FINAL
FEASIBILITY STUDY

FORMER CAMP WELLFLEET FUDS –
MMRP REMEDIAL INVESTIGATION THROUGH DECISION DOCUMENT
WELLFLEET, MASSACHUSETTS

CONTRACT NO.: W912DR-15-D-0015, DELIVERY ORDER 0002

U.S. Army Corps of Engineers
Baltimore & New England Districts

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Remedial Investigation Through Decision Document

Wellfleet, Massachusetts

Contract: W912DR-15-D-0015
Delivery Order 0002

Prepared for:
U.S. Army Corps of Engineers
Baltimore District

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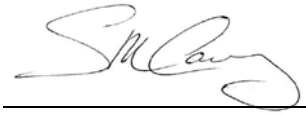

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COMPLETION OF SENIOR TECHNICAL REVIEW

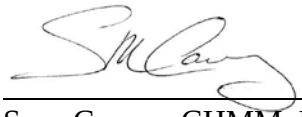
This document has been produced within the framework of the ERT, Inc. (ERT) quality management system. As such, a senior technical review has been conducted. This included review of all elements addressed within the document, proposed or utilized technologies and alternatives and their applications with 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.

06/25/19

Michelle Chesnut Date
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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Independent Technical Reviewer

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ACRONYMS and ABBREVIATIONS

AGC	Advanced Geophysical Classification
AOI	Area of Interest
ARARS	Applicable or Relevant and Appropriate Requirements
ASR	Archive Search Report
BGS	Below Ground Surface
BIP	Blow-in-place
CCNS	Cape Cod National Seashore
CENAB	U.S. Army Corps of Engineers, Baltimore District
CENAE	U.S. Army Corps of Engineers, New England District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
CSM	Conceptual Site Model
DA	Department of the Army
DD	Decision Document
DERP	Defense Environmental Restoration Program
DGM	Digital Geophysical Mapping
DGPS	Differential Global Positioning System
DMM	Discarded Military Munitions
DoD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
EMI	Electromagnetic Induction
ERT	Earth Resources Technology, Inc.
FS	Feasibility Study
FUDS	Formerly Used Defense Site
FUDMIS	FUDS Management Information System
GPS	Global Positioning System
HE	High Explosive
HHRA	Human Health Risk Assessment
IC	Institutional Control
IS	Incremental Sampling
ISM	Incremental Sampling Methodology
ITR	Independent Technical Reviewer
LUCs	Land Use Controls
LUCIP	Land Use Control Implementation Plan
MassDEP	Massachusetts Department of Environmental Protection
MAMMS	Multiple-Award Military Munitions Services
MC	Munitions Constituents
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MPV	Man-portable Vector
MRSPP	Munitions Response Site Prioritization Protocol
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action

NHESP	Natural Heritage & Endangered Species Program
NPS	National Park Service
O&M	Operation and Maintenance
OB	Open Burn
OD	Open Detonation
OE	Ordnance and Explosive
ORNL	Oak Ridge National Laboratory
PDT	Project Delivery Team
PP	Proposed Plan
PSL	Project Screening Level
QA	Quality Assurance
QC	Quality Control
RACER	Remedial Action Cost Engineering Requirements
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RDX	1,3,5-Trinitroperhydro-1,3,5-triazine
RI	Remedial Investigation
RMM	Risk Management Methodology
RTS	Robotic Total Station
SI	Site Inspection
SLERA	Screening Level Ecological Risk Assessment
SPAs	Single Point Anomalies
STR	Senior Technical Reviewer
SU	Sampling Unit
TBC	To be considered
TBD	To be determined
TEC	Topographic Engineering Center
TNT	Trinitrotoluene
TPP	Technical Project Planning
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
UU/UE	Unlimited Use/Unrestricted Exposure
UXO	Unexploded Ordnance

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EXECUTIVE SUMMARY

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 Camp Wellfleet Formerly Used Defense Site (FUDS) near Wellfleet, Massachusetts, under USACE Baltimore District (CENAB) contract W912DR-15-D-0015, Delivery Order 0002. The work falls under the Department of Defense (DoD) Military Munitions Response Program (MMRP), which was established under the Defense Environmental Restoration Program (DERP) to address munitions constituents (MC), and munitions and explosives of concern (MEC) (comprising unexploded ordnance [UXO], discarded military munitions [DMM], and MC in high enough concentrations to pose an explosive threat) that may be present on sites, including the Former Camp Wellfleet. USACE New England District (CENAE) is the Project Management District and USACE Baltimore District (CENAB) is the Military Munition Design Center. CENAE provides technical oversight and is the overall life cycle manager for the project. CENAB provides mission execution services to the PM District.

Purpose

The purpose of this FS is to develop, screen, and provide a detailed analysis of remedial alternatives to mitigate potential unacceptable explosive risks that may remain within the Former Camp Wellfleet FUDS. 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, Former Camp Wellfleet Formerly Used Defense Site, April 2019*.

Background and Site History

The Former Camp Wellfleet consists of a total of 1,738 land acres - of which approximately 1,688 acres are located in the Cape Cod National Seashore (CCNS), currently owned by the National Park Service (NPS). The Town of Wellfleet owns and manages the remaining 49.2 acres. Camp Wellfleet was previously used by the U.S. Army and U.S. Navy for training purposes. The property was leased in 1942 for an anti-aircraft artillery training base, with an artillery firing line located along the beach cliff. From 1945 through the end of World War II, the U.S. Navy used the base as a mobile radar training school supporting Navy night fighter training and for Dove missile training. Camp Wellfleet was officially closed on 30 June 1961.

Various investigation activities and risk reduction actions were performed between 1961 and 1998. MEC items including a 76mm anti-aircraft artillery cartridge have been identified at the site to date. An Archives Search Report (ASR) was compiled in 1994, with areas categorized as containing MEC, potentially containing MEC, or not containing MEC, and an analysis of historical aerial photos and other documents was completed by the Topographic Engineering Center (TEC) in 1998. An Engineering Evaluation and Cost analysis (EE/CA) was completed in May 2000 (Foster-Wheeler, 2000) and an EE/CA Action Memorandum (Foster-Wheeler, 2000a), approved the EE/CA recommendations, which included limited removal actions and institutional controls.

Prior to implementing the EE/CA Action Memorandum recommendations, a helicopter geophysical survey was conducted in 2002 to map unexploded ordnance (UXO); 345 single point anomalies (SPAs) were identified, resulting in removal actions in several focused areas. The removal actions resulted in the excavation of over 1,600 anomalies and removal of over 3,400 pounds of munitions debris (MD): a geophysical grid was installed at a suspected Open Burn/Open Detonation area; a series of pits were installed and 1,040 pounds of MD was removed; and a

removal action was conducted in EE/CA Area B (to the east of a large parking lot), where abundant MD (including rocket parts) was removed.

The RI investigation approach was based primarily on the ASR and EE/CA identified areas. The RI field work was conducted in April 2018, and the Remedial Investigation Report was completed in April 2019. The Project Delivery Team (PDT) developed Areas of Interest (AOIs) as the primary basis of investigation for the RI. The AOI configurations considered the original ASR and EE/CA Areas, the results of subsequent removal actions, the aerial groundscar analysis, and the combining of areas of common past activities (or the screening out of Areas where there was no evidence of MEC/MD), resulting in six (6) AOIs that formed the basis of the RI.

Nature and Extent of Contamination

The determination of the nature and extent of MC and MEC/MD contamination for the Former Camp Wellfleet FUDS is based on the findings of each of the investigative phases.

For the RI, MC soil sampling locations were collected from areas where previous investigations identified MEC/MD, portions of the site judgmentally considered to potentially contain the largest MC contaminant concentrations. Analytical parameters included antimony, copper, lead, manganese, nickel, and zinc, as well as RDX, TNT, nitroglycerin, 2,4-dinitrotoluene, 2,6-dinitrotoluene, tetryl, and nitroguanidine. A groundwater sample was also collected for the same parameters. Sufficient sampling was conducted to adequately define the nature and extent of MC at the former Camp Wellfleet, and the RI Report concluded that the MC sampling results indicated that there was no unacceptable MC risk to either human or ecological receptors resulting from Former Camp Wellfleet DoD activities.

The PDT determined that there were sufficient data to define MEC nature and extent evaluations using only the existing data. For the AOI-06 ocean range fan, MEC presence was assumed and therefore no further field investigation during the RI was required. MEC risk was evaluated using the USACE risk management methodology (RMM) matrix to assess risk posed by explosive risks. The RMM involves the use of four matrices to define acceptable and unacceptable risk from MEC hazards. Those AOIs that were designated as having an unacceptable MEC risk were considered to require remedial actions to mitigate the explosive risks they represent, and they are therefore addressed in this FS.

Baseline conditions that are assessed to be Acceptable do not warrant further action with regard to MEC. A 'No Further Action' (NFA) Proposed Plan (PP) and Decision Document (DD) may be prepared to address those AOIs posing acceptable MEC risk (AOI-01, AOI-03, and AOI-04). However, Unacceptable baseline site conditions warrant further action; this FS addresses those AOIs determined to pose unacceptable explosive risks:

- AOI-02, Artillery Firing Line (firing points for 90 mm and other anti-aircraft artillery)
- AOI-05, Rocket Range and Small Arms Range
- AOI-06, Range Fan of Artillery Targets (168,400 ocean acres)

Remedial Action Objectives (RAOs)

Explosive risks may remain in the surface and subsurface soil or within the waters of the Former Camp Wellfleet FUDS. The source of explosive risks is primarily UXO resulting from historical AOI-02 and AOI-05 firing activities (into AOI-06), as well as the potential for DMM associated with the AOI-02 firing line or AOI-05.

Receptors for the land AOIs include recreational park visitors, NPS personnel and maintenance workers, and construction workers. Exposure pathways for human receptors include direct contact with surface MEC by handling or treading upon, and direct contact with subsurface MEC through intrusive activities. Most munition related items in the land AOIs were found at a depth of less than 2 feet below ground surface (bgs), and while a few items were found as deep as 4.5 feet bgs, a conservative average depth of potential subsurface MEC items remaining is 3 feet bgs.

The AOI-06 artillery range fan source of explosive risks is primarily UXO resulting from historical AOI-02 and AOI-05 firing activities. Receptors for water AOI-06 include recreational users such as waders, swimmers, divers, and fishermen. Exposure pathways include direct contact with MEC on the sea floor by handling and treading upon, and direct contact with MEC beneath the sea floor through intrusive activities. A recreational diver limit (a maximum water depth limit of 120 feet) was defined; beyond that, fishing nets may scrape the sea floor at greater depths to the extent of the AOI boundary.

The proposed RAOs are based on MEC as the hazard of interest in the surface and subsurface soil, or on or beneath the sea floor, the depths for potential exposure of receptors, and the receptors most likely to be exposed. The RAOs include:

- For land AOI-02 and AOI-05: eliminate unacceptable risk due to the presence of MEC to a depth of 3 feet bgs to address direct contact by park personnel and recreational users, and direct contact of MEC in the subsurface to a depth of 6 feet bgs by authorized maintenance workers, such that acceptable conditions (as defined by RMM Matrix 4), within the limitations of detection capability resulting from imposed vegetation cutting prohibitions, are achieved.
- For water AOI-06: eliminate unacceptable risk due to the presence of MEC on or beneath the sea floor (approximately 2 ft bgs) to address direct contact by park personnel, park visitors (waders, swimmers), and recreational divers, to a water depth of 120 feet, and the potential for interaction resulting from the use of fishing nets to the maximum depth of the AOI, such that an acceptable condition (as defined by RMM Matrix 4) is achieved.

Identification and Screening of Technologies

To develop remedial alternatives, Applicable or Relevant and Appropriate Requirements (ARARs) were identified. General response actions to satisfy the RAOs were developed, including Land Use Controls (LUCs) such as signage, fencing, or institutional controls (education and informational material), and MEC Removal (geophysical investigation of anomalies followed by removal/disposal).

For MEC removal, detection process options included analog magnetometers, Digital Geophysical Mapping, and Advanced Geophysical Classification (AGC). It was concluded that the analog magnetometer and AGC options were the most viable primarily because they require minimal vegetation removal and NPS maintains cutting limitations to minimize disturbance to sensitive plant communities at the Former Camp Wellfleet. A MEC removal depth component was also developed, with 3 feet bgs a practical maximum for park visitor activities, while an educational LUC would provide for notification to authorized park workers (utility or construction contractors), who may need to achieve greater depths (e.g., notifications of the intent to safely conduct such activities).

Development and Screening of Alternatives

Based on the explosive risks mitigation technologies reviewed, four remedial alternatives were identified to mitigate the unacceptable explosive risks that may remain:

- Alternative 1: No Action
- Alternative 2: LUCs
- Alternative 3: Partial MEC Removal with LUCs
- Alternative 4: MEC Removal to Unlimited Use/Unrestricted Exposure (UU/UE)

These alternatives were screened against effectiveness, implementability, and cost. Alternatives 2 and 3 met key elements of the effectiveness and implementability criteria and they were retained for the detailed comparative analysis. Alternative 4 did not meet these criteria and it was not retained for further analysis. Alternative 1 was retained as a baseline.

Analysis of Remedial Alternatives – Explosive Risks

Each of the retained remedial alternatives was first screened against the nine CERCLA evaluation criteria, and then they were screened against each other.

Alternative 1 was assessed as not protective of public health and the environment for any of the AOIs.

For AOI-02, Alternatives 2 and 3 were assessed as having an equal number of favorable rankings for the CERCLA criteria. Alternatives 2 and 3 are protective of human health and the environment, and compliant with ARARs. However, while Alternative 3 (Partial MEC Removal with LUCs) had one more moderately favorable ranking, it was significantly more costly than Alternative 2 (LUCs).

For AOI-05, Alternatives 2 and 3 were assessed as having an equal number of favorable rankings for the CERCLA criteria. Alternatives 2 and 3 are protective of human health and the environment, and compliant with ARARs. However, while Alternative 3 (Partial MEC Removal with LUCs) had one more moderately favorable ranking, it was significantly more costly than Alternative 2 (LUCs).

For AOI-06, Alternative 2 was ranked favorable for more CERCLA criteria than were the other alternatives. It is protective of human health and the environment, is compliant with ARARs, is effective in the short term, and is favorable for implementability. Alternative 3 was favorable for only two criteria. The Alternative 2 cost is relatively low while the Alternative 3 cost is significant.

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

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 Camp Wellfleet Formerly Used Defense Site (FUDS) near Wellfleet, Massachusetts, under USACE Baltimore District (CENAB) contract W912DR-15-D-0015, Delivery Order 0002. The work falls under the Department of Defense (DoD) Military Munitions Response Program (MMRP), which was established under the Defense Environmental Restoration Program (DERP).

The DoD established the MMRP to address munitions constituents (MC), and munitions and explosives of concern (MEC) (comprising unexploded ordnance [UXO], discarded military munitions [DMM], and MC in high enough concentrations to pose an explosive threat) that are located on certain properties – including FUDS, and that may be present at the Former Camp Wellfleet. USACE New England District (CENAE) is the Project Management District and CENAB is the Military Munition Design Center. CENAE provides technical oversight and is the overall life cycle manager for the project. CENAB provides mission execution services to the PM District.

Under the DERP, the U.S. Army is the DoD's lead Agent for FUDS, and USACE executes FUDS for the Army. USACE performs its response activities in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). FUDS is administered pursuant to the DERP statute, the CERCLA, Executive Orders 12580 and 13016, the NCP, and DoD and Army policies in managing and executing the FUDS program.

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 Remedial Investigation (RI), and the conclusions and recommendations documented in the *Final Remedial Investigation Report, Former Camp Wellfleet Formerly Used Defense Site, April 2019* (USACE, 2019), hereinafter referenced as the RI Report.

1.1 Purpose of the FS

The purpose of a FS, in accordance with U.S. Environmental Protection Agency (USEPA) guidance (1988), 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." A FS typically develops, screens, and provides a detailed analysis of remedial alternatives.

The purpose of this FS is to develop, screen, and provide a detailed analysis of the remedial alternatives required to mitigate unacceptable explosive risks that may remain within the Former Camp Wellfleet FUDS.

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* (US Army, 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: Site Figures
- Appendix B: Post-Remedy Risk Management Methodology (RMM) Matrices
- Appendix C: Costing Detail
- Appendix D: Institutional Analysis

1.3 Background Information

All background and site history presented in this FS is summarized from the 2019 RI Report (USACE, 2019).

The Former Camp Wellfleet consists of a total of 1,738 acres - of which approximately 1,688 acres are located in the Cape Cod National Seashore (CCNS) and 49.2 acres in the Town of Wellfleet, Barnstable County, Massachusetts, on the Cape Cod peninsula. The site is accessible from U.S. Route 6, which is located just west of the site.

Camp Wellfleet was previously used by the U.S. Army and U.S. Navy for training purposes. The 1,738-acre property was leased beginning in 1942 for an anti-aircraft artillery training base, with an artillery firing line located along the beach cliff. The site was used as such by the U.S. Army until June 1944, when it temporarily closed. From January 1945 through the end of World War II, the U.S. Navy used the base as a mobile radar training school supporting Navy night fighter training based in Quonset Point, Rhode Island, and for Dove missile training. The Camp also was used for training by National Guard troops and Active Army Reserve anti-aircraft artillery training units. Camp Wellfleet was declared as excess and officially closed on 30 June 1961.

The Department of the Interior acquired the land through a Declaration of Taking in August 1961 to establish and develop the CCNS. The majority of the Former Camp Wellfleet site is currently owned by the National Park Service (NPS). The Town of Wellfleet owns and manages approximately 49.2 acres.

Figure 1 presents the site location (all figures are presented in Appendix A).

1.4 Previous Investigation Activities

Historical investigations have been performed at the site to characterize the extent of MEC. Investigation activities were performed between 1961 and 1962, and the discovery of ordnance items at various locations required the execution of risk reduction actions between 1961 and 1998. In 1991, an Inventory Project Report/Preliminary Assessment was completed, and the Camp was determined to be eligible under the FUDS program for hazardous, toxic, and radioactive waste and MMRP evaluations. Munitions used at the Former Camp Wellfleet, based on previous investigations, include MK 65 “Dove” practice bombs, 60-millimeter (mm) projectiles, 90mm projectiles, 105mm projectiles, .30 and .50 caliber ammunition, grenades, and rifle smoke grenades. MEC items including a 76mm anti-aircraft artillery cartridge have been identified at the site to date.

1.4.1 Archives Search Report and Historical Environmental Aerial Photographic Analysis

An Archives Search Report (ASR) was compiled in 1994, with areas categorized as containing MEC, potentially containing MEC, or not containing MEC (USACE, 1994). An analysis of historical aerial photos and other documents was completed by the Topographic Engineering Center (TEC) in 1998. TEC georeferenced air photographs and included stereoscopic delineation of ground scars, excavations, new structures, and other features such as bombing targets, gun emplacements, and ammunition supply points. The TEC report was a primary source of information in the development of the Engineering Evaluation and Cost analysis (EE/CA) work plan, particularly the placement of geophysical grids.

1.4.2 Former Camp Wellfleet EE/CA and ORNL Survey

Based on the conclusions of the ASR, an EE/CA investigation was completed in May 2000. Identified inert munitions-related items that were found included four 1,000-pound Dove missiles, and one 250-pound practice bomb. The EE/CA Action Memorandum, signed in April 2001, approved the recommended removal actions, which included Clearance to Depth for selected areas and Institutional Controls (ICs) without Access Restrictions for all the remaining areas (CENAE, 2013).

Prior to implementing the EE/CA Action Memorandum recommendations, Oak Ridge National Laboratory (ORNL) conducted a helicopter geophysical survey of all of the Former Camp Wellfleet in March 2002, to detect and map UXO and concentrations of metallic waste or debris that could contribute to environmental degradation or otherwise pose a safety hazard. Due to vegetation, the sensor height above ground was a limiting factor in the usefulness of the data, however, 345 single point anomalies (SPAs) were identified; this resulted in removal actions in several focused areas of the Former Camp Wellfleet.

1.4.3 Site Specific Final Report and Addendum, Ordnance and Explosives Removal Action, Former Camp Wellfleet

Ordnance and Explosives (OE) removal activities were conducted from approximately 2003 through 2005 (Zapata, 2006). These activities included investigations of SPAs in 2003 and 2004, investigation grids in 2004, and removal action areas in 2005. Removal actions resulted in the excavation of over 1,600 anomalies and removal of over 3,400 pounds of munitions debris (MD), but only a single MEC item, a smoke grenade, determined to be UXO, was encountered. A geophysical grid was installed at SPA 279, a suspected Open Burn/Open Detonation (OB/OD) area. A series of pits were installed and 1,040 pounds of MD was removed; no MEC was encountered. A removal action was conducted in what the EE/CA identified as Area B (to the east of a large parking lot), where abundant MD (mostly rocket parts) was removed.

1.4.4 Remedial Investigation

The Uniform Federal Policy - Quality Assurance Project Plan (UFP-QAPP) *(Final Remedial Investigation Work Plan for Former Camp Wellfleet FUDS, Wellfleet, MA, April 2018)* was finalized and RI field work conducted in April 2018. The Remedial Investigation Report (*Final Remedial Investigation Report, Former Camp Wellfleet Formerly Used Defense Site,* USACE, 2019) was completed in April 2019, as described below.

1.4.4.1 Areas of Investigation for the RI

The RI investigation approach for the Former Camp Wellfleet was based primarily on the ASR and EE/CA identified 'Areas' (areas that were determined to have MEC, have a potential for MEC, or no potential for MEC). The TEC aerial photo and groundscar analysis further identified the investigation areas for this RI. Consequently, the Project Delivery Team (PDT) developed Areas of Interest (AOIs) as the primary basis of investigation for the RI. The AOI term was used to be consistent with terminology used in the USACE FUDS Handbook on Delineation and Munitions Response Site Prioritization Protocol (MRSPP) Implementation (USACE, 2014).

The AOI configurations considered the original ASR and EE/CA Areas, the results of subsequent removal actions, the aerial groundscar analysis, the FUDS Management Information System (FUDSMIS) project acreage, and the combining of areas of common past activities (or the screening out of Areas where there was no evidence of MEC/MD), resulting in the six (6) AOIs that formed the basis of the RI. The Former Camp Wellfleet FUDS is 1,738 acres of land. The land AOIs (01 through 05) as shown in Table 1.1, are approximately 626 acres. The AOI-06 water AOI is approximately 168,400 acres.

Table 1.1 summarizes the resulting AOIs, indicating the conceptual site model (CSM) and munition types associated with each. Figure 2 presents the site layout with the current configuration of AOIs. Additional description of the AOIs that are the subject of this FS are provided in the detailed analysis discussion presented in Section 5.0.

Table 1.1: RI Areas of Interest

AOI	CSM	Munition Types	Acreage
AOI-01	Burial/Disposal Pits, Possible Landfill	No MEC. MD included 3.5" practice rockets, expended M2 anti-personnel mines, 407 M48 flashtubes, m7A3 2.36" practice rocket, and part of an inert filled M65 1,000lb practice "Dove" guided bomb.	33.1
AOI-02	Artillery Firing Line—firing points for 90 mm and other anti-aircraft artillery	MEC. A 76mm anti-aircraft artillery (MEC), and 50 caliber ammunition, fuze cans, shipping clips for 90mm fuzes, 30 caliber ammunition cans, and unknown frag (MD).	275.0
AOI-03	Ammunition Supply Points and Ground Scars	MEC. Rifle smoke grenade (MEC), and multiple fuze shipping spacers, and some small arms debris (MD).	120.2
AOI-04	Bomb Targets and Small Burial Area	No MEC. MD included fuze shipping spacers, small arms debris, an empty practice Dove Missile/1000-pound bomb, an empty 250-pound bomb, 186 M28A1 flash tubes from 106mm projectile cartridge cases, and fragments of grenade spoons.	141.8
AOI-05	Rocket Range and Small Arms Range	MD indicative of MEC. High explosive (HE) frag from 3.5-inch rockets and 105mm projectiles (MD indicative of MEC), and miscellaneous MD scrap.	56.10
AOI-06	Range Fan of Artillery Targets in Ocean	MEC presence assumed based on 20 years of firing into the ocean. Potential types: 76mm anti-aircraft artillery, 90mm and 105mm projectiles, 3.5" rockets.	167,856

1.5 Nature and Extent of Contamination Summary

The goal of the RI field investigation activities was to determine the nature and extent of MEC and MC contamination at the Former Camp Wellfleet, potentially caused by prior military operations, and to recommend whether further actions are warranted. The determination of the nature and extent of MC and MEC/MD contamination for the Former Camp Wellfleet FUDS is based on the findings of each of the investigative phases, as detailed in the above described reports.

1.5.1 Human Health and Ecological Risk Assessment for MC

MC soil sampling locations were collected from areas where previous investigations identified MEC/MD, portions of the site judgmentally considered to potentially contain the largest MC contaminant concentrations. The incremental sampling methodology (ISM) was used. The analytical parameters included select metals (antimony, copper, lead, manganese, nickel, and zinc) and select explosives (1,3,5-trinitro-1,3,5-triazine [RDX], 2,4,6-trinitrotoluene (TNT), nitroglycerin, 2,4-dinitrotoluene, 2,6-dinitrotoluene, tetryl, and nitroguanidine). ISM soil sampling included collecting surface soil from 17 sampling units (SUs), subsurface soil from three SUs, and surface and subsurface soil from seven background SUs. Eight discrete subsurface soil samples were collected from AOI-01. One groundwater sample was collected for the same parameters.

The RI Report concluded that the MC sampling results for soil and groundwater did not exceed the project screening levels (PSLs), and therefore, no quantitative human health risk assessment (HHRA) or screening level ecological risk assessment (SLERA) were required. In addition to the RI effort, a limited number of soil samples were collected during the 2003-2004 investigation. These samples were analyzed for metals (i.e., arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, and silver), explosives compounds, and extractable petroleum hydrocarbons; the reported results for all soil samples were less than the PSLs for all parameters.

Therefore, the RI Report concluded that there is no unacceptable MC risk to either human or ecological receptors.

1.5.2 Explosive Risks

The PDT determined that there were sufficient data to make MEC nature and extent evaluations using only the existing data, i.e., no MEC field investigation needed to be conducted for the RI. For the ocean range fan AOI, MEC presence was assumed and therefore no further field investigation during this RI was required.

MEC risk was evaluated using the December 2016 USACE risk management methodology (RMM) matrix to assess risk posed by explosive risks (USACE, 2017). The RMM analyses for the individual AOIs, presented in the RI Report, is summarized below.

The RMM involves the use of four matrices to define acceptable and unacceptable risk from MEC hazards based on the likelihood of an encounter, the severity of incident, and the sensitivity of interaction based on expected land use activities. This method is ultimately used to establish remedial action objectives and to help evaluate potential remedial action alternatives. Those AOIs that were designated as having an unacceptable MEC risk were considered to require remedial actions to mitigate the explosive risks they represent, and they are therefore addressed in this FS.

Table 1-2 is a summary of the detailed analysis presented in the RI Report, showing the conclusion of each RMM matrix table for each AOI, indicating whether it was determined to be acceptable or unacceptable with regard to risk posed by explosive hazards.

Table 1.2: Summary of Risk Assessment Matrix Analysis – Baseline Conditions

AOI	Matrix 1: Likelihood of Encounter	Matrix 2: Severity of Incident	Matrix 3: Likelihood of Detonation	Matrix 4: Acceptable and Unacceptable Site Conditions	Addressed in this FS
AOI-01	Seldom (No MEC, Often Access)	D – (Improbable Severity, Seldom Likelihood)	3 – (Not Sensitive, Modest Likelihood)	Acceptable	NO
AOI-02	Likely (Confirmed MEC, Regular Access)	A – (Catastrophic Severity, Likely Likelihood)	2 – (Moderate Sensitivity, Modest Likelihood)	**Unacceptable**	**YES**
AOI-03	Seldom (MEC, Often Access)	C – (Modest Severity, Seldom Likelihood)	2 – (Moderate Sensitivity, Modest Likelihood)	Acceptable	NO
AOI-04	Seldom (No MEC, Often Access)	D – (Improbable Severity, Seldom Likelihood)	3 – (Not Sensitive, Modest Likelihood)	Acceptable	NO
AOI-05	Likely (MD Indicative of MEC, Regular Access)	A – (Catastrophic Severity, Likely Likelihood)	2 – (Moderate Sensitivity, Modest Likelihood)	**Unacceptable**	**YES**
AOI-06	Seldom (MEC Suspected, Regular Access)	B – (Catastrophic Severity, Seldom Likelihood)	2 – (Moderate Sensitivity, Modest Likelihood)	**Unacceptable**	**YES**

Baseline conditions that are assessed to be Acceptable do not warrant further action with regard to MEC, and it is recommended that a 'No Further Action' (NFA) Proposed Plan (PP) and Decision Document (DD) be prepared to address those AOIs posing acceptable MEC risk (AOI-01, AOI-03, and AOI-04. However, unacceptable baseline site conditions warrant further action. Therefore, this FS addresses those AOIs determined to pose unacceptable explosive risks (AOI-

02, AOI-05, and AOI-06). A PP and DD will also be required as part of the CERCLA response process.

Figure 3 presents the site layout showing the three AOIs that are the subject of this FS.

2.0 REMEDIAL ACTION OBJECTIVES

2.1 Remedial Action Objectives

Remedial action objectives (RAOs) specify the contaminants, military munitions, and media of concern, receptors and exposure pathways, and preliminary remediation goals that permit a range of treatment alternatives to be developed. RAOs drive the development of response actions with a goal of achieving the USEPA's threshold criteria of "Overall Protection of Human Health and the Environment" and "Compliance with Applicable or Relevant and Appropriate Requirements.

2.1.1 Contaminants and Media of Concern

Based on the conclusions of the RI Report (see Section 1.5.1), there is no unacceptable MC risk to either human or ecological receptors. Therefore, the RAOs do not address chemical contamination, but rather focus on the MEC-related explosive risks potentially present in AOI 02, AOI-05, and AOI-06. Explosive risks may remain in the surface and subsurface soil or within the waters of the Former Camp Wellfleet FUDS, and AOIs categorized as having unacceptable site conditions with regard to explosive risks (described in Section 1.5.2) require remedial actions to mitigate them. Table 1.1 summarizes the identified MEC items that have been found within each AOI.

MEC distinguishes specific categories of military munitions that may pose unique explosives safety risks, includes UXO, as defined in 10 U.S.C. 101(e)(5); DMM, as defined in 10 U.S.C. 2710(e)(2); or MC (e.g., trinitrotoluene or cyclotrimethylenetrinitramine), as defined in 10 U.S.C. 2710(e)(3), present in high enough concentrations to pose an explosive hazard.

The media of concern at the land AOIs (AOI-02 and AOI-05) are surface and subsurface soil that may potentially contain MEC. For the water AOI (AOI-06), MEC could be on the sea floor or buried beneath it.

2.1.2 Receptors and Exposure Pathways for Land AOIs

The Former Camp Wellfleet FUDS CSM, presented in the RI Report, integrated information on the MEC source, receptors, and receptor/MEC interaction to complete the pathway analysis. The source of explosive risks is primarily UXO resulting from historical AOI-02 and AOI-05 firing activities (into AOI-06), as well as the potential for DMM associated with the AOI-02 and AOI-05 firing lines.

Receptors for the land AOIs (AOI-02 and AOI-05) include recreational park visitors, NPS personnel and maintenance workers, and construction workers.

Exposure pathways identified for human receptors within these AOIs include direct contact with surface MEC by handling and treading upon, and direct contact with subsurface MEC through intrusive activities (e.g., utility, construction, or maintenance workers, or recreational park user activities such as treasure hunting or digging for clams). There is also a potential for wave action and storm surges during high winds, hurricanes, and strong storms to alter the terrain of the AOIs. While erosion of the sandy cliff/bluffs is assumed to be the cause of the AOI-02 76mm MEC item found on the beach, human intrusive actions represent a significant mechanism for exposure to MEC in the subsurface soil.

A review of the previous investigations indicates that most munition related items in the land AOIs were found at a depth of less than 2 feet below ground surface (bgs). While a few items were found as deep as 4.5 feet bgs, a conservative average depth of potential MEC items remaining is 3

feet bgs. The depth of incidental intrusive activities within AOI-02 or AOI-05, based on current and future land uses, is not anticipated to exceed 3 feet bgs. That is, digging by hand, as might be done by a recreational park visitor, would not likely exceed 3 feet bgs. Any deeper excavations, such as for construction or maintenance activities would be conducted by authorized park workers, and would likely require powered equipment.

For unacceptable explosive risks, the MEC pathway for the land AOIs is considered to be complete because there is a source, receptors, and the potential for interaction between them.

2.1.3 Receptors and Exposure Pathways for Water AOI

The AOI-06 artillery range fan extends approximately 17 miles into the Atlantic Ocean, reaching depths greater than 500 feet. The source of explosive risks within AOI-06 is primarily UXO resulting from approximately 20 years of historical AOI-02 and AOI-05 firing activities. While the vast majority of munition items were fired into ocean depths greater than 50 feet, according to the ASR (USACE, 1994), significant storm events can impact the sea floor and transport items to shallower depths.

Receptors for AOI-06 include recreational users such as waders, swimmers, divers, and fishermen (including dropping anchor). Exposure pathways identified for these receptors include direct contact with MEC on the sea floor by handling and treading upon, and direct contact with MEC beneath the sea floor through intrusive activities (e.g., treasure hunting or digging for clams). There are practical depth limits in the open ocean for these receptors and exposure pathways: waders cannot tread upon the sea floor beyond a water depth of approximately 6 feet; recreational divers have a maximum water depth limit of approximately 120 feet (an area extending almost 3 miles from the shoreline); fishing nets may scrape the sea floor at depths far greater than 120 feet, but the nets do not penetrate beneath the sea floor.

For unacceptable explosive risks, the MEC pathway for the water AOI is considered to be complete because there is a source, receptors, and the potential for interaction between them.

2.1.4 Remediation Goals

Unlike RAOs for chemical contaminants, with cleanup levels typically set by the USEPA or state agencies based on specified risk levels, no regulatory guidelines have been promulgated specifying an acceptable hazard level associated with MEC contamination. Rather, MEC RAOs address specific goals for reducing the explosive risks for AOIs to ensure protection of human health and the environment. For the Former Camp Wellfleet FUDS AOIs that potentially pose unacceptable explosive risks, the remediation goal is to:

- Remove geophysically-identified anomalies that may represent MEC, or limit access to areas potentially containing MEC, thereby reducing the potential for encountering MEC and ensuring protection of human health and the environment.

2.1.5 Proposed Remedial Action Objectives

Remedial actions are recommended to mitigate explosive risks for the Former Camp Wellfleet FUDS AOIs that were designated as representing unacceptable site conditions. The proposed RAOs for the remedial actions are based on site-specific information, including MEC as the hazard of interest that may occur in the surface and subsurface soil, or on or beneath the sea floor, the depths for potential exposure of receptors, and the receptors most likely to be exposed.

Combining the affected media, the exposure pathways, and the project goals, the proposed RAOs include:

- For land AOI-02 and AOI-05: eliminate unacceptable risk due to the presence of MEC to a depth of 3 feet bgs to address direct contact by park personnel and recreational users, and direct contact of MEC in the subsurface to a depth of 6 feet bgs by authorized maintenance workers, such that acceptable conditions (as defined by RMM Matrix 4), within the limitations of detection capability resulting from imposed vegetation cutting prohibitions, are achieved.
- For water AOI-06: eliminate unacceptable risk due to the presence of MEC on or beneath the sea floor (approximately 2 ft bgs) to address direct contact by park personnel, park visitors (waders, swimmers), and recreational divers, to a water depth of 120 feet, and the potential for interaction resulting from the use of fishing nets to the maximum depth of the AOI, such that an acceptable condition (as defined by RMM Matrix 4) is achieved.

2.2 Applicable or Relevant and Appropriate Requirements

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

The ARAR analysis is directed at substantive, promulgated regulations with regard to on-site activities [CERCLA § 121(d), 42 U.S.C. § 9621(d); NCP, 40 C.F.R. § 300.5]. Furthermore, CERCLA response actions, per CERCLA/NCP, are exempt from permits and similar procedural requirements with regard to on-site activities [42 USC § 9621(e)(1); 40 C.F.R. § 300.400(e)(1)].

For off-site activities (e.g., transportation), compliance is required for applicable, substantive and procedural requirements [NCP, 40 C.F.R. § 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 C.F.R. § 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.

"Applicable" requirements means those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.

"Relevant and appropriate" requirements means those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site. Only those state standards that are promulgated, are identified by

a state in a timely manner, and are more stringent than federal requirements may be relevant and appropriate.

Whether or not a requirement is appropriate (in addition to being relevant) will vary depending on factors such as the existence of wetlands or endangered species on or near the site, the duration of the response action, the form or concentration of the chemicals present, the nature of the release, the availability of other standards that more directly match the circumstances at the site, and other factors. In some cases only a portion of the requirement may be relevant and appropriate. The identification of relevant and appropriate requirements is a two-step process; only those requirements that are considered both relevant and appropriate must be addressed at CERCLA sites.

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

Table 2.1 provides the ARARs for the Former Camp Wellfleet FUDS and Table 2.2 provides the TBCs. These tables also provide an overview screen against the alternatives developed in Section 4.0.

2.2.2 Identification of Potential ARARs

Because of 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 cleanup levels for the chemicals in the designated media or indicate the appropriate level of concern. For the Former Camp Wellfleet FUDS, there are no chemical-specific ARARs identified for MC in soils, since there were no MC risks identified in the RI Report.
- **Location-specific ARARs** protect against damage to unique or sensitive areas such as 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.

  Table 2.1 contains federal and state location-specific ARARs that are listed based on the presence of any threatened or endangered species (including Piping Plovers, Red Knot, Northern Long-eared bat, Leatherback Sea turtles, Tiger Beetles, Sandplain Gerardia, and many others), as well as special concern plant, bird (including migratory birds), and insect species, and sensitive ecological communities, including Natural Heritage & Endangered Species Program (NHESP) priority habitats.
- **Action-specific ARARs** set controls or restrictions on specific removal/remedial activities at a site. They specify performance levels, actions, or technologies, as well as specific levels for discharges or residual chemicals.

  All proposed activities were reviewed for potential impacts to threatened, endangered, and special concern species and sensitive areas, and will receive NPS approval prior to initiation. Disturbances to any such species or locations will be minimized in coordination with NPS.

To comply with the identified action-specific ARARs, all appropriate control measures will be in place to prevent impacts to local air and water during remediation.

Table 2.1 lists the state and federal location-specific and the federal action-specific ARARs for the remedial alternatives under evaluation. The table provides a screen of the ARARs relative to each remedial alternative; a discussion in greater detail is provided in Section 5.0, Detailed Analysis of Alternatives.

2.3 General Response Actions

General response actions 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 explosive risks due to MEC that may remain within the Former Camp Wellfleet FUDS.

For most MMRP sites, the general response actions evaluated typically include Land Use Controls (LUCs) such as fencing or institutional controls, and MEC Removal (geophysical investigation of anomalies followed by removal and destruction/disposal). (USACE, 2009). These are further described below:

Land Use Controls — LUCs include those mechanisms put in place to reduce the potential for receptors to encounter MEC. LUCs are intended to reduce, mitigate, or otherwise prevent direct contact with surface and subsurface MEC. These include physical LUCs (such as fencing), and administrative LUCs or institutional controls (such as signage, environmental covenants, and/or education).

MEC Removal — MEC is first detected through geophysical investigations, for example, Digital Geophysical Mapping (DGM), and then removed from the surface or subsurface. Upon removal, the MEC is destroyed or treated, and then disposed.

From these general response actions, remedial alternatives that can achieve the RAOs were developed.

2.3.1 Explosive Risks Response Action Areas

Explosive risks associated with the Former Camp Wellfleet FUDS may remain in the surface and subsurface soil, or on or beneath the sea floor, and AOIs categorized as having unacceptable site conditions with regard to explosive risks (described in Section 1.5.2) require remedial actions to mitigate them.

Figure 3 shows the AOIs that present unacceptable explosive risks.

Table 2.1: Summary of Potential ARARs

ARARs	AOI-02			AOI-05			AOI-06		
	Alternative 1: No Further Action	**Alternative 2: Land Use Controls**	**Alternative 3: Partial MEC Removal with LUCs**	**Alternative 1: No Further Action**	**Alternative 2: Land Use Controls**	**Alternative 3: Partial MEC Removal with LUCs**	**Alternative 1: No Further Action**	**Alternative 2: Land Use Controls**	**Alternative 3: Partial MEC Removal with LUCs**
Federal Statutes/Laws									
Federal Endangered Species Act 16 USC 1538(a)(1)(B) (1991, as amended), 1536(a)(2). 50 CFR 402.01(a), 50 CFR 402.14(i).	NA	✓	✓	NA	✓	✓	NA	✓	✓
Federal Migratory Bird Treaty Act of 1918 16 U.S.C. 703(a)	NA	✓	✓	NA	✓	✓	NA	✓	✓
Clean Water Act (Sections 404/401) 40 CFR Part 230.10 Restrictions on discharge	NA	NA	✓	NA	NA	✓	NA	NA	✓
Federal Resource Conservation and Recovery (RCRA) 40 CFR 264.601/602/603	NA	NA	✓	NA	NA	✓	NA	NA	✓
Massachusetts Statutes/Laws									
Massachusetts Endangered Species Act Code of Massachusetts (CMR) regulations 321 CMR 10.04(1)	NA	✓	✓	NA	✓	✓	NA	✓	✓

ARARs	AOI-02			AOI-05			AOI-06		
	Alternative 1: No Further Action	**Alternative 2: Land Use Controls**	**Alternative 3: Partial MEC Removal with LUCs**	**Alternative 1: No Further Action**	**Alternative 2: Land Use Controls**	**Alternative 3: Partial MEC Removal with LUCs**	**Alternative 1: No Further Action**	**Alternative 2: Land Use Controls**	**Alternative 3: Partial MEC Removal with LUCs**
Massachusetts Waterways Regulation 310 CMR 9.40(2)(b) (1st sentence)* 310 CMR 9.40(3)(b) (1st sentence)*	NA	NA	✓	NA	NA	✓	NA	NA	✓
Massachusetts Wetlands Protection Act 310 CMR 10.25(5)-(7) 310 CMR 10.27(3), (6), & (7) 310 CMR 10.28(3) & (6) 310 CMR 10.30 (4) & (6) 310 CMR 10.34 (4)-(5)	NA	NA	✓	NA	NA	✓	NA	NA	✓
Massachusetts Hazardous Waste Regulations 310 CMR 30.606(2)†	NA	NA	✓	NA	NA	✓	NA	NA	✓
Massachusetts Contingency Plan 310 CMR 40.0996 (Table 6 limits for: Antimony, lead, nickel, zinc, cyclotrimethylenetrinitramine [RDX], & 2,4-dinitrotoluene)	NA	NA	✓	NA	NA	✓	NA	NA	✓
314 CMR 4.04(1) 314 CMR 4.05(4)(a), 4.05(3)(b), & 4.05(5)†	NA	NA	✓	NA	NA	✓	NA	NA	✓
401 Water Quality Certification	NA	NA	✓	NA	NA	✓	NA	NA	✓

ARARs	AOI-02			AOI-05			AOI-06		
	Alternative 1: No Further Action	**Alternative 2: Land Use Controls**	**Alternative 3: Partial MEC Removal with LUCs**	**Alternative 1: No Further Action**	**Alternative 2: Land Use Controls**	**Alternative 3: Partial MEC Removal with LUCs**	**Alternative 1: No Further Action**	**Alternative 2: Land Use Controls**	**Alternative 3: Partial MEC Removal with LUCs**
314 CMR 9.06(2)(1st sentence)* 314 CMR 9.07(1)(a)(1st sentence)*									
Ocean Sanctuaries Act M.G.L. c. 132A, ss. 15 (3) & (4)	NA	NA	NA	NA	NA	NA	NA	NA	✓

NA – Not applicable; ARAR not associated with this alternative.

✓ - This is an ARAR for this alternative.

* - Though this project does not constitute dredging and, therefore, this requirement is not applicable, this provision was deemed relevant and appropriate.

† - Only the substantive portions of this regulation will be considered an ARAR. Administrative, permit, license, and notification requirements will not be included.

For Alternative 2, for each of the three AOIs, ARARs are related to the protection of wildlife species, but the minor disruptive activity (e.g., signage installation) of this alternative would be implemented to comply with these ARARs through coordination with NPS, USFWS, MassDEP, and the Town of Wellfleet to minimize any disturbance to these species.

For Alternative 3, for each of the three AOIs, ARARs are related to removal and transportation of MEC items. It is anticipated that any soil or sediment removal, or placement, surrounding MEC would have negligible impact. Thus, ARARs related to soil or sediment removal, water quality, or air quality are not triggered.

Table 2.2: To Be Considered Criteria

TBCs	AOI-02			AOI-05			AOI-06		
	Alternative 1: No Further Action	**Alternative 2: Land Use Controls**	**Alternative 3: Partial MEC Removal with LUCs**	**Alternative 1: No Further Action**	**Alternative 2: Land Use Controls**	**Alternative 3: Partial MEC Removal with LUCs**	**Alternative 1: No Further Action**	**Alternative 2: Land Use Controls**	**Alternative 3: Partial MEC Removal with LUCs**
Massachusetts Guidance									
Massachusetts 2015 Ocean Management Plan	NA	NA	NA	NA	NA	NA	NA	NA	✓
Massachusetts Stormwater Handbook Volumes l and 2 February 2008	NA	NA	✓	NA	NA	✓	NA	NA	NA
2020 Standards and Guidelines for Chemicals in Massachusetts Drinking Waters	NA	NA	✓	NA	NA	✓	NA	NA	NA
Erosion and Sediment Control Guidance May 2003	NA	✓	✓	NA	✓	✓	NA	✓	✓

NA – Not applicable; TBC not associated with this alternative.

✓ - This is a TBC for this alternative.

3.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

At this step of the FS process, the universe of potentially applicable technology types is reduced by evaluation with respect to implementability, screening out technologies that are clearly ineffective or unworkable at a given site.

The term "technology" refers to general categories of technologies for addressing MEC such as detection, removal, and disposal. The term "process option" refers to specific processes within each technology. For example, the process options for detection technology include such things as magnetometers and electromagnetic induction (EMI) metal detectors.

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 Former Camp Wellfleet FUDS, 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 with regard to developing the remedial alternatives that can meet the RAOs. As the analysis for land AOIs can be significantly different than for the water AOI, the discussions are organized accordingly.

3.1 LUC Technology Types

Process options addressed under administrative LUCs include legal mechanisms, educational awareness programs, regular or periodic inspections, fencing, 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 hazard 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.

3.2 Detection Technology Types

Subsurface detection can be accomplished through use of one or a combination of geophysical process options, including sensors such as magnetometers, EMI sensors, and advanced classification technology. Many of the detection technology types are applicable to the water AOI (AOI-06), although the open ocean presents significant challenges relative to the land AOIs. While these options vary in level of cost, ease of use, and availability, under certain conditions, each technology can be capable of achieving the RAOs.

3.2.1 Analog Magnetometers

3.2.1.1 Land AOIs

Hand-held analog geophysical instruments, such as the Schonstedt magnetic locator or any of the White's All-Metals detectors, are used in sweep mode as the instrument is passed back and forth in well-defined search lanes. These analog instruments emit an audible signal as the instrument is moved past a metallic item. The UXO Technician stops when an anomaly is encountered, flags, and then excavates the item (a procedure known as "mag & dig").

Due to its effectiveness, simple operation, and availability of hand-held units, magnetometry is a commonly used technology for locating buried UXO. This technology is light and compact and can be used in any traversable terrain, but depending on the size of the item, the detection depth is generally limited to less than 2 feet bgs.

For the Former Camp Wellfleet FUDS, mag & dig methods may be preferable to DGM (described below) for MEC removals, because hand-held sensors could be used to search for anomalies in thick sensitive vegetation, without cutting, by inserting the small sensor between branches; while some vegetation removal would still be needed to clear metallic anomalies, the impact would be somewhat less severe than the vegetation removal requirements for DGM procedures.

Analog tools can be effective because they provide real-time field observations, because anomaly locations can be manually flagged at the time the signal is observed and excavated immediately following the survey, and there are few constraints due to vegetation or topography. However, their use is limited because data quality depends on human factors that cannot be measured (including attentiveness/distraction, hearing ability, operator judgment). Also, the probability of detection, for munitions of concern, has been demonstrated to be between 50 and 72%, and no permanent electronic record is provided (Intergovernmental Data Quality Task Force [IDQTF], 2018). These limitations, coupled with the vegetation cutting restrictions that NPS imposes for some plant communities, may result in data gaps, even potentially leaving munitions behind.

However, based on previous successful implementation at the Former Camp Wellfleet FUDS, effectiveness, and reasonable costs, the analog Schonstedt or All-Metals detectors are technically implementable at the site.

3.2.1.2 Water AOI

For the water AOI, mag & dig methods using analog sensors can be effective in shallow, calm water. However, the shallow water in AOI-6 is in the high-energy surf zone which can be dangerous to work in, and difficult or impossible to dig in (note that human receptors would not likely be digging or using instrumentation in such settings). In deeper water, surface-supplied air or SCUBA equipment would be necessary, restricting movement and visibility. A support staff for each diver would be necessary, making mag & dig methods using analog sensors very inefficient. Use of analog sensors could work for the shallow surf zone, albeit without great efficiency, but are not practical for deeper water applications and are not implementable for the remainder of the large AOI-06.

3.2.2 DGM Instruments

3.2.2.1 Land AOIs

DGM instruments collect geo-referenced sensor data that can be analyzed, processed, and used to identify targets with known coordinates. Because coordinates are known, the target anomalies can be reacquired and excavated at a later date.

Digital magnetometers, such as the Geometrics G-858, work on the same principle as analog magnetometers, detecting anomalies in the earth's magnetic field. The instruments are effective

at detecting MEC items within 4 feet or more into the subsurface depending on the item's size, shape, attitude and ferrous content. These instruments are readily available for rental, can be easily implemented with a moderate relative cost, and were successfully used in previous Camp Wellfleet investigations.

Digital electromagnetic instruments, such as the Geonics EM61, work on the same principle as analog electromagnetic instruments, transmitting electrical current and measuring either the secondary magnetic field induced in metal objects or the difference between the electrical conductivity of the soil and the object. Electromagnetic instruments detect non-ferrous as well as ferrous metallic items, and thus can detect a broader range of munitions items. However, they may also detect more non-munitions debris. These instruments are readily available and can be easily implemented with a moderate relative cost.

Conducting full DGM operations using these types of instruments may involve significant clearing of vegetation in order to obtain adequate geophysical coverage. However, even though NPS imposes cutting restrictions on some sensitive species, DGM is considered technically implementable.

3.2.2.2 Water AOI

For the water AOI, magnetic and electromagnetic sensors capable of functioning under water are available for DGM, such as the EM61S or G-882. Specialized or custom multi-sensor platforms have been successfully demonstrated. These sensors are capable of mapping the sea floor for anomalies possibly representing MEC, if the proper sensor altitude above the bottom surface can be maintained. DGM is technically implementable for the water AOI at the site.

3.2.3 Advanced Geophysical Classification Technology

3.2.3.1 Land AOIs

Advanced geophysical classification (AGC) is a relatively new approach to improve the efficiency of munitions response DGM. AGC sensors may be used dynamically to cover areas of investigation similar to an EM61, however, dynamic mode would provide substantially more information about metallic items left on the site to confirm their characterization, and "cued" surveys allow for collection of a large amount of data over a single location where an anomaly has been detected previously. Through advanced processing, it is possible to determine with high confidence that a subsurface metallic object is or is not likely to be a munition item, thereby greatly reducing the number of excavations necessary, resulting in overall cost savings.

At the Former Camp Wellfleet FUD, some of the limitations on DGM coverage due to NPS-imposed vegetation cutting restrictions will also apply to AGC sensors. However, the smallest AGC sensor (Man Potable Vector) is smaller than the standard EM61 DGM sensor footprint, and therefore, less vegetation cutting is required for AGC applications. While never used at Former Camp Wellfleet, AGC is also considered technically implementable.

3.2.3.2 Water AOI

AGC has not been successfully demonstrated in the water due to the high positional accuracy required that cannot be achieved in water. Submersible AGC sensors have not been developed. AGC water applications are not considered technically implementable.

3.3 Positioning Technology Types

Positioning technology includes process options such as Differential Global Positioning System (DGPS), Robotic Total Station (RTS), and the fiducial method.

3.3.1 Differential GPS

DGPS uses a constellation of satellites to form a worldwide positioning and navigation system. GPS uses these satellites as reference points to calculate positions on the Earth's surface with centimeter accuracy.

For the water AOI, DGPS is ideally suited for navigation, integration with DGM equipment, and target reacquisition, because there are no obstructions above the water surface interfering with the device's communication with satellites. The aquatic sensor position can be calculated relative to the GPS position by a dragging algorithm and with depth and altitude sensors on the detector.

DGPS is considered technically implementable for land and water applications.

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.	**Low:** The Army cannot impose or enforce restrictive covenants on FUDS property.	Low	**Not Retained:** For Land or Water AOIs
	Educational Awareness Program	**Moderate:** Effectiveness of educational awareness program depends upon ability to notify all potential parties and obtain their cooperation.	**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 public cooperation.	Low	**Retained:** For Land and Water AOIs
	Periodic Inspections	**Moderate:** Useful to evaluate performance and maintain integrity of engineering controls, or evaluate site conditions.	**High:** Readily Implemented. Technical staff required to perform inspection and maintenance of LUCs.	Low-Moderate	**Retained:** For Land and Water AOIs
	Warning Signs	**Moderate-High:** Effective in reducing risk associated with potential MEC by limiting access and reducing the potential for receptor exposure to MEC.	**High:** Signage is commonly used. Warning signs are easily implemented (readily available materials). Must be periodically inspected and maintained.	Low-Moderate	**Retained:** For Land and Water AOIs
	Fencing	**Moderate-High:** Can prevent access to areas as an engineering control. Must be maintained to remain effective.	**Moderate:** The Former Camp Wellfleet is currently open to the public; fencing may be acceptable to the NPS personnel and must be periodically inspected and maintained. Installation in some locations may adversely impact sensitive species.	Moderate	**Retained:** For Land AOIs **Not Retained:** For Water AOI
Detection	Analog Sensors	**LAND AOIs** **Moderate-High:** Analog electromagnetic induction devices may be used with analog magnetometers. Mag & dig describes analog detection and intrusive investigation in real-time. May be used under dense canopy where GPS denial is common, is relatively simple in operation, and is low maintenance. **WATER AOI** In calm, shallow waist-high water, analog technology can be as effective as on land. However, the need for supplied air/SCUBA equipment in deeper water greatly increases the time and reduces the effectiveness (ease of movement, visibility, ability to dig, etc.). The shallow surf zone increases hazards, reduces confidence in coverage, and may make digging ineffective.	**LAND AOIs** **High:** Analog instrument reliability is proven in almost all weather conditions. It is easy to operate in various terrains and vegetation. Analog instruments, such as Schonstedts or all-metals detectors, are routinely used by UXO technicians, and therefore, trained operators are readily available. **WATER AOI** Trained technicians who can operate in calm, shallow water are available. However, a rough surf zone would limit implementability in the shallow area where they could potentially operate. Trained UXO dive teams are also available but the use of analog sensors is not implementable in deeper water.	**LAND AOIs** Low-Moderate **WATER AOI** Moderate - High	**LAND AOIs** **Retained** **WATER AOI** **Not Retained**
	Digital Geophysical Mapping	**LAND AOIs** **High:** DGM (magnetometers and EMI) is effective in detecting ferrous and nonferrous metals. Depth range is variable, depending on size and orientation of object, but can reliably detect medium to large MEC up to a depth of 2-4 feet bgs. Non-munitions related metallic debris may interfere with MEC detection; however, data are less impacted by natural geological interferences. The digital data captured by DGM sensors provides a record of the subsurface at the MRS. **WATER AOI** **Moderate to High:** DGM (magnetometers and EMI) is effective in detecting ferrous and nonferrous metals in water. Limitations to effectiveness include the difficulty of keeping the sensor at a low altitude above the bottom without striking it, ensuring coverage, and the difficulty of emplacing QC seeds. The digital data captured by DGM sensors provides a record of the subsurface.	**LAND AOIs** **Low-Moderate:** DGM equipment is readily available and reliable for use in a variety of terrain and weather conditions. Several detectors can be mounted on a single platform to increase production rates of geophysical data gathering. DGM equipment operators, data processors and analysts require specialized training. DGM allows potential MEC items to be more easily detected, which adds an increased level of protection for workers conducting future removal activities within the AOI. While technically implementable, restrictions on vegetation clearance imposed by NPS may be a significant challenge in obtaining full DGM coverage in many areas. **WATER AOI** **Moderate to High:** Aquatic DGM equipment is readily available (EM61S, G-882 magnetometer) and many specialized or custom multi-sensor platforms have been built and implemented. DGM equipment operators, data processors and analysts require specialized training. DGM allows potential MEC items to be mapped without the use of UXO dive teams in shallow to deep water. However, UXO Dive teams would be needed for investigation/removal of mapped anomalies.	**LAND AOIs** Moderate **WATER AOI** High	**LAND AOIs** **Retained:** The vegetation clearance requirements to achieve a high level of effectiveness for a MEC removal, and the consequent adverse impacts to sensitive species, make this option challenging for this site. DGM could be accomplished using the G-858. However, the DGM would likely need to be supplemented with mag & dig for certain sensitive species areas. **WATER AOI** **Retained:** Aquatic DGM is effective and implementable within reasonable depth limitations (typically used at depths less than 150 ft).
	Advanced Geophysical Classification	**LAND AOIs** **High:** Although not more effective at detection than DGM, it is considered more effective overall by allowing classification of anomalies as either MEC or non-MEC items, thereby reducing	**LAND AOIs** **Moderate:** AGC systems are currently available for use, including the Geometrics MetalMapper 2x2 and Man Portable Vector (MPV). Both require highly trained personnel for data processing and longer field durations than	**LAND AOIs** Moderate	**LAND AOIs** **Retained:** The vegetation clearance may make this option challenging. AGC may need to be supplemented with mag & dig for

Technology Type	Process Option	Effectiveness	Implementability	Cost	Viability-Status
		the number of anomalies to be intrusively investigated. Detects both ferrous and nonferrous metallic objects. **WATER AOI** Not successfully demonstrated in water applications.	conventional DGM efforts due to slower production rates. Can be used in most traversable terrain, but some of the limitations on DGM coverage due to NPS-imposed vegetation cutting restrictions will also apply to AGC sensors. However, the MPV AGC sensor is smaller than the standard EM61 DGM sensor footprint, and therefore, less vegetation cutting is required for AGC applications. **WATER AOI** Not successfully demonstrated in water applications.	**WATER AOI** NA	certain sensitive species areas. However, it can be effective and implementable for several site areas. **WATER AOI** **Not Retained:** Not successfully demonstrated in water applications.
Positioning	Differential Global Positioning System (DGPS)	**LAND AOIs** **High**: Very effective in open areas for digital mapping and reacquiring anomalies. Achieves accuracy to a few centimeters, but is dependent on available satellites. **WATER AOI** **High**: Very effective for digital mapping and reacquiring anomalies. Achieves accuracy to a few centimeters, and open site conditions in the water make it highly effective.	**LAND AOIs** **High**: Easy to operate and available from various vendors. Highly dependent on site conditions and field time can consequently be lost when insufficient satellites where tree canopy present. **WATER AOI** **High:** Easy to operate and available from various vendors. Open site conditions in the water make DGPS highly implementable.	**LAND AOIs** Moderate **WATER AOI** Moderate	**LAND AOIs** **Retained:** Has been used effectively at many similar sites. **WATER AOI** **Retained:** Has been used effectively at many similar sites
	Robotic Total Station	**LAND AOIs** **High**: Effective in open areas for digital mapping and reacquiring anomalies. Effective around buildings and sparse trees. Achieves accuracy to a few centimeters. **WATER AOI** **Low-Moderate**: Effective when rover prism is within a few thousand feet of robotic base station, which must be set up on land. Under specific site conditions, can be as effective as DGPS, but position error increases with distance between robot and prism.	**LAND AOIs** **Moderate**: Easy to operate with trained personnel, but requires existing survey control and must maintain constant line of sight between total station and roving prism. Potential impacts to natural resources based on clearing of areas for highest quality data collection. It is generally more time-consuming than use of DGPS, all other conditions being equal. **WATER AOI** **Low-Moderate**: Many control points along the shoreline would be required to properly set up the robotic base station, and it may have to be moved several times to complete a DGM survey. Radio communication between the robotic base operator and rover are required, which further limits implementability.	**LAND AOIs** Moderate **WATER AOI** Moderate	**LAND AOIs** **Retained:** While this technology has been used effectively at many sites for DGM: it would be relatively easy to employ in some locations and difficult in others. **WATER AOI** **Not Retained:** While robotic total station is somewhat effective and implementable in water, DGPS is far more advantageous.
	Fiducial Method	**LAND AOIs** **Low-Moderate**: Moderate effectiveness when performed by experienced personnel, and low effectiveness when used by inexperienced personnel. **WATER AOI** Impracticable in water application.	**LAND AOIs** **Low-Moderate**: Requires constant pace and detailed field notes. Can be used anywhere, with varying degrees of complexity in the operational setup. Requires additional backend data processing. **WATER AOI** Impracticable in water application.	**LAND AOIs** Moderate **WATER AOI** NA	**LAND AOIs** **Retained** **WATER AOI** **Not Retained:** Impracticable in water application.
Removal	Manual (Hand) Excavation	**LAND AOIs** **High:** Very effective for removing surface and subsurface items. Control of hand digging reduces risk associated with workers excavating potential MEC. **WATER AOI** **Moderate**: Effective for removing bottom surface and shallow subsurface items. Control of hand digging reduces risk. Excavation in water stirs sediment and limits visibility, requiring the diver to identify the object by bringing it to the water surface for examination.	**LAND AOIs** **High:** Manual excavation of anomalies is the most widely used method for removal of MEC. UXO-qualified technicians use small hand tools to remove soil/sediment overburden. Intrusive activity risk to workers is mitigated through the use of highly skilled UXO-qualified technicians controlling the excavation. **WATER AOI** **Moderate:** Trained UXO dive teams are available. Divers use gloved hands or hand tools to perform excavations. Target reacquisition, performed with a DGPS at the surface and a descent line for the diver, becomes less precise with water depth, necessitating a larger search radius at the bottom by the diver to ensure the target is investigated.	**LAND AOIs** Moderate **WATER AOI** High	**LAND AOIs** **Retained:** Successfully used at many sites. Relatively sandy soils allow for easier hand digging. **WATER AOI** **Retained:** Successfully used at many shallow water conditions; effective and implementable within reasonable depth limitations.
	Mechanical Excavation using Powered Equipment	**LAND AOIs** **High:** Very effective for removing surface and subsurface items. Reduces risk associated with site workers. Most effective for deeper items where hand digging could be	**LAND AOIs** **Low:** Powered equipment to excavate anomalies results in less direct MEC exposure for workers than hand digging. UXO-qualified technicians typically use an armored excavator to remove soil. At the Former Camp Wellfleet,	**LAND AOIs** High	**LAND AOIs** **Retained:** While it can be destructive to sensitive species and NPS does not support powered equipment usage if other options

Technology Type	Process Option	Effectiveness	Implementability	Cost	Viability-Status
		problematic, such as a potential DMM pit. **WATER AOI** **Moderate:** Vacuum devices for removing sediment ("airlifts"), which are handled by UXO divers at the bottom surface, can surpass the depth limit reached by manual excavation alone.	where the potential for DMM pits exists, an excavator would be more implementable than manual excavation. **WATER AOI** **Moderate:** Vacuum devices for removing sediment increase the amount of equipment that must be transported to each target of investigation, and are commonly implemented by UXO dive teams.	 **WATER AOI** High	exist, excavators were used in limited situations previously. **WATER AOI** **Retained:** Successfully used at many MMRP sites, within reasonable depth limitations.
	Excavation and Sifting	**LAND AOIs** **Moderate:** Provides a high degree of confidence that MEC is effectively removed and increases efficiency in areas of highly concentrated anomalies potentially representing MEC. Not as suitable for areas where primarily single point anomalies are anticipated. **WATER AOI** **Moderate:** Dredging and sifting of sediment provides confidence that MEC is removed and increases efficiency in areas of highly concentrated anomalies. Not as suitable for areas where primarily single point anomalies are anticipated, or deeper water.	**LAND AOIs** **Low:** Requires shielded/armored equipment, and heavy equipment operators. Would require significant vegetation clearing that would adversely impact sensitive species. **WATER AOI** **Low:** Requires a dredging boat equipped with a screen to filter UXO out of the sediment, which may be immediately returned to the sea floor. Low implementability in deeper water.	**LAND AOIs** High **WATER AOI** High	**LAND AOIs** **Not Retained:** Unnecessarily destructive to sensitive species and not necessary for single point anomalies anticipated. **WATER AOI** **Not Retained:** No indication of MEC conditions that warrant sifting of ocean sediments. Unnecessarily destructive to the marine habitat.
Disposal (destruction of items)	Blow-in-Place	**LAND AOIs** **High:** Effective method for conducting MEC disposal operations of items considered not safe to move. **WATER AOI** **High:** Underwater BIP is effective for conducting MEC disposal operations as on land. Water acts to mitigate the intentional detonation minimum separation distance.	**LAND AOIs** **High:** Commonly implemented by UXO-qualified technicians on MMRP sites. Sandbags or water mitigation may be used to reduce the intentional detonation minimum separation distance. **WATER AOI** **High**: Commonly implemented by UXO dive teams on MMRP sites, although underwater safety protocols are extremely rigorous.	**LAND AOIs** Low **WATER AOI** High	**LAND AOIs** **Retained:** Previously used successfully during EE/CA activities and for disposal of UXO discovered on the beach. **WATER AOI** **Retained:** Has been used successfully under similar conditions.
	Consolidated Shot	**LAND AOIs** **High:** Effective method for conducting MEC disposal operations. Acceptable to move MEC items are consolidated at a collection point within the AOI where controlled detonation renders items safe. **WATER AOI** **High:** Same process above, following water removal.	**LAND AOIs** **High:** Commonly implemented by UXO-qualified technicians on MMRP sites. Sandbags or water mitigation may be used to reduce the intentional detonation minimum separation distance. **WATER AOI** **High:** Same process as above, following water removal.	**LAND AOIs** Low **WATER AOI** Low	**LAND AOIs** **Retained:** Has been used successfully at multiple MMRP sites. **WATER AOI** **Retained:** Has been used successfully at multiple MMRP sites.

AGC	advanced geophysical classification	DGPS	differential global positioning system	LUC	land use controls	NA	not applicable
AOI	area of interest	EMI	electromagnetic induction	MEC	munitions and explosives of concern	NPS	National Park Service
BIP	blow in place	FUDS	formerly used defense site	MMRP	Military Munitions Response Program	QC	quality control
DGM	digital geophysical mapping	GPS	global positioning system	MPV	man-portable vector	UXO	unexploded ordnance

3.3.2 Robotic Total Station

RTS is a survey station consists of a robotic precision laser rangefinder and a roving prism. The robot records the distance and angle between itself and the prism. It can be used for conventional surveying or it can be integrated with geophysical instruments for navigation.

For the water AOI, this method has limited implementability near the shoreline. DGPS is much more implementable.

3.3.3 Fiducial Method

The fiducial positioning method consists of digitally marking a data string with a known position indicator. That is, markers are placed on the ground at known positions (e.g., 25 feet) as a means of establishing position. This was the primary navigation method used during the previous Former Camp Wellfleet investigations.

For the water AOI, this method is impracticable.

3.4 Removal Technology Types

MEC removal technologies include the process options of manual excavation (typically using hand shovels), mechanized excavation using powered equipment, and area-wide excavation and sifting. MEC removal can be performed in a targeted fashion, where individual items are detected, identified, and removed one at a time.

The use of heavy equipment is required for both mechanical excavation and area-wide excavation and sifting, often resulting in considerable disturbance to plant communities; this may be a significant disadvantage where NPS imposes restrictions on vegetation removal activities. For certain AOIs, where the potential for DMM pits exists, mechanized excavation would be more implementable than manual excavation. NPS has indicated a lack of support for powered equipment usage if other options exist, but, excavators were used in limited situations previously.

Hand excavation was conducted extensively during the EE/CA and other previous investigation or removal efforts at the Former Camp Wellfleet FUDS. Hand excavation is considered the industry standard for MEC recovery and can be done very thoroughly and for a low cost relative to other excavation options that require heavy equipment. However, some heavy equipment (excavator) usage was permitted during the previous removal activities.

Therefore, both manual excavation and mechanized excavation process options are considered technically implementable at the site.

For the water AOI, hand excavation of marine anomalies is implementable by trained UXO diver teams. Divers may use gloved hands or hand tools suitable for under water. Due to the tendency of underwater excavations to collapse, powered vacuum technology (“airlift”) can be used to remove sediment. Therefore hand excavation and mechanized removal methods are implementable within reasonable depth limitations.

3.5 Disposal Technology Types

Disposal technology includes the process options of in-situ demolition, also known as “blow-in-place” (BIP), and consolidation of items with subsequent on-site demolition. These options render the material safe through destruction, and are equally effective at removing MEC, but differ in their implementability and cost.

BIP demolition is effective, implementable, and relatively low cost. At the Former Camp Wellfleet FUDS, almost all disposal during the previous investigations has been accomplished through in-situ demolition (i.e., BIP).

Consolidated on-site demolition is controlled detonation of a number of MEC items that are safe to move to a single disposal site where they are destroyed. This approach reduces the number of detonations and therefore limits impacts to the environment. It also allows for detonations to occur in areas where conditions are favorable for site control, evacuation, access, and fire control.

For the water AOI, underwater BIP is practical, and the water itself acts to mitigate the intentional detonation minimum separation distance. If deemed safe to move, MEC items may be moved onshore for consolidated on-site demolition as described above.

Each of these disposal process options is considered technically implementable at the site.

3.6 Summary of Explosive Risks Technologies and Process Options

For the process options considered technically implementable at the site, Table 3.1 provides the screen against effectiveness, implementability, and cost. The analysis is organized by land and water AOIs.

3.6.1 LUCs

Following the screen, all LUC process options with the exception of legal mechanisms and fencing for the water AOI, were retained for the Section 4.0 alternatives development.

3.6.2 Detection

3.6.2.1 Land AOIs

Analog techniques have been used successfully to detect anomalies at the Former Camp Wellfleet FUDS (see limitations described in Section 3.2.1.1); the analog detector process option was retained for the alternatives development.

DGM techniques employing the G-858 have been used successfully to detect anomalies at the Former Camp Wellfleet FUDS. The DGM coverage required for a MEC removal may require significant vegetation clearance, and NPS imposes cutting limitations for certain sensitive species. Relative to avoiding impact to dense sensitive vegetation, the EM61 instrument footprint is a substantial 0.5 square meters, and using such an instrument necessitates significant clearing of vegetation in order to obtain adequate geophysical coverage required for a removal action. The G-858 could be used, but at the same relative instrument footprint as the smallest AGC instrument (MPV), it would make more technical sense to use the AGC process option. Therefore, while the G-858 DGM process option was retained, it would not be more technically viable than AGC for the alternatives development.

Some of the limitations on DGM coverage due to vegetation cutting restrictions will also apply to AGC sensors. However, the smallest AGC sensor (MPV) is smaller than the standard EM61 DGM sensor footprint, and therefore, less vegetation cutting is required for AGC applications (future developments may produce smaller footprint AGC sensors). While the additional work involved in identifying an anomaly, as opposed to just digging it in soft sand, may not be justified from a cost-benefit perspective, the AGC process option can be effective and implementable for specific areas of the site, and it has been retained for the alternatives development.

Based on field efforts conducted at similar sites where vegetation cutting restrictions were imposed, it is likely that AGC surveys would require supplemental mag & dig removals for sensitive plant communities. Therefore, a combination of the analog and AGC detector process options may be required to achieve the RAOs for the Former Camp Wellfleet FUDS.

3.6.2.2 Water AOI

For the water AOI, underwater mag & dig with analog sensors is not practical due to the low coverage rate of a diver moving across the sea floor over a large area. Therefore, analog sensors were not retained for the alternatives development.

DGM (magnetic or electromagnetic sensors towed behind a boat and integrated with DGPS) can be used to map the sea floor for anomalies possibly representing MEC, and it was retained for alternatives development.

AGC has not been successfully demonstrated in the water due to the high positional accuracy required on land that cannot be achieved in water; it was not retained for alternatives development.

3.6.3 Positioning

While the fiducial process option was primarily used most during the previous efforts, all land AOI positioning options were retained for the alternatives development.

For the water AOI, DGPS is suited to operations at the water surface due to lack of tree canopy. RTS has some limited practicality near the shoreline but has no advantage over DGPS. Fiducial methods are not practical in the water at this site. DGPS was retained for alternatives development.

3.6.4 Removal

With regard to removal process options, a distinction can be made for MEC removal down to 3 feet bgs and removal to depths greater than 3 feet. On land, recreational park users who may participate in activities such as clam digging or treasure hunting, are unlikely to reach depths greater than 3 feet in unstable sandy conditions without powered equipment; thus, 3 feet bgs is a practical maximum for such incidental intrusive activities at the site. Authorized park workers (utility or construction contractors), who may need to achieve greater depths, could only do so by use of powered equipment. Intrusive activities conducted by authorized park workers that extend to beyond 3 feet bgs could be addressed with an LUC. While the Army cannot impose restrictive covenants on FUDS property, the Army can work with the NPS to ensure notifications (e.g., no intrusive work greater than 3 feet bgs without adequate safety measures, or notifications of the intent to safely conduct such activities) are implemented and maintained.

Based on the target depth component, effectiveness, and low cost, manual excavation is determined to be the most viable technology removal process option and it has been retained for alternatives development. However, for certain AOIs, where the potential for DMM pits exists, mechanized excavation would be more implementable than manual excavation. NPS has indicated a lack of support for powered equipment usage if other options exist but, excavators were used in limited situations previously. The more complex requirements for full sifting operations, is not considered viable based on NPS restrictions regarding disturbance to plant communities, and sifting was not retained as an option.

For the water AOI, removal by hand excavation, optionally supplemented with powered vacuum equipment, was retained. Dredging and sifting such a large area is not practical and is unnecessarily destructive to the marine environment.

3.6.5 Disposal

BIP and consolidated shot disposal process options were retained for alternatives development, for both the land AOIs and the water AOI.

4.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

4.1 Introduction

At this stage of the FS, 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.

The 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 unlimited use and unrestricted exposure (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 explosive risks to varying degrees, and comply with the DERP Manual requirements. The broad criteria against which they are screened are defined as follows:

4.1.1 Effectiveness

This criterion is evaluated with respect to effectiveness in protecting human health and the environment, and providing reduction of MEC volume. 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 Former Camp Wellfleet FUDS, are sufficient to help evaluate one alternative against another.

4.2 Identification of Remedial Alternatives

4.2.1 Explosive Risks Remedial Alternatives

Based on the explosive risks mitigation technologies review in Section 3.0, four remedial alternatives have been identified to mitigate the explosive risks due to MEC that may remain within the Former Camp Wellfleet FUDS:

- Alternative 1: No Action
- Alternative 2: LUCs
- Alternative 3: Partial MEC Removal with LUCs
- Alternative 4: MEC Removal to UU/UE

4.3 Screening of Explosive Risk Remedial Alternatives

The following sections provide a brief description of each alternative to mitigate the explosive risks due to MEC that may remain within the Former Camp Wellfleet FUDS.

4.3.1 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 explosive risks contaminants are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. This alternative would leave any MEC items potentially present, in place, without further investigation or removal. This alternative does not provide for additional investigation for or removal of MEC items, and does not provide for any active or passive land use controls to reduce the potential for exposure (e.g., physical barriers, deed restrictions).

Effectiveness: The no action alternative would not provide for protection of human health and the environment. The explosive risks associated with MEC would not be expected to decrease significantly over time without removal. 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 volume of MEC, and it 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 Alternative 2: Land Use Controls

LUCs, administrative and physical, can include signage, fencing, environmental covenants, and/or education to limit access to the AOI. As developed for the Former Camp Wellfleet FUDS, Alternative 2 may include the use of signage installed in appropriate locations to limit access by providing awareness of potential hazards, education (training, pamphlets, flyers) concerning the hazards suspected to be present within the AOI, and periodic visual inspections to evaluate changing site conditions.

These ICs (non-engineered LUCs) are designed for both land and water AOIs to limit land or resource use by providing information that helps modify or guide human behavior at the site.

The EE/CA Action Memorandum, signed in April 2001, included LUCs that are still in effect, with potential MEC exposure limited by 1) training NPS personnel in MEC safety; 2) NPS monitoring for MEC; and 3) any MEC found onsite being removed according to the explosive ordnance detail procedure in place. Alternative 2 would reinforce the current efforts.

A key element of this alternative is the requirement to ensure the safe conduct of any intrusive activity conducted by authorized park utility, maintenance, or construction workers. While the Army cannot impose restrictive covenants on FUDS property, the Army can work with the NPS

to ensure notifications (e.g., no intrusive work greater than 3 feet bgs without adequate safety measures, or notifications of the intent to safely conduct such activities) are implemented and maintained.

For the water AOI, LUCs may include the use of signage installed in appropriate locations to limit access by providing awareness of potential hazards and education (training, pamphlets, flyers) concerning the hazards suspected to be present within the AOI. However, the signage would be installed on land, and as a practical matter, may overlap with any signage requirements for the land AOIs.

For this alternative, USACE would develop an LUC Implementation Plan (LUCIP), which would include a delineation of enforcement and maintenance responsibilities, in coordination with NPS.

Effectiveness: The LUCs alternative would provide protection of human health and the environment by modifying human behavior and limiting the potential for an encounter with MEC that may be present. However, this alternative does not reduce the volume of MEC, and it does not allow for UU/UE. This alternative can be effective in the short-term and the long-term with the cooperation of the owner (NPS) and the proper protection of workers involved in the implementation (e.g., installing signage). Instituting LUCs requires cooperation and coordination between the federal government, state environmental regulators, and the property owners. In order 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 designing and installing signage to limit access to the AOI. Educational materials can be developed and notifications of intrusive work can be enforced. Periodic inspections can be planned and implemented. The materials and services required to implement this alternative are available. 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 design signage, educational materials, and develop notification requirements for all intrusive activities.

Cost: The costs for this alternative would not be prohibitive (approximately $500,000-$700,000). LUCs would include a LUCIP, installation and operation & maintenance (O&M) of signage costs (installation of signs, but not fencing, is assumed for Alternative 2 costing purposes), and administrative costs for development of educational and notification requirements. O&M costs are included for USEPA's suggested maximum 30 year period as it cannot be determined how long O&M will be required.

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

4.3.3 Alternative 3: Partial MEC Removal with LUCs

For the land AOIs, Alternative 3 entails conducting a partial MEC removal down to 3 feet bgs, with subsequent MEC destruction, and implementing an educational and notification requirements LUC should there be a need to go deeper than that for maintenance or construction type activities.

As discussed in Section 3.6.4, recreational park users who may participate in incidental intrusive activities such as clam digging or treasure hunting (illegal in NPS parks) are unlikely to reach depths greater than 3 feet in sandy conditions without powered equipment; 3 feet bgs is therefore

a practical maximum depth for such activities at the site (the depth for potential exposure of receptors). Further, 3 feet bgs is a conservative depth that accounts for the potential for shifting terrain and sand deposition in a coastal environment (i.e., a MEC item that was originally shallower may now be deeper due to deposition caused by a storm event). Therefore, a MEC removal depth to 3 feet bgs with educational and notification requirements to safely conduct intrusive activities at greater depths, will achieve the RAO.

The detection and removal methodology would be based on the site conditions of the specific removal areas. The occurrence of sensitive plant species may dictate whether mag & dig or AGC methods, or manual or mechanized excavation, is more appropriate.

For this alternative, MEC removal would not include areas within an AOI that are paved (e.g., the parking lot of AOI-05) and therefore have no interaction between possible MEC items and a receptor. LUCs will further manage any remaining explosive risks for MEC deeper than 3 feet bgs or beneath paved surfaces, through continuing educational awareness, advisories regarding intrusive activities, safety presentations, and community outreach. The requirement to ensure the safe conduct of any intrusive activity conducted by authorized park utility, maintenance, or construction workers would apply should there be a need for intrusive work in these areas, such as for maintenance or construction type activities. While the Army cannot impose restrictive covenants on a FUDS property, the Army can work with the NPS to ensure notifications (e.g., no intrusive work greater than 3 feet bgs, or beneath paved surfaces, without adequate safety measures, or notifications of the intent to safely conduct such activities) are implemented and maintained.

For the water AOI, the partial removal would include items on the sea floor and approximately 2 feet beneath it, and the footprint would extend to the 120 ft recreational diver depth limit, almost 3 miles out from the shoreline. The detection and removal methodology for the water AOI would be based on the specific sea floor depth of the removal area, as discussed in Section 3.0.

Figures 4, 5, and 6 show the partial removal footprint for AOIs 02, 05, and 06, respectively (these are described in more detail in Section 5).

Effectiveness: Alternative 3 would be protective of human health and the environment. It is effective in the long-term as MEC will be removed from the zone of likely exposure to receptors, and destroyed, reducing the volume of contaminants (MEC), and eliminating any residual explosive risks to 3 feet bgs. However, this alternative does not allow for UU/UE.

During implementation, while health and safety precautions would be required to protect workers and park visitors from accidental detonation of MEC items, elaborate excavation and shoring procedures necessary for deeper depths would not be required under this alternative.

Short term effectiveness for the land AOIs is moderate based on achieving the RAOs in a relatively short period. Short term effectiveness is low to moderate for the water AOI based on the difficulty of working in the open ocean environment and the relatively long duration of conducting this work in such conditions.

Implementability: This alternative is technically and administratively feasible. For the land AOIs, the depth requirement allows for manual excavation, resulting in less vegetation cutting. Educational and notification requirements for deeper intrusive work can be enforced. The materials and services required to implement this alternative are available. The ability to obtain coordination from NPS, regulators, and the community, is likely to be achieved since the impact to sensitive plant communities is minimized.

While more challenging, a partial removal in the specified portion of the water AOI is technically and administratively implementable using specially trained UXO dive teams.

Cost: The cost to implement this alternative is moderate to high for the land AOIs (approximately $1.5M - $2M). Costs include mag & dig or AGC teams and specially trained UXO Technicians to safely conduct the MEC removal and destruction.

Implementing this alternative for the water AOI represents a significant cost (approximately $150M - $200M). Costs include multiple DGM teams, water craft, and specially trained UXO dive teams to safely conduct the MEC removal and destruction. A LUCIP and 30 years of O&M to manage the remaining explosive risks would also be required. O&M costs are included for USEPA's suggested maximum 30 year period as it cannot be determined how long O&M will be required.

Outcome: For the land AOIs, Alternative 3 meets key elements of the effectiveness and implementability criteria and was retained for the detailed comparative analysis in the next section. Alternative 3 can also be effective and implementable for the water AOI, and while it presents cost challenges, it has also been retained for the detailed comparative analysis.

4.3.4 Alternative 4: MEC 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 and subsequent destruction of MEC such that LUCs would not be required.

While munition items at the Former Camp Wellfleet FUDS were mostly encountered at shallower depths, for the land AOIs, achievement of the UU/UE standard under Alternative 4 will require excavations to 5 feet bgs in AOI-02, and 4 feet bgs in AOI-05. This is based on the maximum depths of MEC or MD finds in each area.

However, park maintenance or construction contractors work may require depths greater than 5 feet bgs. Therefore a conservative UU/UE depth of 6 feet bgs is proposed to account for utility or construction work. Areas of unstable sandy soil conditions may make the level of excavation necessary for MEC removal to UU/UE conditions problematic, and therefore the use of heavy excavation equipment and safety shoring, and potentially elaborate soil-sifting methods, may be required. While manual excavation of shallower soils can minimize environmental impacts, a full removal to UU/UE that includes all AOI acreage to a depth of 6 feet bgs would require heavy equipment and the potential for significant environmental impacts. Further, areas beneath paved surfaces, such as the large AOI-05 parking lot, would also need to be included in the removal action to address the possibility of future utility or maintenance work beneath the lot.

For the water AOI, the deepest possible interaction of receptor and source would be a deep sea fishing net, which may be deployed to depths exceeding 500 feet. Therefore, UU/UE would involve a sea floor MEC removal of the entire 167,856 acre AOI.

Effectiveness: For the land AOIs, this alternative would be protective of human health and the environment. It is effective in the long-term as MEC will be removed and destroyed, reducing the volume of contaminants (MEC), eliminating any residual explosive risks to 6 feet bgs, and allowing for UU/UE. However, this alternative does not provide short-term effectiveness as it would take considerable time to implement. During implementation, health and safety precautions would be required to protect workers and park visitors from accidental detonation of MEC items.

Additionally, significant safety precautions would be associated with the deeper excavations that may require elaborate shoring methods for worker safety.

For the water AOI, while this alternative would ultimately be protective of human health and the environment, it is not effective in the short term considering the length of time required to complete an ocean removal across 167,856 acres.

Implementability: For the land AOIs, this alternative is not considered technically and administratively feasible. Technical feasibility is adversely impacted by the need to achieve removal depths that can only be accomplished using mechanized equipment and elaborate shoring of unstable subsurface soils, potentially significantly impacting the environment. Administrative feasibility is adversely impacted by the need to obtain approval from NPS to block off significant portions of the park to protect visitors and NPS personnel.

For the water AOI, a MEC removal to UU/UE is not implementable considering the size of the AOI, the ocean depths required for clearance, and diver depth working limitations (i.e., depths of greater than 500 feet cannot realistically be worked by divers).

Cost: The cost to implement this alternative is significant for the land AOIs (> $10M). Costs include multiple geophysical survey team field activities, and specially trained UXO Technicians to safely conduct the MEC removal and destruction. Potentially elaborate excavation operations, including shoring of the deeper unstable subsurface, would need to be planned, designed, and safely implemented.

For the water AOI, this alternative is cost prohibitive (> $200M), requiring multiple dive teams, water craft, and an extremely long duration to complete a removal over such a large area of the open ocean.

Outcome: For the land AOIs, Alternative 4 is not effective in the short term, is not technically or administratively feasible, and is excessively costly. Therefore, Alternative 4 was not retained for the detailed comparative analysis in the next section.

For the water AOI, the UU/UE alternative is not effective in the short term, is not implementable, and is cost prohibitive; it was not retained for the detailed comparative analysis.

4.4 Institutional Analysis

An Institutional Analysis (IA) has been provided as Appendix D. The objectives of the IA are to illustrate the opportunities that exist to implement a LUCs program at the Former Camp Wellfleet; identify 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 site.

5.0 DETAILED ANALYSIS OF ALTERNATIVES

5.1 Introduction

In Section 4.0 the four remedial alternatives were screened against the three broad criteria of effectiveness, implementability, and cost. Alternatives 1, 2, and 3, passed the broad criteria screening and were retained for further detailed evaluation. Alternative 4 (MEC Removal to UU/UE) did not pass the broad criteria screening and was not retained for further evaluation for any of the AOIs.

In this section, the remaining remedial alternatives (1, 2, and 3) 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 sufficient information to adequately select the appropriate remedy for the site, and demonstrate satisfaction of the CERCLA remedy selection requirements.

Section 5.2 analyzes all AOI-02 alternatives against the nine criteria defined below, while Section 5.3 compares the AOI-02 alternatives against each other to determine overall strengths and weaknesses as a means to ultimately select a preferred alternative. Sections 5.4 and 5.5 do the same for AOI-05, and Sections 5.6 and 5.7 do the same for AOI-06.

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.

For MMRP sites, protection of human health is a function of whether site conditions are acceptable or unacceptable with regard to explosive risks that may remain at the AOI. According to the RMM, "Unacceptable Explosive Risk" is defined as the presence of munitions having a specific explosive nature, as well as the accessibility supported by the specific land use, such that the likelihood of encounter, sensitivity of the munitions items, and severity of a potential incident, are collectively unacceptable.

Section 1.5.2 describes how the RMM tool uses four matrices to make this determination and Table 1.1 summarizes all baseline (pre-remedial alternative) explosive risk determinations (as presented in the RI Report). For assessment of the protection of human health threshold criterion, the RMM tool is completed after application of each remedial alternative retained in Section 4.0. This post-remedy determination indicates whether the alternative will result in acceptable (protective) or unacceptable (not protective) conditions for this criterion.

Appendix B presents the post-remedy RMM matrices for each AOI, showing whether a given remedial alternative results in acceptable or unacceptable site conditions.

5.1.1.2 Compliance with ARARs

This threshold criterion is used to determine whether each alternative will meet all of 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 and action-specific ARARs. For the Former Camp Wellfleet FUDS, no chemical-specific ARARs were identified.

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.

In accordance with Army guidance (2009), toxicity and mobility are not specifically relevant to MEC; therefore, the reduction of volume through the removal of MEC is the primary factor for MEC. Accordingly, the evaluation for this criterion only assesses the reduction of MEC volume.

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 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 comment on the FS report and on the Proposed Plan and will be addressed once a final 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 Massachusetts Department of Environmental Protection (MassDEP). This criterion will be fully addressed in the Decision Document once comments on the FS and Proposed Plan have been processed during the public comment period.

5.1.3.2 Community Acceptance

This criterion evaluates the issues and concerns the public may have for each of the alternatives. Similar to state acceptance, this criterion will be fully addressed in the Decision Document once comments on the FS and Proposed Plan have been processed during the public comment period.

5.2 Individual Analysis – AOI-02 Remedial Alternatives

AOI-02 is the Former Artillery Firing Line, a 275 acre area comprising firing points for 90 mm and other anti-aircraft artillery. A 76mm anti-aircraft artillery item determined to be MEC, and 50 caliber ammunition, fuze cans, shipping clips for 90mm fuzes, 30 caliber ammunition cans, and unknown MD scrap have been found there. Remnants of packaging material were present on the 76mm MEC item, indicating it had not been fired, and thus it was classified as DMM. The original EE/CA footprint for AOI-02 included only the beach, bluff, and a narrow area west of the bluff where the artillery firing points were located. However, it was developed into AOI-02 for the RI by expanding westward to include elements of previous investigations, such as EE/CA investigated grids, aerial features, removal action grids, and many SPAs.

This AOI is primarily uplands, but extends to the shoreline below the high bluff. It is a moderate to high traffic beach access area. It contains unpaved and paved trails and paved roads. While most of the northern part of AOI-02 contains moderate to high volume pedestrian and vehicle traffic associated with beach access, the central and southern portions contain a low volume of traffic because there are few trails and a high density of natural vegetation that limits pedestrian access. However, the southern beach areas are essentially open access through adjacent AOI-05. While the NPS owns most of the AOI-02 acreage, the Town of Wellfleet owns and manages approximately 49.2 acres of Camp Wellfleet, a small portion of which extends into AOI-02. See Figure 4.

This section individually evaluates the remaining three explosive risks remedial alternatives for AOI-02 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 AOI-02 explosive risks remedial alternatives.

5.2.1 Alternative 1: No Action

5.2.1.1 Threshold Criteria

For AOI-02, under Alternative 1, no remedial action would be taken, and any explosive risks contaminants are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. This alternative would leave any MEC items potentially present, in place, without further investigation or removal and explosive risks are not mitigated. As shown in Appendix B, the post-remedy RMM indicates that taking no action does not change the baseline conditions. Therefore, Alternative 1 does not result in acceptable conditions and is not protective of public health and the environment for AOI-02.

Alternative 1 was reviewed with respect to compliance with ARARs (Table 2.1 indicates ARARs associated with this alternative). Location-specific ARARs are related to the operation of the area as a national park and protection of 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.

However, because Alternative 1 is not protective of public health and the environment, it is not favorable for the threshold criteria.

5.2.1.2 Balancing Criteria

For AOI-02, Alternative 1 is not favorable for the long-term effectiveness criterion because it would leave any MEC items potentially present, in place, and explosive risks are not mitigated. Alternative 1 is not favorable in reducing the volume of contaminants (MEC) at the site because it would leave any MEC items 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, MEC 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

5.2.2.1 Threshold Criteria

For AOI-02, Alternative 2 may include the use of signage installed in appropriate locations to limit access by providing awareness of potential hazards, education (training, pamphlets, flyers) concerning the hazards suspected to be present within the AOI, and periodic visual inspections to evaluate changing site conditions. It would also include notifications for any future intrusive

activities, which would need to be conducted by UXO trained technicians to ensure safety of personnel or resources from explosive risks.

As shown in Appendix B, the post-remedy RMM indicates that educational awareness designed to help modify human behavior at the site would lessen the frequency of use of the area and the likelihood of encountering and imparting energy to a potential MEC item, and acceptable conditions are achieved. This is based on the expectation of limited or rare occurrences of pedestrians ignoring signage to interact with potential MEC items. Therefore, Alternative 2 is protective of public health and the environment based on using LUCs to limit access to the AOI-02 areas.

Alternative 2 was reviewed with respect to compliance with ARARs (Table 2.1 indicates ARARs associated with this alternative). Location-specific ARARs are related to the operation of the area as a national park and protection of wildlife species and wetlands habitat. While there are federal and/or state listed threatened or endangered species and NHESP priority habitats within the AOI-02 area, the potentially disruptive activity of this alternative (limited to installation of signage) would be implemented to comply with these ARARs through coordination with NPS and the Town of Wellfleet to minimize any disturbance to these species, should they be encountered. None of the wetlands are within the AOI-02 boundary. Therefore, under this alternative, all location-specific ARARs will be complied with, in coordination with NPS and the Town of Wellfleet. Because no MEC removals or construction of physical LUCs will be implemented under Alternative 2, action-specific ARARs related to soil removal, water quality, or air quality are not triggered. Therefore, Alternative 2 complies with ARARs.

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 AOI-02, Alternative 2 is moderately favorable in providing long-term effectiveness by informing the public of the explosive risks within the area, minimizing human exposure. But it would leave any MEC items in place, and while the access of receptors to explosive risks is reduced, it is not eliminated.

Alternative 2 is not favorable in reducing the volume of MEC at the site because it would leave any MEC items 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 installation of signs, and the community, workers, and the environment can easily be protected during implementation. 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 install signage, produce educational materials, and provide notifications of intrusive work. The materials and services to implement this alternative are readily available. The administrative feasibility was also assessed as favorable as the EE/CA based ICs have been in effect for years.

The cost to implement Alternative 2 is relatively low. For AOI-02, LUCs would include a LUCIP, installation and maintenance of four warning signs strategically located around AOI-02, production/distribution of educational materials concerning the hazards (pamphlets, flyers, etc.), administrative costs for development of educational and notification requirements, and costs for

periodic inspections (assumed to be once per year). The cost for CERCLA 5-year reviews would also be included. The estimated cost for Alternative 2 is approximately $153,500 in capital costs plus $476,300 for 30-years of O&M for a total of $629,800. Cost summary worksheets (RACER Version 11.5) are included in Appendix C.

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.

5.2.3 Alternative 3: Partial MEC Removal with LUCs

Under Alternative 3, a partial removal to 3 feet bgs (the depth for potential exposure of receptors), as described in Section 4.3.3, would be supplemented with LUCs. An educational and notification LUC would address the remaining acreage outside the defined partial removal area. Figure 4 indicates the footprint for a partial MEC removal in AOI-02. The intention is to address the potential for DMM that may have been associated with the firing line activities. This 39.2 acre partial removal area is based on a buffer zone on each side of the old firing line road: extending eastward from the old road to the top of the bluff, and extending westward 150 feet from the road. While DMM may exist in the bluff leading down to the shoreline, no removal activity on the bluff is included in this alternative based on worker safety considerations and the intent to minimize bluff erosion that such activity may promote.

5.2.3.1 Threshold Criteria

For AOI-02, Alternative 3 would entail conducting a MEC removal down to 3 feet bgs, removing and destroying any MEC recovered, and implementing an educational and notification LUC should there be a need to go deeper than that for maintenance or construction type activities. Any MEC removed would be inspected to determine its explosive safety status and properly destroyed and disposed of per applicable policy and regulations. LUCs will further manage any remaining explosive risks for MEC deeper than 3 feet bgs through continuing educational awareness to include advisories regarding intrusive activities, safety presentations, and community outreach.

As shown in Appendix B, the post-remedy RMM indicates that MEC removal to 3 feet bgs reduces the likelihood of encountering and imparting energy to a potential MEC item by physically removing MEC, and consequently acceptable conditions are achieved. This is based on the mitigated ability of pedestrians to encounter potential MEC items. Therefore, Alternative 3 is protective of public health and the environment based on MEC removal to reduce the amount of MEC in the AOI-02 areas.

Alternative 3 was reviewed with respect to compliance with ARARs (Table 2.1 indicates ARARs associated with this alternative). There are no chemical-specific ARARs at this site. Location-specific ARARs are related to the operation of the area as a national park and protection of wildlife species and wetlands habitat.

There are federal and/or state listed threatened or endangered species and NHESP priority habitats within the AOI-02 area. Prior to beginning MEC identification and removal down to 3 feet bgs, the USFWS, NPS, and the Town of Wellfleet would be consulted to ensure that as little disturbance to these species or habitats as possible will occur. While wildlife species can be avoided as a function of seasonal habitat (i.e., work could be scheduled for the winter months when none of the species are present), the plant species are present year-round. None of the wetlands are within the

AOI-02 boundary. Therefore, under close coordination with the USFWS, NPS and the Town of Wellfleet, all location-specific ARARs will be complied with under this alternative.

Action-specific ARARs relating to identification, removal, and transportation of MEC items will be complied with. Any removal of soil surrounding MEC items would have negligible impact, so ARARs related to soil removal, water quality, or air quality are not triggered. Therefore, Alternative 3 complies with ARARs.

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

5.2.3.2 Balancing Criteria

For AOI-02, Alternative 3 is favorable for the long-term effectiveness criterion in addressing the explosive risks because it removes and destroys all MEC to 3 feet bgs (the depth for potential exposure of receptors) within the partial removal area. Further, the adequacy and reliability of MEC removal procedures are well established.

This alternative will result in the reduction of the volume of MEC for the partial removal footprint of AOI-02. During the removal, any MEC that is identified would be treated using the disposal process options described in Section 3.5.

Alternative 3 is moderately favorable in meeting the short-term effectiveness criterion because although the community, workers, and the environment can be protected during implementation, there is an increased short-term hazard to workers and the public because MEC will be intrusively removed under this alternative. Engineering controls to perform this work safely and effectively have been well established for this type of operation, but there may be some risk to site workers due to possible challenging site conditions if MEC must be removed from areas where sensitive plant communities must be protected. Additionally, some adverse environmental impacts may result from implementation of the MEC removal alternative.

While MEC removal and its destruction would cause some disruption to park activities, the estimated time to meet the remedial objectives would be relatively short. If a DMM pit (i.e., many items buried together) is discovered, or if manual excavation is required by NPS or the Town of Wellfleet, this would increase the time duration, further impacting short-term effectiveness.

Alternative 3 is moderately favorable in meeting the implementability (technical and administrative feasibility, and availability of materials and services) criterion. The materials and services to implement this alternative are readily available. It is technically and administratively feasible to conduct MEC removals to 3 feet bgs and provide notifications of deeper intrusive activities that may occur in the future. However, the administrative feasibility was assessed as only moderately favorable because NPS may not permit the temporary disruption to park activities to remove MEC from these areas and the subsequent impacts to park workers, visitors, and the potential increased bluff erosion that may result.

The cost to implement Alternative 3 is moderate to high based on working in areas of moderate to high traffic. Costs include mag & dig or AGC teams and specially trained UXO Technicians to safely conduct the MEC removal. The LUCs would include educational and notification administrative costs and periodic inspection visit costs. The cost for a Work Plan, Report, and LUCIP would also be included. The total estimated cost for Alternative 3 is approximately $1,473,500 in capital costs plus $476,300 for 30-years of O&M for a total of $1,949,800. Cost worksheets (RACER Version 11.5) are included in Appendix C.

5.2.3.3 Modifying Criteria

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

5.3 Comparative Analysis – AOI-02 Remedial Alternatives

While Section 5.2 described and individually assessed each of the three AOI-02 explosive risks 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 AOI-02 explosive risks 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 three alternatives were compliant with ARARs.

With regard to the balancing criteria, only Alternative 3 was favorable regarding long term effectiveness due to physically removing and destroying MEC. Alternative 2 was moderately effective in the long term, because while educational awareness would mitigate interactions between MEC and human receptors through behavior modification, any MEC items would remain in place. Alternative 1 was not favorable for this criterion.

Only Alternative 3 was ranked as favorable for the reduction of the volume of MEC criterion for AOI-02, because it is the only alternative to physically remove MEC.

With regard to the short-term effectiveness criterion, Alternative 2 was considered favorable because no significant work would be performed beyond the installation of signs, and the community, workers, and the environment can relatively easily be protected during implementation. The estimated time to meet the remedial objectives would be short. Alternative 3 was moderately favorable for this criterion because there is an increased hazard to workers and the public during MEC removal, and the potential for DMM pits or a requirement for manual excavation could increase the estimated time to meet the remedial objectives. Alternative 1 was considered not favorable for this criterion.

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 was favorable for implementability, while Alternative 3 was ranked as moderately favorable for the implementability criterion.

Alternative 3 had the highest costs based on the need for full mag & dig or AGC teams and specially trained UXO Technicians to safely conduct the MEC removal and destruction, as well as notification requirements to safely conduct intrusive activities greater than 3 feet bgs. Alternative 2 had the next highest costs based on periodic site inspections and signage installation, while Alternative 1 had no associated costs.

Alternatives 2 and 3 were assessed as having an equal number of favorable rankings for the CERCLA criteria. Both were protective of human health and the environment, and compliant with ARARs. However, while Alternative 3 (Partial MEC Removal) had one more moderately favorable ranking, it was significantly more costly than Alternative 2 (LUCs).

Table 5.1: Summary of Detailed Analysis of Explosive Risk Remedial Alternatives – AOI-02

	Screening Criterion	Alternative 1: No Further Action	Alternative 2: Land Use Controls	Alternative 3: Partial MEC Removal with LUCs
Threshold	Overall Protection of Human Health and Environment\1	○	●	●
	Compliance with ARARs	●	●	●
Balancing	Long-Term Effectiveness	○	◑	●
	Reduction of Toxicity, Mobility and Volume Through Treatment\2	○	○	●
	Short-Term Effectiveness	○	●	◑
	Implementability:	●	●	◑
	Cost\3	**$0.00**	**$629,800**	**$1,949,800**
Modifying\4	State Acceptance	TBD	TBD	TBD
	Community Acceptance	TBD	TBD	TBD

● Favorable ('YES' for threshold criteria),

◑ Moderately Favorable

○ Not Favorable ('NO' for threshold criteria)

\1 – Favorable for this criterion requires achieving 'Acceptable' site conditions using the RMM (see Appendix B).
\2 – For MEC, this criterion addresses reduction of volume of MEC.
\3 - Costs were developed using RACER. O&M for a 30-year duration is included, as applicable, for an alternative. Details are provided in Appendix C.
\4 – The Modifying criteria of state and community acceptance are 'To Be Determined (TBD)' following review and input from these parties.

5.4 Individual Analysis – AOI-05 Remedial Alternatives

AOI-05 is a 56 acre area containing a former rocket range and small arms range. The southern portion includes the small 5-acre removal action area described in Section 1.4.3 (Zapata 2006). Some of the multiple pieces of MD from 3.5" rockets and 105mm projectiles found during the previous investigations or removal action were considered MD indicative of MEC, but this is not considered an area where DMM is likely to be found. The original EE/CA footprint for AOI-05 was expanded to include the upland portions of the rocket range and small arms range. The small arms range has been completely covered by the large parking lot now present. See Figure 5.

AOI-05 is primarily uplands, but extends to the shoreline below the high bluff. It is a moderate to high traffic beach access area. It contains unpaved and paved trails, a paved road and a large paved parking lot. While there is some semi-dense natural vegetation that limits pedestrian access, there are no man-made barrier restrictions. Access to the beach is open with daily use.

This section individually evaluates the remaining three explosive risks remedial alternatives for AOI-05 against the nine CERCLA criteria, while Section 5.5 compares the alternatives to each other. Table 5.2, presented at the end of Section 5.5, summarizes the detailed individual analysis of the AOI-05 explosive risks remedial alternatives.

5.4.1 Alternative 1: No Action

5.4.1.1 Threshold Criteria

For AOI-05, under Alternative 1, no remedial action would be taken, and any explosive risks contaminants are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. This alternative would leave any MEC items potentially present, in place, without further investigation or removal and explosive risks are not mitigated. As shown in Appendix B, the post-remedy RMM indicates that taking no action does not change the baseline conditions. Therefore, Alternative 1 does not result in acceptable conditions and is not protective of public health and the environment for AOI-05.

Alternative 1 was reviewed with respect to compliance with ARARs (Table 2.1 indicates ARARs associated with this alternative). Location-specific ARARs are related to the operation of the area as a national park and protection of wildlife species. Under this alternative, since no action will be done, 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.

However, Alternative 1 is not protective of public health and the environment and is therefore not favorable for the threshold criteria.

5.4.1.2 Balancing Criteria

For AOI-05, Alternative 1 is not favorable for the long-term effectiveness criterion because it would leave any MEC items in place, without further investigation or removal, and explosive risks are not mitigated. Alternative 1 is not favorable in reducing the volume of MEC because it would leave any MEC items in place. Alternative 1 is not favorable in meeting the short-term effectiveness criterion because although no time is needed to implement this alternative, RAOs will not be met. Alternative 1 is favorable in meeting the implementability 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.

5.4.2 Alternative 2: Land Use Controls

5.4.2.1 Threshold Criteria

For AOI-05, Alternative 2 may include the use of signage installed in appropriate locations to limit access by providing awareness of potential hazards, education (training, pamphlets, flyers) concerning the hazards suspected to be present within the AOI, and periodic visual inspections to evaluate changing site conditions. It would also include notifications for any future intrusive activities, which would need to be conducted by UXO trained technicians to ensure safety of personnel or resources from explosive risks.

As shown in Appendix B, the post-remedy RMM indicates that educational awareness designed to help modify human behavior at the site would lessen the frequency of use of the area and the likelihood of encountering and imparting energy to a potential MEC item, and acceptable conditions are achieved. This is based on the expectation of limited or rare occurrences of pedestrians ignoring signage to interact with potential MEC items. Therefore, Alternative 2 is protective of public health and the environment based on using LUCs to limit access to the AOI-05 areas.

Alternative 2 was reviewed with respect to compliance with ARARs (Table 2.1 indicates ARARs associated with this alternative). Location-specific ARARs are related to the operation of the area as a national park and protection of wildlife species and wetlands habitat. While there are federal and/or state listed threatened or endangered species and NHESP priority habitats within the AOI-05 area, the potentially disruptive activity of this alternative (limited to installation of signage) would be implemented to comply with these ARARs through coordination with the USFWS and NPS to minimize any disturbance to these species, should they be encountered. None of the wetlands are within the AOI-05 boundary. Therefore, under this alternative, all location-specific ARARs will be complied with, in coordination with NPS. Because no MEC removals or construction of physical LUCs will be implemented under Alternative 2, action-specific ARARs related to soil removal, water quality, or air quality are not triggered. Therefore, Alternative 2 complies with 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 AOI-05, Alternative 2 is moderately favorable in providing long-term effectiveness by informing the public of the explosive risks within the area, minimizing human exposure. But it would leave any MEC items in place, and while the access of receptors to explosive risks is reduced, it is not eliminated.

Alternative 2 is not favorable in reducing the volume of MEC at the site because it would leave any MEC items 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 installation of signs, and the community, workers, and the

environment can easily be protected during implementation. The estimated time to meet the remedial objectives would be short.

Alternative 2 is favorable in meeting the implementability (technical feasibility and availability of materials and services) criterion. It is technically feasible to install signage, produce educational materials, and provide notifications of intrusive work. The materials and services to implement this alternative are readily available. The administrative feasibility was also assessed as favorable as the EE/CA based ICs have been in effect for years.

The cost to implement Alternative 2 is relatively low. For AOI-05, LUCs would include a LUCIP, installation and maintenance of two warning signs strategically located around AOI-05, production/distribution of educational materials concerning the potential hazards (pamphlets, flyers, etc.), administrative costs for development of educational and notification requirements, and costs for periodic inspections (assumed to be once per year). The cost for CERCLA 5-year reviews would also be included. The estimated cost for Alternative 2 is approximately $146,600 in capital costs plus $476,300 for 30-years of O&M for a total of $622,900. Cost summary worksheets (RACER Version 11.5) are included in Appendix C.

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 MEC Removal with LUCs

Under Alternative 3, a partial removal to 3 feet bgs (the depth for potential exposure of receptors), as described in Section 4.3.3, would be supplemented with LUCs. An educational and notification LUC would address the remaining acreage outside the defined partial removal area. Figure 5 indicates the 30.1 acre footprint for a partial MEC removal in AOI-05. The removal area would include all areas of AOI-05 except for the paved parking lot and the previous 5-acre removal area. While MEC could exist in the bluff leading down to the shoreline, no removal activity in the bluff is included in this alternative based on worker safety considerations and the intent to minimize bluff erosion that such activity may promote.

5.4.3.1 Threshold Criteria

For AOI-05, Alternative 3 would entail conducting a MEC removal down to 3 feet bgs, removing and destroying any MEC recovered, and implementing an educational and notification LUC should there be a need to go deeper than that for maintenance or construction type activities. Any MEC removed would be inspected to determine its explosive safety status and properly destroyed and disposed of per applicable policy and regulations. LUCs will further manage any remaining explosive risks for MEC deeper than 3 feet bgs through continuing educational awareness to include advisories regarding intrusive activities, safety presentations, and community outreach.

As shown in Appendix B, the post-remedy RMM indicates that MEC removal to 3 feet bgs reduces the likelihood of encountering and imparting energy to a potential MEC item by physically removing MEC, and consequently acceptable conditions are achieved. This is based on the mitigated ability of pedestrians to encounter potential MEC items. Therefore, Alternative 3 is protective of public health and the environment based on MEC Removal to reduce the amount of MEC in the AOI-05 areas.

Alternative 3 was reviewed with respect to compliance with ARARs (Table 2.1 indicates ARARs associated with this alternative). There are no chemical-specific ARARs at this site. Location-specific ARARs are related to the operation of the area as a national park and protection of wildlife species and wetlands habitat.

There are federal and/or state listed threatened or endangered species and NHESP priority habitats within the AOI-05 area. Prior to beginning MEC identification and removal down to 3 feet bgs, the USFWS and NPS would be consulted to ensure that as little disturbance to these species or habitats as possible will occur. While wildlife species can be avoided as a function of seasonal habitat (i.e., work could be scheduled for the winter months when none of the species are present), the plant species are present year-round. None of the wetlands are within the AOI-05 boundary. Therefore, under close coordination with NPS, all location-specific ARARs will be complied with under this alternative.

Action-specific ARARs relating to identification, removal, and transportation of MEC items will be complied with. Any removal of soil surrounding MEC items would have negligible impact, so ARARs related to soil removal, water quality, or air quality are not triggered. Therefore, Alternative 3 complies with ARARs.

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

5.4.3.2 Balancing Criteria

For AOI-05, Alternative 3 is favorable for the long-term effectiveness criterion in addressing the explosive risks because it removes and destroys all MEC to 3 feet bgs (the depth for potential exposure of receptors) within the partial removal area. Further, the adequacy and reliability of MEC removal procedures are well established.

This alternative will result in the reduction of the volume of MEC for the partial removal footprint of AOI-05. During the removal, any MEC that is identified would be treated using the disposal process options described in Section 3.5.

Alternative 3 is moderately favorable in meeting the short-term effectiveness criterion because although the community, workers, and the environment can be protected during implementation, there is an increased short-term hazard to workers and the public because MEC will be intrusively removed under this alternative. Engineering controls to perform this work safely and effectively have been well established for this type of operation, but there may be some risk to site workers due to possible challenging site conditions if MEC must be removed from areas where sensitive plant communities must be protected. Additionally, some adverse environmental impacts may result from implementation of the MEC removal alternative. Given the lack of MEC finds in AOI-05, the possible environmental impacts resulting from even a partial removal may not be warranted.

While MEC removal and its destruction would cause some disruption to park activities, the estimated time to meet the remedial objectives would be relatively short. If many MEC items are discovered, or if manual excavation is required by NPS, this would increase the time duration, further impacting short-term effectiveness.

Alternative 3 is moderately favorable in meeting the implementability (technical and administrative feasibility, and availability of materials and services) criterion. The materials and services to implement this alternative are readily available. It is technically and administratively

feasible to conduct MEC removals to 3 feet bgs and provide notifications of deeper intrusive activities that may occur in the future. However, the administrative feasibility was assessed as only moderately favorable because NPS may not permit the temporary disruption to park activities to remove MEC from these areas and the subsequent impacts to park workers, visitors, and the environment.

The cost to implement Alternative 3 is moderate to high based on working in some areas of high pedestrian traffic. Costs include mag & dig or AGC teams and specially trained UXO Technicians to safely conduct the MEC removal. The LUCs would include educational and notification administrative costs and periodic inspection visit costs. The cost for a Work Plan and Report would also be included. The total estimated cost for Alternative 3 is approximately $1,296,300 in capital costs plus $476,300 for 30-years of O&M for a total of $1,772,600. Cost worksheets (RACER Version 11.5) are included in Appendix C.

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 – AOI-05 Remedial Alternatives

While Section 5.4 described and individually assessed each of the three AOI-05 explosive risks alternatives against the nine criteria, this section evaluates the performance of each alternative relative to each other. Table 5.2, presented at the end of this section, summarizes the detailed comparative analysis of the AOI-05 explosive risks 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 three alternatives were compliant with ARARs.

With regard to the balancing criteria, only Alternative 3 was favorable regarding long term effectiveness due to physically removing and destroying MEC. Alternative 2 was moderately effective in the long term, because while signage would mitigate interactions between MEC and human receptors through behavior modification, any MEC items would remain in place. Alternative 1 was not favorable for this criterion.

Only Alternative 3 was ranked as favorable for the reduction of the volume of MEC criterion for AOI-05, because it is the only alternative to physically remove MEC.

With regard to the short-term effectiveness criterion, Alternative 2 was considered favorable because no significant work would be performed beyond the installation of signs, and the community, workers, and the environment can relatively easily be protected during implementation. The estimated time to meet the remedial objectives would be short. Alternative 3 was moderately favorable for this criterion because there is an increased hazard to workers and the public during MEC removal, and the potential requirement for manual excavation could increase the estimated time to meet the remedial objectives. Alternative 1 was considered not favorable for this criterion.

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 was favorable for implementability, while Alternative 3 was ranked as moderately favorable for the implementability criterion.

Alternative 3 had the highest costs based on the need for full mag & dig or AGC teams and specially trained UXO Technicians to safely conduct the MEC removal and destruction, as well as notification requirements to safely conduct intrusive activities greater than 3 feet bgs. Alternative 2 had the next highest costs based on periodic site inspections and signage installation, while Alternative 1 had no associated costs.

Alternatives 2 and 3 were assessed as having an equal number of favorable rankings for the CERCLA criteria. Both were protective of human health and the environment, and compliant with ARARs. However, while Alternative 3 (Partial MEC Removal with LUCs) had one more moderately favorable ranking, it was significantly more costly than Alternative 2 (LUCs).

Table 5.2: Summary of Detailed Analysis of Explosive Risk Remedial Alternatives – AOI-05

	Screening Criterion	Alternative 1: No Further Action	Alternative 2: Land Use Controls	Alternative 3: Partial MEC Removal with LUCs
Threshold	Overall Protection of Human Health and Environment\1	○	●	●
	Compliance with ARARs	●	●	●
Balancing	Long-Term Effectiveness	○	◑	●
	Reduction of Toxicity, Mobility and Volume Through Treatment\2	○	○	●
	Short-Term Effectiveness	○	●	◑
	Implementability:	●	●	◑
	Cost\3	**$0.00**	**$622,900**	**$1,772,600**
Modifying\4	State Acceptance	TBD	TBD	TBD
	Community Acceptance	TBD	TBD	TBD

● Favorable ('YES' for threshold criteria)

◑ Moderately Favorable

○ Not Favorable ('NO' for threshold criteria)

\1 – Favorable for this criterion requires achieving 'Acceptable' site conditions using the RMM (see Appendix B).
\2 – For MEC, this criterion addresses reduction of volume of MEC.
\3 - Costs were developed using RACER. O&M for a 30-year duration is included, as applicable, for an alternative. Details are provided in Appendix C.
\4 – The Modifying criteria of state and community acceptance are 'To Be Determined (TBD)' following review and input from these parties.

5.6 Individual Analysis – AOI-06 Remedial Alternatives

AOI-06 is the Range Fan of Artillery Targets in Ocean, occupying 167,856 offshore acres. AOI-06 is considered to be open access and experiences daily use for recreational swimming, fishing, and diving; there are no barriers to these waters. Receptors include recreational waders, swimmers, divers, and fishermen. Exposure pathways identified for these receptors include direct contact with MEC on the sea floor by handling and treading upon, and direct contact with MEC beneath the sea floor through intrusive activities. See Figure 6.

While not previously investigated, for the RI, an assumption was made that MEC is potentially present in the ocean range fan since anti-aircraft and rocket firing at targets over the ocean was conducted for approximately 20 years. While there are no known documented MEC or MD findings by fishermen or divers in the area, the RMM determined that AOI-06 posed unacceptable explosive risks based on the potential for 76mm anti-aircraft artillery, 90mm and 105mm projectiles, 3.5" rockets to be present. This AOI could also be a source of MEC to the AOI-02 and AOI-05 shorelines if munition items wash ashore following storm events, but there is no strong evidence of this occurring on a frequent basis, and the more likely source of MEC findings on the beach (as was likely the case for AOI-02) is erosion out of the bluffs.

This section individually evaluates the remaining three explosive risks remedial alternatives for AOI-06 against the nine CERCLA criteria, while Section 5.7 compares the alternatives to each other. Table 5.3, presented at the end of Section 5.7, summarizes the detailed individual analysis of the AOI-06 explosive risks remedial alternatives.

5.6.1 Alternative 1: No Action

5.6.1.1 Threshold Criteria

For AOI-06, under Alternative 1, no remedial action would be taken, and any explosive risks contaminants are left "as is," without the implementation of any containment, removal, treatment, or other protective actions. This alternative would leave any MEC items potentially present, in place, without further investigation or removal and explosive risks are not mitigated. As shown in Appendix B, the post-remedy RMM indicates that taking no action does not change the baseline conditions. Therefore, Alternative 1 does not result in acceptable conditions and is not protective of public health and the environment for AOI-06.

Alternative 1 was reviewed with respect to compliance with ARARs (Table 2.1 indicates ARARs associated with this alternative). Location-specific ARARs are related to the protection of wildlife species. Under this alternative, since no action will be done, 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.

However, Alternative 1 is not protective of public health and the environment and is therefore not favorable for the threshold criteria.

5.6.1.2 Balancing Criteria

For AOI-06, Alternative 1 is not favorable for the long-term effectiveness criterion because it would leave any MEC items in place, without further investigation or removal, and explosive risks are not mitigated. Alternative 1 is not favorable in reducing the volume of MEC because it would leave any MEC items in place. Alternative 1 is not favorable in meeting the short-term effectiveness criterion because although no time is needed to implement this alternative, RAOs

will not be met. Alternative 1 is favorable in meeting the implementability 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.

5.6.2 Alternative 2: Land Use Controls

5.6.2.1 Threshold Criteria

For AOI-06, Alternative 2 may include the use of signage installed in appropriate locations to limit access by providing awareness of potential hazards and education (training, pamphlets, flyers) concerning the hazards suspected to be present within the AOI. However, the signage would be installed on land, and as a practical matter, may overlap with the signage requirements for AOI-02 and AOI-05, assuming LUCs are part of the remedy for those AOIs.

As shown in Appendix B, the post-remedy RMM indicates that educational awareness designed to help modify human behavior at the site would lessen the frequency of use of the area and the likelihood of encountering and imparting energy to a potential MEC item, and acceptable conditions are achieved. This is based on the expectation of limited or rare occurrences of park visitors ignoring signage to interact with potential MEC items. Therefore, Alternative 2 is protective of public health and the environment based on using LUCs to educate and inform the public of the potential hazards, thereby limiting interactions with potential munitions items in the water AOI.

Alternative 2 was reviewed with respect to compliance with ARARs (Table 2.1 indicates ARARs associated with this alternative). Location-specific ARARs are related to the protection of wildlife species. While there are federal and/or state listed threatened or endangered species and NHESP priority habitats within the waters of AOI-06, any potentially disruptive activity of this alternative (limited to installation of signage) would occur on land, and would be implemented to comply with these ARARs through close coordination with the USFWS and NPS to minimize any disturbance to these species, should they be encountered. Therefore, under this alternative, all location-specific ARARs will be complied with, in coordination with the USFWS and NPS. Because no MEC removals or construction of physical LUCs will be implemented under Alternative 2, action-specific ARARs related to soil removal, water quality, or air quality are not triggered. Therefore, Alternative 2 complies with ARARs.

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

5.6.2.2 Balancing Criteria

For AOI-06, Alternative 2 is moderately favorable in providing long-term effectiveness by informing the public of the explosive risks within the area, minimizing human exposure. But it would leave any MEC items in place, and while the access of receptors to explosive risks is reduced, it is not eliminated.

Alternative 2 is not favorable in reducing the volume of MEC at the site because it would leave any MEC items 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 installation of signs, and the community, workers, and the environment can easily be protected during implementation. 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 install signage and produce educational materials. The materials and services to implement this alternative are readily available. The administrative feasibility was also assessed as favorable, as the EE/CA based ICs have been in effect for years.

The cost to implement Alternative 2 is relatively low. For AOI-06, LUCs would include a LUCIP, installation and maintenance of four warning signs in strategic locations (these signs may overlap with any required for the AOI-02 and AOI-05 remedies), production/distribution of educational materials concerning the potential hazards (pamphlets, flyers, etc.), and administrative costs for development of educational and notification requirements. The LUCIP will describe the specific elements of these actions. The cost for CERCLA 5-year reviews would also be included. The estimated cost for Alternative 2 is approximately $131,700 in capital costs plus $476,300 for 30-years of O&M for a total of $608,000. Cost summary worksheets (RACER Version 11.5) are included in Appendix C.

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 3: Partial MEC Removal with LUCs

Under Alternative 3, the partial removal would include items on the sea floor and approximately 2 feet beneath it, and the footprint would extend to the 120 ft recreational diver depth limit, almost 3 miles out from the shoreline, an area of 15,693 acres. See Figure 6.

5.6.3.1 Threshold Criteria

For AOI-06, Alternative 3 would entail conducting a sea floor MEC removal down to 2 feet bgs, supplemented by educational LUCs for the areas not identified for removal. Any MEC removed would be inspected to determine its explosive safety status and properly destroyed and disposed of per applicable policy and regulations. The LUCs will further manage any explosive risks due to remaining MEC through continuing educational awareness to include advisories regarding intrusive activities, safety presentations, and community outreach.

As shown in Appendix B, the post-remedy RMM indicates that MEC removal reduces the likelihood of encountering and imparting energy to a potential MEC item by physically removing MEC, and consequently acceptable conditions are achieved. This is based on the mitigated ability of pedestrians to encounter potential MEC items in the removal area. Therefore, Alternative 3 is protective of public health and the environment based on MEC Removal to reduce the amount of MEC and supplemental LUCs to educate and inform the public of the potential hazards, thereby limiting interactions with potential munitions items in the water AOI.

Alternative 3 was reviewed with respect to compliance with ARARs (Table 2.1 indicates ARARs associated with this alternative). Location-specific ARARs are related to the protection of wildlife

species. There are federal and/or state listed threatened or endangered species and NHESP priority habitats within the waters of AOI-06, and any disruptive activity of this removal alternative would be implemented to comply with these ARARs to minimize any disturbance to these species, should they be encountered. While challenging, all location-specific ARARs can be complied with, in coordination with the appropriate authorities. Authorities may include the Massachusetts NHESP, the USFWS, the NOAA National Marine Fisheries Service, and others. Review of the requirements to conduct removal activities in AOI-06 would be conducted to ensure that they do not jeopardize any federally-listed and/or state-listed species or sensitive habitats.

Action-specific ARARs relating to identification, removal, and transportation of MEC items will be complied with. It is not anticipated that removal of MEC items from the sea floor will trigger ARARs related to soil removal, water quality, or air quality. Therefore, Alternative 3 complies with ARARs.

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 AOI-06, Alternative 3 is only moderately favorable for the long-term effectiveness criterion in addressing the explosive risks because it removes and destroys all MEC to 2 feet bgs to the 120 foot depth line. However, within these dynamic surf zone areas, after MEC removals were completed, MEC would still have the potential to wash up onshore or be exposed on the shallow sea floor following storm events.

This alternative will result in the reduction of the volume of MEC for the partial removal footprint of AOI-06. During the removal, any MEC that is identified would be treated using the disposal process options described in Section 3.5. However, as described above, there remains the potential for significant storm events to expose additional MEC items, and therefore, this alternative is moderately favorable for this criterion.

Alternative 3 is moderately favorable in meeting the short-term effectiveness criterion because although the community, workers, and the environment can be protected during implementation, there is an increased short-term hazard to workers and the public because MEC will be intrusively removed and destroyed under this alternative. While this work has been performed safely and effectively on other sites, there are considerable safety risks to the UXO teams at these ocean depths. Additionally, some adverse environmental impacts will result from implementation of the MEC removal technologies on the seas floor. Finally, the time required to meet the RAOs would be significant for this acreage.

Alternative 3 is moderately favorable overall in meeting the implementability criterion. The materials and services to implement this alternative are available. Coordinating and delivering these services in a timely manner is challenging, but can be accomplished, and therefore this alternative is moderately favorable for administrative feasibility. However, technical feasibility is not favorable for this alternative. The technical operational difficulties of completing a removal action in the open ocean to depths of 120 feet are significant, and the reliability of the alternative to complete the work without significant schedule delays is low.

The cost to implement Alternative 3 is significantly high based on working in water depths to 120 feet and covering 15,693 acres. Costs include multiple DGM teams, multiple water craft, and specially trained UXO dive teams to safely conduct the MEC removal and destruction. The LUCs would include educational and notification administrative costs. The cost for a Work Plan, Report,

and LUCIP would also be included. The total estimated cost for Alternative 3 is approximately $155,049,600 in capital costs plus $476,300 for 30-years of O&M for a total of $155,525,900. Cost worksheets (RACER Version 11.5) are included in Appendix C.

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 – AOI-06 Remedial Alternatives

While Section 5.6 described and individually assessed each of the three AOI-06 explosive risks alternatives against the nine criteria, this section evaluates the performance of each alternative relative to each other. Table 5.3, presented at the end of this section, summarizes the detailed comparative analysis of the AOI-06 explosive risks remedial alternatives.

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 three alternatives were compliant with ARARs.

With regard to the balancing criteria, Alternative 2 was moderately effective in the long term, because while signage would mitigate interactions between MEC and human receptors through behavior modification, any MEC items would remain in place. Alternative 3 was only moderately effective in the long term because while it removed and destroyed MEC from the partial removal footprint area, after MEC removals were completed, MEC would still have the potential to wash up onshore or be exposed on the shallow sea floor following storm events. Alternative 1 was not favorable for this criterion.

Alternative 3 was ranked as moderately favorable for the reduction of the volume of MEC criterion for AOI-05, because while it is the only alternative to physically remove MEC, there remains the potential for significant storm events to expose additional MEC items.

With regard to the short-term effectiveness criterion, Alternative 1 was considered not favorable. Alternative 2 was considered favorable because no significant work would be performed beyond the installation of signs, and the community, workers, and the environment can relatively easily be protected during implementation. The estimated time to meet the remedial objectives would be short. Alternative 3 was moderately favorable in meeting the short-term effectiveness criterion because while this work has been performed safely and effectively on other sites, there are considerable safety risks to the UXO teams at these ocean depths. Additionally, some adverse environmental impacts will result from implementation of the MEC removal technologies on the sea floor, and the time required to meet the RAOs would be significant for this acreage.

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 was favorable for implementability.

Alternative 3 was ranked moderately favorable overall in meeting the implementability criterion. The materials and services to implement this removal alternative are available. Coordinating and delivering these services in a timely manner is challenging, but can be accomplished. However, technical feasibility is not favorable for this alternative. The technical operational difficulties of

completing a removal action in the open ocean to depths of 120 feet are significant, and the reliability of the alternative to complete the work without significant schedule delays is low.

Alternative 3 had the highest costs based on the need for multiple DGM teams, multiple water craft, and specially trained UXO dive teams to safely conduct the MEC removal and destruction. Alternative 2 had the next highest costs based on periodic site inspections and signage installation, while Alternative 1 had no associated costs.

Alternative 2, Land Use Controls, was ranked favorable for more CERCLA criteria than were the other alternatives. It is protective of human health and the environment, is compliant with ARARs, is effective in the short term, and is favorable for implementability. The Alternative 2 cost is relatively low while the Alternative 3 is cost prohibitive.

Table 5.3: Summary of Detailed Analysis of Explosive Risk Remedial Alternatives – AOI-06

	Screening Criterion	Alternative 1: No Further Action	Alternative 2: Land Use Controls	Alternative 3: Partial MEC Removal with LUCs
Threshold	Overall Protection of Human Health and Environment\1	○	●	●
	Compliance with ARARs	●	●	●
Balancing	Long-Term Effectiveness	○	◑	◑
	Reduction of Toxicity, Mobility and Volume Through Treatment\2	○	○	◑
	Short-Term Effectiveness	○	●	◑
	Implementability:	●	●	◑
	Cost\3	**$0.00**	**$608,000**	**$155,525,900**
Modifying\4	State Acceptance	TBD	TBD	TBD
	Community Acceptance	TBD	TBD	TBD

● Favorable ('YES' for threshold criteria)

◑ Moderately Favorable

○ Not Favorable ('NO' for threshold criteria)

\1 – Favorable for this criterion requires achieving 'Acceptable' site conditions using the RMM (see Appendix B).
\2 – For MEC, this criterion addresses reduction of volume of MEC.
\3 - Costs were developed using RACER. O&M for a 30-year duration is included, as applicable, for an alternative. Details are provided in Appx C.
\4 – The Modifying criteria of state and community acceptance are 'To Be Determined (TBD)' following review and input from these parties.

5.8 Conclusions

No further Action is recommended for those AOIs posing acceptable MEC risk (AOI-01, AOI-03, and AOI-04). The analysis of further actions warranted for the remaining AOIs is summarized below.

5.8.1 AOI-02 Remedial Alternatives

Three remedial alternatives were evaluated for AOI-02: No Action, Land Use Controls, and Partial MEC Removal with LUCs. Table 5.1 presents the summary of the detailed analysis of the explosive risks remedial alternatives. Alternatives 2 and 3 are protective of human health and the environment, and compliant with ARARs. However, while Alternative 3 (Partial MEC Removal with LUCs) had one more moderately favorable ranking, it was significantly more costly than Alternative 2 (LUCs).

5.8.2 AOI-05 Remedial Alternatives

Three remedial alternatives were evaluated for AOI-05: No Action, Land Use Controls, and Partial MEC Removal with LUCs. Table 5.2 presents the summary of the detailed analysis of the explosive risks remedial alternatives. Alternatives 2 and 3 are protective of human health and the environment, and compliant with ARARs. However, while Alternative 3 (Partial MEC Removal with LUCs) had one more moderately favorable ranking, it was significantly more costly than Alternative 2 (LUCs).

5.8.3 AOI-06 Remedial Alternatives

Three remedial alternatives were evaluated for AOI-06: No Action, Land Use Controls, and Partial MEC Removal with LUCs. Table 5.3 presents the summary of the detailed analysis of the explosive risks remedial alternatives. Alternative 2, Land Use Controls, was ranked favorable for more CERCLA criteria than were the other alternatives. It is protective of human health and the environment, is compliant with ARARs, is effective in the short term, and is favorable for implementability. Alternative 3 was favorable for only two criteria. The Alternative 2 cost is relatively low while the Alternative 3 cost is significant.

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Appendix A:
Site Figures

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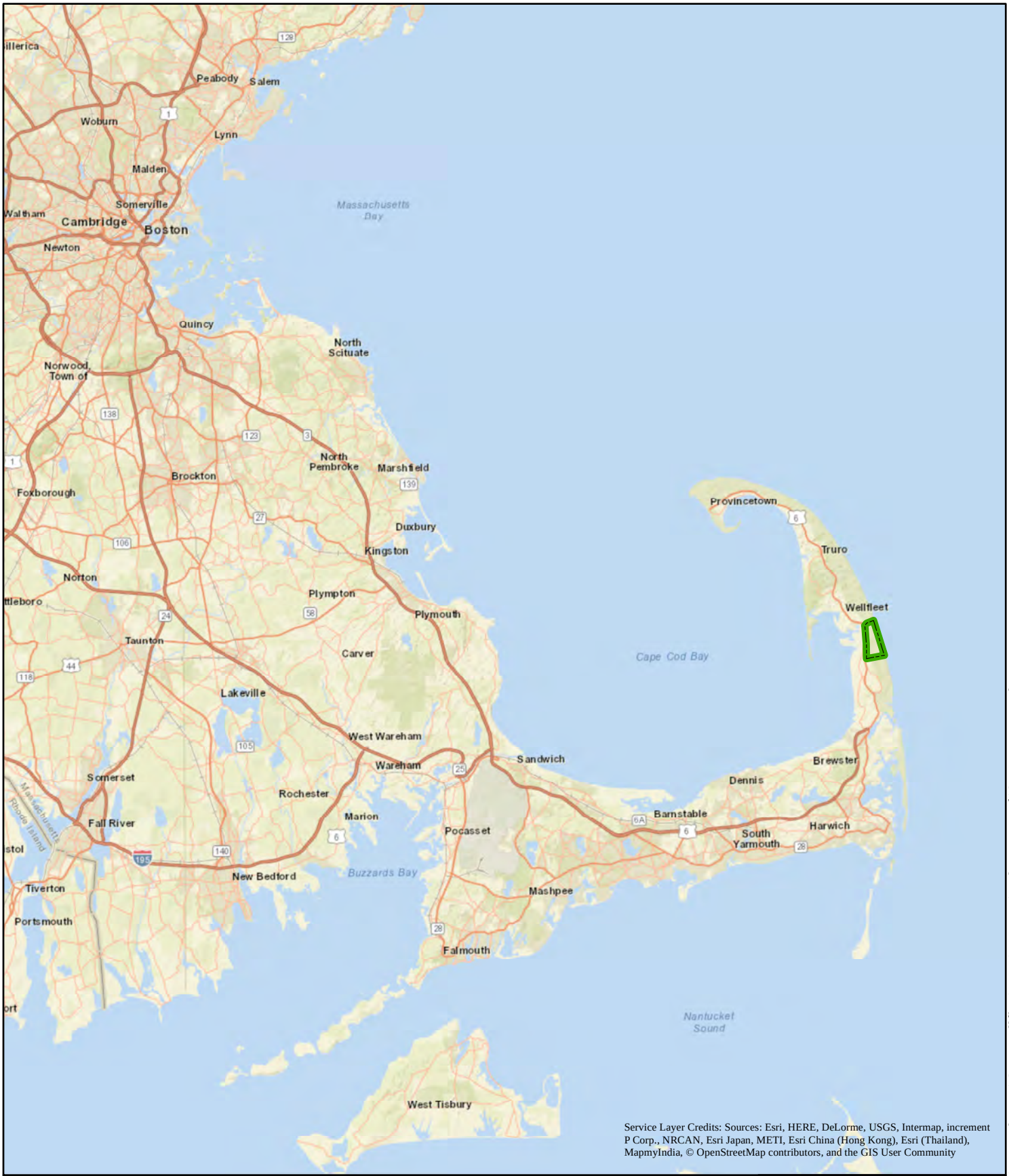

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Legend

Former Camp Wellfleet Boundary

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Figure 1
Site Location

Former Camp Wellfleet
Wellfleet, Barnstable County, Massachusetts

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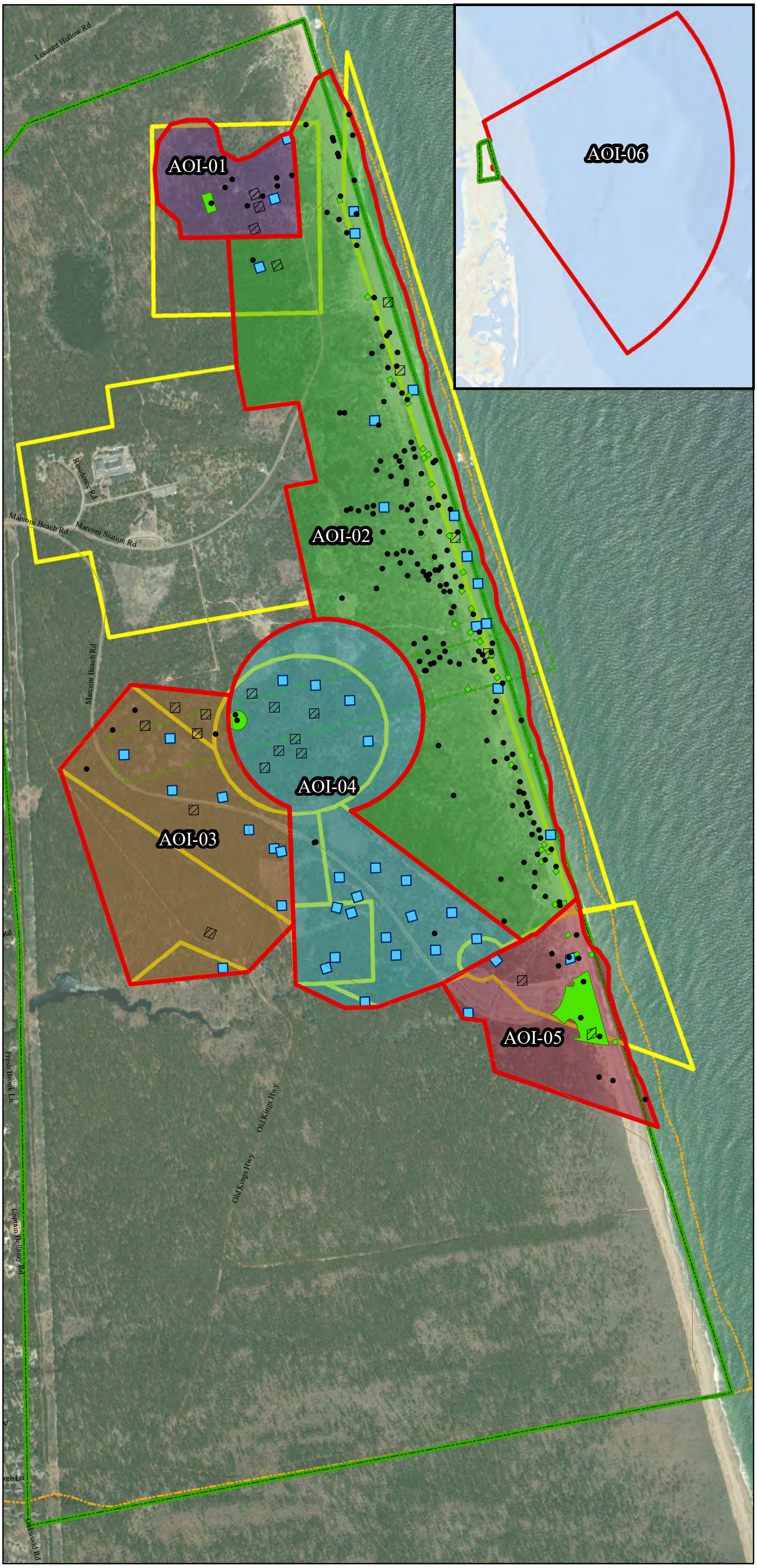

Legend

Areas of Interest (AOIs)

- AOI-01
- AOI-02*
- AOI-03
- AOI-04
- AOI-05*
- AOI-06 (Inset)

- EE/CA Grids (100% of Anomalies Excavated, 2000)
- EE/CA Grid (Partial Excavation of Anomalies, 2000)
- Single Point Anomaly (100% Excavated, 2003 - 2004)
- Removal Area (100% of Anomalies Excavated, 2004 and 2005)
- EE/CA Areas
- U.S. Highway
- Roads
- Town of Wellfleet Parcel
- Former Camp Wellfleet Boundary
- Wellfleet (Town) Boundary

* The eastern boundary of AOI-02 and AOI-05 is the current shoreline downloaded from NOAA's Continuously Updated Shoreline Program, which attempts to provide updated imagery representing mean low tide.

Aerial Image and Inset Map Background: ESRI Online

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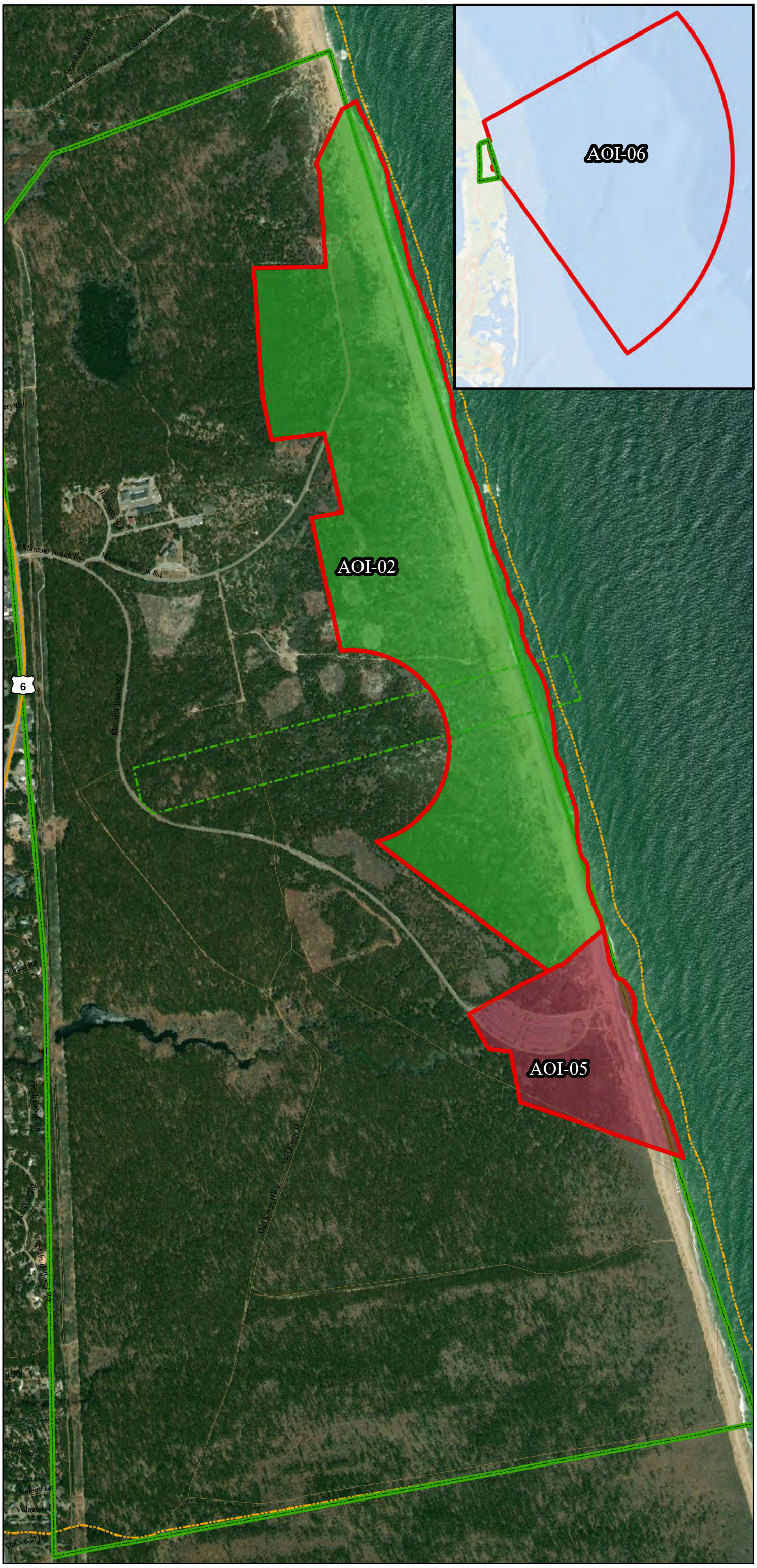
Figure 2
Site Layout
Former Camp Wellfleet
Wellfleet, Barnstable County, Massachusetts



Legend

Areas of Interest (AOIs)

- AOI-02*
- AOI-05*
- AOI-06 (Inset)

- U.S. Highway
- Roads
- Town of Wellfleet Parcel
- Former Camp Wellfleet Boundary
- Wellfleet (Town) Boundary

* The eastern boundary of AOI-02 and AOI-05 is the current shoreline downloaded from NOAA's Continuously Updated Shoreline Program, which attempts to provide updated imagery representing mean low tide.

Aerial Image and Inset Map Background: ESRI Online

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Figure 3
AOIs Showing Unacceptable Explosive Risk
Former Camp Wellfleet
Wellfleet, Barnstable County, Massachusetts

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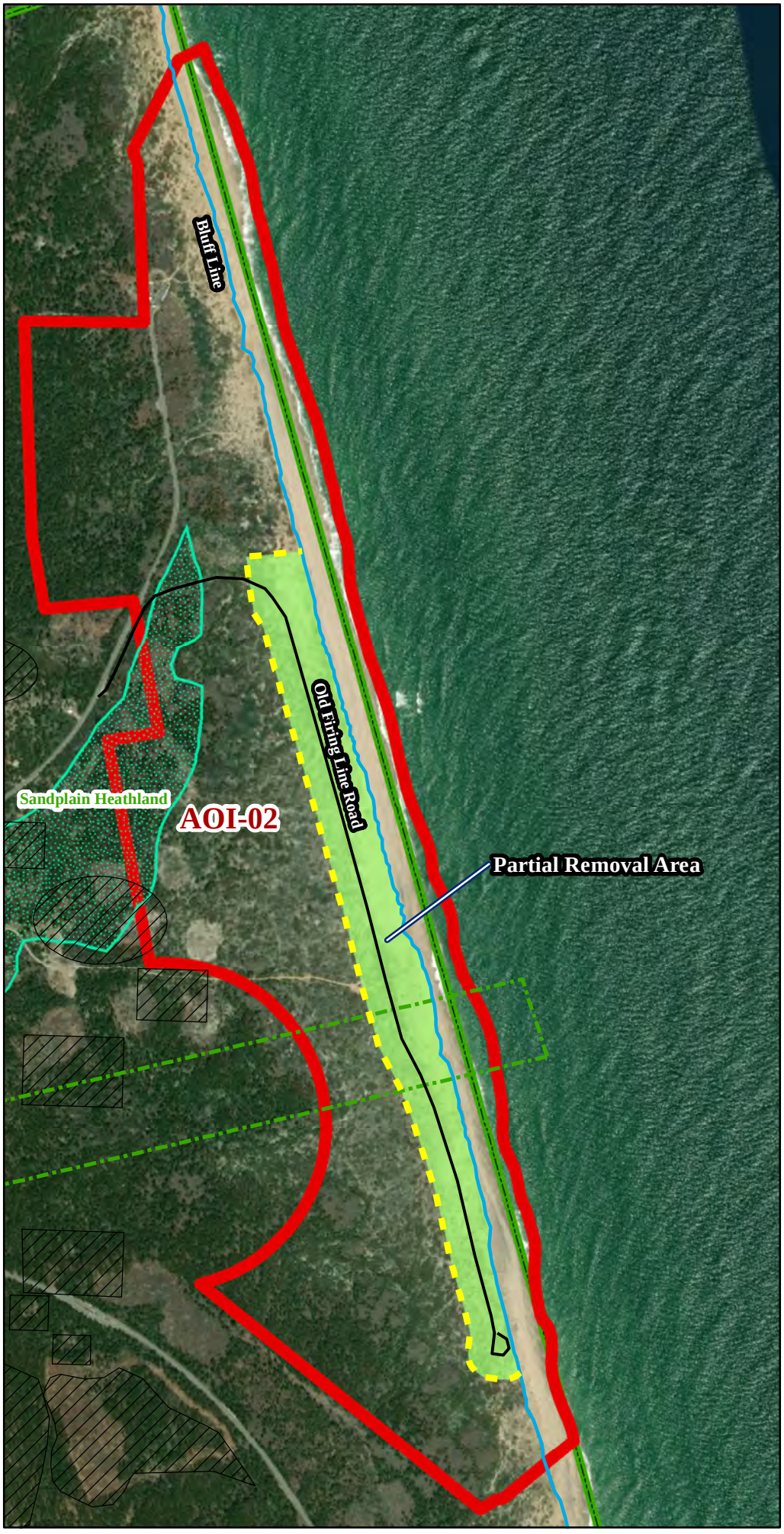

Legend

- 150 ft Partial Removal Limit
- Partial Removal Area (39.2 Acres)
- Historical Firing Line Road
- Approximate Bluff Location (2015)
- NHESP Natural Community Sandplain Heathland
- AOI-02 Boundary
- Areas Ineligible for Work by Request of the Cape Cod National Seashore National Park Service (CCNS NPS) due to Ongoing Research or Habitat Establishment
- Camp Wellfleet Boundary
- Town of Wellfleet Parcel

NHESP - Natural Heritage & Endangered Species Program

Aerial: ESRI Online
Natural Communities: NHESP BioMap2 Core Habitat Priority Natural Communities

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Figure 4
AOI-02
Former Camp Wellfleet
Wellfleet, Barnstable County, Massachusetts

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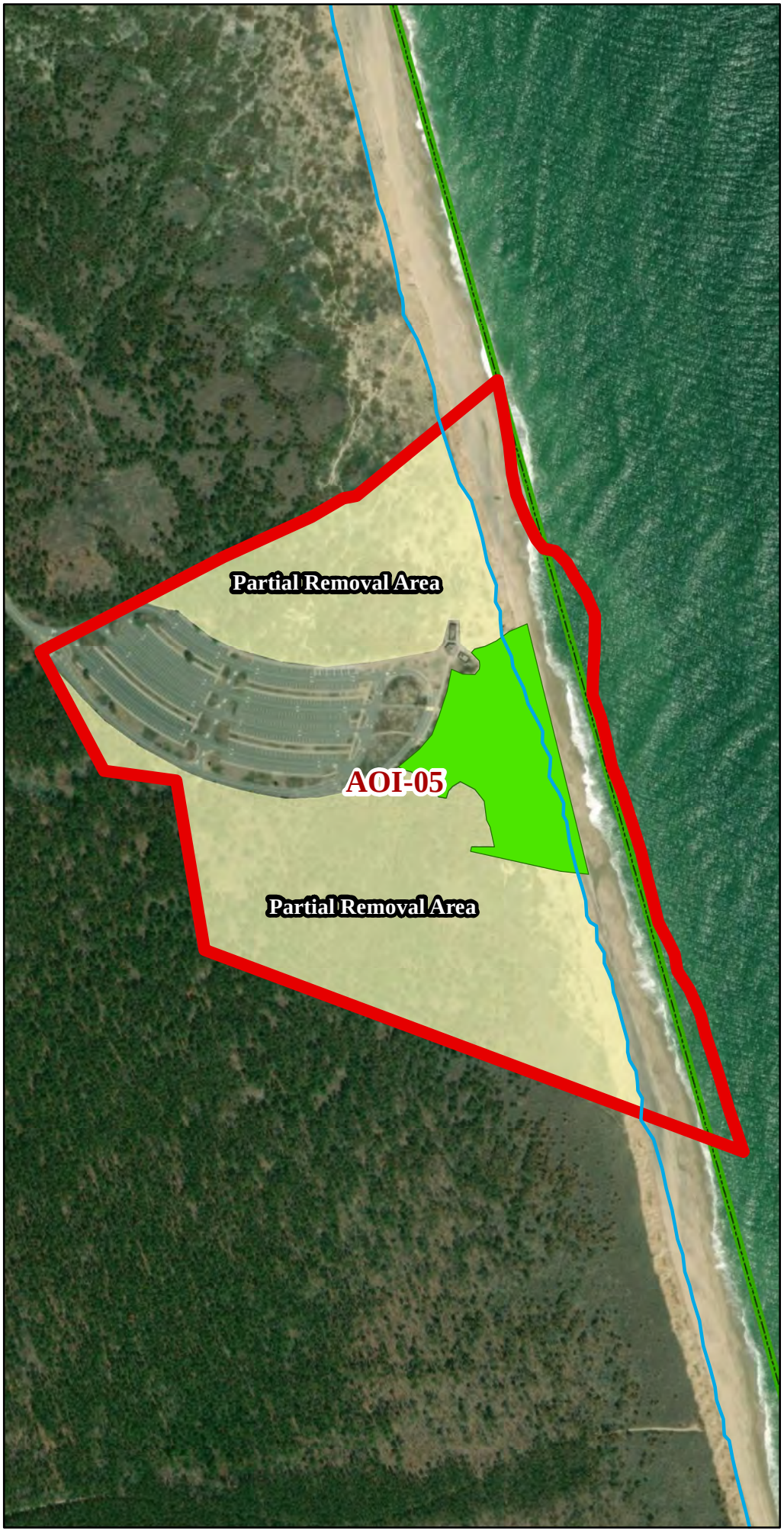

Legend

- Approximate Bluff Location (2015)
- Partial Removal Area (30.1 Acres)
- AOI-05 Boundary
- Removal Area (100% of Anomalies Excavated, 2004 and 2005)
- Camp Wellfleet Boundary

Aerial: ESRI Online

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Figure 5
AOI-05
Former Camp Wellfleet
Wellfleet, Barnstable County, Massachusetts

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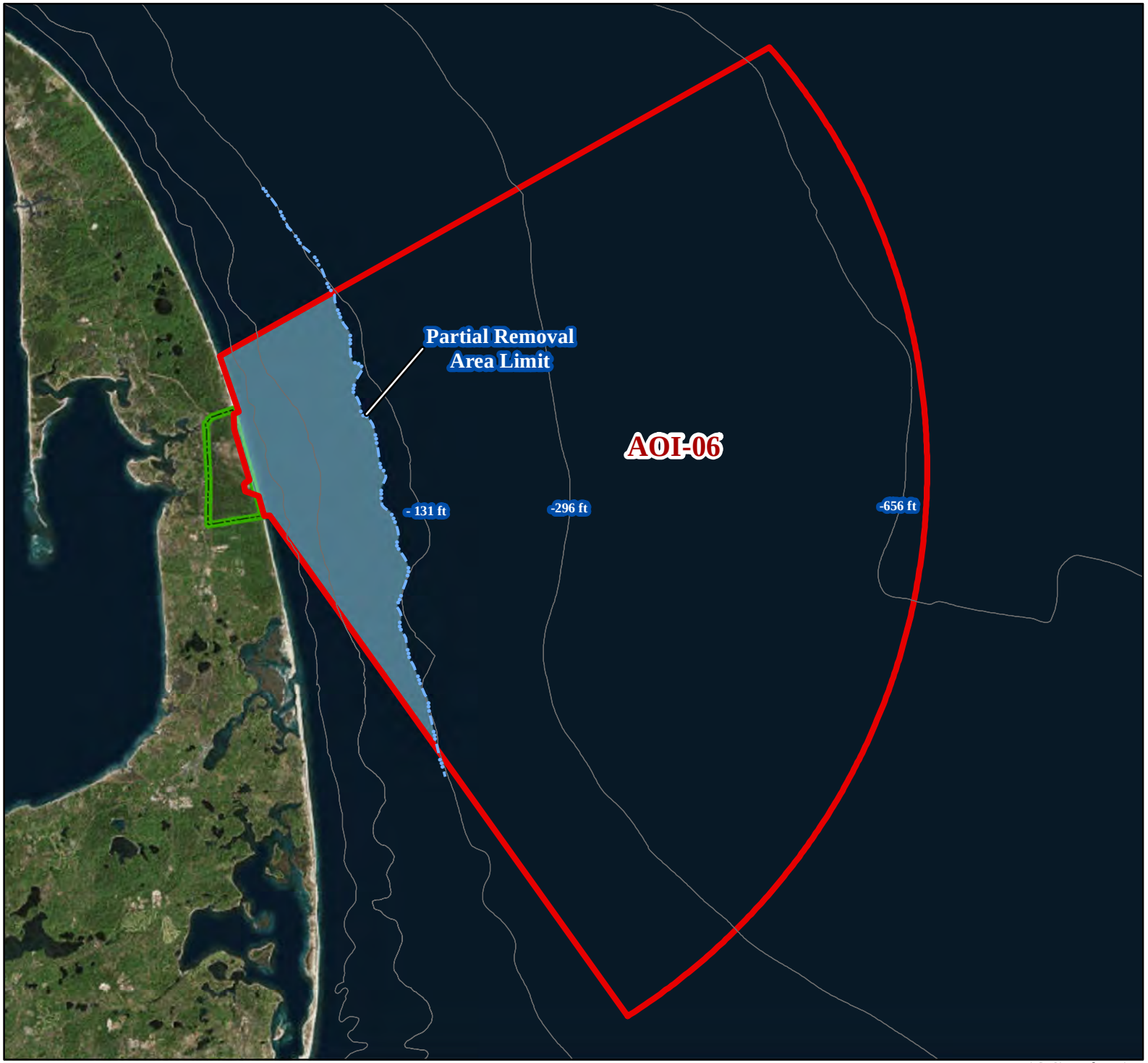

Legend

- Partial Removal Area Limit
- 120 ft Deep Recreational Diver's Limit (15,693 Acres)
- AOI-06
- Bathymetric Contours
- Camp Wellfleet Boundary
- Bathymetric Contours
- Camp Wellfleet Boundary

Aerial: ESRI Online
Bathymetry: EOEA Coastal Zone Management - Mass GIS
http://www.state.ma.us/mgis/
120 ft depth line derrived from NOAA navigation chart.

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Figure 6
AOI-06
Former Camp Wellfleet
Wellfleet, Barnstable County, Massachusetts

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Appendix B:
Post-Remedy Risk Management Methodology (RMM) Matrices

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Matrix 1 – Likelihood of Encounter. This matrix relates the site characterization data for amount of MEC to site use (including accessibility) to determine the likelihood of encountering MEC at a specific site

Matrix 1. Likelihood of Encounter

Likelihood of Encounter, Matrix 1: Amount of MEC vs. Access Conditions		**Access Conditions (frequency of use)**			
		Regular (e.g., daily use, open access)	**Often** (e.g., less regular or periodic use, some access)	**Intermittent** (e.g., some irregular use, or access limited)	**Rare** (e.g., very limited use, access prevented)
Amount of MEC	• MEC is visible on the surface and detected in the subsurface.	**Frequent**	**Frequent**	**Likely**	**Occasional**
	• The area is identified as a Concentrated Munitions Use Area (CMUA) where MEC is known or suspected (e.g., MD indicative of MEC is identified) to be present in surface and subsurface.	**Frequent**	**Likely**	**Occasional**	**Seldom**
	• **MEC presence based on physical evidence (e.g., MD indicative of MEC), although the area is not a CMUA**, or • The MEC concentration is below a project-specific threshold to support this selection (e.g., less than 1.0/acre at 95% confidence).	**Likely**	**Occasional**	**Seldom**	**Unlikely**
	• MEC presence is based on isolated historical discoveries (e.g., EOD report) prior to investigation, or • A DERP response action has been conducted to physically remove MEC and known or suspected hazard remains to support this selection, (e.g., surface removal where subsurface not addressed) or • The MEC concentration is below a project-specific threshold to support this selection (e.g., less than 0.5/acre at 95% confidence).	**Occasional**	**Seldom**	**Unlikely**	**Unlikely**
	• MEC presence is suspected based on historical evidence of munitions use only, or • A DERP response action has been conducted to physically remove surface and subsurface MEC (evidence that some residual hazard remains to support this selection), or • The MEC concentration is below a project-specific threshold to support this selection (e.g., less than 0.25/acre at 95% confidence).	**Seldom**	**Seldom**	**Unlikely**	**Unlikely**
	• Investigation of the MRS did not identify evidence of MEC presence, or • A DERP response action has been conducted that will achieve UU/UE.	**Unlikely**	**Unlikely**	**Unlikely**	**Unlikely**

Baseline Conditions	**Alternative 2**	**Alternative 3**

Baseline Conditions

Baseline Amount of MEC:

AOI-02 is the Former Artillery Firing Line for 90mm and other artillery, primarily firing out to sea. MEC presence has been established; while no MEC were found during the EE/CA or Removal Actions, a 76mm anti-aircraft artillery round was found in October 2016 and was determined to be MEC. The MEC item found was a result of the erosion of the high bluff with the item ultimately found in the beach area. As this AOI includes most of the Former Camp Wellfleet FUDS shoreline, it may also see munition items washing ashore following storm events.

MEC amount is based on physical evidence although there is no indication that the area is a CMUA. The 76mm MEC item was not considered an isolated discovery as the EE/CA reports many "OE" items being found in this area over the years. The MEC density (RI Report, Appendix B) is below the project-specific threshold of 1 TOI/acre. The following MEC and MD items were found in the surface or subsurface of AOI-02:

- MEC: 76mm anti-aircraft artillery. Remnants of packaging material were present on the item, indicating it had not been fired, and thus it is classified as discarded military munitions (DMM).
- MD: 50 caliber machine gun ammunition, fuze cans, shipping clips for 90mm fuzes, and 30 cal. ammunition cans, calcium hydride canisters, and unknown frag.

Baseline Access Conditions:

This AOI is a moderate to high traffic beach access area. It contains unpaved and paved trails and paved roads. While most of the northern part of AOI-02 contains high volume pedestrian and vehicle traffic associated with beach access, the central and southern portions contain a low volume of traffic because there are few trails and a high density of natural vegetation that limits pedestrian access. However, the southern beach areas are essentially open access through adjacent AOI-05. As there are no barriers to the beach, the access or frequency of use for AOI-02 is assessed as ***Regular***.

Baseline Matrix 1 Result: Based on Amount of MEC and Access Conditions, the Likelihood of Encounter for AOI-02 is ***Likely.***

Post-Remedy Matrix 1 Results:

No Action – Alternative 1 Does not change the baseline conditions.

Land Use Controls - Alternative 2

Using signage or educational LUC mitigation, the Likelihood of Encounter is **reduced from *Likely to Seldom.*** This is based on moving to the right in Matrix 1, to limited access based on pedestrians not ignoring signage or educational information to interact with MEC items.

Partial Subsurface MEC Removal with LUCs - Alternative 3

Following a partial MEC Removal to 3 ft bgs, the Likelihood of Encounter is **reduced from *Likely to Seldom.*** This is based on moving downward in Matrix 1 to a DERP response action that removes MEC and the subsequent rare occurrences of pedestrians encountering potential MEC items following the clearance.

Matrix 2 – Severity of Incident. This matrix assesses the likelihood of encounter rating (from Matrix 1) as related to the severity of an unintentional detonation.

Matrix 2. Severity of Incident

Severity of Explosive Incident, Matrix 2: Severity vs. Likelihood of Encounter		**Likelihood of Encounter**					
		Frequent: Regular, or inevitable occurrences	**Likely:** Several or numerous occurrences	**Occasional:** Sporadic or intermittent occurrences	**Seldom:** Infrequent, rare occurrences		**Unlikely:** Not probable
Severity Associated with Specific Munitions items	**Catastrophic/Critical:** May result in 1 or more deaths, permanent total or partial disability, or hospitalization	A	**A**	B	**B**	**B**	D
	Modest: May result in 1 (or more) injury resulting in emergency medical treatment, without hospitalization	B	B	B	C		D
	Minor: May result in 1 or more injuries requiring first aid or medical treatment	B	C	C	C		D
	Improbable: No injury is anticipated	D	D	D	D		D

Baseline Conditions

Baseline Severity of Incident:

Detonation of the identified MEC item while being handled by a human would likely result in at least partial disability or hospitalization (Catastrophic/Critical). Combined with a Frequent Likelihood of Encounter (Likely), this results in a worst-case AOI-02 ***Severity of Incident of A.***

Post-Remedy Matrix 2 Results:

No Action – Alternative 1 Does not change the baseline conditions.

Land Use Controls - Alternative 2

Using signage or educational LUC mitigation, the Matrix 1 Likelihood of Encounter is **reduced from *Likely to Seldom (B),*** based on infrequent or rare occurrences of pedestrians ignoring signage or educational information to interact with potential MEC items.

Partial Subsurface MEC Removal with LUCs - Alternative 3

Following partial MEC Removal to 3 ft bgs, the Likelihood of Encounter is **reduced from *Likely to Seldom (B).*** This is based on a DERP response action removing MEC and the subsequent rare occurrence of pedestrians encounter potential MEC items following the clearance.

Matrix 3 – Likelihood of Detonation. This matrix relates sensitivity of the MEC items to the likelihood for energy to be imparted to an item during an encounter by specific land users.

Matrix 3. Likelihood of Detonation

Likelihood of Detonation, Matrix 3: Munitions Sensitivity vs. Likelihood of Energy to be Imparted		**Likelihood to Impart Energy on an Item**			
		High e.g., areas planned for development, or seasonally tilled	***Modest*** e.g., undeveloped, wildlife refuge, parks	***Inconsequential*** e.g., not anticipated, prevented, mitigated	
Sensitivity: Susceptibility to Detonation	***High*** (e.g., classified as sensitive)	1	1	3	
	Moderate (e.g., high explosive (HE) or pyrotechnics)	1	**2**	**3**	**3**
	Low (e.g., propellant or bulk secondary explosives)	1	3	3	
	Not Sensitive	2	3	3	

Baseline Conditions

Baseline Sensitivity:

The identified MEC item contained some amount of HE. Therefore, the sensitivity is assessed as ***Moderate.***

Baseline Likelihood to Impart Energy:

AOI-02 is a regular, open access area. Park workers performing maintenance operations such as excavating or grading, could encounter MEC. Park visitors (treasure hunters, etc.) could use metal detectors to discover and excavate MEC, or MEC could be found following erosion from the bluffs and migration to the surface. Therefore, the likelihood to impart energy is assessed as ***Modest.***

Post-Remedy Matrix 3 Result:

No Action – Alternative 1 Does not change the baseline conditions.

Land Use Controls - Alternative 2

Using signage or educational LUC mitigation, the Likelihood to Impart Energy is **reduced from *Modest to Inconsequential (3)***. This is based on unanticipated or mitigated ability to impart energy to the MEC item following imposition of LUCs.

Partial Subsurface MEC Removal with LUCs - Alternative 3

Following partial MEC Removal to 3 ft bgs, the Likelihood to Impart Energy is **reduced from *Modest to Inconsequential (3)***. This is based on unanticipated or mitigated ability to impart energy to the MEC item following the clearance.

Matrix 4 – Acceptable and Unacceptable Site Conditions. This final matrix combines the results of Matrices 2 and 3 to differentiate Acceptable and Unacceptable site conditions.

Matrix 4: Acceptable and Unacceptable Site Conditions

Acceptable and Unacceptable Site Conditions		Result From Matrix 2			
		A	B	C	D
Result from Matrix 3	1	Unacceptable	Unacceptable	Unacceptable	Acceptable
	2	**Unacceptable**	Unacceptable	Acceptable	Acceptable
	3	Unacceptable	**Acceptable** / **Acceptable**	Acceptable	Acceptable

Baseline Conditions

The baseline risk matrices demonstrate that AOI-02 has an ***Unacceptable*** risk from MEC hazards due to the combination of severity of incident and likelihood of detonation factors.

Post Remedy Matrix 4 Result:

No Action – Alternative 1 Does not change the baseline conditions.

Land Use Controls - Alternative 2

Using signage or educational LUC mitigation, the Severity of Incident and Likelihood of Detonation matrices result in ***Acceptable*** **(B-3)** conditions.

Partial Subsurface MEC Removal with LUCs - Alternative 3

Following partial MEC Removal to 3 ft bgs, the Severity of Incident and Likelihood of Detonation matrices result in ***Acceptable*** **(B-3)** conditions**.**

Matrix 1 – Likelihood of Encounter. This matrix relates the site characterization data for amount of MEC to site use (including accessibility) to determine the likelihood of encountering MEC at a specific site

Matrix 1. Likelihood of Encounter

Likelihood of Encounter, Matrix 1: Amount of MEC vs. Access Conditions		**Access Conditions (frequency of use)**			
		Regular (e.g., daily use, open access)	**Often** (e.g., less regular or periodic use, some access)	**Intermittent** (e.g., some irregular use, or access limited)	**Rare** (e.g., very limited use, access prevented)
Amount of MEC	• MEC is visible on the surface and detected in the subsurface.	**Frequent**	**Frequent**	**Likely**	**Occasional**
	• The area is identified as a Concentrated Munitions Use Area (CMUA) where MEC is known or suspected (e.g., MD indicative of MEC is identified) to be present in surface and subsurface.	**Frequent**	**Likely**	**Occasional**	**Seldom**
	• **MEC presence based on physical evidence (e.g., MD indicative of MEC), although the area is not a CMUA**, or • The MEC concentration is below a project-specific threshold to support this selection (e.g., less than 1.0/acre at 95% confidence).	**Likely**	**Occasional**	**Seldom**	**Unlikely**
	• MEC presence is based on isolated historical discoveries (e.g., EOD report) prior to investigation, or • A DERP response action has been conducted to physically remove MEC and known or suspected hazard remains to support this selection, (e.g., surface removal where subsurface not addressed) or • The MEC concentration is below a project-specific threshold to support this selection (e.g., less than 0.5/acre at 95% confidence).	**Occasional**	**Seldom**	**Unlikely**	**Unlikely**
	• MEC presence is suspected based on historical evidence of munitions use only, or • A DERP response action has been conducted to physically remove surface and subsurface MEC (evidence that some residual hazard remains to support this selection), or • The MEC concentration is below a project-specific threshold to support this selection (e.g., less than 0.25/acre at 95% confidence).	**Seldom**	**Seldom**	**Unlikely**	**Unlikely**
	• Investigation of the MRS did not identify evidence of MEC presence, or • A DERP response action has been conducted that will achieve UU/UE.	**Unlikely**	**Unlikely**	**Unlikely**	**Unlikely**

Baseline Conditions | **Alternative 2** | **Alternative 3**

Baseline Conditions

Baseline Amount of MEC:

AOI-05 is a former Rocket Range and Small Arms Range. The small arms range has been completely covered by the large paved parking lot. The southern portion includes a 5-acre removal action area. Multiple pieces of frag from 3.5" rockets and 105mm projectiles found during the previous investigations or removal action are considered MD indicative of MEC.

MEC amount is based on physical evidence (MD indicative of MEC) although there is no indication that the area is a CMUA. As this AOI includes portions of the Former Camp Wellfleet FUDS shoreline, MEC finds could result from erosion of the bluffs and the subsequent migration of the item to the surface, or munition items could wash ashore following storm events.

In addition to the presence of MD indicative of MEC, the MEC density as shown in the DQO table in Appendix B is well below the project-specific threshold of 1 TOI/acre. The following MD indicative of MEC and MD items were found in the surface or subsurface of AOI-05:

- MD Indicative of MEC: HE frag from 3.5" Rockets and 105mm projectiles.
- MD: 50 cal bullet, miscellaneous scrap.

Baseline Access Conditions:

AOI-05 is a high traffic beach access area. It contains unpaved and paved trails, a paved road and a large paved parking lot. While there is some semi-dense natural vegetation that limits pedestrian access, there are no man-made barrier restrictions. Access to the beach is open with daily use. Therefore, the access or frequency of use for AOI-05 is assessed as ***Regular***.

Baseline Matrix 1 Result: Based on Amount of MEC and Access Conditions, the Likelihood of Encounter for AOI-05 is ***Likely.***

Post-Remedy Matrix 1 Results:

No Action – Alternative 1 Does not change the baseline conditions.

Land Use Controls - Alternative 2

Using signage or educational LUC mitigation, the Likelihood of Encounter is **reduced from *Likely to Seldom.*** This is based on moving to the right in Matrix 1, to limited access and a lower likelihood of encounter based on pedestrians not ignoring signage or educational information to interact with potential MEC items.

Partial Subsurface MEC Removal with LUCs - Alternative 3

Following a partial MEC Removal to 3 ft bgs, the Likelihood of Encounter is **reduced from *Likely to Seldom.*** This is based on moving downward in Matrix 1 to a DERP response action that removes MEC and the subsequent rare occurrences of pedestrians encountering potential MEC items following the clearance.

Matrix 2 – Severity of Incident. This matrix assesses the likelihood of encounter rating (from Matrix 1) as related to the severity of an unintentional detonation.

Matrix 2. Severity of Incident

Severity of Explosive Incident, Matrix 2: Severity vs. Likelihood of Encounter		**Likelihood of Encounter**					
		Frequent: Regular, or inevitable occurrences	**Likely:** Several or numerous occurrences	**Occasional:** Sporadic or intermittent occurrences	**Seldom:** Infrequent, rare occurrences		**Unlikely:** Not probable
Severity Associated with Specific Munitions items	**Catastrophic/Critical:** May result in 1 or more deaths, permanent total or partial disability, or hospitalization	A	**A**	B	**B**	**B**	D
	Modest: May result in 1 (or more) injury resulting in emergency medical treatment, without hospitalization	B	B	B	C		D
	Minor: May result in 1 or more injuries requiring first aid or medical treatment	B	C	C	C		D
	Improbable: No injury is anticipated	D	D	D	D		D

Baseline Conditions

Baseline Severity of Incident:

Detonation of the identified MEC item while being handled by a human would likely result in at least partial disability or hospitalization (Catastrophic/Critical). Combined with a Frequent Likelihood of Encounter (Likely), this results in a worst-case AOI-05 ***Severity of Incident of A.***

Post-Remedy Matrix 2 Results:

No Action – Alternative 1 Does not change the baseline conditions.

Land Use Controls - Alternative 2

Using signage or educational LUC mitigation, the Matrix 1 Likelihood of Encounter is **reduced from *Likely to Seldom (B),*** based on infrequent or rare occurrences of pedestrians ignoring signage or educational information to interact with potential MEC items.

Partial Subsurface MEC Removal with LUCs - Alternative 3

Following partial MEC Removal to 3 ft bgs, the Likelihood of Encounter is **reduced from *Likely to Seldom (B).*** This is based on a DERP response action removing MEC and the subsequent rare occurrence of pedestrians encounter potential MEC items following the clearance.

Matrix 3 – Likelihood of Detonation. This matrix relates sensitivity of the MEC items to the likelihood for energy to be imparted to an item during an encounter by specific land users.

Matrix 3. Likelihood of Detonation

Likelihood of Detonation, Matrix 3: Munitions Sensitivity vs. Likelihood of Energy to be Imparted		**Likelihood to Impart Energy on an Item**			
		High e.g., areas planned for development, or seasonally tilled	***Modest*** e.g., undeveloped, wildlife refuge, parks	***Inconsequential*** e.g., not anticipated, prevented, mitigated	
Sensitivity: Susceptibility to Detonation	***High*** (e.g., classified as sensitive)	1	1	3	
	Moderate (e.g., high explosive (HE) or pyrotechnics)	1	**2**	**3**	**3**
	Low (e.g., propellant or bulk secondary explosives)	1	3	3	
	Not Sensitive	2	3	3	

Baseline Conditions

Baseline Sensitivity:

The identified MEC item contained some amount of HE. Therefore, the sensitivity is assessed as ***Moderate.***

Baseline Likelihood to Impart Energy:

AOI-05 is a regular, open access area. Park workers performing maintenance operations such as excavating or grading, could encounter MEC. Park visitors (treasure hunters, etc) could use metal detectors to discover and excavate MEC, or MEC could be found following erosion from the bluffs and migration to the surface. Therefore, the likelihood to impart energy is assessed as ***Moderate.***

Post-Remedy Matrix 3 Result:

No Action – Alternative 1 Does not change the baseline conditions.

Land Use Controls - Alternative 2

Using signage or educational LUC mitigation, the Likelihood to Impart Energy is **reduced from *Modest to Inconsequential (3)***. This is based on unanticipated or mitigated ability to impart energy to the MEC item following imposition of LUCs.

Partial Subsurface MEC Removal with LUCs - Alternative 3

Following partial MEC Removal to 3 ft bgs, the Likelihood to Impart Energy is **reduced from *Modest to Inconsequential (3)***. This is based on unanticipated or mitigated ability to impart energy to the MEC item following the clearance.

Matrix 4 – Acceptable and Unacceptable Site Conditions. This final matrix combines the results of Matrices 2 and 3 to differentiate Acceptable and Unacceptable site conditions.

Matrix 4: Acceptable and Unacceptable Site Conditions

Acceptable and Unacceptable Site Conditions		Result From Matrix 2			
		A	B	C	D
Result from Matrix 3	1	Unacceptable	Unacceptable	Unacceptable	Acceptable
	2	**Unacceptable**	Unacceptable	Acceptable	Acceptable
	3	Unacceptable	**Acceptable** / **Acceptable**	Acceptable	Acceptable

Baseline Conditions

The baseline risk matrices demonstrate that AOI-05 has an ***Unacceptable*** risk from MEC hazards due to the combination of severity of incident and likelihood of detonation factors.

Post Remedy Matrix 4 Result:

No Action – Alternative 1 Does not change the baseline conditions.

Land Use Controls - Alternative 2

Using signage or educational LUC mitigation, the Severity of Incident and Likelihood of Detonation matrices result in ***Acceptable*** **(B-3)** conditions.

Partial Subsurface MEC Removal with LUCs - Alternative 3

Following partial MEC Removal to 3 ft bgs, the Severity of Incident and Likelihood of Detonation matrices result in ***Acceptable*** **(B-3)** conditions**.**

Matrix 1 – Likelihood of Encounter. This matrix relates the site characterization data for amount of MEC to site use (including accessibility) to determine the likelihood of encountering MEC at a specific site

Matrix 1. Likelihood of Encounter

Likelihood of Encounter, Matrix 1: Amount of MEC vs. Access Conditions		**Access Conditions (frequency of use)**			
		Regular (e.g., daily use, open access)	**Often** (e.g., less regular or periodic use, some access)	**Intermittent** (e.g., some irregular use, or access limited)	**Rare** (e.g., very limited use, access prevented)
Amount of MEC	• MEC is visible on the surface and detected in the subsurface.	**Frequent**	**Frequent**	**Likely**	**Occasional**
	• The area is identified as a Concentrated Munitions Use Area (CMUA) where MEC is known or suspected (e.g., MD indicative of MEC is identified) to be present in surface and subsurface.	**Frequent**	**Likely**	**Occasional**	**Seldom**
	• MEC presence based on physical evidence (e.g., MD indicative of MEC), although the area is not a CMUA, or • The MEC concentration is below a project-specific threshold to support this selection (e.g., less than 1.0/acre at 95% confidence).	**Likely**	**Occasional**	**Seldom**	**Unlikely**
	• MEC presence is based on isolated historical discoveries (e.g., EOD report) prior to investigation, or • A DERP response action has been conducted to physically remove MEC and known or suspected hazard remains to support this selection, (e.g., surface removal where subsurface not addressed) or • The MEC concentration is below a project-specific threshold to support this selection (e.g., less than 0.5/acre at 95% confidence).	**Occasional**	**Seldom**	**Unlikely**	**Unlikely**
	• **MEC presence is suspected based on historical evidence of munitions use only**, or • A DERP response action has been conducted to physically remove surface and subsurface MEC (evidence that some residual hazard remains to support this selection), or • The MEC concentration is below a project-specific threshold to support this selection (e.g., less than 0.25/acre at 95% confidence).	**Seldom**	**Seldom** **Seldom**	**Unlikely**	**Unlikely**
	• Investigation of the MRS did not identify evidence of MEC presence, or • A DERP response action has been conducted that will achieve UU/UE.	**Unlikely**	**Unlikely**	**Unlikely**	**Unlikely**

Baseline Conditions	**Alternative 2**	**Alternative 3**

Baseline Conditions

Baseline Amount of MEC:

AOI-06 is the Range Fan of Artillery Targets in Ocean. The RI assumed that MEC is potentially present in the ocean range fan, since anti-aircraft and rocket firing at targets over the ocean was conducted for approximately 20 years (i.e., historical evidence only). However, there is no known documentation of MEC or MD findings by fishermen or divers in the area.

This AOI could also be a source of MEC/MD to AOI-02 and AOI-05 if munition items wash ashore following storm events, but there is no strong evidence of this occurring on a frequent basis and the more likely source of MEC findings on the beach is erosion of the bluffs.

The following MEC items might conservatively be expected to be in the ocean range fan:

- MEC: 76mm anti-aircraft artillery, 90mm and 105mm projectiles, 3.5" rockets.

Baseline Access Conditions:

AOI-06 is the Ocean portion of the Artillery Range Fan. It is considered to be open access and daily use for recreational swimming, as well as fishing and diving. As there are no barriers to these waters, the access or frequency of use for AOI-06 is assessed as ***Regular***.

Baseline Matrix 1 Result: Based on Amount of MEC and Access Conditions, the Likelihood of Encounter for AOI-05 is ***Seldom.***

Post-Remedy Matrix 1 Results:

No Action – Alternative 1 Does not change the baseline conditions.

Land Use Controls - Alternative 2

Using signage or educational LUC mitigation, the Likelihood of Encounter remains at ***Seldom***. While the access condition is lowered from Regular to Often, based on moving to the right in Matrix 1 as a result of lower frequency of use due to educational awareness, this does not lower the overall Likelihood of Encounter.

Partial Subsurface MEC Removal with LUCs - Alternative 3

Following a partial MEC Removal to 3 ft bgs, with LUCs, the Likelihood of Encounter remains at ***Seldom***. While the access condition is lowered from Regular to Often, based on moving to the right in Matrix 1 as a result of lower frequency of use due to educational awareness, this does not lower the overall Likelihood of Encounter.

Matrix 2 – Severity of Incident. This matrix assesses the likelihood of encounter rating (from Matrix 1) as related to the severity of an unintentional detonation.

Matrix 2. Severity of Incident

Severity of Explosive Incident, Matrix 2: Severity vs. Likelihood of Encounter		**Likelihood of Encounter**						
		Frequent: Regular, or inevitable occurrences	**Likely:** Several or numerous occurrences	**Occasional:** Sporadic or intermittent occurrences	**Seldom:** Infrequent, rare occurrences			**Unlikely:** Not probable
Severity Associated with Specific Munitions items	**Catastrophic/Critical:** May result in 1 or more deaths, permanent total or partial disability, or hospitalization	A	A	B	**B**	**B**	**B**	D
	Modest: May result in 1 (or more) injury resulting in emergency medical treatment, without hospitalization	B	B	B	C			D
	Minor: May result in 1 or more injuries requiring first aid or medical treatment	B	C	C	C			D
	Improbable: No injury is anticipated	D	D	D	D			D

Baseline Conditions

Baseline Severity of Incident:

Detonation of the identified MEC items while being handled by a human would likely result in at least partial disability or hospitalization (Catastrophic/Critical). Combined with a Frequent Likelihood of Encounter (Seldom), this results in a worst-case AOI-06 ***Severity of Incident of B.***

Post-Remedy Matrix 2 Results:

No Action – Alternative 1 Does not change the baseline conditions.

Land Use Controls - Alternative 2

Using signage or educational LUC mitigation, the Severity of Incident remains at ***B,*** infrequent or rare occurrences.

Partial Subsurface MEC Removal with LUCs - Alternative 3

Following partial MEC Removal the Severity of Incident remains at ***B,*** infrequent or rare occurrences.

Matrix 3 – Likelihood of Detonation. This matrix relates sensitivity of the MEC items to the likelihood for energy to be imparted to an item during an encounter by specific land users.

Matrix 3. Likelihood of Detonation

Likelihood of Detonation, Matrix 3: Munitions Sensitivity vs. Likelihood of Energy to be Imparted		**Likelihood to Impart Energy on an Item**			
		High e.g., areas planned for development, or seasonally tilled	***Modest*** e.g., undeveloped, wildlife refuge, parks	***Inconsequential*** e.g., not anticipated, prevented, mitigated	
Sensitivity: Susceptibility to Detonation	***High*** (e.g., classified as sensitive)	1	1	3	
	Moderate (e.g., high explosive (HE) or pyrotechnics)	1	**2**	**3**	**3**
	Low (e.g., propellant or bulk secondary explosives)	1	3	3	
	Not Sensitive	2	3	3	

Baseline Conditions

Baseline Sensitivity:

The identified MEC items contained some amount of HE. Therefore, the sensitivity is assessed as ***Moderate.***

Baseline Likelihood to Impart Energy:

AOI-06 is an open access and daily use area for recreational swimming, as well as fishing and diving. However, recreational users are not very likely to encounter MEC, although it is possible. Therefore, the likelihood to impart energy is assessed as ***Modest.***

Post-Remedy Matrix 3 Result:

No Action – Alternative 1 Does not change the baseline conditions.

Land Use Controls - Alternative 2

Using signage or educational LUC mitigation, the Likelihood to Impart Energy is **reduced from *Modest to Inconsequential (3)***. This is based on the mitigated ability to impart energy to the MEC item following behavioral modification associated with the imposition of LUCs.

Partial Subsurface MEC Removal with LUCs - Alternative 3

Following partial MEC Removal, the Likelihood to Impart Energy is **reduced from *Modest to Inconsequential (3)***. This is based on the mitigated ability to impart energy to a MEC item following the clearance.

Matrix 4 – Acceptable and Unacceptable Site Conditions. This final matrix combines the results of Matrices 2 and 3 to differentiate Acceptable and Unacceptable site conditions.

Matrix 4: Acceptable and Unacceptable Site Conditions

Acceptable and Unacceptable Site Conditions		Result From Matrix 2			
		A	B	C	D
Result from Matrix 3	1	Unacceptable	Unacceptable	Unacceptable	Acceptable
	2	Unacceptable	**Unacceptable**	Acceptable	Acceptable
	3	Unacceptable	**Acceptable** / **Acceptable**	Acceptable	Acceptable

Baseline Conditions

The baseline risk matrices demonstrate that AOI-06 has an ***Unacceptable*** risk from MEC hazards due to the combination of severity of incident and likelihood of detonation factors.

Post Remedy Matrix 4 Result:

No Action – Alternative 1 Does not change the baseline conditions.

Land Use Controls - Alternative 2

Using signage or educational LUC mitigation, the Severity of Incident and Likelihood of Detonation matrices result in ***Acceptable*** **(B-3)** conditions.

Partial Subsurface MEC Removal with LUCs - Alternative 3

Following partial MEC Removal, the Severity of Incident and Likelihood of Detonation matrices result in ***Acceptable*** **(B-3)** conditions**.**

Appendix C:
Costing Detail

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APPENDIX C: FORMER CAMP WELLFLEET FUDS
FEASIBILITY STUDY COST SUMMARY SHEET

	Alternative 1	Alternative 2			Alternative 3		
	No Action	Land Use Controls			Partial MEC Removal with LUCs		
		Capital	O&M	TOTAL	Capital	O&M	TOTAL
AOI-2	$ -	$ 153,451.00	$ 476,332.00	**$ 629,783.00**	$ 1,473,531.00	$ 476,332.00	**$ 1,949,863.00**
AOI-5	$ -	$ 146,646.00	$ 476,332.00	**$ 622,978.00**	$ 1,296,299.00	$ 476,332.00	**$ 1,772,631.00**
AOI-6	$ -	$ 131,690.00	$ 476,332.00	**$ 608,022.00**	$ 155,049,559.00	$ 476,332.00	**$ 155,525,891.00**

Assumptions:

	Number of signs	Area (acres)	Removal area (acres)
AOI-2	4	275	39.2
AOI-5	2	56.1	30.1
AOI-6	4	167,856	15,693

LUCs

Planning Document includes LUCIP of low complexity and one meeting.
Signs are assumed for costing purposes. Cost is $531.00 each, without markup.
Periodic review for AOI-2 and AOI-5 includes Document Review, Site Inspection, Report, and Travel. Six reviews beginning in 2024.
Periodic review for AOI-6 includes Document Review, Interviews (Staff Management, Community Groups, State Contacts, and Local Gov't Contacts), and Report. Six reviews beginning in 2024.
30-year O&M for all AOIs includes 15 site visits and reports (biennial).

Partial MEC Removal with LUCs, AOI-2 and AOI-5 (Land)

Includes 3 meetings, 1 site visit, UFP QAPP, GIS, CRP, ESS, HASP, Cultural and Archaeological Plan, Environmental Plan.
50% with AGC, 50% Mag & Dig.
Anomaly Density 100/acre.
Removal areas shown in Figures 4 and 5.
No Onsite Donor Explosive Storage.
Topography is gently rolling, vegetation is "Heavy Grass with Numerous Shrubs." Vegetaion removal cost reflects expected limitations set by NPS (i.e., species may be prohibited from being cut).
Vegetation removal is 25% moderate removal, 50% light removal, 25% no removal (areas where cutting prohibited).
Reports include After Action Report, Independent Blind Seed Tracking, IVS Memo, Anomaly Selection Memo, TOI Memo.
Remedial Action starts June 2020.
LUCIP of low complexity to establish educational awareness measures.
30-year O&M for all AOIs includes 15 site visits and reports (biennial).

Partial MEC Removal with LUCs, AOI-6 (Water)

Includes 3 meetings, 1 site visit, UFP QAPP, GIS Database, CRP, ESS, PMP, QASP, HASP.
100% DGM (no AGC) in ocean with towed array of sensors (mag/EM unspecified).
Anomaly Density 20/acre (313,000 anomalies). Assuming 10 rounds/day from 16 cannons, for 5 days a week, for 15 years (16 x 10 x 5 x 52 x 15) = 624,000 rounds fired. Assume half of that is within target zone (313,000)
Removal area shown in Figure 6 (shoreline to 120 ft depth contour).
Dive team is 2 divers (one active, one safety), one tender, and one boat operator. Dive supervisor is assumed to be the SUXOS.
One dive team assumed to be able to complete 1 acre or 20 anomalies/day on average. Thus field duration is 15693 days assuming one dive team. Assuming 260 work days/year, duration is over 60 years. Assuming 10 dive teams, duriation is 6 years.
Reports include After Action Report, IVS Memo, Anomaly Selection Memo.
LUCIP to establish educational awareness measures. The need for signs assumes none placed as part of AOI-02 or AOI-05.
30-year O&M for all AOIs includes 15 site visits and reports (biennial).

Costs developed using RACER 11.5.99 (2018).

Estimate Documentation Detailed Report - Layout 2

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: N:\Projects_Ongoing\3752-Camp Wellfleet\06_FS Report\RACER\Racer_Backup_7_31_2019.mdb

Folder:

Folder Name: Wellfleet

Project:

ID: Alternative 2
Name: Administrative LUC
Category: None

Location
State / Country: MASSACHUSETTS
City: CAPE COD

Location Modifier	Default	User	Reason for changes
	1.180	1.180	

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

Description Administrative Land Use Controls (LUCs) including signs

Estimate Documentation Detailed Report - Layout 2

Site:

ID: AOI-2
Name: Area of Interest 2
Type: None

Media/Waste Type

Primary: Ordnance (not residual)
Secondary: N/A

Contaminant

Primary: Ordnance (not residual)
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☐	
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☐	
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: Area of Interest 2 (AOI-2)
Former Artillery Firing Line
Support Team: Michelle Chesnut
References: Final Remedial Investigation Report, Former Camp Wellfleet FUDS Remedial Investigation Through Decision Document, Wellfleet, Massachusetts (April 2019)

Estimator Information

Estimator Name: James Stuby
Estimator Title: Project Geophysicist
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Lane
Suite 300
Laurel, MD 20707
Telephone Number: 301-323-1429
Email Address: james.stuby@ertcorp.com
Estimate Prepared Date: 06/24/2019

Estimator Signature: _____ **Date:** _____

Estimate Documentation Detailed Report - Layout 2

Reviewer Information

Reviewer Name: Thomas Bachovchin
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Lane
Suite 300
Laurel, MD 20707
Telephone Number: 301-323-1442
Email Address: thomas.bachovchin@ertcorp.com
Date Reviewed: 06/24/2019

Reviewer Signature: _____ **Date:** _____

Estimate Costs:

Phase Names	Marked-Up Cost
Periodic Review	$70,384
Administrative LUC (signs)	$83,067
30-Year O&M	$476,332
Total Cost:	$629,782
Escalation:	$191,354
Total Project Cost:	$821,136

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Periodic Review
Description: Periodic Review
Approach: Ex Situ
Start Date: June, 2024
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: $70,383.52

Estimate Documentation Detailed Report - Layout 2

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		No	n/a
Site Inspection		Yes	n/a
Report		Yes	n/a
Travel		Yes	n/a
Rebound Study		No	n/a
Start Month		June	n/a
No. Reviews		6	EA
Start Year		2024	n/a
Safety Level		D	n/a
Document Review			
Required Parameters			
5-Year Review Check List		Yes	n/a
Record of Decision		No	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		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		No	n/a
Site Visit Documentation (Photos, Diagrams, etc.)		Yes	n/a
Report			
Required Parameters			
Introduction		No	n/a
Remedial Objectives		No	n/a
ARARs Review		No	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			
Summary of Site Visit		Yes	n/a
Areas of Non Compliance		Yes	n/a
Technology Recommendations		No	n/a
Statement of Protectiveness		No	n/a
Next Review		No	n/a
Implementation Requirements		No	n/a
Travel			
Required Parameters			
Number of Travelers		1	EA
Number of Days		1	EA
Air Fare Ticket Price		500.00	$
Need a rental car?		Yes	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: Administrative LUC (signs)
Description: Administrative Land Use Controls including signs (4 signs)

Start Date: June, 2019
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: $83,066.79

Technologies:

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#1)**

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		2019	n/a
Implementation		Yes	n/a
Implementation: Start Date		2019	n/a
Monitoring & Enforcement		No	n/a
Modification/Termination		No	n/a
Type of Site		Active 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)		No	n/a
Memorandum of Agreements (MOA): Number		0	EA
Installation (or City) Master Plan		No	n/a
Construction Permitting		No	n/a
Construction Permitting: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		0	EA
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		1	EA
LUCIP: Number of Days		1	EA
LUCIP: Airfare Cost		1.00	$
LUCIP: Mileage to Meeting Site		100	MI
LTS: Number of Meetings		0	EA

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#1)**

User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	Default	User	UOM
Planning Meetings			
Required Parameters			
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		0	EA
MOA: Number of People		0	EA
MOA: Number of Days		0	EA
MOA: Airfare Cost		0.00	$
MOA: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		0	EA
Master Plan: Number of People		0	EA
Master Plan: Number of Days		0	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		0	EA
GIS/Overlay Maps: Number of People		0	EA
GIS/Overlay Maps: Number of Days		0	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		No	n/a
Deed Notification: Number		0	EA
Negotiating Easements		No	n/a
Negotiating Easements: Number		0	EA
Restrictive Covenants		No	n/a
Restrictive Covenants: Number		0	EA
Equitable Servitudes		No	n/a
Equitable Servitudes: Number		0	EA
Access Control Signs		Yes	n/a
Access Control Signs: Number		4	EA
Access Control Signs: Task Complexity		Low	n/a
Utility Notification Service		Yes	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#1)**

User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	Default	User	UOM
Implementation			
Required Parameters			
Access Control Signs: Number		1	EA
Access Control Signs: Task Complexity		Low	n/a
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		0	EA
Develop Finding of Suitability to Transfer (FOST)		No	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: 30-Year O&M
Description: 30-Year O&M

Start Date: June, 2019
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: $476,331.86

Technologies:

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#1)**

User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	Default	User	UOM
System Definition			
Required Parameters			
Rename Model		ADMINISTRATIVE LAND USE CONTROLS	n/a
Planning Documents		No	n/a
Implementation		No	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2019	n/a
Modification/Termination		No	n/a
Type of Site		Active Government Installation	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		Biennially	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		2	Days
Site Visits/Inspections: Number of People		1	EA
Site Visits/Inspections: Frequency		Biennially	n/a
Site Visits/Inspections: Airfare		500	$ Per Ticket
Site Visits/Inspections: Mileage		100	MI

Comments:

Estimate Documentation Detailed Report - Layout 2

Technology: ADMINISTRATIVE LAND USE CONTROLS

Element: Planning Docs

Year(s)	Cost per Year
2019	$38,432.02

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	22.00	HR	0.00	234.00	0.00	0.00	$5,148.07	No
33220105	Project Engineer	30.00	HR	0.00	198.39	0.00	0.00	$5,951.62	No
33220106	Staff Engineer	45.00	HR	0.00	204.33	0.00	0.00	$9,194.80	No
33220110	QA/QC Officer	11.00	HR	0.00	160.15	0.00	0.00	$1,761.69	No
33220114	Word Processing/Clerical	60.00	HR	0.00	109.73	0.00	0.00	$6,584.04	No
33220115	Draftsman/CADD	30.00	HR	0.00	127.89	0.00	0.00	$3,836.83	No
33220503	Attorney, Partner, Real Estate	22.00	HR	0.00	245.19	0.00	0.00	$5,394.14	No
33240101	Other Direct Costs	1.00	LS	560.83	0.00	0.00	0.00	$560.83	No

Total First Year Element Cost: $38,432.02

Element: Planning Meetings

Year(s)	Cost per Year
2019	$13,006.55

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	100.00	MI	0.00	0.00	0.00	0.32	$31.86	No
33010108	Sedan, Automobile, Rental	2.00	DAY	0.00	0.00	0.00	75.45	$150.91	No
33010202	Per Diem (per person)	3.00	DAY	0.00	0.00	0.00	229.87	$689.61	No
33022038	Overnight delivery service, 1 lb package	1.00	LB	0.00	0.00	0.00	72.00	$72.00	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	1.00	$1.00	No
33220102	Project Manager	39.00	HR	0.00	234.00	0.00	0.00	$9,126.12	No
33220114	Word Processing/Clerical	16.00	HR	0.00	109.73	0.00	0.00	$1,755.74	No
33220115	Draftsman/CADD	8.00	HR	0.00	127.89	0.00	0.00	$1,023.15	No
33240101	Other Direct Costs	1.00	LS	156.15	0.00	0.00	0.00	$156.15	No

Total First Year Element Cost: $13,006.55

Element: Implementation

Year(s)	Cost per Year

Estimate Documentation Detailed Report - Layout 2

Technology: ADMINISTRATIVE LAND USE CONTROLS

2019 $31,628.22

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
18010412	Construction Signs	72.00	SF	44.03	0.00	0.00	0.00	$3,170.08	No
33220102	Project Manager	15.00	HR	0.00	234.00	0.00	0.00	$3,510.05	No
33220105	Project Engineer	30.00	HR	0.00	198.39	0.00	0.00	$5,951.62	No
33220106	Staff Engineer	45.00	HR	0.00	204.33	0.00	0.00	$9,194.80	No
33220110	QA/QC Officer	8.00	HR	0.00	160.15	0.00	0.00	$1,281.23	No
33220114	Word Processing/Clerical	30.00	HR	0.00	109.73	0.00	0.00	$3,292.02	No
33220115	Draftsman/CADD	38.00	HR	0.00	127.89	0.00	0.00	$4,859.99	No
33240101	Other Direct Costs	1.00	LS	368.43	0.00	0.00	0.00	$368.43	No

Total First Year Element Cost: $31,628.22

Total First Year Tech Cost: $83,066.79

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Monitoring & Enforcement	2019	$31,755.46	$31,755.46
Monitoring & Enforcement	2021	$31,755.46	$31,755.46
Monitoring & Enforcement	2023	$31,755.46	$31,755.46
Monitoring & Enforcement	2025	$31,755.46	$31,755.46
Monitoring & Enforcement	2027	$31,755.46	$31,755.46
Monitoring & Enforcement	2029	$31,755.46	$31,755.46
Monitoring & Enforcement	2031	$31,755.46	$31,755.46
Monitoring & Enforcement	2033	$31,755.46	$31,755.46
Monitoring & Enforcement	2035	$31,755.46	$31,755.46
Monitoring & Enforcement	2037	$31,755.46	$31,755.46
Monitoring & Enforcement	2039	$31,755.46	$31,755.46
Monitoring & Enforcement	2041	$31,755.46	$31,755.46
Monitoring & Enforcement	2043	$31,755.46	$31,755.46
Monitoring & Enforcement	2045	$31,755.46	$31,755.46
Monitoring & Enforcement	2047	$31,755.46	$31,755.46

Total Marked Up Tech Cost: $476,331.90

Technology: ADMINISTRATIVE LAND USE CONTROLS

Element: Monitoring & Enforcement

Year(s)	Cost per Year
2019	$31,755.46
2020	$0.00
2021	$31,755.46

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Technology: ADMINISTRATIVE LAND USE CONTROLS

2022	$0.00
2023	$31,755.46
2024	$0.00
2025	$31,755.46
2026	$0.00
2027	$31,755.46
2028	$0.00
2029	$31,755.46
2030	$0.00
2031	$31,755.46
2032	$0.00
2033	$31,755.46
2034	$0.00
2035	$31,755.46
2036	$0.00
2037	$31,755.46
2038	$0.00
2039	$31,755.46
2040	$0.00
2041	$31,755.46
2042	$0.00
2043	$31,755.46
2044	$0.00
2045	$31,755.46
2046	$0.00
2047	$31,755.46
2048	$0.00

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	100.00	MI	0.00	0.00	0.00	0.32	$31.86	No
33010108	Sedan, Automobile, Rental	3.00	DAY	0.00	0.00	0.00	75.45	$226.36	No
33010202	Per Diem (per person)	5.00	DAY	0.00	0.00	0.00	229.87	$1,149.35	No
33022038	Overnight delivery service, 1 lb package	6.00	LB	0.00	0.00	0.00	72.00	$432.01	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	500.00	$500.00	No
33220102	Project Manager	44.00	HR	0.00	285.37	0.00	0.00	$12,556.26	No
33220106	Staff Engineer	40.00	HR	0.00	249.18	0.00	0.00	$9,967.26	No
33220110	QA/QC Officer	4.00	HR	0.00	160.15	0.00	0.00	$640.61	No
33220112	Field Technician	1.00	HR	0.00	135.87	0.00	0.00	$135.87	No
33220114	Word Processing/Clerical	26.00	HR	0.00	133.82	0.00	0.00	$3,479.37	No

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Technology: ADMINISTRATIVE LAND USE CONTROLS

33220115	Draftsman/CADD	16.00	HR	0.00	127.89	0.00	0.00	$2,046.31	No
33220119	Health and Safety Officer	1.00	HR	0.00	209.35	0.00	0.00	$209.35	No
33240101	Other Direct Costs	1.00	LS	380.83	0.00	0.00	0.00	$380.83	No

Total First Year Element Cost: $31,755.46

Total First Year Tech Cost: $31,755.46

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2024	$454.68	$454.68
Document Review	2029	$454.68	$454.68
Document Review	2034	$454.68	$454.68
Document Review	2039	$454.68	$454.68
Document Review	2044	$454.68	$454.68
Document Review	2049	$454.68	$454.68
Site Inspection	2024	$3,010.44	$3,010.44
Site Inspection	2029	$3,010.44	$3,010.44
Site Inspection	2034	$3,010.44	$3,010.44
Site Inspection	2039	$3,010.44	$3,010.44
Site Inspection	2044	$3,010.44	$3,010.44
Site Inspection	2049	$3,010.44	$3,010.44
Report	2024	$7,460.14	$7,460.14
Report	2029	$7,460.14	$7,460.14
Report	2034	$7,460.14	$7,460.14
Report	2039	$7,460.14	$7,460.14
Report	2044	$7,460.14	$7,460.14
Report	2049	$7,460.14	$7,460.14
Travel	2024	$805.32	$805.32
Travel	2029	$805.32	$805.32
Travel	2034	$805.32	$805.32
Travel	2039	$805.32	$805.32
Travel	2044	$805.32	$805.32
Travel	2049	$805.32	$805.32

Total Marked Up Tech Cost: $70,383.48

Technology: Five-Year Review
Element: Document Review

Year(s)	Cost per Year
2024	$454.68
2025 - 2028	$0.00
2029	$454.68
2030 - 2033	$0.00

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Technology: Five-Year Review

2034	$454.68
2035 - 2038	$0.00
2039	$454.68
2040 - 2043	$0.00
2044	$454.68
2045 - 2048	$0.00
2049	$454.68

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220105	Project Engineer	1.00	HR	0.00	241.94	0.00	0.00	$241.94	No
33220109	Staff Scientist	1.00	HR	0.00	212.75	0.00	0.00	$212.75	No

Total First Year Element Cost: $454.68

Element: Site Inspection

Year(s)	Cost per Year
2024	$3,010.44
2025 - 2028	$0.00
2029	$3,010.44
2030 - 2033	$0.00
2034	$3,010.44
2035 - 2038	$0.00
2039	$3,010.44
2040 - 2043	$0.00
2044	$3,010.44
2045 - 2048	$0.00
2049	$3,010.44

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	3.00	HR	0.00	285.37	0.00	0.00	$856.11	No
33220105	Project Engineer	3.00	HR	0.00	241.94	0.00	0.00	$725.81	No
33220108	Project Scientist	3.00	HR	0.00	263.43	0.00	0.00	$790.28	No
33220109	Staff Scientist	3.00	HR	0.00	212.75	0.00	0.00	$638.24	No

Total First Year Element Cost: $3,010.44

Element: Report

Year(s)	Cost per Year
2024	$7,460.14
2025 - 2028	$0.00
2029	$7,460.14
2030 - 2033	$0.00

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Technology: Five-Year Review

2034	$7,460.14
2035 - 2038	$0.00
2039	$7,460.14
2040 - 2043	$0.00
2044	$7,460.14
2045 - 2048	$0.00
2049	$7,460.14

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	285.37	0.00	0.00	$1,141.48	No
33220105	Project Engineer	11.00	HR	0.00	241.94	0.00	0.00	$2,661.29	No
33220108	Project Scientist	5.00	HR	0.00	263.43	0.00	0.00	$1,317.14	No
33220109	Staff Scientist	11.00	HR	0.00	212.75	0.00	0.00	$2,340.23	No

Total First Year Element Cost: $7,460.14

Element: Travel

Year(s)	Cost per Year
2024	$805.32
2025 - 2028	$0.00
2029	$805.32
2030 - 2033	$0.00
2034	$805.32
2035 - 2038	$0.00
2039	$805.32
2040 - 2043	$0.00
2044	$805.32
2045 - 2048	$0.00
2049	$805.32

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	1.00	DAY	0.00	0.00	0.00	75.45	$75.45	No
33010202	Per Diem (per person)	1.00	DAY	0.00	0.00	0.00	229.87	$229.87	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	500.00	$500.00	No

Total First Year Element Cost: $805.32

Total First Year Tech Cost: $11,730.59

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2024	$454.68	$454.68

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Document Review	2029	$454.68	$454.68
Document Review	2034	$454.68	$454.68
Document Review	2039	$454.68	$454.68
Document Review	2044	$454.68	$454.68
Document Review	2049	$454.68	$454.68
Site Inspection	2024	$3,010.44	$3,010.44
Site Inspection	2029	$3,010.44	$3,010.44
Site Inspection	2034	$3,010.44	$3,010.44
Site Inspection	2039	$3,010.44	$3,010.44
Site Inspection	2044	$3,010.44	$3,010.44
Site Inspection	2049	$3,010.44	$3,010.44
Report	2024	$7,460.14	$7,460.14
Report	2029	$7,460.14	$7,460.14
Report	2034	$7,460.14	$7,460.14
Report	2039	$7,460.14	$7,460.14
Report	2044	$7,460.14	$7,460.14
Report	2049	$7,460.14	$7,460.14
Travel	2024	$805.32	$805.32
Travel	2029	$805.32	$805.32
Travel	2034	$805.32	$805.32
Travel	2039	$805.32	$805.32
Travel	2044	$805.32	$805.32
Travel	2049	$805.32	$805.32
		Total Marked Up Tech Cost:	$70,383.48

AOI-02, Alternative 2: Land Use Controls
Project Assembly Level Data Report

Note: Costs are direct (no markup)

Phase Name	Tech. Key	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	units	Cost
LAND USE CONTROLS	28	LAND USE CONTROLS	18010412	Construction Signs	72	SF	29.50	0.00	0.00	0.00	2,124.00		
LAND USE CONTROLS	28	LAND USE CONTROLS	33010104	Vehicle mileage charge, car or van	100	MI	0.00	0.00	0.00	0.32	31.86		
LAND USE CONTROLS	28	LAND USE CONTROLS	33010108	Sedan, Automobile, Rental	2	DAY	0.00	0.00	0.00	62.94	125.88		
LAND USE CONTROLS	28	LAND USE CONTROLS	33010202	Per Diem (per person)	3	DAY	0.00	0.00	0.00	229.87	689.61		
LAND USE CONTROLS	28	LAND USE CONTROLS	33022038	Overnight delivery service, 1 lb package	1	LB	0.00	0.00	0.00	60.06	60.06		
LAND USE CONTROLS	28	LAND USE CONTROLS	33041101	Airfare	1	LS	0.00	0.00	0.00	1.00	1.00		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220102	Project Manager	15	HR	0.00	82.26	0.00	0.00	1,233.87		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220102	Project Manager	22	HR	0.00	82.26	0.00	0.00	1,809.67		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220102	Project Manager	39	HR	0.00	82.26	0.00	0.00	3,208.05		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220105	Project Engineer	30	HR	0.00	69.74	0.00	0.00	2,092.14		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220105	Project Engineer	30	HR	0.00	69.74	0.00	0.00	2,092.14		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220106	Staff Engineer	45	HR	0.00	71.83	0.00	0.00	3,232.20		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220106	Staff Engineer	45	HR	0.00	71.83	0.00	0.00	3,232.20		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220110	QA/QC Officer	11	HR	0.00	56.30	0.00	0.00	619.28		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220110	QA/QC Officer	8	HR	0.00	56.30	0.00	0.00	450.38		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220114	Word Processing/Clerical	30	HR	0.00	38.57	0.00	0.00	1,157.23		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220114	Word Processing/Clerical	60	HR	0.00	38.57	0.00	0.00	2,314.45		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220114	Word Processing/Clerical	16	HR	0.00	38.57	0.00	0.00	617.19		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220115	Draftsman/CADD	8	HR	0.00	44.96	0.00	0.00	359.66		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220115	Draftsman/CADD	38	HR	0.00	44.96	0.00	0.00	1,708.40		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220115	Draftsman/CADD	30	HR	0.00	44.96	0.00	0.00	1,348.74		
LAND USE CONTROLS	28	LAND USE CONTROLS	33220503	Attorney, Partner, Real Estate	22	HR	0.00	164.28	0.00	0.00	3,614.15		
LAND USE CONTROLS	28	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	246.86	0.00	0.00	0.00	246.86		
LAND USE CONTROLS	28	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	375.77	0.00	0.00	0.00	375.77		
LAND USE CONTROLS	28	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	104.62	0.00	0.00	0.00	104.62		
										Total	32,849.41	1	$ 32,849.41
30-Year O&M	36	LAND USE CONTROLS	33010104	Vehicle mileage charge, car or van	100	MI	0.00	0.00	0.00	0.32	31.86		
30-Year O&M	36	LAND USE CONTROLS	33010108	Sedan, Automobile, Rental	3	DAY	0.00	0.00	0.00	62.94	188.82		
30-Year O&M	36	LAND USE CONTROLS	33010202	Per Diem (per person)	5	DAY	0.00	0.00	0.00	229.87	1,149.35		
30-Year O&M	36	LAND USE CONTROLS	33022038	Overnight delivery service, 1 lb package	6	LB	0.00	0.00	0.00	60.06	360.37		
30-Year O&M	36	LAND USE CONTROLS	33041101	Airfare	1	LS	0.00	0.00	0.00	500.00	500.00		
30-Year O&M	36	LAND USE CONTROLS	33220102	Project Manager	44	HR	0.00	100.31	0.00	0.00	4,413.83		
30-Year O&M	36	LAND USE CONTROLS	33220106	Staff Engineer	40	HR	0.00	87.59	0.00	0.00	3,503.74		
30-Year O&M	36	LAND USE CONTROLS	33220110	QA/QC Officer	4	HR	0.00	56.30	0.00	0.00	225.19		
30-Year O&M	36	LAND USE CONTROLS	33220112	Field Technician	1	HR	0.00	47.76	0.00	0.00	47.76		
30-Year O&M	36	LAND USE CONTROLS	33220114	Word Processing/Clerical	26	HR	0.00	47.04	0.00	0.00	1,223.08		
30-Year O&M	36	LAND USE CONTROLS	33220115	Draftsman/CADD	16	HR	0.00	44.96	0.00	0.00	719.33		
30-Year O&M	36	LAND USE CONTROLS	33220119	Health and Safety Officer	1	HR	0.00	73.59	0.00	0.00	73.59		
30-Year O&M	36	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	255.16	0.00	0.00	0.00	255.16		
										Total	12,692.09	15	$190,381.42
Periodic Review	46	Periodic Review	33010108	Sedan, Automobile, Rental	1	DAY	0.00	0.00	0.00	62.94	62.94		
Periodic Review	46	Periodic Review	33010202	Per Diem (per person)	1	DAY	0.00	0.00	0.00	229.87	229.87		
Periodic Review	46	Periodic Review	33041101	Airfare	1	LS	0.00	0.00	0.00	500.00	500.00		
Periodic Review	46	Periodic Review	33220102	Project Manager	3	HR	0.00	100.31	0.00	0.00	300.94		
Periodic Review	46	Periodic Review	33220102	Project Manager	4	HR	0.00	100.31	0.00	0.00	401.26		
Periodic Review	46	Periodic Review	33220105	Project Engineer	3	HR	0.00	85.05	0.00	0.00	255.14		
Periodic Review	46	Periodic Review	33220105	Project Engineer	1	HR	0.00	85.05	0.00	0.00	85.05		
Periodic Review	46	Periodic Review	33220105	Project Engineer	11	HR	0.00	85.05	0.00	0.00	935.51		
Periodic Review	46	Periodic Review	33220108	Project Scientist	3	HR	0.00	92.60	0.00	0.00	277.80		
Periodic Review	46	Periodic Review	33220108	Project Scientist	5	HR	0.00	92.60	0.00	0.00	463.01		
Periodic Review	46	Periodic Review	33220109	Staff Scientist	3	HR	0.00	74.79	0.00	0.00	224.36		
Periodic Review	46	Periodic Review	33220109	Staff Scientist	1	HR	0.00	74.79	0.00	0.00	74.79		
Periodic Review	46	Periodic Review	33220109	Staff Scientist	11	HR	0.00	74.79	0.00	0.00	822.65		
										Total	4,633.31	6	$27,799.85
												Total Direct	$251,030.67
												Mark-up	$ 378,751.00
												TOTAL	**$629,782**

Estimate Documentation Detailed Report - Layout 2

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: N:\Projects_Ongoing\3752-Camp Wellfleet\06_FS Report\RACER\Racer_Backup_7_31_2019.mdb

Folder:

Folder Name: Wellfleet

Project:

ID: Alternative 2
Name: Administrative LUC
Category: None

Location
State / Country: MASSACHUSETTS
City: CAPE COD

Location Modifier	Default	User	Reason for changes
	1.180	1.180	

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

Description Administrative Land Use Controls (LUCs) including signs

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Site:

ID: AOI-5
Name: Area of Interest 5
Type: None

Media/Waste Type

Primary: Ordnance (not residual)
Secondary: N/A

Contaminant

Primary: Ordnance (not residual)
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☐	
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☐	
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: Area of Interest 5 (AOI-5)
Former Small Arms Range and Rocket Range
Support Team: Michelle Chesnut
References: Final Remedial Investigation Report, Former Camp Wellfleet FUDS Remedial Investigation Through Decision Document, Wellfleet, Massachusetts (April 2019)

Estimator Information

Estimator Name: James Stuby
Estimator Title: Project Geophysicist
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Lane
Suite 300
Laurel, MD 20707
Telephone Number: 301-323-1429
Email Address: james.stuby@ertcorp.com
Estimate Prepared Date: 06/24/2019

Estimator Signature: _____ **Date:** _____

Estimate Documentation Detailed Report - Layout 2

Reviewer Information

Reviewer Name: Thomas Bachovchin
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Lane
Suite 300
Laurel, MD 20707
Telephone Number: 301-323-1442
Email Address: thomas.bachovchin@ertcorp.com
Date Reviewed: 06/24/2019

Reviewer Signature: _____ **Date:** _____

Estimate Costs:

Phase Names	Marked-Up Cost
Periodic Review	$70,384
Administrative LUC (signs)	$76,262
30-Year O&M	$476,332
Total Cost:	$622,977
Escalation:	$191,354
Total Project Cost:	$814,331

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Periodic Review
Description: Periodic Review

Approach: Ex Situ
Start Date: June, 2024
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: $70,383.52

Estimate Documentation Detailed Report - Layout 2

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		No	n/a
Site Inspection		Yes	n/a
Report		Yes	n/a
Travel		Yes	n/a
Rebound Study		No	n/a
Start Month		June	n/a
No. Reviews		6	EA
Start Year		2024	n/a
Safety Level		D	n/a
Document Review			
Required Parameters			
5-Year Review Check List		Yes	n/a
Record of Decision		No	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		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		No	n/a
Site Visit Documentation (Photos, Diagrams, etc.)		Yes	n/a
Report			
Required Parameters			
Introduction		No	n/a
Remedial Objectives		No	n/a
ARARs Review		No	n/a

Estimate Documentation Detailed Report - Layout 2

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

User Name: **Five-Year Review**

Description	Default	User	UOM
Report			
Required Parameters			
Summary of Site Visit		Yes	n/a
Areas of Non Compliance		Yes	n/a
Technology Recommendations		No	n/a
Statement of Protectiveness		No	n/a
Next Review		No	n/a
Implementation Requirements		No	n/a
Travel			
Required Parameters			
Number of Travelers		1	EA
Number of Days		1	EA
Air Fare Ticket Price		500.00	$
Need a rental car?		Yes	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: Administrative LUC (signs)
Description: Administrative Land Use Controls including signs (2 signs)

Start Date: June, 2019
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: $76,261.86

Technologies:

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#1)**

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		2019	n/a
Implementation		Yes	n/a
Implementation: Start Date		2019	n/a
Monitoring & Enforcement		No	n/a
Modification/Termination		No	n/a
Type of Site		Active 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)		No	n/a
Memorandum of Agreements (MOA): Number		0	EA
Installation (or City) Master Plan		No	n/a
Construction Permitting		No	n/a
Construction Permitting: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		0	EA
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		1	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

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#1)**

User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	Default	User	UOM
Planning Meetings			
Required Parameters			
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		0	EA
MOA: Number of People		0	EA
MOA: Number of Days		0	EA
MOA: Airfare Cost		0.00	$
MOA: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		0	EA
Master Plan: Number of People		0	EA
Master Plan: Number of Days		0	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		0	EA
GIS/Overlay Maps: Number of People		0	EA
GIS/Overlay Maps: Number of Days		0	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		No	n/a
Deed Notification: Number		0	EA
Negotiating Easements		No	n/a
Negotiating Easements: Number		0	EA
Restrictive Covenants		No	n/a
Restrictive Covenants: Number		0	EA
Equitable Servitudes		No	n/a
Equitable Servitudes: Number		0	EA
Access Control Signs		Yes	n/a
Access Control Signs: Number		2	EA
Access Control Signs: Task Complexity		Low	n/a
Utility Notification Service		Yes	n/a

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Technology Name: **Administrative Land Use Controls (#1)**

User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	Default	User	UOM
Implementation			
Required Parameters			
Access Control Signs: Number		1	EA
Access Control Signs: Task Complexity		Low	n/a
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		0	EA
Develop Finding of Suitability to Transfer (FOST)		No	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: 30-Year O&M
Description: 30-Year O&M

Start Date: June, 2019
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: $476,331.86

Technologies:

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Technology Name: **Administrative Land Use Controls (#1)**

User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	Default	User	UOM
System Definition			
Required Parameters			
Rename Model		ADMINISTRATIVE LAND USE CONTROLS	n/a
Planning Documents		No	n/a
Implementation		No	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2019	n/a
Modification/Termination		No	n/a
Type of Site		Active Government Installation	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		Biennially	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		2	Days
Site Visits/Inspections: Number of People		1	EA
Site Visits/Inspections: Frequency		Biennially	n/a
Site Visits/Inspections: Airfare		500	$ Per Ticket
Site Visits/Inspections: Mileage		100	MI

Comments:

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Technology: ADMINISTRATIVE LAND USE CONTROLS

Element: Planning Docs

Year(s)	Cost per Year
2019	$38,432.02

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	22.00	HR	0.00	234.00	0.00	0.00	$5,148.07	No
33220105	Project Engineer	30.00	HR	0.00	198.39	0.00	0.00	$5,951.62	No
33220106	Staff Engineer	45.00	HR	0.00	204.33	0.00	0.00	$9,194.80	No
33220110	QA/QC Officer	11.00	HR	0.00	160.15	0.00	0.00	$1,761.69	No
33220114	Word Processing/Clerical	60.00	HR	0.00	109.73	0.00	0.00	$6,584.04	No
33220115	Draftsman/CADD	30.00	HR	0.00	127.89	0.00	0.00	$3,836.83	No
33220503	Attorney, Partner, Real Estate	22.00	HR	0.00	245.19	0.00	0.00	$5,394.14	No
33240101	Other Direct Costs	1.00	LS	560.83	0.00	0.00	0.00	$560.83	No

Total First Year Element Cost: $38,432.02

Element: Planning Meetings

Year(s)	Cost per Year
2019	$7,786.66

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	1.00	DAY	0.00	0.00	0.00	229.87	$229.87	No
33220102	Project Manager	20.00	HR	0.00	234.00	0.00	0.00	$4,680.06	No
33220114	Word Processing/Clerical	16.00	HR	0.00	109.73	0.00	0.00	$1,755.74	No
33220115	Draftsman/CADD	8.00	HR	0.00	127.89	0.00	0.00	$1,023.15	No
33240101	Other Direct Costs	1.00	LS	97.83	0.00	0.00	0.00	$97.83	No

Total First Year Element Cost: $7,786.66

Element: Implementation

Year(s)	Cost per Year
2019	$30,043.17

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
18010412	Construction Signs	36.00	SF	44.03	0.00	0.00	0.00	$1,585.04	No
33220102	Project Manager	15.00	HR	0.00	234.00	0.00	0.00	$3,510.05	No
33220105	Project Engineer	30.00	HR	0.00	198.39	0.00	0.00	$5,951.62	No

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Technology: ADMINISTRATIVE LAND USE CONTROLS

33220106	Staff Engineer	45.00	HR	0.00	204.33	0.00	0.00	$9,194.80	No
33220110	QA/QC Officer	8.00	HR	0.00	160.15	0.00	0.00	$1,281.23	No
33220114	Word Processing/Clerical	30.00	HR	0.00	109.73	0.00	0.00	$3,292.02	No
33220115	Draftsman/CADD	38.00	HR	0.00	127.89	0.00	0.00	$4,859.99	No
33240101	Other Direct Costs	1.00	LS	368.43	0.00	0.00	0.00	$368.43	No

Total First Year Element Cost: $30,043.17

Total First Year Tech Cost: $76,261.86

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Monitoring & Enforcement	2019	$31,755.46	$31,755.46
Monitoring & Enforcement	2021	$31,755.46	$31,755.46
Monitoring & Enforcement	2023	$31,755.46	$31,755.46
Monitoring & Enforcement	2025	$31,755.46	$31,755.46
Monitoring & Enforcement	2027	$31,755.46	$31,755.46
Monitoring & Enforcement	2029	$31,755.46	$31,755.46
Monitoring & Enforcement	2031	$31,755.46	$31,755.46
Monitoring & Enforcement	2033	$31,755.46	$31,755.46
Monitoring & Enforcement	2035	$31,755.46	$31,755.46
Monitoring & Enforcement	2037	$31,755.46	$31,755.46
Monitoring & Enforcement	2039	$31,755.46	$31,755.46
Monitoring & Enforcement	2041	$31,755.46	$31,755.46
Monitoring & Enforcement	2043	$31,755.46	$31,755.46
Monitoring & Enforcement	2045	$31,755.46	$31,755.46
Monitoring & Enforcement	2047	$31,755.46	$31,755.46

Total Marked Up Tech Cost: $476,331.90

Technology: ADMINISTRATIVE LAND USE CONTROLS

Element: Monitoring & Enforcement

Year(s)	Cost per Year
2019	$31,755.46
2020	$0.00
2021	$31,755.46
2022	$0.00
2023	$31,755.46
2024	$0.00
2025	$31,755.46
2026	$0.00
2027	$31,755.46
2028	$0.00

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Technology: ADMINISTRATIVE LAND USE CONTROLS

2029	$31,755.46
2030	$0.00
2031	$31,755.46
2032	$0.00
2033	$31,755.46
2034	$0.00
2035	$31,755.46
2036	$0.00
2037	$31,755.46
2038	$0.00
2039	$31,755.46
2040	$0.00
2041	$31,755.46
2042	$0.00
2043	$31,755.46
2044	$0.00
2045	$31,755.46
2046	$0.00
2047	$31,755.46
2048	$0.00

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	100.00	MI	0.00	0.00	0.00	0.32	$31.86	No
33010108	Sedan, Automobile, Rental	3.00	DAY	0.00	0.00	0.00	75.45	$226.36	No
33010202	Per Diem (per person)	5.00	DAY	0.00	0.00	0.00	229.87	$1,149.35	No
33022038	Overnight delivery service, 1 lb package	6.00	LB	0.00	0.00	0.00	72.00	$432.01	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	500.00	$500.00	No
33220102	Project Manager	44.00	HR	0.00	285.37	0.00	0.00	$12,556.26	No
33220106	Staff Engineer	40.00	HR	0.00	249.18	0.00	0.00	$9,967.26	No
33220110	QA/QC Officer	4.00	HR	0.00	160.15	0.00	0.00	$640.61	No
33220112	Field Technician	1.00	HR	0.00	135.87	0.00	0.00	$135.87	No
33220114	Word Processing/Clerical	26.00	HR	0.00	133.82	0.00	0.00	$3,479.37	No
33220115	Draftsman/CADD	16.00	HR	0.00	127.89	0.00	0.00	$2,046.31	No
33220119	Health and Safety Officer	1.00	HR	0.00	209.35	0.00	0.00	$209.35	No
33240101	Other Direct Costs	1.00	LS	380.83	0.00	0.00	0.00	$380.83	No

Total First Year Element Cost: $31,755.46

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Total First Year Tech Cost: $31,755.46

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2024	$454.68	$454.68
Document Review	2029	$454.68	$454.68
Document Review	2034	$454.68	$454.68
Document Review	2039	$454.68	$454.68
Document Review	2044	$454.68	$454.68
Document Review	2049	$454.68	$454.68
Site Inspection	2024	$3,010.44	$3,010.44
Site Inspection	2029	$3,010.44	$3,010.44
Site Inspection	2034	$3,010.44	$3,010.44
Site Inspection	2039	$3,010.44	$3,010.44
Site Inspection	2044	$3,010.44	$3,010.44
Site Inspection	2049	$3,010.44	$3,010.44
Report	2024	$7,460.14	$7,460.14
Report	2029	$7,460.14	$7,460.14
Report	2034	$7,460.14	$7,460.14
Report	2039	$7,460.14	$7,460.14
Report	2044	$7,460.14	$7,460.14
Report	2049	$7,460.14	$7,460.14
Travel	2024	$805.32	$805.32
Travel	2029	$805.32	$805.32
Travel	2034	$805.32	$805.32
Travel	2039	$805.32	$805.32
Travel	2044	$805.32	$805.32
Travel	2049	$805.32	$805.32

Total Marked Up Tech Cost: $70,383.48

Technology: Five-Year Review
Element: Document Review

Year(s)	Cost per Year
2024	$454.68
2025 - 2028	$0.00
2029	$454.68
2030 - 2033	$0.00
2034	$454.68
2035 - 2038	$0.00
2039	$454.68
2040 - 2043	$0.00
2044	$454.68
2045 - 2048	$0.00
2049	$454.68

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Technology: Five-Year Review

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220105	Project Engineer	1.00	HR	0.00	241.94	0.00	0.00	$241.94	No
33220109	Staff Scientist	1.00	HR	0.00	212.75	0.00	0.00	$212.75	No

Total First Year Element Cost: $454.68

Element: Site Inspection

Year(s)	Cost per Year
2024	$3,010.44
2025 - 2028	$0.00
2029	$3,010.44
2030 - 2033	$0.00
2034	$3,010.44
2035 - 2038	$0.00
2039	$3,010.44
2040 - 2043	$0.00
2044	$3,010.44
2045 - 2048	$0.00
2049	$3,010.44

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	3.00	HR	0.00	285.37	0.00	0.00	$856.11	No
33220105	Project Engineer	3.00	HR	0.00	241.94	0.00	0.00	$725.81	No
33220108	Project Scientist	3.00	HR	0.00	263.43	0.00	0.00	$790.28	No
33220109	Staff Scientist	3.00	HR	0.00	212.75	0.00	0.00	$638.24	No

Total First Year Element Cost: $3,010.44

Element: Report

Year(s)	Cost per Year
2024	$7,460.14
2025 - 2028	$0.00
2029	$7,460.14
2030 - 2033	$0.00
2034	$7,460.14
2035 - 2038	$0.00
2039	$7,460.14
2040 - 2043	$0.00
2044	$7,460.14
2045 - 2048	$0.00
2049	$7,460.14

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Technology: Five-Year Review

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	285.37	0.00	0.00	$1,141.48	No
33220105	Project Engineer	11.00	HR	0.00	241.94	0.00	0.00	$2,661.29	No
33220108	Project Scientist	5.00	HR	0.00	263.43	0.00	0.00	$1,317.14	No
33220109	Staff Scientist	11.00	HR	0.00	212.75	0.00	0.00	$2,340.23	No

Total First Year Element Cost: $7,460.14

Element: Travel

Year(s)	Cost per Year
2024	$805.32
2025 - 2028	$0.00
2029	$805.32
2030 - 2033	$0.00
2034	$805.32
2035 - 2038	$0.00
2039	$805.32
2040 - 2043	$0.00
2044	$805.32
2045 - 2048	$0.00
2049	$805.32

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	1.00	DAY	0.00	0.00	0.00	75.45	$75.45	No
33010202	Per Diem (per person)	1.00	DAY	0.00	0.00	0.00	229.87	$229.87	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	500.00	$500.00	No

Total First Year Element Cost: $805.32

Total First Year Tech Cost: $11,730.59

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2024	$454.68	$454.68
Document Review	2029	$454.68	$454.68
Document Review	2034	$454.68	$454.68
Document Review	2039	$454.68	$454.68
Document Review	2044	$454.68	$454.68
Document Review	2049	$454.68	$454.68
Site Inspection	2024	$3,010.44	$3,010.44
Site Inspection	2029	$3,010.44	$3,010.44

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Site Inspection	2034	$3,010.44	$3,010.44
Site Inspection	2039	$3,010.44	$3,010.44
Site Inspection	2044	$3,010.44	$3,010.44
Site Inspection	2049	$3,010.44	$3,010.44
Report	2024	$7,460.14	$7,460.14
Report	2029	$7,460.14	$7,460.14
Report	2034	$7,460.14	$7,460.14
Report	2039	$7,460.14	$7,460.14
Report	2044	$7,460.14	$7,460.14
Report	2049	$7,460.14	$7,460.14
Travel	2024	$805.32	$805.32
Travel	2029	$805.32	$805.32
Travel	2034	$805.32	$805.32
Travel	2039	$805.32	$805.32
Travel	2044	$805.32	$805.32
Travel	2049	$805.32	$805.32
		Total Marked Up Tech Cost:	$70,383.48

AOI-05, Alternative 2: Land Use Controls
Project Assembly Level Data Report

Phase Name	Tech. Key	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	units	Cost
LAND USE CONTROLS	29	LAND USE CONTROLS	18010412	Construction Signs	36	SF	29.50	0.00	0.00	0.00	1,062.00		
LAND USE CONTROLS	29	LAND USE CONTROLS	33010202	Per Diem (per person)	1	DAY	0.00	0.00	0.00	229.87	229.87		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220102	Project Manager	20	HR	0.00	82.26	0.00	0.00	1,645.16		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220102	Project Manager	22	HR	0.00	82.26	0.00	0.00	1,809.67		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220102	Project Manager	15	HR	0.00	82.26	0.00	0.00	1,233.87		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220105	Project Engineer	30	HR	0.00	69.74	0.00	0.00	2,092.14		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220105	Project Engineer	30	HR	0.00	69.74	0.00	0.00	2,092.14		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220106	Staff Engineer	45	HR	0.00	71.83	0.00	0.00	3,232.20		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220106	Staff Engineer	45	HR	0.00	71.83	0.00	0.00	3,232.20		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220110	QA/QC Officer	11	HR	0.00	56.30	0.00	0.00	619.28		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220110	QA/QC Officer	8	HR	0.00	56.30	0.00	0.00	450.38		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220114	Word Processing/Clerical	16	HR	0.00	38.57	0.00	0.00	617.19		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220114	Word Processing/Clerical	60	HR	0.00	38.57	0.00	0.00	2,314.45		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220114	Word Processing/Clerical	30	HR	0.00	38.57	0.00	0.00	1,157.23		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220115	Draftsman/CADD	8	HR	0.00	44.96	0.00	0.00	359.66		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220115	Draftsman/CADD	30	HR	0.00	44.96	0.00	0.00	1,348.74		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220115	Draftsman/CADD	38	HR	0.00	44.96	0.00	0.00	1,708.40		
LAND USE CONTROLS	29	LAND USE CONTROLS	33220503	Attorney, Partner, Real Estate	22	HR	0.00	164.28	0.00	0.00	3,614.15		
LAND USE CONTROLS	29	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	65.55	0.00	0.00	0.00	65.55		
LAND USE CONTROLS	29	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	246.86	0.00	0.00	0.00	246.86		
LAND USE CONTROLS	29	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	375.77	0.00	0.00	0.00	375.77		
										Total	29,506.89	1	$29,506.89
Periodic Review	32	Periodic Review	33010108	Sedan, Automobile, Rental	1	DAY	0.00	0.00	0.00	62.94	62.94		
Periodic Review	32	Periodic Review	33010202	Per Diem (per person)	1	DAY	0.00	0.00	0.00	229.87	229.87		
Periodic Review	32	Periodic Review	33041101	Airfare	1	LS	0.00	0.00	0.00	500.00	500.00		
Periodic Review	32	Periodic Review	33220102	Project Manager	3	HR	0.00	100.31	0.00	0.00	300.94		
Periodic Review	32	Periodic Review	33220102	Project Manager	4	HR	0.00	100.31	0.00	0.00	401.26		
Periodic Review	32	Periodic Review	33220105	Project Engineer	3	HR	0.00	85.05	0.00	0.00	255.14		
Periodic Review	32	Periodic Review	33220105	Project Engineer	1	HR	0.00	85.05	0.00	0.00	85.05		
Periodic Review	32	Periodic Review	33220105	Project Engineer	11	HR	0.00	85.05	0.00	0.00	935.51		
Periodic Review	32	Periodic Review	33220108	Project Scientist	5	HR	0.00	92.60	0.00	0.00	463.01		
Periodic Review	32	Periodic Review	33220108	Project Scientist	3	HR	0.00	92.60	0.00	0.00	277.80		
Periodic Review	32	Periodic Review	33220109	Staff Scientist	3	HR	0.00	74.79	0.00	0.00	224.36		
Periodic Review	32	Periodic Review	33220109	Staff Scientist	1	HR	0.00	74.79	0.00	0.00	74.79		
Periodic Review	32	Periodic Review	33220109	Staff Scientist	11	HR	0.00	74.79	0.00	0.00	822.65		
										Total	4,633.31	6	$27,799.85
30-Year O&M	36	LAND USE CONTROLS	33010104	Vehicle mileage charge, car or van	100	MI	0.00	0.00	0.00	0.32	31.86		
30-Year O&M	36	LAND USE CONTROLS	33010108	Sedan, Automobile, Rental	3	DAY	0.00	0.00	0.00	62.94	188.82		
30-Year O&M	36	LAND USE CONTROLS	33010202	Per Diem (per person)	5	DAY	0.00	0.00	0.00	229.87	1,149.35		
30-Year O&M	36	LAND USE CONTROLS	33022038	Overnight delivery service, 1 lb package	6	LB	0.00	0.00	0.00	60.06	360.37		
30-Year O&M	36	LAND USE CONTROLS	33041101	Airfare	1	LS	0.00	0.00	0.00	500.00	500.00		
30-Year O&M	36	LAND USE CONTROLS	33220102	Project Manager	44	HR	0.00	100.31	0.00	0.00	4,413.83		
30-Year O&M	36	LAND USE CONTROLS	33220106	Staff Engineer	40	HR	0.00	87.59	0.00	0.00	3,503.74		
30-Year O&M	36	LAND USE CONTROLS	33220110	QA/QC Officer	4	HR	0.00	56.30	0.00	0.00	225.19		
30-Year O&M	36	LAND USE CONTROLS	33220112	Field Technician	1	HR	0.00	47.76	0.00	0.00	47.76		
30-Year O&M	36	LAND USE CONTROLS	33220114	Word Processing/Clerical	26	HR	0.00	47.04	0.00	0.00	1,223.08		
30-Year O&M	36	LAND USE CONTROLS	33220115	Draftsman/CADD	16	HR	0.00	44.96	0.00	0.00	719.33		
30-Year O&M	36	LAND USE CONTROLS	33220119	Health and Safety Officer	1	HR	0.00	73.59	0.00	0.00	73.59		
30-Year O&M	36	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	255.16	0.00	0.00	0.00	255.16		
										Total	12,692.09	15	$190,381.42
												Total Direct	$247,688.16
												Mark-up	$ 375,289.00
												TOTAL	**$622,977**

Estimate Documentation Detailed Report - Layout 2

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: N:\Projects_Ongoing\3752-Camp Wellfleet\06_FS Report\RACER\Racer_Backup_7_31_2019.mdb

Folder:

Folder Name: Wellfleet

Project:

ID: Alternative 2
Name: Administrative LUC
Category: None

Location
State / Country: MASSACHUSETTS
City: CAPE COD

Location Modifier	Default	User	Reason for changes
	1.180	1.180	

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

Description Administrative Land Use Controls (LUCs) including signs

Estimate Documentation Detailed Report - Layout 2

Site:

ID: AOI-6
Name: Area of Interest 6
Type: None

Media/Waste Type

Primary: Ordnance (not residual)
Secondary: N/A

Contaminant

Primary: Ordnance (not residual)
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☐	
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☐	
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: Area of Interest 6 (AOI-6)
Former Artillery Range Fan (Ocean)
"Water AOI"
Support Team: Michelle Chesnut
References: Final Remedial Investigation Report, Former Camp Wellfleet FUDS Remedial Investigation Through Decision Document, Wellfleet, Massachusetts (April 2019)

Estimator Information

Estimator Name: James Stuby
Estimator Title: Project Geophysicist
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Lane
Suite 300
Laurel, MD 20707
Telephone Number: 301-323-1429
Email Address: james.stuby@ertcorp.com
Estimate Prepared Date: 06/24/2019

Estimator Signature: _____ **Date:** _____

Estimate Documentation Detailed Report - Layout 2

Reviewer Information

Reviewer Name: Thomas Bachovchin
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Lane
Suite 300
Laurel, MD 20707
Telephone Number: 301-323-1442
Email Address: thomas.bachovchin@ertcorp.com
Date Reviewed: 06/24/2019

Reviewer Signature: _____ **Date:** _____

Estimate Costs:

Phase Names	Marked-Up Cost
Periodic Review	$53,843
Administrative LUC (signs)	$77,847
30-Year O&M	$476,332
Total Cost:	$608,022
Escalation:	$184,190
Total Project Cost:	$792,212

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Periodic Review
Description: Periodic Review
Approach: Ex Situ
Start Date: June, 2024
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: $53,843.11

Estimate Documentation Detailed Report - Layout 2

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		No	n/a
Report		Yes	n/a
Travel		No	n/a
Rebound Study		No	n/a
Start Month		June	n/a
No. Reviews		6	EA
Start Year		2024	n/a
Safety Level		D	n/a
Document Review			
Required Parameters			
5-Year Review Check List		Yes	n/a
Record of Decision		No	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		No	n/a
Interviews			
Required Parameters			
Current and Previous Staff Management		Yes	n/a
Community Groups		Yes	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
Report			
Required Parameters			
Introduction		No	n/a
Remedial Objectives		No	n/a

Estimate Documentation Detailed Report - Layout 2

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

User Name: **Five-Year Review**

Description	Default	User	UOM
Report			
Required Parameters			
ARARs Review		No	n/a
Summary of Site Visit		No	n/a
Areas of Non Compliance		Yes	n/a
Technology Recommendations		No	n/a
Statement of Protectiveness		Yes	n/a
Next Review		No	n/a
Implementation Requirements		Yes	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: Administrative LUC (signs)
Description: Administrative Land Use Controls including signs (4 signs)

Start Date: June, 2019
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: $77,846.90

Technologies:

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#1)**

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		2019	n/a
Implementation		Yes	n/a
Implementation: Start Date		2019	n/a
Monitoring & Enforcement		No	n/a
Modification/Termination		No	n/a
Type of Site		Active 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)		No	n/a
Memorandum of Agreements (MOA): Number		0	EA
Installation (or City) Master Plan		No	n/a
Construction Permitting		No	n/a
Construction Permitting: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		0	EA
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		1	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

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#1)**

User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	Default	User	UOM
Planning Meetings			
Required Parameters			
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		0	EA
MOA: Number of People		0	EA
MOA: Number of Days		0	EA
MOA: Airfare Cost		0.00	$
MOA: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		0	EA
Master Plan: Number of People		0	EA
Master Plan: Number of Days		0	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		0	EA
GIS/Overlay Maps: Number of People		0	EA
GIS/Overlay Maps: Number of Days		0	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		No	n/a
Deed Notification: Number		0	EA
Negotiating Easements		No	n/a
Negotiating Easements: Number		0	EA
Restrictive Covenants		No	n/a
Restrictive Covenants: Number		0	EA
Equitable Servitudes		No	n/a
Equitable Servitudes: Number		0	EA
Access Control Signs		Yes	n/a
Access Control Signs: Number		4	EA
Access Control Signs: Task Complexity		Low	n/a
Utility Notification Service		Yes	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#1)**

User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	Default	User	UOM
Implementation			
Required Parameters			
Access Control Signs: Number		1	EA
Access Control Signs: Task Complexity		Low	n/a
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		0	EA
Develop Finding of Suitability to Transfer (FOST)		No	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: 30-Year O&M
Description: 30-Year O&M

Start Date: June, 2019
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: $476,331.86

Technologies:

Estimate Documentation Detailed Report - Layout 2

Technology Name: **Administrative Land Use Controls (#1)**

User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	Default	User	UOM
System Definition			
Required Parameters			
Rename Model		ADMINISTRATIVE LAND USE CONTROLS	n/a
Planning Documents		No	n/a
Implementation		No	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2019	n/a
Modification/Termination		No	n/a
Type of Site		Active Government Installation	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		Biennially	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		2	Days
Site Visits/Inspections: Number of People		1	EA
Site Visits/Inspections: Frequency		Biennially	n/a
Site Visits/Inspections: Airfare		500	$ Per Ticket
Site Visits/Inspections: Mileage		100	MI

Comments:

Estimate Documentation Detailed Report - Layout 2

Technology: ADMINISTRATIVE LAND USE CONTROLS

Element: Planning Docs

Year(s)	Cost per Year
2019	$38,432.02

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	22.00	HR	0.00	234.00	0.00	0.00	$5,148.07	No
33220105	Project Engineer	30.00	HR	0.00	198.39	0.00	0.00	$5,951.62	No
33220106	Staff Engineer	45.00	HR	0.00	204.33	0.00	0.00	$9,194.80	No
33220110	QA/QC Officer	11.00	HR	0.00	160.15	0.00	0.00	$1,761.69	No
33220114	Word Processing/Clerical	60.00	HR	0.00	109.73	0.00	0.00	$6,584.04	No
33220115	Draftsman/CADD	30.00	HR	0.00	127.89	0.00	0.00	$3,836.83	No
33220503	Attorney, Partner, Real Estate	22.00	HR	0.00	245.19	0.00	0.00	$5,394.14	No
33240101	Other Direct Costs	1.00	LS	560.83	0.00	0.00	0.00	$560.83	No

Total First Year Element Cost: $38,432.02

Element: Planning Meetings

Year(s)	Cost per Year
2019	$7,786.66

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	1.00	DAY	0.00	0.00	0.00	229.87	$229.87	No
33220102	Project Manager	20.00	HR	0.00	234.00	0.00	0.00	$4,680.06	No
33220114	Word Processing/Clerical	16.00	HR	0.00	109.73	0.00	0.00	$1,755.74	No
33220115	Draftsman/CADD	8.00	HR	0.00	127.89	0.00	0.00	$1,023.15	No
33240101	Other Direct Costs	1.00	LS	97.83	0.00	0.00	0.00	$97.83	No

Total First Year Element Cost: $7,786.66

Element: Implementation

Year(s)	Cost per Year
2019	$31,628.22

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
18010412	Construction Signs	72.00	SF	44.03	0.00	0.00	0.00	$3,170.08	No
33220102	Project Manager	15.00	HR	0.00	234.00	0.00	0.00	$3,510.05	No
33220105	Project Engineer	30.00	HR	0.00	198.39	0.00	0.00	$5,951.62	No

Estimate Documentation Detailed Report - Layout 2

Technology: ADMINISTRATIVE LAND USE CONTROLS

33220106	Staff Engineer	45.00	HR	0.00	204.33	0.00	0.00	$9,194.80	No
33220110	QA/QC Officer	8.00	HR	0.00	160.15	0.00	0.00	$1,281.23	No
33220114	Word Processing/Clerical	30.00	HR	0.00	109.73	0.00	0.00	$3,292.02	No
33220115	Draftsman/CADD	38.00	HR	0.00	127.89	0.00	0.00	$4,859.99	No
33240101	Other Direct Costs	1.00	LS	368.43	0.00	0.00	0.00	$368.43	No

Total First Year Element Cost: $31,628.22

Total First Year Tech Cost: $77,846.90

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Monitoring & Enforcement	2019	$31,755.46	$31,755.46
Monitoring & Enforcement	2021	$31,755.46	$31,755.46
Monitoring & Enforcement	2023	$31,755.46	$31,755.46
Monitoring & Enforcement	2025	$31,755.46	$31,755.46
Monitoring & Enforcement	2027	$31,755.46	$31,755.46
Monitoring & Enforcement	2029	$31,755.46	$31,755.46
Monitoring & Enforcement	2031	$31,755.46	$31,755.46
Monitoring & Enforcement	2033	$31,755.46	$31,755.46
Monitoring & Enforcement	2035	$31,755.46	$31,755.46
Monitoring & Enforcement	2037	$31,755.46	$31,755.46
Monitoring & Enforcement	2039	$31,755.46	$31,755.46
Monitoring & Enforcement	2041	$31,755.46	$31,755.46
Monitoring & Enforcement	2043	$31,755.46	$31,755.46
Monitoring & Enforcement	2045	$31,755.46	$31,755.46
Monitoring & Enforcement	2047	$31,755.46	$31,755.46

Total Marked Up Tech Cost: $476,331.90

Technology: ADMINISTRATIVE LAND USE CONTROLS

Element: Monitoring & Enforcement

Year(s)	Cost per Year
2019	$31,755.46
2020	$0.00
2021	$31,755.46
2022	$0.00
2023	$31,755.46
2024	$0.00
2025	$31,755.46
2026	$0.00
2027	$31,755.46
2028	$0.00

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Technology: ADMINISTRATIVE LAND USE CONTROLS

2029	$31,755.46
2030	$0.00
2031	$31,755.46
2032	$0.00
2033	$31,755.46
2034	$0.00
2035	$31,755.46
2036	$0.00
2037	$31,755.46
2038	$0.00
2039	$31,755.46
2040	$0.00
2041	$31,755.46
2042	$0.00
2043	$31,755.46
2044	$0.00
2045	$31,755.46
2046	$0.00
2047	$31,755.46
2048	$0.00

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	100.00	MI	0.00	0.00	0.00	0.32	$31.86	No
33010108	Sedan, Automobile, Rental	3.00	DAY	0.00	0.00	0.00	75.45	$226.36	No
33010202	Per Diem (per person)	5.00	DAY	0.00	0.00	0.00	229.87	$1,149.35	No
33022038	Overnight delivery service, 1 lb package	6.00	LB	0.00	0.00	0.00	72.00	$432.01	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	500.00	$500.00	No
33220102	Project Manager	44.00	HR	0.00	285.37	0.00	0.00	$12,556.26	No
33220106	Staff Engineer	40.00	HR	0.00	249.18	0.00	0.00	$9,967.26	No
33220110	QA/QC Officer	4.00	HR	0.00	160.15	0.00	0.00	$640.61	No
33220112	Field Technician	1.00	HR	0.00	135.87	0.00	0.00	$135.87	No
33220114	Word Processing/Clerical	26.00	HR	0.00	133.82	0.00	0.00	$3,479.37	No
33220115	Draftsman/CADD	16.00	HR	0.00	127.89	0.00	0.00	$2,046.31	No
33220119	Health and Safety Officer	1.00	HR	0.00	209.35	0.00	0.00	$209.35	No
33240101	Other Direct Costs	1.00	LS	380.83	0.00	0.00	0.00	$380.83	No

Total First Year Element Cost: $31,755.46

Estimate Documentation Detailed Report - Layout 2

Total First Year Tech Cost: $31,755.46

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2024	$454.68	$454.68
Document Review	2029	$454.68	$454.68
Document Review	2034	$454.68	$454.68
Document Review	2039	$454.68	$454.68
Document Review	2044	$454.68	$454.68
Document Review	2049	$454.68	$454.68
Interviews	2024	$2,282.96	$2,282.96
Interviews	2029	$2,282.96	$2,282.96
Interviews	2034	$2,282.96	$2,282.96
Interviews	2039	$2,282.96	$2,282.96
Interviews	2044	$2,282.96	$2,282.96
Interviews	2049	$2,282.96	$2,282.96
Report	2024	$6,236.21	$6,236.21
Report	2029	$6,236.21	$6,236.21
Report	2034	$6,236.21	$6,236.21
Report	2039	$6,236.21	$6,236.21
Report	2044	$6,236.21	$6,236.21
Report	2049	$6,236.21	$6,236.21

Total Marked Up Tech Cost: $53,843.10

Technology: Five-Year Review
Element: Document Review

Year(s)	Cost per Year
2024	$454.68
2025 - 2028	$0.00
2029	$454.68
2030 - 2033	$0.00
2034	$454.68
2035 - 2038	$0.00
2039	$454.68
2040 - 2043	$0.00
2044	$454.68
2045 - 2048	$0.00
2049	$454.68

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220105	Project Engineer	1.00	HR	0.00	241.94	0.00	0.00	$241.94	No
33220109	Staff Scientist	1.00	HR	0.00	212.75	0.00	0.00	$212.75	No

Total First Year Element Cost: $454.68

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Element: Interviews

Year(s)	Cost per Year
2024	$2,282.96
2025 - 2028	$0.00
2029	$2,282.96
2030 - 2033	$0.00
2034	$2,282.96
2035 - 2038	$0.00
2039	$2,282.96
2040 - 2043	$0.00
2044	$2,282.96
2045 - 2048	$0.00
2049	$2,282.96

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	285.37	0.00	0.00	$2,282.96	No

Total First Year Element Cost: $2,282.96

Element: Report

Year(s)	Cost per Year
2024	$6,236.21
2025 - 2028	$0.00
2029	$6,236.21
2030 - 2033	$0.00
2034	$6,236.21
2035 - 2038	$0.00
2039	$6,236.21
2040 - 2043	$0.00
2044	$6,236.21
2045 - 2048	$0.00
2049	$6,236.21

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	3.00	HR	0.00	285.37	0.00	0.00	$856.11	No
33220105	Project Engineer	8.00	HR	0.00	241.94	0.00	0.00	$1,935.49	No
33220108	Project Scientist	5.00	HR	0.00	263.43	0.00	0.00	$1,317.14	No
33220109	Staff Scientist	10.00	HR	0.00	212.75	0.00	0.00	$2,127.48	No

Total First Year Element Cost: $6,236.21

Total First Year Tech Cost: $8,973.85

Estimate Documentation Detailed Report - Layout 2

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2024	$454.68	$454.68
Document Review	2029	$454.68	$454.68
Document Review	2034	$454.68	$454.68
Document Review	2039	$454.68	$454.68
Document Review	2044	$454.68	$454.68
Document Review	2049	$454.68	$454.68
Interviews	2024	$2,282.96	$2,282.96
Interviews	2029	$2,282.96	$2,282.96
Interviews	2034	$2,282.96	$2,282.96
Interviews	2039	$2,282.96	$2,282.96
Interviews	2044	$2,282.96	$2,282.96
Interviews	2049	$2,282.96	$2,282.96
Report	2024	$6,236.21	$6,236.21
Report	2029	$6,236.21	$6,236.21
Report	2034	$6,236.21	$6,236.21
Report	2039	$6,236.21	$6,236.21
Report	2044	$6,236.21	$6,236.21
Report	2049	$6,236.21	$6,236.21

Total Marked Up Tech Cost: $53,843.10

AOI-06, Alternative 2: Land Use Controls
Project Assembly Level Data Report

Note:
Costs are direct (no markup)

Phase Name	Tech. Key	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	units	Cost
LAND USE CONTROLS	30	LAND USE CONTROLS	18010412	Construction Signs	72	SF	29.50	0.00	0.00	0.00	2,124.00		
LAND USE CONTROLS	30	LAND USE CONTROLS	33010202	Per Diem (per person)	1	DAY	0.00	0.00	0.00	229.87	229.87		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220102	Project Manager	15	HR	0.00	82.26	0.00	0.00	1,233.87		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220102	Project Manager	22	HR	0.00	82.26	0.00	0.00	1,809.67		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220102	Project Manager	20	HR	0.00	82.26	0.00	0.00	1,645.16		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220105	Project Engineer	30	HR	0.00	69.74	0.00	0.00	2,092.14		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220105	Project Engineer	30	HR	0.00	69.74	0.00	0.00	2,092.14		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220106	Staff Engineer	45	HR	0.00	71.83	0.00	0.00	3,232.20		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220106	Staff Engineer	45	HR	0.00	71.83	0.00	0.00	3,232.20		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220110	QA/QC Officer	8	HR	0.00	56.30	0.00	0.00	450.38		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220110	QA/QC Officer	11	HR	0.00	56.30	0.00	0.00	619.28		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220114	Word Processing/Clerical	16	HR	0.00	38.57	0.00	0.00	617.19		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220114	Word Processing/Clerical	60	HR	0.00	38.57	0.00	0.00	2,314.45		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220114	Word Processing/Clerical	30	HR	0.00	38.57	0.00	0.00	1,157.23		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220115	Draftsman/CADD	38	HR	0.00	44.96	0.00	0.00	1,708.40		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220115	Draftsman/CADD	30	HR	0.00	44.96	0.00	0.00	1,348.74		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220115	Draftsman/CADD	8	HR	0.00	44.96	0.00	0.00	359.66		
LAND USE CONTROLS	30	LAND USE CONTROLS	33220503	Attorney, Partner, Real Estate	22	HR	0.00	164.28	0.00	0.00	3,614.15		
LAND USE CONTROLS	30	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	246.86	0.00	0.00	0.00	246.86		
LAND USE CONTROLS	30	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	65.55	0.00	0.00	0.00	65.55		
LAND USE CONTROLS	30	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	375.77	0.00	0.00	0.00	375.77		
										Total	30,568.89	1	$30,568.89
Periodic Review	33	Periodic Review	33220102	Project Manager	8	HR	0.00	100.31	0.00	0.00	802.52		
Periodic Review	33	Periodic Review	33220102	Project Manager	3	HR	0.00	100.31	0.00	0.00	300.94		
Periodic Review	33	Periodic Review	33220105	Project Engineer	1	HR	0.00	85.05	0.00	0.00	85.05		
Periodic Review	33	Periodic Review	33220105	Project Engineer	8	HR	0.00	85.05	0.00	0.00	680.37		
Periodic Review	33	Periodic Review	33220108	Project Scientist	5	HR	0.00	92.60	0.00	0.00	463.01		
Periodic Review	33	Periodic Review	33220109	Staff Scientist	1	HR	0.00	74.79	0.00	0.00	74.79		
Periodic Review	33	Periodic Review	33220109	Staff Scientist	10	HR	0.00	74.79	0.00	0.00	747.86		
										Total	3,154.53	6	$18,927.17
30-Year O&M	36	LAND USE CONTROLS	33010104	Vehicle mileage charge, car or van	100	MI	0.00	0.00	0.00	0.32	31.86		
30-Year O&M	36	LAND USE CONTROLS	33010108	Sedan, Automobile, Rental	3	DAY	0.00	0.00	0.00	62.94	188.82		
30-Year O&M	36	LAND USE CONTROLS	33010202	Per Diem (per person)	5	DAY	0.00	0.00	0.00	229.87	1,149.35		
30-Year O&M	36	LAND USE CONTROLS	33022038	Overnight delivery service, 1 lb package	6	LB	0.00	0.00	0.00	60.06	360.37		
30-Year O&M	36	LAND USE CONTROLS	33041101	Airfare	1	LS	0.00	0.00	0.00	500.00	500.00		
30-Year O&M	36	LAND USE CONTROLS	33220102	Project Manager	44	HR	0.00	100.31	0.00	0.00	4,413.83		
30-Year O&M	36	LAND USE CONTROLS	33220106	Staff Engineer	40	HR	0.00	87.59	0.00	0.00	3,503.74		
30-Year O&M	36	LAND USE CONTROLS	33220110	QA/QC Officer	4	HR	0.00	56.30	0.00	0.00	225.19		
30-Year O&M	36	LAND USE CONTROLS	33220112	Field Technician	1	HR	0.00	47.76	0.00	0.00	47.76		
30-Year O&M	36	LAND USE CONTROLS	33220114	Word Processing/Clerical	26	HR	0.00	47.04	0.00	0.00	1,223.08		
30-Year O&M	36	LAND USE CONTROLS	33220115	Draftsman/CADD	16	HR	0.00	44.96	0.00	0.00	719.33		
30-Year O&M	36	LAND USE CONTROLS	33220119	Health and Safety Officer	1	HR	0.00	73.59	0.00	0.00	73.59		
30-Year O&M	36	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	255.16	0.00	0.00	0.00	255.16		
										Total	12,692.09	15	$190,381.42
												Grand Total	$239,877.48
												Mark-up	$ 368,144.00
												TOTAL	**$608,021**

Estimate Documentation Detailed Report - Layout 2

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: N:\Projects_Ongoing\3752-Camp Wellfleet\06_FS Report\RACER\Racer_Backup_7_31_2019.mdb

Folder:

Folder Name: Wellfleet

Project:

ID: Alternative 3
Name: Partial MEC Removal with LUC
Category: None

Location
State / Country: MASSACHUSETTS
City: CAPE COD

Location Modifier	Default	User	Reason for changes
	1.180	1.180	

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

Description Partial Munitions and Explosives of Concern (MEC) Removal with Administrative Land Use Controls (LUCs) including signs

Estimate Documentation Detailed Report - Layout 2

Site:

ID: AOI-2
Name: Area of Interest 2
Type: None

Media/Waste Type

Primary: Ordnance (not residual)
Secondary: N/A

Contaminant

Primary: Ordnance (not residual)
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☐	
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☐	
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: Area of Interest 2 (AOI-2)
Former Artillery Firing Line

AOI-2 is 275 acres. Partial Removal Area is 39.2 acres.

Support Team: Michelle Chesnut
References: Final Remedial Investigation Report, Former Camp Wellfleet FUDS Remedial Investigation Through Decision Document, Wellfleet, Massachusetts (April 2019)

Estimator Information

Estimator Name: James Stuby
Estimator Title: Project Geophysicist
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Lane
Suite 300
Laurel, MD 20707
Telephone Number: 301-323-1429
Email Address: james.stuby@ertcorp.com
Estimate Prepared Date: 06/24/2019

Estimator Signature: _____ **Date:** _____

Estimate Documentation Detailed Report - Layout 2

Reviewer Information

Reviewer Name: Thomas Bachovchin
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Lane
Suite 300
Laurel, MD 20707
Telephone Number: 301-323-1442
Email Address: thomas.bachovchin@ertcorp.com
Date Reviewed: 06/24/2019

Reviewer Signature: _____ **Date:** _____

Estimate Costs:

Phase Names	Marked-Up Cost
Partial Removal Action	$1,320,080
Periodic Review	$70,384
Administrative LUC (signs)	$83,067
30-Year O&M	$476,332
Total Cost:	$1,949,863
Escalation:	$191,354
Total Project Cost:	$2,141,217

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Partial Removal Action
Description: Removal Action in 39.2 acres. Area is defined as area between bluff and former firing line road as well as 150 ft wide area west of former firing line road.
Approach: Ex Situ
Start Date: June, 2019
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MEC Removal Action with AGC	Yes	100	0

Total Marked-up Cost: $1,320,080.47

Estimate Documentation Detailed Report - Layout 2

Technologies:

Technology Name: **MEC Removal Action with AGC (#1)**

User Name: **MEC Removal Action with AGC**

Description	Default	User	UOM
System Definition			
Required Parameters			
Surface and Subsurface Removal		39	Acres
SSR Topography 1		Gently Rolling	n/a
SSR Topography 1 Pct		100.00	%
SSR Topography 2		N/A	n/a
SSR Vegetation 1		Heavy grass with numerous shrubs	n/a
SSR Vegetation 1 Pct		100.00	%
SSR Vegetation 2		N/A	n/a
SSR Vegetation 2 Pct		0.00	%
Surface Removal Only		0	Acres
SR Topography 1		N/A	n/a
SR Topography 1 Pct		0.00	%
SR Topography 2		N/A	n/a
SR Vegetation 1		N/A	n/a
SR Vegetation 1 Pct		0.00	%
SR Vegetation 2		N/A	n/a
SR Vegetation 2 Pct		0.00	%
Site Complexity		Low	n/a
Systematic Project Planning			
Secondary Parameters			
Number of Meetings	3	3	n/a
Site Visit	1	1	n/a
UFP QAPP	Yes	Yes	n/a
Establish and Management of GIS Database	Yes	Yes	n/a
Community Relation Plan	Yes	Yes	n/a
Explosives Safety Submission	Yes	Yes	n/a
PMP / Quality Assurance Surveilance Plan	Yes	Yes	n/a
Health and Safety Plan	Yes	Yes	n/a
Cultural and Archaeological Plan	Yes	Yes	n/a
Environmental / Biological Plan	No	Yes	n/a
SSR Site Preparation			
Secondary Parameters			
Heavy Removal	0	0	Acres
Moderate Removal	9.75	9.75	Acres
Light Removal	19.5	19.5	Acres

Estimate Documentation Detailed Report - Layout 2

Technology Name: **MEC Removal Action with AGC (#1)**

User Name: **MEC Removal Action with AGC**

Description	Default	User	UOM
SSR Site Preparation			
Secondary Parameters			
No Removal	9.75	9.75	Acres
Total Vegetation Removal Area	39	39	Acres
Archaeological Survey	39	39	Acres
Flora / Fauna Survey	39	39	Acres
Daily Travel Distance to Site	0 - 50 Miles	0 - 50 Miles	n/a
SR Site Preparation			
Secondary Parameters			
Heavy Removal	0	0	Acres
Moderate Removal	0	0	Acres
Light Removal	0	0	Acres
No Removal	0	0	Acres
Total Vegetation Removal Area	0	0	Acres
Archaeological Survey	0	0	Acres
Flora / Fauna Survey	0	0	Acres
RA Field Activities			
Secondary Parameters			
Mag & Flag (analog Geophysics)	0	19.5	Acres
Digital Geophysical Mapping with Single Sensor	39	19.5	Acres
Digital Geophysical Mapping with Array of Sensors	0	0	Acres
Anomaly Density	500	100	Anomalies / Acre
Investigation			
Secondary Parameters			
Advanced Geophysics Classification Cueing	975	1950	Anomalies
Number of Digs	10248	2145	Anomalies
Onsite Donor Explosive Storage	Yes	No	n/a

Comments:

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Periodic Review
Description: Periodic Review

Approach: Ex Situ
Start Date: June, 2024
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: $70,383.52

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		No	n/a
Site Inspection		Yes	n/a
Report		Yes	n/a
Travel		Yes	n/a
Rebound Study		No	n/a
Start Month		June	n/a
No. Reviews		6	EA
Start Year		2024	n/a
Safety Level		D	n/a
Document Review			
Required Parameters			
5-Year Review Check List		Yes	n/a
Record of Decision		No	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		No	n/a
Site Inspection			
Required Parameters			
General Site Inspection		Yes	n/a
Containment System Inspection		No	n/a

Estimate Documentation Detailed Report - Layout 2

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

User Name: **Five-Year Review**

Description	Default	User	UOM
Site Inspection			
Required Parameters			
Monitoring Systems Inspection		No	n/a
Treatment Systems Inspection		No	n/a
Regulatory Compliance		No	n/a
Site Visit Documentation (Photos, Diagrams, etc.)		Yes	n/a
Report			
Required Parameters			
Introduction		No	n/a
Remedial Objectives		No	n/a
ARARs Review		No	n/a
Summary of Site Visit		Yes	n/a
Areas of Non Compliance		Yes	n/a
Technology Recommendations		No	n/a
Statement of Protectiveness		No	n/a
Next Review		No	n/a
Implementation Requirements		No	n/a
Travel			
Required Parameters			
Number of Travelers		1	EA
Number of Days		1	EA
Air Fare Ticket Price		500.00	$
Need a rental car?		Yes	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: Administrative LUC (signs)
Description: Administrative Land Use Controls including signs (4 signs)

Start Date: June, 2019
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

Estimate Documentation Detailed Report - Layout 2

Total Marked-up Cost: $83,066.79

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		2019	n/a
Implementation		Yes	n/a
Implementation: Start Date		2019	n/a
Monitoring & Enforcement		No	n/a
Modification/Termination		No	n/a
Type of Site		Active 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)		No	n/a
Memorandum of Agreements (MOA): Number		0	EA
Installation (or City) Master Plan		No	n/a
Construction Permitting		No	n/a
Construction Permitting: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		0	EA
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		1	EA
LUCIP: Number of Days		1	EA
LUCIP: Airfare Cost		1.00	$
LUCIP: Mileage to Meeting Site		100	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		0	EA
MOA: Number of People		0	EA
MOA: Number of Days		0	EA
MOA: Airfare Cost		0.00	$
MOA: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		0	EA
Master Plan: Number of People		0	EA
Master Plan: Number of Days		0	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		0	EA
GIS/Overlay Maps: Number of People		0	EA
GIS/Overlay Maps: Number of Days		0	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		No	n/a
Deed Notification: Number		0	EA
Negotiating Easements		No	n/a
Negotiating Easements: 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
Implementation			
Required Parameters			
Restrictive Covenants		No	n/a
Restrictive Covenants: Number		0	EA
Equitable Servitudes		No	n/a
Equitable Servitudes: Number		0	EA
Access Control Signs		Yes	n/a
Access Control Signs: Number		4	EA
Access Control Signs: Task Complexity		Low	n/a
Utility Notification Service		Yes	n/a
Access Control Signs: Number		1	EA
Access Control Signs: Task Complexity		Low	n/a
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		0	EA
Develop Finding of Suitability to Transfer (FOST)		No	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: 30-Year O&M
Description: 30-Year O&M

Start Date: June, 2019
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: $476,331.86

Technologies:

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			
Rename Model		ADMINISTRATIVE LAND USE CONTROLS	n/a
Planning Documents		No	n/a
Implementation		No	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2019	n/a
Modification/Termination		No	n/a
Type of Site		Active Government Installation	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		Biennially	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		2	Days
Site Visits/Inspections: Number of People		1	EA
Site Visits/Inspections: Frequency		Biennially	n/a
Site Visits/Inspections: Airfare		500	$ Per Ticket
Site Visits/Inspections: Mileage		100	MI

Comments:

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Technology: MEC Removal Action with AGC
Element: Systematic Project Planning

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	30.00	DAY	0.00	0.00	0.00	75.45	$2,263.62	No
33010202	Per Diem (per person)	36.00	DAY	0.00	0.00	0.00	229.87	$8,275.32	No
33040947	MEC: Systematic Project Planning Meeting, includes labor and facility rental expenses, per EA	3.00	EA	0.00	22,652.99	0.00	1,379.22	$72,096.62	No
33040948	MEC: Systematic Project Planning, Site Visit, includes labor expenses, per EA	1.00	EA	0.00	6,745.48	0.00	0.00	$6,745.48	No
33040949	MEC: Systematic Project Planning, UFP QAPP, includes labor expenses, per EA	1.00	EA	0.00	73,034.81	0.00	0.00	$73,034.81	No
33040950	MEC: Systematic Project Planning, Establish and Management of GIS Database, includes labor expenses, per EA	1.00	EA	0.00	23,448.13	0.00	0.00	$23,448.13	No
33040951	MEC: Systematic Project Planning,Community Relation Plan, includes labor expenses, per EA	1.00	EA	0.00	13,429.74	0.00	0.00	$13,429.74	No
33040953	MEC: Systematic Project Planning,PMP/Quality Assurance Surveillance Plan, includes labor expenses, per EA	1.00	EA	0.00	10,494.89	0.00	0.00	$10,494.89	No
33040954	MEC: Systematic Project Planning, Health and Safety Plan, includes labor expenses, per EA	1.00	EA	0.00	16,486.44	0.00	0.00	$16,486.44	No
33040955	MEC: Systematic Project Planning, Cultural and Archeological Plan, includes labor expenses, per EA	1.00	EA	0.00	11,338.70	0.00	0.00	$11,338.70	No
33040956	MEC: Systematic Project Planning, Environmental and Biological Plan, includes labor expenses, per EA	1.00	EA	0.00	11,430.23	0.00	0.00	$11,430.23	No
33040961	Explosive Safety	1.00	EA	0.00	30,862.89	0.00	0.00	$30,862.89	No

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Technology: MEC Removal Action with AGC

	Submission, includes labor and equipment expenses, per EA								
33041101	Airfare	6.00	LS	0.00	0.00	0.00	575.00	$3,450.00	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	7,004.82	$7,004.82	No

Total Element Cost: $290,361.68

Element: Surface and Sub Removal - Site Prep

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
17010401	Chipping brush, light brush	19.50	ACR	0.00	1,682.20	571.11	0.00	$43,939.59	No
17010402	Chipping brush, medium brush	9.75	ACR	0.00	2,162.74	734.24	0.00	$28,245.55	No
33010108	Sedan, Automobile, Rental	2.00	DAY	0.00	0.00	0.00	75.45	$150.91	No
33010114	Mobilization Equipment (Soils)	1.00	LS	0.00	2,485.84	2,431.63	0.00	$4,917.47	No
33010202	Per Diem (per person)	108.00	DAY	0.00	0.00	0.00	229.87	$24,825.96	No
33040651	4 X 4 Truck-Rental/Lease	69.00	DAY	0.00	0.00	302.92	0.00	$20,901.41	No
33040934	UXO Technician II	100.00	HR	0.00	70.41	0.00	0.00	$7,041.11	No
33040935	UXO Technician III (UXO Supervisor)	80.00	HR	0.00	83.18	0.00	0.00	$6,654.36	No
33040958	MEC: Surface Clearance , includes labor and equipment expenses, per Day	15.00	DAY	0.00	3,648.24	0.00	94.98	$56,148.18	No
33040959	MEC: Archeological Survey, includes labor and equipment expenses, per Day	1.00	DAY	0.00	1,736.22	0.00	135.72	$1,871.93	No
33040960	MEC: Flora/Fauna Survey, includes labor and equipment expenses, per Day	1.00	DAY	0.00	1,736.22	0.00	135.72	$1,871.93	No
33041101	Airfare	14.00	LS	0.00	0.00	0.00	575.00	$8,050.00	No
33220212	Surveying - 2-man Crew	2.00	DAY	0.00	1,304.24	23.67	0.00	$2,655.82	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	5,395.62	$5,395.62	No

Total Element Cost: $212,669.85

Element: RA Field Activities

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010114	Mobilization Equipment (Soils)	2.00	LS	0.00	2,485.84	2,431.63	0.00	$9,834.93	No

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Technology: MEC Removal Action with AGC

33010202	Per Diem (per person)	105.00	DAY	0.00	0.00	0.00	229.87	$24,136.35	No
33040170	MEC: Instrument Verification Strip Installation, per EA	1.00	EA	625.09	5,227.55	14.19	740.76	$6,607.60	No
33040171	MEC: UXO Seeding, Quality Seeding Installation, per EA	105.00	EA	7.22	60.09	0.00	151.26	$22,950.15	No
33040173	MEC: UXO Mag and Flag Grid Team, per HR	70.00	HR	0.00	400.40	0.00	135.72	$37,528.00	No
33040182	Land-Based Advanced Classification Survey Grid Team, MEC Removal Action, per HR	100.00	HR	0.00	269.26	0.00	226.23	$49,549.77	No
33040270	Geometrics MetalMapper Mobilization Fee	1.00	EA	0.00	0.00	0.00	1,460.13	$1,460.13	No
33040651	4 X 4 Truck-Rental/Lease	24.00	DAY	0.00	0.00	302.92	0.00	$7,270.06	No
33041101	Airfare	5.00	LS	0.00	0.00	0.00	575.00	$2,875.00	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	4,525.68	$4,525.68	No

Total Element Cost: $166,737.68

Element: Investigation

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	195.00	DAY	0.00	0.00	0.00	229.87	$44,824.65	No
33040181	UXO Anomaly Dig Crew, MEC Removal Action, includes Labor and Equipment, per HR	206.00	HR	0.00	306.99	0.00	67.86	$77,218.04	No
33040184	Advanced Geophysics Classification Cueing, MEC Investigation, per EA	1,950.00	EA	0.00	13.24	0.00	5.94	$37,411.05	No
33040185	UXO Anomaly Explosive Demolition, MEC Activities, includes Labor, Material and Equipment, per EA	43.00	EA	273.28	614.36	0.00	0.00	$38,168.55	No
33040186	Munitions Deemed As Safe (MDAS) Disposal, bulk solid waste, includes materials, documentation, transport and disposal fees, per LB	2,896.00	LB	0.00	0.00	0.00	9.65	$27,939.05	No
33040651	4 X 4 Truck-Rental/Lease	52.00	DAY	0.00	0.00	302.92	0.00	$15,751.79	No

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Technology: MEC Removal Action with AGC

33041101	Airfare	10.00	LS	0.00	0.00	0.00	575.00	$5,750.00	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	6,869.39	$6,869.39	No

Total Element Cost: $253,932.52

Element: Site Management

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
16019934	Temporary Office 50' X 12'	2.00	MO	860.33	0.00	0.00	0.00	$1,720.65	No
16019935	Field office expense, office supplies, average, per month	2.00	MO	140.89	0.00	0.00	0.00	$281.79	No
20020310	1/C #2 Aluminum, Bare, Wire	500.00	LF	0.63	1.36	0.12	0.00	$1,056.69	No
20020403	40' Class 3 Treated Power Pole	5.00	EA	774.91	897.24	129.96	0.00	$9,010.52	No
20020431	Terminal Structure, 15 KV Pole Top	2.00	EA	2,931.45	2,906.56	371.46	0.00	$12,418.94	No
33010202	Per Diem (per person)	250.00	DAY	0.00	0.00	0.00	229.87	$57,467.50	No
33010475	Toilet, portable, chemical, rent per month	2.00	MO	174.35	0.00	0.00	0.00	$348.71	No
33040651	4 X 4 Truck-Rental/Lease	250.00	DAY	0.00	0.00	302.92	0.00	$75,729.75	No
33040699	Storage boxes, rent per month, 40' x 8'	2.00	MO	190.20	0.00	0.00	0.00	$380.41	No
33040921	Senior UXO Supervisor (SUXOS)	579.00	HR	0.00	111.18	0.00	0.00	$64,374.29	No
33040923	UXO Project Manager	145.00	HR	0.00	162.04	0.00	0.00	$23,496.39	No
33040930	UXO QC Specialist	356.00	HR	0.00	98.92	0.00	0.00	$35,217.01	No
33040931	UXO Safety Officer	356.00	HR	0.00	99.51	0.00	0.00	$35,423.91	No
33040940	GIS Manager (UXO)	145.00	HR	0.00	116.84	0.00	0.00	$16,941.10	No
33041101	Airfare	5.00	LS	0.00	0.00	0.00	575.00	$2,875.00	No
33220101	Senior Project Manager	12.00	HR	0.00	244.21	0.00	0.00	$2,930.49	No
33220113	Secretarial/ Administrative	12.00	HR	0.00	120.71	0.00	0.00	$1,448.53	No
33222006	Electrician	40.00	HR	0.00	114.58	0.00	0.00	$4,583.23	No

Total Element Cost: $345,704.91

Element: RA Reporting

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33041324	MEC After Action Report - Site Complexity (Low), per	1.00	EA	0.00	16,089.90	0.00	0.00	$16,089.90	No

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Technology: MEC Removal Action with AGC

	EA								
33041325	MEC: Independent Blind Seed Tracking, per EA	1.00	EA	0.00	5,498.68	0.00	0.00	$5,498.68	No
33041326	MEC: IVS Memo, per EA	1.00	EA	0.00	9,517.86	0.00	0.00	$9,517.86	No
33041330	MEC: Anomaly Selection Memo, per EA	1.00	EA	0.00	9,517.86	0.00	0.00	$9,517.86	No
33041331	MEC: TOI Memo, per EA	1.00	EA	0.00	9,517.86	0.00	0.00	$9,517.86	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	531.69	$531.69	No

Total Element Cost: $50,673.84

Total Tech Cost: $1,320,080.47

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Planning Docs	2019	$38,432.02	$38,432.02
Planning Meetings	2019	$13,006.55	$13,006.55
Implementation	2019	$31,628.22	$31,628.22

Total Marked Up Tech Cost: $83,066.79

Technology: ADMINISTRATIVE LAND USE CONTROLS

Element: Planning Docs

Year(s)	Cost per Year
2019	$38,432.02

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	22.00	HR	0.00	234.00	0.00	0.00	$5,148.07	No
33220105	Project Engineer	30.00	HR	0.00	198.39	0.00	0.00	$5,951.62	No
33220106	Staff Engineer	45.00	HR	0.00	204.33	0.00	0.00	$9,194.80	No
33220110	QA/QC Officer	11.00	HR	0.00	160.15	0.00	0.00	$1,761.69	No
33220114	Word Processing/Clerical	60.00	HR	0.00	109.73	0.00	0.00	$6,584.04	No
33220115	Draftsman/CADD	30.00	HR	0.00	127.89	0.00	0.00	$3,836.83	No
33220503	Attorney, Partner, Real Estate	22.00	HR	0.00	245.19	0.00	0.00	$5,394.14	No
33240101	Other Direct Costs	1.00	LS	560.83	0.00	0.00	0.00	$560.83	No

Total First Year Element Cost: $38,432.02

Element: Planning Meetings

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Technology: ADMINISTRATIVE LAND USE CONTROLS

Year(s)	Cost per Year
2019	$13,006.55

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	100.00	MI	0.00	0.00	0.00	0.32	$31.86	No
33010108	Sedan, Automobile, Rental	2.00	DAY	0.00	0.00	0.00	75.45	$150.91	No
33010202	Per Diem (per person)	3.00	DAY	0.00	0.00	0.00	229.87	$689.61	No
33022038	Overnight delivery service, 1 lb package	1.00	LB	0.00	0.00	0.00	72.00	$72.00	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	1.00	$1.00	No
33220102	Project Manager	39.00	HR	0.00	234.00	0.00	0.00	$9,126.12	No
33220114	Word Processing/Clerical	16.00	HR	0.00	109.73	0.00	0.00	$1,755.74	No
33220115	Draftsman/CADD	8.00	HR	0.00	127.89	0.00	0.00	$1,023.15	No
33240101	Other Direct Costs	1.00	LS	156.15	0.00	0.00	0.00	$156.15	No

Total First Year Element Cost: $13,006.55

Element: Implementation

Year(s)	Cost per Year
2019	$31,628.22

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
18010412	Construction Signs	72.00	SF	44.03	0.00	0.00	0.00	$3,170.08	No
33220102	Project Manager	15.00	HR	0.00	234.00	0.00	0.00	$3,510.05	No
33220105	Project Engineer	30.00	HR	0.00	198.39	0.00	0.00	$5,951.62	No
33220106	Staff Engineer	45.00	HR	0.00	204.33	0.00	0.00	$9,194.80	No
33220110	QA/QC Officer	8.00	HR	0.00	160.15	0.00	0.00	$1,281.23	No
33220114	Word Processing/Clerical	30.00	HR	0.00	109.73	0.00	0.00	$3,292.02	No
33220115	Draftsman/CADD	38.00	HR	0.00	127.89	0.00	0.00	$4,859.99	No
33240101	Other Direct Costs	1.00	LS	368.43	0.00	0.00	0.00	$368.43	No

Total First Year Element Cost: $31,628.22

Total First Year Tech Cost: $83,066.79

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost

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Monitoring & Enforcement	2019	$31,755.46	$31,755.46
Monitoring & Enforcement	2021	$31,755.46	$31,755.46
Monitoring & Enforcement	2023	$31,755.46	$31,755.46
Monitoring & Enforcement	2025	$31,755.46	$31,755.46
Monitoring & Enforcement	2027	$31,755.46	$31,755.46
Monitoring & Enforcement	2029	$31,755.46	$31,755.46
Monitoring & Enforcement	2031	$31,755.46	$31,755.46
Monitoring & Enforcement	2033	$31,755.46	$31,755.46
Monitoring & Enforcement	2035	$31,755.46	$31,755.46
Monitoring & Enforcement	2037	$31,755.46	$31,755.46
Monitoring & Enforcement	2039	$31,755.46	$31,755.46
Monitoring & Enforcement	2041	$31,755.46	$31,755.46
Monitoring & Enforcement	2043	$31,755.46	$31,755.46
Monitoring & Enforcement	2045	$31,755.46	$31,755.46
Monitoring & Enforcement	2047	$31,755.46	$31,755.46
		Total Marked Up Tech Cost:	$476,331.90

Technology: ADMINISTRATIVE LAND USE CONTROLS
Element: Monitoring & Enforcement

Year(s)	Cost per Year
2019	$31,755.46
2020	$0.00
2021	$31,755.46
2022	$0.00
2023	$31,755.46
2024	$0.00
2025	$31,755.46
2026	$0.00
2027	$31,755.46
2028	$0.00
2029	$31,755.46
2030	$0.00
2031	$31,755.46
2032	$0.00
2033	$31,755.46
2034	$0.00
2035	$31,755.46
2036	$0.00
2037	$31,755.46
2038	$0.00
2039	$31,755.46
2040	$0.00
2041	$31,755.46
2042	$0.00
2043	$31,755.46

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Technology: ADMINISTRATIVE LAND USE CONTROLS

2044	$0.00
2045	$31,755.46
2046	$0.00
2047	$31,755.46
2048	$0.00

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	100.00	MI	0.00	0.00	0.00	0.32	$31.86	No
33010108	Sedan, Automobile, Rental	3.00	DAY	0.00	0.00	0.00	75.45	$226.36	No
33010202	Per Diem (per person)	5.00	DAY	0.00	0.00	0.00	229.87	$1,149.35	No
33022038	Overnight delivery service, 1 lb package	6.00	LB	0.00	0.00	0.00	72.00	$432.01	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	500.00	$500.00	No
33220102	Project Manager	44.00	HR	0.00	285.37	0.00	0.00	$12,556.26	No
33220106	Staff Engineer	40.00	HR	0.00	249.18	0.00	0.00	$9,967.26	No
33220110	QA/QC Officer	4.00	HR	0.00	160.15	0.00	0.00	$640.61	No
33220112	Field Technician	1.00	HR	0.00	135.87	0.00	0.00	$135.87	No
33220114	Word Processing/Clerical	26.00	HR	0.00	133.82	0.00	0.00	$3,479.37	No
33220115	Draftsman/CADD	16.00	HR	0.00	127.89	0.00	0.00	$2,046.31	No
33220119	Health and Safety Officer	1.00	HR	0.00	209.35	0.00	0.00	$209.35	No
33240101	Other Direct Costs	1.00	LS	380.83	0.00	0.00	0.00	$380.83	No

Total First Year Element Cost: $31,755.46

Total First Year Tech Cost: $31,755.46

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2024	$454.68	$454.68
Document Review	2029	$454.68	$454.68
Document Review	2034	$454.68	$454.68
Document Review	2039	$454.68	$454.68
Document Review	2044	$454.68	$454.68
Document Review	2049	$454.68	$454.68
Site Inspection	2024	$3,010.44	$3,010.44
Site Inspection	2029	$3,010.44	$3,010.44
Site Inspection	2034	$3,010.44	$3,010.44
Site Inspection	2039	$3,010.44	$3,010.44
Site Inspection	2044	$3,010.44	$3,010.44

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Site Inspection	2049	$3,010.44	$3,010.44
Report	2024	$7,460.14	$7,460.14
Report	2029	$7,460.14	$7,460.14
Report	2034	$7,460.14	$7,460.14
Report	2039	$7,460.14	$7,460.14
Report	2044	$7,460.14	$7,460.14
Report	2049	$7,460.14	$7,460.14
Travel	2024	$805.32	$805.32
Travel	2029	$805.32	$805.32
Travel	2034	$805.32	$805.32
Travel	2039	$805.32	$805.32
Travel	2044	$805.32	$805.32
Travel	2049	$805.32	$805.32

Total Marked Up Tech Cost: $70,383.48

Technology: Five-Year Review

Element: Document Review

Year(s)	Cost per Year
2024	$454.68
2025 - 2028	$0.00
2029	$454.68
2030 - 2033	$0.00
2034	$454.68
2035 - 2038	$0.00
2039	$454.68
2040 - 2043	$0.00
2044	$454.68
2045 - 2048	$0.00
2049	$454.68

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220105	Project Engineer	1.00	HR	0.00	241.94	0.00	0.00	$241.94	No
33220109	Staff Scientist	1.00	HR	0.00	212.75	0.00	0.00	$212.75	No

Total First Year Element Cost: $454.68

Element: Site Inspection

Year(s)	Cost per Year
2024	$3,010.44
2025 - 2028	$0.00
2029	$3,010.44
2030 - 2033	$0.00
2034	$3,010.44
2035 - 2038	$0.00

Estimate Documentation Detailed Report - Layout 2

Technology: Five-Year Review

2039	$3,010.44
2040 - 2043	$0.00
2044	$3,010.44
2045 - 2048	$0.00
2049	$3,010.44

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	3.00	HR	0.00	285.37	0.00	0.00	$856.11	No
33220105	Project Engineer	3.00	HR	0.00	241.94	0.00	0.00	$725.81	No
33220108	Project Scientist	3.00	HR	0.00	263.43	0.00	0.00	$790.28	No
33220109	Staff Scientist	3.00	HR	0.00	212.75	0.00	0.00	$638.24	No

Total First Year Element Cost: $3,010.44

Element: Report

Year(s)	Cost per Year
2024	$7,460.14
2025 - 2028	$0.00
2029	$7,460.14
2030 - 2033	$0.00
2034	$7,460.14
2035 - 2038	$0.00
2039	$7,460.14
2040 - 2043	$0.00
2044	$7,460.14
2045 - 2048	$0.00
2049	$7,460.14

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	285.37	0.00	0.00	$1,141.48	No
33220105	Project Engineer	11.00	HR	0.00	241.94	0.00	0.00	$2,661.29	No
33220108	Project Scientist	5.00	HR	0.00	263.43	0.00	0.00	$1,317.14	No
33220109	Staff Scientist	11.00	HR	0.00	212.75	0.00	0.00	$2,340.23	No

Total First Year Element Cost: $7,460.14

Element: Travel

Year(s)	Cost per Year
2024	$805.32
2025 - 2028	$0.00
2029	$805.32
2030 - 2033	$0.00

Estimate Documentation Detailed Report - Layout 2

Technology: Five-Year Review

2034	$805.32
2035 - 2038	$0.00
2039	$805.32
2040 - 2043	$0.00
2044	$805.32
2045 - 2048	$0.00
2049	$805.32

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	1.00	DAY	0.00	0.00	0.00	75.45	$75.45	No
33010202	Per Diem (per person)	1.00	DAY	0.00	0.00	0.00	229.87	$229.87	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	500.00	$500.00	No

Total First Year Element Cost: $805.32

Total First Year Tech Cost: $11,730.59

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2024	$454.68	$454.68
Document Review	2029	$454.68	$454.68
Document Review	2034	$454.68	$454.68
Document Review	2039	$454.68	$454.68
Document Review	2044	$454.68	$454.68
Document Review	2049	$454.68	$454.68
Site Inspection	2024	$3,010.44	$3,010.44
Site Inspection	2029	$3,010.44	$3,010.44
Site Inspection	2034	$3,010.44	$3,010.44
Site Inspection	2039	$3,010.44	$3,010.44
Site Inspection	2044	$3,010.44	$3,010.44
Site Inspection	2049	$3,010.44	$3,010.44
Report	2024	$7,460.14	$7,460.14
Report	2029	$7,460.14	$7,460.14
Report	2034	$7,460.14	$7,460.14
Report	2039	$7,460.14	$7,460.14
Report	2044	$7,460.14	$7,460.14
Report	2049	$7,460.14	$7,460.14
Travel	2024	$805.32	$805.32
Travel	2029	$805.32	$805.32
Travel	2034	$805.32	$805.32
Travel	2039	$805.32	$805.32
Travel	2044	$805.32	$805.32
Travel	2049	$805.32	$805.32

Estimate Documentation Detailed Report - Layout 2

Total Marked Up Tech Cost:	$70,383.48

AOI-02, Alternative 3: Partial MEC Removal with LUCs
Project Assembly Level Data Report

Note:
Costs are direct (no markup)

Phase Name	Tech. Key	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	units	Cost
Partial Removal Action	39	MEC Removal Action with AGC	16019934	Temporary Office 50' X 12'	2	MO	576.43	0.00	0.00	0.00	1,152.86		
Partial Removal Action	39	MEC Removal Action with AGC	16019935	Field office expense, office supplies, average, per month	2	MO	94.40	0.00	0.00	0.00	188.80		
Partial Removal Action	39	MEC Removal Action with AGC	17010401	Chipping brush, light brush	19.5	ACR	0.00	1,127.10	382.65	0.00	29,440.14		
Partial Removal Action	39	MEC Removal Action with AGC	17010402	Chipping brush, medium brush	9.75	ACR	0.00	1,449.06	491.95	0.00	18,924.92		
Partial Removal Action	39	MEC Removal Action with AGC	20020310	1/C #2 Aluminum, Bare, Wire	500	LF	0.42	0.91	0.08	0.00	708.00		
Partial Removal Action	39	MEC Removal Action with AGC	20020403	40' Class 3 Treated Power Pole	5	EA	519.20	601.16	87.07	0.00	6,037.17		
Partial Removal Action	39	MEC Removal Action with AGC	20020431	Terminal Structure, 15 KV Pole Top	2	EA	1,964.11	1,947.44	248.89	0.00	8,320.86		
Partial Removal Action	39	MEC Removal Action with AGC	33010108	Sedan, Automobile, Rental	2	DAY	0.00	0.00	0.00	62.94	125.88		
Partial Removal Action	39	MEC Removal Action with AGC	33010108	Sedan, Automobile, Rental	30	DAY	0.00	0.00	0.00	62.94	1,888.24		
Partial Removal Action	39	MEC Removal Action with AGC	33010114	Mobilization Equipment (Soils)	1	LS	0.00	1,665.55	1,629.23	0.00	3,294.77		
Partial Removal Action	39	MEC Removal Action with AGC	33010114	Mobilization Equipment (Soils)	2	LS	0.00	1,665.55	1,629.23	0.00	6,589.54		
Partial Removal Action	39	MEC Removal Action with AGC	33010202	Per Diem (per person)	36	DAY	0.00	0.00	0.00	229.87	8,275.32		
Partial Removal Action	39	MEC Removal Action with AGC	33010202	Per Diem (per person)	108	DAY	0.00	0.00	0.00	229.87	24,825.96		
Partial Removal Action	39	MEC Removal Action with AGC	33010202	Per Diem (per person)	195	DAY	0.00	0.00	0.00	229.87	44,824.65		
Partial Removal Action	39	MEC Removal Action with AGC	33010202	Per Diem (per person)	105	DAY	0.00	0.00	0.00	229.87	24,136.35		
Partial Removal Action	39	MEC Removal Action with AGC	33010202	Per Diem (per person)	250	DAY	0.00	0.00	0.00	229.87	57,467.50		
Partial Removal Action	39	MEC Removal Action with AGC	33010475	Toilet, portable, chemical, rent per month	2	MO	116.82	0.00	0.00	0.00	233.64		
Partial Removal Action	39	MEC Removal Action with AGC	33040170	MEC: Instrument Verification Strip Installation, per EA	1	EA	418.82	3,502.53	9.51	617.92	4,548.78		
Partial Removal Action	39	MEC Removal Action with AGC	33040171	MEC: UXO Seeding, Quality Seeding Installation, per EA	105	EA	4.84	40.26	0.00	126.18	17,984.08		
Partial Removal Action	39	MEC Removal Action with AGC	33040173	MEC: UXO Mag and Flag Grid Team, per HR	70	HR	0.00	268.27	0.00	113.21	26,703.75		
Partial Removal Action	39	MEC Removal Action with AGC	33040181	UXO Anomaly Dig Crew, MEC Removal Action, includes Labor and Equipment, per HR	206	HR	0.00	205.69	0.00	56.60	54,031.82		
Partial Removal Action	39	MEC Removal Action with AGC	33040182	Land-Based Advanced Classification Survey Grid Team, MEC Removal Action, per HR	100	HR	0.00	180.41	0.00	188.72	36,912.76		
Partial Removal Action	39	MEC Removal Action with AGC	33040184	Advanced Geophysics Classification Cueing, MEC Investigation, per EA	1950	EA	0.00	8.87	0.00	4.96	26,967.72		
Partial Removal Action	39	MEC Removal Action with AGC	33040185	UXO Anomaly Explosive Demolition, MEC Activities, includes Labor, Material and Equipment, per EA	43	EA	183.10	411.63	0.00	0.00	25,573.47		
Partial Removal Action	39	MEC Removal Action with AGC	33040186	Munitions Deemed As Safe (MDAS) Disposal, bulk solid waste, includes materials, documentation, transport and disposal fees, per LB	2896	LB	0.00	0.00	0.00	8.05	23,305.85		
Partial Removal Action	39	MEC Removal Action with AGC	33040270	Geometrics MetalMapper Mobilization Fee	1	EA	0.00	0.00	0.00	1,218.00	1,218.00		
Partial Removal Action	39	MEC Removal Action with AGC	33040651	4 X 4 Truck- Rental/Lease	52	DAY	0.00	0.00	202.96	0.00	10,553.92		
Partial Removal Action	39	MEC Removal Action with AGC	33040651	4 X 4 Truck- Rental/Lease	69	DAY	0.00	0.00	202.96	0.00	14,004.24		
Partial Removal Action	39	MEC Removal Action with AGC	33040651	4 X 4 Truck- Rental/Lease	24	DAY	0.00	0.00	202.96	0.00	4,871.04		
Partial Removal Action	39	MEC Removal Action with AGC	33040651	4 X 4 Truck- Rental/Lease	250	DAY	0.00	0.00	202.96	0.00	50,740.00		
Partial Removal Action	39	MEC Removal Action with AGC	33040699	Storage boxes, rent per month, 40' x 8'	2	MO	127.44	0.00	0.00	0.00	254.88		
Partial Removal Action	39	MEC Removal Action with AGC	33040921	Senior UXO Supervisor (SUXOS)	579	HR	0.00	74.49	0.00	0.00	43,131.68		
Partial Removal Action	39	MEC Removal Action with AGC	33040923	UXO Project Manager	145	HR	0.00	108.57	0.00	0.00	15,742.91		
Partial Removal Action	39	MEC Removal Action with AGC	33040930	UXO QC Specialist	356	HR	0.00	66.28	0.00	0.00	23,595.89		
Partial Removal Action	39	MEC Removal Action with AGC	33040931	UXO Safety Officer	356	HR	0.00	66.67	0.00	0.00	23,734.52		
Partial Removal Action	39	MEC Removal Action with AGC	33040934	UXO Technician II	100	HR	0.00	47.18	0.00	0.00	4,717.64		
Partial Removal Action	39	MEC Removal Action with AGC	33040935	UXO Technician III (UXO Supervisor)	80	HR	0.00	55.73	0.00	0.00	4,458.51		
Partial Removal Action	39	MEC Removal Action with AGC	33040940	GIS Manager (UXO)	145	HR	0.00	78.28	0.00	0.00	11,350.77		
Partial Removal Action	39	MEC Removal Action with AGC	33040947	MEC: Systematic Project Planning Meeting, includes labor and facility rental expenses, per EA	3	EA	0.00	15,177.82	0.00	1,150.50	48,984.96		
Partial Removal Action	39	MEC Removal Action with AGC	33040948	MEC: Systematic Project Planning, Site Visit, includes labor expenses, per EA	1	EA	0.00	4,519.56	0.00	0.00	4,519.56		
Partial Removal Action	39	MEC Removal Action with AGC	33040949	MEC: Systematic Project Planning, UFP QAPP, includes labor expenses, per EA	1	EA	0.00	48,934.35	0.00	0.00	48,934.35		
Partial Removal Action	39	MEC Removal Action with AGC	33040950	MEC: Systematic Project Planning, Establish and Management of GIS Database, includes labor expenses, per EA	1	EA	0.00	15,710.58	0.00	0.00	15,710.58		
Partial Removal Action	39	MEC Removal Action with AGC	33040951	MEC: Systematic Project Planning,Community Relation Plan, includes labor expenses, per EA	1	EA	0.00	8,998.11	0.00	0.00	8,998.11		
Partial Removal Action	39	MEC Removal Action with AGC	33040953	MEC: Systematic Project Planning,PMP/Quality Assurance Surveillance Plan, includes labor expenses, per EA	1	EA	0.00	7,031.73	0.00	0.00	7,031.73		
Partial Removal Action	39	MEC Removal Action with AGC	33040954	MEC: Systematic Project Planning, Health and Safety Plan, includes labor expenses, per EA	1	EA	0.00	11,046.14	0.00	0.00	11,046.14		

AOI-02, Alternative 3: Partial MEC Removal with LUCs
Project Assembly Level Data Report

Note:
Costs are direct (no markup)

Phase Name	Tech. Key	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	units	Cost
Partial Removal Action	39	MEC Removal Action with AGC	33040955	MEC: Systematic Project Planning, Cultural and Archeological Plan, includes labor expenses, per EA	1	EA	0.00	7,597.09	0.00	0.00	7,597.09		
Partial Removal Action	39	MEC Removal Action with AGC	33040956	MEC: Systematic Project Planning, Environmental and Biological Plan, includes labor expenses, per EA	1	EA	0.00	7,658.41	0.00	0.00	7,658.41		
Partial Removal Action	39	MEC Removal Action with AGC	33040958	MEC: Surface Clearance , includes labor and equipment expenses, per Day	15	DAY	0.00	2,444.37	0.00	79.23	37,853.93		
Partial Removal Action	39	MEC Removal Action with AGC	33040959	MEC: Archeological Survey, includes labor and equipment expenses, per Day	1	DAY	0.00	1,163.29	0.00	113.21	1,276.50		
Partial Removal Action	39	MEC Removal Action with AGC	33040960	MEC: Flora/Fauna Survey, includes labor and equipment expenses, per Day	1	DAY	0.00	1,163.29	0.00	113.21	1,276.50		
Partial Removal Action	39	MEC Removal Action with AGC	33040961	Explosive Safety Submission, includes labor and equipment expenses, per EA	1	EA	0.00	20,678.57	0.00	0.00	20,678.57		
Partial Removal Action	39	MEC Removal Action with AGC	33041101	Airfare	6	LS	0.00	0.00	0.00	575.00	3,450.00		
Partial Removal Action	39	MEC Removal Action with AGC	33041101	Airfare	5	LS	0.00	0.00	0.00	575.00	2,875.00		
Partial Removal Action	39	MEC Removal Action with AGC	33041101	Airfare	5	LS	0.00	0.00	0.00	575.00	2,875.00		
Partial Removal Action	39	MEC Removal Action with AGC	33041101	Airfare	10	LS	0.00	0.00	0.00	575.00	5,750.00		
Partial Removal Action	39	MEC Removal Action with AGC	33041101	Airfare	14	LS	0.00	0.00	0.00	575.00	8,050.00		
Partial Removal Action	39	MEC Removal Action with AGC	33041324	MEC After Action Report - Site Complexity (Low), per EA	1	EA	0.00	10,780.46	0.00	0.00	10,780.46		
Partial Removal Action	39	MEC Removal Action with AGC	33041325	MEC: Independent Blind Seed Tracking, per EA	1	EA	0.00	3,684.20	0.00	0.00	3,684.20		
Partial Removal Action	39	MEC Removal Action with AGC	33041326	MEC: IVS Memo, per EA	1	EA	0.00	6,377.10	0.00	0.00	6,377.10		
Partial Removal Action	39	MEC Removal Action with AGC	33041330	MEC: Anomaly Selection Memo, per EA	1	EA	0.00	6,377.10	0.00	0.00	6,377.10		
Partial Removal Action	39	MEC Removal Action with AGC	33041331	MEC: TOI Memo, per EA	1	EA	0.00	6,377.10	0.00	0.00	6,377.10		
Partial Removal Action	39	MEC Removal Action with AGC	33220101	Senior Project Manager	12	HR	0.00	85.84	0.00	0.00	1,030.14		
Partial Removal Action	39	MEC Removal Action with AGC	33220113	Secretarial/ Administrative	12	HR	0.00	42.43	0.00	0.00	509.19		
Partial Removal Action	39	MEC Removal Action with AGC	33220212	Surveying - 2-man Crew	2	DAY	0.00	873.86	15.86	0.00	1,779.44		
Partial Removal Action	39	MEC Removal Action with AGC	33222006	Electrician	40	HR	0.00	76.77	0.00	0.00	3,070.83		
Partial Removal Action	39	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	443.52	443.52		
Partial Removal Action	39	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	5,843.19	5,843.19		
Partial Removal Action	39	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	5,730.22	5,730.22		
Partial Removal Action	39	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	4,500.85	4,500.85		
Partial Removal Action	39	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	3,775.18	3,775.18		
										Total	965,681.79	1	$965,681.79
Periodic Review	43	Periodic Review	33010108	Sedan, Automobile, Rental	1	DAY	0.00	0.00	0.00	62.94	62.94		
Periodic Review	43	Periodic Review	33010202	Per Diem (per person)	1	DAY	0.00	0.00	0.00	229.87	229.87		
Periodic Review	43	Periodic Review	33041101	Airfare	1	LS	0.00	0.00	0.00	500.00	500.00		
Periodic Review	43	Periodic Review	33220102	Project Manager	4	HR	0.00	100.31	0.00	0.00	401.26		
Periodic Review	43	Periodic Review	33220102	Project Manager	3	HR	0.00	100.31	0.00	0.00	300.94		
Periodic Review	43	Periodic Review	33220105	Project Engineer	1	HR	0.00	85.05	0.00	0.00	85.05		
Periodic Review	43	Periodic Review	33220105	Project Engineer	11	HR	0.00	85.05	0.00	0.00	935.51		
Periodic Review	43	Periodic Review	33220105	Project Engineer	3	HR	0.00	85.05	0.00	0.00	255.14		
Periodic Review	43	Periodic Review	33220108	Project Scientist	3	HR	0.00	92.60	0.00	0.00	277.80		
Periodic Review	43	Periodic Review	33220108	Project Scientist	5	HR	0.00	92.60	0.00	0.00	463.01		
Periodic Review	43	Periodic Review	33220109	Staff Scientist	1	HR	0.00	74.79	0.00	0.00	74.79		
Periodic Review	43	Periodic Review	33220109	Staff Scientist	3	HR	0.00	74.79	0.00	0.00	224.36		
Periodic Review	43	Periodic Review	33220109	Staff Scientist	11	HR	0.00	74.79	0.00	0.00	822.65		
										Total	4,633.31	6	$27,799.85
LAND USE CONTROLS	47	LAND USE CONTROLS	18010412	Construction Signs	72	SF	29.50	0.00	0.00	0.00	2,124.00		
LAND USE CONTROLS	47	LAND USE CONTROLS	33010104	Sample collection, vehicle mileage charge, car or van	100	MI	0.00	0.00	0.00	0.32	31.86		
LAND USE CONTROLS	47	LAND USE CONTROLS	33010108	Sedan, Automobile, Rental	2	DAY	0.00	0.00	0.00	62.94	125.88		
LAND USE CONTROLS	47	LAND USE CONTROLS	33010202	Per Diem (per person)	3	DAY	0.00	0.00	0.00	229.87	689.61		
LAND USE CONTROLS	47	LAND USE CONTROLS	33022038	Overnight delivery service, 1 lb package	1	LB	0.00	0.00	0.00	60.06	60.06		
LAND USE CONTROLS	47	LAND USE CONTROLS	33041101	Airfare	1	LS	0.00	0.00	0.00	1.00	1.00		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220102	Project Manager	15	HR	0.00	82.26	0.00	0.00	1,233.87		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220102	Project Manager	22	HR	0.00	82.26	0.00	0.00	1,809.67		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220102	Project Manager	39	HR	0.00	82.26	0.00	0.00	3,208.05		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220105	Project Engineer	30	HR	0.00	69.74	0.00	0.00	2,092.14		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220105	Project Engineer	30	HR	0.00	69.74	0.00	0.00	2,092.14		

AOI-02, Alternative 3: Partial MEC Removal with LUCs
Project Assembly Level Data Report

Note:
Costs are direct (no markup)

Phase Name	Tech. Key	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	units	Cost
LAND USE CONTROLS	47	LAND USE CONTROLS	33220106	Staff Engineer	45	HR	0.00	71.83	0.00	0.00	3,232.20		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220106	Staff Engineer	45	HR	0.00	71.83	0.00	0.00	3,232.20		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220110	QA/QC Officer	8	HR	0.00	56.30	0.00	0.00	450.38		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220110	QA/QC Officer	11	HR	0.00	56.30	0.00	0.00	619.28		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220114	Word Processing/Clerical	16	HR	0.00	38.57	0.00	0.00	617.19		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220114	Word Processing/Clerical	30	HR	0.00	38.57	0.00	0.00	1,157.23		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220114	Word Processing/Clerical	60	HR	0.00	38.57	0.00	0.00	2,314.45		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220115	Draftsman/CADD	8	HR	0.00	44.96	0.00	0.00	359.66		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220115	Draftsman/CADD	30	HR	0.00	44.96	0.00	0.00	1,348.74		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220115	Draftsman/CADD	38	HR	0.00	44.96	0.00	0.00	1,708.40		
LAND USE CONTROLS	47	LAND USE CONTROLS	33220503	Attorney, Partner, Real Estate	22	HR	0.00	164.28	0.00	0.00	3,614.15		
LAND USE CONTROLS	47	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	375.77	0.00	0.00	0.00	375.77		
LAND USE CONTROLS	47	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	104.62	0.00	0.00	0.00	104.62		
LAND USE CONTROLS	47	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	246.86	0.00	0.00	0.00	246.86		
										Total	32,849.41	1	$32,849.41
30-Year O&M	36	LAND USE CONTROLS	33010104	Vehicle mileage charge, car or van	100	MI	0.00	0.00	0.00	0.32	31.86		
30-Year O&M	36	LAND USE CONTROLS	33010108	Sedan, Automobile, Rental	3	DAY	0.00	0.00	0.00	62.94	188.82		
30-Year O&M	36	LAND USE CONTROLS	33010202	Per Diem (per person)	5	DAY	0.00	0.00	0.00	229.87	1,149.35		
30-Year O&M	36	LAND USE CONTROLS	33022038	Overnight delivery service, 1 lb package	6	LB	0.00	0.00	0.00	60.06	360.37		
30-Year O&M	36	LAND USE CONTROLS	33041101	Airfare	1	LS	0.00	0.00	0.00	500.00	500.00		
30-Year O&M	36	LAND USE CONTROLS	33220102	Project Manager	44	HR	0.00	100.31	0.00	0.00	4,413.83		
30-Year O&M	36	LAND USE CONTROLS	33220106	Staff Engineer	40	HR	0.00	87.59	0.00	0.00	3,503.74		
30-Year O&M	36	LAND USE CONTROLS	33220110	QA/QC Officer	4	HR	0.00	56.30	0.00	0.00	225.19		
30-Year O&M	36	LAND USE CONTROLS	33220112	Field Technician	1	HR	0.00	47.76	0.00	0.00	47.76		
30-Year O&M	36	LAND USE CONTROLS	33220114	Word Processing/Clerical	26	HR	0.00	47.04	0.00	0.00	1,223.08		
30-Year O&M	36	LAND USE CONTROLS	33220115	Draftsman/CADD	16	HR	0.00	44.96	0.00	0.00	719.33		
30-Year O&M	36	LAND USE CONTROLS	33220119	Health and Safety Officer	1	HR	0.00	73.59	0.00	0.00	73.59		
30-Year O&M	36	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	255.16	0.00	0.00	0.00	255.16		
										Total	12,692.09	15	$190,381.42
												Grand Total	$1,216,712.46
												Mark-up	$ 733,150.00
												TOTAL	**$1,949,862**

Estimate Documentation Detailed Report - Layout 2

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: N:\Projects_Ongoing\3752-Camp Wellfleet\06_FS Report\RACER\Racer_Backup_7_31_2019.mdb

Folder:

Folder Name: Wellfleet

Project:

ID: Alternative 3
Name: Partial MEC Removal with LUC
Category: None

Location
State / Country: MASSACHUSETTS
City: CAPE COD

Location Modifier	Default	User	Reason for changes
	1.180	1.180	

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

Description Partial Munitions and Explosives of Concern (MEC) Removal with Administrative Land Use Controls (LUCs) including signs

Estimate Documentation Detailed Report - Layout 2

Site:

ID: AOI-5
Name: Area of Interest 5
Type: None

Media/Waste Type

Primary: Ordnance (not residual)
Secondary: N/A

Contaminant

Primary: Ordnance (not residual)
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☐	
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☐	
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: Area of Interest 5 (AOI-5)
Former Small Arms Range and Rocket Range

AOI-5 is 56.1 acres, including large parking lot and previous removal area (Zapata, 2005). Partial Removal Area is 30.1 acres.

Support Team: Michelle Chesnut

References: Final Remedial Investigation Report, Former Camp Wellfleet FUDS Remedial Investigation Through Decision Document, Wellfleet, Massachusetts (April 2019)

Zapata report, 2006

Estimator Information

Estimator Name: James Stuby
Estimator Title: Project Geophysicist
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Lane
Suite 300
Laurel, MD 20707
Telephone Number: 301-323-1429
Email Address: james.stuby@ertcorp.com
Estimate Prepared Date: 06/24/2019

Estimate Documentation Detailed Report - Layout 2

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name: Thomas Bachovchin
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Lane
Suite 300
Laurel, MD 20707
Telephone Number: 301-323-1442
Email Address: thomas.bachovchin@ertcorp.com
Date Reviewed: 06/24/2019

Reviewer Signature: _____ **Date:** _____

Estimate Costs:

Phase Names	Marked-Up Cost
Partial Removal Action	$1,149,653
Periodic Review	$70,384
Administrative LUC (signs)	$76,262
30-Year O&M	$476,332
Total Cost:	$1,772,631
Escalation:	$191,354
Total Project Cost:	$1,963,985

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Partial Removal Action
Description: Removal Action in 30.1 acres. Area is defined as all of AOI-5 excluding the large parking lot and the area where a removal action has been completed by Zapata in 2005.
Approach: Ex Situ
Start Date: June, 2019
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MEC Removal Action with AGC	Yes	100	0

Estimate Documentation Detailed Report - Layout 2

Total Marked-up Cost: $1,149,653.45

Technologies:

Technology Name: **MEC Removal Action with AGC (#1)**

User Name: **MEC Removal Action with AGC**

Description	Default	User	UOM
System Definition			
Required Parameters			
Surface and Subsurface Removal		30	Acres
SSR Topography 1		Gently Rolling	n/a
SSR Topography 1 Pct		100.00	%
SSR Topography 2		N/A	n/a
SSR Vegetation 1		Heavy grass with numerous shrubs	n/a
SSR Vegetation 1 Pct		100.00	%
SSR Vegetation 2		N/A	n/a
SSR Vegetation 2 Pct		0.00	%
Surface Removal Only		0	Acres
SR Topography 1		N/A	n/a
SR Topography 1 Pct		0.00	%
SR Topography 2		N/A	n/a
SR Vegetation 1		N/A	n/a
SR Vegetation 1 Pct		0.00	%
SR Vegetation 2		N/A	n/a
SR Vegetation 2 Pct		0.00	%
Site Complexity		Low	n/a
Systematic Project Planning			
Secondary Parameters			
Number of Meetings	3	3	n/a
Site Visit	1	1	n/a
UFP QAPP	Yes	Yes	n/a
Establish and Management of GIS Database	Yes	Yes	n/a
Community Relation Plan	Yes	Yes	n/a
Explosives Safety Submission	Yes	Yes	n/a
PMP / Quality Assurance Surveilance Plan	Yes	Yes	n/a
Health and Safety Plan	Yes	Yes	n/a
Cultural and Archaeological Plan	Yes	Yes	n/a
Environmental / Biological Plan	No	Yes	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **MEC Removal Action with AGC (#1)**

User Name: **MEC Removal Action with AGC**

Description	Default	User	UOM
SSR Site Preparation			
Secondary Parameters			
Heavy Removal	0	0	Acres
Moderate Removal	7.5	7.5	Acres
Light Removal	15	15	Acres
No Removal	7.5	7.5	Acres
Total Vegetation Removal Area	30	30	Acres
Archaeological Survey	30	30	Acres
Flora / Fauna Survey	30	30	Acres
Daily Travel Distance to Site	0 - 50 Miles	0 - 50 Miles	n/a
SR Site Preparation			
Secondary Parameters			
Heavy Removal	0	0	Acres
Moderate Removal	0	0	Acres
Light Removal	0	0	Acres
No Removal	0	0	Acres
Total Vegetation Removal Area	0	0	Acres
Archaeological Survey	0	0	Acres
Flora / Fauna Survey	0	0	Acres
RA Field Activities			
Secondary Parameters			
Mag & Flag (analog Geophysics)	0	15	Acres
Digital Geophysical Mapping with Single Sensor	30	15	Acres
Digital Geophysical Mapping with Array of Sensors	0	0	Acres
Anomaly Density	500	100	Anomalies / Acre
Investigation			
Secondary Parameters			
Advanced Geophysics Classification Cueing	750	1500	Anomalies
Number of Digs	7975	1650	Anomalies
Onsite Donor Explosive Storage	Yes	No	n/a

Comments:

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Periodic Review
Description: Periodic Review

Approach: Ex Situ

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Start Date: June, 2024
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: $70,383.52

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		No	n/a
Site Inspection		Yes	n/a
Report		Yes	n/a
Travel		Yes	n/a
Rebound Study		No	n/a
Start Month		June	n/a
No. Reviews		6	EA
Start Year		2024	n/a
Safety Level		D	n/a
Document Review			
Required Parameters			
5-Year Review Check List		Yes	n/a
Record of Decision		No	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		No	n/a

Estimate Documentation Detailed Report - Layout 2

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

User Name: **Five-Year Review**

Description	Default	User	UOM
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		No	n/a
Site Visit Documentation (Photos, Diagrams, etc.)		Yes	n/a
Report			
Required Parameters			
Introduction		No	n/a
Remedial Objectives		No	n/a
ARARs Review		No	n/a
Summary of Site Visit		Yes	n/a
Areas of Non Compliance		Yes	n/a
Technology Recommendations		No	n/a
Statement of Protectiveness		No	n/a
Next Review		No	n/a
Implementation Requirements		No	n/a
Travel			
Required Parameters			
Number of Travelers		1	EA
Number of Days		1	EA
Air Fare Ticket Price		500.00	$
Need a rental car?		Yes	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: Administrative LUC (signs)
Description: Administrative Land Use Controls including signs (2 signs)

Start Date: June, 2019
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: $76,261.86

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		2019	n/a
Implementation		Yes	n/a
Implementation: Start Date		2019	n/a
Monitoring & Enforcement		No	n/a
Modification/Termination		No	n/a
Type of Site		Active 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)		No	n/a
Memorandum of Agreements (MOA): Number		0	EA
Installation (or City) Master Plan		No	n/a
Construction Permitting		No	n/a
Construction Permitting: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		0	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			
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		1	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		0	EA
MOA: Number of People		0	EA
MOA: Number of Days		0	EA
MOA: Airfare Cost		0.00	$
MOA: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		0	EA
Master Plan: Number of People		0	EA
Master Plan: Number of Days		0	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		0	EA
GIS/Overlay Maps: Number of People		0	EA
GIS/Overlay Maps: Number of Days		0	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		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			
Deed Notification: Number		0	EA
Negotiating Easements		No	n/a
Negotiating Easements: Number		0	EA
Restrictive Covenants		No	n/a
Restrictive Covenants: Number		0	EA
Equitable Servitudes		No	n/a
Equitable Servitudes: Number		0	EA
Access Control Signs		Yes	n/a
Access Control Signs: Number		2	EA
Access Control Signs: Task Complexity		Low	n/a
Utility Notification Service		Yes	n/a
Access Control Signs: Number		1	EA
Access Control Signs: Task Complexity		Low	n/a
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		0	EA
Develop Finding of Suitability to Transfer (FOST)		No	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: 30-Year O&M
Description: 30-Year O&M

Start Date: June, 2019
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: $476,331.86

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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		No	n/a
Implementation		No	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2019	n/a
Modification/Termination		No	n/a
Type of Site		Active Government Installation	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		Biennially	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		2	Days
Site Visits/Inspections: Number of People		1	EA
Site Visits/Inspections: Frequency		Biennially	n/a
Site Visits/Inspections: Airfare		500	$ Per Ticket
Site Visits/Inspections: Mileage		100	MI

Comments:

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Technology: MEC Removal Action with AGC
Element: Systematic Project Planning

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	30.00	DAY	0.00	0.00	0.00	75.45	$2,263.62	No
33010202	Per Diem (per person)	36.00	DAY	0.00	0.00	0.00	229.87	$8,275.32	No
33040947	MEC: Systematic Project Planning Meeting, includes labor and facility rental expenses, per EA	3.00	EA	0.00	22,652.99	0.00	1,379.22	$72,096.62	No
33040948	MEC: Systematic Project Planning, Site Visit, includes labor expenses, per EA	1.00	EA	0.00	6,745.48	0.00	0.00	$6,745.48	No
33040949	MEC: Systematic Project Planning, UFP QAPP, includes labor expenses, per EA	1.00	EA	0.00	73,034.81	0.00	0.00	$73,034.81	No
33040950	MEC: Systematic Project Planning, Establish and Management of GIS Database, includes labor expenses, per EA	1.00	EA	0.00	23,448.13	0.00	0.00	$23,448.13	No
33040951	MEC: Systematic Project Planning,Community Relation Plan, includes labor expenses, per EA	1.00	EA	0.00	13,429.74	0.00	0.00	$13,429.74	No
33040953	MEC: Systematic Project Planning,PMP/Quality Assurance Surveillance Plan, includes labor expenses, per EA	1.00	EA	0.00	10,494.89	0.00	0.00	$10,494.89	No
33040954	MEC: Systematic Project Planning, Health and Safety Plan, includes labor expenses, per EA	1.00	EA	0.00	16,486.44	0.00	0.00	$16,486.44	No
33040955	MEC: Systematic Project Planning, Cultural and Archeological Plan, includes labor expenses, per EA	1.00	EA	0.00	11,338.70	0.00	0.00	$11,338.70	No
33040956	MEC: Systematic Project Planning, Environmental and Biological Plan, includes labor expenses, per EA	1.00	EA	0.00	11,430.23	0.00	0.00	$11,430.23	No
33040961	Explosive Safety	1.00	EA	0.00	30,862.89	0.00	0.00	$30,862.89	No

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Technology: MEC Removal Action with AGC

	Submission, includes labor and equipment expenses, per EA								
33041101	Airfare	6.00	LS	0.00	0.00	0.00	575.00	$3,450.00	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	7,004.82	$7,004.82	No

Total Element Cost: $290,361.68

Element: Surface and Sub Removal - Site Prep

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
17010401	Chipping brush, light brush	15.00	ACR	0.00	1,682.20	571.11	0.00	$33,799.68	No
17010402	Chipping brush, medium brush	7.50	ACR	0.00	2,162.74	734.24	0.00	$21,727.35	No
33010108	Sedan, Automobile, Rental	2.00	DAY	0.00	0.00	0.00	75.45	$150.91	No
33010114	Mobilization Equipment (Soils)	1.00	LS	0.00	2,485.84	2,431.63	0.00	$4,917.47	No
33010202	Per Diem (per person)	84.00	DAY	0.00	0.00	0.00	229.87	$19,309.08	No
33040651	4 X 4 Truck-Rental/Lease	54.00	DAY	0.00	0.00	302.92	0.00	$16,357.63	No
33040934	UXO Technician II	70.00	HR	0.00	70.41	0.00	0.00	$4,928.77	No
33040935	UXO Technician III (UXO Supervisor)	60.00	HR	0.00	83.18	0.00	0.00	$4,990.77	No
33040958	MEC: Surface Clearance , includes labor and equipment expenses, per Day	12.00	DAY	0.00	3,648.24	0.00	94.98	$44,918.54	No
33040959	MEC: Archeological Survey, includes labor and equipment expenses, per Day	1.00	DAY	0.00	1,736.22	0.00	135.72	$1,871.93	No
33040960	MEC: Flora/Fauna Survey, includes labor and equipment expenses, per Day	1.00	DAY	0.00	1,736.22	0.00	135.72	$1,871.93	No
33041101	Airfare	14.00	LS	0.00	0.00	0.00	575.00	$8,050.00	No
33220212	Surveying - 2-man Crew	1.00	DAY	0.00	1,304.24	23.67	0.00	$1,327.91	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	4,291.06	$4,291.06	No

Total Element Cost: $168,513.05

Element: RA Field Activities

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010114	Mobilization Equipment (Soils)	2.00	LS	0.00	2,485.84	2,431.63	0.00	$9,834.93	No

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Technology: MEC Removal Action with AGC

33010202	Per Diem (per person)	88.00	DAY	0.00	0.00	0.00	229.87	$20,228.56	No
33040170	MEC: Instrument Verification Strip Installation, per EA	1.00	EA	625.09	5,227.55	14.19	740.76	$6,607.60	No
33040171	MEC: UXO Seeding, Quality Seeding Installation, per EA	113.00	EA	7.22	60.09	0.00	151.26	$24,698.74	No
33040173	MEC: UXO Mag and Flag Grid Team, per HR	60.00	HR	0.00	400.40	0.00	135.72	$32,166.85	No
33040182	Land-Based Advanced Classification Survey Grid Team, MEC Removal Action, per HR	80.00	HR	0.00	269.26	0.00	226.23	$39,639.82	No
33040270	Geometrics MetalMapper Mobilization Fee	1.00	EA	0.00	0.00	0.00	1,460.13	$1,460.13	No
33040651	4 X 4 Truck-Rental/Lease	20.00	DAY	0.00	0.00	302.92	0.00	$6,058.38	No
33041101	Airfare	5.00	LS	0.00	0.00	0.00	575.00	$2,875.00	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	4,002.52	$4,002.52	No

Total Element Cost: $147,572.54

Element: Investigation

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	152.00	DAY	0.00	0.00	0.00	229.87	$34,940.24	No
33040181	UXO Anomaly Dig Crew, MEC Removal Action, includes Labor and Equipment, per HR	159.00	HR	0.00	306.99	0.00	67.86	$59,600.33	No
33040184	Advanced Geophysics Classification Cueing, MEC Investigation, per EA	1,500.00	EA	0.00	13.24	0.00	5.94	$28,777.73	No
33040185	UXO Anomaly Explosive Demolition, MEC Activities, includes Labor, Material and Equipment, per EA	33.00	EA	273.28	614.36	0.00	0.00	$29,292.14	No
33040186	Munitions Deemed As Safe (MDAS) Disposal, bulk solid waste, includes materials, documentation, transport and disposal fees, per LB	2,228.00	LB	0.00	0.00	0.00	9.65	$21,494.55	No
33040651	4 X 4 Truck-Rental/Lease	40.00	DAY	0.00	0.00	302.92	0.00	$12,116.76	No

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Technology: MEC Removal Action with AGC

33041101	Airfare	10.00	LS	0.00	0.00	0.00	575.00	$5,750.00	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	5,351.93	$5,351.93	No

Total Element Cost: $197,323.68

Element: Site Management

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
16019934	Temporary Office 50' X 12'	2.00	MO	860.33	0.00	0.00	0.00	$1,720.65	No
16019935	Field office expense, office supplies, average, per month	2.00	MO	140.89	0.00	0.00	0.00	$281.79	No
20020310	1/C #2 Aluminum, Bare, Wire	500.00	LF	0.63	1.36	0.12	0.00	$1,056.69	No
20020403	40' Class 3 Treated Power Pole	5.00	EA	774.91	897.24	129.96	0.00	$9,010.52	No
20020431	Terminal Structure, 15 KV Pole Top	2.00	EA	2,931.45	2,906.56	371.46	0.00	$12,418.94	No
33010202	Per Diem (per person)	214.00	DAY	0.00	0.00	0.00	229.87	$49,192.18	No
33010475	Toilet, portable, chemical, rent per month	2.00	MO	174.35	0.00	0.00	0.00	$348.71	No
33040651	4 X 4 Truck-Rental/Lease	214.00	DAY	0.00	0.00	302.92	0.00	$64,824.67	No
33040699	Storage boxes, rent per month, 40' x 8'	2.00	MO	190.20	0.00	0.00	0.00	$380.41	No
33040921	Senior UXO Supervisor (SUXOS)	494.00	HR	0.00	111.18	0.00	0.00	$54,923.83	No
33040923	UXO Project Manager	124.00	HR	0.00	162.04	0.00	0.00	$20,093.46	No
33040930	UXO QC Specialist	279.00	HR	0.00	98.92	0.00	0.00	$27,599.85	No
33040931	UXO Safety Officer	279.00	HR	0.00	99.51	0.00	0.00	$27,762.00	No
33040940	GIS Manager (UXO)	124.00	HR	0.00	116.84	0.00	0.00	$14,487.56	No
33041101	Airfare	5.00	LS	0.00	0.00	0.00	575.00	$2,875.00	No
33220101	Senior Project Manager	10.00	HR	0.00	244.21	0.00	0.00	$2,442.08	No
33220113	Secretarial/ Administrative	10.00	HR	0.00	120.71	0.00	0.00	$1,207.11	No
33222006	Electrician	40.00	HR	0.00	114.58	0.00	0.00	$4,583.23	No

Total Element Cost: $295,208.67

Element: RA Reporting

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33041324	MEC After Action Report - Site Complexity (Low), per	1.00	EA	0.00	16,089.90	0.00	0.00	$16,089.90	No

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Technology: MEC Removal Action with AGC

	EA								
33041325	MEC: Independent Blind Seed Tracking, per EA	1.00	EA	0.00	5,498.68	0.00	0.00	$5,498.68	No
33041326	MEC: IVS Memo, per EA	1.00	EA	0.00	9,517.86	0.00	0.00	$9,517.86	No
33041330	MEC: Anomaly Selection Memo, per EA	1.00	EA	0.00	9,517.86	0.00	0.00	$9,517.86	No
33041331	MEC: TOI Memo, per EA	1.00	EA	0.00	9,517.86	0.00	0.00	$9,517.86	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	531.69	$531.69	No

Total Element Cost: $50,673.84

Total Tech Cost: $1,149,653.45

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Planning Docs	2019	$38,432.02	$38,432.02
Planning Meetings	2019	$7,786.66	$7,786.66
Implementation	2019	$30,043.17	$30,043.17

Total Marked Up Tech Cost: $76,261.85

Technology: ADMINISTRATIVE LAND USE CONTROLS

Element: Planning Docs

Year(s)	Cost per Year
2019	$38,432.02

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	22.00	HR	0.00	234.00	0.00	0.00	$5,148.07	No
33220105	Project Engineer	30.00	HR	0.00	198.39	0.00	0.00	$5,951.62	No
33220106	Staff Engineer	45.00	HR	0.00	204.33	0.00	0.00	$9,194.80	No
33220110	QA/QC Officer	11.00	HR	0.00	160.15	0.00	0.00	$1,761.69	No
33220114	Word Processing/Clerical	60.00	HR	0.00	109.73	0.00	0.00	$6,584.04	No
33220115	Draftsman/CADD	30.00	HR	0.00	127.89	0.00	0.00	$3,836.83	No
33220503	Attorney, Partner, Real Estate	22.00	HR	0.00	245.19	0.00	0.00	$5,394.14	No
33240101	Other Direct Costs	1.00	LS	560.83	0.00	0.00	0.00	$560.83	No

Total First Year Element Cost: $38,432.02

Element: Planning Meetings

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Technology: ADMINISTRATIVE LAND USE CONTROLS

Year(s)	Cost per Year
2019	$7,786.66

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	1.00	DAY	0.00	0.00	0.00	229.87	$229.87	No
33220102	Project Manager	20.00	HR	0.00	234.00	0.00	0.00	$4,680.06	No
33220114	Word Processing/Clerical	16.00	HR	0.00	109.73	0.00	0.00	$1,755.74	No
33220115	Draftsman/CADD	8.00	HR	0.00	127.89	0.00	0.00	$1,023.15	No
33240101	Other Direct Costs	1.00	LS	97.83	0.00	0.00	0.00	$97.83	No

Total First Year Element Cost: $7,786.66

Element: Implementation

Year(s)	Cost per Year
2019	$30,043.17

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
18010412	Construction Signs	36.00	SF	44.03	0.00	0.00	0.00	$1,585.04	No
33220102	Project Manager	15.00	HR	0.00	234.00	0.00	0.00	$3,510.05	No
33220105	Project Engineer	30.00	HR	0.00	198.39	0.00	0.00	$5,951.62	No
33220106	Staff Engineer	45.00	HR	0.00	204.33	0.00	0.00	$9,194.80	No
33220110	QA/QC Officer	8.00	HR	0.00	160.15	0.00	0.00	$1,281.23	No
33220114	Word Processing/Clerical	30.00	HR	0.00	109.73	0.00	0.00	$3,292.02	No
33220115	Draftsman/CADD	38.00	HR	0.00	127.89	0.00	0.00	$4,859.99	No
33240101	Other Direct Costs	1.00	LS	368.43	0.00	0.00	0.00	$368.43	No

Total First Year Element Cost: $30,043.17

Total First Year Tech Cost: $76,261.86

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Monitoring & Enforcement	2019	$31,755.46	$31,755.46
Monitoring & Enforcement	2021	$31,755.46	$31,755.46
Monitoring & Enforcement	2023	$31,755.46	$31,755.46
Monitoring & Enforcement	2025	$31,755.46	$31,755.46
Monitoring & Enforcement	2027	$31,755.46	$31,755.46
Monitoring & Enforcement	2029	$31,755.46	$31,755.46
Monitoring & Enforcement	2031	$31,755.46	$31,755.46
Monitoring & Enforcement	2033	$31,755.46	$31,755.46

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Monitoring & Enforcement	2035	$31,755.46	$31,755.46
Monitoring & Enforcement	2037	$31,755.46	$31,755.46
Monitoring & Enforcement	2039	$31,755.46	$31,755.46
Monitoring & Enforcement	2041	$31,755.46	$31,755.46
Monitoring & Enforcement	2043	$31,755.46	$31,755.46
Monitoring & Enforcement	2045	$31,755.46	$31,755.46
Monitoring & Enforcement	2047	$31,755.46	$31,755.46

Total Marked Up Tech Cost: $476,331.90

Technology: ADMINISTRATIVE LAND USE CONTROLS
Element: Monitoring & Enforcement

Year(s)	Cost per Year
2019	$31,755.46
2020	$0.00
2021	$31,755.46
2022	$0.00
2023	$31,755.46
2024	$0.00
2025	$31,755.46
2026	$0.00
2027	$31,755.46
2028	$0.00
2029	$31,755.46
2030	$0.00
2031	$31,755.46
2032	$0.00
2033	$31,755.46
2034	$0.00
2035	$31,755.46
2036	$0.00
2037	$31,755.46
2038	$0.00
2039	$31,755.46
2040	$0.00
2041	$31,755.46
2042	$0.00
2043	$31,755.46
2044	$0.00
2045	$31,755.46
2046	$0.00
2047	$31,755.46
2048	$0.00

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override

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Technology: ADMINISTRATIVE LAND USE CONTROLS

33010104	Sample collection, vehicle mileage charge, car or van	100.00	MI	0.00	0.00	0.00	0.32	$31.86	No
33010108	Sedan, Automobile, Rental	3.00	DAY	0.00	0.00	0.00	75.45	$226.36	No
33010202	Per Diem (per person)	5.00	DAY	0.00	0.00	0.00	229.87	$1,149.35	No
33022038	Overnight delivery service, 1 lb package	6.00	LB	0.00	0.00	0.00	72.00	$432.01	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	500.00	$500.00	No
33220102	Project Manager	44.00	HR	0.00	285.37	0.00	0.00	$12,556.26	No
33220106	Staff Engineer	40.00	HR	0.00	249.18	0.00	0.00	$9,967.26	No
33220110	QA/QC Officer	4.00	HR	0.00	160.15	0.00	0.00	$640.61	No
33220112	Field Technician	1.00	HR	0.00	135.87	0.00	0.00	$135.87	No
33220114	Word Processing/Clerical	26.00	HR	0.00	133.82	0.00	0.00	$3,479.37	No
33220115	Draftsman/CADD	16.00	HR	0.00	127.89	0.00	0.00	$2,046.31	No
33220119	Health and Safety Officer	1.00	HR	0.00	209.35	0.00	0.00	$209.35	No
33240101	Other Direct Costs	1.00	LS	380.83	0.00	0.00	0.00	$380.83	No

Total First Year Element Cost: $31,755.46

Total First Year Tech Cost: $31,755.46

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2024	$454.68	$454.68
Document Review	2029	$454.68	$454.68
Document Review	2034	$454.68	$454.68
Document Review	2039	$454.68	$454.68
Document Review	2044	$454.68	$454.68
Document Review	2049	$454.68	$454.68
Site Inspection	2024	$3,010.44	$3,010.44
Site Inspection	2029	$3,010.44	$3,010.44
Site Inspection	2034	$3,010.44	$3,010.44
Site Inspection	2039	$3,010.44	$3,010.44
Site Inspection	2044	$3,010.44	$3,010.44
Site Inspection	2049	$3,010.44	$3,010.44
Report	2024	$7,460.14	$7,460.14
Report	2029	$7,460.14	$7,460.14
Report	2034	$7,460.14	$7,460.14
Report	2039	$7,460.14	$7,460.14
Report	2044	$7,460.14	$7,460.14
Report	2049	$7,460.14	$7,460.14

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Travel	2024	$805.32	$805.32
Travel	2029	$805.32	$805.32
Travel	2034	$805.32	$805.32
Travel	2039	$805.32	$805.32
Travel	2044	$805.32	$805.32
Travel	2049	$805.32	$805.32

Total Marked Up Tech Cost: $70,383.48

Technology: Five-Year Review

Element: Document Review

Year(s)	Cost per Year
2024	$454.68
2025 - 2028	$0.00
2029	$454.68
2030 - 2033	$0.00
2034	$454.68
2035 - 2038	$0.00
2039	$454.68
2040 - 2043	$0.00
2044	$454.68
2045 - 2048	$0.00
2049	$454.68

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220105	Project Engineer	1.00	HR	0.00	241.94	0.00	0.00	$241.94	No
33220109	Staff Scientist	1.00	HR	0.00	212.75	0.00	0.00	$212.75	No

Total First Year Element Cost: $454.68

Element: Site Inspection

Year(s)	Cost per Year
2024	$3,010.44
2025 - 2028	$0.00
2029	$3,010.44
2030 - 2033	$0.00
2034	$3,010.44
2035 - 2038	$0.00
2039	$3,010.44
2040 - 2043	$0.00
2044	$3,010.44
2045 - 2048	$0.00
2049	$3,010.44

								Extended	Cost

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Technology: Five-Year Review

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Cost	Override
33220102	Project Manager	3.00	HR	0.00	285.37	0.00	0.00	$856.11	No
33220105	Project Engineer	3.00	HR	0.00	241.94	0.00	0.00	$725.81	No
33220108	Project Scientist	3.00	HR	0.00	263.43	0.00	0.00	$790.28	No
33220109	Staff Scientist	3.00	HR	0.00	212.75	0.00	0.00	$638.24	No

Total First Year Element Cost: $3,010.44

Element: Report

Year(s)	Cost per Year
2024	$7,460.14
2025 - 2028	$0.00
2029	$7,460.14
2030 - 2033	$0.00
2034	$7,460.14
2035 - 2038	$0.00
2039	$7,460.14
2040 - 2043	$0.00
2044	$7,460.14
2045 - 2048	$0.00
2049	$7,460.14

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	285.37	0.00	0.00	$1,141.48	No
33220105	Project Engineer	11.00	HR	0.00	241.94	0.00	0.00	$2,661.29	No
33220108	Project Scientist	5.00	HR	0.00	263.43	0.00	0.00	$1,317.14	No
33220109	Staff Scientist	11.00	HR	0.00	212.75	0.00	0.00	$2,340.23	No

Total First Year Element Cost: $7,460.14

Element: Travel

Year(s)	Cost per Year
2024	$805.32
2025 - 2028	$0.00
2029	$805.32
2030 - 2033	$0.00
2034	$805.32
2035 - 2038	$0.00
2039	$805.32
2040 - 2043	$0.00
2044	$805.32
2045 - 2048	$0.00

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Technology: Five-Year Review

2049 $805.32

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	1.00	DAY	0.00	0.00	0.00	75.45	$75.45	No
33010202	Per Diem (per person)	1.00	DAY	0.00	0.00	0.00	229.87	$229.87	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	500.00	$500.00	No

Total First Year Element Cost: $805.32

Total First Year Tech Cost: $11,730.59

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2024	$454.68	$454.68
Document Review	2029	$454.68	$454.68
Document Review	2034	$454.68	$454.68
Document Review	2039	$454.68	$454.68
Document Review	2044	$454.68	$454.68
Document Review	2049	$454.68	$454.68
Site Inspection	2024	$3,010.44	$3,010.44
Site Inspection	2029	$3,010.44	$3,010.44
Site Inspection	2034	$3,010.44	$3,010.44
Site Inspection	2039	$3,010.44	$3,010.44
Site Inspection	2044	$3,010.44	$3,010.44
Site Inspection	2049	$3,010.44	$3,010.44
Report	2024	$7,460.14	$7,460.14
Report	2029	$7,460.14	$7,460.14
Report	2034	$7,460.14	$7,460.14
Report	2039	$7,460.14	$7,460.14
Report	2044	$7,460.14	$7,460.14
Report	2049	$7,460.14	$7,460.14
Travel	2024	$805.32	$805.32
Travel	2029	$805.32	$805.32
Travel	2034	$805.32	$805.32
Travel	2039	$805.32	$805.32
Travel	2044	$805.32	$805.32
Travel	2049	$805.32	$805.32

Total Marked Up Tech Cost: $70,383.48

AOI-05, Alternative 3: Partial MEC Removal with LUCs
Project Assembly Level Data Report

Note:
Costs are direct (no markup)

Phase Name	Tech. Key	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	units	Cost
Partial Removal Action	40	MEC Removal Action with AGC	16019934	Temporary Office 50' X 12'	2	MO	576.43	0.00	0.00	0.00	1,152.86		
Partial Removal Action	40	MEC Removal Action with AGC	16019935	Field office expense, office supplies, average, per month	2	MO	94.40	0.00	0.00	0.00	188.80		
Partial Removal Action	40	MEC Removal Action with AGC	17010401	Chipping brush, light brush	15	ACR	0.00	1,127.10	382.65	0.00	22,646.26		
Partial Removal Action	40	MEC Removal Action with AGC	17010402	Chipping brush, medium brush	7.5	ACR	0.00	1,449.06	491.95	0.00	14,557.63		
Partial Removal Action	40	MEC Removal Action with AGC	20020310	1/C #2 Aluminum, Bare, Wire	500	LF	0.42	0.91	0.08	0.00	708.00		
Partial Removal Action	40	MEC Removal Action with AGC	20020403	40' Class 3 Treated Power Pole	5	EA	519.20	601.16	87.07	0.00	6,037.17		
Partial Removal Action	40	MEC Removal Action with AGC	20020431	Terminal Structure, 15 KV Pole Top	2	EA	1,964.11	1,947.44	248.89	0.00	8,320.86		
Partial Removal Action	40	MEC Removal Action with AGC	33010108	Sedan, Automobile, Rental	2	DAY	0.00	0.00	0.00	62.94	125.88		
Partial Removal Action	40	MEC Removal Action with AGC	33010108	Sedan, Automobile, Rental	30	DAY	0.00	0.00	0.00	62.94	1,888.24		
Partial Removal Action	40	MEC Removal Action with AGC	33010114	Mobilization Equipment (Soils)	2	LS	0.00	1,665.55	1,629.23	0.00	6,589.54		
Partial Removal Action	40	MEC Removal Action with AGC	33010114	Mobilization Equipment (Soils)	1	LS	0.00	1,665.55	1,629.23	0.00	3,294.77		
Partial Removal Action	40	MEC Removal Action with AGC	33010202	Per Diem (per person)	214	DAY	0.00	0.00	0.00	229.87	49,192.18		
Partial Removal Action	40	MEC Removal Action with AGC	33010202	Per Diem (per person)	88	DAY	0.00	0.00	0.00	229.87	20,228.56		
Partial Removal Action	40	MEC Removal Action with AGC	33010202	Per Diem (per person)	152	DAY	0.00	0.00	0.00	229.87	34,940.24		
Partial Removal Action	40	MEC Removal Action with AGC	33010202	Per Diem (per person)	36	DAY	0.00	0.00	0.00	229.87	8,275.32		
Partial Removal Action	40	MEC Removal Action with AGC	33010202	Per Diem (per person)	84	DAY	0.00	0.00	0.00	229.87	19,309.08		
Partial Removal Action	40	MEC Removal Action with AGC	33010475	Toilet, portable, chemical, rent per month	2	MO	116.82	0.00	0.00	0.00	233.64		
Partial Removal Action	40	MEC Removal Action with AGC	33040170	MEC: Instrument Verification Strip Installation, per EA	1	EA	418.82	3,502.53	9.51	617.92	4,548.78		
Partial Removal Action	40	MEC Removal Action with AGC	33040171	MEC: UXO Seeding, Quality Seeding Installation, per EA	113	EA	4.84	40.26	0.00	126.18	19,354.30		
Partial Removal Action	40	MEC Removal Action with AGC	33040173	MEC: UXO Mag and Flag Grid Team, per HR	60	HR	0.00	268.27	0.00	113.21	22,888.93		
Partial Removal Action	40	MEC Removal Action with AGC	33040181	UXO Anomaly Dig Crew, MEC Removal Action, includes Labor and Equipment, per HR	159	HR	0.00	205.69	0.00	56.60	41,704.17		
Partial Removal Action	40	MEC Removal Action with AGC	33040182	Land-Based Advanced Classification Survey Grid Team, MEC Removal Action, per HR	80	HR	0.00	180.41	0.00	188.72	29,530.21		
Partial Removal Action	40	MEC Removal Action with AGC	33040184	Advanced Geophysics Classification Cueing, MEC Investigation, per EA	1500	EA	0.00	8.87	0.00	4.96	20,744.40		
Partial Removal Action	40	MEC Removal Action with AGC	33040185	UXO Anomaly Explosive Demolition, MEC Activities, includes Labor, Material and Equipment, per EA	33	EA	183.10	411.63	0.00	0.00	19,626.15		
Partial Removal Action	40	MEC Removal Action with AGC	33040186	Munitions Deemed As Safe (MDAS) Disposal, bulk solid waste, includes materials, documentation, transport and disposal fees, per LB	2228	LB	0.00	0.00	0.00	8.05	17,930.05		
Partial Removal Action	40	MEC Removal Action with AGC	33040270	Geometrics MetalMapper Mobilization Fee	1	EA	0.00	0.00	0.00	1,218.00	1,218.00		
Partial Removal Action	40	MEC Removal Action with AGC	33040651	4 X 4 Truck- Rental/Lease	54	DAY	0.00	0.00	202.96	0.00	10,959.84		
Partial Removal Action	40	MEC Removal Action with AGC	33040651	4 X 4 Truck- Rental/Lease	214	DAY	0.00	0.00	202.96	0.00	43,433.44		
Partial Removal Action	40	MEC Removal Action with AGC	33040651	4 X 4 Truck- Rental/Lease	20	DAY	0.00	0.00	202.96	0.00	4,059.20		
Partial Removal Action	40	MEC Removal Action with AGC	33040651	4 X 4 Truck- Rental/Lease	40	DAY	0.00	0.00	202.96	0.00	8,118.40		
Partial Removal Action	40	MEC Removal Action with AGC	33040699	Storage boxes, rent per month, 40' x 8'	2	MO	127.44	0.00	0.00	0.00	254.88		
Partial Removal Action	40	MEC Removal Action with AGC	33040921	Senior UXO Supervisor (SUXOS)	494	HR	0.00	74.49	0.00	0.00	36,799.74		
Partial Removal Action	40	MEC Removal Action with AGC	33040923	UXO Project Manager	124	HR	0.00	108.57	0.00	0.00	13,462.90		
Partial Removal Action	40	MEC Removal Action with AGC	33040930	UXO QC Specialist	279	HR	0.00	66.28	0.00	0.00	18,492.29		
Partial Removal Action	40	MEC Removal Action with AGC	33040931	UXO Safety Officer	279	HR	0.00	66.67	0.00	0.00	18,600.93		
Partial Removal Action	40	MEC Removal Action with AGC	33040934	UXO Technician II	70	HR	0.00	47.18	0.00	0.00	3,302.35		
Partial Removal Action	40	MEC Removal Action with AGC	33040935	UXO Technician III (UXO Supervisor)	60	HR	0.00	55.73	0.00	0.00	3,343.88		
Partial Removal Action	40	MEC Removal Action with AGC	33040940	GIS Manager (UXO)	124	HR	0.00	78.28	0.00	0.00	9,706.87		
Partial Removal Action	40	MEC Removal Action with AGC	33040947	MEC: Systematic Project Planning Meeting, includes labor and facility rental expenses, per EA	3	EA	0.00	15,177.82	0.00	1,150.50	48,984.96		
Partial Removal Action	40	MEC Removal Action with AGC	33040948	MEC: Systematic Project Planning, Site Visit, includes labor expenses, per EA	1	EA	0.00	4,519.56	0.00	0.00	4,519.56		
Partial Removal Action	40	MEC Removal Action with AGC	33040949	MEC: Systematic Project Planning, UFP QAPP, includes labor expenses, per EA	1	EA	0.00	48,934.35	0.00	0.00	48,934.35		
Partial Removal Action	40	MEC Removal Action with AGC	33040950	MEC: Systematic Project Planning, Establish and Management of GIS Database, includes labor expenses, per EA	1	EA	0.00	15,710.58	0.00	0.00	15,710.58		
Partial Removal Action	40	MEC Removal Action with AGC	33040951	MEC: Systematic Project Planning,Community Relation Plan, includes labor expenses, per EA	1	EA	0.00	8,998.11	0.00	0.00	8,998.11		
Partial Removal Action	40	MEC Removal Action with AGC	33040953	MEC: Systematic Project Planning,PMP/Quality Assurance Surveillance Plan, includes labor expenses, per EA	1	EA	0.00	7,031.73	0.00	0.00	7,031.73		
Partial Removal Action	40	MEC Removal Action with AGC	33040954	MEC: Systematic Project Planning, Health and Safety Plan, includes labor expenses, per EA	1	EA	0.00	11,046.14	0.00	0.00	11,046.14		

AOI-05, Alternative 3: Partial MEC Removal with LUCs
Project Assembly Level Data Report

Note:
Costs are direct (no markup)

Phase Name	Tech. Key	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	units	Cost
Partial Removal Action	40	MEC Removal Action with AGC	33040955	MEC: Systematic Project Planning, Cultural and Archeological Plan, includes labor expenses, per EA	1	EA	0.00	7,597.09	0.00	0.00	7,597.09		
Partial Removal Action	40	MEC Removal Action with AGC	33040956	MEC: Systematic Project Planning, Environmental and Biological Plan, includes labor expenses, per EA	1	EA	0.00	7,658.41	0.00	0.00	7,658.41		
Partial Removal Action	40	MEC Removal Action with AGC	33040958	MEC: Surface Clearance , includes labor and equipment expenses, per Day	12	DAY	0.00	2,444.37	0.00	79.23	30,283.14		
Partial Removal Action	40	MEC Removal Action with AGC	33040959	MEC: Archeological Survey, includes labor and equipment expenses, per Day	1	DAY	0.00	1,163.29	0.00	113.21	1,276.50		
Partial Removal Action	40	MEC Removal Action with AGC	33040960	MEC: Flora/Fauna Survey, includes labor and equipment expenses, per Day	1	DAY	0.00	1,163.29	0.00	113.21	1,276.50		
Partial Removal Action	40	MEC Removal Action with AGC	33040961	Explosive Safety Submission, includes labor and equipment expenses, per EA	1	EA	0.00	20,678.57	0.00	0.00	20,678.57		
Partial Removal Action	40	MEC Removal Action with AGC	33041101	Airfare	14	LS	0.00	0.00	0.00	575.00	8,050.00		
Partial Removal Action	40	MEC Removal Action with AGC	33041101	Airfare	6	LS	0.00	0.00	0.00	575.00	3,450.00		
Partial Removal Action	40	MEC Removal Action with AGC	33041101	Airfare	5	LS	0.00	0.00	0.00	575.00	2,875.00		
Partial Removal Action	40	MEC Removal Action with AGC	33041101	Airfare	5	LS	0.00	0.00	0.00	575.00	2,875.00		
Partial Removal Action	40	MEC Removal Action with AGC	33041101	Airfare	10	LS	0.00	0.00	0.00	575.00	5,750.00		
Partial Removal Action	40	MEC Removal Action with AGC	33041324	MEC After Action Report - Site Complexity (Low), per EA	1	EA	0.00	10,780.46	0.00	0.00	10,780.46		
Partial Removal Action	40	MEC Removal Action with AGC	33041325	MEC: Independent Blind Seed Tracking, per EA	1	EA	0.00	3,684.20	0.00	0.00	3,684.20		
Partial Removal Action	40	MEC Removal Action with AGC	33041326	MEC: IVS Memo, per EA	1	EA	0.00	6,377.10	0.00	0.00	6,377.10		
Partial Removal Action	40	MEC Removal Action with AGC	33041330	MEC: Anomaly Selection Memo, per EA	1	EA	0.00	6,377.10	0.00	0.00	6,377.10		
Partial Removal Action	40	MEC Removal Action with AGC	33041331	MEC: TOI Memo, per EA	1	EA	0.00	6,377.10	0.00	0.00	6,377.10		
Partial Removal Action	40	MEC Removal Action with AGC	33220101	Senior Project Manager	10	HR	0.00	85.84	0.00	0.00	858.45		
Partial Removal Action	40	MEC Removal Action with AGC	33220113	Secretarial/ Administrative	10	HR	0.00	42.43	0.00	0.00	424.33		
Partial Removal Action	40	MEC Removal Action with AGC	33220212	Surveying - 2-man Crew	1	DAY	0.00	873.86	15.86	0.00	889.72		
Partial Removal Action	40	MEC Removal Action with AGC	33222006	Electrician	40	HR	0.00	76.77	0.00	0.00	3,070.83		
Partial Removal Action	40	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	443.52	443.52		
Partial Removal Action	40	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	4,464.40	4,464.40		
Partial Removal Action	40	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	3,338.78	3,338.78		
Partial Removal Action	40	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	3,579.47	3,579.47		
Partial Removal Action	40	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	5,843.19	5,843.19		
										Total	839,273.02	1	$839,273.02
Periodic Review	44	Periodic Review	33010108	Sedan, Automobile, Rental	1	DAY	0.00	0.00	0.00	62.94	62.94		
Periodic Review	44	Periodic Review	33010202	Per Diem (per person)	1	DAY	0.00	0.00	0.00	229.87	229.87		
Periodic Review	44	Periodic Review	33041101	Airfare	1	LS	0.00	0.00	0.00	500.00	500.00		
Periodic Review	44	Periodic Review	33220102	Project Manager	4	HR	0.00	100.31	0.00	0.00	401.26		
Periodic Review	44	Periodic Review	33220102	Project Manager	3	HR	0.00	100.31	0.00	0.00	300.94		
Periodic Review	44	Periodic Review	33220105	Project Engineer	3	HR	0.00	85.05	0.00	0.00	255.14		
Periodic Review	44	Periodic Review	33220105	Project Engineer	1	HR	0.00	85.05	0.00	0.00	85.05		
Periodic Review	44	Periodic Review	33220105	Project Engineer	11	HR	0.00	85.05	0.00	0.00	935.51		
Periodic Review	44	Periodic Review	33220108	Project Scientist	3	HR	0.00	92.60	0.00	0.00	277.80		
Periodic Review	44	Periodic Review	33220108	Project Scientist	5	HR	0.00	92.60	0.00	0.00	463.01		
Periodic Review	44	Periodic Review	33220109	Staff Scientist	1	HR	0.00	74.79	0.00	0.00	74.79		
Periodic Review	44	Periodic Review	33220109	Staff Scientist	11	HR	0.00	74.79	0.00	0.00	822.65		
Periodic Review	44	Periodic Review	33220109	Staff Scientist	3	HR	0.00	74.79	0.00	0.00	224.36		
										Total	4,633.31	6	$27,799.85
LAND USE CONTROLS	48	LAND USE CONTROLS	18010412	Construction Signs	36	SF	29.50	0.00	0.00	0.00	1,062.00		
LAND USE CONTROLS	48	LAND USE CONTROLS	33010202	Per Diem (per person)	1	DAY	0.00	0.00	0.00	229.87	229.87		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220102	Project Manager	15	HR	0.00	82.26	0.00	0.00	1,233.87		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220102	Project Manager	22	HR	0.00	82.26	0.00	0.00	1,809.67		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220102	Project Manager	20	HR	0.00	82.26	0.00	0.00	1,645.16		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220105	Project Engineer	30	HR	0.00	69.74	0.00	0.00	2,092.14		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220105	Project Engineer	30	HR	0.00	69.74	0.00	0.00	2,092.14		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220106	Staff Engineer	45	HR	0.00	71.83	0.00	0.00	3,232.20		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220106	Staff Engineer	45	HR	0.00	71.83	0.00	0.00	3,232.20		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220110	QA/QC Officer	11	HR	0.00	56.30	0.00	0.00	619.28		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220110	QA/QC Officer	8	HR	0.00	56.30	0.00	0.00	450.38		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220114	Word Processing/Clerical	16	HR	0.00	38.57	0.00	0.00	617.19		

AOI-05, Alternative 3: Partial MEC Removal with LUCs
Project Assembly Level Data Report

Note:
Costs are direct (no markup)

Phase Name	Tech. Key	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	units	Cost
LAND USE CONTROLS	48	LAND USE CONTROLS	33220114	Word Processing/Clerical	30	HR	0.00	38.57	0.00	0.00	1,157.23		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220114	Word Processing/Clerical	60	HR	0.00	38.57	0.00	0.00	2,314.45		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220115	Draftsman/CADD	38	HR	0.00	44.96	0.00	0.00	1,708.40		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220115	Draftsman/CADD	8	HR	0.00	44.96	0.00	0.00	359.66		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220115	Draftsman/CADD	30	HR	0.00	44.96	0.00	0.00	1,348.74		
LAND USE CONTROLS	48	LAND USE CONTROLS	33220503	Attorney, Partner, Real Estate	22	HR	0.00	164.28	0.00	0.00	3,614.15		
LAND USE CONTROLS	48	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	246.86	0.00	0.00	0.00	246.86		
LAND USE CONTROLS	48	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	65.55	0.00	0.00	0.00	65.55		
LAND USE CONTROLS	48	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	375.77	0.00	0.00	0.00	375.77		
										Total	29,506.89	1	$29,506.89
30-Year O&M	36	LAND USE CONTROLS	33010104	Vehicle mileage charge, car or van	100	MI	0.00	0.00	0.00	0.32	31.86		
30-Year O&M	36	LAND USE CONTROLS	33010108	Sedan, Automobile, Rental	3	DAY	0.00	0.00	0.00	62.94	188.82		
30-Year O&M	36	LAND USE CONTROLS	33010202	Per Diem (per person)	5	DAY	0.00	0.00	0.00	229.87	1,149.35		
30-Year O&M	36	LAND USE CONTROLS	33022038	Overnight delivery service, 1 lb package	6	LB	0.00	0.00	0.00	60.06	360.37		
30-Year O&M	36	LAND USE CONTROLS	33041101	Airfare	1	LS	0.00	0.00	0.00	500.00	500.00		
30-Year O&M	36	LAND USE CONTROLS	33220102	Project Manager	44	HR	0.00	100.31	0.00	0.00	4,413.83		
30-Year O&M	36	LAND USE CONTROLS	33220106	Staff Engineer	40	HR	0.00	87.59	0.00	0.00	3,503.74		
30-Year O&M	36	LAND USE CONTROLS	33220110	QA/QC Officer	4	HR	0.00	56.30	0.00	0.00	225.19		
30-Year O&M	36	LAND USE CONTROLS	33220112	Field Technician	1	HR	0.00	47.76	0.00	0.00	47.76		
30-Year O&M	36	LAND USE CONTROLS	33220114	Word Processing/Clerical	26	HR	0.00	47.04	0.00	0.00	1,223.08		
30-Year O&M	36	LAND USE CONTROLS	33220115	Draftsman/CADD	16	HR	0.00	44.96	0.00	0.00	719.33		
30-Year O&M	36	LAND USE CONTROLS	33220119	Health and Safety Officer	1	HR	0.00	73.59	0.00	0.00	73.59		
30-Year O&M	36	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	255.16	0.00	0.00	0.00	255.16		
										Total	12,692.09	15	$190,381.42
												Total Direct	$1,086,961.18
												Mark-up	$ 685,670.00
												TOTAL	**$1,772,631**

Estimate Documentation Detailed Report - Layout 2

Software:

RACER Version: RACER® Version 11.5.99.0
Database Location: N:\Projects_Ongoing\3752-Camp Wellfleet\06_FS Report\RACER\Racer_Backup_7_31_2019.mdb

Folder:

Folder Name: Wellfleet

Project:

ID: Alternative 3
Name: Partial MEC Removal with LUC
Category: None

Location
State / Country: MASSACHUSETTS
City: CAPE COD

Location Modifier	Default	User	Reason for changes
	1.180	1.180	

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

Description Partial Munitions and Explosives of Concern (MEC) Removal with Administrative Land Use Controls (LUCs) including signs

Estimate Documentation Detailed Report - Layout 2

Site:

ID: AOI-6
Name: Area of Interest 6
Type: None

Media/Waste Type

Primary: Ordnance (not residual)
Secondary: N/A

Contaminant

Primary: Ordnance (not residual)
Secondary: None

Phase Names

Pre-Study	☐	
Study	☐	
Design	☐	
Removal/Interim Action	☐	
Remedial Action	☑	**Safety Level:** D
Operations & Maintenance	☑	**Safety Level:** D
Long Term Monitoring	☐	
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: Area of Interest 6 (AOI-6)
Former Artillery Range Fan (Ocean)
"Water AOI"

AOI-6 is 167,856 acres. The partial removal area, from the shoreline to the 120 ft bathymetric contour, is 15,693 acres.

Support Team: Michelle Chesnut

References: Final Remedial Investigation Report, Former Camp Wellfleet FUDS Remedial Investigation Through Decision Document, Wellfleet, Massachusetts (April 2019).

Navigational Chart 13246, Cape Cod Bay. 40th Edition, Oct. 2013. Last Correction 2/8/2019. National Oceanic and Atmospheric Administration, National Ocean Service, Coast Survey.

Estimator Information

Estimator Name: James Stuby
Estimator Title: Project Geophysicist
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Lane
Suite 300

Estimate Documentation Detailed Report - Layout 2

Laurel, MD 20707
Telephone Number: 301-323-1429
Email Address: james.stuby@ertcorp.com
Estimate Prepared Date: 06/24/2019

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name: Thomas Bachovchin
Reviewer Title: Project Manager
Agency/Org./Office: ERT, Inc.
Business Address: 14401 Sweitzer Lane
Suite 300
Laurel, MD 20707
Telephone Number: 301-323-1442
Email Address: thomas.bachovchin@ertcorp.com
Date Reviewed: 06/24/2019

Reviewer Signature: _____ **Date:** _____

Estimate Costs:

Phase Names	Marked-Up Cost
DGM and Removal	$154,923,763
Periodic Review	$49,534
Administrative LUC (signs)	$76,262
30-Year O&M	$476,332
Total Cost:	$155,525,891
Escalation:	$3,079,399
Total Project Cost:	$158,605,289

Phase Documentation:

Phase Type: Remedial Action
Phase Name: DGM and Removal
Description: Marine Digital Geophysical Mapping (DGM) with Target Removal by UXO Dive Teams
Approach: Ex Situ
Start Date: June, 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.
MEC Removal Action with AGC	Yes	100	0

Total Marked-up Cost: $154,923,762.55

Technologies:

Technology Name: **MEC Removal Action with AGC (#1)**

User Name: **MEC Removal Action with AGC**

Description	Default	User	UOM
System Definition			
Required Parameters			
Surface and Subsurface Removal		15693	Acres
SSR Topography 1		Flat	n/a
SSR Topography 1 Pct		100.00	%
SSR Topography 2		N/A	n/a
SSR Vegetation 1		Barren or low grass	n/a
SSR Vegetation 1 Pct		100.00	%
SSR Vegetation 2		N/A	n/a
SSR Vegetation 2 Pct		0.00	%
Surface Removal Only		0	Acres
SR Topography 1		N/A	n/a
SR Topography 1 Pct		0.00	%
SR Topography 2		N/A	n/a
SR Vegetation 1		N/A	n/a
SR Vegetation 1 Pct		0.00	%
SR Vegetation 2		N/A	n/a
SR Vegetation 2 Pct		0.00	%
Site Complexity		Low	n/a
Systematic Project Planning			
Secondary Parameters			
Number of Meetings	3	3	n/a
Site Visit	1	1	n/a
UFP QAPP	Yes	Yes	n/a
Establish and Management of GIS Database	Yes	Yes	n/a
Community Relation Plan	Yes	Yes	n/a
Explosives Safety Submission	Yes	Yes	n/a
PMP / Quality Assurance Surveilance Plan	Yes	Yes	n/a

Estimate Documentation Detailed Report - Layout 2

Technology Name: **MEC Removal Action with AGC (#1)**

User Name: **MEC Removal Action with AGC**

Description	Default	User	UOM
Systematic Project Planning			
Secondary Parameters			
Health and Safety Plan	Yes	Yes	n/a
Cultural and Archaeological Plan	Yes	No	n/a
Environmental / Biological Plan	No	No	n/a
SSR Site Preparation			
Secondary Parameters			
Heavy Removal	0	0	Acres
Moderate Removal	0	0	Acres
Light Removal	3923.25	0	Acres
No Removal	11769.75	15693	Acres
Total Vegetation Removal Area	1	15693	Acres
Archaeological Survey	0	0	Acres
Flora / Fauna Survey	0	0	Acres
Daily Travel Distance to Site	0 - 50 Miles	0 - 50 Miles	n/a
SR Site Preparation			
Secondary Parameters			
Heavy Removal	0	0	Acres
Moderate Removal	0	0	Acres
Light Removal	0	0	Acres
No Removal	0	0	Acres
Total Vegetation Removal Area	0	0	Acres
Archaeological Survey	0	0	Acres
Flora / Fauna Survey	0	0	Acres
RA Field Activities			
Secondary Parameters			
Mag & Flag (analog Geophysics)	0	0	Acres
Digital Geophysical Mapping with Single Sensor	1569.3	0	Acres
Digital Geophysical Mapping with Array of Sensors	14123.7	15693	Acres
Anomaly Density	500	20	Anomalies / Acre
Investigation			
Secondary Parameters			
Advanced Geophysics Classification Cueing	313860	1	Anomalies
Number of Digs	31786	313860	Anomalies
Onsite Donor Explosive Storage	Yes	Yes	n/a

Comments: RA area is 15693 acres. Anomaly density assumed to be 20/acre. Total anomalies 313860.

Dive team is 2 divers (one active, one safety), one tender, and one boat operator. Dive supervisor is assumed to be the SUXOS.

Estimate Documentation Detailed Report - Layout 2

One dive team assumed to be able to complete 1 acre or 20 anomalies/day on average. Thus field duration is 15693 days assuming one dive team. Assuming 260 work days/year, duration is over 60 years. Assuming 10 dive teams, duriation is 6 years.

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Periodic Review
Description: Periodic Review

Approach: Ex Situ
Start Date: June, 2024
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: $49,534.45

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		No	n/a
Report		Yes	n/a
Travel		No	n/a
Rebound Study		No	n/a
Start Month		June	n/a
No. Reviews		6	EA
Start Year		2024	n/a
Safety Level		D	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			
5-Year Review Check List		Yes	n/a
Record of Decision		No	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		No	n/a
Interviews			
Required Parameters			
Current and Previous Staff Management		Yes	n/a
Community Groups		Yes	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
Report			
Required Parameters			
Introduction		No	n/a
Remedial Objectives		No	n/a
ARARs Review		No	n/a
Summary of Site Visit		No	n/a
Areas of Non Compliance		Yes	n/a
Technology Recommendations		No	n/a
Statement of Protectiveness		Yes	n/a
Next Review		No	n/a
Implementation Requirements		No	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: Administrative LUC (signs)
Description: Administrative Land Use Controls including signs (2 signs)

Estimate Documentation Detailed Report - Layout 2

Start Date: June, 2019
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: $76,261.86

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		2019	n/a
Implementation		Yes	n/a
Implementation: Start Date		2019	n/a
Monitoring & Enforcement		No	n/a
Modification/Termination		No	n/a
Type of Site		Active 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)		No	n/a
Memorandum of Agreements (MOA): Number		0	EA
Installation (or City) Master Plan		No	n/a

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

User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	Default	User	UOM
Planning Documents			
Required Parameters			
Construction Permitting		No	n/a
Construction Permitting: Number		0	EA
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		0	EA
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		1	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		0	EA
MOA: Number of People		0	EA
MOA: Number of Days		0	EA
MOA: Airfare Cost		0.00	$
MOA: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		0	EA
Master Plan: Number of People		0	EA
Master Plan: Number of Days		0	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		0	EA
GIS/Overlay Maps: Number of People		0	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			
GIS/Overlay Maps: Number of Days		0	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		No	n/a
Deed Notification: Number		0	EA
Negotiating Easements		No	n/a
Negotiating Easements: Number		0	EA
Restrictive Covenants		No	n/a
Restrictive Covenants: Number		0	EA
Equitable Servitudes		No	n/a
Equitable Servitudes: Number		0	EA
Access Control Signs		Yes	n/a
Access Control Signs: Number		2	EA
Access Control Signs: Task Complexity		Low	n/a
Utility Notification Service		Yes	n/a
Access Control Signs: Number		1	EA
Access Control Signs: Task Complexity		Low	n/a
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		0	EA
Develop Finding of Suitability to Transfer (FOST)		No	n/a

Comments:

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: 30-Year O&M
Description: 30-Year O&M

Start Date: June, 2019
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

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Phase Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Total Marked-up Cost: $476,331.86

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		No	n/a
Implementation		No	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2019	n/a
Modification/Termination		No	n/a
Type of Site		Active Government Installation	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		Biennially	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		2	Days
Site Visits/Inspections: Number of People		1	EA
Site Visits/Inspections: Frequency		Biennially	n/a
Site Visits/Inspections: Airfare		500	$ Per Ticket

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

User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	Default	User	UOM
Monitoring & Enforcement			
Required Parameters			
Site Visits/Inspections: Mileage		100	MI

Comments:

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Technology: ADMINISTRATIVE LAND USE CONTROLS

Element: Planning Docs

Year(s)	Cost per Year
2019	$38,432.02

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	22.00	HR	0.00	234.00	0.00	0.00	$5,148.07	No
33220105	Project Engineer	30.00	HR	0.00	198.39	0.00	0.00	$5,951.62	No
33220106	Staff Engineer	45.00	HR	0.00	204.33	0.00	0.00	$9,194.80	No
33220110	QA/QC Officer	11.00	HR	0.00	160.15	0.00	0.00	$1,761.69	No
33220114	Word Processing/Clerical	60.00	HR	0.00	109.73	0.00	0.00	$6,584.04	No
33220115	Draftsman/CADD	30.00	HR	0.00	127.89	0.00	0.00	$3,836.83	No
33220503	Attorney, Partner, Real Estate	22.00	HR	0.00	245.19	0.00	0.00	$5,394.14	No
33240101	Other Direct Costs	1.00	LS	560.83	0.00	0.00	0.00	$560.83	No

Total First Year Element Cost: $38,432.02

Element: Planning Meetings

Year(s)	Cost per Year
2019	$7,786.66

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	1.00	DAY	0.00	0.00	0.00	229.87	$229.87	No
33220102	Project Manager	20.00	HR	0.00	234.00	0.00	0.00	$4,680.06	No
33220114	Word Processing/Clerical	16.00	HR	0.00	109.73	0.00	0.00	$1,755.74	No
33220115	Draftsman/CADD	8.00	HR	0.00	127.89	0.00	0.00	$1,023.15	No
33240101	Other Direct Costs	1.00	LS	97.83	0.00	0.00	0.00	$97.83	No

Total First Year Element Cost: $7,786.66

Element: Implementation

Year(s)	Cost per Year
2019	$30,043.17

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
18010412	Construction Signs	36.00	SF	44.03	0.00	0.00	0.00	$1,585.04	No
33220102	Project Manager	15.00	HR	0.00	234.00	0.00	0.00	$3,510.05	No
33220105	Project Engineer	30.00	HR	0.00	198.39	0.00	0.00	$5,951.62	No

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Technology: ADMINISTRATIVE LAND USE CONTROLS

33220106	Staff Engineer	45.00	HR	0.00	204.33	0.00	0.00	$9,194.80	No
33220110	QA/QC Officer	8.00	HR	0.00	160.15	0.00	0.00	$1,281.23	No
33220114	Word Processing/Clerical	30.00	HR	0.00	109.73	0.00	0.00	$3,292.02	No
33220115	Draftsman/CADD	38.00	HR	0.00	127.89	0.00	0.00	$4,859.99	No
33240101	Other Direct Costs	1.00	LS	368.43	0.00	0.00	0.00	$368.43	No

Total First Year Element Cost: $30,043.17

Total First Year Tech Cost: $76,261.86

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Monitoring & Enforcement	2019	$31,755.46	$31,755.46
Monitoring & Enforcement	2021	$31,755.46	$31,755.46
Monitoring & Enforcement	2023	$31,755.46	$31,755.46
Monitoring & Enforcement	2025	$31,755.46	$31,755.46
Monitoring & Enforcement	2027	$31,755.46	$31,755.46
Monitoring & Enforcement	2029	$31,755.46	$31,755.46
Monitoring & Enforcement	2031	$31,755.46	$31,755.46
Monitoring & Enforcement	2033	$31,755.46	$31,755.46
Monitoring & Enforcement	2035	$31,755.46	$31,755.46
Monitoring & Enforcement	2037	$31,755.46	$31,755.46
Monitoring & Enforcement	2039	$31,755.46	$31,755.46
Monitoring & Enforcement	2041	$31,755.46	$31,755.46
Monitoring & Enforcement	2043	$31,755.46	$31,755.46
Monitoring & Enforcement	2045	$31,755.46	$31,755.46
Monitoring & Enforcement	2047	$31,755.46	$31,755.46

Total Marked Up Tech Cost: $476,331.90

Technology: ADMINISTRATIVE LAND USE CONTROLS

Element: Monitoring & Enforcement

Year(s)	Cost per Year
2019	$31,755.46
2020	$0.00
2021	$31,755.46
2022	$0.00
2023	$31,755.46
2024	$0.00
2025	$31,755.46
2026	$0.00
2027	$31,755.46
2028	$0.00

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Technology: ADMINISTRATIVE LAND USE CONTROLS

2029	$31,755.46
2030	$0.00
2031	$31,755.46
2032	$0.00
2033	$31,755.46
2034	$0.00
2035	$31,755.46
2036	$0.00
2037	$31,755.46
2038	$0.00
2039	$31,755.46
2040	$0.00
2041	$31,755.46
2042	$0.00
2043	$31,755.46
2044	$0.00
2045	$31,755.46
2046	$0.00
2047	$31,755.46
2048	$0.00

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	100.00	MI	0.00	0.00	0.00	0.32	$31.86	No
33010108	Sedan, Automobile, Rental	3.00	DAY	0.00	0.00	0.00	75.45	$226.36	No
33010202	Per Diem (per person)	5.00	DAY	0.00	0.00	0.00	229.87	$1,149.35	No
33022038	Overnight delivery service, 1 lb package	6.00	LB	0.00	0.00	0.00	72.00	$432.01	No
33041101	Airfare	1.00	LS	0.00	0.00	0.00	500.00	$500.00	No
33220102	Project Manager	44.00	HR	0.00	285.37	0.00	0.00	$12,556.26	No
33220106	Staff Engineer	40.00	HR	0.00	249.18	0.00	0.00	$9,967.26	No
33220110	QA/QC Officer	4.00	HR	0.00	160.15	0.00	0.00	$640.61	No
33220112	Field Technician	1.00	HR	0.00	135.87	0.00	0.00	$135.87	No
33220114	Word Processing/Clerical	26.00	HR	0.00	133.82	0.00	0.00	$3,479.37	No
33220115	Draftsman/CADD	16.00	HR	0.00	127.89	0.00	0.00	$2,046.31	No
33220119	Health and Safety Officer	1.00	HR	0.00	209.35	0.00	0.00	$209.35	No
33240101	Other Direct Costs	1.00	LS	380.83	0.00	0.00	0.00	$380.83	No

Total First Year Element Cost: $31,755.46

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Total First Year Tech Cost: $31,755.46

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
General	2020	$154,923,762.55	$154,923,762.55

Total Marked Up Tech Cost: $154,923,762.55

Technology: MEC Removal Action with AGC

Element: Systematic Project Planning

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010108	Sedan, Automobile, Rental	30.00	DAY	0.00	0.00	0.00	75.45	$2,263.62	No
33010202	Per Diem (per person)	36.00	DAY	0.00	0.00	0.00	229.87	$8,275.32	No
33040947	MEC: Systematic Project Planning Meeting, includes labor and facility rental expenses, per EA	3.00	EA	0.00	22,652.99	0.00	1,379.22	$72,096.62	No
33040948	MEC: Systematic Project Planning, Site Visit, includes labor expenses, per EA	1.00	EA	0.00	6,745.48	0.00	0.00	$6,745.48	No
33040949	MEC: Systematic Project Planning, UFP QAPP, includes labor expenses, per EA	1.00	EA	0.00	73,034.81	0.00	0.00	$73,034.81	No
33040950	MEC: Systematic Project Planning, Establish and Management of GIS Database, includes labor expenses, per EA	1.00	EA	0.00	23,448.13	0.00	0.00	$23,448.13	No
33040951	MEC: Systematic Project Planning,Community Relation Plan, includes labor expenses, per EA	1.00	EA	0.00	13,429.74	0.00	0.00	$13,429.74	No
33040953	MEC: Systematic Project Planning,PMP/Quality Assurance Surveillance Plan, includes labor expenses, per EA	1.00	EA	0.00	10,494.89	0.00	0.00	$10,494.89	No
33040954	MEC: Systematic Project Planning, Health and Safety Plan, includes labor expenses, per EA	1.00	EA	0.00	16,486.44	0.00	0.00	$16,486.44	No
33040961	Explosive Safety Submission, includes labor and equipment expenses, per EA	1.00	EA	0.00	30,862.89	0.00	0.00	$30,862.89	No

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Technology: MEC Removal Action with AGC

33041101	Airfare	6.00	LS	0.00	0.00	0.00	575.00	$3,450.00	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	6,456.17	$6,456.17	No

Total First Year Element Cost: $267,044.10

Element: Surface and Sub Removal - Site Prep

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	14.00	DAY	0.00	0.00	0.00	229.87	$3,218.18	No
33040651	4 X 4 Truck-Rental/Lease	14.00	DAY	0.00	0.00	302.92	0.00	$4,240.87	No
33040934	UXO Technician II	200.00	HR	0.00	70.41	0.00	0.00	$14,082.21	No
33040958	MEC: Surface Clearance , includes labor and equipment expenses, per Day	0.00	DAY	0.00	3,648.24	0.00	94.98	$0.00	No
33041101	Airfare	2.00	LS	0.00	0.00	0.00	575.00	$1,150.00	No
33220212	Surveying - 2-man Crew	1.00	DAY	0.00	1,304.24	23.67	0.00	$1,327.91	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	11,988.00	$11,988.00	Yes

Total First Year Element Cost: $36,007.17

Element: RA Field Activities

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	6,314.00	DAY	0.00	0.00	0.00	229.87	$1,451,399.18	No
33040170	MEC: Instrument Verification Strip Installation, per EA	1.00	EA	625.09	5,227.55	14.19	740.76	$6,607.60	No
33040171	MEC: UXO Seeding, Quality Seeding Installation, per EA	0.00	EA	7.22	60.09	0.00	151.26	$0.00	No
33040179	Digital Geophysical Mapping with Array Sensor, Survey Grid Team, per HR	22,548.00	HR	0.00	497.42	0.00	664.27	$26,193,913.62	No
33040270	Geometrics MetalMapper Mobilization Fee	0.00	EA	0.00	0.00	0.00	1,460.13	$0.00	No
33040651	4 X 4 Truck-Rental/Lease	3,157.00	DAY	0.00	0.00	302.92	0.00	$956,315.30	No
33040653	All Terrain Vehicle (ATV) - Rental/Lease	0.00	DAY	0.00	0.00	0.00	226.33	$0.00	No
33041101	Airfare	4.00	LS	0.00	0.00	0.00	575.00	$2,300.00	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	812,762.86	$812,762.86	No

Total First Year Element Cost: $29,423,298.55

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Technology: MEC Removal Action with AGC

Element: Investigation

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
12020401	Lightning Protection System	1.00	EA	272.86	482.08	0.00	0.00	$754.94	No
16029002	Mobilization & Fee	1.00	LS	3,254.62	0.00	0.00	0.00	$3,254.62	No
17030103	Rough Grading, 14G, 1 Pass	1,111.00	SY	0.00	0.32	0.51	0.00	$919.62	No
18010102	Gravel, Delivered & Dumped	185.00	CY	51.95	9.11	9.60	0.00	$13,071.66	No
18040101	Security Fence, 10' Galvanized with 3 Strands Barbed Wire	400.00	LF	59.88	26.47	5.99	0.00	$36,934.98	No
18040119	Chain link fence gates and posts, auger fence post hole, medium soil, 3' deep, by hand, includes excavation	2.00	EA	0.00	16.94	0.00	0.00	$33.88	No
18040132	Chain link fences & gates, gate, chain link, galvanized steel, double gate, 3 strand barbed wire, 10' x 10', excludes excavation	1.00	EA	1,708.32	635.25	141.16	0.00	$2,484.73	No
33010202	Per Diem (per person)	62,772.00	DAY	0.00	0.00	0.00	229.87	$14,429,399.64	No
33022601	Safety Signs, Barriers, Yellow Nylon Tape Allowance	4.00	EA	38.71	0.00	0.00	0.00	$154.84	No
33040181	UXO Anomaly Dig Crew, MEC Removal Action, includes Labor and Equipment, per HR	0.00	HR	0.00	306.99	0.00	67.86	$0.00	No
33040184	Advanced Geophysics Classification Cueing, MEC Investigation, per EA	0.00	EA	0.00	13.24	0.00	5.94	$0.00	No
33040185	UXO Anomaly Explosive Demolition, MEC Activities, includes Labor, Material and Equipment, per EA	6,278.00	EA	273.28	614.36	0.00	0.00	$5,572,608.57	No
33040186	Munitions Deemed As Safe (MDAS) Disposal, bulk solid waste, includes materials, documentation, transport and disposal fees, per LB	423,711.00	LB	0.00	0.00	0.00	9.65	$4,087,735.96	No
33040651	4 X 4 Truck-Rental/Lease	604.00	DAY	0.00	0.00	302.92	0.00	$182,963.08	No
33040817	Explosives Storage	1.00	EA	60,477.25	0.00	0.00	0.00	$60,477.25	No

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Technology: MEC Removal Action with AGC

	Locker/Shelter, 22' x 7' x 7’								
33040941	Outside Diver	313,860.00	HR	0.00	188.83	0.00	0.00	$59,266,577.29	No
33040942	Diver Tender	156,930.00	HR	0.00	102.73	0.00	0.00	$16,121,150.22	No
33040943	Work Boat Operator	156,930.00	HR	0.00	95.68	0.00	0.00	$15,015,636.75	No
33041101	Airfare	24.00	LS	0.00	0.00	0.00	575.00	$13,800.00	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	310,338.80	$310,338.80	No

Total First Year Element Cost: $115,118,296.84

Element: Site Management

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
16019934	Temporary Office 50' X 12'	24.00	MO	860.33	0.00	0.00	0.00	$20,647.80	No
16019935	Field office expense, office supplies, average, per month	24.00	MO	140.89	0.00	0.00	0.00	$3,381.42	No
20020310	1/C #2 Aluminum, Bare, Wire	500.00	LF	0.63	1.36	0.12	0.00	$1,056.69	No
20020403	40' Class 3 Treated Power Pole	5.00	EA	774.91	897.24	129.96	0.00	$9,010.52	No
20020431	Terminal Structure, 15 KV Pole Top	2.00	EA	2,931.45	2,906.56	371.46	0.00	$12,418.94	No
33010202	Per Diem (per person)	2,913.00	DAY	0.00	0.00	0.00	229.87	$669,611.31	No
33010475	Toilet, portable, chemical, rent per month	24.00	MO	174.35	0.00	0.00	0.00	$4,184.51	No
33040651	4 X 4 Truck-Rental/Lease	2,913.00	DAY	0.00	0.00	302.92	0.00	$882,403.06	No
33040699	Storage boxes, rent per month, 40' x 8'	24.00	MO	190.20	0.00	0.00	0.00	$4,564.92	No
33040921	Senior UXO Supervisor (SUXOS)	6,921.00	HR	0.00	111.18	0.00	0.00	$769,489.53	No
33040923	UXO Project Manager	17,303.00	HR	0.00	162.04	0.00	0.00	$2,803,848.30	No
33040930	UXO QC Specialist	11,734.00	HR	0.00	98.92	0.00	0.00	$1,160,776.43	No
33040931	UXO Safety Officer	11,734.00	HR	0.00	99.51	0.00	0.00	$1,167,596.02	No
33040940	GIS Manager (UXO)	17,303.00	HR	0.00	116.84	0.00	0.00	$2,021,598.70	No
33041101	Airfare	5.00	LS	0.00	0.00	0.00	575.00	$2,875.00	No
33220101	Senior Project Manager	1,385.00	HR	0.00	244.21	0.00	0.00	$338,227.75	No
33220113	Secretarial/ Administrative	1,385.00	HR	0.00	120.71	0.00	0.00	$167,184.46	No

Estimate Documentation Detailed Report - Layout 2

Technology: MEC Removal Action with AGC

33222006	Electrician	40.00	HR	0.00	114.58	0.00	0.00	$4,583.23	No

Total First Year Element Cost: $10,043,458.59

Element: RA Reporting

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33041324	MEC After Action Report - Site Complexity (Low), per EA	1.00	EA	0.00	16,089.90	0.00	0.00	$16,089.90	No
33041325	MEC: Independent Blind Seed Tracking, per EA	0.00	EA	0.00	5,498.68	0.00	0.00	$0.00	No
33041326	MEC: IVS Memo, per EA	1.00	EA	0.00	9,517.86	0.00	0.00	$9,517.86	No
33041330	MEC: Anomaly Selection Memo, per EA	1.00	EA	0.00	9,517.86	0.00	0.00	$9,517.86	No
33041331	MEC: TOI Memo, per EA	0.00	EA	0.00	9,517.86	0.00	0.00	$0.00	No
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	531.69	$531.69	No

Total First Year Element Cost: $35,657.30

Total First Year Tech Cost: $154,923,762.55

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2024	$454.68	$454.68
Document Review	2029	$454.68	$454.68
Document Review	2034	$454.68	$454.68
Document Review	2039	$454.68	$454.68
Document Review	2044	$454.68	$454.68
Document Review	2049	$454.68	$454.68
Interviews	2024	$2,282.96	$2,282.96
Interviews	2029	$2,282.96	$2,282.96
Interviews	2034	$2,282.96	$2,282.96
Interviews	2039	$2,282.96	$2,282.96
Interviews	2044	$2,282.96	$2,282.96
Interviews	2049	$2,282.96	$2,282.96
Report	2024	$5,518.10	$5,518.10
Report	2029	$5,518.10	$5,518.10
Report	2034	$5,518.10	$5,518.10
Report	2039	$5,518.10	$5,518.10
Report	2044	$5,518.10	$5,518.10
Report	2049	$5,518.10	$5,518.10

Estimate Documentation Detailed Report - Layout 2

Total Marked Up Tech Cost: $49,534.44

Technology: Five-Year Review

Element: Document Review

Year(s)	Cost per Year
2024	$454.68
2025 - 2028	$0.00
2029	$454.68
2030 - 2033	$0.00
2034	$454.68
2035 - 2038	$0.00
2039	$454.68
2040 - 2043	$0.00
2044	$454.68
2045 - 2048	$0.00
2049	$454.68

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220105	Project Engineer	1.00	HR	0.00	241.94	0.00	0.00	$241.94	No
33220109	Staff Scientist	1.00	HR	0.00	212.75	0.00	0.00	$212.75	No

Total First Year Element Cost: $454.68

Element: Interviews

Year(s)	Cost per Year
2024	$2,282.96
2025 - 2028	$0.00
2029	$2,282.96
2030 - 2033	$0.00
2034	$2,282.96
2035 - 2038	$0.00
2039	$2,282.96
2040 - 2043	$0.00
2044	$2,282.96
2045 - 2048	$0.00
2049	$2,282.96

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	285.37	0.00	0.00	$2,282.96	No

Total First Year Element Cost: $2,282.96

Element: Report

Estimate Documentation Detailed Report - Layout 2

Technology: Five-Year Review

Year(s)	Cost per Year
2024	$5,518.10
2025 - 2028	$0.00
2029	$5,518.10
2030 - 2033	$0.00
2034	$5,518.10
2035 - 2038	$0.00
2039	$5,518.10
2040 - 2043	$0.00
2044	$5,518.10
2045 - 2048	$0.00
2049	$5,518.10

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	3.00	HR	0.00	285.37	0.00	0.00	$856.11	No
33220105	Project Engineer	7.00	HR	0.00	241.94	0.00	0.00	$1,693.55	No
33220108	Project Scientist	4.00	HR	0.00	263.43	0.00	0.00	$1,053.71	No
33220109	Staff Scientist	9.00	HR	0.00	212.75	0.00	0.00	$1,914.73	No

Total First Year Element Cost: $5,518.10

Total First Year Tech Cost: $8,255.74

Cost Over Time Summary

Element	Year(s)	Cost per Year	Total Cost
Document Review	2024	$454.68	$454.68
Document Review	2029	$454.68	$454.68
Document Review	2034	$454.68	$454.68
Document Review	2039	$454.68	$454.68
Document Review	2044	$454.68	$454.68
Document Review	2049	$454.68	$454.68
Interviews	2024	$2,282.96	$2,282.96
Interviews	2029	$2,282.96	$2,282.96
Interviews	2034	$2,282.96	$2,282.96
Interviews	2039	$2,282.96	$2,282.96
Interviews	2044	$2,282.96	$2,282.96
Interviews	2049	$2,282.96	$2,282.96
Report	2024	$5,518.10	$5,518.10
Report	2029	$5,518.10	$5,518.10
Report	2034	$5,518.10	$5,518.10
Report	2039	$5,518.10	$5,518.10
Report	2044	$5,518.10	$5,518.10
Report	2049	$5,518.10	$5,518.10

Estimate Documentation Detailed Report - Layout 2

Total Marked Up Tech Cost:	$49,534.44

AOI-06, Alternative 3: Partial MEC Removal with LUCs
Project Assembly Level Data Report

Note:
Costs are direct (no markup)

Phase Name	Tech. Key	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	units	Cost
Partial Removal Action	38	MEC Removal Action with AGC	12020401	Lightning Protection System	1	EA	182.82	323.00	0.00	0.00	505.82		
Partial Removal Action	38	MEC Removal Action with AGC	16019934	Temporary Office 50' X 12'	24	MO	576.43	0.00	0.00	0.00	13,834.32		
Partial Removal Action	38	MEC Removal Action with AGC	16019935	Field office expense, office supplies, average, per month	24	MO	94.40	0.00	0.00	0.00	2,265.60		
Partial Removal Action	38	MEC Removal Action with AGC	16029002	Mobilization & Fee	1	LS	2,180.64	0.00	0.00	0.00	2,180.64		
Partial Removal Action	38	MEC Removal Action with AGC	17030103	Rough Grading, 14G, 1 Pass	1111	SY	0.00	0.21	0.34	0.00	616.16		
Partial Removal Action	38	MEC Removal Action with AGC	18010102	Gravel, Delivered & Dumped	185	CY	34.81	6.10	6.43	0.00	8,758.20		
Partial Removal Action	38	MEC Removal Action with AGC	18040101	Security Fence, 10' Galvanized with 3 Strands Barbed Wire	400	LF	40.12	17.74	4.01	0.00	24,746.96		
Partial Removal Action	38	MEC Removal Action with AGC	18040119	Chain link fence gates and posts, auger fence post hole, medium soil, 3' deep, by hand, includes excavation	2	EA	0.00	11.35	0.00	0.00	22.70		
Partial Removal Action	38	MEC Removal Action with AGC	18040132	Chain link fences & gates, gate, chain link, galvanized steel, double gate, 3 strand barbed wire, 10' x 10', excludes excavation	1	EA	1,144.60	425.63	94.58	0.00	1,664.80		
Partial Removal Action	38	MEC Removal Action with AGC	20020310	1/C #2 Aluminum, Bare, Wire	500	LF	0.42	0.91	0.08	0.00	708.00		
Partial Removal Action	38	MEC Removal Action with AGC	20020403	40' Class 3 Treated Power Pole	5	EA	519.20	601.16	87.07	0.00	6,037.17		
Partial Removal Action	38	MEC Removal Action with AGC	20020431	Terminal Structure, 15 KV Pole Top	2	EA	1,964.11	1,947.44	248.89	0.00	8,320.86		
Partial Removal Action	38	MEC Removal Action with AGC	33010108	Sedan, Automobile, Rental	30	DAY	0.00	0.00	0.00	62.94	1,888.24		
Partial Removal Action	38	MEC Removal Action with AGC	33010202	Per Diem (per person)	36	DAY	0.00	0.00	0.00	229.87	8,275.32		
Partial Removal Action	38	MEC Removal Action with AGC	33010202	Per Diem (per person)	6314	DAY	0.00	0.00	0.00	229.87	1,451,399.18		
Partial Removal Action	38	MEC Removal Action with AGC	33010202	Per Diem (per person)	2913	DAY	0.00	0.00	0.00	229.87	669,611.31		
Partial Removal Action	38	MEC Removal Action with AGC	33010202	Per Diem (per person)	62772	DAY	0.00	0.00	0.00	229.87	14,429,399.64		
Partial Removal Action	38	MEC Removal Action with AGC	33010202	Per Diem (per person)	14	DAY	0.00	0.00	0.00	229.87	3,218.18		
Partial Removal Action	38	MEC Removal Action with AGC	33010475	Toilet, portable, chemical, rent per month	24	MO	116.82	0.00	0.00	0.00	2,803.68		
Partial Removal Action	38	MEC Removal Action with AGC	33022601	Safety Signs, Barriers, Yellow Nylon Tape Allowance	4	EA	25.94	0.00	0.00	0.00	103.75		
Partial Removal Action	38	MEC Removal Action with AGC	33040170	MEC: Instrument Verification Strip Installation, per EA	1	EA	418.82	3,502.53	9.51	617.92	4,548.78		
Partial Removal Action	38	MEC Removal Action with AGC	33040171	MEC: UXO Seeding, Quality Seeding Installation, per EA	0	EA	4.84	40.26	0.00	126.18	0.00		
Partial Removal Action	38	MEC Removal Action with AGC	33040179	Digital Geophysical Mapping with Array Sensor, Survey Grid Team, per HR	22548	HR	0.00	333.28	0.00	554.12	20,008,990.59		
Partial Removal Action	38	MEC Removal Action with AGC	33040181	UXO Anomaly Dig Crew, MEC Removal Action, includes Labor and Equipment, per HR	0	HR	0.00	205.69	0.00	56.60	0.00		
Partial Removal Action	38	MEC Removal Action with AGC	33040184	Advanced Geophysics Classification Cueing, MEC Investigation, per EA	0	EA	0.00	8.87	0.00	4.96	0.00		
Partial Removal Action	38	MEC Removal Action with AGC	33040185	UXO Anomaly Explosive Demolition, MEC Activities, includes Labor, Material and Equipment, per EA	6278	EA	183.10	411.63	0.00	0.00	3,733,726.07		
Partial Removal Action	38	MEC Removal Action with AGC	33040186	Munitions Deemed As Safe (MDAS) Disposal, bulk solid waste, includes materials, documentation, transport and disposal fees, per LB	423711	LB	0.00	0.00	0.00	8.05	3,409,856.49		
Partial Removal Action	38	MEC Removal Action with AGC	33040270	Geometrics MetalMapper Mobilization Fee	0	EA	0.00	0.00	0.00	1,218.00	0.00		
Partial Removal Action	38	MEC Removal Action with AGC	33040651	4 X 4 Truck- Rental/Lease	604	DAY	0.00	0.00	202.96	0.00	122,587.83		
Partial Removal Action	38	MEC Removal Action with AGC	33040651	4 X 4 Truck- Rental/Lease	3157	DAY	0.00	0.00	202.96	0.00	640,744.69		
Partial Removal Action	38	MEC Removal Action with AGC	33040651	4 X 4 Truck- Rental/Lease	2913	DAY	0.00	0.00	202.96	0.00	591,222.45		
Partial Removal Action	38	MEC Removal Action with AGC	33040651	4 X 4 Truck- Rental/Lease	14	DAY	0.00	0.00	202.96	0.00	2,841.44		
Partial Removal Action	38	MEC Removal Action with AGC	33040653	All Terrain Vehicle (ATV) - Rental/Lease	0	DAY	0.00	0.00	0.00	188.80	0.00		
Partial Removal Action	38	MEC Removal Action with AGC	33040699	Storage boxes, rent per month, 40' x 8'	24	MO	127.44	0.00	0.00	0.00	3,058.56		
Partial Removal Action	38	MEC Removal Action with AGC	33040817	Explosives Storage Locker/Shelter, 22' x 7' x 7'	1	EA	40,520.61	0.00	0.00	0.00	40,520.61		
Partial Removal Action	38	MEC Removal Action with AGC	33040921	Senior UXO Supervisor (SUXOS)	6921	HR	0.00	74.49	0.00	0.00	515,568.80		
Partial Removal Action	38	MEC Removal Action with AGC	33040923	UXO Project Manager	17303	HR	0.00	108.57	0.00	0.00	1,878,617.77		
Partial Removal Action	38	MEC Removal Action with AGC	33040930	UXO QC Specialist	11734	HR	0.00	66.28	0.00	0.00	777,736.53		
Partial Removal Action	38	MEC Removal Action with AGC	33040931	UXO Safety Officer	11734	HR	0.00	66.67	0.00	0.00	782,305.75		
Partial Removal Action	38	MEC Removal Action with AGC	33040934	UXO Technician II	200	HR	0.00	47.18	0.00	0.00	9,435.28		
Partial Removal Action	38	MEC Removal Action with AGC	33040940	GIS Manager (UXO)	17303	HR	0.00	78.28	0.00	0.00	1,354,499.54		
Partial Removal Action	38	MEC Removal Action with AGC	33040941	Outside Diver	313860	HR	0.00	126.52	0.00	0.00	39,709,439.89		
Partial Removal Action	38	MEC Removal Action with AGC	33040942	Diver Tender	156930	HR	0.00	68.83	0.00	0.00	10,801,397.26		
Partial Removal Action	38	MEC Removal Action with AGC	33040943	Work Boat Operator	156930	HR	0.00	64.11	0.00	0.00	10,060,687.69		
Partial Removal Action	38	MEC Removal Action with AGC	33040947	MEC: Systematic Project Planning Meeting, includes labor and facility rental expenses, per EA	3	EA	0.00	15,177.82	0.00	1,150.50	48,984.96		
Partial Removal Action	38	MEC Removal Action with AGC	33040948	MEC: Systematic Project Planning, Site Visit, includes labor expenses, per EA	1	EA	0.00	4,519.56	0.00	0.00	4,519.56		

AOI-06, Alternative 3: Partial MEC Removal with LUCs
Project Assembly Level Data Report

Note:
Costs are direct (no markup)

Phase Name	Tech. Key	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	units	Cost
Partial Removal Action	38	MEC Removal Action with AGC	33040949	MEC: Systematic Project Planning, UFP QAPP, includes labor expenses, per EA	1	EA	0.00	48,934.35	0.00	0.00	48,934.35		
Partial Removal Action	38	MEC Removal Action with AGC	33040950	MEC: Systematic Project Planning, Establish and Management of GIS Database, includes labor expenses, per EA	1	EA	0.00	15,710.58	0.00	0.00	15,710.58		
Partial Removal Action	38	MEC Removal Action with AGC	33040951	MEC: Systematic Project Planning,Community Relation Plan, includes labor expenses, per EA	1	EA	0.00	8,998.11	0.00	0.00	8,998.11		
Partial Removal Action	38	MEC Removal Action with AGC	33040953	MEC: Systematic Project Planning,PMP/Quality Assurance Surveillance Plan, includes labor expenses, per EA	1	EA	0.00	7,031.73	0.00	0.00	7,031.73		
Partial Removal Action	38	MEC Removal Action with AGC	33040954	MEC: Systematic Project Planning, Health and Safety Plan, includes labor expenses, per EA	1	EA	0.00	11,046.14	0.00	0.00	11,046.14		
Partial Removal Action	38	MEC Removal Action with AGC	33040958	MEC: Surface Clearance , includes labor and equipment expenses, per Day	0	DAY	0.00	2,444.37	0.00	79.23	0.00		
Partial Removal Action	38	MEC Removal Action with AGC	33040961	Explosive Safety Submission, includes labor and equipment expenses, per EA	1	EA	0.00	20,678.57	0.00	0.00	20,678.57		
Partial Removal Action	38	MEC Removal Action with AGC	33041101	Airfare	2	LS	0.00	0.00	0.00	575.00	1,150.00		
Partial Removal Action	38	MEC Removal Action with AGC	33041101	Airfare	6	LS	0.00	0.00	0.00	575.00	3,450.00		
Partial Removal Action	38	MEC Removal Action with AGC	33041101	Airfare	5	LS	0.00	0.00	0.00	575.00	2,875.00		
Partial Removal Action	38	MEC Removal Action with AGC	33041101	Airfare	24	LS	0.00	0.00	0.00	575.00	13,800.00		
Partial Removal Action	38	MEC Removal Action with AGC	33041101	Airfare	4	LS	0.00	0.00	0.00	575.00	2,300.00		
Partial Removal Action	38	MEC Removal Action with AGC	33041324	MEC After Action Report - Site Complexity (Low), per EA	1	EA	0.00	10,780.46	0.00	0.00	10,780.46		
Partial Removal Action	38	MEC Removal Action with AGC	33041325	MEC: Independent Blind Seed Tracking, per EA	0	EA	0.00	3,684.20	0.00	0.00	0.00		
Partial Removal Action	38	MEC Removal Action with AGC	33041326	MEC: IVS Memo, per EA	1	EA	0.00	6,377.10	0.00	0.00	6,377.10		
Partial Removal Action	38	MEC Removal Action with AGC	33041330	MEC: Anomaly Selection Memo, per EA	1	EA	0.00	6,377.10	0.00	0.00	6,377.10		
Partial Removal Action	38	MEC Removal Action with AGC	33041331	MEC: TOI Memo, per EA	0	EA	0.00	6,377.10	0.00	0.00	0.00		
Partial Removal Action	38	MEC Removal Action with AGC	33220101	Senior Project Manager	1385	HR	0.00	85.84	0.00	0.00	118,895.32		
Partial Removal Action	38	MEC Removal Action with AGC	33220113	Secretarial/ Administrative	1385	HR	0.00	42.43	0.00	0.00	58,769.43		
Partial Removal Action	38	MEC Removal Action with AGC	33220212	Surveying - 2-man Crew	1	DAY	0.00	873.86	15.86	0.00	889.72		
Partial Removal Action	38	MEC Removal Action with AGC	33222006	Electrician	40	HR	0.00	76.77	0.00	0.00	3,070.83		
Partial Removal Action	38	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	443.52	443.52		
Partial Removal Action	38	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	10,000.00	10,000.00		
Partial Removal Action	38	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	258,874.54	258,874.54		
Partial Removal Action	38	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	677,980.36	677,980.36		
Partial Removal Action	38	MEC Removal Action with AGC	33240101	Other Direct Costs	1	LS	0.00	0.00	0.00	5,385.53	5,385.53		
										Total	112,431,469.47	1	$112,431,469.47
Periodic Review	45	Five-Year Review	33220102	Project Manager	8	HR	0.00	100.31	0.00	0.00	802.52		
Periodic Review	45	Five-Year Review	33220102	Project Manager	3	HR	0.00	100.31	0.00	0.00	300.94		
Periodic Review	45	Five-Year Review	33220105	Project Engineer	1	HR	0.00	85.05	0.00	0.00	85.05		
Periodic Review	45	Five-Year Review	33220105	Project Engineer	7	HR	0.00	85.05	0.00	0.00	595.32		
Periodic Review	45	Five-Year Review	33220108	Project Scientist	4	HR	0.00	92.60	0.00	0.00	370.40		
Periodic Review	45	Five-Year Review	33220109	Staff Scientist	9	HR	0.00	74.79	0.00	0.00	673.07		
Periodic Review	45	Five-Year Review	33220109	Staff Scientist	1	HR	0.00	74.79	0.00	0.00	74.79		
										Total	2,902.09	6	$17,412.57
LAND USE CONTROLS	49	LAND USE CONTROLS	18010412	Construction Signs	36	SF	29.50	0.00	0.00	0.00	1,062.00		
LAND USE CONTROLS	49	LAND USE CONTROLS	33010202	Per Diem (per person)	1	DAY	0.00	0.00	0.00	229.87	229.87		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220102	Project Manager	15	HR	0.00	82.26	0.00	0.00	1,233.87		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220102	Project Manager	22	HR	0.00	82.26	0.00	0.00	1,809.67		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220102	Project Manager	20	HR	0.00	82.26	0.00	0.00	1,645.16		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220105	Project Engineer	30	HR	0.00	69.74	0.00	0.00	2,092.14		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220105	Project Engineer	30	HR	0.00	69.74	0.00	0.00	2,092.14		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220106	Staff Engineer	45	HR	0.00	71.83	0.00	0.00	3,232.20		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220106	Staff Engineer	45	HR	0.00	71.83	0.00	0.00	3,232.20		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220110	QA/QC Officer	11	HR	0.00	56.30	0.00	0.00	619.28		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220110	QA/QC Officer	8	HR	0.00	56.30	0.00	0.00	450.38		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220114	Word Processing/Clerical	60	HR	0.00	38.57	0.00	0.00	2,314.45		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220114	Word Processing/Clerical	16	HR	0.00	38.57	0.00	0.00	617.19		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220114	Word Processing/Clerical	30	HR	0.00	38.57	0.00	0.00	1,157.23		

AOI-06, Alternative 3: Partial MEC Removal with LUCs
Project Assembly Level Data Report

Note:
Costs are direct (no markup)

Phase Name	Tech. Key	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	units	Cost
LAND USE CONTROLS	49	LAND USE CONTROLS	33220115	Draftsman/CADD	8	HR	0.00	44.96	0.00	0.00	359.66		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220115	Draftsman/CADD	30	HR	0.00	44.96	0.00	0.00	1,348.74		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220115	Draftsman/CADD	38	HR	0.00	44.96	0.00	0.00	1,708.40		
LAND USE CONTROLS	49	LAND USE CONTROLS	33220503	Attorney, Partner, Real Estate	22	HR	0.00	164.28	0.00	0.00	3,614.15		
LAND USE CONTROLS	49	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	246.86	0.00	0.00	0.00	246.86		
LAND USE CONTROLS	49	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	65.55	0.00	0.00	0.00	65.55		
LAND USE CONTROLS	49	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	375.77	0.00	0.00	0.00	375.77		
										Total	29,506.89	1	$29,506.89
30-Year O&M	36	LAND USE CONTROLS	33010104	Vehicle mileage charge, car or van	100	MI	0.00	0.00	0.00	0.32	31.86		
30-Year O&M	36	LAND USE CONTROLS	33010108	Sedan, Automobile, Rental	3	DAY	0.00	0.00	0.00	62.94	188.82		
30-Year O&M	36	LAND USE CONTROLS	33010202	Per Diem (per person)	5	DAY	0.00	0.00	0.00	229.87	1,149.35		
30-Year O&M	36	LAND USE CONTROLS	33022038	Overnight delivery service, 1 lb package	6	LB	0.00	0.00	0.00	60.06	360.37		
30-Year O&M	36	LAND USE CONTROLS	33041101	Airfare	1	LS	0.00	0.00	0.00	500.00	500.00		
30-Year O&M	36	LAND USE CONTROLS	33220102	Project Manager	44	HR	0.00	100.31	0.00	0.00	4,413.83		
30-Year O&M	36	LAND USE CONTROLS	33220106	Staff Engineer	40	HR	0.00	87.59	0.00	0.00	3,503.74		
30-Year O&M	36	LAND USE CONTROLS	33220110	QA/QC Officer	4	HR	0.00	56.30	0.00	0.00	225.19		
30-Year O&M	36	LAND USE CONTROLS	33220112	Field Technician	1	HR	0.00	47.76	0.00	0.00	47.76		
30-Year O&M	36	LAND USE CONTROLS	33220114	Word Processing/Clerical	26	HR	0.00	47.04	0.00	0.00	1,223.08		
30-Year O&M	36	LAND USE CONTROLS	33220115	Draftsman/CADD	16	HR	0.00	44.96	0.00	0.00	719.33		
30-Year O&M	36	LAND USE CONTROLS	33220119	Health and Safety Officer	1	HR	0.00	73.59	0.00	0.00	73.59		
30-Year O&M	36	LAND USE CONTROLS	33240101	Other Direct Costs	1	LS	255.16	0.00	0.00	0.00	255.16		
										Total	12,692.09	15	$190,381.42
												Total Direct	$112,668,770.35
												Mark-up	$ 42,857,120.00
												TOTAL	**$155,525,890**

Appendix D:
Institutional Analysis

FINAL

APPENDIX D
TO THE FEASIBILITY STUDY:

INSTITUTIONAL ANALYSIS

FORMER CAMP WELLFLEET FUDS –
MMRP REMEDIAL INVESTIGATION THROUGH DECISION DOCUMENT
WELLFLEET, MASSACHUSETTS

CONTRACT NO.: W912DR-15-D-0015, DELIVERY ORDER 0002

Prepared for:

U.S. Army Corps of Engineers
Baltimore District

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ACRONYMS and ABBREVIATIONS

Abbreviation	Definition
CA	Cooperative Agreement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CCNS	Cape Cod National Seashore
DERP	Defense Environmental Restoration Program
DID	Data Item Description
DMM	Discarded Military Munitions
DoD	Department of the Defense
DMOA	Defense Memorandum of Agreement
EP	Engineering Pamphlet
ERT	ERT, Inc.
FS	Feasibility Study
FUDS	Formerly Used Defense Site
IA	Institutional Analysis
IC	Institutional Control
LUC	land use control
MC	munitions constituents
MEC	munitions and explosives of concern
MMRP	Military Munitions Response Program
NCP	National Contingency Plan
NPS	National Park Service
RI	Remedial Investigation
RAO	Remedial Action Objective
SARA	Superfund Amendments and Reauthorization Act
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USEPA	U.S. Environmental Protection Agency
UXO	unexploded ordnance

1.0 INTRODUCTION

This Institutional Analysis (IA) was prepared by ERT, Inc. (ERT), for the U.S. Army Corps of Engineers (USACE), as an appendix to the Feasibility Study (FS) for the Former Camp Wellfleet FUDS.).

Note: This Draft-Final IA will be supplemented by completed forms from the institutions surveyed. Where this information will be presented is indicated as "To Be Determined".

This IA has been prepared in accordance with the *MMRP Remedial Investigation/Feasibility Study Guidance* (U.S. Army, 2009), Engineer Pamphlet (EP) 1110-1-24 (USACE, 2000), the U.S. 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* (USEPA, 2012), and Data Item Description (DID) MR-100 *Institutional Analysis and Institutional Control Plan* (DID, 2003).

The objectives of the IA are to illustrate the opportunities that exist to implement an institutional control (IC) program at the site; identify 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 site. ICs are substantially the same as "land use controls (LUCs)," as defined in the DoD's Interim Policy on Land Use Controls Associated with Environmental Restoration Activities (31 August 2000). The three general types of ICs are legal mechanisms, engineering controls, and educational programs.

This IA documents and assesses institutional authority, jurisdiction, and desire to participate in implementing education and awareness initiatives within the Former Camp Wellfleet to achieve the RAOs. Education and awareness initiatives may include community-wide mailings of educational material such as understanding the 3 'R's (recognize, retreat, and report) with regard to areas where potential munitions may be encountered. The RAOs are as follows:

- For land AOI-02 and AOI-05: eliminate unacceptable risk due to the presence of MEC to a depth of 3 feet bgs to address direct contact by park personnel and recreational users, and direct contact of MEC in the subsurface to a depth of 6 feet bgs by authorized maintenance workers, such that acceptable conditions (as defined by RMM Matrix 4), within the limitations of detection capability resulting from imposed vegetation cutting prohibitions, are achieved.
- For water AOI-06: eliminate unacceptable risk due to the presence of MEC on or beneath the sea floor (approximately 2 ft bgs) to address direct contact by park personnel, park visitors (waders, swimmers), and recreational divers, to a water depth of 120 feet, and the potential for interaction resulting from the use of fishing nets to the maximum depth of the AOI, such that an acceptable condition (as defined by RMM Matrix 4) is achieved.

1.1 Overview

Typical strategies for addressing the presence of MEC are physical removals and ICs. Physical removal actions are conducted to reduce the amount of MEC at a site. However, in a practical sense, current technologies do not provide for detection and removal of 100 percent of all MEC. ICs are implemented to manage the residual hazard of MEC that could remain at the site. ICs may be implemented without a physical removal action. Property owners provide critical input into the development of a viable IC program for a site effecting their property. If an IC program is selected for a site not under the control of the DoD, as is the case for the Former Camp Wellfleet, it is

typically the property owners and/or appropriate state and local governments that have the authority to maintain compliance with the provisions of the ICs and maintain the effectiveness of the ICs.

ICs consist of various mechanisms used to minimize the potential for hazards to human receptors from a property impacted with MEC or other hazards. ICs include engineering and physical barriers (e.g., fencing); and non-engineering instruments called ICs. ICs are a subset of LUCs and include educational programs (e.g., public notification of residual MEC concerns), or administrative and legal controls (e.g., zoning restrictions, easements, covenants) that help to minimize the potential for human exposure to MEC. ICs typically are designed to work by limiting land and/or resource use or by providing information that helps guide human behavior at a site to reduce or eliminate the hazard. The IC program identified in the RAO for the Former Camp Wellfleet is the educational program IC. As part of this IC program, educational materials could be made available to property owners, including information on the three "R's" of munitions safety (recognize, retreat, and report). These could be made available on a USACE website in the form of a factsheet, and provided during any public meetings held. USACE already has established communications and outreach mechanisms that could be used to provide educational materials to all institutions and residential/commercial property owners within the Former Camp Wellfleet.

EP 1110-1-24 (USACE, 2000) states that, "*The policy of the 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 potential residual hazards at a MEC site, USACE seeks and encourages stakeholder involvement to identify site-specific objectives for an effective IC program. This IA documents the further coordination conducted to identify whether and how relevant institutions may support in the IC program for the Former Camp Wellfleet to achieve the RAOs.

1.2 Purpose and Objectives

The overall purpose of this IA is to provide information on the capability of government agencies and/or non-government entities associated with Former Camp Wellfleet to take part in the implementation and maintenance of ICs in order to minimize exposure to MEC. The objectives of this IA are to:

- Identify and document the agencies and entities that have jurisdiction over any impacted areas at the Former Camp Wellfleet;
- 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 MEC hazards;
- Document the mission, if any, of each agency and entity to protect the surrounding community from MEC hazards under the law; and
- Document existing ICs currently in place for the protection of the community from MEC hazards.

Governmental and non-governmental entities that will be required to support the short-term and long-term ICs for the Former Camp Wellfleet are identified and described in this IA.

1.3 Hazard Review

As fully described in the FS, potential explosive hazards associated with the Former Camp Wellfleet FUDS may remain in the surface and subsurface soil, or on or beneath the sea floor, and

AOIs categorized as having unacceptable site conditions with regard to potential explosive hazards (described in Section 1.5.2 of the FS) require remedial actions to mitigate them.

Figure 3, Appendix A, shows the AOIs that present unacceptable explosive hazards.

1.4 Regulatory Background

A number of existing statutes and regulations allow for and/or clarify the implementation of ICs and the performance of an IA. The regulatory authorities governing the establishment and maintenance of ICs during munitions response actions include:

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

These statutes and regulations are discussed below.

The DERP created the authority of the DoD to undertake certain response actions and established the Defense Environmental Restoration Account. One of the goals of the DERP is the correction of environmental damage (such as detection and disposal of munitions and MEC) 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. As a matter of DoD policy, munitions responses are conducted in accordance with CERCLA, as amended by the SARA, and the NCP.

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 MEC-contaminated 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 formally establishing the DERP.

The NCP (40 Code of Federal Regulations (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 March 1990 revision is the latest version of the NCP. Paragraph 300.120(c) identifies the DoD as the removal response authority with respect to incidents involving DoD military weapons and munitions.

The National Defense Authorization Act for fiscal year 2002 (Public Law 107-107) formally amended the DERP by establishing the MMRP. The MMRP is a program element of the DERP for the remediation of property known or suspected to contain MEC. Under the MMRP, the DoD conducts munitions responses per CERCLA, the NCP, and applicable federal and state laws. The DoD considers reasonably anticipated future land use in the design and implementation of response actions and provides, to the fullest extent practicable, the opportunity for meaningful involvement of state and local governments and members of the public in the munitions response process.

1.5 Selection Criteria 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 IC 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 IC or what specific aspect of an IC 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 an IC program.
- **Capability** – Even if an agency has the jurisdiction, authority, and mission to be involved in an IC 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 particular government or private agency to participate in an IC program is absolutely critical to its success. The effectiveness of ICs is increased when local officials are committed to participation in an IC 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.

1.6 Institution Selection

Institutions were selected for this analysis based on their specific mission to protect the public from MEC hazards and/or their jurisdiction and authority over the Former Camp Wellfleet, where focus areas of potential MEC hazards were identified during the RI.

The property owners selected for the analysis are those who are expected to have a long-term presence within the Former Camp Wellfleet and are set up as institutions which could potentially support long-term implementation of education and awareness ICs. The Former Camp Wellfleet consists of a total of 1,738 acres - of which approximately 1,688 acres are located in the Cape Cod National Seashore (CCNS), currently owned by the National Park Service (NPS). The Department of the Interior acquired the acreage of the Former Camp Wellfleet through a Declaration of Taking in August 1961 to establish and develop the CCNS. The Town of Wellfleet owns and manages approximately 49.2 acres (see Figure 2, Appendix A).

This IA also selected institutions outside the focus areas of potential MEC hazards to obtain a larger understanding of willingness to participate across the Former Camp Wellfleet. The institutions in the analysis, including property owners and agencies, are:

- U.S. Army Corps of Engineers
- National Park Service (NPS)
- Massachusetts Department of Environment Protection (MassDEP)
- Town of Wellfleet

As part of the preparation of this IA, the selected institutions have been contacted through a combination of phone interviews and email communication to obtain information on the capability of government agencies and/or non-government entities associated with Former Camp Wellfleet to take part in the implementation of education and awareness ICs in order to minimize exposure to MEC. This IA will be supplemented with that information once received.

2.0 TECHNICAL CAPABILITY

Each institution selected for analysis in Section 1.6 and its jurisdiction, authority, and potential role in an IC program will be compiled in Tables 2-1 through 2-5. These tables have been submitted to the respective institutions, however, where not yet received, the information is indicated as "To Be Determined". As received, these questionnaires will be submitted in an amended Institutional Analysis.

2.1 U.S. Army Corps of Engineers

The USACE is responsible for Formerly Used Defense Site (FUDS) program management and execution as directed by the Department of the Army. USACE is designated as the lead responsible for managing project cost, schedule, and scope to ensure quality and proper coordination with government and non-government entities for the Former Camp Wellfleet. USACE Baltimore District is one of four USACE districts that have a Military Munitions Design Center; the Baltimore District is responsible for providing MMRP support.

The USACE New England District is the hazardous, toxic, and radioactive waste lead responsible for programming funding and for upward reporting, including coordinating DMOA funding for oversight as funded by the Army (ER 200-3-1).

As technical advisor to the Army and as the DoD executive agent for the FUDS program, USACE is responsible for the selection of ICs including awareness activities that would reduce the probability of receptors handling MEC encountered within the Former Camp Wellfleet. USACE would administer an IC maintenance/oversight contract to support the RAOs if programmed and funded by the Army. Basic information for USACE is summarized in Table 2-1.

Table 2-1. U.S. Army Corps of Engineers

Name of Agency	U.S. Army Corps of Engineers
Origin of Institution	USACE was established in 1775 during the American Revolution to provide the Army with combat engineering, military construction and engineering support. The Army established the Corps of Engineers as a separate, permanent branch on March 16, 1802. With the formation of the Defense Environmental Restoration Program in 1983, USACE adopted a role of providing the DoD with technical and project management support on environmental and MMRP projects, including FUDS projects.
Basis of Authority	USACE conducts munitions response actions under the provisions of the Comprehensive Environmental Response, Compensation and Liability Act, as amended by the Superfund Amendments and Reauthorization Act, Executive Orders 12580 and 13016, and the safety requirements of the DoD Explosives Safety Board. USACE has project-specific management and technical oversight authority on FUDS projects. FUDS is a program authorized under the Defense Environmental Restoration Program per section 2701(a)(1) of title 10, United States Code (U.S.C.) (Reference n). The USACE Baltimore District is one of four USACE districts that have a Military Munitions Design Center and serves as Munitions technical lead for the Former Camp Wellfleet. The USACE New

Table 2-1. U.S. Army Corps of Engineers	
	England District is the geographic district and provides management lead and all other technical oversight.
Sunset Provisions	None.
Geographic Jurisdiction	USACE has nine regional divisions that include all of the U.S., the Pacific, Europe, the Middle East, and Afghanistan The New England District is the geographical district.
Mission of the Agency	USACE is a major Army command that provides engineering, design, and construction management services.
Public Safety Function:	One of USACE's missions is public safety in munitions response, which is captured in the mission statement for the Directorate of Ordnance and Explosives: "To safely eliminate or reduce risks from ordnance, explosives and recovered chemical warfare materiel at current or formerly used defense sites."
Land Use Control Function:	As technical advisor to the Army and as the Department of Defense executive agent for the FUDS program, USACE is responsible for the selection of ICs such as awareness activities that would reduce the probability of residents, contractor/maintenance workers, and visitors/passers-by from handling MEC encountered during residential or construction/maintenance activities conducted within the Former Camp Wellfleet. In addition, USACE 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 an IC maintenance/oversight contract if programmed and funded by the Army.
Desire to Participate	Yes.
Constraints to Institutional Effectiveness	USACE is constrained by not being the property owner and therefore can only evaluate and provide advice or notification to the owners.
Sources of Information: Correspondence with USACE, 24 March 2016	

2.2 National Park Service

NPS owns approximately 1,688 acres of the 1,738 acres of the Former Camp Wellfleet. As a federal agency owning and managing property within the Former Camp Wellfleet, the NPS has jurisdiction over its portion of the property. NPS as a property owner has authority to support awareness activities that would reduce the probability of receptors handling MEC encountered within the Former Camp Wellfleet. Basic information for NPS is summarized in Table 2-2.

Table 2-2. National Park Service	
Name of Agency	National Park Service (NPS)
Origin of Institution	The first National Park, Yellowstone, was established by the Yellowstone Act of 1872. The Organic Act of 1916 officially established the National Park Service in the Department of the

Table 2-2. National Park Service	
	Interior responsible for protecting the 35 national parks and monuments then managed by the department. [1]
Basis of Authority	National Parks and Related Programs 54 U.S.C. (2014). Public Law 87-126 CCNS legislative authority and Title 36, Code of Federal Regulations, Chapter 1, Parts 1 through 7, authorized by Title 54, United States Code for regulatory authorities. NPS does have enforcement authority.
Sunset Provisions	None.
Geographic Jurisdiction	The NPS has jurisdiction over the portions of the Former Camp Wellfleet that are federally owned.
Mission of the Agency	The NPS preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world. [2]
Public Safety Function:	US Park Police and NPS Rangers enforce federal laws on property administered by the NPS.
Land Use Control Function:	NPS as a property owner has authority to support awareness activities that would reduce the probability of receptors handling MEC encountered within the Former Camp Wellfleet.
Financial Capability	Federally funded.
Desire to Participate	The NPS has participated in the TPP process and provided support during field activities throughout the environmental investigations conducted at the Former Camp Wellfleet. The NPS has been participating in the EE/CA-based land use controls (LUCs), including annual ordnance training, monitoring new potential MEC finds and has adhered to the 3 R's when potential MEC items have been found. The NPS is willing to continue supporting awareness activities to reduce the probability of park workers, visitors, and construction workers from handling MEC encountered within the Cape Cod National Seashore.
Constraints to Institutional Effectiveness	The NPS is willing to continue to participate in educational awareness for its employees only. People who live on the cape are aware that there is UXO potential especially in these areas. We are concerned if we start advertising it, more people would try to find the UXOs and get themselves into trouble. NPS does not want fences or informational signs in the park.
Sources of Information: [1] http://www.nps.gov/aboutus/history.htm [2] http://www.nps.gov/aboutus/index.htm	

2.3 Massachusetts Department of Environment Protection (MassDEP)

The MassDEP provides regulatory oversight of the environmental projects at the Former Camp Wellfleet. USEPA has delegated regulatory oversight of the Former Camp Wellfleet to MassDEP. MassDEP has acted as the lead regulatory agency and has been an active participant throughout the environmental investigations conducted at the Former Camp Wellfleet. Basic information for MassDEP is summarized in Table 2-3.

Table 2-3. Massachusetts Department of Environmental Protection	
Name of Agency	Massachusetts Department of Environment Protection (MassDEP)
Origin of Institution	MassDEP is a department in the Massachusetts Executive Office of Energy and Environmental Affairs. The Executive Office of Environmental Affairs was established by the Massachusetts Legislature in 1975.[1]
Basis of Authority	Article 97 of the Massachusetts Constitution and the General Laws of Massachusetts Chapter 21A Section 2.
Sunset Provisions	None.
Geographic Jurisdiction	State regulatory oversight.
Mission of the Agency	The Massachusetts Department of Environmental Protection works to fulfill Article 97 of the Massachusetts Constitution, which guarantees the people's right to clean air and water as well as the natural, scenic, historic, and aesthetic qualities of their environment. [1]
Public Safety Function:	The MassDEP provides regulatory oversight for cleanup of contaminated sites in Massachusetts, including the Former Camp Wellfleet.
Land Use Control Function:	No active role in implementation, maintenance, monitoring, or enforcement of LUCs within the Former Camp Wellfleet. MassDEP will provide regulatory review of the LUCIP and 5-year review reports.
Financial Capability	State funded.
Desire to Participate	The MassDEP is **willing/not willing** to support awareness activities that would reduce the probability of park workers, visitors, and construction workers from handling MEC encountered at the Former Camp Wellfleet. **Questionnaire not yet received-To Be Determined**.
Constraints to Institutional Effectiveness	The MassDEP has environmental oversight jurisdiction over the Former Camp Wellfleet. However, MassDEP does not have technical experience with UXO safety and management. **Questionnaire not yet received-To Be Determined.**
Sources of Information: [1] https://www.mass.gov/service-details/brief-history-of-eea	

2.4 Town of Wellfleet

The Town of Wellfleet owns approximately 49.2 acres within the Former Camp Wellfleet, and could implement, maintain, and enforce ICs within this portion of the site. The Town of Wellfleet may also have jurisdiction over land use and zoning ICs governing the entire Former Camp Wellfleet. Basic information for the Town of Wellfleet is summarized in Table 2-4.

Table 2-4. Town of Wellfleet	
Name of Agency	Town of Wellfleet
Origin of Institution	The Town of Wellfleet was established in 1763[1].
Basis of Authority	The Town of Wellfleet Charter[1].
Sunset Provisions	None.
Geographic Jurisdiction	The Town of Wellfleet owns approximately 49.2 acres within the Former Camp Wellfleet. The Town of Wellfleet could implement, maintain, and enforce ICs within this portion of the site. The Town of Wellfleet may also have jurisdiction over land use and zoning ICs governing the entire Former Camp Wellfleet.
Mission of the Agency	
Public Safety Function:	**Questionnaire not yet received-To Be Determined**
Land Use Control Function:	**Questionnaire not yet received-To Be Determined**
Financial Capability	Tax (real estate, personal property, and sales) funded. The Town of Wellfleet is willing/ not willing to provide funding to support the implementation, maintenance, monitoring, and enforcement of ICs at the Former Camp Wellfleet. **Questionnaire not yet received-To Be Determined**.
Desire to Participate	The Town of Wellfleet is **willing/not willing** to support awareness activities that would reduce the probability of park workers, visitors, and construction workers from handling MEC encountered at the Former Camp Wellfleet. **Questionnaire not yet received-To Be Determined**
Constraints to Institutional Effectiveness	**Questionnaire not yet received-To Be Determined**
Sources of Information: [1] https://www.wellfleet-ma.gov/	

3.0 EVALUATION AND RECOMMENDATIONS

This section provides an evaluation of existing ICs as they relate to potential munition hazards, and based on the analysis of selected institutions, makes recommendations on activities USACE may consider as part of the process of implementing the education and awareness ICs identified in the RAOs.

3.1 Evaluation of Existing Controls

With reference to potential MEC hazards in the Former Camp Wellfleet, land use or ownership is not expected to change in the future. Community relations programs may be developed to support Former Camp Wellfleet public participation requirements. Initiatives may include regular postings to a dedicated project website, production of informative videos, routine development of factsheets, weekly and monthly email updates, maintenance of targeted automatic emergency notification systems, mailing of quarterly mailed newsletters, and holding public meetings as needed. The public participation program works to include all property owners within the Former Camp Wellfleet, as well as the other institutions.

3.2 Recommendations for Implementation of Future Controls

This section will summarize the information received from the institutions, as described in Section 2. (To Be Determined).

4.0 REFERENCES

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