials, hazardous substances, hazardous wastes, or petroleum products. The report presents detailed information on the Depot's utilities and infrastructure, hazardous substances and petroleum products, stockpiled materials, medical and biohazardous waste, suspected asbestos-containing material, lead-based paint, radioactive materials/wastes, military munitions/ordnance, and polychlorinated biphenyls. The report concluded that 22 ECs (seven Military Munitions Response Program [MMRP] and 15 Installation Restoration Program [IRP] ECs) required additional investigations, in the form of an RI.

1.4.4 Remedial Investigation/Feasibility Study for MMRP and IRP ECs, ERT

In 2021, an RI of the ECs was completed (EA, 2021) that included surface soil, subsurface soil, sediment, surface water, and groundwater sampling to investigate potential human health and environmental risks. ERT collected a total of 826 discrete samples, including 583 primary surface and subsurface samples, 26 groundwater samples, four sediment samples, six surface water samples, and 183 quality control samples. Based on the results of this sampling and the HHRA and Screening Level Ecological Risk Assessment (SLERA) results, all but six ECs (EC-21, EC-28, EC-32, EC-36, EC-57B, and EC-57D) were recommended for site-wide institutional controls to preclude residential use of the property. The remaining six ECs were recommended for evaluation in an FS to address the remaining human health and ecological risks.

As part of the RI data evaluation, it was determined that further evaluation, including a reassessment of the conceptual site model (CSM) and data gap analysis was needed based on the distribution and locations of arsenic and/or manganese contaminated soil.

1.4.5 Remedial Investigation for Arsenic and Manganese in Soil

RI field work was conducted in March and April 2019. The Remedial Investigation Report (ERT, 2021) was finalized in September 2021, as described below.

1.4.5.1 Areas of Investigation for the RI

Arsenic and manganese impacts were investigated within the boundaries of the Depot that are currently owned by the GSA and managed by DLA, except for the area that is undergoing a Non-Time Critical Removal Action (NTCRA), as shown in Appendix A, Figure 2. The investigation area for this RI was approximately 425 acres and did not include the Anne Arundel County Facility or U.S. Army Reserve Dock, which are not owned by GSA.

The decision units (DUs) for arsenic and manganese in soil were based on previous RI soil analytical data for arsenic and/or manganese, primarily in surface soil, where concentrations were greater than the previous investigation project screening levels (PSLs). Based on the previously collected soil sampling results, the Depot arsenic and manganese RI sampling was divided into three areas with two soil horizons (surface 0 – 1 ft below ground surface [bgs] and subsurface 1 –

2 ft bgs) in each area. Thus, there were a total of six DUs, three surface soil DUs and three subsurface soil DUs, investigated during the arsenic and manganese RI.

Table 1.1 summarizes the resulting DUs, indicating the CSM and previous investigation results associated with each.

Table 1.1: RI Decision Units

DU	CSM	Previous Sampling Results	Acreage
DU 1A (Surface Soil)	Historical Depot activities that may have contributed to the widespread, non-point source arsenic and/or manganese contamination potentially included herbicide/pesticide usage and/or material stockpiling. Previous investigations determined that sediment, surface water, and groundwater exposure pathways were incomplete.	Previous sampling results indicated potential arsenic and/or manganese impacts to soil with no clear indication whether results represented an unacceptable risk to human health and/or the environment. Distances between discrete soil samples resulted in large areas with little or no sampling.	411.1
DU 1B (Subsurface Soil)			
DU 2A (Surface Soil)	Historical Depot activities that may have contributed to the widespread, non-point source arsenic contamination potentially included herbicide/pesticide usage and/or material stockpiling. Area was previously known as the IRP Shop Area. Previous investigations determined that sediment, surface water, and groundwater exposure pathways were incomplete.	Previous sampling results indicated arsenic impacts to soil at concentrations greater than the PSLs, primarily in surface soil. Only three sampling locations were analyzed for manganese. Therefore, manganese impacts to DU 2A and DU 2B were unknown.	8.6
DU 2B (Subsurface Soil)			
DU 3A (Surface Soil)	Historical Depot activities that may have contributed to the widespread, non-point source manganese contamination potentially included material stockpiling. Area was previously known as the EC-57D Area. Previous investigations determined that sediment, surface water, and groundwater exposure pathways were incomplete.	Previous sampling results indicated manganese impacts to soil at concentrations greater than the PSLs, primarily in surface soil. Only four sampling locations were analyzed for arsenic. Therefore, arsenic impacts to DU 3A and DU 3B were unknown.	5.1
DU 3B (Subsurface Soil)			

The RI for Arsenic and Manganese in soil focused on filling the data gaps identified in the 'Previous Sampling Results' discussions in Table 1.1. In addition to the site sampling, background sampling was conducted to determine the arsenic and manganese concentrations in surface and subsurface soil due to naturally occurring and/or anthropogenic sources unrelated to Depot activities. The background sampling was conducted in the U.S. Army Reserve Facility (Appendix A, Figure 2).

1.4.5.2 Goals of the Depot-Wide Arsenic and Manganese RI

The goals of the RI were to determine the nature and extent of arsenic and/or manganese impacts in surface and subsurface soil at the Depot potentially caused by prior DoD use, determine potential risks to human health and/or the environment, and to recommend whether further environmental management decisions were warranted.

1.4.5.3 Nature and Extent of Contamination Summary

The determination of the nature and extent of arsenic and manganese contamination for the Depot is based on the findings of the RI (ERT, 2021). Arsenic and manganese were detected in all sampling units (SUs) collected from each DU. The surface soil and subsurface soil sampling results confirmed that impacts due to arsenic and/or manganese are found throughout the Depot.

Sampling results were greater than the human health and/or ecological screening levels for arsenic and manganese at all three DUs. There were sufficient data to evaluate the risks to human health and to the environment, and as part of this RI, an HHRA and SLERA were completed to quantify the risks.

1.4.5.4 Receptors and Exposure Pathways

The Depot is zoned as an industrial property (W2 Industrial – Light) and is expected to remain an industrial property in the future. Although the Depot is zoned for industrial use, the risks to future hypothetical resident receptors (child and adult) were evaluated in the RI to support the development of a remedial alternative that allows for residential land use. The residential remedial alternative is typically developed so that DoD can consider the measures necessary to allow "unlimited use/unrestricted exposure" (UU/UE) of the land. Because UU/UE is interpreted to mean residential land use, it was necessary to determine if unacceptable risks are posed by arsenic or manganese concentrations in soil to hypothetical residential receptors.

The receptors and exposure pathways are the same for all three DUs and are based on the HHRA and SLERA presented in the RI report.

Potential exposures to surface soil (0-1 ft bgs) were evaluated in the HHRA for:

- Site Workers (current and future),
- Construction Workers (future),
- Resident Child (hypothetical future), and
- Resident Adult (hypothetical future).

Current potential exposures to combined surface and subsurface soil (0-2 ft bgs) were evaluated in the HHRA for:

- Construction Workers (future),
- Resident Child (hypothetical future), and
- Resident Adult (hypothetical future).

Trespassers are also expected to be exposed to surface soil, but the exposure frequency will be less than that for maintenance workers. Pathways considered in the HHRA include direct exposure (ingestion, dermal, and inhalation) and ingestion of contaminated biota.

The SLERA evaluated the exposure pathways to ecological receptors including invertebrates, plants, birds, and mammals exposed to the combined surface and subsurface soil (0-2 ft bgs).

Pathways considered in the SLERA include direct exposure (ingestion, dermal, and inhalation) and ingestion of contaminated biota.

1.4.5.5 Human Health Risk Assessment for Arsenic and Manganese

The HHRA quantitatively evaluated the risks to human health for the resident child, resident adult, maintenance worker, and construction worker. Although it is unlikely that the site will be developed for residential use in the future, this evaluation included a potential future use of the land as residential to provide protective future use risk estimates. For the future residential child, site soil impacts due to arsenic and/or manganese in all three DUs may result in non-cancer hazards and/or cancer risk above the acceptable values. For the future residential adult, site soil impacts due to arsenic and/or manganese at DU 2 and DU 3 may result in non-cancer hazards and/or cancer risk above the acceptable values. For the current and future maintenance worker and construction worker, DU 3 soil impacts, due to manganese, may result in non-cancer hazards above acceptable values. Table 1.2 summarizes the conclusions of the HHRA for each DU at the Depot.

Table 1.2. HHRA Conclusions for the Former Curtis Bay Depot Arsenic and Manganese RI

Decision Unit	DU 1	DU 2	DU 3
Future Resident Child	**Unacceptable Non-Carcinogenic Risks Due to Manganese**	**Unacceptable Carcinogenic Risks Due to Arsenic** **Unacceptable Non-Carcinogenic Risk Due to Manganese**	**Unacceptable Carcinogenic Risks Due to Arsenic** **Unacceptable Non-Carcinogenic Risk Due to Manganese**
Future Resident Adult	No Risks Identified	**Unacceptable Carcinogenic Risks Due to Arsenic**	**Unacceptable Non-Carcinogenic Risk Due to Manganese**
Current and Future Maintenance Workers	No Risks Identified	No Risks Identified	**Unacceptable Non-Carcinogenic Risk Due to Manganese**
Current and Future Construction Workers	No Risks Identified	No Risks Identified	**Unacceptable Non-Carcinogenic Risk Due to Manganese**

Legend:
Bold text indicates unacceptable human health risks. (i.e., Carcinogenic Risks > 10^{-5}; Non-carcinogenic hazard index [HI] > 1)

1.4.5.6 Ecological Risk Assessment for Arsenic and Manganese

Although the Depot is not a managed ecological site and will likely be used for industrial purposes based on current zoning, a SLERA was performed in accordance with USEPA guidance for each site DU. Based on the results of the SLERA for the Depot, significant ecological impacts due to the presence of arsenic in soils at all three DU sites are unlikely.

Based on the results of the SLERA for the Depot, potentially significant ecological impacts due to the presence of manganese exist at DU 3, but ecological impacts due to the presence of manganese

are unlikely at DU 1 and/or DU 2. Table 1.3 summarizes the conclusions of the SLERA for each DU at the Depot.

Although the overall ecological risk in DU 1 and DU 2 are unlikely, review of individual SU sampling data for DUs 1 and 2 reveal an apparent pattern of significantly elevated concentrations of manganese in soil in the southwestern-most 2 SUs of DU 2 (SU11A and SU12A) and 4 adjacent DU 1 SUs (SU12A/B, SU15A, and SU18A). In addition, sampling results for four DU 1 SUs (SU23A, SU24A, and SU37A/B) exhibit manganese concentrations in soil that may adversely impact ecological receptors.

Table 1.3. SLERA Conclusions for the Former Curtis Bay Depot Arsenic and Manganese RI

Decision Unit	DU 1	DU 2	DU 3
SLERA Arsenic	Ecological Impacts Are Unlikely	Ecological Impacts Are Unlikely	Ecological Impacts Are Unlikely
SLERA Manganese	Ecological Impacts Are Unlikely	Ecological Impacts Are Unlikely	**Ecological Impacts are Likely**
Legend: *Bold text indicates likely ecological impacts.*			

1.4.5.7 RI Conclusions and Recommendations

A summary of the RI conclusions and recommendations to mitigate potential risks to human health and/or the environment that remain within the Depot is presented for each DU below.

DU 1 A/B

Based on the results of the HHRA and SLERA, potential risks to human health (hypothetical future resident child receptor) health and potential ecological risks in select SUs due to manganese contamination in surface (DU 1A) and subsurface (DU 1B) soil exist in DU 1. Further action is warranted to address the manganese impacts to DU 1 soil, and the RI recommended an FS be conducted to evaluate the remedial alternatives to address the potential risks to human health and the environment from manganese in the DU 1 soil.

DU 2 A/B

Based on the results of the HHRA, potential risks to human health (hypothetical future resident child and adult receptors) due to arsenic and/or manganese contamination in surface (DU 2A) and subsurface (DU 2B) soil exist in DU 2. Based on the results of the SLERA, potential ecological risks may exist due to manganese contamination in surface soil in select SUs. Further action is warranted to address the arsenic and manganese impacts to soil at DU 2, and the RI recommended an FS be conducted to evaluate the remedial alternatives to address the potential risks to human health from arsenic and manganese in the DU 2 soil.

DU 3 A/B

Based on the results of the HHRA and SLERA, potential risks to human health (all evaluated human receptors) and/or the environment due to arsenic and/or manganese contamination in surface (DU 3A) and subsurface (DU 3B) soil exist in DU 3. Further action is warranted to address the arsenic and manganese impacts to soil at DU 3, and the RI recommended an FS be conducted to evaluate the remedial alternatives to address the potential risks to human health from arsenic

and manganese in the DU 3 soil, and potential risk to the environment from manganese in the DU 3 soil.

2.0 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are developed to specify contaminants and media of concern, potential exposure pathways, provide a basis for selecting appropriate remedial technologies and developing remedial alternatives for the site, and remediation goals. Remediation goals establish acceptable levels of exposure that are protective of human health and the environment.

In assessing the need for remediation and evaluating remedial alternatives, two threshold criteria must be met under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP):

- the remedy must be protective of human health and the environment, and
- the remedy must achieve Applicable or Relevant and Appropriate Requirements (ARARs).

The RAO for this site is to prevent direct contact (ingestion and/or dermal contact) with constituents of concern (COCs) in surface and subsurface soil that cause an unacceptable risk to an exposed human or ecological receptor.

The RAO for this site is based on the arsenic and manganese soil sampling analytical results, ARARs, and conclusions of the RI, HHRA, and SLERA.

2.1 Impacted Media and Contaminants of Concern

Based on the conclusions of the RI Report (ERT, 2020) (see Section 1.4.5.6), there are unacceptable risks from arsenic and/or manganese in Depot soil to child and/or adult resident receptors and from manganese in DU 3 soil to ecological receptors. Potential human health and/or environmental risks may remain in the surface and subsurface soil of the Depot, and DUs categorized as having unacceptable risks due to arsenic and/or manganese (described in Section 1.4.5) require remedial actions to mitigate them. Table 1.2 summarizes the potential risks to human health at DU 1, DU 2, and DU 3. Table 1.3 summarizes the unlikely ecological impacts at DU 1 and DU 2 and the likely ecological impacts identified at DU 3.

2.2 Applicable or Relevant and Appropriate Requirements (ARARs)

ARARs must be identified during the development of remedial alternatives. Pursuant to CERCLA/NCP, compliance with ARARs is a threshold requirement that a remedial alternative must meet to be eligible for selection (unless the ARAR is waived). ARARs include federal and/or state promulgated standards, requirements, criteria, and limitations. Chemical-, location-, and action-specific ARARs are identified.

The ARAR analysis is directed at substantive, promulgated regulations regarding on-site activities [CERCLA § 121(d), 42 U.S.C. § 9621(d); NCP, 40 Code of Federal Regulations {CFR} § 300.5]. Furthermore, CERCLA response actions, per CERCLA/NCP, are exempt from permits and similar procedural requirements regarding on-site activities [42 U.S.C. § 9621(e)(1); 40 CFR § 300.400(e)(1)].

For off-site activities (e.g., transportation), compliance is required for applicable, substantive and procedural requirements [NCP, 40 CFR § 300.400(e)(2)]. Such off-site activities are not part of the ARAR analysis, but rather may be discussed under the implementability factor, to the extent that they pose challenges for certain alternatives.

2.2.1 Definition of ARARs

Pursuant to the NCP, 40 CFR § 300.5, a regulation may qualify as an ARAR if it meets the definition of being either "applicable" or "relevant and appropriate." Each of these components is discussed below.

A requirement under CERCLA, may be either "applicable" or "relevant and appropriate" to a site-specific remedial action, but not both.

- **Applicable Requirements** - These cleanup standards are standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site.
- **Relevant and Appropriate Requirements** - These cleanup standards are standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well suited to the particular site. In some circumstances, a requirement may be relevant, but not appropriate, for the site-specific situation.

In addition to ARARs, advisories, criteria, or guidance may be identified as "to be considered" (TBC) information for a scenario. TBCs may be developed by USEPA, other Federal agencies, or states.

2.2.2 Identification of ARARs

Due to their site-specific nature, identification of ARARs calls for evaluation of federal and state environmental and facility siting laws regarding contaminants of concern, site characteristics, and proposed remedial alternatives. Requirements that pertain to the remedial response at a CERCLA site can be categorized as follows:

- **Chemical-specific ARARs -** set health- or risk-based concentration limits in various environmental media for specific hazardous substances, pollutants, or contaminants. These ARARs establish either protective exposure and cleanup levels for the chemicals in the designated media or indicate the appropriate level of concern.
- **Location-specific ARARs -** protect against damage to unique or sensitive areas such as historic landmarks, floodplains, wetlands, and fragile ecosystems. They also restrict activities that may be harmful as a result of the characteristics of the site or the immediate environment.
- **Action-specific ARARs -** Requirements that set controls or restrictions on the design, implementation, and performance levels of activities related to the management of hazardous substances, pollutants, or contaminants. Typical examples of action specific ARARs include National Pollutant Discharge Elimination System requirements or Clean Air Act requirements.

To be consistent with the NCP definition of ARARs, the following groups of ARARs were considered during the identification process:

- Federal requirements
- State of Maryland and local requirements

Table 2-1 presents the state/local ARARs. These ARARs have been chosen for their potential applicability or relevance and appropriateness according to the procedures identified in the CERCLA Compliance with Other Laws Manual (Office of Solid Waste and Emergency Response Directive 9234.1-01 (USEPA, 1988a) and Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (Office of Solid Waste and Emergency Response Directive 9355.3-01) (USEPA, 1988).

In preparing this FS, the project delivery team reviewed numerous State and Federal regulations, such as Standards Applicable to Generators of Hazardous Waste (Code of Maryland Regulations [COMAR] 26.13.03) Chesapeake Bay Critical Area (COMAR 27.01.09), water quality criteria (COMAR 26.08), Maryland Stormwater Management (COMAR 26.17.02), general emissions standards (COMAR 26.11), and the Federal Endangered Species Act (16 U.S.C § 1531). The ARARs, as specifically reviewed relative to each remedial alternative, are discussed in greater detail in Section 5.0, Detailed Analysis of Alternatives.

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Table 2.1. ARARs for the Former Curtis Bay Ordnance Depot			
Standard, Requirement, Criteria, or Limitation	**Citation**	**Description of Requirement**	**Comments (Applicable or Relevant and Appropriate)**
Location-Specific			
Protection of Floodplains	40 CFR § 6 Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR §§ 6.302	Federal - Actions taken should avoid adverse effects, minimize potential harm and restore and preserve natural and beneficial values.	Applicable. A portion of the investigation area that is within a 100-year flood zone; therefore, the requirements of this regulation are applicable.
Protection of Chesapeake Bay Critical Areas	Annotated Code of Maryland (COMAR), Natural Resource Article, Title B - Waters, Subtitle 18 - Chesapeake Bay Area Critical Protection Program	State - Minimize impacts of the Chesapeake Bay water quality and to conserve plant, fish, and wildlife habitat.	Relevant and appropriate. Appropriate for the portion of the investigation area that is within the Critical Area Buffer.
Migratory Bird Treaty Act of 1918	16 U.S.C. 703(a)	Federal - Protects over 800 bird species, their nests and their eggs from unlawful possession, transport, and harm. Prohibits action that would be considered a "take" of a threatened or endangered species.	Applicable. Migratory birds (including osprey, red-winged blackbirds, Canada geese, and others) have been observed within the Depot boundaries.
Archeological and Historical Preservation Act of 1974	16 U.S. Code 469-469c	Federal – Provides requirements for authorized removal of archaeological resources from public and tribal lands; Applicable for substantive portions of regulation if cultural resources are identified at the site	Applicable if objects of historical importance are encountered during excavation at the former Depot.
Anne Arundel County Critical Area Management Plan	COMAR 27.01	State/County – Protects the Critical Area along the shoreline.	Applicable to remedial areas which are within 1000 feet of mean high tide.
Action-Specific			

Table 2.1. ARARs for the Former Curtis Bay Ordnance Depot			
Standard, Requirement, Criteria, or Limitation	**Citation**	**Description of Requirement**	**Comments (Applicable or Relevant and Appropriate)**
Clean Water Act (Sections 404/401)	33 U.S.C. 1251 et seq. 33 CFR 323. 40 CFR Part 230.10, restrictions on discharge	Federal – Establishes the basic structure for regulating discharges of pollutants into waters of the United States and regulatory quality standards for surface waters.	Relevant and Appropriate. Appropriate for any earthwork or clearing of vegetation. (Note that the State standards are equivalent to the Clean Water Act standards.)
Standards Applicable to Generators of Hazardous Waste	40 CFR § 262, Subpart C, 40 CFR §§ 262.34	Federal -Generator may accumulate waste onsite for 90 days or less or must comply with requirements for operating a storage facility.	Potentially applicable. If waste is generated at the site and is determined to be hazardous, any storage of the hazardous waste will not exceed 90 days. Accumulation of hazardous waste onsite for longer than 90 days would be subject to the substantive Resource Conservation and Recovery Act (RCRA) requirements for storage facilities.
Standards Applicable to Generators of Hazardous Waste	40 CFR § 261, Subpart B, 10	Federal - A person who generates a solid waste, as defined in 40 CFR 261.2, must make an accurate determination as to whether that waste is a hazardous waste in order to ensure wastes are properly managed according to applicable RCRA regulations.	Potentially applicable. If waste is generated at the site and is determined to be hazardous, waste will be handled and disposed of as RCRA waste. Applicability is limited to waste generated at the site where arsenic exceeds hazardous waste criteria. (*Note that the State standards are equivalent to the RCRA standards.*)
Land Disposal Restrictions	40 CFR Part 268	Federal - Identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise prohibited waste may continue to be land disposed.	Applicable to alternatives involving soil removal

Table 2.1. ARARs for the Former Curtis Bay Ordnance Depot			
Standard, Requirement, Criteria, or Limitation	**Citation**	**Description of Requirement**	**Comments (Applicable or Relevant and Appropriate)**
Clean Air Act National Primary and Secondary Ambient Air Quality Standards	40 CFR Part 50	Federal - National primary ambient air quality standards define levels of air quality which the Administrator judges are necessary, with an adequate margin of safety, to protect the public health. National secondary ambient air quality standards define levels of air quality which the Administrator judges necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.	Applicable to remedial actions resulting in the generation of dust or airborne contaminants.
National Pollutant Discharge Elimination System Program	40 CFR 122 including 122.26	Federal – Basic EPA permitting requirements, including storm water discharge permits.	Applicable to remedial actions that could result in runoff or generate wastewater
Noise and Vibration Prohibitions	COMAR 26.02.03.02	State - Standards for Environmental Noise including industrial limits in dBA.	Applicable to remediation alternatives which result in noise levels requiring monitoring
Control of Fugitive Particulate Matter	COMAR 26.11.06.03 and .08	State - Emission Standards, Prohibitions, and Restrictions on the release of particulate matter (dust).	Applicable to alternatives which could result in emission of dust particles to the air.
Standards for Generators of Hazardous Waste	COMAR 26.13.02.03-.15, .20-.22	State – Definitions of Solid Waste and Hazardous Waste, including disposal and sampling procedures.	Applicable to remedial actions which may generate hazardous wastes.
Erosion and Sediment Control	COMAR 26.17.01.05, .07B, and .11	State - Activities for which approved erosion and sediment control plans are required,	Alternatives which will cause disturbance of 5000 square feet or 100 cubic feet of soil will require the preparation/submission of

Table 2.1. ARARs for the Former Curtis Bay Ordnance Depot			
Standard, Requirement, Criteria, or Limitation	**Citation**	**Description of Requirement**	**Comments (Applicable or Relevant and Appropriate)**
		application procedures, and design standards.	an Erosion Control Plan to the Maryland Department of the Environment's Stormwater and Sediment Control Program for approval.
Solid Waste Capping Requirements	COMAR 26.04.07.21-.22	State – Closure of Sanitary Landfills (caps), and post-closure maintenance.	Applicable to alternatives which will construct a cap over contaminants left in place to protect human and ecological receptors from exposure risk, and requirements for postremedial cap maintenance/monitoring.
Chemical-Specific			
The United States Environmental Protection Agency Regional Screening Levels found in the Regional Screening Level Table.	https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables	Federal – The screening level tables are presented with target cancer risk of 1E-06, however, tables are presented with target hazard quotients of 1.0 and 0.1.	Applicable to future sampling events at the property.
Maryland's cancer remedial action standard of 1E-5	State of Maryland, Department of the Environment, Cleanup Standards for Soil and Groundwater, October 2018, Interim Final Guidance, (Update No. 3)	State – Guidelines on determining cancer risk.	Applicable to future risk assessments of the property.

2.3 Development of Preliminary Remedial Goals

The remediation goals for soil potentially posing an unacceptable carcinogenic and/or non-carcinogenic risk to human receptors are to reduce the reasonable maximum exposure (RME) cancer risk due to arsenic to less than 1 x 10^{-5} and the RME Hazard Index (HI) due to manganese to less than 1 (ERT, 2020).

The remediation goal for soil potentially posing an unacceptable risk to ecological receptors is to reduce the RME hazard quotient (HQ) to no more than a moderate risk level (i.e., HQ < 100) (ERT, 2020).

The site-specific preliminary remedial goals (PRGs) are chemical limits calculated based upon toxicity values and site-specific exposure conditions evaluated in the HHRA (ERT, 2020). The HHRA selected the MDE carcinogenic risk of 10^{-5} and non-carcinogenic hazards greater than 1 (based upon target organ endpoints) as the point of departure. The only medium of concern at the site is soil. Surface soil and combined surface/subsurface soil are the media of concern for the resident (adult and child).

Unacceptable risks for the maintenance worker and construction worker were identified in DU 3 (only). Trespassers were not evaluated directly in the HHRA, but the exposure to site soils for trespassers would be less than the exposure to site soils for the maintenance worker. Therefore, unacceptable risks to the trespasser are unlikely.

Within the HHRA, the Summary of Significant Contributors to Risk was presented for each receptor with risk results greater than the point of departure. These tables present all constituents of potential concern (COPCs) with carcinogenic risks greater than 10^{-5} and HIs greater than 1. Hypothetical future resident child and/or resident adult receptors evaluated for exposure to the site had risk results above the point of departure.

The hypothetical future resident child receptor is the most vulnerable receptor. Using this receptor results in the most conservative (lowest) PRG. For the hypothetical future resident child, the following equation was used to calculate site-specific PRGs:

For carcinogens:

$$Site - Specific\ PRG\ = \frac{EPC}{Risk} \times TR$$

Where,

PRG = Preliminary remedial goal
TR = Target carcinogenic risk level (10^{-5})
Risk = Chemical-specific cumulative carcinogenic risk presented in the HHRA
EPC = Chemical-specific exposure point concentration presented in the HHRA

For non-carcinogens:

$$Site - Specific\ PRG\ = \frac{EPC}{HQ} \times THQ$$

Where,

PRG = Preliminary remedial goal
THQ = Target hazard quotient (1)
HQ = Chemical-specific total hazard quotient presented in the HHRA
EPC = Chemical-specific exposure point concentration presented in the HHRA

For the resident, the site-specific PRG considers complete exposures to both total soil and surface soil. Exposure routes for total soil include ingestion, dermal contact, and inhalation of particulates. The final site-specific PRG was calculated based upon the following equation:

$$Site - Specific\ PRG = \frac{1}{\left(\frac{1}{PRG_{ingestion}}\right) + \left(\frac{1}{PRG_{dermal}}\right) + \left(\frac{1}{PRG_{inhalation}}\right))}$$

2.4 Selection of DU-Specific PRGs

Although the current zoning for the Depot is industrial (W2 Industrial – Light), for the selection of the final DU-specific PRGs, evaluation of an alternative that allowed for UU/UE was considered. The hypothetical resident child receptor was used to develop the DU-specific PRGs as this will result in the most conservative values. The human health PRGs for each of the DUs at the Depot are presented in Table 2-2.

Table 2.2. Summary of Human Health Preliminary Remedial Goals for Total Soil at the Former Curtis Bay Ordnance Depot

Decision Unit (DU)	EPC (mg/kg)	Maximum (mg/kg)	PRG (mg/kg)
DU 1			
Manganese	6,153	27,700	2,255
DU 2			
Arsenic	55.6	137.1	18.65
Manganese	2,764	7,010	2,169
DU 3			
Arsenic	24.5	108.11	18.81
Manganese	29,584	48,800	2,227

EPC – Exposure Point Concentration
mg/kg – milligrams per kilogram

2.5 Proposed Remedial Action Objectives

The quantitative HHRA identified arsenic and/or manganese as COCs in DU 1, DU 2, and DU 3 Depot soil. The receptors at risk throughout the Depot (DUs 1, 2, and 3) are the hypothetical resident child and/or hypothetical resident adult. All evaluated receptors (hypothetical resident child/adult, maintenance worker, and construction worker) are at risk at DU 3. In addition, the SLERA identified manganese as a constituent of environmental concern (COEC) in DU 3 soil. The DUs are shown in Appendix A, Figure 2.

Based on the COCs, COEC, affected media, exposure pathways, and the preliminary remediation goals, the Depot remedial action objectives include:

- Prevent direct contact with arsenic and/or manganese contaminated soil having a non-carcinogenic HI greater than 1.
- Prevent direct contact with arsenic and/or manganese contaminated soil having a carcinogenic risk greater than $1x10^{-5}$.
- Reduce ecological risks to no more than a moderate risk level (Hazard Quotient < 100). .

2.6 Estimated Volume of Contaminated Soil

The total investigation area is approximately 424.8 acres. DU 1 consists of approximately 411.1 acres. DU 2 consists of approximately 8.6 acres, and DU 3 consists of approximately 5.1 acres. The Maryland residential soil standard extends to a depth of 15 ft bgs or to the zone of saturation (MDE, 2018). Contamination due to arsenic and manganese is not fully delineated vertically; calculations of contaminated soil volumes assume the depth of contamination is 15 ft bgs.

2.6.1 DU 1

Within DU 1A/B, 59 of all possible 829 SUs were randomly selected for sampling using Visual Sample Plan version 7.12. Manganese was the only COC for which human health risks were identified in DU 1 with eight SU sampling results in the surface (DU 1A) and five SU sampling results in the subsurface (DU 1B) soil being greater than the PRG (2,225 mg/kg). Under the assumption that the percentage of all possible SUs where manganese concentrations are greater than the PRG is the same as the percentage of SUs sampled where manganese concentrations are greater than the PRG (approximately 14 percent in surface soil and 8 percent in the subsurface soil), then 116 SUs in the surface and 66 SUs in the subsurface soil within DU 1 are impacted by manganese. This is equivalent to approximately 58 acres or 280,720 square yards (yd^2) in the surface and 33 acres or 159,720 yd^2 in the subsurface. Subsurface soil was collected from the 1-2 ft bgs interval; DU 1B is not fully delineated vertically. Therefore, it is conservatively assumed that the contamination depth is 15 ft bgs in the 66 subsurface SUs assumed to be contaminated to be consistent with the Maryland residential soil standard. As a result, the volume of contaminated soil in DU 1 is approximately **838,933** cubic yards (CY).

2.6.2 DU 2

Every possible SU within DU 2A/B (18 SUs at each interval) was sampled during the RI. Arsenic and manganese were identified as COCs for which human health risks were identified with 11 SU (5.5 acres) sampling results greater than the PRG for arsenic (18.65 mg/kg) and/or manganese (2,169 mg/kg) in the surface (DU 2A) and/or subsurface (DU 2B) soil. Subsurface soil was collected from the 1-2 ft bgs interval; DU 2 is not fully delineated vertically. Of the SUs with sampling results greater than the PRGs, five SUs reported concentrations of arsenic (no reported results for manganese in DU 2B were greater than the PRG) in DU 2B. Therefore, it is conservatively assumed that the contamination depth is 15 ft bgs at these five SUs (2.4 acres) to be consistent with the Maryland residential soil standard. As a result, the volume of contaminated soil in DU 2 is approximately **63,081** CY.

2.6.3 DU 3

Every possible SU within DU 3 A/B (10 SUs at each interval) was sampled during the RI. Arsenic and manganese were identified as COCs for which human health risks were identified with eight SU (4 acres) sampling results greater than the PRG for arsenic (18.81 mg/kg) and/or manganese (2,227 mg/kg) in the surface (DU 3A) and/or subsurface (DU 3B) soil. Subsurface soil was collected from the 1-2 ft bgs interval; DU 3 is not fully delineated vertically. Of the SUs with sampling results greater than the PRGs, four SUs reported concentrations of arsenic and/or manganese in DU 2B. Therefore, it is conservatively assumed that the contamination depth is 15 ft bgs at these four SUs (2.1 acres) to be consistent with the Maryland residential soil standard. As a result, the volume of contaminated soil in DU 3 is approximately **53,885** CY.

2.7 General Response Actions

General response actions (GRAs) are those actions that must be taken to satisfy the RAOs for the site. These are developed for each medium of interest defining treatment, excavation, or other actions. Volumes or areas of media are identified for which the general response actions might be applicable. The actions consider the requirements for protectiveness as identified in the RAOs and the chemical and physical characterization of the site. This FS addresses response actions to mitigate the potential human health and/or environmental risks due to arsenic and/or manganese at the Depot. From these general response actions, remedial alternatives that can achieve the RAOs were developed.

The GRAs identified to address the impacts present in Depot soil are:

- Land use controls (LUCs)
- Excavation
- Containment
- *In situ* Treatment
- *Ex Situ* Treatment

2.7.1 No Action

The NCP requires consideration of a "No Action" alternative. No Action serves as a baseline against which the performance of other remedial alternatives can be compared. This response assumes no active remedial measures or long-term maintenance and monitoring are implemented, although any processes that naturally attenuate the contamination would continue under this GRA.

2.7.2 Land Use Controls

The DoD uses the term LUCs to describe "any physical, legal, or administrative mechanism that restricts the use of or limits access to, real property to prevent or reduce risks to human health and the environment" (DoD, 2001). LUCs may be categorized as government controls, propriety controls, enforcement and permit tools, and informational devices.

Government controls use the regulatory authority of a governmental entity to impose land or resource restrictions on sites under its jurisdiction. Examples of government controls include zoning, building codes, building or drilling permits, and/or use restrictions. Proprietary controls are based on state law and use a variety of tools to prohibit activities that may compromise the effectiveness of the remedy or restrict activities or future uses of resources that may result in unacceptable risk to human health or the environment. The most common examples of proprietary controls are easements and covenants.

The State of Maryland adopted the Uniform Environmental Covenants Act (UECA) – House Bill 679 – on 26 April 2005. An environmental covenant is a legal device that restricts activities on sites where some contamination remains in place. Restrictions limit property use to safe use. These restrictions are necessary to protect human health and the environment from the potential of inadvertent exposures to residual contamination while encouraging economic development.

Enforcement and permit tools are types of legal tools that include orders, permits, and consent decrees. These instruments may be issued unilaterally or negotiated to compel a party to limit certain site activities as well as to ensure the performance of affirmative obligations.

Informational devices are used to provide public information about risks from contamination or whether a remedy is operating as designed. Informational devices may include state registries, deed notices, and advisories.

2.7.2.1 Institutional Analysis

An Institutional Analysis (IA) is provided in Appendix B. The objectives of the IA are to illustrate the opportunities that exist to implement a LUCs program at the Depot; identify the property owners and government agencies having jurisdiction over the site; and assess the appropriateness, capability, and willingness of property owners and government agencies to assert their control over the Depot.

2.7.3 Excavation

Excavation would address contaminated soils by excavating and removing the soils from the Depot for offsite disposal. This would reduce the mass of the contaminants at the site and, therefore, decrease the potential risk from exposure to site soils in the long term. Excavation would use conventional earth moving equipment, conventional soil hauling equipment, and conventional dust and erosion control methods. The soil would be disposed of at an authorized offsite disposal facility.

2.7.4 Containment

Containment would reduce the potential for exposure to arsenic and manganese in site soil by physically containing the contaminants and would reduce and control their mobility. Capping (surface barrier) is an example of a containment remedy. Capping would likely limit future use of the capped area because the cap would need to remain in place to control exposure to the COCs.

2.7.5 *In Situ* Treatment

Treatment of the soil using *in situ* (in place) methods includes the use of physical, chemical, or biological mechanisms for reducing concentrations, mobility, and/or bioavailability of contaminants. Treatment is performed without removing the impacted soil. Methods for *in situ* treatments at the Depot may include soil stabilization and solidification or phytoremediation (phytoextraction).

2.7.6 *Ex Situ* Treatment

Treatment of the soil using *ex situ* methods includes the removal of the impacted media (soil) followed by a treatment technology that will transform, remove, destroy, or immobilize the COCs. Treated soil is placed back at the site. Methods for *ex situ* treatment include soil washing or solidification/encapsulation.

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3.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

The universe of potentially applicable technology types is reduced by evaluation with respect to implementability and screening out technologies that are clearly ineffective or unworkable at a given site.

The term "technology" refers to general categories of technologies for addressing contaminants such as detection, removal, and disposal. The term "process option" refers to specific processes within each technology.

Technology types and process options are eliminated from further consideration based on technical implementability. In general, this is accomplished by using actual data and on-site experience, focusing on technologies that have been successfully employed previously at the Depot, or in similar situations. In accordance with the USEPA guidance, one representative process is selected, if possible, for each technology type. The remaining process option then undergoes a more detailed evaluation against effectiveness, implementability, and cost criteria.

The technology types discussed below are considered technically implementable at the site. Table 3-1 provides the follow-on detailed screening of the technology types and process options indicating viability regarding development of the remedial alternatives that can meet the RAOs.

3.1 LUC Technology Types

Process options addressed under administrative LUCs include legal mechanisms, educational awareness programs, regular or periodic inspections, and warning signs. Legal mechanisms can include restrictive covenants and deed notices. Administrative mechanisms include notices, local ordinances and land use plans, educational programs, or construction permitting that may be used to ensure use restriction compliance. Educational programs can include a variety of types of information dissemination and training that can be tailored to specifically address an identified risk and exposed populations. These are institutional controls designed to limit land or resource use by providing information that helps modify or guide human behavior at a site.

Physical LUCs include engineered structures to contain or reduce contamination and physical barriers to limit access to property, such as fencing. As the Depot will be sold once all environmental investigations and remedial activities are complete, the monitoring and maintenance of physical LUCs would become the responsibility of the property buyer. Although analysis and costs for LUCs implementation is presented separately for each DU, LUCs would be implemented for the entire property rather than for individual DUs.

LUCs, primarily via zoning and deed restrictions, are likely a feasible alternative for remediation at the Depot, either alone or as part of another remedy, and are retained for further analysis.

3.2 Excavation and Offsite Disposal

Contaminated soils are removed and transported to an offsite treatment, storage and disposal facility (TSDF). Excavation and offsite disposal are standard practice for reducing the contaminant volume and are a feasible alternative for remediation at the Depot. This alternative is retained for further analysis.

Arsenic concentrations throughout the Depot may result in leachable arsenic concentrations that are greater than the regulatory limit of 5 milligrams per liter. Therefore, the soils may need to be disposed of at a permitted hazardous waste TSDF or must be treated to achieve the leachability

limit prior to disposal at a permitted solid waste landfill. Additional testing of the soil for leachable arsenic would likely be required to implement this technology effectively.

3.3 Containment by Capping

Capping involves placing cover (made of various types of material) over the contaminated soil. The cap isolates the contaminated soil preventing human and environmental exposure. Capping also prevents precipitation infiltration through the contaminated soil and contaminated dust from moving off site. Capping is a commonly used remedial technique for contaminants in soil. This alternative will be evaluated further.

3.4 *In Situ* Treatment

In situ treatment technologies include biological, physical/chemical, and thermal methods. They are active remedial measures that reduce the toxicity, mobility, and volume of the contaminated media.

3.4.1 *In Situ* Soil Solidification/Stabilization

This process changes the physical and chemical characteristics of the waste in order to immobilize contaminants. Various chemical additives (Portland cement, kiln dust, and pozzolanic binders) are used to chemically bind and immobilize contaminants or to microencapsulate them in a matrix that physically prevents mobility. Although this technology could achieve protection of human health and the environment through immobilization of the COPCs, thus reducing toxicity and mobility, a treatability study would be required to determine the effectiveness of soil solidification/stabilization at the Depot.

Long-term effectiveness of this technology is questionable. Most arsenic (one of the site COPCs) compounds are strongly sorbed by soils at pH 4.5 to 5.0 and are relatively immobile, but other arsenic compounds in other conditions are much more mobile (USEPA, 1999). The USEPA cautions against the use of immobilization techniques for arsenic due to the sensitivity in the effectiveness of treatment in different potential of hydrogen (pH) conditions. Another long-term effectiveness consideration would be residual risks associated with the long-term stability of the treated material (i.e., the potential that the material would degrade under site conditions, thus releasing COPCs back into the environment). The clayey silt soils found throughout the Depot may cause problems with the stabilization process (the higher the clay content the more difficult successful soil stabilization becomes).

Physical bulking or hardening of soil during soil stabilization could also potentially cause future difficulties for landscaping and/or construction activities. LUCs would be required as the contaminant mass will remain onsite. Due to these limitations, this alternative will not be evaluated further.

3.4.2 Phytoextraction

Phytoextraction involves the use of hyperaccumulating plants to remove metals from soil by plant absorption into the roots, stems, and leaves of the plant. A hyperaccumulator is defined as a plant that can yield greater than or equal to 1 milligram per gram (mg/g) arsenic or 10 mg/g manganese in the above ground portion of the plant on a dry weight basis (Parvaiz, 2016). The typical depth of effectiveness for phytoextraction is 1-2 ft bgs but may be down to 5 ft bgs (Interstate Technology and Regulatory Council [ITRC], 2009). The above ground portions of the plant would be harvested and disposed of or treated offsite to remove contaminants from the site. Soil amendments may be necessary to mitigate the toxic effects of the metals on the plants and/or to

improve the accumulation of metals in plant material. A site-specific treatability study would be required to fully determine the appropriateness of this technology.

Although this technology could achieve protection of human health and the environment through reduction of the COPC concentrations, thus reducing toxicity and mobility, a treatability study would be required to determine the effectiveness of phytoextraction at the Depot. Plant species that would hyperaccumulate arsenic and/or manganese which will thrive at the Depot would need to be identified. In addition, plant care (e.g. irrigation) needs would need to be evaluated, soil conditions and fertility would need to be assessed, and plant tolerances to both arsenic and manganese would need to be considered. Phytoextraction may take longer than other cleanup methods to achieve the cleanup goals and treatment time must include the time to establish the plant community which can take more than a year to reach optimal conditions. LUCs would be required until soil sampling results indicate achievement of the RAOs.

Although phytoextraction presents remedial design challenges, as noted above, this alternative represents a viable remedial alternative that will reduce contaminant toxicity, mobility, or volume through treatment. Therefore, this alternative will be evaluated further.

3.5 *Ex Situ* Treatment

Like *in situ* treatments, *ex situ* treatments include biological, physical/chemical, and thermal methods. They are active remedial measures that reduce the toxicity, mobility, and volume of the contaminated media.

Compared to *in situ* treatment, *ex situ* treatment generally requires shorter time periods and provides more certainty about the uniformity of treatment. *Ex situ* treatment methods generally provide the ability to homogenize, screen, and continuously mix the contaminated media. *Ex situ* treatment requires removal of the contaminated media to a treatment cell or facility, which typically increases material handling/worker exposure considerations.

3.5.1 Soil Washing

Soil washing is a remediation technique in which contaminants are separated from the soil particles to which they are sorbed. This is achieved through excavating and washing the soil with a leaching agent, surfactant, or chelating agent or through pH adjustments. Washing solutions may consist of water only or may include additives such as acids, bases, surfactants, solvents, chelating or sequestering agents that are used to enhance the separation of contaminants from soil (ITRC, 1997). An on-site treatment facility would be designed and constructed. A portion of the treated soil could be used as backfill although it would be necessary to supplement this soil with backfill from an offsite source. Sludge generated during the process would be disposed at an appropriate offsite facility.

A site-specific treatability study would be required to fully determine the appropriateness of soil washing which would negate the short-term effectiveness. This technology could provide protection of human health and the environment by removing the COPCs from site soils, thus reducing the mobility, toxicity, and volume of contaminated soil; however, it is unknown if the materials used in the washing process may pose a risk to human health and the environment during implementation of this technology. Like *in situ* soil stabilization, the clayey silt content of the soils at the Depot would make it more difficult to achieve the desired RAOs using this technology.

This technology is labor intensive, and the materials and services required to implement it are not widely available. Therefore, this alternative will not be further evaluated.

3.5.2 *Ex Situ* Soil Solidification/Encapsulation

Like *in situ* soil solidification/encapsulation, this process changes the physical and chemical characteristics of the waste in order to immobilize contaminants. Soils are first excavated, then treated, and then replaced into the excavation (clean portion) or disposed of offsite (contaminated post treatment residue). Various chemical additives (Portland cement, kiln dust, and pozzolanic binders) are used to chemically bind and immobilize contaminants or to microencapsulate them in a matrix that physically prevents mobility. A site-specific treatability study would be required to fully determine the appropriateness of this technology.

Although this technology could achieve protection of human health and the environment through immobilization of the COPCs, thus reducing toxicity and mobility, a treatability study would be required to determine the effectiveness of soil solidification/stabilization at the Depot. Long-term effectiveness of this technology is questionable. Most arsenic (one of the Depot COPCs) compounds are strongly sorbed by soils at pH 4.5 to 5.0 and are relatively immobile, but other arsenic compounds in other conditions are much more mobile (USEPA, 1999). The USEPA cautions against the use of immobilization techniques for arsenic due to the sensitivity in the effectiveness of treatment in different pH conditions although, this may be able to be controlled during the *ex situ* stabilization process. The clayey silt soils found throughout the Depot may cause problems with the stabilization process (the higher the clay content the more difficult successful soil stabilization becomes).

Physical bulking or hardening of soil during soil stabilization could also potentially cause future difficulties for landscaping and/or construction activities. In addition, because *ex-situ* stabilization requires excavation of contaminated soils, it will be more costly than the *in-situ* soil stabilization. LUCs would be required because the contaminant mass would remain onsite. Due to these limitations, this alternative will not be evaluated further.

Table 3.1: Technology Types and Process Options Screen

Technology Type	Process Option	Effectiveness	Implementability	Cost	Viability-Status
LUCs (Administrative and Physical)	Legal Mechanism	**High:** Effective for ensuring land use restrictions remain in place during and after changes in property ownership.	**High:** The current land use for the Depot is industrial. The State of Maryland has adopted the Uniform Environmental Covenants Act (UECA) to facilitate implementation of deed restrictions. The DLA (as executor for the GSA) has indicated willingness to impose restrictive covenants on the Depot property.	Low	**Retained:** For all DUs. Provides long-term risk mitigation that will be carried forward with the deeded property.
	Educational Awareness Program	**Low to Moderate:** Effectiveness depends upon ability to notify all potential parties and obtain their cooperation.	**Low to Moderate:** Although preparing fact sheets and providing training is relatively easy, it is more difficult to ensure everyone who may potentially visit the site is properly informed, and success depends upon future landowner cooperation.	Low	**Not Retained:** For all DUs. Success dependent on the continued incorporation by future landowners.
	Periodic Inspections	**Moderate:** Useful to evaluate performance and maintain integrity of engineering controls or evaluate site conditions.	**Moderate:** Technical staff required to perform inspection and maintenance of LUCs. Future success depends on future landowner cooperation	Low	**Retained:** For all DUs. Success dependent on the continued incorporation by future landowners.
	Engineering Controls	**Moderate:** Can prevent access to areas. Must be maintained to remain effective.	**Moderate:** The Depot will be sold once all environmental investigations and remedial actions are complete. Future effectiveness depends on future landowner maintenance of installed engineering controls.	Moderate	**Not Retained:** For all DUs. Success dependent on the continued incorporation by future landowners.
Excavation and Offsite Disposal	Mechanical Excavation	**High**: Very effective for removing surface and subsurface soil.	**High:** Mechanical excavation has been proven successfully in the NTCRA area of the Depot.	High	**Retained:** For all DUs. Mechanical excavation will reduce contaminant mass at the site.
Containment	Capping	**Moderate:** Containment via capping is effective if the cap properly installed and is maintained and monitored.	**Moderate to High:** Capping has been used to limit exposure to contaminated soils at similar sites. Long-term maintenance will require the cooperation of future landowners.	Moderate	**Retained:** For all DUs. Capping will limit exposure to the contaminant mass onsite.
***In Situ* Treatment**	Soil Solidification/Stabilization	**Moderate:** This technology requires long-term monitoring to verify that the remedy remains effective. Effectiveness for arsenic contamination is pH dependent and therefore may require soil amending.	**Moderate to High:** Soil solidification/stabilization has been used to limit exposure to contaminated soils at similar sites.	Moderate	**Not Retained:** For all DUs. May not be suitable for arsenic contamination due to soil pH levels.
	Phytoextraction	**Moderate to High:** This technology may take longer than other technologies to reach the RAOs however, is an effective remedy. Harvested plant material will need to be disposed of appropriately.	**Moderate to High:** Requires identification of plants that can uptake arsenic and manganese while surviving the concentrations of arsenic and manganese in site soils. Phytoextraction has been used to reduce concentrations of metals in soil at similar sites.	Moderate	**Retained:** For all DUs. Phytoextraction will reduce contaminant mass at the site.
***Ex Situ* Treatment**	Soil Washing	**Moderate:** Soil types at the Depot may limit the effectiveness of this technology.	**Low to Moderate:** This technology is labor intensive, and the materials and services required to implement it are not widely available. *Ex situ* treatments require excavation of contaminated soils prior to treatment increasing project costs.	High	**Not Retained:** For all DUs. Technology is cost and labor prohibitive.
	Soil Solidification/Stabilization	**Moderate:** This technology requires long-term monitoring to verify that the remedy remains effective in the long term. Effectiveness for arsenic contamination is pH dependent and therefore may require soil amending.	**Moderate to High:** Soil solidification/stabilization has been used to limit exposure to contaminated soils at similar sites. *Ex situ* treatments require excavation of contaminated soils prior to treatment which increases costs over *in situ* soil solidification/stabilization. Long-term maintenance requires the cooperation of future landowners.	High	**Not Retained:** For all DUs. May not be suitable for arsenic contamination. Technology is cost and labor prohibitive.

DLA – Defense Logistics Agency
DU – Decision Unit
GSA – General Services Administration
LUC – Land Use Control
NTCRA – Non-Time Critical Removal Action

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4.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

The results of the technology screening and the media of concern are combined to develop and assemble alternatives that meet the RAOs. Defined alternatives are evaluated against the short and long-term aspects of three broad criteria: effectiveness, implementability, and cost. The purpose of the screening evaluation is to reduce the number of alternatives that will undergo the more thorough and detailed analysis against the CERCLA nine criteria in the next section (Section 5.0), and is therefore, a broader, more general screening.

4.1 Introduction

The Defense Environmental Restoration Program (DERP) Manual, 4715.20 (DoD, 2012) requires consideration of at least three alternatives: No action, action to remediate a site to a condition that allows for UU/UE, and action to remediate a site to a protective condition that requires LUCs. The remedial alternatives presented in Section 4.2 represent scenarios that meet the RAOs for the potential risks to varying degrees and comply with the DERP Manual requirements. The broad criteria, effectiveness, implementability, and cost, against which they are screened are defined in the following sections.

4.1.1 Effectiveness

This criterion is evaluated with respect to effectiveness in protecting human health and the environment. The short-term (construction and implementation period) and long-term components (effective period after the remedial action is complete) are also evaluated.

4.1.2 Implementability

This criterion is evaluated as a measure of both the technical and administrative feasibility of constructing, operating, and maintaining a remedial alternative. Technical feasibility is the ability to construct, reliably operate and maintain (as required) an alternative, while administrative feasibility refers to the ability to obtain approvals from agencies, and the availability of required goods and services.

4.1.3 Cost

The cost of each alternative is also evaluated. However, at this stage, it is not necessary to define the cost with the same level of detail or accuracy required for the detailed analysis presented in Section 5.0. Prior estimates, sound engineering judgment, and most importantly, real-world cost experience based on having previously completed portions of these efforts within the Depot or within similar sites are sufficient to help evaluate one alternative against another.

4.2 Identification of Remedial Alternatives

Based on the mitigation technologies reviewed in Section 3.0, six remedial alternatives have been identified to mitigate the potential risks due to arsenic and manganese that may remain within the Depot soil:

- Alternative 1: No Action
- Alternative 2: LUCs
- Alternative 3: Partial Soil Removal with LUCs
- Alternative 4: Complete Soil Removal to UU/UE
- Alternative 5: Capping

- Alternative 6: Phytoextraction to Reduce Contaminant Concentrations

Each of the alternatives will be evaluated for DU 1, DU 2, and DU 3.

4.3 Screening of Remedial Alternatives

The following provides a brief description of each alternative to mitigate the potential risks due to arsenic and manganese that may remain within the Depot soil.

4.3.1 DU 1

In DU 1 soil, the HHRA identified risks to human health (hypothetical child receptor, only) due to manganese concentrations in soil. The SLERA concluded that ecological impacts were unlikely. Therefore, manganese is the only human health COPC in DU 1 soil and there are no COECs in DU 1 soil.

4.3.1.1 Alternative 1: No Action

The No Action alternative is evaluated to satisfy the NCP requirement of 40 CFR 300.430(e)(6), which requires consideration of this alternative as a baseline against which other alternatives may be compared. The no action alternative would involve leaving the subject areas in their current condition. Under this alternative, no remedial action will be taken, and any potential contaminants are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. This alternative would leave manganese impacted soil in place, without further environmental management or remedial action

Effectiveness: The no action alternative would not provide for protection of human health and the environment. The potential risks associated with manganese would not be expected to decrease significantly over time. Therefore, this alternative would not be effective in achieving the RAOs in the short term or the long term, as it does not reduce the risk to human health and the environment, reduce contaminant concentration or mass, nor does not allow for UU/UE.

Implementability: The no action alternative is easy to implement. No services or materials would be required to implement this alternative.

Cost: There are no costs associated with the no action alternative.

Outcome: Alternative 1 fails the effectiveness criteria. However, in accordance with the NCP, this alternative must be evaluated against the threshold criteria and balancing factors in the next section, as a baseline for comparison, and is therefore retained for further evaluation.

4.3.1.2 Alternative 2: Land Use Controls

LUCs, administrative and physical, can include signage, security fencing, environmental covenants, and/or education to limit access. As developed for the Depot, Alternative 2 will include an environmental covenant that conveys when the property is sold to restrict land use to industrial purposes.

For this alternative, a LUC Implementation Plan (LUCIP) will be developed, which would include a delineation of enforcement and maintenance responsibilities.

Effectiveness: The LUCs alternative would provide protection of human health and the environment by limiting the potential for exposure to risks that may be present. However, this alternative does not reduce the volume of contaminated soil, and it does not allow for UU/UE as

it does not eliminate the risk to human health and the environment or reduce contaminant concentration or mass.

This alternative is effective in the short term and the long term with implementation of a UECA agreement. Instituting LUCs requires cooperation and coordination between the federal government, state environmental regulators, and the property owners. For LUCs to be effective, the parties must consult and work collaboratively to take responsibility for their implementation, management and enforcement.

Implementability: The LUCs alternative can be readily implemented by completing a UECA agreement with the State. As the SLERA indicated that environmental risks were unlikely at DU 1, the administrative feasibility of LUCs, i.e., the ability to obtain approvals from agencies, is likely to be achieved. Administrative services would be necessary in the implementation of this alternative to implement the UECA agreement.

Cost: The costs for this alternative would be low when compared to Alternatives 3 through 6. LUCs would include a LUCIP and administrative costs for development of the UECA agreement. Because the DU will not achieve UU/UE, Five-Year reviews to verify the effectiveness of the alternative will be required.

Outcome: While Alternative 2 is not effective in reducing the volume of impacted soil or contaminant mass and does not allow for UU/UE, it is effective in reducing the risk of exposure to the contaminant mass and implementable. Accordingly, the LUCs alternative will be evaluated in the detailed analysis because it meets key elements of the effectiveness and implementability criteria.

4.3.1.3 Alternative 3: Partial Soil Removal with LUCs

For DU 1, Alternative 3 entails conducting "hot spot" soil removals up to 2 ft bgs in SUs with identified risks. For the purposes of this FS, hot spots for DU 1 are defined as SUs with manganese concentrations that result in a DU-wide 95% UCL greater than the PRG (2,255 mg/kg). Because individual SUs with concentrations greater than the PRG may remain, Alternative 3 would not achieve UU/UE conditions. Therefore, this alternative would also include LUCs to limit land use to industrial uses.

ProUCL was used to determine the DU-wide 95% UCL by removing the maximum manganese concentration at each sampling interval until the PRG was achieved. Based on the RI sampling data, 1 foot of soil removal from five SUs (DU1A-SU12, DU1A-SU15, DU1A-SU18, DU1A-SU24, and DU1A-SU37) would reduce the DU-wide 95% UCL for manganese to less than the PRG for surface soil (0-1 ft bgs) and the combined surface and subsurface soil (0-2 ft bgs). The estimated volume of soil to be removed is 4,166 CY. Because DU 1 SUs were selected using statistical methods (as opposed to sampling 100% of the SUs), additional areas may be present within the DU where manganese concentrations are greater than the PRG and additional delineation sampling would be required to verify that the DU-wide 95% UCL manganese concentration was less than the PRG. In addition, DU1B-SU12 and DU1B-SU37 would also require excavation in order to reduce potential ecological risks due to manganese. The additional volume of soil requiring excavation is 1,667 CY for a total of 5,833 CY.

Appendix A, Figure 3 shows the locations and excavation depths for the DU 1 SUs. ProUCL output is provided in Appendix C.

Additional soil sampling and analysis would be required to verify that the concentrations of manganese in DU 1 soil result in a DU-wide 95% UCL that is less than the PRG and to properly profile and dispose of the waste stream as either RCRA hazardous or RCRA non-hazardous.

Effectiveness: Alternative 3 would be protective of human health and the environment. It is effective in the short and long term as contaminated soil will be removed from "hot spots" and will reduce the volume of contaminants. However, this alternative does not allow for UU/UE.

During implementation, health and safety precautions would be required to protect workers from risks associated with excavation and offsite disposal of contaminated soil.

Implementability: This alternative is technically feasible. Excavation equipment and personnel are readily available. The materials and services required to implement this alternative are available. The ability to obtain coordination from regulators and the community is likely to be achieved.

Although there are no identified risks to human receptors for an industrial use property and other alternatives (e.g., LUCs) will address risks to hypothetical future resident child and/or adult receptors, the DLA (as executor for the GSA) is likely to support hot spot excavation to facilitate the sale of the Depot property.

LUCs to manage the remaining potential risks would also be required. The LUCs can be readily implemented by completing a UECA agreement with the state. Because the SLERA indicated that environmental risks were unlikely at DU 1, the administrative feasibility of LUCs, i.e., the ability to obtain approvals from agencies, is likely to be achieved. Administrative services would be necessary in the implementation of this alternative to implement the UECA agreement.

Cost: The cost to implement this alternative is high when compared with the costs for Alternative 2, moderate when compared with the costs for Alternative 5 and 6 but lower than the costs for Alternative 4. Costs include, preparation of sediment and erosion control plans, UECA documents, additional soil sampling and analysis, clearing vegetation, removal of buildings and foundations, removal of debris from collapsed buildings, excavation of more than five of acres of soil, site restoration, and Five Year Reviews.

Outcome: This alternative is more costly than Alternative 2 and does not allow for UU/UE. However, Alternative 3 provides a remedial alternative that results in a reduction of contaminant mass at the DU and mitigates future risk of exposure to receptors. Therefore, Alternative 3 will be evaluated for DU 1 in the detailed analysis in the next section.

4.3.1.4 Alternative 4: Complete Soil Removal to UU/UE

The DERP Manual requires an action to remediate a site to a condition that allows for UU/UE. Therefore, Alternative 4 would include complete removal of manganese contaminated soil such that LUCs would not be required. This alternative would include additional delineation to fully define the vertical (up to 15 ft bgs) and horizontal extent of the manganese impacts. Based on the percentage of sampled SUs exhibiting contamination greater than PRGs, there may be up to 58 acres of soil where manganese concentrations are greater than the PRG (Section 2.6.1). Additional delineation of manganese impacted soil in the vertical and horizontal extents would be necessary to refine the estimated volume of impacted soil.

Effectiveness: For the DU, this alternative would be protective of human health and the environment. This alternative would not be effective in the short term due to the large area of

excavation and the adverse impacts to the environment during implementation. It is effective in the long term as contaminated soil will be removed and disposed of offsite, reducing the volume of contaminants onsite, eliminating any residual risk associated with manganese as identified in the RI (ERT, 2020), and allowing for UU/UE. During implementation, health and safety precautions would be required to protect workers and site visitors from remedial activities. Additionally, significant safety precautions would be associated with the potential deeper excavations that would require sophisticated shoring methods for worker safety.

Implementability: For the DU, this alternative is considered technically feasible. Excavation equipment and personnel are readily available. Buildings abandoned rail lines, and roads within DU 1 may need to be demolished, removed, and disposed of to successfully implement this alternative.

Given the current zoning for industrial use, it is unlikely that the DLA (as executor for the GSA) will administratively support this alternative as no risks to industrial use site receptors (maintenance workers and construction) at DU 1 were identified in the HHRA.

Cost: The cost to implement this alternative is high for the DU. Costs include, additional soil sampling and analysis, clearing vegetation, removal of buildings and foundations, removal of debris from collapsed buildings, excavation of tens of acres of soil, and site restoration. Potentially elaborate excavation operations, including shoring of the deeper unstable subsurface soil, would need to be planned, designed, and safely implemented. Alternative 4 has the highest costs when compared with all other alternatives.

Outcome: Although Alternative 4 is effective in the long term it is excessively costly and potentially administratively infeasible. Therefore, Alternative 4 was not retained for the detailed comparative analysis in the next section.

4.3.1.5 Alternative 5: Capping

Alternative 5 would implement a treatment technology that would result in a reduction of exposure to site contaminants. Alternative 5 would include capping of manganese in soil. Because contaminants remain on site, LUCs would be required.

Additional soil sampling and analysis would be required to determine the full horizontal extent of manganese contaminated soil within the DU and, therefore, the size of the area to be capped.

Effectiveness: For the DU, this alternative would be protective of human health and the environment. It is effective in the long term as exposure to manganese impacted soil would be reduced, but long-term monitoring of the cap would be required to maintain long-term effectiveness. This alternative provides short-term effectiveness as it would not take a long time to implement.

Implementability: For the DU, this alternative is considered technically and potentially administratively feasible. Technically, this alternative has been implemented at similar sites within the State and all required labor, equipment and materials are readily available. Administrative feasibility may be adversely impacted by the need to obtain approval from DLA (as executor for the GSA) to commit to the remedy for this DU because no risks to the likely industrial receptors were identified in the HHRA.

Cost: The cost to implement this alternative is moderate to high for the DU when compared with Alternative 2 and Alternative 6, but less than Alternatives 3, and 4. Costs include additional delineation sampling and analysis, site preparation, design of the cap, cap maintenance and long-

term monitoring of the cap. Costs also include implementation of LUCs, the development of a LUCIP and 5-Year reviews.

Outcome: Alternative 5 is effective in the short and long term. No risks to the likely current and future human receptors were identified in the HHRA. Alternative 5 may not be administratively feasible as other alternatives (e.g., LUCs) will address identified risks to hypothetical future resident child and/or adult receptors and it is unlikely that the DLA (as executor for the GSA) will commit to this remedy. Therefore, Alternative 5 was not retained for the detailed comparative analysis in the next section.

4.3.1.6 Alternative 6: Phytoextraction to Reduce Contaminant Concentrations

Alternative 6 would implement a treatment technology, as discussed in Section 3.4.2, that would result in a reduction of contaminant volume for offsite disposal (as compared to Alternative 4) and reduce human health risks. Because UU/UE conditions may not be achieved, LUCs would be required.

Additional soil sampling and analysis plus a treatability study would be required to determine the full horizontal and vertical extent of manganese contaminated soil and the efficacy of phytoextraction at the DU.

Effectiveness: For the DU, this alternative would be protective of human health and the environment. It is effective in the long term as manganese will be removed, reducing the volume of site contaminants. However, this alternative does not provide short-term effectiveness as it could take considerable time to implement.

Implementability: For the DU, this alternative may be technically and administratively feasible. Technical feasibility may be adversely impacted by the depth of the manganese impacted soil. Administrative feasibility may be adversely impacted by the need to obtain approval from DLA (as executor for the GSA) to commit to the time required to remediate the DU because the identified risks are to hypothetical resident receptors and no risks to the likely industrial receptors were identified in the HHRA. In addition, risks to ecological receptors were determined to be unlikely in the SLERA.

Cost: The cost to implement this alternative is significant for the DU when compared with Alternative 2. Costs include a treatability study to determine suitable plant species for phytoextraction of manganese and efficacy of phytoextraction at the site, preparation of the site for planting, purchase of seeds/plants, maintenance of the planting (e.g., watering, weeding), harvesting the above ground portions of the plants, and disposal of the harvested plant materials. Costs also include implementation of LUCs, the development of a LUCIP and 5-Year reviews since risk to human health may remain onsite.

Outcome: For the DU, Alternative 6 is not effective in the short term, may not be technically or administratively feasible, and is more costly than Alternative 2. Therefore, Alternative 6 was not retained for the detailed comparative analysis in the next section.

4.3.2 DU 2

In DU 2 soil, the HHRA identified risks to human health (hypothetical resident child and hypothetical adult receptors) due to arsenic and manganese concentrations in soil. Therefore, arsenic and manganese are the human health COPCs in DU 2 soil. The SLERA concluded that ecological impacts at DU 2 were unlikely.

4.3.2.1 Alternative 1: No Action

The No Action alternative is evaluated to satisfy the NCP requirement of 40 CFR 300.430(e)(6), which requires consideration of this alternative as a baseline against which other alternatives may be compared. The no action alternative would involve leaving the subject areas in their current condition. Under this alternative, no remedial action will be taken, and any potential contaminants are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. The No Action alternative is evaluated to satisfy the NCP requirement of 40 CFR 300.430(e)(6), which requires consideration of this alternative as a baseline against which other alternatives may be compared. The no action alternative would involve leaving the subject areas in their current condition. Under this alternative, no remedial action will be taken, and any potential contaminants are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. This alternative would leave arsenic and manganese concentrations in place, without further environmental management or remedial action

Effectiveness: The no action alternative would not provide for protection of human health and the environment. The potential risks associated with arsenic and/or manganese would not be expected to decrease significantly over time. Therefore, this alternative would not be effective in achieving the RAOs in the short term or the long term, as it does not reduce the risk to human health and the environment, reduce contaminant concentration or mass, nor does not allow for UU/UE.

Implementability: The no action alternative is easy to implement. No services or materials would be required to implement this alternative. However, it will be technically ineffective and administratively unfavorable and will fail to achieve the RAOs.

Cost: There are no costs associated with the no action alternative.

Outcome: Alternative 1 fails the effectiveness and implementability criteria. However, in accordance with the NCP, this alternative must be evaluated against the threshold criteria and balancing factors in the next section, as a baseline for comparison, and is therefore retained for further evaluation.

4.3.2.2 Alternative 2: Land Use Controls

LUCs, administrative and physical, can include signage, security fencing, environmental covenants, and/or education to limit access. As developed for the Depot, Alternative 2 will include an environmental covenant that conveys when the property is sold to restrict land use to industrial purposes.

For this alternative, a LUCIP will be developed, which would include a delineation of enforcement and maintenance responsibilities.

Effectiveness: The LUCs alternative would provide protection of human health and the environment by limiting the potential for exposure to risks that may be present. However, this alternative does not reduce the volume of contaminated soil, and it does not allow for UU/UE as it does not eliminate the risk to human health and the environment or reduce contaminant concentration or mass.

This alternative is effective in the short term and the long term with implementation of a UECA agreement. Instituting LUCs requires cooperation and coordination between the federal government, state environmental regulators, and the property owners. For LUCs to be effective,

the parties must consult and work collaboratively to take responsibility for their implementation, management and enforcement.

Implementability: The LUCs alternative can be readily implemented by completing a UECA agreement with the State. As the SLERA indicated that environmental risks were unlikely at DU 2, the administrative feasibility of LUCs, i.e., the ability to obtain approvals from agencies, is likely to be achieved. Administrative services would be necessary in the implementation of this alternative to implement the UECA agreement.

Cost: The costs for this alternative would be low when compared to Alternatives 3 through 6. LUCs would include a LUCIP and administrative costs for development of the UECA agreement. Because the DU will not achieve UU/UE, Five-Year reviews to verify the effectiveness of the alternative will be required.

Outcome: While Alternative 2 is not effective in reducing the volume of impacted soil and does not allow for UU/UE, it is effective in reducing the risk of exposure to the contaminant mass and implementable. Accordingly, the LUCs alternative will be evaluated in the detailed analysis because it meets key elements of the effectiveness and implementability criteria.

4.3.2.3 Alternative 3: Partial Soil Removal with LUCs

For DU 2, Alternative 3 entails conducting "hot spot" soil removals down to 2 ft bgs in SUs with identified risks. For the purposes of this FS, hot spots for DU 2 are defined as SUs with arsenic and/or manganese concentrations that result in a DU-wide 95% UCL greater than the PRGs (18.65 mg/kg for arsenic and 2,169 mg/kg for manganese). Because individual SUs and soil below 2 ft bgs with concentrations greater than the PRGs may remain, this alternative would also include LUCs to limit land use to industrial uses.

ProUCL was used to determine the DU-wide 95% UCL by removing the maximum arsenic and manganese concentrations at each sampling interval until the PRG was achieved. Based on the RI sampling data, 1 foot of soil removal from five SUs (DU2A-SU03, DU2A-SU08, DU2A-SU11, DU2A-SU12, and DU2A-SU15) and 2 feet of soil removal from three surface and three subsurface SUs (DU2 A/B-SU06, DU2 A/B-SU07, and DU2 A/B-SU14) would reduce the DU-wide 95% UCL for arsenic and manganese to less than the PRG for surface soil (0-1 ft bgs) and the combined surface and subsurface soil (0-2 ft bgs). The estimated volume of soil to be removed is 8,870 CY. Figure 4 shows the locations and excavation depths for the DU 2 SUs. ProUCL output is provided in Appendix C.

Additional soil sampling and analysis would be required to verify that the concentrations of arsenic and manganese in DU 2 soil result in a DU-wide 95% UCLs that are less than the PRGs and to properly profile and dispose of the waste stream as either RCRA hazardous or RCRA non-hazardous.

Effectiveness: Alternative 3 would be protective of human health and the environment. It is effective in the short and long term as contaminated soil will be removed from "hot spots" and will reduce the volume of contaminants

During implementation, health and safety precautions would be required to protect workers from risks associated with excavation and offsite disposal of contaminated soil.

Implementability: This alternative is technically and administratively feasible. The materials and services required to implement this alternative are available. The ability to obtain coordination from regulators and the community is likely to be achieved.

Although there are no identified risks to human receptors for an industrial use property and other alternatives (e.g., LUCs) will address risks to hypothetical future resident child and/or adult receptors, the DLA (as executor for the GSA) is likely to support hot spot excavation to facilitate the sale of the Depot property.

LUCs to manage the remaining potential risks would also be required. The LUCs alternative can be readily implemented by completing a UECA agreement with the state. The administrative feasibility of LUCs, i.e., the ability to obtain approvals from agencies, is likely to be achieved. Administrative services would be necessary in the implementation of this alternative to implement the UECA agreement.

Cost: The cost to implement this alternative is high when compared with the costs for Alternative 2, Alternative 5 and Alternative 6, but lower than the costs for Alternative 4. Costs include, preparation of sediment and erosion control plans, UECA documents, additional soil sampling and analysis, clearing vegetation, removal of buildings and foundations, removal of debris from collapsed buildings, excavation of more than five of acres of soil, site restoration, and Five Year Reviews.

Outcome: This alternative is effective in the short and long term, is technically feasible. Alternative 3 does not allow for UU/UE and is more costly than Alternative 2. However, Alternative 3 would result in a reduction in contaminant mass at the DU and mitigates future risk of exposure to receptors. Therefore, Alternative 3 will be evaluated in the detailed analysis in the next section.

4.3.2.4 Alternative 4: Complete Soil Removal to UU/UE

The DERP Manual requires an action to remediate a site to a condition that allows for UU/UE. Therefore, Alternative 4 would include complete removal of arsenic and/or manganese contaminated soil (up to 15 ft bgs) such that LUCs would not be required. Additional delineation of arsenic and manganese impacted soil in the vertical and horizontal (additional arsenic and/or manganese impacts may exist outside of the DU boundary) directions would be advised to refine the estimated volume of impacted soil.

Effectiveness For the DU, this alternative would be protective of human health and the environment. This alternative would be effective in the short term as it is a relatively small area. Short-term effectiveness is adversely affected as the environment would be adversely impacted during excavation activities. It is effective in the long term as contaminated soil will be removed and disposed of offsite, reducing the volume of contaminants onsite, eliminating any residual risk associated with concentrations of arsenic and manganese identified in the RI (ERT, 2020), and allowing for UU/UE. During implementation, health and safety precautions would be required to protect workers and site visitors from remedial activities. Additionally, significant safety precautions would be associated with the deeper excavations that may require sophisticated shoring methods for worker safety.

Implementability: This alternative is technical feasibility as equipment is readily available, the size of the removal area (estimated at 9 acres) is not overly large. However, this alternative may require sophisticated shoring of unstable subsurface soils and may significantly impact the environment. In addition, buildings, abandoned rail lines, and roads within DU 2 may need to be demolished, removed, and disposed of to successfully implement this alternative.

Given the current zoning for industrial use, that the risks identified in the HHRA are only to resident receptors and risks to ecological receptors were determined to be unlikely in the SLERA, it is unlikely that the DLA (as executor for the GSA) will administratively support this alternative.

Cost: The cost to implement this alternative is significant for the DU and are high when compared with all other alternatives. Costs include, additional soil sampling and analysis; clearing vegetation; removal and disposal of buildings, rail lines and foundations; excavation of approximately nine of acres of soil; and site restoration. Potentially elaborate excavation operations, including shoring of the deeper unstable subsurface, if necessary, would need to be planned, designed, and safely implemented. Alternative 4 has the highest costs when compared with all other alternatives.

Outcome: For the DU, Alternative 4 is effective in the long term and is technically feasible. Alternative 4 may not be administratively feasible and is excessively costly as compared to all other alternatives. Therefore, Alternative 4 was not retained for the detailed comparative analysis in the next section.

4.3.2.1 Alternative 5: Capping

Alternative 5 would implement a treatment technology that would result in a reduction of exposure to DU contaminants. Alternative 5 would include capping of arsenic and manganese in soil. Because contaminants remain on site, LUCs would be required.

Effectiveness: For the DU, this alternative would be protective of human health and the environment. It is effective in the long term as exposure to arsenic and manganese impacted soil would be reduced, but long-term monitoring of the cap would be required to maintain long-term effectiveness. This alternative provides short-term effectiveness as it would not take a long time to implement.

Implementability: For the DU, this alternative is considered technically and potentially administratively feasible. Technically, this alternative has been implemented at similar sites within the State and all required labor, equipment and materials are readily available. Administrative feasibility may be adversely impacted by the need to obtain approval from DLA (as executor for the GSA) to commit to the remedy for this DU because no risks to the likely industrial receptors were identified in the HHRA and risks to ecological receptors were determined to be unlikely in the SLERA.

Cost: The cost to implement this alternative is moderate to high for the DU when compared with Alternative 2 and Alternative 6, but less than Alternatives 3, and 4. Costs include site preparation, design of the cap, cap maintenance and long-term monitoring of the cap. Costs also include implementation of LUCs, the development of a LUCIP and 5-Year reviews.

Outcome: Alternative 5 is effective in the short and long term. No risks to the likely current and future human receptors were identified in the HHRA, Alternative 5 may not be administratively feasible as it is unlikely that the DLA (as executor for the GSA) will commit to this remedy. Therefore, Alternative 5 was not retained for the detailed comparative analysis in the next section.

4.3.2.2 Alternative 6: Phytoextraction to Reduce Contaminant Concentrations

Alternative 6 would implement a treatment technology, as discussed in Section 3.4.2, that would result in a reduction of contaminant volume for offsite disposal (as compared to Alternative 4) and

reduce human health risks. Because UU/UE conditions may not be achieved, LUCs would be required.

Additional soil sampling and analysis plus a treatability study would be required to determine the full vertical extent of arsenic and manganese contaminated soil and the efficacy of phytoextraction at the DU.

Effectiveness: For the DU, this alternative would be protective of human health and the environment. It is effective in the long term as arsenic and manganese will be removed, reducing the volume of site contaminants. However, this alternative does not provide short-term effectiveness as it could take considerable time to implement.

Implementability: For the DU, this alternative may be technically and administratively feasible. Technical feasibility may be adversely impacted by the depth of the arsenic and/or manganese impacted soils as phytoremediation may not be feasible at depths greater than 5 ft bgs. Administrative feasibility may be adversely impacted by the need to obtain approval from DLA (as executor for the GSA) to commit to the time required to remediate the DU.

Given the current zoning for industrial use and that the risks identified in the HHRA are only to resident receptors (no risks to the likely industrial receptors were identified) and risks to ecological receptors were determined to be unlikely in the SLERA, it is unlikely that the DLA (as executor for the GSA) will administratively support this alternative.

Cost: The cost to implement this alternative is significant for the DU when compared with Alternative 2. Costs include additional soil sampling and analysis, a treatability study to determine suitable plant species for phytoextraction of COCs and efficacy of phytoextraction at the DU, preparation of the site for planting, purchase of seeds/plants, maintenance of the planting (e.g., watering, weeding), harvesting the above ground portions of the plants, and disposal of the harvested plant materials. Costs also include implementation of LUCs, the development of a LUCIP and 5-Year reviews since risk to human health may remain onsite.

Outcome: Alternative 6 may be technically feasible and is effective in the long term. However, Alternative 6 is not effective in the short term, may not be administratively feasible, and is more costly than Alternative 2. Therefore, Alternative 6 will not be evaluated in the detailed analysis section.

4.3.3 DU 3

In DU 3 soil, the HHRA identified risks to human health (all evaluated receptors) due to arsenic and/or manganese concentrations in soil. The SLERA concluded that ecological impacts due to manganese concentrations in soil were likely. Therefore, arsenic and manganese are the human health COPCs and manganese is the ecological COEC in DU 3 soil.

4.3.3.1 Alternative 1: No Action

The No Action alternative is evaluated to satisfy the NCP requirement of 40 CFR 300.430(e)(6), which requires consideration of this alternative as a baseline against which other alternatives may be compared. The no action alternative would involve leaving the subject areas in their current condition. Under this alternative, no remedial action will be taken, and any potential contaminants are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. The No Action alternative is evaluated to satisfy the NCP requirement of 40 CFR 300.430(e)(6), which requires consideration of this alternative as a baseline against which other alternatives may be compared. The no action alternative would involve leaving the subject

areas in their current condition. Under this alternative, no remedial action will be taken, and any potential contaminants are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. This alternative would leave arsenic and manganese concentrations in place, without further environmental management or remedial action

Effectiveness: The no action alternative would not provide for protection of human health and the environment. The potential risks associated with arsenic and/or manganese would not be expected to decrease significantly over time. Therefore, this alternative would not be effective in achieving the RAOs in the short term or the long term, as it does not reduce the risk to human health and the environment, reduce contaminant concentration or mass, nor does not allow for UU/UE.

Implementability: The no action alternative is easy to implement. No services or materials would be required to implement this alternative. However, it will be technically ineffective and administratively unfavorable and will fail to achieve the RAOs.

Cost: There are no costs associated with the no action alternative.

Outcome: Alternative 1 fails the effectiveness and implementability criteria. However, in accordance with the NCP, this alternative must be evaluated against the threshold criteria and balancing factors in the next section, as a baseline for comparison, and is therefore retained for further evaluation.

4.3.3.2 Alternative 2: Land Use Controls

LUCs, administrative and physical, can include signage, security fencing, environmental covenants, and/or education to limit access. As developed for the Depot, Alternative 2 will include an environmental covenant that conveys when the property is sold to restrict land use to industrial purposes.

For this alternative, a LUCIP will be developed, which would include a delineation of enforcement and maintenance responsibilities.

Effectiveness: This alternative is effective for mitigating human health risks in the short term and the long term with the implementation of a UECA agreement but, LUCs would not be effective for mitigating the environmental risks due to manganese in soil at DU 3. This alternative does not reduce the volume of contaminated soil, and it does not allow for UU/UE as it does not eliminate the risk to human health and the environment or reduce contaminant concentration or mass.

Instituting LUCs requires cooperation and coordination between the federal government, state environmental regulators, and the property owners. For LUCs to be effective, the parties must consult and work collaboratively to take responsibility for their implementation, management and enforcement.

Implementability: The LUCs alternative can be readily implemented by completing a UECA agreement with the State. As the SLERA indicated that environmental risks were evident at DU 3, the administrative feasibility of LUCs, i.e., the ability to obtain approvals from regulatory agencies, is not likely to be achieved.

Cost: The costs for this alternative would be low. Costs for LUCs would include development of a LUCIP and administrative costs for development of the UECA agreement. Because the DU will not achieve UU/UE, costs also include a LUCIP and the 5-Year review reports to verify the effectiveness of the alternative.

Outcome: Alternative 2 is not effective in reducing the volume of impacted soil and does not allow for UU/UE. Unlike the other DUs, DU 3 poses ecological risks and LUCs will not be effective in mitigating them. Accordingly, the LUCs only alternative will not be evaluated as a separate alternative in the detailed analysis because it does not meet the key elements of the effectiveness but will be evaluated as part of other remedial alternatives.

4.3.3.3 Alternative 3: Partial Soil Removal with LUCs

For DU 3, Alternative 3 entails conducting a partial soil removal to remediate soil down to 2 ft bgs. This alternative would include additional sampling of soil for arsenic and manganese analysis and an evaluation of the risks remaining in the DU. This alternative may also include LUCs to limit land use to industrial uses, as with Alternative 2.

For DU 3, Alternative 3 entails conducting "hot spot" soil removal down to 2 ft bgs in SUs with identified risks. For the purposes of this FS, hot spots for DU 3 are defined as SUs with arsenic and/or manganese concentrations that result in a DU-wide 95% UCL greater than the PRGs (18.81 mg/kg for arsenic and 2,227 mg/kg for manganese). Because individual SUs and soil below 2 ft bgs with concentrations greater than the PRGs may remain, this alternative may also include LUCs to limit land use to industrial uses.

ProUCL was used to determine the DU-wide 95% UCL by removing the maximum arsenic and manganese concentrations at each sampling interval until the PRG was achieved. Based on the RI sampling data, 1 foot of soil removal from four surface soil SUs (DU3A-SU02, DU3A-SU06, DU3A-SU07, and DU3A-SU09) and 2 feet of soil removal from four surface and four subsurface soil SUs (DU3 A/B-SU01, DU3 A/B-SU03, DU3 A/B-SU04, and DU3 A/B-SU10) would reduce the DU-wide 95% UCL for arsenic and manganese to less than the PRG for surface soil (0-1 ft bgs) and the combined surface and subsurface soil (0-2 ft bgs). The estimated volume of soil to be removed is 9,680 CY. Figure 5 shows the locations and excavation depths for the DU 3 SUs. ProUCL output is provided in Appendix C.

Additional soil sampling and analysis would be required to verify that the concentrations of arsenic and manganese in DU 3 soil result in DU-wide 95% UCLs that are less than the PRGs and to properly profile and dispose of the waste stream as either RCRA hazardous or RCRA non-hazardous.

Effectiveness: Alternative 3 would be protective of human health and the environment. It is effective in the long term as impacted soil will be removed from the DU and will reduce the volume of contaminants. Alternative 3 is effective in the short term based on the ability to achieve the RAOs in a relatively short period.

During implementation, health and safety precautions would be required to protect workers from risks associated with excavation and offsite disposal of contaminated soil.

Implementability: This alternative is technically and administratively feasible. Educational and notification requirements for intrusive work can be enforced. The materials and services required to implement this alternative are available. The ability to obtain coordination from DLA (as executor for the GSA) , regulators, and the community, is likely to be achieved.

Cost: The cost to implement this alternative is moderate to high for the DU. Costs include, additional soil sampling and analysis, clearing vegetation, removal of pavement, excavation of up to five of acres of soil, site restoration, a LUCIP, LUCs, and five-year reviews. Excavation operations would need to be planned, designed, and safely implemented.

Outcome: Alternative 3 is effective in the short and long term and is technically and administratively feasible. Alternative 3 will also reduce the risks to ecological receptors. Therefore, Alternative 3 will be evaluated in the detailed analysis in the next section.

4.3.3.4 Alternative 4: Complete Soil Removal to UU/UE

As the DERP Manual requires an action to remediate a site to a condition that allows for UU/UE, Alternative 4 was developed. Therefore, Alternative 4 would include complete removal of arsenic and/or manganese contaminated soil (up to 15 ft bgs) such that LUCs would not be required. Additional delineation of arsenic and manganese impacted soil in the vertical and horizontal (additional arsenic and/or manganese impacts may exist outside of the DU boundary) directions would be necessary to refine the estimated volume of impacted soil.

Effectiveness: For the DU, this alternative would be protective of human health and the environment. This alternative does not provide short-term effectiveness as it would take considerable time to implement. It is effective in the long term as contaminated soil will be removed and disposed of offsite, reducing the volume of contaminants onsite, eliminating any residual risk, and allowing for UU/UE. During implementation, health and safety precautions would be required to protect workers and site visitors from remedial activities. Additionally, significant safety precautions would be associated with the deeper excavations that may require elaborate shoring methods for worker safety.

Implementability: This alternative is technical feasibility as equipment is readily available, the size of the removal area (estimated at 4 acres) is not overly large. However, this alternative may require elaborate shoring of unstable subsurface soils and may significantly impact the environment. There are no known buildings, foundations, or rail lines within DU 3. There is a concrete pad associated with the former ore pile storage in DU 3. This concrete pad may have to be demolished and disposed of in order to successfully implement this alternative.

Given the current zoning for industrial use and that the risks identified in the HHRA and SLERA can be mitigated with less costly alternatives, it is unlikely that the DLA (as executor for the GSA) will administratively support this alternative.

Cost: The cost to implement this alternative is significant for the DU and are high when compared with other alternatives. Costs include, additional soil sampling and analysis, clearing vegetation, removal of pavement, excavation of four of acres of soil, and site restoration. Potentially elaborate excavation operations, including shoring of the deeper unstable subsurface, would need to be planned, designed, and safely implemented. Alternative 4 has the highest costs when compared with all other alternatives.

Outcome: For the DU, Alternative 4 is effective in the long term and is technically feasible. Alternative 4 may not be administratively feasible and is excessively costly as compared to other alternatives. Therefore, Alternative 4 was not retained for the detailed comparative analysis in the next section.

4.3.3.1 Alternative 5: Capping

Alternative 5 would implement a treatment technology that would result in a reduction of exposure to site contaminants. Alternative 5 would include capping of arsenic and manganese in soil. Because contaminants remain on site, LUCs would be required.

Effectiveness: For the DU, this alternative would be protective of human health and the environment. It is effective in the long term as exposure to arsenic and manganese impacted soil would be reduced, but long-term monitoring of the cap would be required to maintain long-term effectiveness. This alternative provides short-term effectiveness as it would not take a long time to implement.

Implementability: For the DU, this alternative is considered technically and potentially administratively feasible. Technically, this alternative has been implemented at similar sites within the State and all required labor, equipment and materials are readily available. This alternative would reduce the risks to the likely industrial receptors identified in the HHRA and would reduce the ecological risks due to manganese in soil identified in the SLERA. Therefore, DLA (as executor for the GSA) would likely consider this an acceptable remedy.

Cost: The cost to implement this alternative is moderate to high for the DU when compared with Alternative 2 and Alternative 6, but less than Alternatives 3, and 4. Costs include site preparation, design of the cap, cap maintenance and long-term monitoring of the cap. Costs also include implementation of LUCs, the development of a LUCIP and 5-Year reviews.

Outcome: Alternative 5 is effective in the short and long term and is technically feasible. Alternative 5 would likely be administratively feasible. Therefore, Alternative 5 will be retained for the detailed comparative analysis in the next section.

4.3.3.2 Alternative 6: Phytoextraction to Reduce Contaminant Concentrations

Alternative 6 would implement a treatment technology that would result in a reduction of contaminant volume for offsite disposal (as compared to Alternative 4) and reduce human health and ecological risks. Because UU/UE conditions may not be achieved, LUCs would be required.

Additional soil sampling and analysis plus a treatability study would be required to determine the full extent vertical of arsenic and manganese contaminated soil and the efficacy of phytoextraction at the DU.

Effectiveness: For the DU, this alternative would be protective of human health and the environment. It is effective in the long term as arsenic and manganese will be removed, reducing the volume of site contaminants. However, this alternative does not provide short-term effectiveness as it could take considerable time to implement.

Implementability: For the DU, this alternative is considered technically and may be administratively feasible. Technical feasibility may be adversely impacted by the depth of the arsenic and/or manganese impacted soils as phytoremediation may not be feasible at depths greater than 5 ft bgs. Administrative feasibility may be adversely impacted by the need to obtain approval from DLA (as executor for the GSA) to commit to the time required to remediate the DU.

The risks to human health and ecological receptor risks can be mitigated with alternatives that require less time to implement, it is unlikely that the DLA (as executor for the GSA) will administratively support this alternative.

Cost: The cost to implement this alternative is significant for the DU when compared with Alternative 2. Costs include additional sampling and analysis, a treatability study to determine suitable plant species for phytoextraction of COCs and efficacy of phytoextraction at the site, preparation of the site for planting, purchase of seeds/plants, maintenance of the planting (e.g., watering, weeding), harvesting the above ground portions of the plants, and disposal of the

harvested plant materials. Costs also include implementation of LUCs, the development of a LUCIP and 5-Year reviews since risk to human health may remain onsite.

Outcome: Alternative 6 is technically feasible and is effective in the long term. However, Alternative 6 is not effective in the short term and may not be administratively feasible. Therefore, Alternative 6 will not be evaluated in the detailed analysis section.

4.4 Summary of Remedial Alternatives Screening

Five alternatives were evaluated for each DU. The alternatives that are retained for further evaluation are summarized in Table 4-1.

Table 4.1. Summary of Retained Remedial Alternatives at the Former Curtis Bay Ordnance Depot

Alternative	DU 1	DU 2	DU 3
Alternative 1: No Action	**Yes**	**Yes**	**Yes**
Alternative 2: LUCs	**Yes**	**Yes**	No
Alternative 3: Partial Soil Removal with LUCs	**Yes**	**Yes**	**Yes**
Alternative 4: Complete Soil Removal to Achieve UU/UE	No	No	No
Alternative 5: Capping	No	No	**Yes**
Alternative 6: Phytoextraction to Reduce Contaminant Concentrations	No	No	No

5.0 DETAILED ANALYSIS OF ALTERNATIVES

In Section 4.0 the five remedial alternatives were screened against the three broad criteria of effectiveness, implementability, and cost. Alternatives 1 and 2 passed the broad criteria screening and were retained for further detailed evaluation for DU 1 and DU 2. Alternatives 1, 3 and 5 passed the criteria screening and were retained for further detailed evaluation for DU 3. Alternative 4 (Complete Soil Removal to UU/UE) and Alternative 6 (Phytoextraction to UU/UE) did not pass the broad criteria screening and were not retained for further evaluation for any of the DUs.

In this section, the remaining remedial alternatives undergo a detailed analysis where each alternative is assessed against the evaluation criteria described below. Then, the alternatives are compared to each other. The results identify the key tradeoffs among the alternatives to provide decision makers with information to adequately select the appropriate remedy for the site and demonstrate satisfaction of the CERCLA remedy selection requirements.

The detailed analysis of alternatives compares the alternatives against the threshold, balancing, and modifying criteria for DU 1 (Section 5.2), DU 2 (Section 5.4), and DU 3 (Section 5.6). Sections 5.3 (DU 1), 5.5 (DU 2), and 5.7 (DU 3) compare each of the DU alternatives against each other to determine overall strengths and weaknesses to ultimately select a preferred alternative in the Proposed Plan.

5.1 Evaluation Criteria

Nine evaluation criteria are directed by the NCP to address CERCLA requirements and technical and policy considerations that have proven to be important for selecting among remedial alternatives. These criteria serve as the basis for analyzing proposed remedial alternatives to determine the most appropriate alternatives to address remediation. The nine criteria are divided into three categories: threshold, balancing, and modifying. They are as follows:

- Threshold
  - Overall Protection of Public Health and Environment
  - Compliance with ARARs
- Balancing
  - Long-Term Effectiveness
  - Reduction of Toxicity, Mobility and Volume Through Treatment
  - Short-Term Effectiveness
  - Implementability
  - Cost
- Modifying
  - State (Regulator) Acceptance
  - Community Acceptance

5.1.1 Threshold Criteria

Assessments against two of the criteria relate directly to statutory findings that must ultimately be made in the Decision Document; therefore, these are categorized as threshold criteria and the remedial alternative chosen must meet the two criteria within this category (USEPA 1988).

5.1.1.1 Overall Protection of Public Health and Environment

This threshold criterion assesses whether each alternative provides adequate protection of human health and the environment. The overall assessment of protection considers assessments conducted under other evaluation criteria, including long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

5.1.1.2 Compliance with ARARs

This threshold criterion is used to determine whether each alternative will meet all the ARARs (as defined in CERCLA Section 121) that have been identified in Table 2.1. For each alternative, the following should be addressed: compliance with location-specific ARARs, action-specific ARARs, and chemical-specific ARARs.

5.1.2 Balancing Criteria

Balancing criteria are those that form the basis for comparison among alternatives that meet the threshold criteria. The five criteria in this category represent the primary criteria upon which the analysis is based.

5.1.2.1 Long-Term Effectiveness

This criterion addresses the remedial action in terms of the risk remaining at the site after response objectives have been met. The primary focus of this evaluation is the extent and effectiveness of the controls that may be required to manage the risk posed by residuals and/or any untreated wastes. The primary focus of the analysis is on:

- The magnitude of residual risk following completion of the remedial activities (CERCLA 5-year reviews are required when, following remediation, hazardous substances remain on site above levels which permit UU/UE); and
- The adequacy and reliability of any controls (e.g., access limitations, deed restrictions, long-term monitoring, etc.) used to manage the treated residuals or untreated wastes that remain at the site.

5.1.2.2 Reduction of Toxicity, Mobility or Volume Through Treatment

Based on USEPA's preference that a chosen removal alternative will reduce toxicity, mobility, or volume through treatment, an alternative must be evaluated based upon the following specific factors:

- The treatment processes employed and the materials it will treat;
- The amount of hazardous materials to be destroyed or treated;
- The degree of reduction expected in toxicity, mobility or volume;
- The degree to which the treatment will be irreversible;
- The type and quantity of residuals that will remain after treatment; and
- Whether the alternative meets the USEPA's preference for treatment.

5.1.2.3 Short-Term Effectiveness

This criterion addresses the effects of an alternative during the implementation phase, until the remedial objectives are met. More specifically, each alternative will be evaluated for:

- Protection of the community and workers during the remedial action;
- Adverse environmental impacts resulting from construction and implementation; and
- The time required to meet the remedial objectives.

5.1.2.4 Implementability

The implementability criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. This criterion focuses on analysis of the following factors:

Technical feasibility evaluates the ease of implementing a specific alternative, including:

- The reliability of the alternative and any technical operational difficulties;
- The reliability of the alternative to complete the remediation without significant schedule delays;
- The ease of conducting additional remedial actions following the initial undertaking; and
- The environmental conditions with respect to set-up, construction and operation of the alternative.

Administrative feasibility focuses on the planning stages for each alternative and includes evaluation of:

- Adherence to non-environmental laws (e.g., siting of a treatment plant in a residential neighborhood);
- Coordinating services needed to carry out an alternative;
- Arranging the delivery of services in a timely manner; and
- Addressing the concerns of other regulatory agencies.

Availability of materials and services evaluates the following:

- Availability of the personnel needed to perform the operations based on schedule;
- Availability of adequate off-site treatment, storage and disposal for materials; and
- Availability of supporting services (e.g., power lines, laboratory services, etc.).

5.1.2.5 Cost

This criterion evaluates projected costs associated with implementing the alternative. These costs include direct capital costs (i.e., costs of the technology or to perform the alternative), indirect capital costs (e.g., design expenses, legal fees, and permit fees), and post remedial site control costs (e.g., monitoring and operations and maintenance [O&M] costs). Where applicable, O&M costs are calculated for a 30-year duration. The USEPA RI/FS Guidance (USEPA 1988) indicates that order-of-magnitude cost estimates having an accuracy of -30% to +50% should suffice for the detailed analysis of response alternatives. All costs presented are rounded to the nearest thousand dollars.

5.1.3 Modifying Criteria

The final two criteria will be evaluated following the finalization of the FS and Proposed Plan and will be addressed once a final remedial decision is made (USEPA 1988).

5.1.3.1 State (Regulator) Acceptance

This criterion evaluates the technical and administrative issues and concerns the state may have for each of the alternatives. For this project, State Regulator is the MDE. This criterion will be assessed during the public comment period on the Proposed Plan and recorded in the Decision Document.

5.1.3.2 Community Acceptance

This criterion evaluates the issues and concerns the public may have for each of the alternatives. Like state acceptance, this criterion will be assessed during the public comment period on the Proposed Plan and recorded in the Decision Document.

5.2 Individual Analysis – DU 1 Remedial Alternatives

DU 1 is approximately 411 acres and consists of the area owned by GSA, but not within DU 2, DU 3, or the NTCRA areas (Appendix A, Figure 2). For this DU, unacceptable risk to human receptors (hypothetical resident child and resident adult) due to manganese concentrations in soil was identified in the HHRA.

This section individually evaluates the remaining two remedial alternatives for DU 1 against the nine CERCLA criteria, while Section 5.3 compares the alternatives to each other. The following discussions focus on how, and to what extent, the alternatives address each of the criteria by qualitatively assessing whether the alternative is favorable, moderately favorable, or not favorable, relative to the criterion (note that for the threshold criteria, which must be met, 'favorable' means criteria will be met, while 'unfavorable' means criteria will not be met). Table 5.1, presented at the end of Section 5.3, summarizes the detailed individual analysis of the DU 1 remedial alternatives.

5.2.1 Alternative 1: No Action

The No Action alternative is evaluated to satisfy the NCP requirement of 40 CFR 300.430(e)(6), which requires consideration of this alternative as a baseline against which other alternatives may be compared. The no action alternative would involve leaving the subject areas in their current condition. Under this alternative, no remedial action will be taken, and any potential contaminants are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. This alternative would leave arsenic and/or manganese concentrations in place, without further environmental management or remedial action

5.2.1.1 Threshold Criteria

For DU 1, under Alternative 1, no remedial action would be taken, and any potential contaminant risks are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. This alternative would leave any potentially contaminated soil present, in place, without further investigation or removal and potential risks are not mitigated. Therefore, Alternative 1 does not result in acceptable conditions and is not protective of human health and the environment for DU 1.

Alternative 1 was reviewed with respect to compliance with ARARs (see Table 2.1). Location-specific ARARs are related to the protection of the environment and wildlife species. Under this alternative, since no action will be taken, all location-specific ARARs will be complied with. Because no actions will be implemented under Alternative 1, no action-specific ARARs are triggered. Therefore, Alternative 1 complies with ARARs.

Because Alternative 1 is not protective of human health and the environment, it is not favorable for the threshold criteria.

5.2.1.2 Balancing Criteria

For DU 1, Alternative 1 is not favorable for the long-term effectiveness criterion because it would leave any contaminated soil potentially present, in place, and potential risks are not mitigated. Alternative 1 is not favorable in reducing the volume of contaminants at the site because it would leave any contaminated soil in place, without further investigation or removal. Alternative 1 is not favorable in meeting the short-term effectiveness criterion because although no time is needed to implement this alternative, soil remedial objectives will not be met.

Alternative 1 is favorable in meeting the implementability (technical and administrative feasibility, and availability of materials and services) criterion in that there are no activities proposed.

There are no costs associated with the no action alternative.

5.2.1.3 Modifying Criteria

State and community acceptance cannot be fully assessed until comments are processed following the public review period on the Proposed Plan. Therefore, these modifying criteria have not been included in this analysis but will be included following review and input from those parties.

5.2.2 Alternative 2: Land Use Controls

LUCs, administrative and physical, can include signage, security fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 2 will include an environmental covenant that conveys when the property is sold to restrict land use to industrial uses.

5.2.2.1 Threshold Criteria

For DU 1, Alternative 2 may include environmental covenants (a UECA agreement) to limit access to the DU. Because no risks to industrial receptors (maintenance workers, construction workers) were identified in the HHRA and risks to environmental receptors were determined to be unlikely in the SLERA, the purpose of the LUCs is to limit DU uses to industrial activities and exclude uses of the DU by children.

Alternative 2 was reviewed with respect to compliance with ARARs (see Table 2.1). Location-specific ARARs are related to the protection of the environment and wildlife species. While portions of the DU are within the Chesapeake Bay Critical Area and within a floodplain, and migratory birds are present in the DU, the implementation of a UECA agreement would not result in disruptive activities. Therefore, this alternative will comply with the location-specific ARARs. Because no soil removals or construction of physical LUCs will be implemented under Alternative 2, action-specific ARARs related to soil removal, water quality, or hazardous waste are not triggered.

Alternative 2 is protective of public health and the environment and complies with ARARs and is therefore favorable for the threshold criteria.

5.2.2.2 Balancing Criteria

For DU 1, Alternative 2 is favorable in providing long-term effectiveness by limiting the DU to industrial uses, minimizing human exposure. But it would leave any contaminated soil in place, and while the access of receptors to potential risks is reduced, it is not eliminated.

Alternative 2 is not favorable in reducing the volume of contaminated soil at the site because it would leave any contaminated soil in place, without further investigation or removal.

Alternative 2 is favorable in meeting the short-term effectiveness criterion because no significant work would be performed beyond the implementation of a UECA agreement. The estimated time to meet the remedial objectives would be short.

Overall, Alternative 2 is favorable in meeting the implementability (technical feasibility and availability of materials and services) criterion. It is technically feasible to implement a UECA agreement. The materials and services to implement this alternative are readily available. The administrative feasibility is also favorable as it is expected that the DLA (as executor for the property owner [GSA]) and MDE would be willing to implement the UECA agreement.

The estimated cost for Alternative 2 is approximately $107,000 in capital costs plus $1,251,000 for 30-years of O&M for a total of $1,358,000. Cost estimate documentation and cost summary reports (Remedial Action Cost Engineering Requirements [RACER] Version 11.5) are included in Appendix D.

5.2.2.3 Modifying Criteria

State and community acceptance cannot be fully assessed until comments are processed following the public review period on the Proposed Plan.

5.2.1 Alternative 3: Partial Soil Removal with LUCs

Alternative 3 includes removal of soil to mitigate risks to ecological receptors and LUCs to mitigate risks to human receptors (hypothetical resident child and resident adult). LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 3 will include an environmental covenant that conveys when the property is sold to restrict land use to industrial uses.

5.2.1.1 Threshold Criteria

For DU 1, Alternative 3 may include environmental covenants (a UECA agreement) to limit access to the DU. The purpose of the LUCs is to limit DU uses to industrial activities and exclude uses of the DU by resident children and resident adults. Alternative 3 includes partial removal of manganese contaminated soil to mitigate the risks to human health and ecological receptors.

Alternative 3 was reviewed with respect to compliance with ARARs (see Table 2.1). Location-specific ARARs are related to the protection of the environment and wildlife species. Migratory birds are present in the DU and coordinated planning and planned mitigation is required. Partial removal of the arsenic and/or manganese contaminated soil would be conducted so that all location-specific ARARs are met. Soil removal is a common remedial technology and proper planning of the soil removal action to ensure that the location-specific ARARs are met is implementable. The implementation of a UECA agreement would not result in disruptive activities. Therefore, this alternative will comply with the location-specific ARARs.

Because soil removals will be implemented under Alternative 3, action-specific ARARs would be triggered and remedial actions related to soil removal, water quality, or hazardous waste would be required to be conducted so that all action-specific ARARs are met. Soil removal is a common remedial technology and proper planning of the soil removal action to ensure that the action-specific ARARs are met is implementable.

Alternative 3 is protective of human health and the environment and complies with ARARs and is therefore favorable for the threshold criteria.

5.2.1.2 Balancing Criteria

For DU 1, Alternative 3 is favorable in providing long-term effectiveness by limiting the DU to industrial uses, minimizing human exposure, and by reducing exposure to ecological receptors. Alternative 3 may leave some contaminated soil in place, and while the access of receptors to potential risks is reduced, it is not eliminated.

Alternative 3 is moderately favorable in reducing the volume of contaminated soil at the site although, it may leave some contaminated soil in place at removal completion (i.e., removal is not to UU/UE).

Alternative 3 is effective in the short term as it is a relatively small area (based on the RI soil sampling results and ProUCL analysis shown in Section 4.3.1.3 this alternative includes, but is not limited to, soil removal from DU1A-SU12, DU1A-SU15, DU1A-SU18, DU1A-SU24, DU1A-SU37, DU1B-SU12, and DU1B-SU37). Short-term effectiveness is affected as the environment would be adversely impacted during excavation activities. The estimated time to meet the remedial objectives would be short.

Overall, Alternative 3 is favorable in meeting the implementability (technical feasibility and availability of materials and services) criterion. It is technically feasible to excavate and dispose of contaminated soils offsite and to implement a UECA agreement. The materials and services to implement this alternative are readily available. The administrative feasibility is favorable as it is expected that the property owner and MDE would be willing to support the implementation of the UECA agreement. The DLA (as executor for the property owner [GSA]) is likely to support Alternative 3 to facilitate the sale of the Depot property.

The cost to implement Alternative 3 is moderate to high. For DU 1, cost would include planning and implementation of the partial soil removal, LUCs, including a LUCIP, and implementation of the UECA. The cost for CERCLA 5-year reviews would also be included. The estimated cost for Alternative 3 is approximately $659,000 in capital costs plus $1,358,000 for 30-years of O&M for a total of $2,017,000. Cost estimate documentation and cost summary reports (RACER Version 11.5) are included in Appendix D.

5.2.1.3 Modifying Criteria

State and community acceptance cannot be fully assessed until comments are processed following the public review period on the Proposed Plan.

5.3 Comparative Analysis – DU 1 Remedial Alternatives

While Section 5.2 described and individually assessed each of the three DU 1 remedial alternatives against the nine criteria, this section evaluates the performance of each alternative relative to each other. The purpose of this comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another so that the key tradeoffs can be identified, and a preferred alternative selected. Table 5.1, presented at the end of this section, summarizes the detailed comparative analysis of the DU 1 remedial alternatives.

The most important evaluation is against the threshold criteria, as these must be met. While Alternative 1 was not protective of human health and the environment, Alternatives 2 and 3

achieved acceptable site conditions and were considered protective of human health and the environment.

All alternatives were compliant with the ARARs.

Regarding the balancing criteria, Alternatives 2 and 3 were effective in the long term, because the UECA agreement would limit the site to industrial uses, only. Alternative 1 was not favorable for this criterion.

With respect to the short-term effectiveness criterion, Alternative 2 was considered favorable because no significant work would be performed beyond the implementation of a UECA agreement, workers, and the environment will be protected during implementation. The estimated time to meet the remedial objectives would be short. Alternative 3 was considered moderately favorable for short-term effectiveness due to short-term impacts during soil removal activities. Alternative 1 was considered not favorable for this criterion.

Alternative 2 was ranked favorable with respect to the long-term effectiveness criterion because the UECA agreement would convey with a property transfer and would continue to be protective of human health and the environment. Alternative 3 was ranked favorable with respect to the long-term effectiveness criterion because the UECA agreement would convey with a property transfer and would continue to be protective of human health and the environment and would reduce potential risks. Alternative 1 was considered not favorable for this criterion.

Alternatives 1 and 2 were not favorable for the Reduction of Toxicity, Mobility and Volume Through Treatment criterion as neither alternative would result in a reduction of toxicity, mobility, or volume of contaminated soil. Alternative 3 was moderately favorable for this criterion as this alternative would result in the reduction of the volume of contaminants onsite.

Alternative 1 was ranked favorable in meeting the implementability (technical and administrative feasibility, and availability of materials and services) criterion, but only in that there are no activities proposed. Alternative 2 is favorable for the implementability criterion. Alternative 3 is favorable for the implementability criterion.

Alternative 3 had the highest cost due to the partial removal of soil plus implementation of the UECA agreement and Five-year reviews. Alternative 2 had the second highest costs based on implementation of the UECA agreement and Five-year reviews, while Alternative 1 had no associated costs.

Alternative 2 was assessed as having the highest number of favorable rankings for the CERCLA criteria. Alternative 3 is at a minimum moderately favorable for all CERCLA criteria rankings. Alternatives 2 and 3 are protective of human health and the environment, and compliant with ARARs.

Table 5.1: Summary of Detailed Analysis of Remedial Alternatives – DU 1

Evaluation Criteria	Screening Criterion	Alternative 1: No Action	Alternative 2: Land Use Controls	Alternative 3: Partial Soil Removal with Land Use Controls
Threshold	Overall Protection of Human Health and Environment	○	●	●
	Compliance with ARARs	○	●	●
Balancing	Long-Term Effectiveness	○	●	●
	Reduction of Toxicity, Mobility and Volume Through Treatment	○	○	◑
	Short-Term Effectiveness	○	●	◑
	Implementability:	●	●	●
	Cost\1	**$0.00**	**$1,358,000**	**$2,044,000**
Modifying\2	State Acceptance	TBD	TBD	TBD
	Community Acceptance	TBD	TBD	TBD

● Favorable ('YES' for threshold criteria),

◑ Moderately Favorable

○ Not Favorable ('NO' for threshold criteria)

\1 - Costs were developed using RACER. O&M for a 30-year duration is included, as applicable, for an alternative. Details are provided in Appendix D.
\2 – The Modifying criteria of state and community acceptance are 'To Be Determined (TBD)' following review and input from these parties.

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5.4 Individual Analysis – DU 2 Remedial Alternatives

DU 2 is approximately 8.6 acres and consists of the area formerly known as the IRP Shop Area (Appendix A, Figure 2). For this DU, unacceptable risk to human receptors (hypothetical resident child and hypothetical adult receptors) due to arsenic and manganese concentrations in soil were identified in the HHRA.

This section individually evaluates the remaining three remedial alternatives for DU 2 against the nine CERCLA criteria, while Section 5.5 compares the alternatives to each other. The following discussions focus on how, and to what extent, the alternatives address each of the criteria by qualitatively assessing whether the alternative is favorable, moderately favorable, or not favorable, relative to the criterion (note that for the threshold criteria, which must be met, 'favorable' means criteria will be met, while 'unfavorable' means criteria will not be met). Table 5.2, presented at the end of Section 5.5, summarizes the detailed individual analysis of the DU 2 remedial alternatives.

5.4.1 Alternative 1: No Action

The No Action alternative is evaluated to satisfy the NCP requirement of 40 CFR 300.430(e)(6), which requires consideration of this alternative as a baseline against which other alternatives may be compared. The no action alternative would involve leaving the subject areas in their current condition. Under this alternative, no remedial action will be taken, and any potential contaminants are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. This alternative would leave arsenic and/or manganese concentrations in place, without further environmental management or remedial action

5.4.1.1 Threshold Criteria

For DU 2, under Alternative 1, no remedial action would be taken, and any potential contaminant risks are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. This alternative would leave any potentially contaminated soil present, in place, without further investigation or removal and potential risks are not mitigated. Therefore, Alternative 1 does not result in acceptable conditions and is not protective of human health and the environment for DU 2.

Alternative 1 was reviewed with respect to compliance with ARARs (see Table 2.1). Location-specific ARARs are related to the protection of the environment and wildlife species. Under this alternative, since no action will be taken, all location-specific ARARs will be complied with. Because no actions will be implemented under Alternative 1, no action-specific ARARs are triggered. Therefore, Alternative 1 complies with ARARs.

Because Alternative 1 is not protective of human health and the environment, it is not favorable for the threshold criteria.

5.4.1.2 Balancing Criteria

For DU 2, Alternative 1 is not favorable for the long-term effectiveness criterion because it would leave any contaminated soil potentially present, in place, and potential risks are not mitigated. Alternative 1 is not favorable in reducing the volume of contaminants at the site because it would leave any contaminated soil in place, without further investigation or removal. Alternative 1 is not favorable in meeting the short-term effectiveness criterion because although no time is needed to implement this alternative, soil remedial objectives will not be met.

Alternative 1 is favorable in meeting the implementability (technical and administrative feasibility, and availability of materials and services) criterion in that there are no activities proposed.

There are no costs associated with the no action alternative.

5.4.1.3 Modifying Criteria

State and community acceptance cannot be fully assessed until comments are processed following the public review period on the Proposed Plan. Therefore, these modifying criteria have not been included in this analysis but, will be included following review and input from those parties.

5.4.2 Alternative 2: Land Use Controls

LUCs, administrative and physical, can include signage, security fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 2 will include an environmental covenant that conveys when the property is sold to restrict land use to industrial uses.

5.4.2.1 Threshold Criteria

For DU 2, Alternative 2 may include environmental covenants (a UECA agreement) to limit access to the DU. Because no risks to industrial receptors (maintenance workers, construction workers) were identified in the HHRA and risks to environmental receptors were determined to be unlikely in the SLERA, the purpose of the LUCs is to limit DU uses to industrial activities and exclude uses of the DU by resident children.

Alternative 2 was reviewed with respect to compliance with ARARs (see Table 2.1). Location-specific ARARs are related to the protection of the environment and wildlife species. This DU is not within the Chesapeake Bay Critical Area or a floodplain. However, migratory birds are present in the DU. The implementation of a UECA would not result in disruptive activities. Therefore, this alternative will comply with the location-specific ARARs. Because no soil removals or construction of physical LUCs will be implemented under Alternative 2, action-specific ARARs related to soil removal, water quality, or hazardous waste are not triggered. Therefore, Alternative 2 complies with the ARARs.

Alternative 2 is protective of public health and the environment and complies with ARARs and is therefore favorable for the threshold criteria.

5.4.2.2 Balancing Criteria

For DU 2, Alternative 2 is favorable in providing long-term effectiveness by limiting the DU to industrial uses, minimizing human exposure. But it would leave any contaminated soil in place, and while the access of receptors to potential risks is reduced, it is not eliminated.

Alternative 2 is not favorable in reducing the volume of contaminated soil at the site because it would leave any contaminated soil in place, without further investigation or removal.

Alternative 2 is favorable in meeting the short-term effectiveness criterion because no significant work would be performed beyond the implementation of a UECA agreement. The estimated time to meet the remedial objectives would be short.

Overall, Alternative 2 is favorable in meeting the implementability (technical feasibility and availability of materials and services) criterion. It is technically feasible to implement a UECA agreement. The materials and services to implement this alternative are readily available. The

administrative feasibility is also favorable as it is expected that the property owner and MDE would be willing to implement the UECA agreement.

The cost to implement Alternative 2 is relatively low. For DU 2, LUCs would include a LUCIP, and implementation of the UECA agreement. The cost for CERCLA 5-year reviews would also be included. The estimated cost for Alternative 2 is approximately $107,000 in capital costs plus $1,251,000 for 30-years of O&M for a total of $1,421,000. Cost estimate documentation and cost summary reports (RACER Version 11.5) are included in Appendix D.

5.4.2.3 Modifying Criteria

State and community acceptance cannot be fully assessed until comments are processed following the public review period on the Proposed Plan.

5.4.3 Alternative 3: Partial Soil Removal with LUCs

Alternative 3 includes removal of soil to mitigate risks to ecological receptors and LUCs to mitigate risks to human receptors (hypothetical resident child and resident adult). LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 3 will include an environmental covenant that conveys when the property is sold to restrict land use to industrial uses.

5.4.3.1 Threshold Criteria

For DU 2, Alternative 3 may include environmental covenants (a UECA agreement) to limit access to the DU. The purpose of the LUCs is to limit DU uses to industrial activities and exclude uses of the DU by resident children and resident adults. Alternative 3 includes partial removal of arsenic and/or manganese contaminated soil to mitigate the risks to human health and ecological receptors.

Alternative 3 was reviewed with respect to compliance with ARARs (see Table 2.1). Location-specific ARARs are related to the protection of the environment and wildlife species. Migratory birds are present in the DU and coordinated planning and planned mitigation is required. Partial removal of the arsenic and/or manganese contaminated soil would be conducted so that all location-specific ARARs are met. Soil removal is a common remedial technology and proper planning of the soil removal action to ensure that the location-specific ARARs are met is implementable. The implementation of a UECA agreement would not result in disruptive activities. Therefore, this alternative will comply with the location-specific ARARs.

Because soil removals will be implemented under Alternative 3, action-specific ARARs would be triggered and remedial actions related to soil removal, water quality, or hazardous waste would be required to be conducted so that all action-specific ARARs are met. Soil removal is a common remedial technology and proper planning of the soil removal action to ensure that the action-specific ARARs are met is implementable.

Alternative 3 is protective of human health and the environment and complies with ARARs and is therefore favorable for the threshold criteria.

5.4.3.2 Balancing Criteria

For DU 2, Alternative 3 is favorable in providing long-term effectiveness by limiting the DU to industrial uses, minimizing human exposure, and by reducing exposure to ecological receptors.

Alternative 3 may leave some contaminated soil in place, and while the access of receptors to potential risks is reduced, it is not eliminated.

Alternative 3 is moderately favorable in reducing the volume of contaminated soil at the site although, it may leave some contaminated soil in place at removal completion (i.e., removal is not to UU/UE).

Alternative 3 is effective in the short term as it is a relatively small area. Short-term effectiveness is affected as the environment would be adversely impacted during excavation activities. The estimated time to meet the remedial objectives would be short.

Overall, Alternative 3 is favorable in meeting the implementability (technical feasibility and availability of materials and services) criterion. It is technically feasible to excavate and dispose of contaminated soils offsite and to implement a UECA agreement. The materials and services to implement this alternative are readily available. The administrative feasibility is favorable as it is expected that the property owner and MDE would be willing to support the implementation of the UECA agreement. The DLA (as executor for the property owner [GSA]) is likely to support Alternative 3 to facilitate the sale of the Depot property.

The cost to implement Alternative 3 is moderate to high. For DU 2, cost would include planning and implementation of the partial soil removal, LUCs, including a LUCIP, and implementation of the UECA. The cost for CERCLA 5-year reviews would also be included. The estimated cost for Alternative 3 is approximately $586,000 in capital costs plus $1,251,000 for 30-years of O&M for a total of $1,837,000. Cost estimate documentation and cost summary reports (RACER Version 11.5) are included in Appendix D.

5.4.3.3 Modifying Criteria

State and community acceptance cannot be fully assessed until comments are processed following the public review period on the Proposed Plan.

5.5 Comparative Analysis – DU 2 Remedial Alternatives

While Section 5.4 described and individually assessed each of the three DU 2 remedial alternatives against the nine criteria, this section evaluates the performance of each alternative relative to each other. The purpose of this comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another so that the key tradeoffs can be identified, and a preferred alternative selected. Table 5.2, presented at the end of this section, summarizes the detailed comparative analysis of the DU 2 remedial alternatives.

The most important evaluation is against the threshold criteria, as these must be met. While Alternative 1 was not protective of human health and the environment, Alternatives 2 and 3 achieved acceptable site conditions and were considered protective of human health and the environment.

All alternatives were compliant with the ARARs.

Regarding the balancing criteria, Alternatives 2 and 3 were effective in the long term, because the UECA agreement would limit the site to industrial uses, only. Alternative 1 was not favorable for this criterion.

With respect to the short-term effectiveness criterion, Alternatives 2 was considered favorable because no significant work would be performed beyond the implementation of a UECA

agreement, workers, and the environment will be protected during implementation. The estimated time to meet the remedial objectives would be short. Alternative 3 was considered moderately favorable for short-term effectiveness due to short-term impacts during soil removal activities. Alternative 1 was considered not favorable for this criterion.

Alternative 2 was ranked favorable with respect to the long-term effectiveness criterion because the UECA agreement would convey with a property transfer and would continue to be protective of human health and the environment. Alternative 3 was ranked favorable with respect to the long-term effectiveness criterion because the UECA agreement would convey with a property transfer and would continue to be protective of human health and the environment and would reduce potential risks. Alternative 1 was considered not favorable for this criterion.

Alternatives 1 and 2 were not favorable for the Reduction of Toxicity, Mobility and Volume Through Treatment criterion as neither alternative would result in a reduction of toxicity, mobility, or volume of contaminated soil. Alternative 3 was moderately favorable for this criterion as this alternative would result in the reduction of the volume of contaminants onsite.

Alternative 1 was ranked favorable in meeting the implementability (technical and administrative feasibility, and availability of materials and services) criterion, but only in that there are no activities proposed. Alternative 2 is favorable for the implementability criterion. Alternative 3 is moderately favorable for the implementability criterion.

Alternative 3 had the highest cost due to the partial removal of soil plus implementation of the UECA agreement and Five-year reviews. Alternative 2 had the second highest costs based on implementation of the UECA agreement and Five-year reviews, while Alternative 1 had no associated costs.

Alternative 2 was assessed as having the highest number of favorable rankings for the CERCLA criteria. It is protective of human health and the environment, and compliant with ARARs. Alternative 3 is at a minimum moderately favorable for all CERCLA criteria rankings. It is protective of human health and the environment, and compliant with ARARs.

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Table 5.2: Summary of Detailed Analysis of Remedial Alternatives – DU 2

Evaluation Criteria	Screening Criterion	Alternative 1: No Action	Alternative 2: Land Use Controls	Alternative 3: Partial Soil Removal with Land Use Controls
Threshold	Overall Protection of Human Health and Environment	○	●	●
	Compliance with ARARs	○	●	●
Balancing	Long-Term Effectiveness	○	●	●
	Reduction of Toxicity, Mobility and Volume Through Treatment	○	○	◑
	Short-Term Effectiveness	○	●	◑
	Implementability:	●	●	●
	Cost\1	**$0.00**	**$1,358,000**	**$2,264,000**
Modifying\2	State Acceptance	TBD	TBD	TBD
	Community Acceptance	TBD	TBD	TBD

● Favorable ('YES' for threshold criteria),

◑ Moderately Favorable

○ Not Favorable ('NO' for threshold criteria)

\1 - Costs were developed using RACER. O&M for a 30-year duration is included, as applicable, for an alternative. Details are provided in Appendix D.
\2 – The Modifying criteria of state and community acceptance are 'To Be Determined (TBD)' following review and input from these parties.

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5.6 Individual Analysis – DU 3 Remedial Alternatives

DU 3 is approximately 5 acres and consists of the area formerly known as the EC-57D Area (Appendix A, Figure 2). RI investigation results for arsenic and manganese in soil in DU 3 were greater than the PSLs. Unacceptable risk to human health due to arsenic and manganese concentrations in soil were identified in the HHRA and unacceptable risks to ecological receptors due to manganese concentrations in soil were identified in the SLERA.

This section individually evaluates the remaining three remedial alternatives for DU 3 against the nine CERCLA criteria, while Section 5.7 compares the alternatives to each other. The following discussions focus on how, and to what extent, the alternatives address each of the criteria by qualitatively assessing whether the alternative is favorable, moderately favorable, or not favorable, relative to the criterion (note that for the threshold criteria, which must be met, 'favorable' means criteria will be met, while 'unfavorable' means criteria will not be met). Table 5.3, presented at the end of Section 5.7, summarizes the detailed individual analysis of the DU 3 remedial alternatives.

5.6.1 Alternative 1: No Action

The No Action alternative is evaluated to satisfy the NCP requirement of 40 CFR 300.430(e)(6), which requires consideration of this alternative as a baseline against which other alternatives may be compared. The no action alternative would involve leaving the subject areas in their current condition. Under this alternative, no remedial action will be taken, and any potential contaminants are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. This alternative would leave arsenic and/or manganese concentrations in place, without further environmental management or remedial action

5.6.1.1 Threshold Criteria

For DU 3, under Alternative 1, no remedial action would be taken, and any potential contaminant risks are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. This alternative would leave any potentially contaminated soil present, in place, without further investigation or removal and potential risks are not mitigated. Therefore, Alternative 1 does not result in acceptable conditions and is not protective of human health and the environment for DU 3.

Alternative 1 was reviewed with respect to compliance with ARARs (see Table 2.1). Location-specific ARARs are related to the protection of the environment and wildlife species. Under this alternative, since no action will be taken, all location-specific ARARs will be complied with. Because no actions will be implemented under Alternative 1, no action-specific ARARs are triggered. Therefore, Alternative 1 does not comply with ARARs.

In addition, because Alternative 1 is not protective of human health and the environment, it is not favorable for the threshold criteria.

5.6.1.2 Balancing Criteria

For DU 3, Alternative 1 is not favorable for the long-term effectiveness criterion because it would leave any contaminated soil potentially present, in place, and potential risks are not mitigated. Alternative 1 is not favorable in reducing the volume of contaminants at the site because it would leave any contaminated soil in place, without further investigation or removal. Alternative 1 is not

favorable in meeting the short-term effectiveness criterion because although no time is needed to implement this alternative, soil remedial objectives will not be met.

Alternative 1 is favorable in meeting the implementability (technical and administrative feasibility, and availability of materials and services) criterion in that there are no activities proposed.

There are no costs associated with the no action alternative.

5.6.1.3 Modifying Criteria

State and community acceptance cannot be fully assessed until comments are processed following the public review period on the Proposed Plan. Therefore, these modifying criteria have not been included in this analysis but, will be included following review and input from those parties.

5.6.2 Alternative 3: Partial Soil Removal with LUCs

Alternative 3 includes removal of soil to mitigate risks to ecological receptors and LUCs to mitigate risks to human receptors. LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 3 will include an environmental covenant that conveys when the property is sold to restrict land use to industrial uses.

5.6.2.1 Threshold Criteria

For DU 3, Alternative 3 may include environmental covenants (a UECA agreement) to limit access to the DU. The purpose of the LUCs is to limit DU uses to industrial activities and exclude uses of the DU by resident children and adults. LUCs alone will not mitigate the risks to human and ecological receptors due to manganese concentrations in soil. Therefore, Alternative 3 includes partial removal of manganese contaminated soil to mitigate the risks to human and ecological receptors.

Alternative 3 was reviewed with respect to compliance with ARARs (see Table 2.1). Location-specific ARARs are related to the protection of the environment and wildlife species. Portions of the DU are within a floodplain. Migratory birds are present in the DU and coordinated planning and planned mitigation is required. Partial removal of the manganese contaminated soil would be conducted so that all location-specific ARARs are met. Soil removal is a common remedial technology and proper planning of the soil removal action to ensure that the location-specific ARARs are met is implementable. The implementation of a UECA agreement would not result in disruptive activities. Therefore, this alternative will comply with the location-specific ARARs.

Because soil removals will be implemented under Alternative 3, action-specific ARARs related to soil removal, water quality, or hazardous waste would be required to be conducted so that all action-specific ARARs are met. Soil removal is a common remedial technology and proper planning of the soil removal action to ensure that the action-specific ARARs are met is implementable.

Alternative 3 is protective of human health and the environment and complies with ARARs and is therefore favorable for the threshold criteria.

5.6.2.2 Balancing Criteria

For DU 3, Alternative 3 is favorable in providing long-term effectiveness by limiting the DU to industrial uses, minimizing human exposure, and by reducing exposure to ecological receptors.

Alternative 3 may leave some contaminated soil in place, and while the access of receptors to potential risks is reduced, it is not eliminated.

Alternative 3 is moderately favorable in reducing the volume of contaminated soil at the site although, it may leave some contaminated soil in place at removal completion (i.e., removal is not to UU/UE conditions).

Alternative 3 is moderately favorable in meeting the short-term effectiveness criterion because significant work would be performed to minimize short-term impacts. The estimated time to meet the remedial objectives would be short.

Overall, Alternative 3 is favorable in meeting the implementability (technical feasibility and availability of materials and services) criterion. It is technically feasible to excavate and dispose of contaminated soils offsite and to implement a UECA agreement. The materials and services to implement this alternative are readily available. The administrative feasibility is also favorable as it is expected that the property owner and MDE would be willing to support the partial removal of soil for offsite disposal and implement the UECA agreement.

The cost to implement Alternative 3 is moderate to high. For DU 3, cost would include planning and implementation of the partial soil removal, LUCs, including a LUCIP, and implementation of the UECA. The cost for CERCLA 5-year reviews would also be included. The estimated cost for Alternative 3 is approximately $1,227,000 in capital costs plus $1,251,000 for 30-years of O&M for a total of $2,478,000. Cost estimate documentation and cost summary reports (RACER Version 11.5) are included in Appendix D.

5.6.2.3 Modifying Criteria

State and community acceptance cannot be fully assessed until comments are processed following the public review period on the Proposed Plan.

5.6.3 Alternative 5: Capping

Alternative 5 includes capping of soil to mitigate risks to ecological receptors and LUCs to mitigate risks to human receptors (hypothetical resident child and resident adult). LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 5 will include an environmental covenant to restrict land use to industrial uses that conveys when the property is sold.

5.6.3.1 Threshold Criteria

For DU 3, Alternative 5 will include environmental covenants (a UECA agreement) to limit access to the DU. The purpose of the LUCs is to limit DU uses to industrial activities and exclude uses of the DU by resident children and adults. LUCs alone will not mitigate the risks to human and ecological receptors due to manganese concentrations in soil. Therefore, Alternative 3 includes capping of manganese contaminated soil to mitigate the risks to human and ecological receptors.

Alternative 5 was reviewed with respect to compliance with ARARs (see Table 2.1). Location-specific ARARs are related to the protection of the environment and wildlife species. Portions of the DU are within a floodplain. Migratory birds are present in the DU and coordinated planning and planned mitigation is required. Capping of the manganese contaminated soil would be conducted so that all location-specific ARARs are met. Capping is a common remedial technology and proper planning of the capping remedial action to ensure that the location-specific ARARs are

met is implementable. The implementation of a UECA agreement would not result in disruptive activities. Therefore, this alternative will comply with the location-specific ARARs.

Because capping will be implemented under Alternative 5, action-specific ARARs related to capping (i.e., vegetation clearance) would be triggered and capping would be required to be conducted so that all action-specific ARARs are met. Capping is a common remedial technology and proper planning of the site preparation for capping to ensure that the action-specific ARARs are met is implementable.

Alternative 3 is protective of public health and the environment and complies with ARARs and is therefore favorable for the threshold criteria.

5.6.3.2 Balancing Criteria

For DU 3, Alternative 5 is moderately favorable in providing long-term effectiveness by limiting the DU to industrial uses, minimizing human exposure, and by reducing exposure to ecological receptors. Alternative 5 will leave contaminated soil in place, and while the access of receptors to potential risks is reduced, it is not eliminated. The cap would require long-term maintenance and inspections.

Alternative 5 is moderately favorable for reduction of toxicity, mobility, and volume through treatment. Although contaminated soil will remain at the site, the cap will reduce the mobility of site contaminants.

Alternative 5 is moderately favorable and effective in the short term as it is a relatively small area. Short-term effectiveness is affected as the environment would be adversely impacted during excavation activities.

Overall, Alternative 5 is favorable in meeting the implementability (technical feasibility and availability of materials and services) criterion. It is technically feasible to excavate and dispose of contaminated soils offsite and to implement a UECA agreement. The materials and services to implement this alternative are readily available. The administrative feasibility is also favorable as it is expected that the property owner and MDE would be willing to support capping contaminated soil and implement the UECA agreement.

The cost to implement Alternative 5 is moderate to high. For DU 3, cost would include planning and implementation of the cap, LUCs, including a LUCIP, and implementation of the UECA agreement. The cost for CERCLA 5-year reviews would also be included. The estimated cost for Alternative 5 is approximately $2,195,000 in capital costs plus $2,035,000 for 30-years of O&M for a total of $4,230,000. Cost summary worksheets (RACER Version 11.5) are included in Appendix D.

5.6.3.3 Modifying Criteria

State and community acceptance cannot be fully assessed until comments are processed following the public review period on the Proposed Plan.

5.7 Comparative Analysis – DU 3 Remedial Alternatives

While Section 5.6 described and individually assessed each of the three DU 3 remedial alternatives against the nine criteria, this section evaluates the performance of each alternative relative to each other. The purpose of this comparative analysis is to identify the advantages and disadvantages of

each alternative relative to one another so that the key tradeoffs can be identified, and a preferred alternative selected. Table 5.3, presented at the end of this section, summarizes the detailed comparative analysis of the DU 3 remedial alternatives.

The most important evaluation is against the threshold criteria, as these must be met. While Alternative 1 was not protective of human health and the environment, Alternatives 3 and 5 achieved acceptable site conditions and are considered protective of human health and the environment.

Alternative 1 was compliant with all ARARs. Alternatives 3 and 5 will be conducted so that they are compliant with all ARARs.

Regarding the balancing criteria, Alternatives 3 and 5 are effective in the long term, because the UECA agreement would limit the site to industrial uses, only, and soil removal or capping would provide long-term effectiveness for the human and ecological receptors. Alternative 1 was not favorable for this criterion.

With respect to the short-term effectiveness criterion, Alternatives 3 and 5 are considered moderately favorable because work would be conducted so that workers and the environment will be protected during implementation. The estimated time to meet the remedial objectives would be short for either alternative. Alternative 1 was considered not favorable for this criterion.

Alternatives 3 was ranked favorable with respect to the long-term effectiveness criterion because soil representing a risk to the human and ecological receptors would be removed and the UECA agreement would convey with a property transfer and would continue to be protective of human health and the environment. Alternatives 5 was ranked as moderately favorable with respect to the long-term effectiveness criterion because soil representing a risk to the ecological receptors would be capped and the UECA agreement would convey with a property transfer and would continue to be protective of human health and the environment. However, the cap would require long-term inspections and maintenance to maintain long-term effectiveness. Alternative 1 was considered not favorable for this criterion.

Alternative 3 was considered favorable for the reduction of toxicity, mobility and volume through treatment criterion as Alternative 3 would reduce the onsite volume of contaminated soil. Alternative 5 was considered moderately favorable for the reduction of toxicity, mobility and volume through treatment criterion as it would reduce mobility by capping but would not reduce the toxicity of contaminants or volume of contaminated soil. Alternative 1 would not result in a reduction of toxicity, mobility, or volume of contaminated soil.

Alternative 1 was ranked favorable in meeting the implementability (technical and administrative feasibility, and availability of materials and services) criterion, but only in that there are no activities proposed. Alternatives 3 and 5 are favorable for the implementability criterion.

Alternative 5 had the highest costs based on implementation of the, remedial action, UECA, and Five-year reviews, the costs for Alternative 3 are approximately 1.7 million dollars less than for Alternative 5, and Alternative 1 had no associated costs.

Alternative 3 was assessed as having the highest number of favorable rankings for the CERCLA criteria. It is protective of human health and the environment, and compliant with ARARs. Alternative 5 is at least moderately favorable for all CERCLA criteria rankings. It is protective of human health and the environment, and compliant with ARARs.

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Table 5.3: Summary of Detailed Analysis of Remedial Alternatives – DU 3

Evaluation Criteria	Screening Criterion	Alternative 1: No Action	Alternative 3: Partial Soil Removal with Land Use Controls	Alternative 5: Capping with Land Use Controls
Threshold	Overall Protection of Human Health and Environment	○	●	●
	Compliance with ARARs	○	●	●
Balancing	Long-Term Effectiveness	○	●	◑
	Reduction of Toxicity, Mobility and Volume Through Treatment	○	◑	◑
	Short-Term Effectiveness	○	◑	◑
	Implementability:	●	●	●
	Cost\1	**$0.00**	**$2,478,000**	**$4,230,000**
Modifying\2	State Acceptance	TBD	TBD	TBD
	Community Acceptance	TBD	TBD	TBD

● Favorable ('YES' for threshold criteria)

◑ Moderately Favorable

○ Not Favorable ('NO' for threshold criteria)

\1 – Costs were developed using RACER. O&M for a 30-year duration is included, as applicable, for an alternative. Details are provided in Appendix D.
\2 – The Modifying criteria of state and community acceptance are 'To Be Determined' following review and input from these parties.

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5.8 Conclusions

Remedial action is required for all three DUs at the Depot. This section summarizes the evaluation of the remedial alternatives evaluated for each DU.

5.8.1 DU 1 Remedial Alternatives

Three remedial alternatives were evaluated for DU 1: No Action, Land Use Controls, and Partial Soil Removal with Land Use Controls. Table 5.1 presents the summary of the detailed analysis of the remedial alternatives. Alternative 2 was assessed as having the highest number of favorable rankings for the CERCLA criteria; however, alternative 2 does not reduce the toxicity, mobility and volume through treatment.. Alternative 3 was assessed having favorable ranking for the overall protection of human health and the environment, compliance of ARARs, long term effectiveness, and implementability. Alternative 3 included moderately favorable ranking for reduction of toxicity, mobility and volume through treatment which alternative 2 does not address. Alternative 1 is not protective of human health and the environment.

5.8.2 DU 2 Remedial Alternatives

Three remedial alternatives were evaluated for DU 2: No Action, Land Use Controls, and Partial Soil Removal with Land Use Controls. Table 5.2 presents the summary of the detailed analysis of the remedial alternatives. Alternative 2 was assessed as having the highest number of favorable rankings for the CERCLA criteria; however, alternative 2 does not reduce the toxicity, mobility and volume through treatment. Alternative 3 was assessed having favorable ranking for the overall protection of human health and the environment, compliance of ARARs, long term effectiveness, and implementability. Alternative 3 included moderately favorable ranking for reduction of toxicity, mobility and volume through treatment, which alternative 2 does not address. Alternative 1 is not protective of human health and the environment.

5.8.3 DU 3 Remedial Alternatives

Three remedial alternatives were evaluated for DU 3: No Action, Partial Soil Removal with Land Use Controls, and Capping with Land Use Controls. Table 5.3 presents the summary of the detailed analysis of the remedial alternatives. Alternative 3 was assessed as having the highest number of favorable rankings for the CERCLA criteria. Alternative 5 was at least moderately favorable for all CERCLA criteria. Alternative 1 is not protective of human health and the environment.

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Appendix A:
Figures

Figure 1: Site Location

Figure 2: Site Layout

Figure 3: Alternative 3: Partial Soil Removal with LUCs for Decision Unit 1

Figure 4: Alternative 3: Partial Soil Removal with LUCs for Decision Unit 2

Figure 5: Alternative 3: Partial Soil Removal with LUCs for Decision Unit 3

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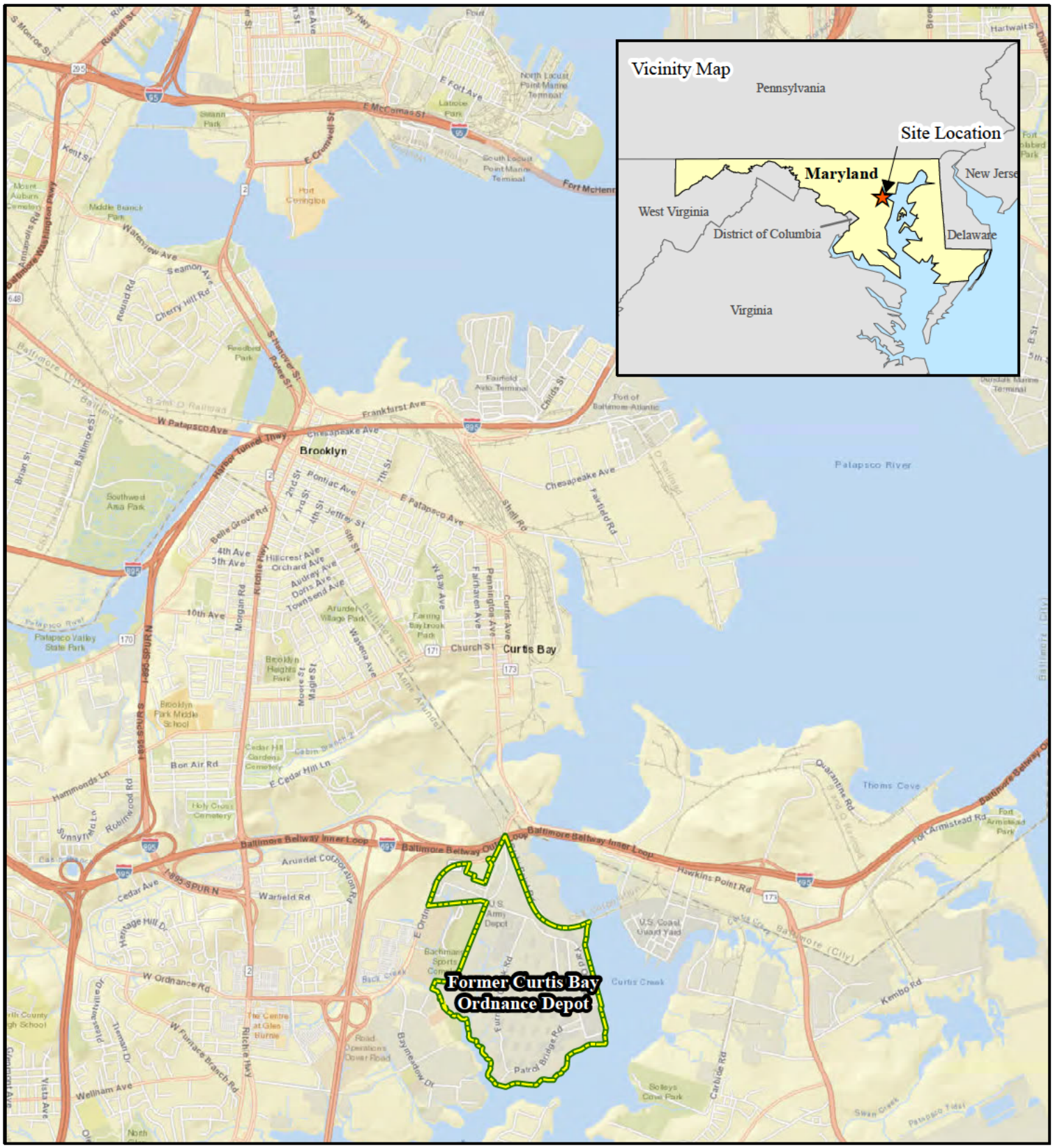

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ERT

Figure 1
Site Location
Former Curtis Bay Ordnance Depot
Anne Arundel County, Maryland

Date: February 2020

Source: ESRI Online

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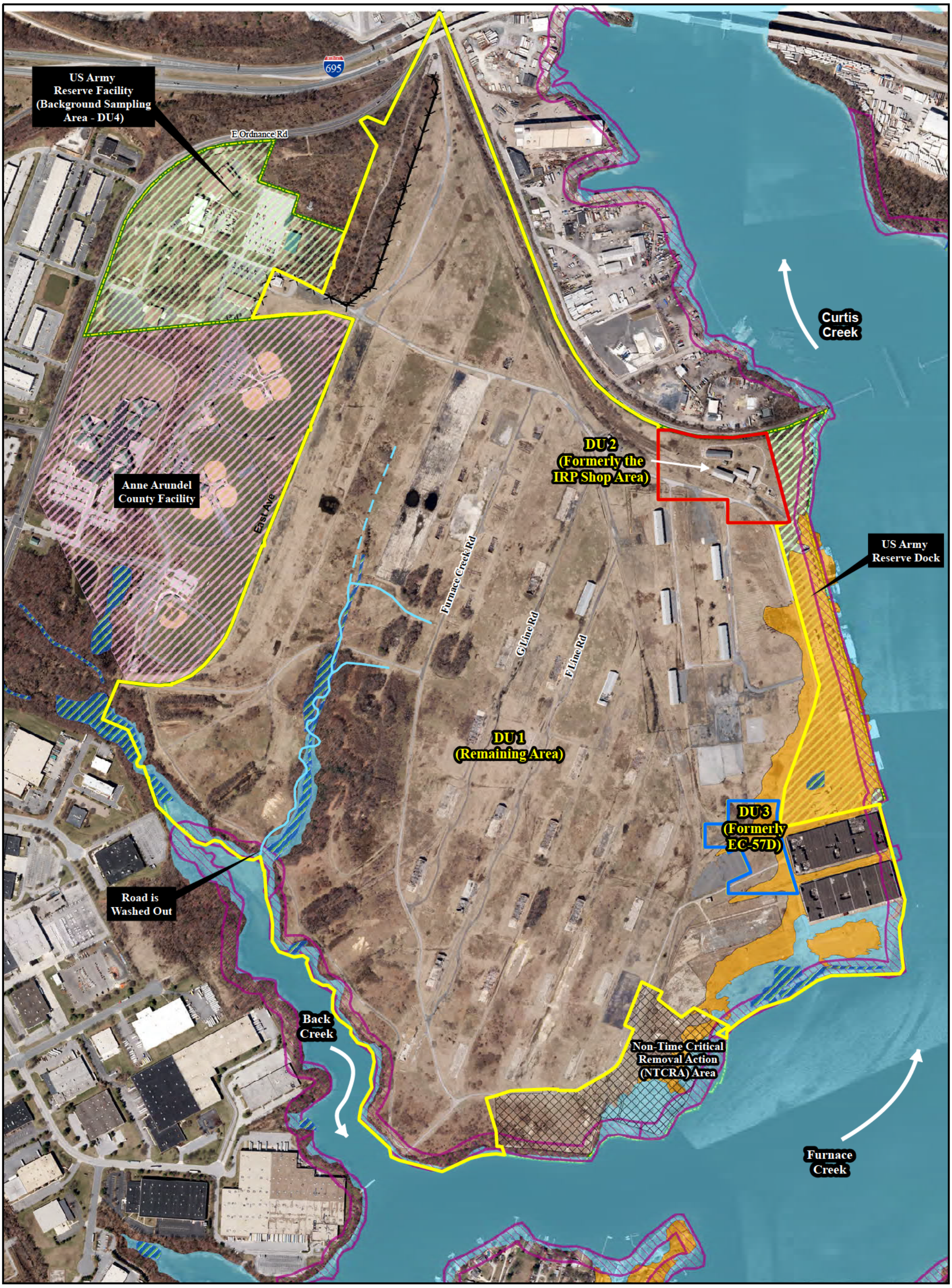

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Legend

- DU 1
- DU 2
- DU 3
- Non-Time Critical Removal Action (NTCRA)
- Chesapeake Bay Critical Area Buffer
- 0.2% Annual Chance Flood Hazard
- 1 % Annual Chance Flood Hazard
- Wetlands
- Curtis Bay Ordnance Depot Boundary
- US Army Reserve Property
- Anne Arundel County Facility
- Un-Named Tributary (Intermittent Where Dashed)
- Fence

N W E S

0 300 600 Feet

Figure 2
Site Layout
Former Curtis Bay Ordnance Depot
Anne Arundel County, Maryland

Date: February 2020

Imagery Source: U.S. Gelogical Survey, 2011, Data Sources: Parsons, 2006, FEMA, 2015, National Wetlands Inventory, 2016

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Legend

- Decision Unit (DU) 1 Boundary
- DU1 Soil Sampling Units (SUs)
  - No Excavation
  - Surface Soil (0-1 ft bgs)
  - Surface and Subsurface (0-2 ft bgs)
  - DU 1 Potential SUs (Not Sampled)
- NTCRA and RA Area
- Former Curtis Bay Ordnance Depot Boundary
- Un-Named Tributary (Intermittent Where Dashed)
- Fence
- US Army Reserve Property
- Anne Arundel County Facility

Imagery Source: U.S. Gelogical Survey, 2011; Data Sources: USACE, 2016; Parsons, 2006

ft bgs - feet below ground surface
LUC - Land Use Controls
NTCRA - Non-Time Critical Removal Action
RA - Remedial Action

N
W E
S

0 500 1,000
Feet

Figure 3
Alternative 3: Partial Soil Removal with LUCs for Decision Unit 1
Former Curtis Bay Ordnance Depot
Anne Arundel County, Maryland

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Date: April 2021

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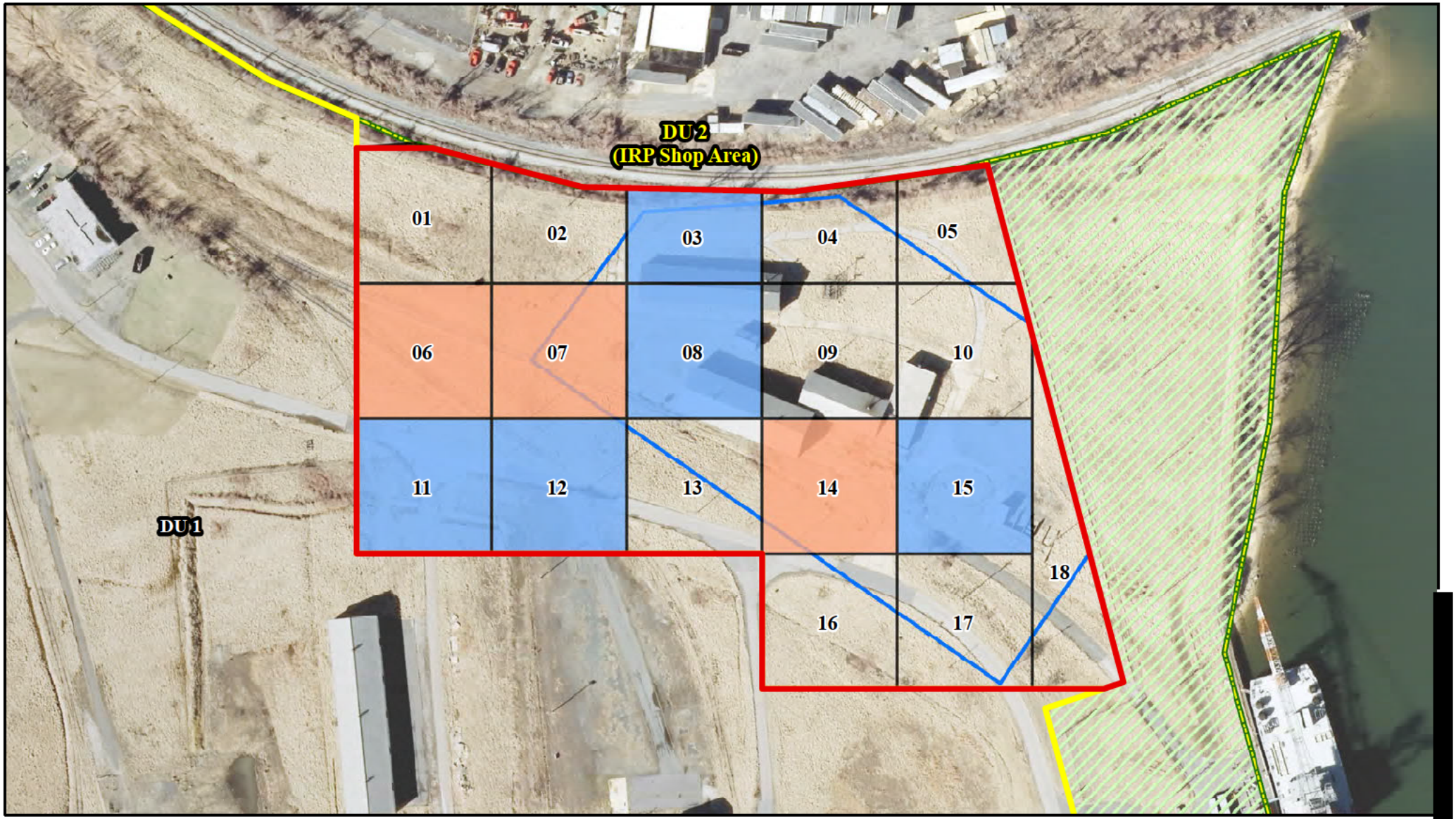

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Legend

DU 2 Sampling Units

- No Excavation
- Surface (0-1 ft bgs)
- Surface and Subsurface (0-2 ft bgs)

Decision Units (DUs)

- DU 1
- DU 2

- Curtis Bay Ordnance Depot Boundary
- IRP Shop Area
- US Army Reserve Property

N
W E
S

0 75 150
Feet

Date: February 2020

Imagery Source: U.S. Gelogical Survey, 2011

Figure 4
Alternative 3: Partial Soil Removal with LUCS for DU 2 (IRP Shop Area)
Former Curtis Bay Ordnance Depot
Anne Arundel County, Maryland

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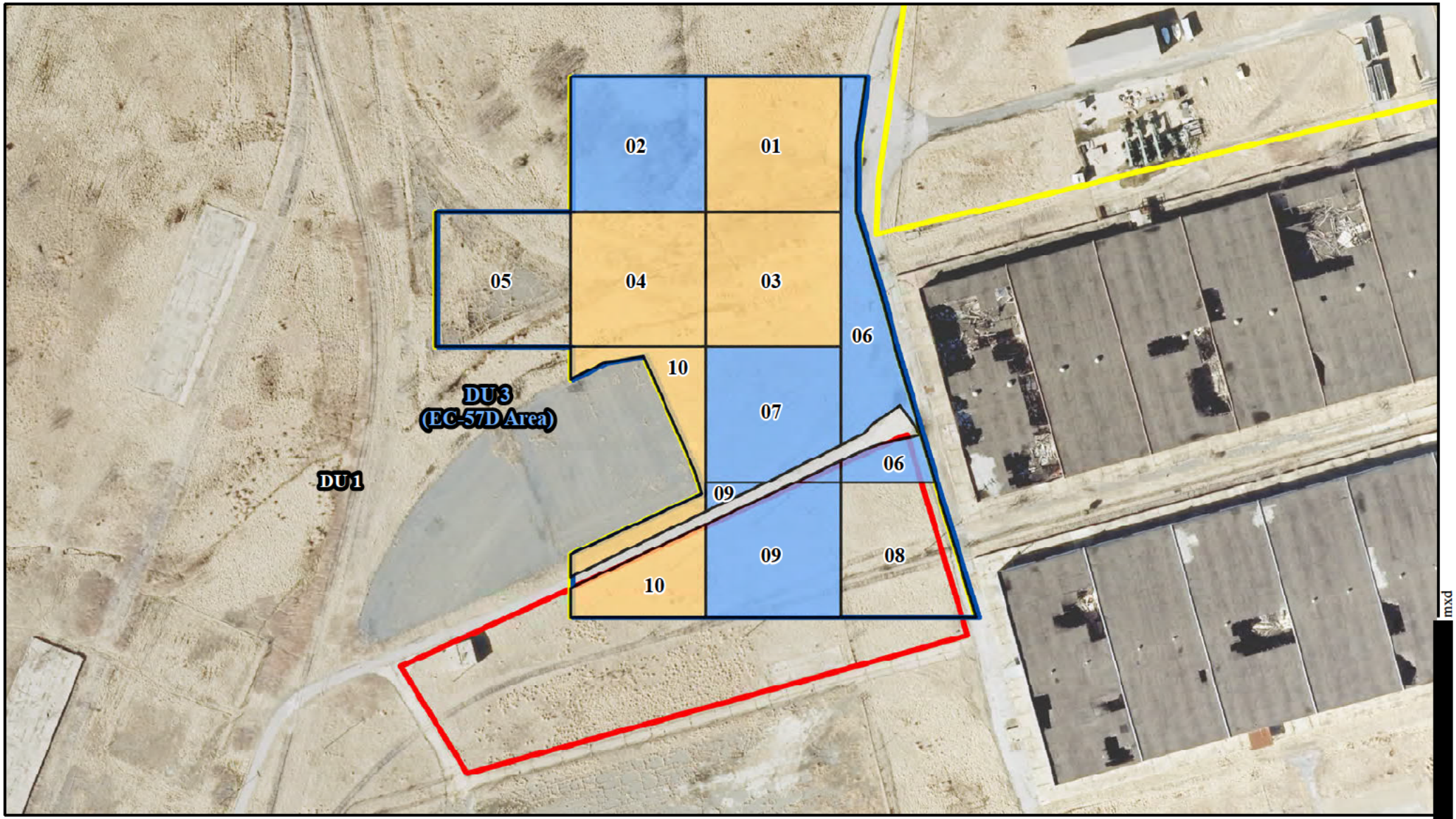

US Army Corps of Engineers
BUILDING STRONG

ERT

Legend

DU 3 (EC-57D Area) Sampling Units

- No Excavation
- Surface Soil Excavation (0-1 ft bgs)
- Surface and Subsurface Soil Excavation (0-2 ft bgs)

Decision Units (DUs)

- DU 3 (EC-57D Area)
- DU 1
- EC-57D Boundary

DU - Decision Unit
ft bgs - feet below ground surface
LUCs - Land Use Controls

N
W E
S

0 75 150
Feet

Date: February 2020

Imagery Source: U.S. Gelogical Survey, 2011

Figure 5
Alternative 3: Partial Soil Removal with LUCs for DU 3 (EC-57D Area)
Former Curtis Bay Ordnance Depot
Anne Arundel County, Maryland

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Document

Appendix B:
Institutional Analysis

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FINAL

INSTITUTIONAL ANALYSIS

FOR

DEPOT-WIDE REMEDIAL INVESTIGATION FEASIBILITY STUDY FOR ARSENIC AND MANGANESE IN SOIL AT THE FORMER CURTIS BAY ORDNANCE DEPOT ANNE ARUNDEL COUNTY, MARYLAND

Contract No.: [redacted], **Delivery Order** [redacted]

Prepared for:

May 2022

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FINAL

INSTITUTIONAL ANALYSIS

Depot-Wide Remedial Investigation/Feasibility Study for Arsenic and Manganese in Soil at the Former Curtis Bay Ordnance Depot

Anne Arundel County, Maryland

Prepared for:

U.S. Army Corps of Engineers

Contract: [redacted]

Delivery Order [redacted]

Prepared by:

ERT, Inc.

Laurel, Maryland 20701

(301) 323-0620

[redacted]

12 January 2022

[redacted]

Date

Project Manager

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ACRONYMS AND ABBREVIATIONS

Abbreviation	Definition
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CD	Consent Decree
CFR	Code of Federal Regulations
COC	Constituent of Concern
DERA	Defense Environmental Restoration Account
DERP	Defense Environmental Restoration Program
DID	Data Item Description
DLA	Defense Logistics Agency
DoD	Department of the Defense
ERT	ERT, Inc.
FFA	Federal Facility Agreement
FS	Feasibility Study
GSA	General Services Administration
IA	Institutional Analysis
IC	Institutional Control
LA	Landholding agency
LUC	Land Use Control
MDE	Maryland Department of the Environment
NCP	National Contingency Plan
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act
UAO	Unilateral Administrative Order
UECA	Uniform Environmental Covenants Act
U.S.	United States
USAEC	U.S. Army Environmental Command
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

GLOSSARY OF TERMS

Defense Site – All locations that are or were owned by, leased to, or otherwise possessed or used by the Department of Defense (DoD). The term does not include any operational range, operating storage or manufacturing facility, or facility that is used or was permitted for the treatment or disposal of military munitions.

Covenant - A promise by one landowner to another generally made in connection with a conveyance of property (e.g., warranty of title) that may or may not run with the land. Covenants also may include a promise by the grantee of a possessory interest in property to use or refrain from using the property in a certain manner. Covenants are similar to easements but have been traditionally subject to somewhat different formal requirements.

Deed Restriction - Not a traditional real property law term, but used in the National Contingency Plan as a shorthand way to refer to various types of proprietary controls.

Easement - A right that allows the grantee to use the property of another or restrict its use according to the terms of the easement. An "affirmative" easement allows the grantee to enter upon or use another's property for a particular purpose (e.g., ingress/egress). A "negative" easement imposes limits on how the owner of the servient estate can use the property.
Land Use Control (LUC) - Any restriction or control, including institutional controls and engineering controls, arising from the need to protect human health and the environment, such as the restriction of access or limitation of activities at a site that has residual contamination.

Institutional Controls – non-engineering measures designed to prevent or limit exposure to hazardous substance left in place at a site or assure effectiveness of the chosen remedy. These typically include legal controls, land easements, restrictive covenants, and zoning ordinances.

Land Use Controls – consist of non-engineered and engineered instruments to help minimize the potential for exposure to contamination and/or resource use or by providing information that helps modify or guide human behavior at a site.

1.0 INTRODUCTION

This Institutional Analysis (IA) was prepared by ERT, Inc. (ERT) in support of the Feasibility Study (FS) for the depot-wide arsenic and manganese contamination at the Former Curtis Bay Ordnance (herein after referred to as "the Depot") in Curtis Bay, Maryland. This IA has been prepared in accordance with the *United States Environmental Protection Agency (USEPA) guidance EPA-540-R-09-001 Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites (Final, December 2012)*, and *Data Item Description (DID) WERS-017.0: Institutional Analysis and Institutional Control Plan (April 2010).*

The Former Curtis Bay Ordnance Depot (the Depot) is in Anne Arundel County, Curtis Bay, Maryland, approximately one mile southeast of Baltimore, Maryland. Through various property transfers, the Depot is now owned by General Services Administration (GSA) and covers approximately 435 acres, bordered on the east by Curtis Creek and on the south by Furnace Creek (**Figure 1**). This IA only applies to the property within the former Depot boundary that is owned by GSA and managed by the Defense Logistics Agency (DLA) (**Figure 2**). This IA excludes the Anne Arundel County Facility and U.S. Army Reserve Dock and Facility which are not owned by GSA.

1.1 Overview

Typical strategies for addressing the presence constituents of concern (COC) are physical removal and land use controls (LUCs). Physical removal actions are conducted to reduce the amount of COCs at a site. However, due to the current and future land use (industrial) and the large size of the site, the complete removal of contaminated soil to achieve residential cleanup standards is unlikely. Therefore, LUCs will likely be implemented to manage the residual risk of COCs remaining at the site. LUCs may be implemented with or without a physical removal action.

LUCs are controls that limit access or use of a property to protect people from site risks or provide warnings of a potential site risk. LUCs include engineering controls and physical barriers (e.g., fencing) as well as institutional controls (ICs), which include non-engineered instruments such as administrative and legal controls. The U.S. Environmental Protection Agency (USEPA) publication EPA-540-R-09-001 (USEPA, 2012) describes four categories of ICs:

- Proprietary controls are generally created pursuant to state and tribal law to prohibit activities that may compromise the effectiveness of the response action or restrict activities or future resource use that may result in unacceptable risk to human health or the environment. The most common examples of proprietary controls are easements and covenants. Many states have enacted statutes addressing the implementation and long-term effectiveness of proprietary controls. One model that has been developed is the Uniform Environmental Covenants Act (UECA), which can be adopted as is or in modified form by states to provide advantages over traditional common law proprietary controls.
- Governmental controls impose restrictions on land use or resource use, using the authority of a government entity. Typical examples of governmental controls include zoning; building codes; state, tribal, or local ground water use regulations; and commercial fishing bans and sports/recreational fishing limits posed by federal, state and/or local resources and/or public health agencies. In many cases, federal landholding agencies (LAs), such as the Department of Defense (DoD), possess the authority to enforce ICs on their property.

At active federal facilities, land use restrictions may be addressed in Base Master Plans, facility construction review processes, facility digging permit systems, and/or the facility well permitting systems.

- Enforcement and permit tools with IC components are legal tools, such as administrative orders, permits, Federal Facility Agreements (FFAs) and Consent Decrees (CDs), that limit certain site activities or require the performance of specific activities (e.g., to monitor and report on an IC's effectiveness). They may be issued unilaterally or negotiated.
- Informational devices provide information or notification to local communities that residual or contained contamination remains on site. As such, the site manager and site attorney should make sure to provide language that clearly conveys the purpose of the informational device. Typical informational devices include state registries of contaminated sites, notices in deeds, tracking systems, and fish advisories.

EP 1110-1-24 (USACE, 2000) states that, "*The policy of the U.S. Army Corps of Engineers (USACE) is to establish and maintain institutional controls in a manner which fully meet customers' expectations of quality, timeliness, and cost effectiveness within the bounds of legal responsibility.*" In order to effectively manage residual risk at a site, USACE seeks and encourages stakeholder involvement to identify site-specific objectives for an effective LUC program.

1.2 Purpose

The overall purpose of this IA is to provide information on the capability of government agencies and/or non-government entities associated with the Depot to take part in the implementation and maintenance of LUCs in order to minimize potential unacceptable risks that may remain. The IA will assist in the evaluation of LUCs that are components of alternatives in the FS. The objectives of this IA are to:

- Identify and document the agencies and entities that have jurisdiction over any impacted areas at the Depot;
- Assess the authority exercised by, capability of, and desire to participate of each agency and entity to assert controls that would protect the community from arsenic and manganese risks;
- Document the mission, if any, of each agency and entity to protect the surrounding community from arsenic and manganese risks under the law; and
- Document existing LUCs currently in place for the protection of the community from arsenic and manganese risks.

Local, state, and federal agencies and non-governmental entities that will be required to support the short-term and long-term LUCs for the Depot. These entities are identified and described in this IA.

1.3 Risk Review

The Depot is part of the original U.S. Army Ordnance Depot built in 1918 on 789 acres of farmland. The GSA currently owns approximately 435 acres of the land currently occupied by the Depot, which was declared as excess property in 2005. GSA has delegated the responsibilities for environmental investigations and possible remedial actions to the DLA, who acts as executor for

the GSA for the Depot environmental activities. The USACE provides expertise and support to the GSA and DLA for the environmental investigations performed at the Depot.

Based on the conclusions of the *Remedial Investigation (RI) Report for Depot-Wide Remedial Investigation/Feasibility Study for Arsenic and Manganese in Soil at the Former Curtis Bay Ordnance Depot, Anne Arundel County, Maryland, September 2021*, there are unacceptable human health and ecological risks from arsenic and/or manganese at the Depot.

There are currently no active uses of the Depot. The property is zoned for "W2 - Industrial Light" (Anne Arundel County, 2019) use and the future land use is expected to remain industrial. Ownership of the property is expected to be transferred once all environmental investigations are complete. Once transferred, the property will likely be developed for industrial uses.

1.4 Regulatory Background

Several existing statutes, regulations, and guidance documents allow for and/or clarify the implementation of LUCs and the performance of an IA. The regulatory authorities governing the establishment and maintenance of LUCs during environmental response actions include:

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA);
- National Oil and Hazardous Substances Pollution Contingency Plan (NCP); and
- Defense Environmental Restoration Account (DERA) funded under the Defense Environmental Restoration Program (DERP).

These statutes, regulations, and resulting guidance documents are discussed below.

CERCLA (commonly known as Superfund) was enacted in 1980 to provide a legal framework to clean up sites contaminated with hazardous substances. CERCLA was enlarged and reauthorized by the Superfund Amendments and Reauthorization Act (SARA) in 1986. SARA included aspects that directly apply to hazardous waste sites. SARA also included Section 211, the DERP statute. This portion of the statute amended Title 10 of the United States Code (10 U.S.C.) by adding Chapter 160 to Title 10, Environmental Restoration, thus establishing the DERP.

The DERP created the authority of the DoD to undertake certain response actions and established the DERA. One of the goals of DERP is the correction of environmental damage (such as cleanup from hazardous substances, pollutants, and contaminants) that creates an imminent and substantial endangerment to public health/welfare or to the environment. The DERP is required to undertake response actions at facilities or sites under the jurisdiction of the DoD and owned by, leased to, or otherwise possessed by the U.S. at the time of the actions leading to contamination.

The NCP (40 CFR Part 300) was established by the Clean Water Act of 1972 and has been revised and broadened several times since then. The purpose of the NCP is to provide the organizational structure and procedures for developing, evaluating, and implementing response actions at a site. The September 1994 revision is the latest version of the NCP. Paragraph 300.120 (c) identifies the DoD as the removal response authority with respect to hazardous contamination incidents involving DoD military activities. As a matter of DoD policy, contamination responses are conducted in accordance with CERCLA, as amended by the SARA, and the NCP.

The state of Maryland adopted the Uniform Environmental Covenants Act – House Bill 679 – on 26 April 2005. An environmental covenant is a legal device that restricts activities on sites where some contamination remains in place. Restrictions limit property use to safe use. These

restrictions are necessary to protect human health and the environment from the potential of inadvertent exposures to residual contamination while encouraging economic development.

1.5 Institution Selection

Institutions were selected for this analysis based on their jurisdiction and authority over the Depot sites, and/or their specific mission to protect the public from COCs. The institutions included in the analysis include the State of Maryland, the Maryland Department of the Environment (MDE), Anne Arundel County, GSA, USACE, and USEPA Region III. The current land use of the Depot is industrial and is expected to remain industrial.

State of Maryland:

The State of Maryland has been serving as the lead regulatory agency, MDE will represent the State of Maryland at the Depot.

Maryland Department of the Environment:

In 1987, MDE was created to protect and preserve the state's natural resources. In addition to restoring Maryland's environment and safeguarding the environmental health of Maryland citizens, MDE's duties encompass enforcement and regulation, long-term planning and research, and technical assistance to industry and communities for pollution, growth issues, and environmental emergencies. The mission of the agency is to, "*protect and restore the quality of Maryland's air, water, and land resources. We do this while fostering smart growth, economic development, healthy and safe communities, and quality environmental education for the benefit of the environment, public health, and future generations*." The Code of Maryland Regulations provides MDE with jurisdiction to administer and enforce the environmental laws of the state.

MDE has acted as the lead regulatory agency and has been an active participant throughout previous investigations completed at the Depot.

Anne Arundel County:

The Depot is located within Anne Arundel County. The UECA was singed into Maryland law in 2005 and enforces restrictions by means of an environmental covenant to control the future use of real estate when transferred from one owner to another. The county is authorized to enforce environmental covenants under UECA and has existing staff who record deeds and covenants, issue permits and enforce zoning and planning ordinances. The County has an ongoing relationship with the State of Maryland, MDE, and the Depot and can assist and work with the U.S. Army in developing LUCs and recording environmental covenants related to the Depot. The county has limited ability to actively support any unfunded obligations.

General Services Administration:

GSA is the current property owner and would be responsible for implementing LUCs at the Depot until transfer of the property is executed. The DLA acts as executor for GSA and is responsible for environmental investigations and possible remedial actions at the Depot. If transfer of the Depot property occurs, the GSA and DLA will no longer be institutions with authority over the Depot.

U.S. Army Corps of Engineers:

The USACE has extensive practical and legal experience designing and implementing LUCs related to hazardous sites. USACE is contracted by the U.S. Army Environmental Command

(USAEC) and may fill a technical oversight role or may be the primary project manager for the project, depending on the contracting vehicle.

USEPA Region III:

MDE has acted as the lead regulatory agency throughout the previous investigations and maintains an active relationship with USEPA Region III. Throughout the previous investigation, USEPA Region III has deferred oversight of environmental activities at the Depot to MDE and will only become engaged at the request of MDE. Therefore, further evaluation of USEPA Region III in the institution selection is not required.

1.6 Institutional Analysis Methodology

There are five elements that are considered when assessing the ability of a local, county, or state agency, or landowner to assist in the implementation or monitoring of a proposed LUC program. These five elements are:

- Jurisdiction – Federal, state, and/or local government agencies may have jurisdiction within the area of a project site. The laws governing the existence of the specific agency will convey this jurisdiction. In some areas, several agencies may be involved, depending on the type of LUC or what specific aspect of a LUC is being contemplated. Private agencies do not usually have any jurisdictional authority.
- Authority – Key questions that must be asked regarding the authority exercised by a government agency are listed below. Private agencies usually do not have any enforcement authority other than those provided by normal trespass laws.
    a. What are the limits of the agency's authority?
    b. What is the origin of the agency's authority?
    c. How much control is exercised by the agency?
    d. Does the agency have enforcement authority?
- Mission – The specific mission of the agency is critical to its ability to implement, enforce, or maintain a LUC program.
- Capability – Even if an agency has the jurisdiction, authority, and mission to be involved in a LUC program, if it does not have the capability, it cannot be an effective partner. In the case of local government agencies, the capabilities may be unique and are often a reflection of the desires of the local community. The capabilities of a government or private agency can be augmented; however, this may require additional funding.
- Desire – The desire of a government or private agency to participate in a LUC program is critical to its success. The effectiveness of LUCs is increased when local officials are committed to participation in a LUC program that is in their best interests. Resources in the form of funding for the agency's implementation costs may overcome the initial hesitancy to become involved.

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2.0 LAND USE CONTROLS

This section provides a summary of LUC options that are available for the Depot. LUCs protect property owners and the public from potential risks present at the Depot by warning of potential contaminant risks and/or limiting access to, or use of, the site. LUCs may include legal mechanisms, engineering controls, and educational controls. However, the effectiveness of LUCs depends on the support, involvement, and willingness of local agencies and landowners to enforce and maintain LUCs.

2.1 Proprietary Controls

Proprietary controls are contractual mechanisms associated with ownership of the land established by a private agreement. These controls would include easements that restrict land use (e.g. negative easements) and restrictive covenants (e.g., Uniform Environmental Covenants Act [UECA] agreements) that prohibit certain types of development or use. These types of LUCs are regulated by federal, state, or local governments. a

Restrictive covenants, also known as deed restrictions, are outlined in Section 1209(h)(3) of CERCLA. are typically regulated by government agencies and restrict activities or use on land. Under restrictive covenants, the government can take legal to enforce deed restriction.

2.2 Governmental Controls

Legal mechanisms limit or control the land use and/or activities that can occur on a property through actions such as zoning, permits, and activity requirements/restrictions. Anne Arundel County has jurisdiction and authority to regulate zoning, which consists of land use or activity restrictions within a specified area. Zoning requirements can specify the type of land use and can provide specific requirements such as building sizes, setbacks, and street and parking provisions.

2.3 Enforcement Controls

Enforcement controls may be used to require implementation and/or maintenance of an or seek to remedy for an IC breach, include CDs, FFAs, Unilateral Administrative Orders (UAOs), and permits. This includes unilateral administrative orders which require potentially responsible parties to undertake a response action when the USEPA finds there may be an imminent and substantial endangerment to the public health or environment.

2.4 Engineering Controls

Engineering controls consist physical controls to restrict access to a site that contains a potential public risk, such as fences, warning signs, and soil caps. Fences provide the most direct means of restricting public entry to a contaminated site. Although warning signs do not provide a physical barrier, signage can be used to notify and inform the public of the potential risks at the site and how to avoid risks. A soil cap is a proven effective physical barrier that can minimize exposure to contamination. Soil caps are most effective when combined with other controls, such as restricting any future excavation. Engineering controls, although effective, require frequent inspection and maintenance.

2.5 Educational Controls

Educational controls include formal seminars, public notices, and other educational materials that could be provided to nearby residents. Public notices may include brochures, service announcements on local radio or television, or periodic notices in local newspapers. This type of

education control can reach a wide audience on the potential risks at the site. Formal education programs, such as seminars and training, may be used to educate personnel entering or working on the site, construction personnel.

3.0 INSTITUTIONAL SUMMARIES

Successful management of LUCs is contingent on communication and cooperation among each authority. Each institution selected for analysis in Section 1.5 and its jurisdiction, authority, mission, and potential role in a LUC program is briefly discussed below. Specific information regarding each institution is provided in **Table 1** through **Table 5**.

3.1 General Services Administration

GSA is the current landowner and is also the federal agency responsible for managing sales of excess federal property no longer needed for mission-related purposes. GSA is responsible for disclosing all information regarding hazardous substance activities that took place on the Depot as outlined by 40 Code of Federal Regulations (CFR), Part 373, and responsible for executing the transfer of and land and current LUCs. If transfer of the Depot property occurs, the GSA will no longer be institutions with authority over the Depot. Basic information for the GSA is summarized in **Table 1**.

3.2 Defense Logistics Agency

The DLA acts as the executor acts as executor for the GSA for the Depot environmental activities. The DLA would act as an authority to implement a LUCs program initiated while GSA owns the property. DLA would no longer be an institution with authority if transfer of the Depot property were to occur. Basic information for the DLA is summarized in **Table 2**.

3.3 Maryland Department of the Environment

In 1987, MDE was created to protect and preserve the state's natural resources. The mission of the agency is to, protect and restore the quality of Maryland's air, water, and land resources. The Code of Maryland Regulations provides MDE with jurisdiction to administer and enforce the environmental laws of the state.

MDE has acted as the lead regulatory agency and has been an active participant throughout previous investigations completed at the Depot. The role of MDE in a LUC program would be as the lead regulatory agency for the implementation of the LUCs at the Depot. Basic information for MDE is summarized in **Table 3**.

3.4 Anne Arundel County

The Depot is located within Anne Arundel County. As such, the Office of Planning and Zoning is responsible for comprehensive planning, zoning, and environmental needs within the county. The County has a Comprehensive Plan for implementing land use, zoning, and development policies. The County has jurisdictional and enforcement authority on the Depot for laws and ordinances.

The County is also authorized to enforce environmental covenants under UECA and has existing staff who record deeds and covenants, issue permits, and enforce zoning and planning ordinances. The role of the County in a LUC program would be to assist and work with the GSA in developing LUCs and recording environmental covenants related to the Depot. Basic information for the County is summarized in **Table 4**.

3.5 U.S. Army Corps of Engineers

The USACE provides managerial and technical support to the GSA and DLA on environmental projects at the Depot. USACE has experience in planning, monitoring, and maintaining LUCs at numerous former defense sites. Basic information on USACE is provided in **Table 5**.

Table 1. General Services Administration Institutional Analysis	
Origin of Institution	GSA was created in 1949 by President Harry S. Truman.
Basis of Authority	Independent agency of the U.S. Government
Geographic Jurisdiction	GSA has jurisdiction under the executive branch of the Federal Government to manage sales of excess federal property.
Public Safety Function	The mission of the agency is to deliver value and savings in real estate acquisition, technology, and other mission-support services across government.
Land Use Controls	GSA has responsibility for implementing, maintaining, and monitoring LUCs while they are the landowner.
Financial Capability	Federally funded
Desire to Participate	Yes.
Constraints to Institutional Effectiveness	If transfer of the property occurs, GSA will no longer be an institutional with authority.

Table 2. Defense Logistics Agency Institutional Analysis	
Origin of Institution	DLA was established in 1961.
Basis of Authority	DoD Charter
Geographic Jurisdiction	DLA has jurisdiction to manages the reutilization and disposition of excess and/or hazardous DoD or federal property.
Public Safety Function	DLA's mission is to support worldwide logistics support to military and federal agencies and allied partners.
Land Use Controls	DLA has authority under GSA as acting executor to manage environmental activities, including LUCs.
Financial Capability	Federally funded.
Desire to Participate	Yes.
Constraints to Institutional Effectiveness	If transfer of the property occurs, DLA will no longer be an institutional with authority.

Table 3. Maryland Department of Environment Institutional Analysis	
Origin of Institution	MDE was created in 1987.
Basis of Authority	The Code of Maryland Regulations (Title 26, Department of Environment) provides MDE with jurisdiction to administer and enforce the environmental laws of the state.
Geographic Jurisdiction	MDE has jurisdiction to administer and enforce the environmental laws within the State of Maryland.
Public Safety Function	The mission of the agency is to protect and restore the quality of Maryland's air, water, and land resources.
Land Use Controls	MDE would be the lead regulatory agency for the planning and implementation of LUCs.
Financial Capability	State funded.
Desire to Participate	Yes.
Constraints to Institutional Effectiveness	MDE is responsible for registry, oversight, and monitoring of all environmental covenants and any amendments or terminations of a covenant.

Table 4. Anne Arundel County Institutional Analysis	
Origin of Institution	Anne Arundel County was created in 1650 by the Maryland General Assembly. The county was named for Lady Anne Arundel (1615-1649), the wife of Cecil Calvert who was the first Proprietor of the Province of Maryland.
Basis of Authority	County Charter
Geographic Jurisdiction	Anne Arundel County has jurisdiction within the county.
Public Safety Function	Anne Arundel County provides sheriff, fire, and emergency services within the County.
Land Use Controls	The County is authorized to enforce environmental covenants under the UECA and has existing staff who record deeds and covenants, issue permits, and enforce zoning and planning ordinances.
Financial Capability	County funded.
Desire to Participate	Yes.
Constraints to Institutional Effectiveness	The County had jurisdictional authority over the Depot but has no responsibility for implementing, maintaining, or monitoring LUCs.

Table 5. U.S. Army Corps of Engineers Institutional Analysis	
Origin of Institution	USACE was established in 1775 to provide the Army with military construction and engineering support. In the 1880s, congress also provided USACE authority over dumping and dredging in harbors and waterways. With the formation of DERP in 1983, USACE adopted a role of providing the DoD with technical and project management support on environmental projects.
Basis of Authority	USACE conducts environmental response actions under the provisions of CERCLA, as amended by the Superfund Amendments and SARA, Executive Orders 12580 and 13016. USACE has project-specific management and technical oversight authority on Army environmental projects as contracted through USACE. The USACE Baltimore District is one of four USACE districts that have a Military Munitions Design Center and have provided MMRP project oversight for the Depot since 1999.
Geographic Jurisdiction	USACE has nine regional divisions that include all the U.S., the Pacific, Europe, the Middle East, and Afghanistan. USACE has provided MMRP project oversight for the Depot through the Baltimore District. USACE also has jurisdiction over all navigable waterways in the U.S.
Public Safety Function	USACE is a major Army command that provides engineering, design, and construction management services.
Land Use Controls	As technical advisor to the Army, USACE influences the selection of LUCs, as well as establishing them in the Decision Document. In addition, they can perform real estate services for the military and civil works activities of the Army, and for other federal agencies, as requested.
Financial Capability	USACE could administer a LUC maintenance/oversight contract if programmed and funded by USAEC.
Desire to Participate	Yes.
Constraints to Institutional Effectiveness	None.

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4.0 EVALUATION INSTITUTIONAL CONTROLS

4.1 Existing Institutional Controls

Gates exist along the entrance areas and fencing occurs around the perimeter of the Depot, but to what extent and degree is uncertain. The fence is not maintained and has areas where trespassers can get onto the property. Evidence of trespassers has been seen during site visits to include: the potential use of the buildings for shelter by homeless people, and lawn chairs and beer kegs along the creeks edge and within the Depot boundaries. Additional anecdotal information on trespassers has been provided by the U.S. Army Reserve staff who have "chased people off of the Depot property" when they see them.

4.2 Potential Institutional Controls

Future institutional controls would consist of a land use covenant under UECA which would restrict activities to the safe uses of the Depot. The UECA agreement would define the grantee the environmental covenant as the "holder" who would be primarily responsible for enforcing the proprietary control.

5.0 REFERENCES

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 2009. Remedial Investigation/Feasibility Study and Selection of Remedy, 40 CFR 300.430. Volume 27. July.

Data Item Description (DID) WERS-017.01, 2010. *Institutional Analysis and Institutional Control Plan.* April.

ERT, Inc. (ERT). 2021. *Remedial Investigation Report for Depot-Wide Remedial Investigation/Feasibility Study for Arsenic and Manganese in Soil at the Former Curtis Bay Ordnance Depot, Anne Arundel County, Maryland*. September.

U.S. Army Corps of Engineers (USACE), 2000. *Establishing and Maintaining Institutional Controls for Ordnance and Explosives (OE) Projects. EP 1110-1-24*. December.

U.S. Environmental Protection Agency (USEPA), 2012. *Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites, EPA-540-R-09-001*. December.

Appendix C:
ProUCL Output (Provided on CD)

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Appendix D:
Costing Detail

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Site Escalated Cost Summary Report (with Markups)

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: F[redacted]

Folder:

Folder Name: New Folder

Project:

ID: DU 1
Name: DU 1
Category: None

Location
State / Country: MARYLAND
City: MARYLAND STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.990	0.990	

Options
Database: System Costs
Cost Database Date: 2019
Report Option: Fiscal

Description Remaining area at the Former Curtis Bay Ordnance Depot.

Site Escalated Cost Summary Report (with Markups)

Site:

ID: DU 1
Name: Alternative 2: LUCs
Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☐	
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☑	**Safety Level:** D
Site Closeout	☐	

In the RACER Preferences the default value for the Safety Level is established. This sets the default value for the safety level for each technology model based on the type of work being completed. Note: RACER Technologies that safety level is not appropriate to change from the default are hard-coded to estimate costs without a safety level productivity factor, which is Safety Level E.

Documentation

Description: LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 2 will include an environmental covenant to restrict land use to industrial uses that conveys when the property is sold.
Support Team: Former Curtis Bay Ordnance Depot Remedial Investigation Report for Arsenic and Manganese in Depot-Wide Soil.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: [redacted]
Estimator Title: Environmental Scientist
Agency/Org./Office: [redacted]
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Estimate Prepared Date: 11/21/2019

Site Escalated Cost Summary Report
(with Markups)

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name: [redacted]
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]

Date Reviewed: 11/21/2019

Reviewer Signature: _____ **Date:** _____

Site Escalated Cost Summary Report (with Markups)

Phase	Direct Cost	Markups	Total Cost
Operations & Maintenance	$ [redacted]		
Long Term Monitoring			
Total Site Cost	[redacted]		
		Escalation	[redacted]
		Escalated Site Cost	$1,729,516

Estimate Documentation Detailed Report - Layout 2

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: [redacted]

Folder:

Folder Name: New Folder

Project:

ID: DU 1
Name: DU 1
Category: None

Location
State / Country: MARYLAND
City: MARYLAND STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.990	0.990	

Options
Database: System Costs
Cost Database Date: 2019
Report Option: Fiscal

Description Remaining area at the Former Curtis Bay Ordnance Depot.

Estimate Documentation Detailed Report - Layout 2

Site:

ID: DU 1
Name: Alternative 2: LUCs
Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☐	
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☑	**Safety Level:** D
Site Closeout	☐	

In the RACER Preferences the default value for the Safety Level is established. This sets the default value for the safety level for each technology model based on the type of work being completed. Note: RACER Technologies that safety level is not appropriate to change from the default are hard-coded to estimate costs without a safety level productivity factor, which is Safety Level E.

Documentation

Description: LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 2 will include an environmental covenant to restrict land use to industrial uses that conveys when the property is sold.
Support Team: Former Curtis Bay Ordnance Depot Remedial Investigation Report for Arsenic and Manganese in Depot-Wide Soil.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: [redacted]
Estimator Title: Environmental Scientist
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Estimate Prepared Date: 11/21/2019

Estimator Signature: _____ **Date:** _____

Estimate Documentation Detailed Report - Layout 2

Reviewer Information

Reviewer Name: [redacted]
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Date Reviewed: 11/21/2019

Reviewer Signature: _____ **Date:** _____

Estimate Costs:

Phase Names	Marked-Up Cost
LUCs	$[redacted]
5-Year Review	$[redacted]
Total Cost:	$ [redacted]
Escalation:	$[redacted]
Total Project Cost:	$1,729,516

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: LUCs
Description: Land Use Controls: Deed Restriction

Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administrative Land Use Controls	Yes	100	0

Total Marked-up Cost: $1,251,484.73

Estimate Documentation Detailed Report - Layout 2

Technologies:

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
System Definition			
Required Parameters			
Rename Model		Administrative Land Use Controls	n/a
Planning Documents		Yes	n/a
Planning Documents: Start Date		2020	n/a
Implementation		Yes	n/a
Implementation: Start Date		2020	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2020	n/a
Modification/Termination		No	n/a
Type of Site		Transferring Government Installation	n/a
Planning Documents			
Required Parameters			
LUC Assurance Plan (LUCAP)		No	n/a
LUC Implementation Plan (LUCIP)		Yes	n/a
LUC Implementation Plan (LUCIP): Number		1	EA
LUC Implementation Plan (LUCIP): Plan Complexity		Low	n/a
Long-term Stewardship (LTS) Plan		No	n/a
Long-term Stewardship (LTS) Plan: Number		0	EA
Memorandum of Agreements (MOA)		Yes	n/a
Memorandum of Agreements (MOA): Number		1	EA
Memorandum of Agreements (MOA): Plan Complexity		Low	n/a
Installation (or City) Master Plan		Yes	n/a
Installation (or City) Master Plan: Plan Complexity		Low	n/a
Construction Permitting		No	n/a
Construction Permitting: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Plan Complexity		Low	n/a
Planning Meetings			
Required Parameters			
LUCAP: Number of Meetings		0	EA
LUCAP: Number of People		0	EA
LUCAP: Number of Days		0	EA

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Planning Meetings			
Required Parameters			
LUCAP: Airfare Cost		0.00	$
LUCAP: Mileage to Meeting Site		0	MI
LUCIP: Number of Meetings		1	EA
LUCIP: Number of People		2	EA
LUCIP: Number of Days		1	EA
LUCIP: Airfare Cost		0.00	$
LUCIP: Mileage to Meeting Site		0	MI
LTS: Number of Meetings		0	EA
LTS: Number of People		0	EA
LTS: Number of Days		0	EA
LTS: Airfare Cost		0.00	$
LTS: Mileage to Meeting Site		0	MI
MOA: Number of Meetings		1	EA
MOA: Number of People		1	EA
MOA: Number of Days		1	EA
MOA: Airfare Cost		0.00	$
MOA: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		1	EA
Master Plan: Number of People		1	EA
Master Plan: Number of Days		1	EA
Master Plan: Airfare Cost		0.00	$
Master Plan: Mileage to Meeting Site		0	MI
Construction Permitting: Number of Meetings		0	EA
Construction Permitting: Number of People		0	EA
Construction Permitting: Number of Days		0	EA
Construction Permitting: Airfare Cost		0.00	$
Construction Permitting: Mileage to Meeting Site		0	MI
GIS/Overlay Maps: Number of Meetings		1	EA
GIS/Overlay Maps: Number of People		1	EA
GIS/Overlay Maps: Number of Days		1	EA
GIS/Overlay Maps: Airfare Cost		0.00	$
GIS/Overlay Maps: Mileage to Meeting Site		0	MI
Implementation			
Required Parameters			
Modify Installation (or City) Master Plan		No	n/a
Deed Notification		Yes	n/a
Deed Notification: Number		1	EA
Deed Notification: Task Complexity		Low	n/a
Negotiating Easements		No	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Implementation			
Required Parameters			
Negotiating Easements: Number		0	EA
Restrictive Covenants		Yes	n/a
Restrictive Covenants: Number		1	EA
Restrictive Covenants: Task Complexity		Low	n/a
Equitable Servitudes		No	n/a
Equitable Servitudes: Number		0	EA
Access Control Signs		No	n/a
Access Control Signs: Number		0	EA
Utility Notification Service		No	n/a
Access Control Signs: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Task Complexity		Low	n/a
Develop Finding of Suitability to Transfer (FOST)		Yes	n/a
Develop Finding of Suitability to Transfer (FOST): Task Complexity		Low	n/a
Monitoring & Enforcement			
Required Parameters			
Duration of Monitoring/Enforcement		30	Years
Notice Letters		No	n/a
Notice Letters: Number		0	EA
Guard Service/Security		No	n/a
Guard Service/Security: Number		0	EA
Reports & Certifications		Yes	n/a
Reports & Certifications: Frequency		Annually	n/a
Site Visits/Inspections		Yes	n/a
Site Visits/Inspections: Number		1	EA
Site Visits/Inspections: Safety Level		D	n/a
Site Visits/Inspections: Duration		1	Days
Site Visits/Inspections: Number of People		2	EA
Site Visits/Inspections: Frequency		Annually	n/a
Site Visits/Inspections: Airfare		0	$ Per Ticket
Site Visits/Inspections: Mileage		40	MI

Comments:

Phase Documentation:

Estimate Documentation Detailed Report - Layout 2

Phase Type: Long Term Monitoring
Phase Name: 5-Year Review
Description: 5-Year Review

Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Five-Year Review	Yes	100	0

Total Marked-up Cost: $106,551.74

Technologies:

Technology Name: **Five-Year Review (#1)**
User Name: **Five-Year Review**

Description	Default	User	UOM
System Definition			
Required Parameters			
Site Complexity		Low	n/a
Document Review		Yes	n/a
Interviews		Yes	n/a
Site Inspection		Yes	n/a
Report		Yes	n/a
Travel		Yes	n/a
Rebound Study		No	n/a
Start Month		December	n/a
No. Reviews		6	EA
Start Year		2025	n/a
Safety Level		D	n/a
Document Review			
Required Parameters			
5-Year Review Check List		Yes	n/a
Record of Decision		Yes	n/a
Remedial Action Design & Construction		No	n/a
Close-Out Report		No	n/a
Operations & Maintenance Manuals & Reports		No	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Five-Year Review (#1)**

User Name: **Five-Year Review**

Description	Default	User	UOM
Document Review			
Required Parameters			
Consent Decree or Settlement Records		No	n/a
Groundwater Monitoring & Reports		No	n/a
Remedial Action Required		No	n/a
Previous 5-Year Review Reports		Yes	n/a
Interviews			
Required Parameters			
Current and Previous Staff Management		Yes	n/a
Community Groups		No	n/a
State Contacts		Yes	n/a
Local Government Contacts		Yes	n/a
Operations & Maintenance Contractors		No	n/a
PRPs		No	n/a
Remedial Design Consultant		No	n/a
Site Inspection			
Required Parameters			
General Site Inspection		Yes	n/a
Containment System Inspection		No	n/a
Monitoring Systems Inspection		No	n/a
Treatment Systems Inspection		No	n/a
Regulatory Compliance		Yes	n/a
Site Visit Documentation (Photos, Diagrams, etc.)		Yes	n/a
Report			
Required Parameters			
Introduction		Yes	n/a
Remedial Objectives		No	n/a
ARARs Review		Yes	n/a
Summary of Site Visit		Yes	n/a
Areas of Non Compliance		No	n/a
Technology Recommendations		Yes	n/a
Statement of Protectiveness		Yes	n/a
Next Review		Yes	n/a
Implementation Requirements		No	n/a
Travel			
Required Parameters			
Number of Travelers		1	EA
Number of Days		2	EA
Air Fare Ticket Price		[redacted]	$
Need a rental car?		Yes	n/a

Estimate Documentation Detailed Report - Layout 2

Comments:

Estimate Documentation Detailed Report - Layout 2

Technology: Five-Year Review

Element: Document Review

Year(s)	Cost per Year
2026	[redacted]
2027 - 2030	
2031	
2032 - 2035	
2036	
2037 - 2040	
2041	
2042 - 2045	
2046	
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220105	Project Engineer	4.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220108	Project Scientist	3.00	HR	0.00		0.00	0.00		No
33220109	Staff Scientist	6.00	HR	0.00		0.00	0.00		No

Total First Year Element Cost: $2,545.91

Element: Interviews

Year(s)	Cost per Year
2026	[redacted]
2027 - 2030	
2031	
2032 - 2035	
2036	
2037 - 2040	
2041	
2042 - 2045	
2046	
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	6.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No

Total First Year Element Cost: $1,436.52

Element: Site Inspection

Year(s)	Cost per Year

Estimate Documentation Detailed Report - Layout 2

Technology: Five-Year Review

Year(s)	Cost per Year
2026	[redacted]
2027 - 2030	
2031	
2032 - 2035	
2036	
2037 - 2040	
2041	
2042 - 2045	
2046	
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	4.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220105	Project Engineer	4.00	HR	0.00		0.00	0.00		No
33220108	Project Scientist	4.00	HR	0.00		0.00	0.00		No
33220109	Staff Scientist	4.00	HR	0.00		0.00	0.00		No

Total First Year Element Cost: $3,367.61

Element: Report

Year(s)	Cost per Year
2026	[redacted]
2027 - 2030	
2031	
2032 - 2035	
2036	
2037 - 2040	
2041	
2042 - 2045	
2046	
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	5.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220105	Project Engineer	12.00	HR	0.00		0.00	0.00		No
33220108	Project Scientist	10.00	HR	0.00		0.00	0.00		No
33220109	Staff Scientist	20.00	HR	0.00		0.00	0.00		No

Total First Year Element Cost: $9,412.81

Estimate Documentation Detailed Report - Layout 2

Technology: Five-Year Review

Element: Travel

Year(s)	Cost per Year
2026	[redacted]
2027 - 2030	
2031	
2032 - 2035	
2036	
2037 - 2040	
2041	
2042 - 2045	
2046	
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	2.00	DAY	0.00	0.00	0.00	[redacted]	[redacted]	No
33010202	Per Diem (per person)	2.00	DAY	0.00	0.00	0.00			No
33041101	Airfare	1.00	LS	0.00	0.00	0.00			No

Total First Year Element Cost: $995.77

Total First Year Tech Cost: $17,758.62

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Planning Docs	2020	[redacted]	[redacted]
Planning Meetings	2020		
Implementation	2020		
Monitoring & Enforcement	2020 - 2049		

Total Marked Up Tech Cost: $1,251,484.74

Technology: Administrative Land Use Controls

Element: Planning Docs

Year(s)	Cost per Year
2020	$275,870.10

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	67.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220105	Project Engineer	210.00	HR	0.00		0.00	0.00		No
33220106	Staff Engineer	465.00	HR	0.00		0.00	0.00		No

Estimate Documentation Detailed Report - Layout 2

Technology: Administrative Land Use Controls

33220110	QA/QC Officer	73.00	HR	0.00	[redacted]	0.00	0.00	[redacted] No
33220114	Word Processing/Clerical	300.00	HR	0.00		0.00	0.00	No
33220115	Draftsman/CADD	368.00	HR	0.00		0.00	0.00	No
33220120	Computer Data Entry	375.00	HR	0.00		0.00	0.00	No
33220503	Attorney, Partner, Real Estate	22.00	HR	0.00		0.00	0.00	No
33220504	Attorney, Partner, Contracts	30.00	HR	0.00		0.00	0.00	No
33220507	Attorney, Associate, Real Estate	30.00	HR	0.00		0.00	0.00	No
33220508	Attorney, Associate, Contracts	60.00	HR	0.00		0.00	0.00	No
33220509	Paralegal, Real Estate	30.00	HR	0.00		0.00	0.00	No
33220510	Paralegal, Contracts	60.00	HR	0.00		0.00	0.00	No
33240101	Other Direct Costs	1.00	LS	3,983.12	0.00	0.00	0.00	No

Total First Year Element Cost: $275,870.10

Element: Planning Meetings

Year(s)	Cost per Year
2020	$26,618.99

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	5.00	DAY	0.00	[redacted]	0.00	[redacted]	[redacted]	No
33220102	Project Manager	80.00	HR	0.00		0.00			No
33220105	Project Engineer	16.00	HR	0.00		0.00			No
33220114	Word Processing/Clerical	48.00	HR	0.00		0.00			No
33220115	Draftsman/CADD	24.00	HR	0.00		0.00			No
33240101	Other Direct Costs	1.00	LS	332.67		0.00			No

Total First Year Element Cost: $26,618.99

Element: Implementation

Year(s)	Cost per Year
2020	$125,739.25

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33022037	Overnight Delivery, 8 oz Letter	14.00	EA	0.00	0.00	0.00	[redacted]	[redacted]	No
33040671	Portable GPS Set with Mapping, 5 cm	1.00	MO	[redacted]	0.00	0.00	0.00		No

Estimate Documentation Detailed Report - Layout 2

Technology: Administrative Land Use Controls

	Accuracy							
33220102	Project Manager	47.00	HR	0.00	[redacted]	0.00	0.00	[redacted] No
33220105	Project Engineer	105.00	HR	0.00		0.00	0.00	No
33220106	Staff Engineer	120.00	HR	0.00		0.00	0.00	No
33220110	QA/QC Officer	31.00	HR	0.00		0.00	0.00	No
33220114	Word Processing/Clerical	94.00	HR	0.00		0.00	0.00	No
33220115	Draftsman/CADD	240.00	HR	0.00		0.00	0.00	No
33220120	Computer Data Entry	150.00	HR	0.00		0.00	0.00	No
33220212	Surveying - 2-man Crew	3.00	DAY	0.00		[redacted]	0.00	No
33220503	Attorney, Partner, Real Estate	30.00	HR	0.00		0.00	0.00	No
33220507	Attorney, Associate, Real Estate	5.00	HR	0.00		0.00	0.00	No
33220509	Paralegal, Real Estate	36.00	HR	0.00		0.00	0.00	No
33240101	Other Direct Costs	1.00	LS	[redacted]		0.00	0.00	No
33990111	Local Fees	1.00	LS			0.00	0.00	No

Total First Year Element Cost: $125,739.25

Element: Monitoring & Enforcement

Year(s)	Cost per Year
2020 - 2049	$27,441.88

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010104	Sample collection, vehicle mileage charge, car or van	40.00	MI	0.00	0.00	0.00	0.27	$10.69	No
33010202	Per Diem (per person)	3.00	DAY	0.00	0.00	0.00	[redacted]	[redacted]	No
33022038	Overnight delivery service, 1 lb package	6.00	LB	0.00	0.00	0.00			No
33220102	Project Manager	18.00	HR	0.00	[redacted]	0.00	0.00		No
33220106	Staff Engineer	65.00	HR	0.00		0.00	0.00		No
33220110	QA/QC Officer	4.00	HR	0.00		0.00	0.00		No
33220112	Field Technician	1.00	HR	0.00		0.00	0.00		No
33220114	Word Processing/Clerical	26.00	HR	0.00		0.00	0.00		No
33220115	Draftsman/CADD	16.00	HR	0.00		0.00	0.00		No
33220119	Health and Safety Officer	17.00	HR	0.00		0.00	0.00		No
33240101	Other Direct Costs	1.00	LS	343.28	0.00	0.00	0.00		No

Estimate Documentation Detailed Report - Layout 2

Total First Year Element Cost:	[redacted]
Total First Year Tech Cost:	$455,670.22

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Planning Docs	2020	[redacted]	[redacted]
Planning Meetings	2020		
Implementation	2020		
Monitoring & Enforcement	2020 - 2049		

Total Marked Up Tech Cost: $1,251,484.74

Site Escalated Cost Summary Report (with Markups)

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: [redacted]

Folder:

Folder Name: New Folder

Project:

ID: DU 2
Name: DU 2
Category: None

Location
State / Country: MARYLAND
City: MARYLAND STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.990	0.990	

Options
Database: System Costs
Cost Database Date: 2019
Report Option: Fiscal

Description Former IRP shop area at the Former Curtis Bay Ordnance Depot

Site Escalated Cost Summary Report (with Markups)

Site:

ID: DU 2
Name: Alternative 2: LUCs
Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☐	
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☑	**Safety Level:** D
Site Closeout	☐	

In the RACER Preferences the default value for the Safety Level is established. This sets the default value for the safety level for each technology model based on the type of work being completed. Note: RACER Technologies that safety level is not appropriate to change from the default are hard-coded to estimate costs without a safety level productivity factor, which is Safety Level E.

Documentation

Description: LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 2 will include an environmental covenant to restrict land use to industrial uses that conveys when the property is sold.
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: [redacted]
Estimator Title: Environmental Scientist
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Estimate Prepared Date: 11/21/2019

Site Escalated Cost Summary Report (with Markups)

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name: [redacted]
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Date Reviewed: 11/21/2019

Reviewer Signature: _____ **Date:** _____

Site Escalated Cost Summary Report (with Markups)

Phase	Direct Cost	Markups	Total Cost
Operations & Maintenance	[redacted]	[redacted]	[redacted]
Long Term Monitoring			
Total Site Cost	$521,259	$836,778	$1,358,036
		Escalation	[redacted]
		Escalated Site Cost	$1,729,516

Estimate Documentation Detailed Report - Layout 2

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: [redacted]

Folder:

Folder Name: New Folder

Project:

ID: DU 2
Name: DU 2
Category: None

Location
State / Country: MARYLAND
City: MARYLAND STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.990	0.990	

Options
Database: System Costs
Cost Database Date: 2019
Report Option: Fiscal

Description Former IRP shop area at the Former Curtis Bay Ordnance Depot

Estimate Documentation Detailed Report - Layout 2

Site:

ID: DU 2
Name: Alternative 2: LUCs
Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☐	
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☑	**Safety Level:** D
Site Closeout	☐	

In the RACER Preferences the default value for the Safety Level is established. This sets the default value for the safety level for each technology model based on the type of work being completed. Note: RACER Technologies that safety level is not appropriate to change from the default are hard-coded to estimate costs without a safety level productivity factor, which is Safety Level E.

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Description: LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 2 will include an environmental covenant to restrict land use to industrial uses that conveys when the property is sold.
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Estimator Information

Estimator Name: [redacted]
Estimator Title: Environmental Scientist
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Estimate Prepared Date: 11/21/2019

Estimator Signature: _____ **Date:** _____

Estimate Documentation Detailed Report - Layout 2

Reviewer Information

Reviewer Name: [redacted]
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Date Reviewed: 11/21/2019

Reviewer Signature: _____ **Date:** _____

Estimate Costs:

Phase Names	Marked-Up Cost
LUCs	[redacted]
5-Year Review	
Total Cost:	[redacted]
Escalation:	
Total Project Cost:	$1,729,516

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: LUCs
Description: Land Use Controls: Deed Restriction

Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administrative Land Use Controls	Yes	100	0

Total Marked-up Cost: $1,251,484.73

Estimate Documentation Detailed Report - Layout 2

Technologies:

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
System Definition			
Required Parameters			
Rename Model		Administrative Land Use Controls	n/a
Planning Documents		Yes	n/a
Planning Documents: Start Date		2020	n/a
Implementation		Yes	n/a
Implementation: Start Date		2020	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2020	n/a
Modification/Termination		No	n/a
Type of Site		Transferring Government Installation	n/a
Planning Documents			
Required Parameters			
LUC Assurance Plan (LUCAP)		No	n/a
LUC Implementation Plan (LUCIP)		Yes	n/a
LUC Implementation Plan (LUCIP): Number		1	EA
LUC Implementation Plan (LUCIP): Plan Complexity		Low	n/a
Long-term Stewardship (LTS) Plan		No	n/a
Long-term Stewardship (LTS) Plan: Number		0	EA
Memorandum of Agreements (MOA)		Yes	n/a
Memorandum of Agreements (MOA): Number		1	EA
Memorandum of Agreements (MOA): Plan Complexity		Low	n/a
Installation (or City) Master Plan		Yes	n/a
Installation (or City) Master Plan: Plan Complexity		Low	n/a
Construction Permitting		No	n/a
Construction Permitting: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Plan Complexity		Low	n/a
Planning Meetings			
Required Parameters			
LUCAP: Number of Meetings		0	EA
LUCAP: Number of People		0	EA
LUCAP: Number of Days		0	EA

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Planning Meetings			
Required Parameters			
LUCAP: Airfare Cost		0.00	$
LUCAP: Mileage to Meeting Site		0	MI
LUCIP: Number of Meetings		1	EA
LUCIP: Number of People		2	EA
LUCIP: Number of Days		1	EA
LUCIP: Airfare Cost		0.00	$
LUCIP: Mileage to Meeting Site		0	MI
LTS: Number of Meetings		0	EA
LTS: Number of People		0	EA
LTS: Number of Days		0	EA
LTS: Airfare Cost		0.00	$
LTS: Mileage to Meeting Site		0	MI
MOA: Number of Meetings		1	EA
MOA: Number of People		1	EA
MOA: Number of Days		1	EA
MOA: Airfare Cost		0.00	$
MOA: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		1	EA
Master Plan: Number of People		1	EA
Master Plan: Number of Days		1	EA
Master Plan: Airfare Cost		0.00	$
Master Plan: Mileage to Meeting Site		0	MI
Construction Permitting: Number of Meetings		0	EA
Construction Permitting: Number of People		0	EA
Construction Permitting: Number of Days		0	EA
Construction Permitting: Airfare Cost		0.00	$
Construction Permitting: Mileage to Meeting Site		0	MI
GIS/Overlay Maps: Number of Meetings		1	EA
GIS/Overlay Maps: Number of People		1	EA
GIS/Overlay Maps: Number of Days		1	EA
GIS/Overlay Maps: Airfare Cost		0.00	$
GIS/Overlay Maps: Mileage to Meeting Site		0	MI
Implementation			
Required Parameters			
Modify Installation (or City) Master Plan		No	n/a
Deed Notification		Yes	n/a
Deed Notification: Number		1	EA
Deed Notification: Task Complexity		Low	n/a
Negotiating Easements		No	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Implementation			
Required Parameters			
Negotiating Easements: Number		0	EA
Restrictive Covenants		Yes	n/a
Restrictive Covenants: Number		1	EA
Restrictive Covenants: Task Complexity		Low	n/a
Equitable Servitudes		No	n/a
Equitable Servitudes: Number		0	EA
Access Control Signs		No	n/a
Access Control Signs: Number		0	EA
Utility Notification Service		No	n/a
Access Control Signs: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Task Complexity		Low	n/a
Develop Finding of Suitability to Transfer (FOST)		Yes	n/a
Develop Finding of Suitability to Transfer (FOST): Task Complexity		Low	n/a
Monitoring & Enforcement			
Required Parameters			
Duration of Monitoring/Enforcement		30	Years
Notice Letters		No	n/a
Notice Letters: Number		0	EA
Guard Service/Security		No	n/a
Guard Service/Security: Number		0	EA
Reports & Certifications		Yes	n/a
Reports & Certifications: Frequency		Annually	n/a
Site Visits/Inspections		Yes	n/a
Site Visits/Inspections: Number		1	EA
Site Visits/Inspections: Safety Level		D	n/a
Site Visits/Inspections: Duration		1	Days
Site Visits/Inspections: Number of People		2	EA
Site Visits/Inspections: Frequency		Annually	n/a
Site Visits/Inspections: Airfare		0	$ Per Ticket
Site Visits/Inspections: Mileage		40	MI

Comments:

Phase Documentation:

Estimate Documentation Detailed Report - Layout 2

Phase Type: Long Term Monitoring
Phase Name: 5-Year Review
Description: 5-Year Review

Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Five-Year Review	Yes	100	0

Total Marked-up Cost: $106,551.74

Technologies:

Technology Name: **Five-Year Review (#2)**
User Name: **Five-Year Review**

Description	Default	User	UOM
System Definition			
Required Parameters			
Site Complexity		Low	n/a
Document Review		Yes	n/a
Interviews		Yes	n/a
Site Inspection		Yes	n/a
Report		Yes	n/a
Travel		Yes	n/a
Rebound Study		No	n/a
Start Month		December	n/a
No. Reviews		6	EA
Start Year		2025	n/a
Safety Level		D	n/a
Document Review			
Required Parameters			
5-Year Review Check List		Yes	n/a
Record of Decision		Yes	n/a
Remedial Action Design & Construction		No	n/a
Close-Out Report		No	n/a
Operations & Maintenance Manuals & Reports		No	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Five-Year Review (#2)**

User Name: **Five-Year Review**

Description	Default	User	UOM
Document Review			
Required Parameters			
Consent Decree or Settlement Records		No	n/a
Groundwater Monitoring & Reports		No	n/a
Remedial Action Required		No	n/a
Previous 5-Year Review Reports		Yes	n/a
Interviews			
Required Parameters			
Current and Previous Staff Management		Yes	n/a
Community Groups		No	n/a
State Contacts		Yes	n/a
Local Government Contacts		Yes	n/a
Operations & Maintenance Contractors		No	n/a
PRPs		No	n/a
Remedial Design Consultant		No	n/a
Site Inspection			
Required Parameters			
General Site Inspection		Yes	n/a
Containment System Inspection		No	n/a
Monitoring Systems Inspection		No	n/a
Treatment Systems Inspection		No	n/a
Regulatory Compliance		Yes	n/a
Site Visit Documentation (Photos, Diagrams, etc.)		Yes	n/a
Report			
Required Parameters			
Introduction		Yes	n/a
Remedial Objectives		No	n/a
ARARs Review		Yes	n/a
Summary of Site Visit		Yes	n/a
Areas of Non Compliance		No	n/a
Technology Recommendations		Yes	n/a
Statement of Protectiveness		Yes	n/a
Next Review		Yes	n/a
Implementation Requirements		No	n/a
Travel			
Required Parameters			
Number of Travelers		1	EA
Number of Days		2	EA
Air Fare Ticket Price		[redacted]	$
Need a rental car?		Yes	n/a

Estimate Documentation Detailed Report - Layout 2

Comments:

Estimate Documentation Detailed Report - Layout 2

Technology: Administrative Land Use Controls

Element: Planning Docs

Year(s)	Cost per Year
2020	$275,870.10

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost verride
33220102	Project Manager	67.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220105	Project Engineer	210.00	HR	0.00		0.00	0.00		No
33220106	Staff Engineer	465.00	HR	0.00		0.00	0.00		No
33220110	QA/QC Officer	73.00	HR	0.00		0.00	0.00		No
33220114	Word Processing/Clerical	300.00	HR	0.00		0.00	0.00		No
33220115	Draftsman/CADD	368.00	HR	0.00		0.00	0.00		No
33220120	Computer Data Entry	375.00	HR	0.00		0.00	0.00		No
33220503	Attorney, Partner, Real Estate	22.00	HR	0.00		0.00	0.00		No
33220504	Attorney, Partner, Contracts	30.00	HR	0.00		0.00	0.00		No
33220507	Attorney, Associate, Real Estate	30.00	HR	0.00		0.00	0.00		No
33220508	Attorney, Associate, Contracts	60.00	HR	0.00		0.00	0.00		No
33220509	Paralegal, Real Estate	30.00	HR	0.00		0.00	0.00		No
33220510	Paralegal, Contracts	60.00	HR	0.00		0.00	0.00		No
33240101	Other Direct Costs	1.00	LS	[redacted]		0.00	0.00		No

Total First Year Element Cost: $275,870.10

Element: Planning Meetings

Year(s)	Cost per Year
2020	$26,618.99

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	5.00	DAY	0.00	0.00	0.00	184.58	[redacted]	No
33220102	Project Manager	80.00	HR	0.00	[redacted]	0.00	0.00		No
33220105	Project Engineer	16.00	HR	0.00		0.00	0.00		No
33220114	Word Processing/Clerical	48.00	HR	0.00		0.00	0.00		No
33220115	Draftsman/CADD	24.00	HR	0.00		0.00	0.00		No
33240101	Other Direct Costs	1.00	LS	[redacted]		0.00	0.00		No

Total First Year Element Cost: $26,618.99

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Element: Implementation

Year(s)	Cost per Year
2020	$125,739.25

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33022037	Overnight Delivery, 8 oz Letter	14.00	EA	0.00	0.00	0.00	[redacted]	[redacted]	No
33040671	Portable GPS Set with Mapping, 5 cm Accuracy	1.00	MO	[redacted]	0.00	0.00	0.00	[redacted]	No
33220102	Project Manager	47.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220105	Project Engineer	105.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220106	Staff Engineer	120.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220110	QA/QC Officer	31.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220114	Word Processing/Clerical	94.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220115	Draftsman/CADD	240.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220120	Computer Data Entry	150.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220212	Surveying - 2-man Crew	3.00	DAY	0.00	[redacted]	[redacted]	0.00	[redacted]	No
33220503	Attorney, Partner, Real Estate	30.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220507	Attorney, Associate, Real Estate	5.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220509	Paralegal, Real Estate	36.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	[redacted]	No
33990111	Local Fees	1.00	LS	[redacted]	0.00	0.00	0.00	[redacted]	No

Total First Year Element Cost: $125,739.25

Element: Monitoring & Enforcement

Year(s)	Cost per Year
2020 - 2049	$27,441.88

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010104	Sample collection, vehicle mileage charge, car or van	40.00	MI	0.00	0.00	0.00	[redacted]	[redacted]	No
33010202	Per Diem (per person)	3.00	DAY	0.00	0.00	0.00	[redacted]	[redacted]	No
33022038	Overnight delivery service, 1 lb package	6.00	LB	0.00	0.00	0.00	[redacted]	[redacted]	No
33220102	Project Manager	18.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220106	Staff Engineer	65.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No

Estimate Documentation Detailed Report - Layout 2

Technology: Administrative Land Use Controls

33220110	QA/QC Officer	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220112	Field Technician	1.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	26.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	16.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220119	Health and Safety Officer	17.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $27,441.88

Total First Year Tech Cost: $455,670.22

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2026	$[redacted]	$[redacted]
Document Review	2031	$[redacted]	$[redacted]
Document Review	2036	$[redacted]	$[redacted]
Document Review	2041	$[redacted]	$[redacted]
Document Review	2046	$[redacted]	$[redacted]
Document Review	2051	$[redacted]	$[redacted]
Interviews	2026	$[redacted]	$[redacted]
Interviews	2031	$[redacted]	$[redacted]
Interviews	2036	$[redacted]	$[redacted]
Interviews	2041	$[redacted]	$[redacted]
Interviews	2046	$[redacted]	$[redacted]
Interviews	2051	$[redacted]	$[redacted]
Site Inspection	2026	$[redacted]	$[redacted]
Site Inspection	2031	$[redacted]	$[redacted]
Site Inspection	2036	$[redacted]	$[redacted]
Site Inspection	2041	$[redacted]	$[redacted]
Site Inspection	2046	$[redacted]	$[redacted]
Site Inspection	2051	$[redacted]	$[redacted]
Report	2026	$[redacted]	$[redacted]
Report	2031	$[redacted]	$[redacted]
Report	2036	$[redacted]	$[redacted]
Report	2041	$[redacted]	$[redacted]
Report	2046	$[redacted]	$[redacted]
Report	2051	$[redacted]	$[redacted]
Travel	2026	$[redacted]	$[redacted]
Travel	2031	$[redacted]	$[redacted]
Travel	2036	$[redacted]	$[redacted]
Travel	2041	$[redacted]	$[redacted]
Travel	2046	$[redacted]	$[redacted]

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Travel	2051	$[redacted]	$[redacted]

Total Marked Up Tech Cost: $106,551.72

Technology: Five-Year Review

Element: Document Review

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220105	Project Engineer	4.00	HR	0.00	202.98	0.00	0.00	$[redacted]	No
33220108	Project Scientist	3.00	HR	0.00	221.01	0.00	0.00	$[redacted]	No
33220109	Staff Scientist	6.00	HR	0.00	178.49	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $2,545.91

Element: Interviews

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	6.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $1,436.52

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Element: Site Inspection

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220109	Staff Scientist	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $3,367.61

Element: Report

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	5.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	12.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	10.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220109	Staff Scientist	20.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Estimate Documentation Detailed Report - Layout 2

Total First Year Element Cost: $9,412.81

Element: Travel

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	2.00	DAY	0.00	0.00	0.00	[redacted]	$[redacted]	No
33010202	Per Diem (per person)	2.00	DAY	0.00	0.00	0.00	[redacted]	$[redacted]	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	[redacted]	$[redacted]	No

Total First Year Element Cost: $995.77

Total First Year Tech Cost: $17,758.62

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2026	$[redacted]	$[redacted]
Document Review	2031	$[redacted]	$[redacted]
Document Review	2036	$[redacted]	$[redacted]
Document Review	2041	$[redacted]	$[redacted]
Document Review	2046	$[redacted]	$[redacted]
Document Review	2051	$[redacted]	$[redacted]
Interviews	2026	$[redacted]	$[redacted]
Interviews	2031	$[redacted]	$[redacted]
Interviews	2036	$[redacted]	$[redacted]
Interviews	2041	$[redacted]	$[redacted]
Interviews	2046	$[redacted]	$[redacted]
Interviews	2051	$[redacted]	$[redacted]
Site Inspection	2026	$[redacted]	$[redacted]
Site Inspection	2031	$[redacted]	$[redacted]
Site Inspection	2036	$[redacted]	$[redacted]
Site Inspection	2041	$[redacted]	$[redacted]

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Site Inspection	2046	$[redacted]	$[redacted]
Site Inspection	2051	$[redacted]	$[redacted]
Report	2026	$[redacted]	$[redacted]
Report	2031	$[redacted]	$[redacted]
Report	2036	$[redacted]	$[redacted]
Report	2041	$[redacted]	$[redacted]
Report	2046	$[redacted]	$[redacted]
Report	2051	$[redacted]	$[redacted]
Travel	2026	$[redacted]	$[redacted]
Travel	2031	$[redacted]	$[redacted]
Travel	2036	$[redacted]	$[redacted]
Travel	2041	$[redacted]	$[redacted]
Travel	2046	$[redacted]	$[redacted]
Travel	2051	$[redacted]	$[redacted]

Total Marked Up Tech Cost: $106,551.72

Site Cost Summary Report
(with Markups)

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: [redacted]

Folder:

Folder Name: New Folder

Project:

ID: DU 1
Name: DU 1
Category: None

Location
State / Country: MARYLAND
City: MARYLAND STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.990	0.990	

Options
Database: System Costs
Cost Database Date: 2019
Report Option: Fiscal

Description Remaining area at the Former Curtis Bay Ordnance Depot.

Site Cost Summary Report
(with Markups)

Site:

ID: DU 1
Name: Alternative 3: Partial Soil Removal with LUCs
Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: None

Phase Names

Pre-Study	☑	**Safety Level:** E
Study	☑	**Safety Level:** D
Design	☑	**Safety Level:** E
Removal/Interim Action	☑	**Safety Level:** D
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☑	**Safety Level:** D
Site Closeout	☑	**Safety Level:** D

In the RACER Preferences the default value for the Safety Level is established. This sets the default value for the safety level for each technology model based on the type of work being completed. Note: RACER Technologies that safety level is not appropriate to change from the default are hard-coded to estimate costs without a safety level productivity factor, which is Safety Level E.

Documentation

Description: LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 2 will include an environmental covenant to restrict land use to industrial uses that conveys when the property is sold.
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: [redacted]
Estimator Title: Environmental Scientist
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Estimate Prepared Date: 11/21/2019

Site Cost Summary Report
(with Markups)

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name: [redacted]
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]

Date Reviewed: 11/21/2019

Reviewer Signature: _____ **Date:** _____

Site Cost Summary Report
(with Markups)

Phase	Direct Cost	Markups	Total Cost
Design	$20,000	$7,388	$27,388

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: [redacted]

Folder:

Folder Name: New Folder

Project:

ID: DU 1
Name: DU 1
Category: None

Location
State / Country: MARYLAND
City: MARYLAND STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.990	0.990	

Options
Database: System Costs
Cost Database Date: 2019
Report Option: Fiscal

Description Remaining area at the Former Curtis Bay Ordnance Depot.

Site Cost Summary Report
(with Markups)

Site:

ID: DU 1
Name: Alternative 3: Partial Soil Removal with LUCs
Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: None

Phase Names

Pre-Study	☑	**Safety Level:** E
Study	☑	**Safety Level:** D
Design	☑	**Safety Level:** E
Removal/Interim Action	☑	**Safety Level:** D
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☑	**Safety Level:** D
Site Closeout	☑	**Safety Level:** D

In the RACER Preferences the default value for the Safety Level is established. This sets the default value for the safety level for each technology model based on the type of work being completed. Note: RACER Technologies that safety level is not appropriate to change from the default are hard-coded to estimate costs without a safety level productivity factor, which is Safety Level E.

Documentation

Description: LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 2 will include an environmental covenant to restrict land use to industrial uses that conveys when the property is sold.
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Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Estimate Prepared Date: 11/21/2019

Site Cost Summary Report
(with Markups)

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name: [redacted]
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]

Date Reviewed: 11/21/2019

Reviewer Signature: _____ **Date:** _____

Site Cost Summary Report
(with Markups)

Phase	Direct Cost	Markups	Total Cost
Remedial Action	$[redacted]	$[redacted]	$[redacted]
Operations & Maintenance	$[redacted]	$[redacted]	$[redacted]
Long Term Monitoring	$[redacted]	$[redacted]	$[redacted]
Total Site Cost	$1,018,867	$1,025,419	$2,044,286

Estimate Documentation Detailed Report - Layout 2

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: [redacted]

Folder:

Folder Name: New Folder

Project:

ID: DU 1
Name: DU 1
Category: None

Location
State / Country: MARYLAND
City: MARYLAND STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.990	0.990	

Options
Database: System Costs
Cost Database Date: 2019
Report Option: Fiscal

Description Remaining area at the Former Curtis Bay Ordnance Depot.

Estimate Documentation Detailed Report - Layout 2

Site:

ID: DU 1
Name: Alternative 3: Partial Soil Removal with LUCs
Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: None

Phase Names

Pre-Study	☑	**Safety Level:** E
Study	☑	**Safety Level:** D
Design	☑	**Safety Level:** E
Removal/Interim Action	☑	**Safety Level:** D
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☑	**Safety Level:** D
Site Closeout	☑	**Safety Level:** D

In the RACER Preferences the default value for the Safety Level is established. This sets the default value for the safety level for each technology model based on the type of work being completed. Note: RACER Technologies that safety level is not appropriate to change from the default are hard-coded to estimate costs without a safety level productivity factor, which is Safety Level E.

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Description: LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 2 will include an environmental covenant to restrict land use to industrial uses that conveys when the property is sold.
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Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Estimate Prepared Date: 11/21/2019

Estimator Signature: _____ **Date:** _____

Estimate Documentation Detailed Report - Layout 2

Reviewer Information

Reviewer Name: [redacted]
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Date Reviewed: 11/21/2019

Reviewer Signature: _____ **Date:** _____

Estimate Costs:

Phase Names	Marked-Up Cost
UECA documents	$[redacted]
Sediment and Erosion Control Plans	$[redacted]
Partial excavation of soil 2 ft	$[redacted]
Partial excavation of soil 1 ft	$[redacted]
LUCs	$[redacted]
5-Year Review	$[redacted]
Total Cost:	$2,044,286

Total Project Cost: $2,044,286

Phase Documentation:

Phase Type: Design
Phase Name: UECA documents
Description: Uniform Environmental Covenants Act document preparation

Start Date: May, 2022
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Estimate Documentation Detailed Report - Layout 2

Total Marked-up Cost: $22,387.59

Technologies:

Technology Name: **User Defined Estimate (#2)**

User Name: **USER DEFINED ESTIMATE**

Description	Default	User	UOM
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		321.20.91	n/a
Safety Level		D	n/a

Comments:

Phase Documentation:

Phase Type: Design
Phase Name: Sediment and Erosion Control Plans
Description: Sediment and Erosion Control Plans

Start Date: May, 2022
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $5,000.00

Technologies:

Estimate Documentation Detailed Report - Layout 2

Technology Name: **User Defined Estimate (#2)**

User Name: **USER DEFINED ESTIMATE**

Description	Default	User	UOM
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		321.20.91	n/a
Safety Level		D	n/a

Comments:

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Partial excavation of soil 2 ft
Description: Partial excavation of soil to up to 2 ft bgs
Approach: Ex Situ
Start Date: September, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Clear and Grub	Yes	100	0
Excavation	Yes	100	0
Off-site Transportation and Waste Disposal	Yes	100	0

Total Marked-up Cost: $355,622.61

Technologies:

Technology Name: **Clear and Grub (#2)**

User Name: **Clear and Grub**

Description	Default	User	UOM
System Definition			
Required Parameters			
Acres		1	AC

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Clear and Grub (#2)**

User Name: **Clear and Grub**

Description	Default	User	UOM
System Definition			
Required Parameters			
Dry Soil		90.00	%
Wet Soil		10.00	%
Include Load and Haul Costs		Yes	n/a
Safety Level		D	n/a
Clearing			
Secondary Parameters			
Brush Density	Medium	Medium	n/a
Debris Reduction	None	None	n/a
Trees Per Acre (<= 6")	0	0	EA/AC
Trees Per Acre (> 6" & <= 12")	100	100	EA/AC
Trees Per Acre (> 12" & <= 24")	0	0	EA/AC
Trees Per Acre (> 24" & <= 36")	0	0	EA/AC
Stumps Per Acre (<= 6")	0	0	EA/AC
Stumps Per Acre (> 6" & <= 12")	100	100	EA/AC
Stumps Per Acre (> 12" & <= 24")	0	0	EA/AC
Stumps Per Acre (> 24" & <= 36")	0	0	EA/AC
Grubbing			
Secondary Parameters			
Grubbing Depth	6	6	IN
Bulk Factor	1.2	1.2	n/a
Equipment	Dozer - 105hp	Dozer - 105hp	n/a
Soil Stripping			
Secondary Parameters			
Soil Depth	0	0	IN
Stripping Area	0.00	0.00	%
Soil Equipment	Dozer - 200hp	Dozer - 200hp	n/a
Disposal	Stockpilling	Stockpilling	n/a
Bulk Factor	1.2	1.2	n/a
Load and Haul			
Secondary Parameters			
Truck Type		Highway	n/a
Volume		12281.58	CY
One-way Haul Distance		5	MI
Dump Charge		15	$/CY

Comments:

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Excavation (#2)**

User Name: **Excavation**

Description	Default	User	UOM
System Definition			
Required Parameters			
Estimating Method		Area / Depth	n/a
Area		1	AC
Depth		2	FT
Soil Type		Sand-Silt/Sand-Clay Mixture	n/a
Safety Level		D	n/a
Excavation			
Secondary Parameters			
Existing Cover	Soil/Gravel	Soil/Gravel	n/a
Replacement Cover	Soil/Seeding	Soil/Seeding	n/a
Sidewall Protection	None	None	n/a
% of Excavated Material To Be Used as Backfill	0.00	0.00	%
Source of Additional Fill	Off Site	Off Site	n/a
Backfill Hauling Distance (one way)	10	10	MI
Dewatering Required	No	No	n/a
Analytical			
Secondary Parameters			
Primary Analytical Template	System Soil - Metals	System Soil - Metals	n/a
Secondary Analytical Template	None	None	n/a
Number of Sampling Points/Locations	73	73	EA
Number of Composites Submitted to Lab	19	19	EA
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Submit Data Electronically	Yes	Yes	n/a
Data Package / QC	Stage 1	Stage 1	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Sampling Reports	Abbreviated	Abbreviated	n/a

Comments:

Technology Name: **Off-site Transportation and Waste Disposal (#2)**

User Name: **Off-site Transportation and Waste Disposal**

Description	Default	User	UOM
System Definition			
Required Parameters			
Waste Type		Non-Hazardous	n/a
Waste Form		Solid	n/a
Condition of Waste		Bulk to remain as bulk	n/a
Volume of Bulk Solid Waste		3333	CY
Transportation Type		Truck	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Off-site Transportation and Waste Disposal (#2)**

User Name: **Off-site Transportation and Waste Disposal**

Description	Default	User	UOM
System Definition			
Required Parameters			
Transportation Type #1 - Distance to Disposal Facility (one-way)		30	MI
Safety Level		D	n/a

Comments:

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Partial excavation of soil 1 ft
Description: Partial excavation of soil to up to 1 ft bgs

Approach: Ex Situ
Start Date: September, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Clear and Grub	Yes	100	0
Excavation	Yes	100	0
Off-site Transportation and Waste Disposal	Yes	100	0

Total Marked-up Cost: $303,239.67

Technologies:

Technology Name: **Clear and Grub (#2)**

User Name: **Clear and Grub**

Description	Default	User	UOM
System Definition			
Required Parameters			
Acres		1.6	AC
Dry Soil		90.00	%
Wet Soil		10.00	%

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Clear and Grub (#2)**

User Name: **Clear and Grub**

Description	Default	User	UOM
System Definition			
Required Parameters			
Include Load and Haul Costs		Yes	n/a
Safety Level		D	n/a
Clearing			
Secondary Parameters			
Brush Density	Medium	Medium	n/a
Debris Reduction	None	None	n/a
Trees Per Acre (<= 6")	0	0	EA/AC
Trees Per Acre (> 6" & <= 12")	100	100	EA/AC
Trees Per Acre (> 12" & <= 24")	0	0	EA/AC
Trees Per Acre (> 24" & <= 36")	0	0	EA/AC
Stumps Per Acre (<= 6")	0	0	EA/AC
Stumps Per Acre (> 6" & <= 12")	100	100	EA/AC
Stumps Per Acre (> 12" & <= 24")	0	0	EA/AC
Stumps Per Acre (> 24" & <= 36")	0	0	EA/AC
Grubbing			
Secondary Parameters			
Grubbing Depth	6	6	IN
Bulk Factor	1.2	1.2	n/a
Equipment	Dozer - 105hp	Dozer - 105hp	n/a
Soil Stripping			
Secondary Parameters			
Soil Depth	0	0	IN
Stripping Area	0.00	0.00	%
Soil Equipment	Dozer - 200hp	Dozer - 200hp	n/a
Disposal	Stockpilling	Stockpilling	n/a
Bulk Factor	1.2	1.2	n/a
Load and Haul			
Secondary Parameters			
Truck Type		Highway	n/a
Volume		12281.58	CY
One-way Haul Distance		5	MI
Dump Charge		15	$/CY

Comments:

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Excavation (#2)**

User Name: **Excavation**

Description	Default	User	UOM
System Definition			
Required Parameters			
Estimating Method		Area / Depth	n/a
Area		1.6	AC
Depth		1	FT
Soil Type		Sand-Silt/Sand-Clay Mixture	n/a
Safety Level		D	n/a
Excavation			
Secondary Parameters			
Existing Cover	Soil/Gravel	Soil/Gravel	n/a
Replacement Cover	Soil/Seeding	Soil/Seeding	n/a
Sidewall Protection	None	None	n/a
% of Excavated Material To Be Used as Backfill	0.00	0.00	%
Source of Additional Fill	Off Site	Off Site	n/a
Backfill Hauling Distance (one way)	10	10	MI
Dewatering Required	No	No	n/a
Analytical			
Secondary Parameters			
Primary Analytical Template	System Soil - Metals	System Soil - Metals	n/a
Secondary Analytical Template	None	None	n/a
Number of Sampling Points/Locations	114	114	EA
Number of Composites Submitted to Lab	29	29	EA
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Submit Data Electronically	Yes	Yes	n/a
Data Package / QC	Stage 1	Stage 1	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Sampling Reports	Abbreviated	Abbreviated	n/a

Comments:

Technology Name: **Off-site Transportation and Waste Disposal (#2)**

User Name: **Off-site Transportation and Waste Disposal**

Description	Default	User	UOM
System Definition			
Required Parameters			
Waste Type		Non-Hazardous	n/a
Waste Form		Solid	n/a
Condition of Waste		Bulk to remain as bulk	n/a
Volume of Bulk Solid Waste		2500	CY
Transportation Type		Truck	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Off-site Transportation and Waste Disposal (#2)**

User Name: **Off-site Transportation and Waste Disposal**

Description	Default	User	UOM
System Definition			
Required Parameters			
Transportation Type #1 - Distance to Disposal Facility (one-way)		30	MI
Safety Level		D	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: LUCs
Description: Land Use Controls: Deed Restriction

Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administrative Land Use Controls	Yes	100	0

Total Marked-up Cost: $1,251,484.73

Technologies:

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
System Definition			
Required Parameters			
Rename Model		Administrative Land Use Controls	n/a
Planning Documents		Yes	n/a
Planning Documents: Start Date		2020	n/a
Implementation		Yes	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
System Definition			
Required Parameters			
Implementation: Start Date		2020	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2020	n/a
Modification/Termination		No	n/a
Type of Site		Transferring Government Installation	n/a
Planning Documents			
Required Parameters			
LUC Assurance Plan (LUCAP)		No	n/a
LUC Implementation Plan (LUCIP)		Yes	n/a
LUC Implementation Plan (LUCIP): Number		1	EA
LUC Implementation Plan (LUCIP): Plan Complexity		Low	n/a
Long-term Stewardship (LTS) Plan		No	n/a
Long-term Stewardship (LTS) Plan: Number		0	EA
Memorandum of Agreements (MOA)		Yes	n/a
Memorandum of Agreements (MOA): Number		1	EA
Memorandum of Agreements (MOA): Plan Complexity		Low	n/a
Installation (or City) Master Plan		Yes	n/a
Installation (or City) Master Plan: Plan Complexity		Low	n/a
Construction Permitting		No	n/a
Construction Permitting: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Plan Complexity		Low	n/a
Planning Meetings			
Required Parameters			
LUCAP: Number of Meetings		0	EA
LUCAP: Number of People		0	EA
LUCAP: Number of Days		0	EA
LUCAP: Airfare Cost		0.00	$
LUCAP: Mileage to Meeting Site		0	MI
LUCIP: Number of Meetings		1	EA
LUCIP: Number of People		2	EA
LUCIP: Number of Days		1	EA
LUCIP: Airfare Cost		0.00	$
LUCIP: Mileage to Meeting Site		0	MI
LTS: Number of Meetings		0	EA
LTS: Number of People		0	EA

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Planning Meetings			
Required Parameters			
LTS: Number of Days		0	EA
LTS: Airfare Cost		0.00	$
LTS: Mileage to Meeting Site		0	MI
MOA: Number of Meetings		1	EA
MOA: Number of People		1	EA
MOA: Number of Days		1	EA
MOA: Airfare Cost		0.00	$
MOA: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		1	EA
Master Plan: Number of People		1	EA
Master Plan: Number of Days		1	EA
Master Plan: Airfare Cost		0.00	$
Master Plan: Mileage to Meeting Site		0	MI
Construction Permitting: Number of Meetings		0	EA
Construction Permitting: Number of People		0	EA
Construction Permitting: Number of Days		0	EA
Construction Permitting: Airfare Cost		0.00	$
Construction Permitting: Mileage to Meeting Site		0	MI
GIS/Overlay Maps: Number of Meetings		1	EA
GIS/Overlay Maps: Number of People		1	EA
GIS/Overlay Maps: Number of Days		1	EA
GIS/Overlay Maps: Airfare Cost		0.00	$
GIS/Overlay Maps: Mileage to Meeting Site		0	MI
Implementation			
Required Parameters			
Modify Installation (or City) Master Plan		No	n/a
Deed Notification		Yes	n/a
Deed Notification: Number		1	EA
Deed Notification: Task Complexity		Low	n/a
Negotiating Easements		No	n/a
Negotiating Easements: Number		0	EA
Restrictive Covenants		Yes	n/a
Restrictive Covenants: Number		1	EA
Restrictive Covenants: Task Complexity		Low	n/a
Equitable Servitudes		No	n/a
Equitable Servitudes: Number		0	EA
Access Control Signs		No	n/a
Access Control Signs: Number		0	EA
Utility Notification Service		No	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Implementation			
Required Parameters			
Access Control Signs: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Task Complexity		Low	n/a
Develop Finding of Suitability to Transfer (FOST)		Yes	n/a
Develop Finding of Suitability to Transfer (FOST): Task Complexity		Low	n/a
Monitoring & Enforcement			
Required Parameters			
Duration of Monitoring/Enforcement		30	Years
Notice Letters		No	n/a
Notice Letters: Number		0	EA
Guard Service/Security		No	n/a
Guard Service/Security: Number		0	EA
Reports & Certifications		Yes	n/a
Reports & Certifications: Frequency		Annually	n/a
Site Visits/Inspections		Yes	n/a
Site Visits/Inspections: Number		1	EA
Site Visits/Inspections: Safety Level		D	n/a
Site Visits/Inspections: Duration		1	Days
Site Visits/Inspections: Number of People		2	EA
Site Visits/Inspections: Frequency		Annually	n/a
Site Visits/Inspections: Airfare		0	$ Per Ticket
Site Visits/Inspections: Mileage		40	MI

Comments:

Phase Documentation:

Phase Type: Long Term Monitoring
Phase Name: 5-Year Review
Description: 5-Year Review

Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Estimate Documentation Detailed Report - Layout 2

Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Five-Year Review	Yes	100	0

Total Marked-up Cost: $106,551.74

Technologies:

Technology Name: **Five-Year Review (#2)**

User Name: **Five-Year Review**

Description	Default	User	UOM
System Definition			
Required Parameters			
Site Complexity		Low	n/a
Document Review		Yes	n/a
Interviews		Yes	n/a
Site Inspection		Yes	n/a
Report		Yes	n/a
Travel		Yes	n/a
Rebound Study		No	n/a
Start Month		December	n/a
No. Reviews		6	EA
Start Year		2025	n/a
Safety Level		D	n/a
Document Review			
Required Parameters			
5-Year Review Check List		Yes	n/a
Record of Decision		Yes	n/a
Remedial Action Design & Construction		No	n/a
Close-Out Report		No	n/a
Operations & Maintenance Manuals & Reports		No	n/a
Consent Decree or Settlement Records		No	n/a
Groundwater Monitoring & Reports		No	n/a
Remedial Action Required		No	n/a
Previous 5-Year Review Reports		Yes	n/a
Interviews			
Required Parameters			
Current and Previous Staff Management		Yes	n/a
Community Groups		No	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Five-Year Review (#2)**

User Name: **Five-Year Review**

Description	Default	User	UOM
Interviews			
Required Parameters			
State Contacts		Yes	n/a
Local Government Contacts		Yes	n/a
Operations & Maintenance Contractors		No	n/a
PRPs		No	n/a
Remedial Design Consultant		No	n/a
Site Inspection			
Required Parameters			
General Site Inspection		Yes	n/a
Containment System Inspection		No	n/a
Monitoring Systems Inspection		No	n/a
Treatment Systems Inspection		No	n/a
Regulatory Compliance		Yes	n/a
Site Visit Documentation (Photos, Diagrams, etc.)		Yes	n/a
Report			
Required Parameters			
Introduction		Yes	n/a
Remedial Objectives		No	n/a
ARARs Review		Yes	n/a
Summary of Site Visit		Yes	n/a
Areas of Non Compliance		No	n/a
Technology Recommendations		Yes	n/a
Statement of Protectiveness		Yes	n/a
Next Review		Yes	n/a
Implementation Requirements		No	n/a
Travel			
Required Parameters			
Number of Travelers		1	EA
Number of Days		2	EA
Air Fare Ticket Price		[redacted]	$
Need a rental car?		Yes	n/a

Comments:

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Technology: Clear and Grub
Element:

Year(s)	Cost per Year
2020	$21,967.91

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
17010102	Selective clearing, brush, medium clearing, with dozer and brush rake, excludes removal offsite	0.90	ACR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010111	Clear trees, wet conditions, medium growth, 200 H.P. dozer, excludes grubbing	0.10	ACR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010211	Site clearing trees, with 335 H.P. dozer, to 12" diameter	100.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010311	Remove stumps, wet conditions, with dozer, 6" to 12" diameter	10.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010315	Grub stumps, with 335 H.P. dozer, to 12" diameter	90.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010501	Grub and stack, 140 H.P. dozer	116.97	CY	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17020401	Dump Charges	441.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
17030220	910, 1.25 CY, Wheel Loader	11.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030284	8 CY, Dump Truck	33.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No

Total Element Cost: $21,967.91

Total Tech Cost: $21,967.91

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2020	$180,662.16	$180,662.16

Total Marked Up Tech Cost: $180,662.16

Technology: Excavation
Element:

Year(s)	Cost per Year
2020	$180,662.16

Extended Cost

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Technology: Excavation

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Cost	Override
17020416	12 CY Dump Truck Haul/Hour	200.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030277	Excavate and load, bank measure, medium material, 2 C.Y. bucket, hydraulic excavator	3,227.00	BCY	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	4,194.67	CY	[redacted]	[redacted]	[redacted]	0.01	$[redacted]	No
18050402	Seeding, Vegetative Cover	1.20	ACR	[redacted]	[redacted]	[redacted]	0.00	$[redacted]	No
33020401	Disposable Materials per Sample	73.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
33021709	Testing, TAL metals (6010/7000s)	19.00	EA	0.00	0.00	0.00	[redacted]	$[redacted]	No
33220102	Project Manager	6.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	12.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	2.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220112	Field Technician	2.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	2.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	2.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total Element Cost: $180,662.16

Total Tech Cost: $180,662.16

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2020	$152,992.54	$152,992.54

Total Marked Up Tech Cost: $152,992.54

Technology: Off-site Transportation and Waste Disposal

Element:

Year(s)	Cost per Year
2020	$152,992.54

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	3,333.00	BCY	[redacted]	[redacted]	[redacted]	0.00	$[redacted]	No
33190205	Transport Bulk Solid Hazardous Waste,	5,010.00	MI	0.00	0.00	0.00	[redacted]	$[redacted]	No

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Technology: Off-site Transportation and Waste Disposal

	Maximum 20 CY (per Mile)								
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	[redacted]	$[redacted]	No
33190807	32 Ft. Dump Truck, 6 Mil Liner, disposable	167.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
33197270	Landfill Nonhazardous Solid Bulk Waste by CY	3,333.00	CY	0.00	0.00	0.00	[redacted]	$[redacted]	No

Total Element Cost: $152,992.54

Total Tech Cost: $152,992.54

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2020	$31,701.23	$31,701.23

Total Marked Up Tech Cost: $31,701.23

Technology: Clear and Grub

Element:

Year(s)	Cost per Year
2020	$31,701.23

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
17010102	Selective clearing, brush, medium clearing, with dozer and brush rake, excludes removal offsite	1.44	ACR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010111	Clear trees, wet conditions, medium growth, 200 H.P. dozer, excludes grubbing	0.16	ACR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010211	Site clearing trees, with 335 H.P. dozer, to 12" diameter	160.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010311	Remove stumps, wet conditions, with dozer, 6" to 12" diameter	16.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010315	Grub stumps, with 335 H.P. dozer, to 12" diameter	144.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010501	Grub and stack, 140 H.P. dozer	187.15	CY	0.00	[redacted]	[redacted]	0.00	$[redacted]	No

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Technology: Clear and Grub

17020401	Dump Charges	705.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
17030222	926, 2.0 CY, Wheel Loader	13.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030287	20 CY, Semi Dump	28.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No

Total Element Cost: $31,701.23

Total Tech Cost: $31,701.23

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2020	$156,795.46	$156,795.46

Total Marked Up Tech Cost: $156,795.46

Technology: Excavation
Element:

Year(s)	Cost per Year
2020	$156,795.46

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
17020416	12 CY Dump Truck Haul/Hour	160.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030277	Excavate and load, bank measure, medium material, 2 C.Y. bucket, hydraulic excavator	2,582.00	BCY	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	3,355.73	CY	[redacted]	1.51	[redacted]	0.01	$[redacted]	No
18050402	Seeding, Vegetative Cover	1.92	ACR	[redacted]	[redacted]	[redacted]	0.00	$[redacted]	No
33020401	Disposable Materials per Sample	114.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
33021709	Testing, TAL metals (6010/7000s)	29.00	EA	0.00	0.00	0.00	[redacted]	$[redacted]	No
33220102	Project Manager	7.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	18.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	3.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220112	Field Technician	3.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	3.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	3.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total Element Cost: $[redacted]

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Total Tech Cost:	$156,795.46

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2020	$114,742.98	$114,742.98

Total Marked Up Tech Cost: $114,742.98

Technology: Off-site Transportation and Waste Disposal

Element:

Year(s)	Cost per Year
2020	$114,742.98

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	2,500.00	BCY	[redacted]	[redacted]	[redacted]	0.00	$[redacted]	No
33190205	Transport Bulk Solid Hazardous Waste, Maximum 20 CY (per Mile)	3,750.00	MI	0.00	0.00	0.00	[redacted]	$[redacted]	No
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	61.18	$[redacted]	No
33190807	32 Ft. Dump Truck, 6 Mil Liner, disposable	125.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
33197270	Landfill Nonhazardous Solid Bulk Waste by CY	2,500.00	CY	0.00	0.00	0.00	[redacted]	$[redacted]	No

Total Element Cost:	$114,742.98
Total Tech Cost:	$114,742.98

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Planning Docs	2020	$[redacted]	$[redacted]
Planning Meetings	2020	$[redacted]	$[redacted]
Implementation	2020	$[redacted]	$[redacted]
Monitoring & Enforcement	2020 - 2049	$[redacted]	$[redacted]

Total Marked Up Tech Cost: $1,251,484.74

Technology: Administrative Land Use Controls

Element: Planning Docs

Year(s)	Cost per Year

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Technology: Administrative Land Use Controls

Year(s)	Cost per Year
2020	$275,870.10

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	67.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	210.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220106	Staff Engineer	465.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	73.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	300.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	368.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220120	Computer Data Entry	375.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220503	Attorney, Partner, Real Estate	22.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220504	Attorney, Partner, Contracts	30.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220507	Attorney, Associate, Real Estate	30.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220508	Attorney, Associate, Contracts	60.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220509	Paralegal, Real Estate	30.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220510	Paralegal, Contracts	60.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $275,870.10

Element: Planning Meetings

Year(s)	Cost per Year
2020	$26,618.99

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	5.00	DAY	0.00	0.00	0.00	[redacted]	$[redacted]	No
33220102	Project Manager	80.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	16.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	48.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	24.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $26,618.99

Element: Implementation

Year(s)	Cost per Year

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Technology: Administrative Land Use Controls

2020 $125,739.25

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33022037	Overnight Delivery, 8 oz Letter	14.00	EA	0.00	0.00	0.00	[redacted]	$[redacted]	No
33040671	Portable GPS Set with Mapping, 5 cm Accuracy	1.00	MO	[redacted]	0.00	0.00	0.00	$[redacted]	No
33220102	Project Manager	47.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	105.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220106	Staff Engineer	120.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	31.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	94.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	240.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220120	Computer Data Entry	150.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220212	Surveying - 2-man Crew	3.00	DAY	0.00	[redacted]	19.86	0.00	$[redacted]	No
33220503	Attorney, Partner, Real Estate	30.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220507	Attorney, Associate, Real Estate	5.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220509	Paralegal, Real Estate	36.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No
33990111	Local Fees	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $125,739.25

Element: Monitoring & Enforcement

Year(s)	Cost per Year
2020 - 2049	$27,441.88

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010104	Sample collection, vehicle mileage charge, car or van	40.00	MI	0.00	0.00	0.00	[redacted]	$[redacted]	No
33010202	Per Diem (per person)	3.00	DAY	0.00	0.00	0.00	[redacted]	$[redacted]	No
33022038	Overnight delivery service, 1 lb package	6.00	LB	0.00	0.00	0.00	[redacted]	$[redacted]	No
33220102	Project Manager	18.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220106	Staff Engineer	65.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220112	Field Technician	1.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

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Technology: Administrative Land Use Controls

33220114	Word Processing/Clerical	26.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	16.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220119	Health and Safety Officer	17.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $27,441.88

Total First Year Tech Cost: $455,670.22

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2026	$[redacted]	$[redacted]
Document Review	2031	$[redacted]	$[redacted]
Document Review	2036	$[redacted]	$[redacted]
Document Review	2041	$[redacted]	$[redacted]
Document Review	2046	$[redacted]	$[redacted]
Document Review	2051	$[redacted]	$[redacted]
Interviews	2026	$[redacted]	$[redacted]
Interviews	2031	$[redacted]	$[redacted]
Interviews	2036	$[redacted]	$[redacted]
Interviews	2041	$[redacted]	$[redacted]
Interviews	2046	$[redacted]	$[redacted]
Interviews	2051	$[redacted]	$[redacted]
Site Inspection	2026	$[redacted]	$[redacted]
Site Inspection	2031	$[redacted]	$[redacted]
Site Inspection	2036	$[redacted]	$[redacted]
Site Inspection	2041	$[redacted]	$[redacted]
Site Inspection	2046	$[redacted]	$[redacted]
Site Inspection	2051	$[redacted]	$[redacted]
Report	2026	$[redacted]	$[redacted]
Report	2031	$[redacted]	$[redacted]
Report	2036	$[redacted]	$[redacted]
Report	2041	$[redacted]	$[redacted]
Report	2046	$[redacted]	$[redacted]
Report	2051	$[redacted]	$[redacted]
Travel	2026	$[redacted]	$[redacted]
Travel	2031	$[redacted]	$[redacted]
Travel	2036	$[redacted]	$[redacted]
Travel	2041	$[redacted]	$[redacted]
Travel	2046	$[redacted]	$[redacted]
Travel	2051	$[redacted]	$[redacted]

Total Marked Up Tech Cost: $106,551.72

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Technology: Five-Year Review

Element: Document Review

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220105	Project Engineer	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	3.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220109	Staff Scientist	6.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $2,545.91

Element: Interviews

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	6.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $1,436.52

Element: Site Inspection

Year(s)	Cost per Year

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Technology: Five-Year Review

2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220109	Staff Scientist	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $3,367.61

Element: Report

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	5.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	12.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	10.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220109	Staff Scientist	20.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $9,412.81

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Technology: Five-Year Review

Element: Travel

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	2.00	DAY	0.00	0.00	0.00	[redacted]	$[redacted]	No
33010202	Per Diem (per person)	2.00	DAY	0.00	0.00	0.00	[redacted]	$[redacted]	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	[redacted]	$[redacted]	No

Total First Year Element Cost: $995.77

Total First Year Tech Cost: $17,758.62

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2022	$22,387.59	$22,387.59

Total Marked Up Tech Cost: $22,387.59

Technology: USER DEFINED ESTIMATE

Element:

Year(s)	Cost per Year
2022	$22,387.59

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
32032001	Remedial Design Professional Labor	1.00	EA	0.00	22,387.59	0.00	0.00	$22,387.59	No

Total First Year Element Cost: $22,387.59

Total First Year Tech Cost: $22,387.59

Cost Over Time Summary

Estimate Documentation Detailed Report - Layout 2

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2022	$5,000.00	$5,000.00

Total Marked Up Tech Cost: $5,000.00

Technology: USER DEFINED ESTIMATE

Element:

Year(s)	Cost per Year
2022	$5,000.00

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
32039005	Remedial Design - User Defined Cost	1.00	EA	0.00	5,000.00	0.00	0.00	$5,000.00	No

Total First Year Element Cost: $5,000.00

Total First Year Tech Cost: $5,000.00

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2022	$5,000.00	$5,000.00

Total Marked Up Tech Cost: $5,000.00

Site Cost Summary Report
(with Markups)

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: [redacted]

Folder:

Folder Name: New Folder

Project:

ID: DU 2
Name: DU 2
Category: None

Location
State / Country: MARYLAND
City: MARYLAND STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.990	0.990	

Options
Database: System Costs
Cost Database Date: 2019
Report Option: Fiscal

Description Former IRP shop area at the Former Curtis Bay Ordnance Depot

Site Cost Summary Report
(with Markups)

Site:

ID: DU 2
Name: Alternative 3: Partial Soil Removal with LUCs
Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☑	**Safety Level:** E
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☑	**Safety Level:** D
Site Closeout	☐	

In the RACER Preferences the default value for the Safety Level is established. This sets the default value for the safety level for each technology model based on the type of work being completed. Note: RACER Technologies that safety level is not appropriate to change from the default are hard-coded to estimate costs without a safety level productivity factor, which is Safety Level E.

Documentation

Description: LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 2 will include an environmental covenant to restrict land use to industrial uses that conveys when the property is sold.
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: [redacted]
Estimator Title: Environmental Scientist
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Estimate Prepared Date: 11/21/2019

Site Cost Summary Report
(with Markups)

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name: [redacted]
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]

Date Reviewed: 11/21/2019

Reviewer Signature: _____ **Date:** _____

Site Cost Summary Report
(with Markups)

Phase	Direct Cost	Markups	Total Cost
Design	$[redacted]	$[redacted]	$[redacted]
Remedial Action	$[redacted]	$[redacted]	$[redacted]
Operations & Maintenance	$[redacted]	$[redacted]	$[redacted]
Long Term Monitoring	$[redacted]	$[redacted]	$[redacted]
Total Site Cost	$1,185,257	$1,078,860	$2,264,118

Estimate Documentation Detailed Report - Layout 2

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: [redacted]

Folder:

Folder Name: New Folder

Project:

ID: DU 2
Name: DU 2
Category: None

Location
State / Country: MARYLAND
City: MARYLAND STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.990	0.990	

Options
Database: System Costs
Cost Database Date: 2019
Report Option: Fiscal

Description Former IRP shop area at the Former Curtis Bay Ordnance Depot

Estimate Documentation Detailed Report - Layout 2

Site:

ID: DU 2
Name: Alternative 3: Partial Soil Removal with LUCs
Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☑	**Safety Level:** E
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☑	**Safety Level:** D
Site Closeout	☐	

In the RACER Preferences the default value for the Safety Level is established. This sets the default value for the safety level for each technology model based on the type of work being completed. Note: RACER Technologies that safety level is not appropriate to change from the default are hard-coded to estimate costs without a safety level productivity factor, which is Safety Level E.

Documentation

Description: LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 2 will include an environmental covenant to restrict land use to industrial uses that conveys when the property is sold.
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References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: [redacted]
Estimator Title: Environmental Scientist
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]ertcorp.com
Estimate Prepared Date: 11/21/2019

Estimator Signature: _____ **Date:** _____

Estimate Documentation Detailed Report - Layout 2

Reviewer Information

Reviewer Name: [redacted]
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Date Reviewed: 11/21/2019

Reviewer Signature: _____ **Date:** _____

Estimate Costs:

Phase Names	Marked-Up Cost
Sediment and Erosion Control Plans	$[redacted]
UECA documents	$[redacted]
Partial excavation of surface and subsurface soil	$[redacted]
Partial excavation of surface soil	$[redacted]
LUCs	$[redacted]
5-Year Review	$[redacted]
Total Cost:	$2,264,118
Total Project Cost:	$2,264,118

Phase Documentation:

Phase Type: Design
Phase Name: Sediment and Erosion Control Plans
Description: Sediment and Erosion Control Plans

Start Date: May, 2022
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Estimate Documentation Detailed Report - Layout 2

Total Marked-up Cost: $5,000.00

Technologies:

Technology Name: **User Defined Estimate (#1)**

User Name: **USER DEFINED ESTIMATE**

Description	Default	User	UOM
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		321.20.91	n/a
Safety Level		D	n/a

Comments:

Phase Documentation:

Phase Type: Design
Phase Name: UECA documents
Description: Uniform Environmental Covenants Act document preparation

Start Date: May, 2022
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $22,387.59

Technologies:

Estimate Documentation Detailed Report - Layout 2

Technology Name: **User Defined Estimate (#1)**

User Name: **USER DEFINED ESTIMATE**

Description	Default	User	UOM
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		321.20.91	n/a
Safety Level		D	n/a

Comments:

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Partial excavation of surface and subsurface soil
Description: Partial excavation of soil to 2 ft bgs

Approach: Ex Situ
Start Date: September, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Clear and Grub	Yes	100	0
Excavation	Yes	100	0
Off-site Transportation and Waste Disposal	Yes	100	0

Total Marked-up Cost: $584,142.94

Technologies:

Technology Name: **Clear and Grub (#2)**

User Name: **Clear and Grub**

Description	Default	User	UOM
System Definition			
Required Parameters			
Acres		1.5	AC

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Clear and Grub (#2)**

User Name: **Clear and Grub**

Description	Default	User	UOM
System Definition			
Required Parameters			
Dry Soil		90.00	%
Wet Soil		10.00	%
Include Load and Haul Costs		Yes	n/a
Safety Level		D	n/a
Clearing			
Secondary Parameters			
Brush Density	Medium	Medium	n/a
Debris Reduction	None	None	n/a
Trees Per Acre (<= 6")	0	0	EA/AC
Trees Per Acre (> 6" & <= 12")	100	100	EA/AC
Trees Per Acre (> 12" & <= 24")	0	0	EA/AC
Trees Per Acre (> 24" & <= 36")	0	0	EA/AC
Stumps Per Acre (<= 6")	0	0	EA/AC
Stumps Per Acre (> 6" & <= 12")	100	100	EA/AC
Stumps Per Acre (> 12" & <= 24")	0	0	EA/AC
Stumps Per Acre (> 24" & <= 36")	0	0	EA/AC
Grubbing			
Secondary Parameters			
Grubbing Depth	6	6	IN
Bulk Factor	1.2	1.2	n/a
Equipment	Dozer - 105hp	Dozer - 105hp	n/a
Soil Stripping			
Secondary Parameters			
Soil Depth	0	0	IN
Stripping Area	0.00	0.00	%
Soil Equipment	Dozer - 200hp	Dozer - 200hp	n/a
Disposal	Stockpilling	Stockpilling	n/a
Bulk Factor	1.2	1.2	n/a
Load and Haul			
Secondary Parameters			
Truck Type		Highway	n/a
Volume		4402	CY
One-way Haul Distance		5	MI
Dump Charge		15	$/CY

Comments:

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Excavation (#2)**

User Name: **Excavation**

Description	Default	User	UOM
System Definition			
Required Parameters			
Estimating Method		Area / Depth	n/a
Area		1.5	AC
Depth		1	FT
Soil Type		Sand-Silt/Sand-Clay Mixture	n/a
Safety Level		D	n/a
Excavation			
Secondary Parameters			
Existing Cover	Soil/Gravel	Soil/Gravel	n/a
Replacement Cover	Soil/Seeding	Soil/Seeding	n/a
Sidewall Protection	None	None	n/a
% of Excavated Material To Be Used as Backfill	0.00	0.00	%
Source of Additional Fill	Off Site	Off Site	n/a
Backfill Hauling Distance (one way)	10	10	MI
Dewatering Required	No	No	n/a
Analytical			
Secondary Parameters			
Primary Analytical Template	System Soil - Metals	System Soil - Metals	n/a
Secondary Analytical Template	None	None	n/a
Number of Sampling Points/Locations	107	107	EA
Number of Composites Submitted to Lab	27	27	EA
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Submit Data Electronically	Yes	Yes	n/a
Data Package / QC	Stage 1	Stage 1	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Sampling Reports	Abbreviated	Abbreviated	n/a

Comments:

Technology Name: **Off-site Transportation and Waste Disposal (#2)**

User Name: **Off-site Transportation and Waste Disposal**

Description	Default	User	UOM
System Definition			
Required Parameters			
Waste Type		Non-Hazardous	n/a
Waste Form		Solid	n/a
Condition of Waste		Bulk to remain as bulk	n/a
Volume of Bulk Solid Waste		8870	CY
Transportation Type		Truck	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Off-site Transportation and Waste Disposal (#2)**

User Name: **Off-site Transportation and Waste Disposal**

Description	Default	User	UOM
System Definition			
Required Parameters			
Transportation Type #1 - Distance to Disposal Facility (one-way)		30	MI
Safety Level		D	n/a

Comments:

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Partial excavation of surface soil
Description: Partial excavation of soil to 1 ft bgs. Transportation and disposal are included with the partial excavation of surface and subsurface soil.
Approach: Ex Situ
Start Date: September, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Clear and Grub	Yes	100	0
Excavation	Yes	100	0

Total Marked-up Cost: $294,550.54

Technologies:

Technology Name: **Clear and Grub (#2)**

User Name: **Clear and Grub**

Description	Default	User	UOM
System Definition			
Required Parameters			
Acres		2.5	AC
Dry Soil		90.00	%
Wet Soil		10.00	%

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Clear and Grub (#2)**

User Name: **Clear and Grub**

Description	Default	User	UOM
System Definition			
Required Parameters			
Include Load and Haul Costs		Yes	n/a
Safety Level		D	n/a
Clearing			
Secondary Parameters			
Brush Density	Medium	Medium	n/a
Debris Reduction	None	None	n/a
Trees Per Acre (<= 6")	0	0	EA/AC
Trees Per Acre (> 6" & <= 12")	100	100	EA/AC
Trees Per Acre (> 12" & <= 24")	0	0	EA/AC
Trees Per Acre (> 24" & <= 36")	0	0	EA/AC
Stumps Per Acre (<= 6")	0	0	EA/AC
Stumps Per Acre (> 6" & <= 12")	100	100	EA/AC
Stumps Per Acre (> 12" & <= 24")	0	0	EA/AC
Stumps Per Acre (> 24" & <= 36")	0	0	EA/AC
Grubbing			
Secondary Parameters			
Grubbing Depth	6	6	IN
Bulk Factor	1.2	1.2	n/a
Equipment	Dozer - 105hp	Dozer - 105hp	n/a
Soil Stripping			
Secondary Parameters			
Soil Depth	0	0	IN
Stripping Area	0.00	0.00	%
Soil Equipment	Dozer - 200hp	Dozer - 200hp	n/a
Disposal	Stockpilling	Stockpilling	n/a
Bulk Factor	1.2	1.2	n/a
Load and Haul			
Secondary Parameters			
Truck Type		Highway	n/a
Volume		4402	CY
One-way Haul Distance		5	MI
Dump Charge		15	$/CY

Comments:

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Excavation (#2)**

User Name: **Excavation**

Description	Default	User	UOM
System Definition			
Required Parameters			
Estimating Method		Area / Depth	n/a
Area		2.5	AC
Depth		1	FT
Soil Type		Sand-Silt/Sand-Clay Mixture	n/a
Safety Level		D	n/a
Excavation			
Secondary Parameters			
Existing Cover	Soil/Gravel	Soil/Gravel	n/a
Replacement Cover	Soil/Seeding	Soil/Seeding	n/a
Sidewall Protection	None	None	n/a
% of Excavated Material To Be Used as Backfill	0.00	0.00	%
Source of Additional Fill	Off Site	Off Site	n/a
Backfill Hauling Distance (one way)	10	10	MI
Dewatering Required	No	No	n/a
Analytical			
Secondary Parameters			
Primary Analytical Template	System Soil - Metals	System Soil - Metals	n/a
Secondary Analytical Template	None	None	n/a
Number of Sampling Points/Locations	177	177	EA
Number of Composites Submitted to Lab	45	45	EA
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Submit Data Electronically	Yes	Yes	n/a
Data Package / QC	Stage 1	Stage 1	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Sampling Reports	Abbreviated	Abbreviated	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: LUCs
Description: Land Use Controls: Deed Restriction

Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Estimate Documentation Detailed Report - Layout 2

Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administrative Land Use Controls	Yes	100	0

Total Marked-up Cost: $1,251,484.73

Technologies:

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
System Definition			
Required Parameters			
Rename Model		Administrative Land Use Controls	n/a
Planning Documents		Yes	n/a
Planning Documents: Start Date		2020	n/a
Implementation		Yes	n/a
Implementation: Start Date		2020	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2020	n/a
Modification/Termination		No	n/a
Type of Site		Transferring Government Installation	n/a
Planning Documents			
Required Parameters			
LUC Assurance Plan (LUCAP)		No	n/a
LUC Implementation Plan (LUCIP)		Yes	n/a
LUC Implementation Plan (LUCIP): Number		1	EA
LUC Implementation Plan (LUCIP): Plan Complexity		Low	n/a
Long-term Stewardship (LTS) Plan		No	n/a
Long-term Stewardship (LTS) Plan: Number		0	EA
Memorandum of Agreements (MOA)		Yes	n/a
Memorandum of Agreements (MOA): Number		1	EA
Memorandum of Agreements (MOA): Plan Complexity		Low	n/a
Installation (or City) Master Plan		Yes	n/a
Installation (or City) Master Plan: Plan Complexity		Low	n/a
Construction Permitting		No	n/a
Construction Permitting: Number		0	EA

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Planning Documents			
Required Parameters			
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Plan Complexity		Low	n/a
Planning Meetings			
Required Parameters			
LUCAP: Number of Meetings		0	EA
LUCAP: Number of People		0	EA
LUCAP: Number of Days		0	EA
LUCAP: Airfare Cost		0.00	$
LUCAP: Mileage to Meeting Site		0	MI
LUCIP: Number of Meetings		1	EA
LUCIP: Number of People		2	EA
LUCIP: Number of Days		1	EA
LUCIP: Airfare Cost		0.00	$
LUCIP: Mileage to Meeting Site		0	MI
LTS: Number of Meetings		0	EA
LTS: Number of People		0	EA
LTS: Number of Days		0	EA
LTS: Airfare Cost		0.00	$
LTS: Mileage to Meeting Site		0	MI
MOA: Number of Meetings		1	EA
MOA: Number of People		1	EA
MOA: Number of Days		1	EA
MOA: Airfare Cost		0.00	$
MOA: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		1	EA
Master Plan: Number of People		1	EA
Master Plan: Number of Days		1	EA
Master Plan: Airfare Cost		0.00	$
Master Plan: Mileage to Meeting Site		0	MI
Construction Permitting: Number of Meetings		0	EA
Construction Permitting: Number of People		0	EA
Construction Permitting: Number of Days		0	EA
Construction Permitting: Airfare Cost		0.00	$
Construction Permitting: Mileage to Meeting Site		0	MI
GIS/Overlay Maps: Number of Meetings		1	EA
GIS/Overlay Maps: Number of People		1	EA

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Planning Meetings			
Required Parameters			
GIS/Overlay Maps: Number of Days		1	EA
GIS/Overlay Maps: Airfare Cost		0.00	$
GIS/Overlay Maps: Mileage to Meeting Site		0	MI
Implementation			
Required Parameters			
Modify Installation (or City) Master Plan		No	n/a
Deed Notification		Yes	n/a
Deed Notification: Number		1	EA
Deed Notification: Task Complexity		Low	n/a
Negotiating Easements		No	n/a
Negotiating Easements: Number		0	EA
Restrictive Covenants		Yes	n/a
Restrictive Covenants: Number		1	EA
Restrictive Covenants: Task Complexity		Low	n/a
Equitable Servitudes		No	n/a
Equitable Servitudes: Number		0	EA
Access Control Signs		No	n/a
Access Control Signs: Number		0	EA
Utility Notification Service		No	n/a
Access Control Signs: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Task Complexity		Low	n/a
Develop Finding of Suitability to Transfer (FOST)		Yes	n/a
Develop Finding of Suitability to Transfer (FOST): Task Complexity		Low	n/a
Monitoring & Enforcement			
Required Parameters			
Duration of Monitoring/Enforcement		30	Years
Notice Letters		No	n/a
Notice Letters: Number		0	EA
Guard Service/Security		No	n/a
Guard Service/Security: Number		0	EA
Reports & Certifications		Yes	n/a
Reports & Certifications: Frequency		Annually	n/a
Site Visits/Inspections		Yes	n/a
Site Visits/Inspections: Number		1	EA
Site Visits/Inspections: Safety Level		D	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Monitoring & Enforcement			
Required Parameters			
Site Visits/Inspections: Duration		1	Days
Site Visits/Inspections: Number of People		2	EA
Site Visits/Inspections: Frequency		Annually	n/a
Site Visits/Inspections: Airfare		0	$ Per Ticket
Site Visits/Inspections: Mileage		40	MI

Comments:

Phase Documentation:

Phase Type: Long Term Monitoring
Phase Name: 5-Year Review
Description: 5-Year Review

Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Five-Year Review	Yes	100	0

Total Marked-up Cost: $106,551.74

Technologies:

Technology Name: **Five-Year Review (#2)**

User Name: **Five-Year Review**

Description	Default	User	UOM
System Definition			
Required Parameters			
Site Complexity		Low	n/a
Document Review		Yes	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Five-Year Review (#2)**

User Name: **Five-Year Review**

Description	Default	User	UOM
System Definition			
Required Parameters			
Interviews		Yes	n/a
Site Inspection		Yes	n/a
Report		Yes	n/a
Travel		Yes	n/a
Rebound Study		No	n/a
Start Month		December	n/a
No. Reviews		6	EA
Start Year		2025	n/a
Safety Level		D	n/a
Document Review			
Required Parameters			
5-Year Review Check List		Yes	n/a
Record of Decision		Yes	n/a
Remedial Action Design & Construction		No	n/a
Close-Out Report		No	n/a
Operations & Maintenance Manuals & Reports		No	n/a
Consent Decree or Settlement Records		No	n/a
Groundwater Monitoring & Reports		No	n/a
Remedial Action Required		No	n/a
Previous 5-Year Review Reports		Yes	n/a
Interviews			
Required Parameters			
Current and Previous Staff Management		Yes	n/a
Community Groups		No	n/a
State Contacts		Yes	n/a
Local Government Contacts		Yes	n/a
Operations & Maintenance Contractors		No	n/a
PRPs		No	n/a
Remedial Design Consultant		No	n/a
Site Inspection			
Required Parameters			
General Site Inspection		Yes	n/a
Containment System Inspection		No	n/a
Monitoring Systems Inspection		No	n/a
Treatment Systems Inspection		No	n/a
Regulatory Compliance		Yes	n/a
Site Visit Documentation (Photos, Diagrams, etc.)		Yes	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Five-Year Review (#2)**

User Name: **Five-Year Review**

Description	Default	User	UOM
Report			
Required Parameters			
Introduction		Yes	n/a
Remedial Objectives		No	n/a
ARARs Review		Yes	n/a
Summary of Site Visit		Yes	n/a
Areas of Non Compliance		No	n/a
Technology Recommendations		Yes	n/a
Statement of Protectiveness		Yes	n/a
Next Review		Yes	n/a
Implementation Requirements		No	n/a
Travel			
Required Parameters			
Number of Travelers		1	EA
Number of Days		2	EA
Air Fare Ticket Price		500.00	$
Need a rental car?		Yes	n/a

Comments:

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Technology: Clear and Grub
Element:

Year(s)	Cost per Year
2020	$29,808.25

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
17010102	Selective clearing, brush, medium clearing, with dozer and brush rake, excludes removal offsite	1.35	ACR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010111	Clear trees, wet conditions, medium growth, 200 H.P. dozer, excludes grubbing	0.15	ACR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010211	Site clearing trees, with 335 H.P. dozer, to 12" diameter	150.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010311	Remove stumps, wet conditions, with dozer, 6" to 12" diameter	15.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010315	Grub stumps, with 335 H.P. dozer, to 12" diameter	135.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010501	Grub and stack, 140 H.P. dozer	175.45	CY	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17020401	Dump Charges	661.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
17030222	926, 2.0 CY, Wheel Loader	13.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030287	20 CY, Semi Dump	26.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No

Total Element Cost: $29,808.25

Total Tech Cost: $29,808.25

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2020	$147,328.79	$147,328.79

Total Marked Up Tech Cost: $147,328.79

Technology: Excavation
Element:

Year(s)	Cost per Year
2020	$147,328.79

Extended	Cost

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Technology: Excavation

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Cost	Override
17020416	12 CY Dump Truck Haul/Hour	151.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030277	Excavate and load, bank measure, medium material, 2 C.Y. bucket, hydraulic excavator	2,420.00	BCY	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	3,146.00	CY	[redacted]	[redacted]	[redacted]	0.01	$[redacted]	No
18050402	Seeding, Vegetative Cover	1.80	ACR	[redacted]	[redacted]	[redacted]	0.00	$[redacted]	No
33020401	Disposable Materials per Sample	107.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
33021709	Testing, TAL metals (6010/7000s)	27.00	EA	0.00	0.00	0.00	[redacted]	$[redacted]	No
33220102	Project Manager	7.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	17.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	3.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220112	Field Technician	3.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	3.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	3.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total Element Cost: $147,328.79

Total Tech Cost: $147,328.79

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2020	$407,005.91	$407,005.91

Total Marked Up Tech Cost: $407,005.91

Technology: Off-site Transportation and Waste Disposal

Element:

Year(s)	Cost per Year
2020	$407,005.91

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	8,870.00	BCY	[redacted]	[redacted]	[redacted]	0.00	$[redacted]	No
33190205	Transport Bulk Solid Hazardous Waste,	13,320.00	MI	0.00	0.00	0.00	[redacted]	$[redacted]	No

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Technology: Off-site Transportation and Waste Disposal

	Maximum 20 CY (per Mile)								
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	[redacted]	$[redacted]	No
33190807	32 Ft. Dump Truck, 6 Mil Liner, disposable	444.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
33197270	Landfill Nonhazardous Solid Bulk Waste by CY	8,870.00	CY	0.00	0.00	0.00	[redacted]	$[redacted]	No

Total Element Cost: $407,005.91

Total Tech Cost: $407,005.91

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2020	$49,505.87	$49,505.87

Total Marked Up Tech Cost: $49,505.87

Technology: Clear and Grub

Element:

Year(s)	Cost per Year
2020	$49,505.87

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
17010102	Selective clearing, brush, medium clearing, with dozer and brush rake, excludes removal offsite	2.25	ACR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010111	Clear trees, wet conditions, medium growth, 200 H.P. dozer, excludes grubbing	0.25	ACR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010211	Site clearing trees, with 335 H.P. dozer, to 12" diameter	250.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010311	Remove stumps, wet conditions, with dozer, 6" to 12" diameter	25.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010315	Grub stumps, with 335 H.P. dozer, to 12" diameter	225.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010501	Grub and stack, 140 H.P. dozer	292.42	CY	0.00	[redacted]	[redacted]	0.00	$[redacted]	No

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Technology: Clear and Grub

17020401	Dump Charges	1,101.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
17030222	926, 2.0 CY, Wheel Loader	21.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030287	20 CY, Semi Dump	43.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No

Total Element Cost: $49,505.87

Total Tech Cost: $49,505.87

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2020	$245,044.67	$245,044.67

Total Marked Up Tech Cost: $245,044.67

Technology: Excavation

Element:

Year(s)	Cost per Year
2020	$245,044.67

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
17020416	12 CY Dump Truck Haul/Hour	250.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030278	Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	4,034.00	BCY	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	5,243.33	CY	[redacted]	[redacted]	[redacted]	0.01	$[redacted]	No
18050402	Seeding, Vegetative Cover	3.00	ACR	[redacted]	[redacted]	[redacted]	0.00	$[redacted]	No
33020401	Disposable Materials per Sample	177.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
33021709	Testing, TAL metals (6010/7000s)	45.00	EA	0.00	0.00	0.00	[redacted]	$[redacted]	No
33220102	Project Manager	9.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	27.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	5.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220112	Field Technician	5.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	5.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	5.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total Element Cost: $245,044.67

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Total Tech Cost:	$245,044.67

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Planning Docs	2020	$[redacted]	$[redacted]
Planning Meetings	2020	$[redacted]	$[redacted]
Implementation	2020	$[redacted]	$[redacted]
Monitoring & Enforcement	2020 - 2049	$[redacted]	$[redacted]

Total Marked Up Tech Cost: $1,251,484.74

Technology: Administrative Land Use Controls

Element: Planning Docs

Year(s)	Cost per Year
2020	$275,870.10

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	67.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	210.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220106	Staff Engineer	465.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	73.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	300.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	368.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220120	Computer Data Entry	375.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220503	Attorney, Partner, Real Estate	22.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220504	Attorney, Partner, Contracts	30.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220507	Attorney, Associate, Real Estate	30.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220508	Attorney, Associate, Contracts	60.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220509	Paralegal, Real Estate	30.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220510	Paralegal, Contracts	60.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

Total First Year Element Cost:	$275,870.10

Element: Planning Meetings

Year(s)	Cost per Year
2020	$26,618.99

	Extended	Cost

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Technology: Administrative Land Use Controls

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Cost	Override
33010202	Per Diem (per person)	5.00	DAY	0.00	0.00	0.00	[redacted]	$[redacted]	No
33220102	Project Manager	80.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	16.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	48.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	24.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $26,618.99

Element: Implementation

Year(s)	Cost per Year
2020	$125,739.25

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33022037	Overnight Delivery, 8 oz Letter	14.00	EA	0.00	0.00	0.00	[redacted]	$[redacted]	No
33040671	Portable GPS Set with Mapping, 5 cm Accuracy	1.00	MO	[redacted]	0.00	0.00	0.00	$[redacted]	No
33220102	Project Manager	47.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	105.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220106	Staff Engineer	120.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	31.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	94.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	240.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220120	Computer Data Entry	150.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220212	Surveying - 2-man Crew	3.00	DAY	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
33220503	Attorney, Partner, Real Estate	30.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220507	Attorney, Associate, Real Estate	5.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220509	Paralegal, Real Estate	36.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No
33990111	Local Fees	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $125,739.25

Element: Monitoring & Enforcement

Year(s)	Cost per Year

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Technology: Administrative Land Use Controls

2020 - 2049 $27,441.88

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010104	Sample collection, vehicle mileage charge, car or van	40.00	MI	0.00	0.00	0.00	[redacted]	$[redacted]	No
33010202	Per Diem (per person)	3.00	DAY	0.00	0.00	0.00	[redacted]	$[redacted]	No
33022038	Overnight delivery service, 1 lb package	6.00	LB	0.00	0.00	0.00	[redacted]	$[redacted]	No
33220102	Project Manager	18.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220106	Staff Engineer	65.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220112	Field Technician	1.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	26.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	16.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220119	Health and Safety Officer	17.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $27,441.88

Total First Year Tech Cost: $455,670.22

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2026	$[redacted]	$[redacted]
Document Review	2031	$[redacted]	$[redacted]
Document Review	2036	$[redacted]	$[redacted]
Document Review	2041	$[redacted]	$[redacted]
Document Review	2046	$[redacted]	$[redacted]
Document Review	2051	$[redacted]	$[redacted]
Interviews	2026	$[redacted]	$[redacted]
Interviews	2031	$[redacted]	$[redacted]
Interviews	2036	$[redacted]	$[redacted]
Interviews	2041	$[redacted]	$[redacted]
Interviews	2046	$[redacted]	$[redacted]
Interviews	2051	$[redacted]	$[redacted]
Site Inspection	2026	$[redacted]	$[redacted]
Site Inspection	2031	$[redacted]	$[redacted]
Site Inspection	2036	$[redacted]	$[redacted]
Site Inspection	2041	$[redacted]	$[redacted]
Site Inspection	2046	$[redacted]	$[redacted]
Site Inspection	2051	$[redacted]	$[redacted]

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Report	2026	$[redacted]	$[redacted]
Report	2031	$[redacted]	$[redacted]
Report	2036	$[redacted]	$[redacted]
Report	2041	$[redacted]	$[redacted]
Report	2046	$[redacted]	$[redacted]
Report	2051	$[redacted]	$[redacted]
Travel	2026	$[redacted]	$[redacted]
Travel	2031	$[redacted]	$[redacted]
Travel	2036	$[redacted]	$[redacted]
Travel	2041	$[redacted]	$[redacted]
Travel	2046	$[redacted]	$[redacted]
Travel	2051	$[redacted]	$[redacted]

Total Marked Up Tech Cost: $106,551.72

Technology: Five-Year Review

Element: Document Review

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220105	Project Engineer	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	3.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220109	Staff Scientist	6.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $2,545.91

Element: Interviews

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]

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Technology: Five-Year Review

2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	6.00	HR	0.00	[redacted]	0.00	0.00	$1,436.52	No

Total First Year Element Cost: $1,436.52

Element: Site Inspection

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220109	Staff Scientist	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $3,367.61

Element: Report

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00

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Technology: Five-Year Review

2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	5.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	12.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	10.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220109	Staff Scientist	20.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $9,412.81

Element: Travel

Year(s)	Cost per Year
2026	$[redacted]
2027 - 2030	$0.00
2031	$[redacted]
2032 - 2035	$0.00
2036	$[redacted]
2037 - 2040	$0.00
2041	$[redacted]
2042 - 2045	$0.00
2046	$[redacted]
2047 - 2050	$0.00
2051	$[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	2.00	DAY	0.00	0.00	0.00	[redacted]	$[redacted]	No
33010202	Per Diem (per person)	2.00	DAY	0.00	0.00	0.00	[redacted]	$[redacted]	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	[redacted]	$[redacted]	No

Total First Year Element Cost: $995.77

Total First Year Tech Cost: $17,758.62

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2022	$5,000.00	$5,000.00

Total Marked Up Tech Cost: $5,000.00

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Technology: USER DEFINED ESTIMATE
Element:

Year(s)	Cost per Year
2022	$5,000.00

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
32039005	Remedial Design - User Defined Cost	1.00	EA	0.00	5,000.00	0.00	0.00	$5,000.00	No

Total First Year Element Cost: $5,000.00

Total First Year Tech Cost: $5,000.00

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2022	$22,387.59	$22,387.59

Total Marked Up Tech Cost: $22,387.59

Technology: USER DEFINED ESTIMATE
Element:

Year(s)	Cost per Year
2022	$22,387.59

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
32032001	Remedial Design Professional Labor	1.00	EA	0.00	22,387.59	0.00	0.00	$22,387.59	No

Total First Year Element Cost: $22,387.59

Total First Year Tech Cost: $22,387.59

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2022	$22,387.59	$22,387.59

Total Marked Up Tech Cost: $22,387.59

Site Escalated Cost Summary Report (with Markups)

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: [redacted]

Folder:

Folder Name: New Folder

Project:

ID: DU 3
Name: DU 3
Category: None

Location
State / Country: MARYLAND
City: MARYLAND STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.990	0.990	

Options
Database: System Costs
Cost Database Date: 2019
Report Option: Fiscal

Description Former EC-57D area at the Former Curtis Bay Ordnance Depot

Site Escalated Cost Summary Report (with Markups)

Site:

ID: DU 3
Name: Alternative 3: Partial Soil Removal with LUCs
Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☑	**Safety Level:** E
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☑	**Safety Level:** D
Site Closeout	☐	

In the RACER Preferences the default value for the Safety Level is established. This sets the default value for the safety level for each technology model based on the type of work being completed. Note: RACER Technologies that safety level is not appropriate to change from the default are hard-coded to estimate costs without a safety level productivity factor, which is Safety Level E.

Documentation

Description: LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 2 will include an environmental covenant to restrict land use to industrial uses that conveys when the property is sold.
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: [redacted]
Estimator Title: Environmental Scientist
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]ertcorp.com
Estimate Prepared Date: 11/21/2019

Site Escalated Cost Summary Report
(with Markups)

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name: [redacted]
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]

Date Reviewed: 11/21/2019

Reviewer Signature: _____ **Date:** _____

Site Escalated Cost Summary Report (with Markups)

Phase	Direct Cost	Markups	Total Cost
Remedial Action	$[redacted]	$[redacted]	$[redacted]
Operations & Maintenance	$[redacted]	$[redacted]	$[redacted]
Long Term Monitoring	$[redacted]	$[redacted]	$[redacted]
Total Site Cost	$1,319,665	$1,159,039	$2,478,704
		Escalation	$411,988
		Escalated Site Cost	$2,890,692

Estimate Documentation Detailed Report - Layout 2

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: [redacted]

Folder:

Folder Name: New Folder

Project:

ID: DU 3
Name: DU 3
Category: None

Location
State / Country: MARYLAND
City: MARYLAND STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.990	0.990	

Options
Database: System Costs
Cost Database Date: 2019
Report Option: Fiscal

Description Former EC-57D area at the Former Curtis Bay Ordnance Depot

Estimate Documentation Detailed Report - Layout 2

Site:

ID: DU 3
Name: Alternative 3: Partial Soil Removal with LUCs
Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☑	**Safety Level:** E
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☑	**Safety Level:** D
Site Closeout	☐	

In the RACER Preferences the default value for the Safety Level is established. This sets the default value for the safety level for each technology model based on the type of work being completed. Note: RACER Technologies that safety level is not appropriate to change from the default are hard-coded to estimate costs without a safety level productivity factor, which is Safety Level E.

Documentation

Description: LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the DU. As developed for the Depot, Alternative 2 will include an environmental covenant to restrict land use to industrial uses that conveys when the property is sold.
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Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]ertcorp.com
Estimate Prepared Date: 11/21/2019

Estimator Signature: _____ **Date:** _____

Estimate Documentation Detailed Report - Layout 2

Reviewer Information

Reviewer Name: [redacted]
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Ln
Suite 300
Laurel, MD 20707
Telephone Number: [redacted]
Email Address: [redacted]
Date Reviewed: 11/21/2019

Reviewer Signature: _____ **Date:** _____

Estimate Costs:

Phase Names	Marked-Up Cost
Partial excavation of surface and subsurface soil	$[redacted]
Partial excavation of surface	$[redacted]
LUCs	$[redacted]
5-Year Review	$[redacted]
Total Cost:	$[redacted]
Escalation:	$[redacted]
Total Project Cost:	$[redacted]

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Partial excavation of surface and subsurface soil
Description: Partial excavation of soil to 2 ft bgs
Approach: Ex Situ
Start Date: September, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Clear and Grub	Yes	100	0
Excavation	Yes	100	0
Off-site Transportation and Waste Disposal	Yes	100	0

Estimate Documentation Detailed Report - Layout 2

Total Marked-up Cost: $883,731.53

Technologies:

Technology Name: **Clear and Grub (#1)**

User Name: **Clear and Grub**

Description	Default	User	UOM
System Definition			
Required Parameters			
Acres		4	AC
Dry Soil		90.00	%
Wet Soil		10.00	%
Include Load and Haul Costs		Yes	n/a
Safety Level		D	n/a
Clearing			
Secondary Parameters			
Brush Density	Medium	Medium	n/a
Debris Reduction	None	None	n/a
Trees Per Acre (<= 6")	0	0	EA/AC
Trees Per Acre (> 6" & <= 12")	100	100	EA/AC
Trees Per Acre (> 12" & <= 24")	0	0	EA/AC
Trees Per Acre (> 24" & <= 36")	0	0	EA/AC
Stumps Per Acre (<= 6")	0	0	EA/AC
Stumps Per Acre (> 6" & <= 12")	100	100	EA/AC
Stumps Per Acre (> 12" & <= 24")	0	0	EA/AC
Stumps Per Acre (> 24" & <= 36")	0	0	EA/AC
Grubbing			
Secondary Parameters			
Grubbing Depth	6	6	IN
Bulk Factor	1.2	1.2	n/a
Equipment	Dozer - 105hp	Dozer - 105hp	n/a
Soil Stripping			
Secondary Parameters			
Soil Depth	0	0	IN
Stripping Area	0.00	0.00	%
Soil Equipment	Dozer - 200hp	Dozer - 200hp	n/a
Disposal	Stockpilling	Stockpilling	n/a
Bulk Factor	1.2	1.2	n/a
Load and Haul			
Secondary Parameters			
Truck Type		Highway	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Clear and Grub (#1)**

User Name: **Clear and Grub**

Description	Default	User	UOM
Load and Haul			
Secondary Parameters			
Volume		3521.6	CY
One-way Haul Distance		5	MI
Dump Charge		15	$/CY

Comments:

Technology Name: **Excavation (#1)**

User Name: **Excavation**

Description	Default	User	UOM
System Definition			
Required Parameters			
Estimating Method		Area / Depth	n/a
Area		2	AC
Depth		2	FT
Soil Type		Sand-Silt/Sand-Clay Mixture	n/a
Safety Level		D	n/a
Excavation			
Secondary Parameters			
Existing Cover	Soil/Gravel	Soil/Gravel	n/a
Replacement Cover	Soil/Seeding	Soil/Seeding	n/a
Sidewall Protection	None	None	n/a
% of Excavated Material To Be Used as Backfill	0.00	0.00	%
Source of Additional Fill	Off Site	Off Site	n/a
Backfill Hauling Distance (one way)	10	10	MI
Dewatering Required	No	No	n/a
Analytical			
Secondary Parameters			
Primary Analytical Template	System Soil - Metals	System Soil - Metals	n/a
Secondary Analytical Template	None	None	n/a
Number of Sampling Points/Locations	144	144	EA
Number of Composites Submitted to Lab	36	36	EA
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Submit Data Electronically	Yes	Yes	n/a
Data Package / QC	Stage 1	Stage 1	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Sampling Reports	Abbreviated	Abbreviated	n/a

Comments:

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Off-site Transportation and Waste Disposal (#1)**

User Name: **Off-site Transportation and Waste Disposal**

Description	Default	User	UOM
System Definition			
Required Parameters			
Waste Type		Non-Hazardous	n/a
Waste Form		Solid	n/a
Condition of Waste		Bulk to remain as bulk	n/a
Volume of Bulk Solid Waste		9680	CY
Transportation Type		Truck	n/a
Transportation Type #1 - Distance to Disposal Facility (one-way)		30	MI
Safety Level		D	n/a

Comments:

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Partial excavation of surface
Description: Partial excavation of soil to 1 ft bgs. Clear and grub and transporation are included with the surface/subsurface soil excavation task.
Approach: Ex Situ
Start Date: September, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation	Yes	100	0

Total Marked-up Cost: $195,551.20

Technologies:

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Excavation (#2)**

User Name: **Excavation**

Description	Default	User	UOM
System Definition			
Required Parameters			
Estimating Method		Area / Depth	n/a
Area		2	AC
Depth		1	FT
Soil Type		Sand-Silt/Sand-Clay Mixture	n/a
Safety Level		D	n/a
Excavation			
Secondary Parameters			
Existing Cover	Soil/Gravel	Soil/Gravel	n/a
Replacement Cover	Soil/Seeding	Soil/Seeding	n/a
Sidewall Protection	None	None	n/a
% of Excavated Material To Be Used as Backfill	0.00	0.00	%
Source of Additional Fill	Off Site	Off Site	n/a
Backfill Hauling Distance (one way)	10	10	MI
Dewatering Required	No	No	n/a
Analytical			
Secondary Parameters			
Primary Analytical Template	System Soil - Metals	System Soil - Metals	n/a
Secondary Analytical Template	None	None	n/a
Number of Sampling Points/Locations	142	142	EA
Number of Composites Submitted to Lab	36	36	EA
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Submit Data Electronically	Yes	Yes	n/a
Data Package / QC	Stage 1	Stage 1	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Sampling Reports	Abbreviated	Abbreviated	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: LUCs
Description: Land Use Controls: Deed Restriction

Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Estimate Documentation Detailed Report - Layout 2

Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administrative Land Use Controls	Yes	100	0

Total Marked-up Cost: $1,251,484.73

Technologies:

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
System Definition			
Required Parameters			
Rename Model		Administrative Land Use Controls	n/a
Planning Documents		Yes	n/a
Planning Documents: Start Date		2020	n/a
Implementation		Yes	n/a
Implementation: Start Date		2020	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2020	n/a
Modification/Termination		No	n/a
Type of Site		Transferring Government Installation	n/a
Planning Documents			
Required Parameters			
LUC Assurance Plan (LUCAP)		No	n/a
LUC Implementation Plan (LUCIP)		Yes	n/a
LUC Implementation Plan (LUCIP): Number		1	EA
LUC Implementation Plan (LUCIP): Plan Complexity		Low	n/a
Long-term Stewardship (LTS) Plan		No	n/a
Long-term Stewardship (LTS) Plan: Number		0	EA
Memorandum of Agreements (MOA)		Yes	n/a
Memorandum of Agreements (MOA): Number		1	EA
Memorandum of Agreements (MOA): Plan Complexity		Low	n/a
Installation (or City) Master Plan		Yes	n/a
Installation (or City) Master Plan: Plan Complexity		Low	n/a
Construction Permitting		No	n/a
Construction Permitting: Number		0	EA

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Planning Documents			
Required Parameters			
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Plan Complexity		Low	n/a
Planning Meetings			
Required Parameters			
LUCAP: Number of Meetings		0	EA
LUCAP: Number of People		0	EA
LUCAP: Number of Days		0	EA
LUCAP: Airfare Cost		0.00	$
LUCAP: Mileage to Meeting Site		0	MI
LUCIP: Number of Meetings		1	EA
LUCIP: Number of People		2	EA
LUCIP: Number of Days		1	EA
LUCIP: Airfare Cost		0.00	$
LUCIP: Mileage to Meeting Site		0	MI
LTS: Number of Meetings		0	EA
LTS: Number of People		0	EA
LTS: Number of Days		0	EA
LTS: Airfare Cost		0.00	$
LTS: Mileage to Meeting Site		0	MI
MOA: Number of Meetings		1	EA
MOA: Number of People		1	EA
MOA: Number of Days		1	EA
MOA: Airfare Cost		0.00	$
MOA: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		1	EA
Master Plan: Number of People		1	EA
Master Plan: Number of Days		1	EA
Master Plan: Airfare Cost		0.00	$
Master Plan: Mileage to Meeting Site		0	MI
Construction Permitting: Number of Meetings		0	EA
Construction Permitting: Number of People		0	EA
Construction Permitting: Number of Days		0	EA
Construction Permitting: Airfare Cost		0.00	$
Construction Permitting: Mileage to Meeting Site		0	MI
GIS/Overlay Maps: Number of Meetings		1	EA
GIS/Overlay Maps: Number of People		1	EA

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Planning Meetings			
Required Parameters			
GIS/Overlay Maps: Number of Days		1	EA
GIS/Overlay Maps: Airfare Cost		0.00	$
GIS/Overlay Maps: Mileage to Meeting Site		0	MI
Implementation			
Required Parameters			
Modify Installation (or City) Master Plan		No	n/a
Deed Notification		Yes	n/a
Deed Notification: Number		1	EA
Deed Notification: Task Complexity		Low	n/a
Negotiating Easements		No	n/a
Negotiating Easements: Number		0	EA
Restrictive Covenants		Yes	n/a
Restrictive Covenants: Number		1	EA
Restrictive Covenants: Task Complexity		Low	n/a
Equitable Servitudes		No	n/a
Equitable Servitudes: Number		0	EA
Access Control Signs		No	n/a
Access Control Signs: Number		0	EA
Utility Notification Service		No	n/a
Access Control Signs: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Task Complexity		Low	n/a
Develop Finding of Suitability to Transfer (FOST)		Yes	n/a
Develop Finding of Suitability to Transfer (FOST): Task Complexity		Low	n/a
Monitoring & Enforcement			
Required Parameters			
Duration of Monitoring/Enforcement		30	Years
Notice Letters		No	n/a
Notice Letters: Number		0	EA
Guard Service/Security		No	n/a
Guard Service/Security: Number		0	EA
Reports & Certifications		Yes	n/a
Reports & Certifications: Frequency		Annually	n/a
Site Visits/Inspections		Yes	n/a
Site Visits/Inspections: Number		1	EA
Site Visits/Inspections: Safety Level		D	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Monitoring & Enforcement			
Required Parameters			
Site Visits/Inspections: Duration		1	Days
Site Visits/Inspections: Number of People		2	EA
Site Visits/Inspections: Frequency		Annually	n/a
Site Visits/Inspections: Airfare		0	$ Per Ticket
Site Visits/Inspections: Mileage		40	MI

Comments:

Phase Documentation:

Phase Type: Long Term Monitoring
Phase Name: 5-Year Review
Description: 5-Year Review

Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Five-Year Review	Yes	100	0

Total Marked-up Cost: $147,936.58

Technologies:

Technology Name: **Five-Year Review (#2)**

User Name: **Five-Year Review**

Description	Default	User	UOM
System Definition			
Required Parameters			
Site Complexity		Low	n/a
Document Review		Yes	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Five-Year Review (#2)**

User Name: **Five-Year Review**

Description	Default	User	UOM
System Definition			
Required Parameters			
Interviews		Yes	n/a
Site Inspection		Yes	n/a
Report		Yes	n/a
Travel		Yes	n/a
Rebound Study		No	n/a
Start Month		December	n/a
No. Reviews		6	EA
Start Year		2025	n/a
Safety Level		D	n/a
Document Review			
Required Parameters			
5-Year Review Check List		Yes	n/a
Record of Decision		Yes	n/a
Remedial Action Design & Construction		No	n/a
Close-Out Report		No	n/a
Operations & Maintenance Manuals & Reports		Yes	n/a
Consent Decree or Settlement Records		Yes	n/a
Groundwater Monitoring & Reports		No	n/a
Remedial Action Required		No	n/a
Previous 5-Year Review Reports		Yes	n/a
Interviews			
Required Parameters			
Current and Previous Staff Management		Yes	n/a
Community Groups		No	n/a
State Contacts		Yes	n/a
Local Government Contacts		No	n/a
Operations & Maintenance Contractors		Yes	n/a
PRPs		No	n/a
Remedial Design Consultant		No	n/a
Site Inspection			
Required Parameters			
General Site Inspection		Yes	n/a
Containment System Inspection		Yes	n/a
Monitoring Systems Inspection		No	n/a
Treatment Systems Inspection		No	n/a
Regulatory Compliance		Yes	n/a
Site Visit Documentation (Photos, Diagrams, etc.)		Yes	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Five-Year Review (#2)**

User Name: **Five-Year Review**

Description	Default	User	UOM
Report			
Required Parameters			
Introduction		Yes	n/a
Remedial Objectives		Yes	n/a
ARARs Review		Yes	n/a
Summary of Site Visit		Yes	n/a
Areas of Non Compliance		Yes	n/a
Technology Recommendations		Yes	n/a
Statement of Protectiveness		Yes	n/a
Next Review		Yes	n/a
Implementation Requirements		Yes	n/a
Travel			
Required Parameters			
Number of Travelers		1	EA
Number of Days		2	EA
Air Fare Ticket Price		[redacted]	$
Need a rental car?		Yes	n/a

Comments:

Estimate Documentation Detailed Report - Layout 2

Technology: Clear and Grub
Element:

Year(s)	Cost per Year
2020	$79,291.73

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
17010102	Selective clearing, brush, medium clearing, with dozer and brush rake, excludes removal offsite	3.60	ACR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010111	Clear trees, wet conditions, medium growth, 200 H.P. dozer, excludes grubbing	0.40	ACR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010211	Site clearing trees, with 335 H.P. dozer, to 12" diameter	400.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010311	Remove stumps, wet conditions, with dozer, 6" to 12" diameter	40.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010315	Grub stumps, with 335 H.P. dozer, to 12" diameter	360.00	EA	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17010501	Grub and stack, 140 H.P. dozer	467.87	CY	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17020401	Dump Charges	1,761.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
17030222	926, 2.0 CY, Wheel Loader	34.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030287	20 CY, Semi Dump	69.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No

Total Element Cost: $79,291.73

Total Tech Cost: $79,291.73

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2020	$360,330.68	$360,330.68

Total Marked Up Tech Cost: $360,330.68

Technology: Excavation
Element:

Year(s)	Cost per Year
2020	$360,330.68

	Extended	Cost

Estimate Documentation Detailed Report - Layout 2

Technology: Excavation

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Cost	Override
17020416	12 CY Dump Truck Haul/Hour	400.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030278	Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	6,454.00	BCY	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	8,389.33	CY	[redacted]	[redacted]	[redacted]	[redacted]	$[redacted]	No
18050402	Seeding, Vegetative Cover	2.40	ACR	[redacted]	[redacted]	[redacted]	0.00	$[redacted]	No
33020401	Disposable Materials per Sample	144.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
33021709	Testing, TAL metals (6010/7000s)	36.00	EA	0.00	0.00	0.00	[redacted]	$[redacted]	No
33220102	Project Manager	8.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	21.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220112	Field Technician	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total Element Cost: $360,330.68

Total Tech Cost: $360,330.68

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2020	$444,109.12	$444,109.12

Total Marked Up Tech Cost: $444,109.12

Technology: Off-site Transportation and Waste Disposal

Element:

Year(s)	Cost per Year
2020	$444,109.12

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	9,680.00	BCY	[redacted]	[redacted]	[redacted]	0.00	$[redacted]	No
33190205	Transport Bulk Solid Hazardous Waste,	14,520.00	MI	0.00	0.00	0.00	[redacted]	$[redacted]	No

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Technology: Off-site Transportation and Waste Disposal

	Maximum 20 CY (per Mile)								
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	[redacted]	$[redacted]	No
33190807	32 Ft. Dump Truck, 6 Mil Liner, disposable	484.00	EA	41.52	0.00	0.00	0.00	$[redacted]	No
33197270	Landfill Nonhazardous Solid Bulk Waste by CY	9,680.00	CY	0.00	0.00	0.00	[redacted]	$[redacted]	No

Total Element Cost: $444,109.12

Total Tech Cost: $444,109.12

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2020	$195,551.20	$195,551.20

Total Marked Up Tech Cost: $195,551.20

Technology: Excavation

Element:

Year(s)	Cost per Year
2020	$195,551.20

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
17020416	12 CY Dump Truck Haul/Hour	200.00	HR	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030277	Excavate and load, bank measure, medium material, 2 C.Y. bucket, hydraulic excavator	3,227.00	BCY	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	4,194.67	CY	[redacted]	[redacted]	[redacted]	0.01	$[redacted]	No
18050402	Seeding, Vegetative Cover	2.40	ACR	[redacted]	[redacted]	[redacted]	0.00	$[redacted]	No
33020401	Disposable Materials per Sample	142.00	EA	[redacted]	0.00	0.00	0.00	$[redacted]	No
33021709	Testing, TAL metals (6010/7000s)	36.00	EA	0.00	0.00	0.00	[redacted]	$[redacted]	No
33220102	Project Manager	8.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220108	Project Scientist	21.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

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Technology: Excavation

33220112	Field Technician	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total Element Cost: $195,551.20

Total Tech Cost: $195,551.20

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Planning Docs	2020	$[redacted]	$[redacted]
Planning Meetings	2020	$[redacted]	$[redacted]
Implementation	2020	$[redacted]	$[redacted]
Monitoring & Enforcement	2020 - 2049	$[redacted]	$[redacted]

Total Marked Up Tech Cost: $1,251,484.74

Technology: Administrative Land Use Controls

Element: Planning Docs

Year(s)	Cost per Year
2020	$275,870.10

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	67.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	210.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220106	Staff Engineer	465.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	73.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	300.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	368.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220120	Computer Data Entry	375.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220503	Attorney, Partner, Real Estate	22.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220504	Attorney, Partner, Contracts	30.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220507	Attorney, Associate, Real Estate	30.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220508	Attorney, Associate, Contracts	60.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220509	Paralegal, Real Estate	30.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220510	Paralegal, Contracts	60.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

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Total First Year Element Cost: $275,870.10

Element: Planning Meetings

Year(s)	Cost per Year
2020	$26,618.99

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	5.00	DAY	0.00	0.00	0.00	[redacted]	$[redacted]	No
33220102	Project Manager	80.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	16.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	48.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	24.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $26,618.99

Element: Implementation

Year(s)	Cost per Year
2020	$125,739.25

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33022037	Overnight Delivery, 8 oz Letter	14.00	EA	0.00	0.00	0.00	[redacted]	$[redacted]	No
33040671	Portable GPS Set with Mapping, 5 cm Accuracy	1.00	MO	[redacted]	0.00	0.00	0.00	$[redacted]	No
33220102	Project Manager	47.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220105	Project Engineer	105.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220106	Staff Engineer	120.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	31.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	94.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	240.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220120	Computer Data Entry	150.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220212	Surveying - 2-man Crew	3.00	DAY	0.00	[redacted]	[redacted]	0.00	$[redacted]	No
33220503	Attorney, Partner, Real Estate	30.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220507	Attorney, Associate, Real Estate	5.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220509	Paralegal, Real Estate	36.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

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Technology: Administrative Land Use Controls

33990111	Local Fees	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $125,739.25

Element: Monitoring & Enforcement

Year(s)	Cost per Year
2020 - 2049	$27,441.88

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010104	Sample collection, vehicle mileage charge, car or van	40.00	MI	0.00	0.00	0.00	[redacted]	$[redacted]	No
33010202	Per Diem (per person)	3.00	DAY	0.00	0.00	0.00	[redacted]	$[redacted]	No
33022038	Overnight delivery service, 1 lb package	6.00	LB	0.00	0.00	0.00	[redacted]	$[redacted]	No
33220102	Project Manager	18.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220106	Staff Engineer	65.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220110	QA/QC Officer	4.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220112	Field Technician	1.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220114	Word Processing/Clerical	26.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220115	Draftsman/CADD	16.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33220119	Health and Safety Officer	17.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $27,441.88

Total First Year Tech Cost: $455,670.22

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2026	$[redacted]	$[redacted]
Document Review	2031	$[redacted]	$[redacted]
Document Review	2036	$[redacted]	$[redacted]
Document Review	2041	$[redacted]	$[redacted]
Document Review	2046	$[redacted]	$[redacted]
Document Review	2051	$[redacted]	$[redacted]
Interviews	2026	$[redacted]	$[redacted]
Interviews	2031	$[redacted]	$[redacted]
Interviews	2036	$[redacted]	$[redacted]
Interviews	2041	$[redacted]	$[redacted]
Interviews	2046	$[redacted]	$[redacted]
Interviews	2051	$[redacted]	$[redacted]

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Site Inspection	2026	$	
Site Inspection	2031	$	
Site Inspection	2036	$	
Site Inspection	2041	$	
Site Inspection	2046	$	
Site Inspection	2051	$	
Report	2026	$	
Report	2031	$	
Report	2036	$	
Report	2041	$	$
Report	2046	$	$
Report	2051	$	$
Travel	2026	$	$
Travel	2031	$	$
Travel	2036	$	$
Travel	2041	$	$
Travel	2046	$	$
Travel	2051	$	$

Total Marked Up Tech Cost: $147,936.54

Technology: Five-Year Review

Element: Document Review

Year(s)	Cost per Year
2026	
2027 - 2030	
2031	
2032 - 2035	
2036	
2037 - 2040	
2041	
2042 - 2045	
2046	
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220105	Project Engineer	7.00	HR	0.00		0.00	0.00		No
33220108	Project Scientist	5.00	HR	0.00		0.00	0.00		No
33220109	Staff Scientist	9.00	HR	0.00		0.00	0.00		No

Total First Year Element Cost: $4,132.34

Element: Interviews

Year(s)	Cost per Year

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Technology: Five-Year Review

Year(s)	
2026	[redacted]
2027 - 2030	
2031	
2032 - 2035	
2036	
2037 - 2040	
2041	
2042 - 2045	
2046	
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	6.00	HR	0.00	[redacted]	0.00	0.00	$1,436.52	No

Total First Year Element Cost: $1,436.52

Element: Site Inspection

Year(s)	Cost per Year
2026	[redacted]
2027 - 2030	
2031	
2032 - 2035	
2036	
2037 - 2040	
2041	
2042 - 2045	
2046	
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	7.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220105	Project Engineer	7.00	HR	0.00		0.00	0.00		No
33220108	Project Scientist	7.00	HR	0.00		0.00	0.00		No
33220109	Staff Scientist	7.00	HR	0.00		0.00	0.00		No

Total First Year Element Cost: $5,893.32

Element: Report

Year(s)	Cost per Year
2026	$12,198.14

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Technology: Five-Year Review

Year(s)	Cost per Year
2027 - 2030	[redacted]
2031	
2032 - 2035	
2036	
2037 - 2040	
2041	
2042 - 2045	
2046	
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	6.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220105	Project Engineer	16.00	HR	0.00		0.00	0.00		No
33220108	Project Scientist	13.00	HR	0.00		0.00	0.00		No
33220109	Staff Scientist	26.00	HR	0.00		0.00	0.00		No

Total First Year Element Cost: $12,198.14

Element: Travel

Year(s)	Cost per Year
2026	[redacted]
2027 - 2030	
2031	
2032 - 2035	
2036	
2037 - 2040	
2041	
2042 - 2045	
2046	
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	2.00	DAY	0.00	0.00	0.00	[redacted]	[redacted]	No
33010202	Per Diem (per person)	2.00	DAY	0.00	0.00	0.00			No
33041101	Airfare	1.00	LS	0.00	0.00	0.00			No

Total First Year Element Cost: $995.77

Total First Year Tech Cost: $24,656.10

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Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2026	[redacted]	[redacted]
Document Review	2031		
Document Review	2036		
Document Review	2041		
Document Review	2046		
Document Review	2051		
Interviews	2026		
Interviews	2031		
Interviews	2036		
Interviews	2041		
Interviews	2046		
Interviews	2051		
Site Inspection	2026		
Site Inspection	2031		
Site Inspection	2036		
Site Inspection	2041		
Site Inspection	2046		
Site Inspection	2051		
Report	2026		
Report	2031		
Report	2036		
Report	2041		
Report	2046		
Report	2051		
Travel	2026		
Travel	2031		
Travel	2036		
Travel	2041		
Travel	2046		
Travel	2051		

Total Marked Up Tech Cost: $147,936.54

Site Escalated Cost Summary Report (with Markups)

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: [redacted]

Folder:

Folder Name: New Folder

Project:

ID: DU 3
Name: DU 3
Category: None

Location
State / Country: MARYLAND
City: MARYLAND STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.990	0.990	

Options
Database: System Costs
Cost Database Date: 2019
Report Option: Fiscal

Description Former EC-57D area at the Former Curtis Bay Ordnance Depot

Site Escalated Cost Summary Report (with Markups)

Site:

ID: DU 3
Name: Alternative 5: Capping
Type: None

Media/Waste Type

Primary: N/A
Secondary: N/A

Contaminant

Primary: None
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☑	**Safety Level:** E
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☑	**Safety Level:** D
Site Closeout	☐	

In the RACER Preferences the default value for the Safety Level is established. This sets the default value for the safety level for each technology model based on the type of work being completed. Note: RACER Technologies that safety level is not appropriate to change from the default are hard-coded to estimate costs without a safety level productivity factor, which is Safety Level E.

Documentation

Description: Capping
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: [redacted]
Estimator Title: Environmental Scientist
Agency/Org./Office: ERT, Inc
Business Address: 14401 Swietzer Ln, Suite 300
Laurel, MD
Telephone Number: [redacted]
Email Address: [redacted]@ertcorp.com
Estimate Prepared Date: 02/05/2020

Estimator Signature: _____ **Date:** _____

Reviewer Information

Site Escalated Cost Summary Report (with Markups)

Reviewer Name: [redacted]
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc
Business Address: 11401 Sweitzer Ln, Suite 300
Laurel, MD
Telephone Number: [redacted]
Email Address: [redacted]

Date Reviewed: 02/05/2020

Reviewer Signature: _____ **Date:** _____

Site Escalated Cost Summary Report (with Markups)

Phase	Direct Cost	Markups	Total Cost
Design	[redacted]	[redacted]	[redacted]
Remedial Action			
Operations & Maintenance			
Long Term Monitoring			
Total Site Cost	$2,205,592	$2,024,487	$4,230,080
		Escalation	$786,162
		Escalated Site Cost	$5,016,242

Estimate Documentation Detailed Report - Layout 2

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: [redacted]

Folder:

Folder Name: New Folder

Project:

ID: DU 3
Name: DU 3
Category: None

Location
State / Country: MARYLAND
City: MARYLAND STATE AVERAGE

Location Modifier	Default	User	Reason for changes
	0.990	0.990	

Options
Database: System Costs
Cost Database Date: 2019
Report Option: Fiscal

Description Former EC-57D area at the Former Curtis Bay Ordnance Depot

Estimate Documentation Detailed Report - Layout 2

Site:

ID: DU 3
Name: Alternative 5: Capping
Type: None

Media/Waste Type

Primary: N/A
Secondary: N/A

Contaminant

Primary: None
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☑	**Safety Level:** E
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☑	**Safety Level:** D
Site Closeout	☐	

In the RACER Preferences the default value for the Safety Level is established. This sets the default value for the safety level for each technology model based on the type of work being completed. Note: RACER Technologies that safety level is not appropriate to change from the default are hard-coded to estimate costs without a safety level productivity factor, which is Safety Level E.

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Estimator Information

Estimator Name: [redacted]
Estimator Title: Environmental Scientist
Agency/Org./Office: ERT, Inc
Business Address: 14401 Swietzer Ln, Suite 300
Laurel, MD
Telephone Number: [redacted]
Email Address: [redacted]
Estimate Prepared Date: 02/05/2020

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name: [redacted]

Estimate Documentation Detailed Report - Layout 2

Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc
Business Address: 11401 Sweitzer Ln, Suite 300
Laurel, MD
Telephone Number: [redacted]
Email Address: [redacted]ertcorp.com
Date Reviewed: 02/05/2020

Reviewer Signature: _____ **Date:** _____

Estimate Costs:

Phase Names	Marked-Up Cost
Cap Design	[redacted]
Cap Installation	
O&M of Cap	
LUCs	
LTM of Cap	
Total Cost:	
Escalation:	
Total Project Cost:	

Phase Documentation:

Phase Type: Design
Phase Name: Cap Design
Description: Cap design

Start Date: September, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Remedial Design	Yes	100	0

Total Marked-up Cost: $269,344.19

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Technologies:

Technology Name: **Remedial Design (#1)**

User Name: **Remedial Design**

Description	Default	User	UOM
System Definition			
Required Parameters			
Project Approach		In-Situ Containment	n/a
Complexity		Moderately Low	n/a
Project Planning		Yes	n/a
Treatability & Other Studies		No	n/a
Preliminary Design (30%)		Yes	n/a
Intermediate Design (60%)		Yes	n/a
Prefinal Design (90%)		Yes	n/a
Final Design (100%)		Yes	n/a
Bid Documents		No	n/a
Site Distance		10	MI
Level of RD Detail		Moderate	n/a
Project Planning			
Required Parameters			
Site Visit		Yes	n/a
RD Work Plan		Yes	n/a
Data Review		Yes	n/a
Public Meetings		No	n/a
Preliminary Design			
Required Parameters			
Design Criteria Memorandum		Yes	n/a
Basis of Design Report		Yes	n/a
Preliminary Plans & Specifications		Yes	n/a
VE Screening Report		No	n/a
Public Meetings		No	n/a
Intermediate Design			
Required Parameters			
Revised Basis of Design Report		Yes	n/a
Intermediate Plans & Specifications		Yes	n/a
VE Report		No	n/a
Prefinal Design			
Required Parameters			
Prefinal Plans & Specifications		Yes	n/a
Construction QA Plan		Yes	n/a

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Technology Name: **Remedial Design (#1)**

User Name: **Remedial Design**

Description	Default	User	UOM
Final Design			
Required Parameters			
Final Plans & Specifications		Yes	n/a
Final Report		Yes	n/a
Public Meetings		No	n/a
Post Design Fact Sheet		No	n/a

Comments:

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Cap Installation
Description: Cap Installation
Approach: Ex Situ
Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Capping	Yes	100	0
Clear and Grub	Yes	100	0
Cleanup and Landscaping	Yes	100	0

Total Marked-up Cost: $1,777,434.58

Technologies:

Technology Name: **Capping (#1)**

User Name: **Capping**

Description	Default	User	UOM
System Definition			
Required Parameters			
Type of Cap		Evapotranspiration Cap	n/a
Acres		5	AC

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Technology Name: **Capping (#1)**

User Name: **Capping**

Description	Default	User	UOM
System Definition			
Required Parameters			
Length		660	FT
Width		330	FT
Safety Level		D	n/a
General			
Secondary Parameters			
Side Slope of Cap	3:1	3:1	n/a
Horizontal Projection of Side Slope	82	82	FT
Horizontal Projection of Top Slope	82	82	FT
Evapotranspiration Cap			
Secondary Parameters			
Vegetation Type	Seasonal Grass Mixture	Seasonal Grass Mixture	n/a
Top Cover Thickness	6	6	IN
Top Cover Borrow Source	Off-Site	Off-Site	n/a
Clay Loam Layer Thickness	36	36	IN
Clay Loam Layer Borrow Source	Off-Site	Off-Site	n/a
Foundation Layer Thickness	12	12	IN
Foundation Layer Borrow Source	Off-Site	Off-Site	n/a
Lysimeter	1	1	n/a

Comments:

Technology Name: **Clear and Grub (#1)**

User Name: **Clear and Grub**

Description	Default	User	UOM
System Definition			
Required Parameters			
Acres		5	AC
Dry Soil		90.00	%
Wet Soil		10.00	%
Include Load and Haul Costs		No	n/a
Safety Level		D	n/a
Clearing			
Secondary Parameters			
Brush Density	Medium	Medium	n/a
Debris Reduction	None	None	n/a
Trees Per Acre (<= 6")	0	0	EA/AC
Trees Per Acre (> 6" & <= 12")	100	100	EA/AC
Trees Per Acre (> 12" & <= 24")	0	0	EA/AC

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Clear and Grub (#1)**

User Name: **Clear and Grub**

Description	Default	User	UOM
Clearing			
Secondary Parameters			
Trees Per Acre (> 24" & <= 36")	0	0	EA/AC
Stumps Per Acre (<= 6")	0	0	EA/AC
Stumps Per Acre (> 6" & <= 12")	100	100	EA/AC
Stumps Per Acre (> 12" & <= 24")	0	0	EA/AC
Stumps Per Acre (> 24" & <= 36")	0	0	EA/AC
Grubbing			
Secondary Parameters			
Grubbing Depth	6	6	IN
Bulk Factor	1.2	1.2	n/a
Equipment	Dozer - 105hp	Dozer - 105hp	n/a
Soil Stripping			
Secondary Parameters			
Soil Depth	0	6	IN
Stripping Area	0.00	100.00	%
Soil Equipment	Dozer - 200hp	Dozer - 200hp	n/a
Disposal	Stockpilling	Stockpilling	n/a
Bulk Factor	1.2	1.2	n/a

Comments:

Technology Name: **Cleanup and Landscaping (#1)**

User Name: **Cleanup and Landscaping**

Description	Default	User	UOM
System Definition			
Required Parameters			
Type of Site Preparation		Cleanup and Landscape	n/a
Preparation Area		5	AC
Safety Level		D	n/a
Cleanup			
Secondary Parameters			
Cleanup Type	Area Cleanup	Area Cleanup	n/a
Cleanup Area	100.00	100.00	%
Landscaping			
Secondary Parameters			
Landscaping Type	Seeding	Seeding	n/a
Landscaping Area	100.00	100.00	%

Comments:

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Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: O&M of Cap
Description: O&M of Cap

Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Operations and Maintenance	Yes	100	0

Total Marked-up Cost: $783,879.54

Technologies:

Technology Name: **Operations and Maintenance (#1)**
User Name: **Operations and Maintenance**

Description	Default	User	UOM
CAP - Capping			
Wizard Parameters			
Acres		5	AC
Type of Cap		Evapotranspiration Cap	n/a
Vegetation Type		Seasonal Grass Mixture	n/a
Labor			
Secondary Parameters			
Operations Labor: Type	Exclude from Estimate	Moderately Low	n/a
Professional Labor: Type	Exclude from Estimate	Minimum	n/a
Analytical			
Secondary Parameters			
Wastewater/Effluent: Sampling Frequency	Exclude from Estimate	Exclude from Estimate	n/a
Wastewater/Effluent: Primary Analytical Template	None	None	n/a
Wastewater/Effluent: Secondary Analytical Template	None	None	n/a
Air Emissions: Sampling Frequency	Exclude from Estimate	Exclude from Estimate	n/a
Air Emissions: Primary Analytical Template	None	None	n/a
Air Emissions: Secondary Analytical Template	None	None	n/a

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Technology Name: **Operations and Maintenance (#1)**

User Name: **Operations and Maintenance**

Description	Default	User	UOM
Analytical			
Secondary Parameters			
Solid Wastes: Sampling Frequency	Exclude from Estimate	Exclude from Estimate	n/a
Solid Wastes: Primary Analytical Template	None	None	n/a
Solid Wastes: Secondary Analytical Template	None	None	n/a
Heating Requirements			
Secondary Parameters			
Air Streams: Flow Rate	0	0	CFM
Air Streams: Temperature Difference	0	0	F
Air Streams: Months per Year	0	0	Month
Water Streams: Flow Rate	0	0	CFM
Water Streams: Temperature Difference	0	0	F
Water Streams: Months per Year	0	0	Month
Facility: Area	0	0	SF
Facility: Temperature Difference	0	0	F
Facility: Months per Year	0	0	Month

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: LUCs
Description: Land Use Controls: Deed Restriction

Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administrative Land Use Controls	Yes	100	0

Total Marked-up Cost: $1,251,484.73

Technologies:

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Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
System Definition			
Required Parameters			
Rename Model		Administrative Land Use Controls	n/a
Planning Documents		Yes	n/a
Planning Documents: Start Date		2020	n/a
Implementation		Yes	n/a
Implementation: Start Date		2020	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2020	n/a
Modification/Termination		No	n/a
Type of Site		Transferring Government Installation	n/a
Planning Documents			
Required Parameters			
LUC Assurance Plan (LUCAP)		No	n/a
LUC Implementation Plan (LUCIP)		Yes	n/a
LUC Implementation Plan (LUCIP): Number		1	EA
LUC Implementation Plan (LUCIP): Plan Complexity		Low	n/a
Long-term Stewardship (LTS) Plan		No	n/a
Long-term Stewardship (LTS) Plan: Number		0	EA
Memorandum of Agreements (MOA)		Yes	n/a
Memorandum of Agreements (MOA): Number		1	EA
Memorandum of Agreements (MOA): Plan Complexity		Low	n/a
Installation (or City) Master Plan		Yes	n/a
Installation (or City) Master Plan: Plan Complexity		Low	n/a
Construction Permitting		No	n/a
Construction Permitting: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Plan Complexity		Low	n/a
Planning Meetings			
Required Parameters			
LUCAP: Number of Meetings		0	EA
LUCAP: Number of People		0	EA
LUCAP: Number of Days		0	EA
LUCAP: Airfare Cost		0.00	$
LUCAP: Mileage to Meeting Site		0	MI
LUCIP: Number of Meetings		1	EA
LUCIP: Number of People		2	EA

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Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Planning Meetings			
Required Parameters			
LUCIP: Number of Days		1	EA
LUCIP: Airfare Cost		0.00	$
LUCIP: Mileage to Meeting Site		0	MI
LTS: Number of Meetings		0	EA
LTS: Number of People		0	EA
LTS: Number of Days		0	EA
LTS: Airfare Cost		0.00	$
LTS: Mileage to Meeting Site		0	MI
MOA: Number of Meetings		1	EA
MOA: Number of People		1	EA
MOA: Number of Days		1	EA
MOA: Airfare Cost		0.00	$
MOA: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		1	EA
Master Plan: Number of People		1	EA
Master Plan: Number of Days		1	EA
Master Plan: Airfare Cost		0.00	$
Master Plan: Mileage to Meeting Site		0	MI
Construction Permitting: Number of Meetings		0	EA
Construction Permitting: Number of People		0	EA
Construction Permitting: Number of Days		0	EA
Construction Permitting: Airfare Cost		0.00	$
Construction Permitting: Mileage to Meeting Site		0	MI
GIS/Overlay Maps: Number of Meetings		1	EA
GIS/Overlay Maps: Number of People		1	EA
GIS/Overlay Maps: Number of Days		1	EA
GIS/Overlay Maps: Airfare Cost		0.00	$
GIS/Overlay Maps: Mileage to Meeting Site		0	MI
Implementation			
Required Parameters			
Modify Installation (or City) Master Plan		No	n/a
Deed Notification		Yes	n/a
Deed Notification: Number		1	EA
Deed Notification: Task Complexity		Low	n/a
Negotiating Easements		No	n/a
Negotiating Easements: Number		0	EA
Restrictive Covenants		Yes	n/a
Restrictive Covenants: Number		1	EA
Restrictive Covenants: Task Complexity		Low	n/a

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Technology Name: **Administrative Land Use Controls (#2)**

User Name: **Administrative Land Use Controls**

Description	Default	User	UOM
Implementation			
Required Parameters			
Equitable Servitudes		No	n/a
Equitable Servitudes: Number		0	EA
Access Control Signs		No	n/a
Access Control Signs: Number		0	EA
Utility Notification Service		No	n/a
Access Control Signs: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Task Complexity		Low	n/a
Develop Finding of Suitability to Transfer (FOST)		Yes	n/a
Develop Finding of Suitability to Transfer (FOST): Task Complexity		Low	n/a
Monitoring & Enforcement			
Required Parameters			
Duration of Monitoring/Enforcement		30	Years
Notice Letters		No	n/a
Notice Letters: Number		0	EA
Guard Service/Security		No	n/a
Guard Service/Security: Number		0	EA
Reports & Certifications		Yes	n/a
Reports & Certifications: Frequency		Annually	n/a
Site Visits/Inspections		Yes	n/a
Site Visits/Inspections: Number		1	EA
Site Visits/Inspections: Safety Level		D	n/a
Site Visits/Inspections: Duration		1	Days
Site Visits/Inspections: Number of People		2	EA
Site Visits/Inspections: Frequency		Annually	n/a
Site Visits/Inspections: Airfare		0	$ Per Ticket
Site Visits/Inspections: Mileage		40	MI

Comments:

Phase Documentation:

Phase Type: Long Term Monitoring
Phase Name: LTM of Cap
Description: LTM of Cap

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Start Date: December, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Five-Year Review	Yes	100	0

Total Marked-up Cost: $147,936.58

Technologies:

Technology Name: **Five-Year Review (#1)**
User Name: **Five-Year Review**

Description	Default	User	UOM
System Definition			
Required Parameters			
Site Complexity		Low	n/a
Document Review		Yes	n/a
Interviews		Yes	n/a
Site Inspection		Yes	n/a
Report		Yes	n/a
Travel		Yes	n/a
Rebound Study		No	n/a
Start Month		December	n/a
No. Reviews		6	EA
Start Year		2025	n/a
Safety Level		D	n/a
Document Review			
Required Parameters			
5-Year Review Check List		Yes	n/a
Record of Decision		Yes	n/a
Remedial Action Design & Construction		No	n/a
Close-Out Report		No	n/a
Operations & Maintenance Manuals & Reports		Yes	n/a
Consent Decree or Settlement Records		Yes	n/a
Groundwater Monitoring & Reports		No	n/a
Remedial Action Required		No	n/a
Previous 5-Year Review Reports		Yes	n/a

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Technology Name: **Five-Year Review (#1)**

User Name: **Five-Year Review**

Description	Default	User	UOM
Interviews			
Required Parameters			
Current and Previous Staff Management		Yes	n/a
Community Groups		No	n/a
State Contacts		Yes	n/a
Local Government Contacts		No	n/a
Operations & Maintenance Contractors		Yes	n/a
PRPs		No	n/a
Remedial Design Consultant		No	n/a
Site Inspection			
Required Parameters			
General Site Inspection		Yes	n/a
Containment System Inspection		Yes	n/a
Monitoring Systems Inspection		No	n/a
Treatment Systems Inspection		No	n/a
Regulatory Compliance		Yes	n/a
Site Visit Documentation (Photos, Diagrams, etc.)		Yes	n/a
Report			
Required Parameters			
Introduction		Yes	n/a
Remedial Objectives		Yes	n/a
ARARs Review		Yes	n/a
Summary of Site Visit		Yes	n/a
Areas of Non Compliance		Yes	n/a
Technology Recommendations		Yes	n/a
Statement of Protectiveness		Yes	n/a
Next Review		Yes	n/a
Implementation Requirements		Yes	n/a
Travel			
Required Parameters			
Number of Travelers		1	EA
Number of Days		2	EA
Air Fare Ticket Price		500.00	$
Need a rental car?		Yes	n/a

Comments:

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Technology: Remedial Design

Element: Project Planning

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010104	Sample collection, vehicle mileage charge, car or van	10.00	MI	0.00	0.00	0.00	0.27	[redacted]	No
33220102	Project Manager	36.00	HR	0.00	[redacted]	0.00	0.00		No
33220103	Office Manager	6.00	HR	0.00		0.00	0.00		No
33220105	Project Engineer	11.00	HR	0.00		0.00	0.00		No
33220106	Staff Engineer	61.00	HR	0.00		0.00	0.00		No
33220109	Staff Scientist	156.00	HR	0.00		0.00	0.00		No
33220110	QA/QC Officer	26.00	HR	0.00		0.00	0.00		No
33220111	Certified Industrial Hygienist	11.00	HR	0.00		0.00	0.00		No
33220112	Field Technician	45.00	HR	0.00		0.00	0.00		No
33220113	Secretarial/ Administrative	15.00	HR	0.00		0.00	0.00		No
33220114	Word Processing/Clerical	28.00	HR	0.00		0.00	0.00		No
33220115	Draftsman/CADD	21.00	HR	0.00		0.00	0.00		No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00		No

Total Element Cost: $59,544.49

Element: Preliminary Design

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	8.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220103	Office Manager	4.00	HR	0.00		0.00	0.00		No
33220105	Project Engineer	29.00	HR	0.00		0.00	0.00		No
33220106	Staff Engineer	101.00	HR	0.00		0.00	0.00		No
33220109	Staff Scientist	48.00	HR	0.00		0.00	0.00		No
33220110	QA/QC Officer	14.00	HR	0.00		0.00	0.00		No
33220113	Secretarial/ Administrative	11.00	HR	0.00		0.00	0.00		No
33220114	Word Processing/Clerical	31.00	HR	0.00		0.00	0.00		No
33220115	Draftsman/CADD	20.00	HR	0.00		0.00	0.00		No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00		No

Total Element Cost: $39,506.00

Element: Intermediate Design

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override

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Technology: Remedial Design

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Cost Override
33220102	Project Manager	3.00	HR	0.00	[redacted]	0.00	0.00	No
33220105	Project Engineer	4.00	HR	0.00		0.00	0.00	No
33220106	Staff Engineer	17.00	HR	0.00		0.00	0.00	No
33220109	Staff Scientist	2.00	HR	0.00		0.00	0.00	No
33220110	QA/QC Officer	4.00	HR	0.00		0.00	0.00	No
33220113	Secretarial/ Administrative	1.00	HR	0.00		0.00	0.00	No
33220114	Word Processing/Clerical	2.00	HR	0.00		0.00	0.00	No
33220115	Draftsman/CADD	6.00	HR	0.00		0.00	0.00	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	No

Total Element Cost: $5,947.10

Element: Prefinal Design

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	10.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220103	Office Manager	5.00	HR	0.00		0.00	0.00		No
33220105	Project Engineer	36.00	HR	0.00		0.00	0.00		No
33220106	Staff Engineer	147.00	HR	0.00		0.00	0.00		No
33220109	Staff Scientist	102.00	HR	0.00		0.00	0.00		No
33220110	QA/QC Officer	53.00	HR	0.00		0.00	0.00		No
33220111	Certified Industrial Hygienist	42.00	HR	0.00		0.00	0.00		No
33220113	Secretarial/ Administrative	27.00	HR	0.00		0.00	0.00		No
33220114	Word Processing/Clerical	64.00	HR	0.00		0.00	0.00		No
33220115	Draftsman/CADD	86.00	HR	0.00		0.00	0.00		No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00		No

Total Element Cost: $81,725.98

Element: Final Design

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	10.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220103	Office Manager	5.00	HR	0.00		0.00	0.00		No
33220105	Project Engineer	36.00	HR	0.00		0.00	0.00		No
33220106	Staff Engineer	151.00	HR	0.00		0.00	0.00		No
33220109	Staff Scientist	99.00	HR	0.00		0.00	0.00		No

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Technology: Remedial Design

33220110	QA/QC Officer	53.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220111	Certified Industrial Hygienist	42.00	HR	0.00		0.00	0.00		No
33220113	Secretarial/ Administrative	27.00	HR	0.00		0.00	0.00		No
33220114	Word Processing/Clerical	64.00	HR	0.00		0.00	0.00		No
33220115	Draftsman/CADD	92.00	HR	0.00		0.00	0.00		No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00		No

Total Element Cost: $82,620.62

Total Tech Cost: $269,344.19

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2021	$1,675,819.97	$1,675,819.97

Total Marked Up Tech Cost: $1,675,819.97

Technology: Capping

Element:

Year(s)	Cost per Year
2021	$1,675,819.97

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	10,376.07	CY	[redacted]	[redacted]	[redacted]	0.01	[redacted]	No
17030465	Silty/Clayey Loam, Delivered, Dumped & Spread	34,863.59	CY				0.00		No
18050301	Loam or topsoil, imported topsoil, 6" deep, furnish and place	5,188.03	LCY				0.00		No
33111040	Lysimeter Monitoring System	1.00	EA				[redacted]		No

Total Element Cost: $1,675,819.97

Total Tech Cost: $1,675,819.97

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2021	$43,101.39	$43,101.39

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Total Marked Up Tech Cost: $43,101.39

Technology: Clear and Grub
Element:

Year(s)	Cost per Year
2021	$43,101.39

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
17010102	Selective clearing, brush, medium clearing, with dozer and brush rake, excludes removal offsite	4.50	ACR	0.00	[redacted]	[redacted]	0.00	[redacted]	No
17010111	Clear trees, wet conditions, medium growth, 200 H.P. dozer, excludes grubbing	0.50	ACR	0.00			0.00		No
17010211	Site clearing trees, with 335 H.P. dozer, to 12" diameter	500.00	EA	0.00			0.00		No
17010311	Remove stumps, wet conditions, with dozer, 6" to 12" diameter	50.00	EA	0.00			0.00		No
17010315	Grub stumps, with 335 H.P. dozer, to 12" diameter	450.00	EA	0.00			0.00		No
17010501	Grub and stack, 140 H.P. dozer	584.83	CY	0.00			0.00		No
17010502	Grub and stack, 200 H.P. dozer	4,033.33	CY	0.00			0.00		No

Total Element Cost: $43,101.39

Total Tech Cost: $43,101.39

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2021	$58,513.23	$58,513.23

Total Marked Up Tech Cost: $58,513.23

Technology: Cleanup and Landscaping
Element:

Year(s)	Cost per Year
2021	$58,513.23

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override

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Technology: Cleanup and Landscaping

17040101	Cleaning Up, site debris clean up and removal	5.00	ACR	0.00	[redacted]	[redacted]	0.00	[redacted] No
18050101	Area Preparation, 67% Level & 33% Slope	5.00	ACR	0.00			0.00	No
18050401	Seeding, 67% Level & 33% Slope, Hydroseeding	5.00	ACR	[redacted]			0.00	No
18050408	Fertilizer, Hydro Spread	10.00	ACR				0.00	No
18050413	Watering with 3,000-Gallon Tank Truck, per Pass	40.00	ACR				0.00	No
18050415	Mowing	10.00	ACR	0.00		0.00	0.00	No

Total Element Cost: $58,513.23

Total Tech Cost: $58,513.23

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Misc. Support Cost	2021	[redacted]	[redacted]
Misc. Support Cost	2022 - 2050		
Capping	2021		
Capping	2022 - 2050		

Total Marked Up Tech Cost: $783,879.48

Technology: Operations and Maintenance

Element: Misc. Support Cost

Year(s)	Cost per Year
2021	$13,537.94
2022 - 2050	$16,245.53

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	6.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220105	Project Engineer	22.00	HR	0.00		0.00	0.00		No
33220106	Staff Engineer	22.00	HR	0.00		0.00	0.00		No
33220110	QA/QC Officer	3.00	HR	0.00		0.00	0.00		No
33220112	Field Technician	22.00	HR	0.00		0.00	0.00		No
33220114	Word Processing/Clerical	9.00	HR	0.00		0.00	0.00		No
33220115	Draftsman/CADD	3.00	HR	0.00		0.00	0.00		No
33223001	Treatment System Operator	10.00	HR	0.00		0.00	0.00		No

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Technology: Operations and Maintenance

33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $16,245.53

Element: Capping

Year(s)	Cost per Year
2021	$8,358.13
2022 - 2050	$10,029.76

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
18050301	Loam or topsoil, imported topsoil, 6" deep, furnish and place	100.83	LCY	[redacted]	[redacted]	[redacted]	0.00	[redacted]	No
18050410	Fertilize, 800 Lbs/Acre, Spray from Truck	5.00	ACR				0.00		No
18050415	Mowing	10.00	ACR				0.00		No
33111045	Seeding, Seasonal Grass Mixture, Per Acre	0.13	ACR				0.00		No

Total First Year Element Cost: $10,029.76

Total First Year Tech Cost: $26,275.29

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Planning Docs	2020	[redacted]	[redacted]
Planning Meetings	2020		
Implementation	2020		
Monitoring & Enforcement	2020 - 2049		

Total Marked Up Tech Cost: $1,251,484.74

Technology: Administrative Land Use Controls

Element: Planning Docs

Year(s)	Cost per Year
2020	$275,870.10

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	67.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220105	Project Engineer	210.00	HR	0.00		0.00	0.00		No
33220106	Staff Engineer	465.00	HR	0.00		0.00	0.00		No
33220110	QA/QC Officer	73.00	HR	0.00		0.00	0.00		No
33220114	Word	300.00	HR	0.00		0.00	0.00		No

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Technology: Administrative Land Use Controls

	Processing/Clerical							
33220115	Draftsman/CADD	368.00	HR	0.00	[redacted]	0.00	0.00	[redacted] No
33220120	Computer Data Entry	375.00	HR	0.00		0.00	0.00	No
33220503	Attorney, Partner, Real Estate	22.00	HR	0.00		0.00	0.00	No
33220504	Attorney, Partner, Contracts	30.00	HR	0.00		0.00	0.00	No
33220507	Attorney, Associate, Real Estate	30.00	HR	0.00		0.00	0.00	No
33220508	Attorney, Associate, Contracts	60.00	HR	0.00		0.00	0.00	No
33220509	Paralegal, Real Estate	30.00	HR	0.00		0.00	0.00	No
33220510	Paralegal, Contracts	60.00	HR	0.00		0.00	0.00	No
33240101	Other Direct Costs	1.00	LS	3,983.12	0.00	0.00	0.00	No

Total First Year Element Cost: $275,870.10

Element: Planning Meetings

Year(s)	Cost per Year
2020	$26,618.99

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	5.00	DAY	0.00	0.00	0.00	[redacted]	[redacted]	No
33220102	Project Manager	80.00	HR	0.00	[redacted]	0.00	0.00		No
33220105	Project Engineer	16.00	HR	0.00		0.00	0.00		No
33220114	Word Processing/Clerical	48.00	HR	0.00		0.00	0.00		No
33220115	Draftsman/CADD	24.00	HR	0.00		0.00	0.00		No
33240101	Other Direct Costs	1.00	LS	[redacted]		0.00	0.00		No

Total First Year Element Cost: $26,618.99

Element: Implementation

Year(s)	Cost per Year
2020	$125,739.25

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33022037	Overnight Delivery, 8 oz Letter	14.00	EA	0.00	0.00	0.00	[redacted]	[redacted]	No
33040671	Portable GPS Set with Mapping, 5 cm Accuracy	1.00	MO	[redacted]	0.00	0.00	0.00		No
33220102	Project Manager	47.00	HR	0.00	[redacted]	0.00	0.00		No

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Technology: Administrative Land Use Controls

33220105	Project Engineer	105.00	HR	0.00	[redacted]	0.00	0.00	No
33220106	Staff Engineer	120.00	HR	0.00		0.00	0.00	No
33220110	QA/QC Officer	31.00	HR	0.00		0.00	0.00	No
33220114	Word Processing/Clerical	94.00	HR	0.00		0.00	0.00	No
33220115	Draftsman/CADD	240.00	HR	0.00		0.00	0.00	No
33220120	Computer Data Entry	150.00	HR	0.00		0.00	0.00	No
33220212	Surveying - 2-man Crew	3.00	DAY	0.00		19.86	0.00	No
33220503	Attorney, Partner, Real Estate	30.00	HR	0.00		0.00	0.00	No
33220507	Attorney, Associate, Real Estate	5.00	HR	0.00		0.00	0.00	No
33220509	Paralegal, Real Estate	36.00	HR	0.00		0.00	0.00	No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00	No
33990111	Local Fees	1.00	LS	[redacted]	0.00	0.00	0.00	No

Total First Year Element Cost: $125,739.25

Element: Monitoring & Enforcement

Year(s)	Cost per Year
2020 - 2049	$27,441.88

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010104	Sample collection, vehicle mileage charge, car or van	40.00	MI	0.00	0.00	0.00	[redacted]	[redacted]	No
33010202	Per Diem (per person)	3.00	DAY	0.00	0.00	0.00			No
33022038	Overnight delivery service, 1 lb package	6.00	LB	0.00	0.00	0.00			No
33220102	Project Manager	18.00	HR	0.00	[redacted]	0.00	0.00		No
33220106	Staff Engineer	65.00	HR	0.00		0.00	0.00		No
33220110	QA/QC Officer	4.00	HR	0.00		0.00	0.00		No
33220112	Field Technician	1.00	HR	0.00		0.00	0.00		No
33220114	Word Processing/Clerical	26.00	HR	0.00		0.00	0.00		No
33220115	Draftsman/CADD	16.00	HR	0.00		0.00	0.00		No
33220119	Health and Safety Officer	17.00	HR	0.00		0.00	0.00		No
33240101	Other Direct Costs	1.00	LS	[redacted]	0.00	0.00	0.00		No

Total First Year Element Cost: $27,441.88

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Total First Year Tech Cost: $455,670.22

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2026	[redacted]	[redacted]
Document Review	2031		
Document Review	2036		
Document Review	2041		
Document Review	2046		
Document Review	2051		
Interviews	2026		
Interviews	2031		
Interviews	2036		
Interviews	2041		
Interviews	2046		
Interviews	2051		
Site Inspection	2026		
Site Inspection	2031		
Site Inspection	2036		
Site Inspection	2041		
Site Inspection	2046		
Site Inspection	2051		
Report	2026		
Report	2031		
Report	2036		
Report	2041		
Report	2046		
Report	2051		
Travel	2026		
Travel	2031		
Travel	2036		
Travel	2041		
Travel	2046		
Travel	2051		

Total Marked Up Tech Cost: $147,936.54

Technology: Five-Year Review
Element: Document Review

Year(s)	Cost per Year
2026	[redacted]
2027 - 2030	
2031	
2032 - 2035	
2036	

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Technology: Five-Year Review

2037 - 2040	[redacted]
2041	
2042 - 2045	
2046	
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220105	Project Engineer	7.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220108	Project Scientist	5.00	HR	0.00		0.00	0.00		No
33220109	Staff Scientist	9.00	HR	0.00		0.00	0.00		No

Total First Year Element Cost: $4,132.34

Element: Interviews

Year(s)	Cost per Year
2026	[redacted]
2027 - 2030	
2031	
2032 - 2035	
2036	
2037 - 2040	
2041	
2042 - 2045	
2046	
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	6.00	HR	0.00	[redacted]	0.00	0.00	$[redacted]	No

Total First Year Element Cost: $1,436.52

Element: Site Inspection

Year(s)	Cost per Year
2026	[redacted]
2027 - 2030	
2031	
2032 - 2035	
2036	
2037 - 2040	
2041	

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Technology: Five-Year Review

2042 - 2045	$0.00
2046	[redacted]
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	7.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220105	Project Engineer	7.00	HR	0.00		0.00	0.00		No
33220108	Project Scientist	7.00	HR	0.00		0.00	0.00		No
33220109	Staff Scientist	7.00	HR	0.00		0.00	0.00		No

Total First Year Element Cost: $5,893.32

Element: Report

Year(s)	Cost per Year
2026	[redacted]
2027 - 2030	
2031	
2032 - 2035	
2036	
2037 - 2040	
2041	
2042 - 2045	
2046	
2047 - 2050	
2051	

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	6.00	HR	0.00	[redacted]	0.00	0.00	[redacted]	No
33220105	Project Engineer	16.00	HR	0.00		0.00	0.00		No
33220108	Project Scientist	13.00	HR	0.00		0.00	0.00		No
33220109	Staff Scientist	26.00	HR	0.00		0.00	0.00		No

Total First Year Element Cost: $12,198.14

Element: Travel

Year(s)	Cost per Year
2026	[redacted]
2027 - 2030	
2031	
2032 - 2035	
2036	

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Technology: Five-Year Review

2037 - 2040
2041
2042 - 2045
2046
2047 - 2050
2051

[redacted]

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	2.00	DAY	0.00	0.00	0.00	[redacted]	[redacted]	No
33010202	Per Diem (per person)	2.00	DAY	0.00	0.00	0.00			No
33041101	Airfare	1.00	LS	0.00	0.00	0.00			No

Total First Year Element Cost: $995.77

Total First Year Tech Cost: $24,656.10

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2026	[redacted]	[redacted]
Document Review	2031		
Document Review	2036		
Document Review	2041		
Document Review	2046		
Document Review	2051		
Interviews	2026		
Interviews	2031		
Interviews	2036		
Interviews	2041		
Interviews	2046		
Interviews	2051		
Site Inspection	2026		
Site Inspection	2031		
Site Inspection	2036		
Site Inspection	2041		
Site Inspection	2046		
Site Inspection	2051		
Report	2026		
Report	2031		
Report	2036		
Report	2041		
Report	2046		
Report	2051		
Travel	2026		

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Travel	2031	[redacted]	[redacted]
Travel	2036		
Travel	2041		
Travel	2046		
Travel	2051		

Total Marked Up Tech Cost: $147,936.54