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ENGINEERING EVALUATION/COST ANALYSIS FOR NON-TIME CRITICAL REMOVAL ACTION AT UNEXPLODED ORDNANCE 2 (UXO 2) NAS WHITING FIELD FL

1/1/2016

RESOLUTION CONSULTANTS

ENGINEERING EVALUATION/COST ANALYSIS FOR NON-TIME-CRITICAL REMOVAL ACTION

Site UXO 02
Naval Air Station Whiting Field
Milton, Florida

FINAL
USEPA ID No. FL2170023244

Prepared for:

Department of the Navy
Naval Facilities Engineering Command Southeast
Building 135 N, P.O. Box 30
Jacksonville, Florida 32212-0030

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Comprehensive Long-Term Environmental Action Navy
Contract Number N62470-11-D-8013
CTO JM68

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LIST OF ACRONYMS AND ABBREVIATIONS

ABB-ES	ABB-Environmental Services, Inc.
AGM	Analog Geophysical Mapping
AM	Action Memorandum
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
BIP	blown-in-place
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action – Navy
CSM	conceptual site model
CTO	Contract Task Order
DoD	Department of Defense
DON	Department of Navy
EE/CA	Engineering Evaluation/Cost Analysis
EOD	Explosive Ordnance Disposal
ESO	Explosive Safety Officer
EZ	exclusion zone
°F	degrees Fahrenheit
FDEP	Florida Department of Environmental Protection
IDW	investigation-derived waste
INRMP	Integrated Natural Resources Management Plan
LUC	land use controls
MC	munitions constituents
MD	munitions debris
MDAS	material documented as safe
MEC	Munitions and Explosives of Concern
MPPEH	material potentially presenting an explosive hazard
MRS	Munitions Response Site
msl	mean sea level
NASWF	Naval Air Station Whiting Field
NAVFAC	Naval Facilities Engineering Command
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NTCRA	Non-Time-Critical Removal Action
O&E	ordnance and explosives
O&M	Operation and Maintenance

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

PA	Preliminary Assessment
RAA	remedial alternative analysis
RAO	removal action objective
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
SOP	standard operating procedures
THA	task hazard analysis
USEPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers
USC	United States Code
UU/UE	unlimited use/unrestricted exposure
UXO	Unexploded Ordnance

EXECUTIVE SUMMARY

This Engineering Evaluation/Cost Analysis (EE/CA) was prepared by Resolution Consultants under the Naval Facilities Engineering Command (NAVFAC) Comprehensive Long-term Environmental Action – Navy (CLEAN) Contract N62470-11-D-8013, Contract Task Order (CTO) JM68. The purpose of this EE/CA is to present and evaluate removal alternatives for Site Unexploded Ordnance (UXO) 02 that address Material Potentially Presenting an Explosive Hazard (MPPEH) and munitions constituents (MC), if present, and recommend a removal alternative. Based on the outcome of the removal action or a subsequent investigation, a follow-on remedial action will be conducted if site-related hazardous substances, pollutants, or contaminants, including MC, are discovered and remain in site media at Site UXO 02.

This EE/CA has been issued by the Department of the Navy and complies with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 (United States Environmental Protection Agency [USEPA], 1986) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) in Title 40 of the Code of Federal Regulations (CFR), Part 300. This EE/CA has been prepared in general accordance with the USEPA guidance document *Superfund, Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA*, PB93-963402 (USEPA, 1993a) and guidelines provided in *EPA Munitions Response Guidelines, OSWER Directive 9200.1-101, Interim Final* (USEPA, 2010).

Based on the analysis of applicable removal technologies for MPPEH and MC, three alternatives were retained for further evaluation and are as follows:

- Alternative 1 – No Action
- Alternative 2 – Land Use Controls
- Alternative 3 – MPPEH Clearance and MC Confirmatory Sampling

Based on the comparative analysis, Alternative 3 – MPPEH Clearance and MC Confirmatory Sampling was selected as the recommended alternative for Site UXO 02 based on the following factors:

- Alternative 3 is the most effective and provides the most protection to human health. In addition, Alternative 3 reduces the toxicity, mobility, and volume of MPPEH and co-located MC-contaminated soil, if present; this reduction would not be achieved under Alternatives 1 or 2.

- All three of the alternatives are implementable from a technical, administrative, and services/materials perspective; however, Alternative 3 is the most implementable alternative since it is anticipated to be the most acceptable alternative to the stakeholders and the community.

- The estimated cost of Alternative 3 is higher than Alternative 2; however, its overall protectiveness is significantly higher since Alternative 3 provides the most protection and is a permanent solution since MPPEH and co-located MC-contaminated soil, if present, will be removed from the site.

Implementation of Alternative 3 will address MPPEH and co-located MC-contaminated soil, if present, at Site UXO 02 and restore the operational status of Site UXO 02 to a condition protective of human health and suitable for Air Operations. Implementation of Alternative 3 is anticipated to be the final remedy; however, based on the outcome of the removal action, a subsequent remedial investigation and/or follow-on remedial action may be conducted if site-related hazardous substances, pollutants, or contaminants, including MC, are discovered and remain in site media at Site UXO 02.

1.0 INTRODUCTION

Resolution Consultants was retained by the Department of the Navy (DON), Naval Facilities Engineering Command Southeast (NAVFAC SE) under the Comprehensive Long-term Environmental Action – Navy (CLEAN) Contract Number N62470-11-D-8013, Contract Task Order (CTO) JM68 to complete an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action (NTCRA) at Munitions Response Site (MRS) unexploded ordnance (UXO) 02, located at Naval Air Station Whiting Field (NASWF), Florida. The Navy's intent for the development of this EE/CA and subsequent execution of a NTCRA, as necessary, is to restore the operational status of Site UXO 02 to a condition protective of human health and suitable for Air Operations. Based on the outcome of the removal action or a subsequent investigation, a follow-on remedial action will be conducted if site-related hazardous substances, pollutants, or contaminants, including MC, are discovered and remain in site media at Site UXO 02.

This EE/CA has been prepared in general accordance with the United States Environmental Protection Agency (USEPA) guidance document *Superfund, Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA*, PB93-963402 (USEPA, 1993a) and guidelines provided in *EPA Munitions Response Guidelines, OSWER Directive 9200.1-101, Interim Final* (USEPA, 2010).

1.1 Purpose and Objectives

The purpose of this EE/CA is to (1) satisfy environmental review requirements for removal actions; (2) satisfy administrative record requirements for unproved documentation of removal action selection; and (3) provide a framework for evaluating and selecting alternative technologies. Additionally, this EE/CA provides the framework for recommending a removal action alternative for a NTCRA at Site UXO 02. The recommended removal action alternative presented in this EE/CA addresses identified Material Potentially Presenting an Explosive Hazard (MPPEH) and munitions constituents (MC) affecting current and future land uses of Site UXO 02. This EE/CA also provides the documentation required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to support a NTCRA at Site UXO 2.

1.2 Regulatory Framework

This EE/CA has been issued by the DON and complies with CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the National Contingency Plan (NCP) in Title 40 of the Code of Federal Regulations (CFR), Section 300. Subject to Section 104 and 121 of CERCLA and Executive Order 12580, the DON is the delegated authority and lead agency with respect to remedial and removal actions for releases or threatened releases of hazardous substances, pollutants, or contaminants on facilities under their jurisdiction. As lead agency, the

DON is authorized to remove the risk of hazardous substances, pollutants, or contaminants at any time, or to take other response measures consistent with the NCP as deemed necessary for the protection of public health or welfare and the environment.

The NCP, Section 300, provides regulations for implementing CERCLA and SARA, and regulations specific to removal actions. In accordance with Section §300.410, a removal site evaluation of Site UXO 02 was conducted in March 2013 (*Munitions Preliminary Assessment (PA) Report for Flare Disposal Area, Naval Air Station Whiting Field, Florida;* Resolution Consultants, 2014a). The information gathered during the removal site evaluation, as presented in "Section 2.0 Conceptual Site Model" of this EE/CA, indicated that an actual or threatened release/exposure to hazardous substances from Site UXO 02 may present an endangerment to public health and the environment.

Pursuant to Section §300.415(b)(2), the NCP provides factors to consider in determining the appropriateness of undertaking a removal action in response to a given or threatened release of hazardous substances, pollutants, or contaminants. The factors determined to be most applicable to the current conditions at Site UXO 02 are: (1) actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants; (2) weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released; and (3) threat of fire or explosion. Based on the removal site evaluation and consideration of factors in determining the appropriateness of a removal action, sufficient evidence exists to justify proceeding with a removal action at Site UXO 02.

Because a planning period of six months was available to the DON before the needed initiation of on-site removal action activities at Site UXO 02, this EE/CA was developed to meet the requirements of Section §300.415(b)(4) of the NCP. While the removal actions evaluated within this EE/CA are considered non-time critical, if it is determined that an immediate response is necessary to address a specific explosive hazard, an appropriate emergency response may be necessary in accordance with the EPA's *Munitions Response Guidelines* (USEPA, 2010). These guidelines provide considerable deference to explosives or munitions emergency response specialists (e.g., explosive ordnance disposal and other UXO-qualified personnel) with regard to explosives safety considerations. An explosives or munitions emergency response generally should be used when an immediate or imminent and substantial threat to public health or the environment is present and may require immediate and expeditious action to eliminate the threat (USEPA, 2010). The Military Munitions Rule (MMR), 40 CFR 266.200 et seq., provides that explosives or munitions emergency response specialists base any determination of the need for an emergency action upon an actual or potential immediate threat to human health, including safety, or the environment, including property. In addition, the MMR assigns to the explosives or

munitions emergency response specialists the responsibility for making this determination, which will ordinarily be a judgment call by the specialist. The MMR exempts explosives or munitions emergency or time critical responses from the RCRA Subtitle C hazardous waste regulatory requirements, including notifications, except that a record of the response must be kept.

Although unlikely, MPPEH may be corroded, encased, or otherwise degraded, making it difficult or impossible to determine their actual condition and the explosives hazard they present. When such uncertainty is involved, response personnel ordinarily assume the item presents a potentially acute explosive hazard. Deference should be given to this judgment, but the explosive emergency response specialist should be able to describe and document afterwards the basis for this determination. Explosives or munitions emergency responses are normally appropriate for discrete emergency situations, and may be appropriate during planned munitions responses (USEPA, 2010).

The DON will select the removal action alternative to be implemented after fulfilling all community involvement requirements in accordance with Section §300.415(n) of the NCP. Community involvement requirements for NTCRAs include making the EE/CA available for public review and comment for a period of 30 days. An announcement of the 30-day public comment period on the EE/CA shall be provided in a local newspaper as required. Written responses to significant comments will be summarized in an Action Memorandum (AM) and will be included in the NASWF Administrative Record.

The selected removal action will be funded by the DON. The Navy/Marine Corps Installation Restoration Program Manual does not limit the cost or duration of the removal action. However, cost-effectiveness is a criterion for the evaluation of removal action alternatives.

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2.0 CONCEPTUAL SITE MODEL

This section presents a current conceptual site model (CSM) for Site UXO 02, NASWF. This CSM is based on findings from the PA (Resolution Consultants, 2014a) and is modeled after the suggested formats presented in *Conceptual Site Models* (U.S. Army Corps of Engineers [USACE], 2012) and *Remedial Alternatives Analysis (RAA) Guidance* (DON, 2012) with revisions and additions to accommodate the unique aspects of this MRS.

2.1 Installation and Site Setting

The following subsections provide a general description of the location and background information relating to NASWF and Site UXO 02.

2.1.1 Site Location and Description

NASWF is located in the northwest portion of the Florida Panhandle within Santa Rosa County, approximately six miles north of Milton, Florida and approximately 25 miles northeast of Pensacola, Florida (Figure 2-1). NASWF was constructed in the early 1940s as a naval aviation training facility and occupies approximately 3,842 acres. The station is divided into two primary air fields (North Field and South Field) with installation operations and administrative support facilities, and military quarters within a common industrial area located between the two air fields. The station's mission has been to train student naval aviators in the use of basic aircraft instruments, formation and tactical phases of fixed-wing and propeller-driven aircraft, and in the basic and advanced portions of helicopter training. Currently, the North Field is used for fixed-wing aircraft training. The South Field is primarily used for helicopter training, but is also used for fixed-wing aircraft training, as needed.

Site UXO 02 is located at the north tip of Taxiway Y within the South Field at NASWF (Figure 2-1). Site UXO 02 occupies approximately 1 acre within a well-maintained grassy area that adjoins Taxiway Y along its southwestern boundary. The predominant feature of Site UXO 02 is a shallow, engineered storm water drainage ditch that is approximately 175 feet long, ranges in width from 5 to 15 feet, and occupies an area of approximately 2,000 square feet (Figure 2-2). The drainage ditch is oriented southwest (upgradient) to northeast (downgradient) and collects storm water runoff from a portion of Taxiway Y and surrounding areas, where it is discharged radially as sheet flow to a topographically lower area away from the airfield (Figure 2-2).

The upgradient portion of the drainage ditch, adjoining Taxiway Y, is concrete-lined and includes a large iron diversion grate, concrete headwall and deteriorated concrete apron approximately 15 feet wide. The remaining downgradient length of the drainage ditch (approximately 160 feet

long) is unlined with nearly vertical sidewalls. Influent pipes or culverts are not present in the drainage ditch.

2.1.2 Site Background

Historically, MPPEH has been observed at Site UXO 02, which has required Explosives or Munitions Emergency Response actions to be taken. MPPEH consisting of AN-M57A2 – Signal Illumination Aircraft Double Star Flare casings were removed from the storm water drainage ditch located within Site UXO 02 on three separate occasions: 4 March 2009 – 19 flare casings were removed (per Richard Ballinger, NASWF Explosive Site Officer [ESO]); 24 April 2012 – 47 flare casings removed; and 27 June 2012 – 10 flare casings were removed. During these response actions, observed MPPEH were removed from a downgradient portion of the Site UXO 02 drainage ditch by the Eglin Air Force Base Explosive Ordnance Disposal (EOD) detachment, were determined to be free of explosives, and were turned over to the NASWF ESO for disposal coordination. A total of 76 spent flare casings or material documented as safe (MDAS) has been reportedly removed from Site UXO 02 since 2009. To date, no Munitions and Explosives of Concern (MEC; e.g., unspent or dud flares) have been observed at Site UXO 02 (Resolution Consultants, 2013).

Site UXO 02 or adjoining Taxiway Y was likely a historic training area used for the instruction of military personnel on the use of AN-M57A2 – Signal Illumination Aircraft Double Star Flares. This training may have served two purposes: 1) to train personnel on how to use a flare gun, and 2) to signal pilots that their aircraft landing gear is up while approaching the runway (Resolution Consultants, 2013). Upon completion of flare training exercises, flare casings and potentially unspent and dud flares would have been collected for disposal; however, actual disposal methods are unknown. According to the NASWF ESO, the flare casings may have been buried in freshly dug holes by military personnel upon completion of training activities (Resolution Consultants, 2014a). Although speculative, flare training activities may have occurred as recently as the 1990s at NASWF based on the *Memorandum: Review of Small Arms Training* (NASWF, 1993) and the *NASWF Training Attendance Roster* (NASWF, 1995).

2.2 Site Physical Profile

The following subsections provide a general description of climate and meteorology, surface topography, geology, hydrology, hydrogeology, and historical and cultural resources information relating to NASWF and Site UXO 02.

2.2.1 Climate and Meteorology

The climate of northwest Florida is classified as subtropical marine and is characterized by mild winters and hot, humid, breezy summers. The Milton area has an average temperature of

66.8 degrees Fahrenheit (ºF) and receives an average of 66.5 inches of rainfall per year (NASWF, 2013).

Rainfall may be influenced by three types of weather disturbances that result in unpredictable weather patterns: cold fronts, thunderstorms, and hurricanes. Hurricane season extends from June through November, and the frequency of hurricanes in the Gulf of Mexico is greatest during August through October. A hurricane strikes the Florida Panhandle once every 17 years, on average, and fringe effects are experienced once every 5 years. In 1995, the western Florida Panhandle was directly affected by two major hurricanes within two months of each other, Hurricane Erin on 5 August 1995 and Hurricane Opal on 5 October 1995. The area was decimated by Category 3 Hurricane Ivan on 16 September 2004, and was hit the next year by Category 3 Hurricane Dennis on 10 July 2005 (NASWF, 2013).

2.2.2 Surface Topography

NASWF is relatively flat with elevations generally ranging from 150 to 190 feet above mean sea level (msl). The station is bounded by lower-lying Clear Creek to the west and Big Coldwater Creek to the east. The western perimeter of NASWF slopes to an elevation of approximately 30 feet above msl (Tetra Tech, 2012). NASWF is drained by an extensive stormwater drainage system (Tetra Tech, 2011).

Surface topography at Site UXO 02 generally slopes gently toward the northeast away from Taxiway Y at elevations ranging from 167 to 171 feet above msl (Resolution Consultants, 2013). The majority of the area is comprised of well-maintained grasses that surround the predominant topographic feature: a stormwater drainage ditch. The shallow drainage ditch is approximately 175 feet long, ranges from approximately 5 to 15 feet wide, and is oriented southwest (upgradient) to northeast (downgradient; Figure 2-3). The ditch is comprised of an upgradient concrete-lined section adjoining Taxiway Y, followed by an unlined section that discharges radially at its northeastern end.

2.2.3 Geology

NASWF lies in the Western Highland subdivision of the Coastal Plain Province (Tetra Tech, 2012). The Coastal Plain is comprised primarily of beds of sand, silt, limestone, and clay that dip gently seaward. The Western Highland consists of a southward-sloping plateau with a surface that has been incised by numerous streams (Marsh, 1966).

The lithology consists of lightly colored (white to tan to orange to red-orange) poorly graded sands (fine- to medium-grained) with interstitial silts and clays. These sand and clay beds are typically not extensive and are interbedded with silt and clay layers. These sediments are

associated with limonite-cemented sandstone found at and near the surface, at depth in several borings, and immediately above the Pensacola Clay. The oxidized color scheme continues down to the top of the Pensacola Clay. The lithology and stratification of the material encountered at NASWF are consistent with the description of the Citronelle Formation (Marsh, 1966; Scott, 1992; ABB-Environmental Services, Inc. [ABB-ES], 1992; ABB-ES, 1994).

The sedimentary patterns described above are typically associated with a fluvial or riverine depositional environment. As such, sand or clay beds may be continuous over several or tens of acres. Due to the nature of the depositional processes, lack of correlation over even short distances indicates these beds were likely frequently truncated by post-deposition erosion during penecontemporaneous fluvial processes. Clay layers within the Citronelle Formation have been extensive enough to confidently map over small areas but frequently are discontinuous, not located at consistent depths, and cannot be confidently traced between borings. Therefore, they are not believed to be significant or massive subsurface features (ABB-ES, 1994).

The Citronelle Formation is described by Marsh (1966) as lying unconformably over the lower member of the Pensacola Clay. At NASWF, a massive layer of dark to light gray clay, typically silty, with very fine to coarse micaceous quartz sand is found across the installation at a depth of approximately 75 feet below msl. Associated carbonized wood and plants (leaves and reeds) are present throughout the formation as well as intermittent layers with abundant mollusk shells. These characteristics are consistent with Marsh's description (1966) of the lower member of the Pensacola Clay.

Based on soil lithology provided on boring log WHF-33-5, presented in the *Draft Remedial Investigation Report for Site 40, Basewide Groundwater* (Tetra Tech, 2012), located approximately 1,500 feet west of Site UXO 02, the Citronelle Formation is described as silt and sand occurring from ground surface to approximately 130 feet below ground surface (bgs). Within this formation, clays are present from 62 to 70 feet bgs and interbedded silt/sands and clays are present from 70 to 81 feet bgs and 110 to 117 feet bgs. The clay layers also occur at similar elevations based on boring log WHF-9-2 for Site 9 provided in the *Final Remedial Investigation and Feasibility Study Technical Memorandum* (ABB-ES, 1992), located approximately 1,200 feet east of Site UXO 02.

2.2.4 Hydrology

Surface water at NASWF is dispersed from a topographic high located along the eastern edge of the industrial area (Tetra Tech, 2012). The surface water drainage system on the western portion of the facility conveys the vast majority of surface water originating from NASWF to Clear Creek (Tetra Tech, 2012). On the eastern side of the divide, surface water is conveyed to the east as sheet flow (Tetra Tech, 2012).

Surface water from a portion of Taxiway Y and the relatively flat, surrounding grassy area is collected in the drainage ditch. Influent pipes or culverts are not present at the drainage ditch. According to the PA Report (Resolution Consultants, 2013), approximately 0.5 to 1 foot of ponded surface water was present in the unlined section of the ditch during the site reconnaissance. Based on surface topography, evidence of sheet flow, and presumed low-permeability clay, water collected in the drainage ditch slowly percolates through the drainage ditch soil or discharges radially to a downgradient grassy area. Surface water from the drainage ditch may reach a heavily wooded area approximately 150 feet northeast from the downgradient end of the drainage ditch.

2.2.5 Hydrogeology

The surficial water-bearing aquifer within Santa Rosa County is primarily comprised of sand, gravel, silt, and clay and is approximately 200 to 350 feet thick in the vicinity of NASWF. Oftentimes, the clay layers interbedded within the sand-and-gravel aquifer act as semi-confining units and create localized artesian-like conditions (Tetra Tech, 2012). The inferred flow direction of groundwater beneath NASWF is oriented towards the southwest, and groundwater discharges to Clear Creek, the floodplain, or other surface water features (ABB-ES, 1998). Based on soil lithology provided on boring log WHF-33-5, presented in the *Draft Remedial Investigation Report for Site 40, Basewide Groundwater* (Tetra Tech, 2012), the depth to groundwater at Site UXO 02 is estimated to be approximately 110 to 120 feet bgs. Surficial aquifer system characteristics of NASWF are summarized in Table 2-1.

2.2.6 Historical and Cultural Resources

According to the *Draft Final Preliminary Range Assessment Report, Naval Air Station Whiting Field, Florida* (Malcolm Pirnie, 2004), Phase I archeological surveys documented in the Integrated Natural Resources Management Plan (INRMP) did not identify significant archeological areas at NASWF. Other than potentially historic World War II structures located in the industrial area, cultural resources have not been identified at the installation.

2.3 Release Profile

As discussed in Section 2.1.2, Site UXO 02 or adjoining Taxiway Y was likely a historic training area used for the instruction of military personnel on the use of AN-M57A2 – Signal Illumination Aircraft Double Star Flares. Upon completion of flare training exercises, flare casings and potentially unspent and dud flares may have been buried in freshly dug holes by military personnel (Resolution Consultants, 2014a). The following subsections provide a release profile of potential MPPEH and MC anticipated at Site UXO 02.

2.3.1 Nature of Contamination

The nature of potential MPPEH includes unspent or dud AN-M57A2 – Signal Illumination Aircraft Double Star Flares and flare casings. Potential MC associated with the AN-M57A2 includes the composition ingredients of propellant and pyrotechnic charges and post-detonation residues.

2.3.2 Potential Source Areas

The potential source area of MPPEH and MC, if present, is anticipated to be near the headwall of the drainage ditch adjoining Taxiway Y, where flare casings have been recovered.

2.3.3 Types of MPPEH

To date, types of MPPEH associated with Site UXO 02 are limited to the AN-M57A2 – Signal Illumination Aircraft Double Star Flare. To date, only flare casings have been found which were classified as munitions debris (MD). The presence of MEC has not been confirmed.

2.3.4 MPPEH Density and Distribution

MPPEH, if present, is likely confined to the area near the headwall of the drainage ditch adjoining Taxiway Y, but could be present at areas downgradient of the ditch based on the locations of collected flare casings. Since no geophysical surveys or clearances have been conducted, the density and distribution of MPPEH are unknown.

2.3.5 MPPEH Depth

MPPEH, if present, is likely confined to shallow soil (less than 1.5 feet bgs) based on the potential disposal scenario described in Section 2.1.2 and the history of recovered flare casings from the ground surface. Intrusive investigations have not occurred; therefore, the depth of potential MPPEH has not been confirmed.

2.3.6 MC Density and Distribution

MC, if present, are likely confined to surface soil (less than 2 feet bgs) and potentially surface water. Presently, media associated with Site UXO 02 have not been sampled and analyzed for the presence of MC; therefore, the density and distribution of MC are unknown.

2.3.7 Potential MC

Based on AN-M57A2 – Signal Illumination Aircraft Double Star Flare propellant and pyrotechnic charge composition (metals [fuel source] and perchlorate [pyrotechnic oxygen source]) and probable post-detonation residues, chemicals associated with these MC sources include hexachlorobenzene, perchlorate, strontium, sulfide, nitrate, and nitrite (Resolution Consultants, 2014a).

2.3.8 Fate and Transport Mechanisms and Migration Pathways

The primary transport mechanism associated with MPPEH mobility is surface water runoff. Surface water may transport MPPEH to downgradient locations by sheet flow or may cover MPPEH with soil deposited from sheet flow. Preferential migration pathways at the ground surface include the drainage ditch and the radial dispersion area downgradient of the drainage ditch.

Potential transport mechanisms for MC include bio-uptake, air transport (dust and volatilization), surface water runoff, leaching to groundwater, and/or groundwater migration. Of these transport mechanisms, surface water transport is considered the most significant transport mechanism at Site UXO 02. Surface water runoff has the potential to collect and deposit dissolved phase MC or adsorbed MC on soil particles while moving to areas of lower elevation as sheet flow. Migration of MC, if present, beyond the drainage ditch to grassy areas, is possible based on the presence of flare casings at downgradient locations. Leaching to groundwater and groundwater migration transport mechanisms are potentially viable, but are not considered significant transport mechanisms for MC due to the thickness of the vadose zone (110 feet), and the low-permeability of the surface soils (based on evidence of sheet flow and standing water in the drainage ditch) and subsurface soil, which will likely inhibit the vertical mobility of MC. Bio-uptake and air transport mechanisms are expected to be insignificant transport mechanisms for MC (Resolution Consultants, 2013).

2.4 Land Use and Exposure Profile

The following subsections provide a general description of the current and potential future land use, accessibility, and potential human receptors and exposure pathways information relating to NASWF and Site UXO 02.

2.4.1 Current and Potential Future Land Use

NASWF is currently used for fixed-wing aircraft training and helicopter training and will likely remain as a training facility in the future. The majority of land area at NASWF is developed and used to support the installation's training mission. These areas include the North Field, South Field, runway buffer/clear zones, administrative and classroom buildings, and installation housing. Exceptions include undeveloped areas adjacent to Clear Creek (along the southwestern boundary of the installation), the golf course, and scattered forest stands along the periphery of the installation. Land surrounding NASWF consists primarily of agricultural land to the northwest, residential and forested areas to the south and southwest, and forests along the remaining boundaries (Tetra Tech, 2011).

Three potable water wells provide water for NASWF and are located between the North and South Fields oriented along USS Saratoga Street (CH2MHILL, 2012). The nearest potable well is located approximately 1,280 feet west (CH2MHILL, 2012) and hydraulically cross-gradient of Site UXO 02. The remaining wells are located northwest and hydraulically upgradient of Site UXO 02. Due to historic groundwater contamination, groundwater is treated with a granular activated carbon system operated and maintained by the Navy (Tetra Tech, 2012).

Site UXO 02 is located adjacent to the active flight line, at the north end of Taxiway Y of the South Field, within the industrial area of NASWF. The South Field is used for aircraft operations and training student aviators. There are no known plans to change the land use in the vicinity of Site UXO 02 from "industrial".

The Santa Rosa Aviation Commerce Park is located approximately 1,500 feet northeast of the South Field. The Santa Rosa Aviation Commerce Park is an approximately 237-acre parcel owned by Santa Rosa County and is slated for development as an aviation maintenance facility. Santa Rosa County has made arrangements with the Navy to use the South Field after the Aviation Commerce Park is built. As part of that development, a taxiway would be constructed to connect the Aviation Commerce Park to the South Field. Projected future land use is cited in *Land Acquisition & Other Planning Efforts Around NAS Whiting Field* (NASWF, 2011).

A summary of the current and potential future land use of Site UXO 02 and the land use of areas surrounding Site UXO 02 is provided in Table 2-2.

2.4.2 Accessibility

NASWF is inaccessible to the general public. Security Forces control entry onto the installation through identification checks and vehicle inspections.

Site UXO 02 lies within the restricted South Field Airfield Management Area that is circumscribed by an 8 to 10-foot-tall chain-link fence to deter unauthorized access. Access to the restricted Airfield Management Area requires approval from the airfield manager and Security Forces. In addition, individuals seeking access to the restricted area must possess a flight line driver's license or be accompanied by Department of Defense (DoD) personnel with a flight line driver's license prior to accessing Site UXO 02 by vehicle. If individuals are escorted by DoD personnel, individuals must remain with their escort while in the restricted area of NASWF. Security Forces routinely patrol the installation and the Airfield Management Areas of the installation.

2.4.3 Potential Human Receptors and Exposure Pathways

Potential human receptors and exposure pathways were identified based on the current and potential future land use. Navy public works personnel or subcontractors are the primary human receptors that could come into contact with MPPEH and/or MC during maintenance activities (Resolution Consultants, 2013).

Potentially complete exposure pathways for MPPEH include:

- **Current and future industrial/occupational workers (grounds and utility maintenance) and future construction/utility workers:** Direct contact of MPPEH with receptors performing grounds maintenance or conducting intrusive activities within Site UXO 02.

Potentially complete exposure pathways for MC include:

- **Current and future industrial/occupational workers (grounds and utility maintenance workers):** Incidental ingestion, dermal contact, and inhalation of soil from the 0 to 2-foot bgs interval and incidental ingestion and dermal contact of storm water with receptors performing grounds and utility maintenance within Site UXO 02.

- **Future construction/utility workers:** Incidental ingestion, dermal contact, and inhalation of soil from the 0 to 10-foot bgs interval and incidental ingestion and dermal contact of surface water with receptors conducting intrusive activities within Site UXO 02.

2.5 Ecological Profile

The following subsections provide a general description of the biological resources and federal and state special status species information relating to NASWF and Site UXO 02.

2.5.1 Biological Resources

As described in the *Draft Final Preliminary Range Assessment Report, Naval Air Station Whiting Field, Florida* (Malcolm Pirnie, 2004), ecological habitats at NASWF range from disturbed, heavily traveled areas to native communities that are re-establishing themselves along the installation perimeter. The dominant habitat types include pine forest, old field, maintained field, wetland, and aquatic habitat. Jurisdictional wetland boundaries have not been delineated for NASWF; however, National Wetlands Inventory maps (which indicate jurisdictional wetlands) show approximately 48 acres of wetlands at the installation. These wetland areas are classified as palustrine, which includes non-tidal wetlands, and consist primarily of the forested wetlands associated with Clear Creek. According to information included in the INRMP (NASWF, 2013),

NASWF is not located near Essential Fish Habitat, coral reef systems, endemic mangroves, or sea grass ecosystems. Additionally, there are no areas designated as critical habitat for threatened or endangered species.

Site UXO 02 lies within Operational Protected Area 1 (NASWF, 2013). The management focus objectives of Operational Protected Area 1 are land management and forestry (NASWF, 2013). The areas at and in the immediate vicinity of Site UXO 02 include airfield pavement and grass (i.e., "clear zone") and forests (i.e., "pine plantation"; NASWF, 2013). The "clear zone" area does not provide an attractive habitat for wildlife because much of the area is paved, grasses are regularly maintained by NASWF, and the zone lies within the Bird/Animal Aircraft Strike Hazard area. The pine plantation area provides a habitat with limited diversity and lies within the Bird/Animal Aircraft Strike Hazard area.

2.5.2 Federal and State Special Status Species

According to information in the INRMP (NASWF, 2013), rare, threatened, and endangered species have been documented at NASWF. These species were identified during four surveys conducted since 1990. The federal and state-listed plant and animal species are identified in Table 2-3 and described below.

Table 2-3: Summary of Known or Potential Special Status Species

Year Species was Observed				Ecological Receptors	Species	Preferred Habitat	Federal Status	State of Florida Status
1990	1996	2006	2009					
X	X	X	X	Plant	Spoon-Leaved Sundew	Baygall, Beaver Pond, Floodplain Marsh	-	Threatened
X	X			Plant	Florida Anise	Baygall, Floodplain Marsh	-	Rare
	X	X	X	Plant	Coville's Rush	Floodplain Marsh	-	Endangered
X	X	X	X	Plant	Primrose-Flowered Butterwort	Blackwater River Marsh, Seepage Stream	-	Endangered
	X		X	Plant	Rose Pogonia	Wet Prairie	-	Threatened
X	X	X	X	Plant	White-Top Pitcher Plant	Baygall	-	Threatened
-	X	-	X	Reptile	Gopher Tortoise	Clear Zone, Pine Plantation, Ruderal, Sandhill, Xeric Upland	Candidate	Threatened
-	X	-	X	Reptile	Eastern Diamondback Rattlesnake	Clear Zone, Pine Plantation	Under Review for Listing	Not listed, but of interest to NASWF Complex Natural Resources Managers
-	X	-	X	Bird	Henslow's Sparrow	Clear Zone	Not listed, but of interest to NASWF Complex Natural Resources Managers	Not listed, but of interest to NASWF Complex Natural Resources Managers
-	X	-		Bird	Snowy Egret	Stormwater Retention Ponds	Not listed, but of interest to NASWF Complex Natural Resources Managers	Species of Special Concern
-	X	-		Bird	Great Egret	Stormwater Retention Ponds	Not listed, but of interest to NASWF Complex Natural Resources Managers	Not listed, but of interest to NASWF Complex Natural Resources Managers
-	X	-		Bird	Little Blue Heron	Stormwater Retention Ponds	Not listed, but of interest to NASWF Complex Natural Resources Managers	Species of Special Concern

Notes:
The 2013 INRMP cites the following sources for the surveys: Environmental Protection Systems 1991, Florida Natural Areas Inventory (FNAI) 1997, FNAI 2007, and FNAI 2010.
"X" = Species was observed.
"-" = Not applicable or survey was not conducted.

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Basewide surveys of rare plants (e.g., state-listed rare, threatened, and endangered plants) were conducted in 1990, 1996-1997, 2006, and 2009-2010. No federally listed plant species were found, but six state-listed rare, threatened, or endangered plant species have been identified between 1990 and 2010. These plant species and associated status include the spoon-leaved sundew (Drosera intermedia), threatened; Florida anise (*Illicium floridanum*), rare; Coville's rush (Juncus gymnocarpus), endangered; primrose-flowered butterwort (Pinguicula primulifora), endangered; rose pogonia (Pogonia ophioglossoides), threatened; and the white-top pitcher plant (Sarracenia leucophylla), endangered. Plant species that have not been observed since the 1990s only include the Florida anise; however, the habitat required by this "missing" species is still present at NASWF, so there remains potential for this species to be identified in future surveys.

Basewide rare vertebrate surveys were conducted in 1996-1997 and 2009-2010. Under the federal status, two reptiles and four birds were identified as either a candidate for listing, under review for listing, or "of interest to NASWF". These animals and associated federal status include the gopher tortoise (*Gopherus polyphemus*), candidate for listing; eastern diamondback rattlesnake (*Crotalus adamanteus*), under review for listing; Henslow's sparrow (*Ammodrammus henslowii*), of interest to NASWF; great egret (*Casmerodius albus*), of interest to NASWF; little blue heron (*Egretta caerulea*), of interest to NASWF; and the snowy egret (*Egretta thula*), of interest to NASWF. Under the State of Florida status, the gopher tortoise is threatened, the little blue heron and the snowy egret are considered Species of Special Concern, and the eastern diamond rattlesnake, Henslow's sparrow, and the great egret are considered of interest to NASWF. Animal species that have not been observed since the 1990s include the great egret, little blue heron, and the snowy egret; however, the habitat required by these "missing" species is still present at NASWF, so there remains potential for these species to be identified in future surveys.

According to the INRMP, rare species observed within Operational Protected Area 1 (includes Site UXO 02) only include the Eastern diamondback rattlesnake, gopher tortoise, and Henslow's sparrow (NASWF, 2013).

2.6 Risk Profile

The following subsections provide a general description of the human health and ecological risk profiles relating to Site UXO 02.

2.6.1 Human Health

MPPEH consisting of MEC presents an acute explosive hazard to potential receptors. MC from propellant and pyrotechnic charges and probable post-detonation residues associated with the AN-M57A2 – Signal Illumination Aircraft Double Star Flare may also present human health

exposure risks. Media have not yet been sampled at Site UXO 02 for the presence of MC; therefore, a human health risk assessment has not been conducted.

2.6.2 Ecological

Although no critical habit, endangered species, or threatened species have been identified at the site, confirmation of MEC or MC may trigger an ecological risk evaluation. Potential ecological receptors may include terrestrial birds, small mammals, and/or deer. The composition of propellant and pyrotechnic charges and probable post-detonation residues associated with the AN-M57A2 – Signal Illumination Aircraft Double Star Flare may also present ecological exposure risks. Media have not yet been sampled at Site UXO 02 for the presence of MC; therefore, an ecological risk assessment has not been conducted.

2.7 CSM Overview

The CSM for the Site UXO 02 is summarized in Table 2-4 and presented on Figure 2-4.

3.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVE

Section 3.0 identifies the scope, purpose, and objectives for the potential NTCRA, which may be conducted at Site UXO 02. In addition, the Applicable or Relevant and Appropriate Requirements (ARARs) for the potential NTCRA are identified.

3.1 Statutory Limits on Removal Actions

The NCP (40 CFR §300.415) dictates statutory limits of $2 million and 12 months of USEPA-financed removal actions, with statutory exemptions for emergencies and actions consistent with the removal action to be taken. This removal action will be financed by the Navy rather than being USEPA-financed. The Navy/Marine Corps Installation Restoration Program Manual does not limit the cost or duration of the removal action; however, cost-effectiveness is a recommended criterion for the evaluation of removal action alternatives.

3.2 Scope and Purpose of the Removal Action

MPPEH may potentially be present in the area occupied by Site UXO 02 based on findings presented in the PA Report (Resolution Consultants, 2013). Although only flare casings have been observed and recovered to date (Resolution Consultants, 2013), flare training activities conducted in this area suggest that unspent or dud flares (e.g., MEC) and MC could potentially be present; therefore, a removal action is deemed necessary to minimize risks to current and future receptors.

3.3 Development of Removal Action Objectives

Removal Action Objectives (RAOs) are the established criteria upon which removal action alternatives are identified, selected, and evaluated to achieve the project goals. The general requirements of the NCP are considered in the development of the RAOs. The NCP requires that a selected removal action alternative ensures protection of human health consistent with current and future land uses. Because both MPPEH and MC may be present at Site UXO 02, RAOs were developed to address the potential hazard to human health associated with MPPEH and co-located MC-contaminated soil.

Based on these considerations, the proposed RAOs for Site UXO 02 are:

- Prevent or minimize contact with MPPEH, which poses a potential hazard to NASWF personnel and contractors under current and anticipated future land use scenarios.
- Prevent or minimize the migration of MPPEH and co-located MC-contaminated soil, which poses a potential hazard to the environment.

Based on the outcome of the removal action or a subsequent investigation, a follow-on remedial action will be conducted if site related hazardous substances, pollutants, or contaminants, including MC, are discovered and remain in site media at Site UXO 02.

3.4 Identification of Applicable or Relevant and Appropriate Requirements

The lead agency has the primary responsibility for identifying ARARs. The NCP requires that removal actions must attain ARARs when practicable and while considering the circumstances of the situation (40 CFR §300.415(j)). Identified ARARs for Site UXO 02 are presented in Table 3-1.

ARAR evaluation is a two-step process: (1) determination of applicability, and (2) if not applicable, determination of relevance and appropriateness. Applicable requirements are those requirements specific to the conditions at the Site UXO 02 and the surrounding airfield that satisfy all jurisdiction prerequisites of the law or requirement. Relevant and appropriate requirements are those that do not have jurisdiction authority over the particular circumstances at the Site UXO 02, but are meant to address similar situations and are thus suitable for use at this site. Only requirements that are both relevant and appropriate are considered ARARs. The final determination of federal ARARs will be made when the Navy issues the AM.

In accordance with the NCP (40 CFR §300.400(g)(2)), the following criteria will be used to determine what requirements of environmental laws are relevant and appropriate:

- Purpose of the requirement in relation to the purpose of CERCLA;
- Medium or media regulated or affected by the requirement;
- Substance(s) regulated by the requirement;
- Actions or activities regulated by the requirement;
- Variances, waivers, or exemptions of the requirement;
- Type of place regulated and the type of place affected by the release or CERCLA action;
- Type and size of the facility or structure regulated by the requirement or affected by the release; and
- Consideration of the use or potential use of affected resources in the requirement.

Under CERCLA, only substantive provisions of federal environmental or more stringent state environment or facility sitings (promulgated) requirements are considered to be ARARs. Procedural or administrative requirements are not considered ARARs. Moreover, CERCLA Section 121(e)(1) (42 United States Code [USC], Section 9621(e)(1)) provides that "No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely on-site, where such action is selected and carried out in compliance with this section." This

exemption applies to all administrative requirements, but substantive requirements of the permit(s) must still be attained.

ARARs are divided into three classifications pursuant to USEPA guidance: action-specific, chemical-specific, and location-specific. Federal and Florida ARARs potentially applicable to Site UXO 02 are summarized in Table 3-1.

- *Action-specific ARARs* usually are restrictions on the conduct of certain activities or the operation of certain technologies at a particular site. Regulations that dictate the design, construction, and operating characteristics of incinerators, air stripping units, or a landfill construction are examples of action-specific ARARs.

- *Chemical-specific ARARs* usually are either health- or risk-based numerical values or methodologies that establish the acceptable amount or concentration of a chemical that may remain in or be discharged to the environment. Where more than one requirement addressing a contaminant is determined to be an ARAR, the requirement that should be used is the one that is the most stringent. Note, however, that in some cases, a less stringent requirement is better suited to the circumstances at a site, such that a more stringent requirement will not be deemed relevant and appropriate under the circumstances.

- *Location-specific ARARs* generally restrict certain activities or limit concentrations of hazardous substances solely because of geographical or land use concerns. Requirements addressing wetlands, historic places, floodplains, or sensitive ecosystems and habitats are potential location-specific ARARs.

3.5 Determination of Removal Action Schedule

Because a planning period of six months was available to the DON between the determination that a removal action is appropriate and the initiation of on-site removal action activities at Site UXO 02, this EE/CA was developed to meet the requirements of Section §300.415(b)(4) of the NCP. Consequently, removal actions evaluated within this EE/CA are considered non-time critical.

The DON will select the removal action alternative to be implemented after fulfilling all community involvement requirements in accordance with Section §300.415(n) of the NCP. Community involvement requirements for removal actions include making the EE/CA available for public review and comment for a period of 30 days. An announcement of the 30-day public comment period on the EE/CA shall be provided in a local newspaper as required. Written responses to significant

comments shall be summarized in an AM and will be included in the NASWF Administrative Record.

Following the finalization of the AM, the total project period is anticipated to span an estimated 10 months, from the start of the preparation of the planning documents through completion of the NTCRA after action reporting. This is an estimated schedule for project completion. Should critical milestones not be met, the total project timeframe would also be extended. Critical milestone periods related to the removal action schedule are summarized below:

- Preparation of planning documents – four months.
- Performance of field removal action activities – one month.
- Preparation of after action report – four months.

4.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

The purpose of this section is to identify, screen, develop, and evaluate removal action alternatives that may be applicable for achieving the RAOs established in Section 3.0 of this EE/CA.

4.1 Identification of Potentially Applicable Remediation Technologies

This section identifies potentially applicable remediation technologies for Site UXO 02 based on site-specific conditions that have been determined to be present. The EE/CA technology identification process focuses only on those technologies that have proven to be effective at similar sites. Potentially Applicable Remedial Technologies evaluated within this EE/CA were pre-screened by the DON in the *Remedial Alternatives Analysis (RAA;* Resolution Consultants, 2014b). The RAA was prepared to streamline the selection of applicable remediation technologies specific to MPPEH and MCs co-located with MPPEH potentially present at Site UXO 02. Remedial technologies presented and evaluated in the RAA include land use controls (LUCs), MEC/MC removal, and capping, as well as treatment and monitoring technologies including soil washing, phytoremediation, thermal desorption, chemical oxidation, biological treatment, and chemical solidification/stabilization.

Based on the RAA pre-screening, capping was not retained as a viable technology because: 1) MPPEH and MCs co-located with MPPEH, if present, would remain as a source of contamination in soil; 2) a cap placed in the drainage ditch would require extensive maintenance for long-term performance; and 3) construction and periodic maintenance of the cap could result in exposure to MPPEH and MC contamination, if present. Additionally, treatment and monitoring technologies (i.e., soil washing, phytoremediation, thermal desorption, chemical oxidation, biological treatment, and chemical solidification/stabilization) were not retained as viable remediation technologies because they would only be applicable to MC in site media and are not viable remediation technologies for MPPEH. As a result, LUCs and MEC/MC removal were determined to be the only viable remediation technologies for Site UXO 02.

4.2 Description of Potential Removal Action Alternatives

Based on the RAA pre-screening analysis of the applicable remediation technologies, the three potential removal action alternatives identified for Site UXO 02 included:

- Alternative 1 – No Action
- Alternative 2 – LUCs
- Alternative 3 – MPPEH Clearance and MC Confirmatory Sampling

These alternatives are included in this EE/CA for further evaluation to determine the recommended alternative that when implemented, will satisfy the RAOs and ARARs. A description of each of these alternatives is provided in the following subsections.

4.2.1 Alternative 1 – No Action

The No Action alternative serves as a baseline against which all other developed alternatives can be compared. The No Action alternative consists of no measures being taken to limit or prevent contact with MPPEH and MC in soil at Site UXO 02. No administrative or engineering controls or actions to reduce the toxicity, mobility, or volume of MC would occur under this alternative.

4.2.2 Alternative 2 – LUCs

LUCs would be implemented to limit/prevent human contact with MPPEH and MC, if present, within Site UXO 02. LUCs include physical, legal, and/or administrative mechanisms that restrict the use of, or limit access to, a property to prevent exposure as described below:

- **Physical mechanisms** – Physical mechanisms would include the installation of a fence as an engineering control to limit/prevent potential receptors from coming into contact with MPPEH and MC, if present. A 10-foot high chain link fence would be installed around the boundary of Site UXO 02, and warning signs indicating the presence of buried munitions/explosive hazards would be placed on the fence every 100 linear feet (Figure 4-1). Intrusive operations would be required during fence installation, which will require UXO-qualified personnel to perform MEC avoidance. Solicitation of input from Airfield Management would be required prior to erecting a fence near Taxiway Y.

- **Legal mechanisms** – Legal mechanisms would include land use controls preventing excavation, removal, and transportation of soil unless all applicable regulations and standards are met, prohibiting the use of the site for residential and industrial land use, and placing additional requirements on any land sale/transfer. In the case of any title transfer, the deed would have to have covenants describing the residual munitions and explosives of concern/contamination and specifying necessary use restrictions, terms for future oversight and reporting, and for future enforceability by the Navy, Florida Department of Environmental Protection (FDEP), and USEPA.

- **Administrative mechanisms** – Administrative mechanisms would include awareness training for personnel who may work on the site and the establishment of standard operating procedures (SOPs) and task hazard analyses (THAs) that provide safety protocols for grounds and utility maintenance workers to follow when working at

Site UXO 02. Administrative mechanisms would also include updating internal Navy databases that identify Site UXO 02 as a restricted use area.

Under this alternative, LUCs would remain in effect until MPPEH and MC no longer pose a hazard to current and future receptors (i.e., the site qualifies for unlimited use/unlimited exposure [UU/UE]). The site would be evaluated with periodic inspections and Five-Year Reviews to ensure that LUCs were successfully implemented and maintained and to identify if changes to site conditions may compromise the effectiveness of LUCs.

4.2.3 Alternative 3 – MPPEH Clearance and MC Confirmatory Sampling

The MPPEH Clearance and MC Confirmatory Sampling alternative includes the physical removal (e.g., excavation using hand tools or small excavator) of MPPEH within the site boundary and soil sampling and removal for MCs co-located with MPPEH, as required. Ditch water removal, removal of the concrete-lined section of the drainage ditch, establishment of a clearance grid, removal action, soil sampling and removal, treatment of MEC and disposal of MD and soil investigation-derived waste (IDW), land surveying, and site restoration are chronologically listed and are the anticipated activities to be performed as part of a NTCRA. The removal areas, clearance grids, and clearance areas described in the following bullets are shown on Figure 4-2. As part of this alternative, a sampling and analysis plan that covers soil sampling tasks where there is no explosive risk will be prepared and submitted to the USEPA for review, comment, and approval with concurrence by FDEP.

- **Ditch "Dewatering" Water Removal.** Standing water within the Site UXO 02 drainage ditch would be removed, if necessary, using a pump system, and discharged to an area immediately downgradient of the drainage ditch which lies within the same stormwater management system. The amount of water to be removed is anticipated to be less than 1,000 gallons due to the dimensions of the drainage ditch and the typical standing water depth in the ditch.

- **Concrete Removal.** The concrete-lined section of the drainage ditch would be demolished and removed using heavy equipment. The soil underlying this area is a suspected potential source area of MPPEH.

- **Clearance Grid Establishment.** MPPEH clearance grid cells no larger than 10,000 square feet (100 feet x 100 feet) would be established across the site (includes the drainage ditch). The corners of each clearance grid cell would be staked and marked.

- **Removal Action.** A 200-foot, safety exclusion zone (EZ) would be established to exceed the hazardous fragmentation distance associated with an unspent flare. For safety purposes, roadways and runways/taxiways/airspace within the EZ would be closed to non-essential personnel/vehicles/aircraft during intrusive/processing operations, which would be coordinated with NASWF.

  A UXO clearance team would conduct an MPPEH clearance within each grid cell (including the drainage ditch) using analog geophysical mapping (AGM) survey techniques. The UXO clearance team would conduct AGM operations utilizing handheld all-metal detectors (Whites XLT, effective penetration detection depth of 18 inches). Positive anomaly detections would be flagged, investigated, and subsequently removed.

  Recovered MPPEH would be inspected, categorized, and cataloged. Recovered flare casings, if found to be free of explosives, will be categorized as MD, whereas recovered unspent and dud flares will be categorized as MEC. If flares or flare casings are recovered, the bottom six inches of soil at the base of anomaly investigation areas may be removed prior to soil sampling based on visual observation of soil discoloration. A magnetometer sweep would be performed at the base of anomaly investigation areas to verify that deeper anomalies are not present. Deeper anomalies, if present within an anomaly investigation area, would be removed up to a depth of 4 feet bgs. MD and other recovered non-munitions related debris will be segregated and consolidated in drums for recycling/disposal.

  The Subpart M RCRA-based MMR (40 CFR 266.200, et seq.) exempts an explosives or munitions emergency from the RCRA Subtitle C hazardous waste regulatory requirements. The response activity would be subject to any applicable RCRA Subtitle C hazardous waste regulations if the material meets a listing description (see 40 CFR part 261, subpart D) or exhibits any of the characteristics of ignitability, corrosivity, reactivity, or toxicity under the criteria of 40 CFR parts 261.21, 261.22, 261.23, or 261.24. However, if the known or suspected presence of military munitions, or other explosive material or explosive device, as determined by an explosive or munitions emergency response specialist, would present an immediate threat to human health, public safety, property or the environment, the management of such material would not be subject to the RCRA Subtitle C management standards and a RCRA permit would not be required by 40 CFR 264.1(g)(8).

- **Soil Sampling and Removal.** Discrete soil samples would only be collected from the base of removal areas where flares or flare casings were recovered to determine if MC are

present at levels above applicable screening criteria. Samples would only be analyzed for the MC identified in Section 2.3.7. Analytical data would be screened against the more conservative values of current USEPA Residential Regional Screening Levels and FDEP residential Soil Cleanup Target Levels and would also be screened against background levels for metals. If chemicals are present in soil at concentrations that exceed the screening criteria and background levels, the soil would be removed and additional samples will be collected as necessary. If UU/UE cannot be achieved, industrial cleanup levels may be used, and LUCs as described in Alternative 2 will be applied.

- **Treatment of MEC and Disposal of MD and Soil IDW.** The MMR exempts an explosives or munitions emergency from the RCRA Subtitle C hazardous waste regulatory requirements. Recovered MEC deemed safe to relocate would be consolidated and treated by detonation within the site boundary using donor explosives in accordance with the *Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives (O&E) Sites*, *August 1998* (Terminology Update, March 2000). MEC deemed unsafe to relocate would be blown-in-place (BIP). Consultation with the DON EOD detachment would be necessary if observed MEC differs from the anticipated AN-M57A2 – Signal Illumination Aircraft Double Star Flare or is unidentifiable by the UXO clearance team. A soil sample would be collected from the base of each treatment-by-detonation and BIP location to verify that soil impacted by post-detonation MC residues has not occurred. If chemicals are present in soil at concentrations that exceed the screening criteria and background levels, the soil will be removed and additional samples will be collected as necessary.

  MD generated from treatment of MEC by detonation or BIP methods or from anomaly investigations would be collected and consolidated. MD will be tested/inspected by a UXO Technician before being certified as MDAS. MDAS would then be transported and disposed at an off-site recycling/disposal facility. Soil IDW will be placed in drums, characterized by sampling, and then shipped to an off-site disposal facility. MDAS and soil IDW will be disposed of in accordance with state and federal regulations including the CERCLA Off-Site Rule.

- **Land Surveying.** A land survey would be performed at the end of the removal action to acquire coordinates and elevations for grid nodes, anomaly locations, identified MPPEH, and other pertinent site features. The land survey would be performed by a State of Florida-licensed land surveyor.

- **Site Restoration.** Removal action areas would be restored with excavation spoils and certified clean backfill, as necessary, to re-establish site grade followed by seeding with a NASWF-approved grass and mulching. Additionally, the concrete-lined section of the storm water drainage ditch would also be restored. The level spreader apron area would be properly graded with a gravel base course before placement of erosion control armament (e.g., erosion control block).

Upon completion of the NTCRA, LUCs (as identified in Section 4.2.2) may be required as part of the final remedy. This determination would be made by the project stakeholders based on removal action findings (presence/absence of MEC, quantities of MEC, depth of anomalies, frequency of anomalies, etc).

4.3 Development and Evaluation of Removal Action Alternatives

Each of the three alternatives was evaluated using the effectiveness, implementability, and cost criteria set forth in the NCP and the USEPA guidance for conducting EE/CAs. Each evaluation criterion is described in Table 4-1.

4.3.1 Effectiveness

The effectiveness of a technology refers to its capability of removing the specific items in the volume required, the degree to which the technology achieves the RAOs, and the reliability and performance of the technology over time, including protection of human health and the environment, compliance with ARARs to the extent practical, long-term effectiveness and permanence, reduction in explosive safety hazard, and short-term effectiveness. Table 4-2 provides the detailed analysis of each alternative by the effectiveness criteria.

4.3.2 Implementability

The ease of implementation of a technology refers to the availability of commercial services to support it, the constructability of the technology under site-specific conditions, and the acceptability of the technology to all parties involved (e.g., regulators, public, airfield operations). These criteria include technical feasibility, administrative feasibility, availability of services, support agency acceptance, and community acceptance. Table 4-3 provides the detailed analysis of each alternative by the implementability criteria.

4.3.3 Cost

The expenditures required to complete each alternative were estimated in terms of capital costs, and operations and maintenance (O&M) costs. Capital costs include costs to complete initial removal action activities. O&M costs will be incurred to ensure the integrity of land use controls.

Indirect costs include engineering expenses. By combining the different costs associated with each alternative, a present worth calculation for each alternative can be made for comparison.

The costs estimated for this section are provided to an accuracy of -30 percent to +50 percent. The alternative cost estimates are in 2015 dollars. A summary of the present worth costs for each alternative is provided in Table 4-4 and detailed costing backup for Alternatives 2 and 3 is provided in Appendix A. There are no costs associated with Alternative 1, No Action.

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5.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

A comparative analysis of the three alternatives based on an evaluation of the effectiveness, implementability, and cost criteria is presented in the following subsections. The purpose of this comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another so that key trade-offs can be identified.

5.1 Effectiveness

5.1.1 Protection of Human Health

Alternative 1 is not protective of human health because risks to human health are not reduced and the RAOs are not met.

Alternative 2 would meet the RAOs and would reduce but not eliminate risks to human health through the implementation of LUCs. LUCs will limit direct exposure of MPPEH and MC-contaminated soils, if present, to grounds and utility maintenance workers by erecting a fence around the site, providing training to grounds maintenance workers, developing SOPs and THAs, and updating internal databases that identify land use restrictions for the area occupied by Site UXO 02.

Alternative 3 would meet the RAOs and is the most protective of human health because MPPEH and MC-contaminated soils co-located with MPPEH, if present, would be removed, thereby eliminating any potentially complete exposure pathways. Although not anticipated, LUCs may be required under Alternative 3 depending on the results of the removal action.

5.1.2 Compliance with ARARs and other Criteria, Advisories and Guidance

Alternative 1 would not comply with ARARs and/or other regulatory criteria. Alternatives 2 and 3 would comply with ARARs as listed in Table 3-1.

5.1.3 Short-Term Effectiveness

Alternative 1 provides short-term effectiveness. Because no action will be performed at the site, potential receptors such as a removal action worker will not be present; therefore, a complete exposure pathway will not exist.

Alternative 2 provides some short-term effectiveness because the application of LUCs would be protective; however, intrusive activities associated with the construction of the fence would pose a potential risk to site workers from contact with MPPEH and MC-contaminated soil, if present. Potential short-term risks to site workers would be mitigated through the adherence to well-developed health and safety documents, SOPs, THAs, and MEC avoidance procedures.

Alternative 3 provides some short-term effectiveness. Short-term risks are expected to be similar as Alternative 2 because intrusive activities will be performed as part of the removal action. Potential short-term risks to site workers would be mitigated through the adherence to well-developed health and safety documents, SOPs, THAs, and MEC avoidance procedures.

5.1.4 Long-Term Effectiveness

Alternative 1 would not offer any long-term effectiveness since the implementation of this alternative offers no protection to human health and would not achieve RAOs.

Alternative 2 provides some long-term effectiveness, although the area occupied by Site UXO 02 could not be redeveloped unless a removal action is performed. Annual/periodic inspections of institutional controls would be required indefinitely. RAOs would be achieved and site conditions would be improved with respect to the protection of the community and industrial/occupational/construction workers.

Alternative 3 provides very good long-term effectiveness because MPPEH and co-located MC-contaminated soil, if present, would be removed. RAOs would be achieved and site conditions would be improved with respect to the protection of the community and industrial/occupational/construction workers.

5.1.5 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternatives 1 and 2 would not reduce toxicity, mobility, or volume of contaminants within Site UXO 02 since MPPEH and MC-contaminated soil, if present, would not be removed.

Alternative 3 is the most effective because "treatment" of MPPEH and co-located MC-contaminated soil, if present, will be accomplished through removal. Surface water removed from the drainage ditch will not be treated as IDW because the water will be discharged to an area immediately downgradient of the drainage ditch which lies within the same stormwater management system.

5.2 Implementability

5.2.1 Technical Feasibility

The three alternatives are technically feasible. Alternative 1 is the most feasible because no action would be taken. Alternative 2 is the second most feasible since LUCs are relatively simple to implement. Alternative 3 is technically feasible, as excavation is an accepted and commonly used method for removal of MPPEH and MC-contaminated soil. This alternative does not involve the implementation of advanced technology; however, it does require the most planning, scheduling, and reporting of the three alternatives.

5.2.2 Administrative Feasibility

The three alternatives are administratively feasible. The most feasible is Alternative 1, because no coordination, personnel, or processes would be involved. Alternatives 2 and 3 respectively have increasing degrees of administrative feasibility.

Alternative 2 would require administrative coordination related to LUC implementation, development of SOPs and THAs, and training for site industrial/occupational/maintenance workers. Alternative 3 would require the most administrative coordination due to the tasks associated with implementation of the removal action. Excavation of the removed soil would require a contractor and oversight for operations would be necessary. Removed soil would be disposed at an off-site Subtitle C landfill, necessitating the need for a waste profile backed by analytical results. Based on the estimated volume of soil slated for removal and the fact that base access is restricted, extensive coordination between the transport contractor and NASWF would be necessary.

5.2.3 Availability of Services and Materials

Alternative 1 does not require services and materials. Alternatives 2 and 3 require services and materials. For Alternative 3, the required services and materials may also include the requirements of Alternative 2; therefore, Alternative 3 was identified as requiring the most services and materials.

5.2.4 State/Community Acceptance

State and community acceptance/rejection of an alternative will ultimately be determined after fulfilling all community involvement requirements in accordance with Section §300.415(n) of the NCP. Alternative 1 is not anticipated to be acceptable to the state and community since no action will be performed at the site. Alternatives 2 and 3 are anticipated to be acceptable to the state and community; however, Alternative 3 will likely be preferred because it is considered to be the most protective of human health.

5.3 Cost

The present worth costs of each of the alternatives are summarized in Table 4-3. The detailed cost breakdown for each alternative is provided in Appendix A and includes the contribution of direct and indirect capital costs as well as operations and maintenance costs.

Alternative 3 is the most costly alternative but provides the most protection and is a permanent solution since MPPEH and co-located MC-contaminated soil, if present, will be removed from the site. Alternative 2 is slightly less expensive than Alternative 3, but is not a long-term solution since MPPEH and MC-contaminated soil, if present, would remain at the site and exposure could occur during grounds maintenance activities and during implementation of annual LUC inspections.

Alternative 1 is the cheapest alternative; however, no action is taken to protect human health and the RAOs would not be achieved.

6.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE

This EE/CA was developed in accordance with current USEPA guidance documents for a NTCRA under CERCLA. Three alternatives were assessed based on an evaluation of the effectiveness, implementability, and cost criteria. The effectiveness criterion included an evaluation of the protectiveness of human health, compliance with ARARs and the RAOs, the short- and long-term effectiveness, and the reduction of toxicity, mobility or volume. The implementability criterion included an evaluation of the technical and administrative feasibility, availability of services/equipment, and state/community acceptance of the alternative. The cost criterion included an evaluation of present worth costs based on capital costs and operating costs.

Based on the comparative analysis, Alternative 3 – MPPEH Clearance and MC Confirmatory Sampling was selected as the recommended alternative for Site UXO 2 based on the following factors:

- Alternative 3 is the most effective and provides the most protection to human health. In addition, Alternative 3 reduces the toxicity, mobility, and volume of MPPEH and co-located MC-contaminated soil, if present, which is not achieved under Alternatives 1 or 2.
- All three of the alternatives are implementable from a technical, administrative, and services/materials perspective; however, Alternative 3 is the most implementable alternative since it is anticipated to be the most acceptable alternative to the stakeholders and the community.
- The estimated cost of Alternative 3 is higher than Alternative 2; however, its overall value is significantly higher since Alternative 3 provides the most protection and is a permanent solution since MPPEH and MCs co-located with MPPEH, if present, will be removed from the site. Alternative 2 is slightly less expensive than Alternative 3 but is not a long-term effective solution since MPPEH and MC, if present, would remain at the site and exposure could occur during grounds maintenance activities.

Implementation of Alternative 3 will prevent or minimize contact with MPPEH and co-located MC-contaminated soil, if present, which poses a potential hazard to NASWF personnel and contractors under current and future land use scenarios. Implementation of this alternative will restore the operational status of Site UXO 02 to a condition protective of human health and suitable for Air Operations. Implementation of Alternative 3 is anticipated to be the final remedy; however, based on the outcome of the removal action or a subsequent investigation, a follow-on remedial action will be conducted if site-related hazardous substances, pollutants, or contaminants, including MC, are discovered and remain in site media at Site UXO 02.

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7.0 REFERENCES

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TABLES

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Table 2-1
Surficial Aquifer System Characteristics

Surficial Aquifer System Characteristics	Approximate Value
Type	unconfined
Composition	Sand and gravel
Thickness	200 to 350 feet
Inferred flow direction	southwest
Depth to groundwater	1.5 to 90.0 feet bgs
Horizontal hydraulic gradient	0.0039 to 0.0048 feet per foot
Vertical hydraulic gradient	0.0006 to 0.0486 feet per foot
Hydraulic conductivity	100 to 150 feet per day
Flow velocity	unknown

Table 2-2
Land Use Conditions for the Flare Disposal Area

Current Land Use		Surrounding Land Use		Future Land Use	
	Residential		Residential		Residential
X	Industrial	X	Industrial	X	Industrial
	Commercial		Commercial		Commercial
	Agricultural		Agricultural		Agricultural
	Recreational		Recreational		Recreational
	Other:		Other:		Other:

Table 2-4
Conceptual Site Model Overview for the Flare Disposal Area

Profile Type	Data Type	Information
Facility Profile	MRA Name and Installation:	Site UXO 02 (formerly Flare Disposal Area), NASWF
	EPA Region:	Region 4
	Lead Organization:	NAVFAC Southeast
	Installation Mission:	NASWF has served as a naval aviation training facility since 1943.
	Location and Area:	Site UXO 02 lies at the northern tip of Taxiway Y in the South Field at NASWF and occupies approximately 1 acre (see Figures 1-1 and 1-2). Site UXO 02 includes a drainage ditch that is approximately 175 feet long, ranges from approximately 5 to 15 feet wide, and occupies approximately 2,000 square feet. The drainage ditch is oriented southwest (upgradient) to northeast (downgradient) and is comprised of an upgradient concrete-lined section followed by an unlined section. The remaining areas are comprised of well maintained grasses (Resolution Consultants, 2013b).
	Brief History:	The area occupied by Site UXO 02 was likely used by military personnel as a training area for the AN-M57A2 – Signal Illumination Aircraft Double Star Flares. The training may have served two purposes: 1) to train personnel on how to use a flare gun, and 2) to signal pilots that their aircraft landing gear is up while approaching the runway (Resolution Consultants, 2013b). Although speculative, flare training activities may have occurred as recently as the 1990s at NASWF based on the Memorandum: Review of Small Arms Training (NASWF 1993) and the NASWF Training Attendance Roster (NASWF 1993). Upon completion of flare training exercises, Flare casings (i.e. MD) and potentially unspent and dud flares (i.e. MEC) were collected and either properly disposed, tossed in the drainage ditch, or were possibly deposited into a freshly dug hole and buried (Resolution Consultants, 2013b).
	Status:	Inactive, no longer used for the disposal of flare casings.
MC and MEC Profile	Potential Source Areas:	Drainage ditch
	Types of Munitions and Explosives:	AN-M57A2 – Signal Illumination Aircraft Double Star Flares, although only flare casings have been found.
	MEC Density and Distribution:	MEC, if present, is likely confined to the drainage ditch, but could be present at areas downgradient of the ditch based on the location of collected flare casings. Since no MEC surveys have been conducted, the density and distribution of MEC (excludes AN-M57A2 flare casings), if present at Site UXO 02, is unknown.
	MEC Depth:	MEC, if present, is likely confined to surface sediment/soil (less than 2 feet bgs). Intrusive investigations have not occurred at the Site UXO 02; therefore, the presence/absence of MEC has not been confirmed.
	MCs and Media:	The MC associated with the AN-M57A2 – Signal Illumination Aircraft Double Star Flare includes metals (fuel source) and perchlorate (pyrotechnic oxygen source). MC, if present, are likely confined to surface sediment, surface soil, and surface water.

Table 2-4
Conceptual Site Model Overview for the Flare Disposal Area

Profile Type	Data Type	Information
Physical Profile	Climate and Meteorology:	The climate of northwest Florida is classified as subtropical marine, and is characterized by mild winters and hot, humid, breezy summers. The Milton area has an average temperature of 66.8ºF and receives an average of 66.5 inches of rainfall per year. Rainfall may be influenced by three types of weather disturbances that result in unpredictable weather patterns: cold fronts, thunderstorms, and hurricanes (NASWF, 2013).
	Surface Topography:	Site UXO 02 includes a drainage ditch that is approximately 175 feet long, ranges from approximately 5 to 15 feet wide, and occupies approximately 2,000 square feet. The drainage ditch is oriented southwest (upgradient) to northeast (downgradient) and is comprised of an upgradient concrete-lined section followed by an unlined section. The remaining areas are comprised of well maintained grasses (Resolution Consultants, 2013b). The sides of the unlined ditch are nearly vertical with heights ranging from approximately 3 feet at the upgradient side to less than 1 foot at the downgradient side. The downgradient end of the drainage ditch gradually becomes shallower and transitions into a grassy area.
	Geology:	Site lithology consists of lightly colored (white to tan to orange to red-orange) poorly graded sands (fine- to medium-grained) with interstitial silts and clays. These sand beds are typically not extensive and are interbedded with silt and clay-rich layers. The stratification of these subsurface soils is consistent with sedimentary patterns associated with a fluvial or riverine depositional environment and descriptions of the Citronelle Formation (Marsh, 1966; Scott, 1992; ABB-ES, 1992; ABB-ES, 1994). Based on soil descriptions taken from boring log WHF-33-5 (located approximately 1,500 feet west [Tetra Tech 2012]) and boring log WHF-9-2, (located approximately 1,200 feet east of Site UXO 02 [ABB-ES 1992]), site stratigraphy in the vicinity of Site UXO 02 is anticipated to consist of interbedded silt and sand beds from ground surface to approximately 130 feet below ground surface (bgs) with a notable clay bed located approximately 62 to 70 feet bgs and notable silty, sandy, clay beds located approximately 70 to 81 feet and 110 to 117 feet bgs.
	Hydrology:	Surface water from a portion of Taxiway Y and the relatively flat, surrounding grassy area is collected in the drainage ditch associated with Site UXO 02. No other influent pipes or culverts discharge to this drainage ditch. Based on surface topography, evidence of sheet flow, and presumed low-permeability soils, water collected in the drainage ditch slowly percolates through the drainage ditch soil or discharges radially to a downgradient grassy area to the north (Resolution Consultants, 2013b).

Table 2-4
Conceptual Site Model Overview for the Flare Disposal Area

Profile Type	Data Type	Information		
Physical Profile (continued)	Hydrogeology:	**Surficial Aquifer Characteristics**	**Value**	**Reference**
		Type	unconfined	Tetra Tech, 2012
		Composition	Sand and gravel	Tetra Tech, 2012
		Thickness	200 to 350 feet	Tetra Tech, 2012
		Inferred flow direction	southwest	Tetra Tech, 2012
		Depth to groundwater	110 to 120 feet bgs	ABB-ES, 1992
		Horizontal hydraulic gradient	0.0039 to 0.0048 feet per foot	ABB-ES, 1998
		Vertical hydraulic gradient	0.0006 to 0.0486 feet per foot	ABB-ES, 1998
		Hydraulic conductivity	100 to 150 feet per day	Tetra Tech, 2012
		Flow velocity	unknown	-
	Historical and Cultural Resources:	Other than potentially historic WW II structures located in the industrial area, cultural resources have not been identified at the installation (Malcolm Pirnie, 2004).		
Release Profile	Fate and Transport Mechanisms:	The primary transport mechanism associated with MEC/MD mobility is surface water runoff. Surface water may transport MEC/MD, if present, to downgradient locations by sheet flow or may cover MEC/MD with soil deposited from sheet flow. Preferential migration pathways at ground surface include the drainage ditch and the radial dispersion area at the distal end of the drainage ditch (Resolution Consultants, 2013b). Primary transport mechanisms for MC include bio-uptake, air transport (dust and volatilization), surface water runoff, leaching to groundwater, and/or groundwater migration. Of these transport mechanisms, surface water transport of dissolved phase MC or adsorbed MC on soil particles is considered to be the most significant transport mechanism at Site UXO 02. Leaching to groundwater and groundwater migration transport mechanisms are potentially viable, but are not considered significant transport mechanisms for MC due to the thickness of the vadose zone (110 feet), low-permeability of the surface soils (based on evidence of sheet flow and standing water in the drainage ditch), and subsurface soil, which will likely inhibit the vertical mobility of MC. Bio-uptake and air transport mechanisms are expected to be insignificant transport mechanisms for MC (Resolution Consultants, 2013b).		
	Migration Pathways:	Preferential migration pathways for MC and MEC transport via surface water runoff include the drainage ditch and the radial dispersion area downgradient of the drainage ditch.		

Table 2-4
Conceptual Site Model Overview for the Flare Disposal Area

Profile Type	Data Type	Information
Land Use and Exposure Profile	Current land use:	Industrial; airfield operations.
	Surrounding land use:	Industrial; airfield operations.
	Future land use:	Industrial; airfield operations.
	Accessibility:	Site UXO 02 lies within the restricted area of NASWF and is not very accessible.
	Potential Human Receptors:	Current and future industrial/occupational workers (grounds maintenance workers)
		Future construction workers
	Potentially Complete Exposure Pathways:	Current and future industrial/occupational workers (grounds maintenance workers): Incidental ingestion, dermal contact, and inhalation of soil/sediment from the 0 to 2-foot bgs interval and incidental ingestion and dermal contact of surface water are potentially complete exposure pathways. Direct contact with dud or unspent flares, if present, is a potentially complete pathway.
		Future construction workers: Incidental ingestion, dermal contact, and inhalation of soil/sediment from the 0 to 10-foot bgs interval and incidental ingestion and dermal contact of surface water are potentially complete exposure pathways. Direct contact with dud or unspent flares, if present, is a potentially complete pathway.
Ecological Profile	Known or Potential Special Status Species of Plants:	Spoon-Leaf Sundew, Florida Anise, Coville's Rush, Primrose-Flowered Butterwort, Rose Pogonia, and White-Top Pitcher Plant are federal or State of Florida known or potential special status species of plants (NASWF, 2013).
	Known or Potential Special Status Species of Reptiles:	Gopher Tortoise and Eastern Diamondback Rattlesnake are federal or State of Florida known or potential special status species of reptiles (NASWF, 2013).
	Known or Potential Special Status Species of Birds:	Henslow's Sparrow, Snowy Egret, Great Egret, Little Blue Heron, and Red-Cockaded Woodpecker are federal or State of Florida known or potential special status species of birds (NASWF, 2013).

Table 3-1
ARARs
Site UXO 02, NASWF

Action/Media	Requirement	Prerequisite	Citation(s)
Control of Nuisance Dust, Visible Emissions and Particulate Matter	Requires reasonable precautions, such as application of water or other dust suppressants, to control emission of particulate matter from any activity including but not limited to, vehicular movement and construction. Precautions will be undertaken to prevent fugitive dust emissions from any land disturbing activities.	If generate dust emissions and/or disturb more than one acre of land this is **Applicable.**	Chapter 62-296.320(4)(c), F.A.C. Florida General Pollutant Emission Limitation Standards
Stormwater Discharge Standards	Establishes requirements for discharges from stormwater discharge facility to ensure protection of the surface waters of the state. Erosion and stormwater control BMPs will be implemented during construction to retain sediment on site. Requires development and implementation of best management practices (BMPs) and erosion and sedimentation controls for stormwater discharges to ensure protection of the surface waters of the state.	If erosional conditions are present, this is **Applicable.**	Chapter 62-25.025(7), F.A.C. Florida Regulation of Stormwater Discharge – Facility Performance Standards Chapter 62- 621.300(4)(a), F.A.C. Florida Generic Permit for Stormwater Discharge from Construction Activities
Cleanup Levels	This rule provides default cleanup criteria, namely cleanup target levels (CTLs) in Table II and an explanation for deriving CTLs for soil and surface water that can be used for site rehabilitation (i.e., cleanup). SCTLs in Table II for Direct Exposure and Leachability Based on Groundwater Criteria were used to establish cleanup goals for the soil COCs.	If environmental samples are collected for analysis, then this is **Relevant and Appropriate.**	Chapter 62-777.170, F.A.C., Table II Florida Contaminant Cleanup Target Levels Rule
Management of Military Munitions	Identification, treatment, and storage requirements for the management of "Military Munitions" as defined under 40 CFR 260.10.	If Military Munitions discovered on site qualify as solid waste which is also hazardous under cited subpart or 40 CFR Part 261, then U.S. EPA's Military Munitions Rule is **Applicable.**	40 CFR Part 266, Subpart M

Table 3-1
ARARs
Site UXO 02, NASWF

Action/Media	Requirement	Prerequisite	Citation(s)
Management of Military Munitions (cont'd)	Criteria for determining when unused, used, or fired Military Munitions constitute solid waste subject to potential RCRA hazardous waste regulation.	While used or fired Military Munitions are solid waste potentially subject to RCRA Subtitle C requirements if not on an active or inactive range, unused Military Munitions are not solid wastes unless the criteria specified in this subpart apply. **Applicable.**	40 CFR 266.202
	Criteria for the application of, or exemption from, hazardous waste regulations for Waste Military Munitions (WMM) being transported.	Military Munitions transported offsite for reclamation, treatment, or disposal constitute WMM subject to these RCRA Subtitle C requirements. **Applicable.**	40 CFR 266.203
	Criteria for hazardous waste regulation of WMM placed into storage.	Should any WMM found on site be placed into storage, RCRA Subtitle C requirements will apply unless the conditional exemption set forth in this subpart applies. **Applicable.**	40 CFR 266.205

Table 3-1
ARARs
Site UXO 02, NASWF

Action/Media	Requirement	Prerequisite	Citation(s)
Military Munitions Emergency Response (Exemptions)	Explosives and munitions emergencies involving military munitions or explosives are subject to 40 CFR 262.10(i), 263.10(e), 264.1(g)(8), 265.1(c)(11), and 270.1(c)(3), or alternatively to 270.61. Explosives or munitions emergency means a situation involving the suspected or detected presence of unexploded ordnance (UXO), damaged or deteriorated explosives or munitions, an improvised explosive device (IED), other potentially explosive material or device, or other potentially harmful military chemical munitions or device, that creates an actual or potential imminent threat to human health, including safety, or the environment, including property, as determined by an explosives or munitions emergency response specialist. Such situations may require immediate and expeditious action by an explosives or munitions emergency response specialist to control, mitigate, or eliminate the threat.	If nature and/or condition of explosives or military munitions found on site warrant undertaking emergency response during NTCRA. **Applicable**	40 CFR 266.204
	Persons responding to an explosives or munitions emergency in accordance with 40 CFR 264.1(g)(8)(i)(D) or (iv) or 265.1(c)(11)(i)(D) or (iv), and 270.1(c)(3)(i)(D) or (iii) are not required to comply with the standards of 40 CFR 262 (Standards Applicable to Generators of Hazardous Waste).	If conducting explosives or munitions emergency response activities, exemption is **Applicable.**	40 CFR 262.10; 264.1(g)(8)(i)(D) or (iv); 265.1(c)(11)(i)(D) or (iv); 270.1(c)(3)(i)(D) or (iii)
	The regulations in 40 CFR 263 (Standards Applicable to Transporters of Hazardous Waste) do not apply to transportation during an explosives or munitions emergency response, conducted in accordance with 40 CFR 264.1(g)(8)(i)(D) or (iv) or 265.1(c)(11)(i)(D) or (iv), and 270.1(c)(3)(i)(D) or (iii).	If conducting explosives or munitions emergency response activities, exemption is **Applicable.**	40 CFR 263.10(e); 264.1(g)(8)(i)(D) or (iv); 265.1(c)(11)(i)(D) or (iv); 270.1(c)(3)(i)(D) or (iii)

Table 3-1
ARARs
Site UXO 02, NASWF

Action/Media	Requirement	Prerequisite	Citation(s)
Military Munitions Emergency Response (Exemptions) (*cont'd)*	If an explosives or munitions emergency response specialist determines that immediate removal of the material or waste is necessary for the protection of human health and the environment, the specialist may authorize the removal of the material or waste by transporters who do not have EPA identification numbers and without the preparation of a manifest.	If conducting explosives or munitions emergency response activities, exemption is **Applicable.**	40 CFR 264.1(g)(8) (*Purpose, Scope and Applicability*) and 265.1(c)(11) (*Purpose, Scope and Applicability*)
	If during conduct of NTCRA, it becomes necessary to conduct military munitions emergency response, those activities would be exempt from substantive requirements of RCRA TSD permit.	If conducting explosives or munitions emergency response activities, exemption is **Applicable.**	40 CFR 270.1(c)(3)(i)(D) (*Further Exclusions*)
Characterization of solid waste	A person who generates a solid waste, as defined in 40 CFR 261.2, must determine if that waste is a hazardous waste using the following method: a) first determine if the waste is excluded from regulation under 261.4; b) determine if the waste is listed as a hazardous waste under 261 subpart D; c) determine if the waste is identified under 261 subpart C by either (1) testing in accordance with methods in 261 subpart C or according to an equivalent method approved by the Administrator under 260.21 or (2) applying knowledge of the hazard characteristic of the waste in light of the materials or processes used.	If solid waste is to be generated and RCRA generator exemption not afforded by application of MMR regulations to site activities, this is **Applicable**.	40 CFR 262.11(a), (b) and (c) (*Hazardous Waste Determination*)
	If the solid waste is determined to be hazardous, refer to 40 CFR 261, 264, 265, 266, 268, and 273 for possible exclusions or restrictions pertaining to management of the specific waste.	If solid waste is determined to be a hazardous waste, this is **Applicable**.	40 CFR 262.11(d) (*Hazardous Waste Determination*)
Scrap metal recycling	Scrap metal is excluded from solid waste and hazardous waste regulations when recycling is used as final disposal.	If scrap metal is recycled as part of final disposition, this is **Applicable**.	40 CFR 261.4(a)(13) (*Exclusions*)

Table 3-1
ARARs
Site UXO 02, NASWF

Action/Media	Requirement	Prerequisite	Citation(s)
Characterization of hazardous waste	Must obtain a detailed chemical and physical analysis of a representative sample of the wastes. At a minimum, the analysis must contain all the information which must be known to treat, store, or dispose of the waste in accordance with 40 CFR 264 and 268.	If hazardous waste treatment, storage, or disposal is occurring, this is **Applicable**.	40 CFR 264.13(a)(1) (*General Waste Analysis*)
Management of hazardous waste	Containers that may be used for temporary storage of hazardous waste (i.e., contaminated soil) on site prior to off-site treatment and disposal will comply with these requirements.	If hazardous wastes are stored temporarily stored in containers, this is **Applicable.**	40 CFR Part 265.171 to 173 (*RCRA Regulations – Use and Management of Containers*)
	Must determine each EPA Hazardous Waste Number (waste code) applicable to the waste in order to determine the applicable treatment standards under 40 CFR 268 subpart D. This determination may be made concurrently with the hazardous waste determination required in 40 CFR 262.11.	If hazardous waste treatment is occurring, this is **Applicable**.	40 CFR 268.9(a) (*Special Rules Regarding Wastes that Exhibit a Characteristic*)
	Must determine the underlying hazardous constituents (as defined in 40 CFR 268.2(i)) in the characteristic waste.	If waste displays hazardous characteristic (and is not D001 non-wastewaters treated by CMBST, RORGS, OR POLYM of 268.42, Table 1), this is **Applicable**.	40 CFR 268.9(a) (*Special Rules Regarding Wastes that Exhibit a Characteristic*)
	Must determine if the waste has to be treated before it can be land disposed. This is done by determining if the hazardous waste meets the treatment standards in 40 CFR 268.40, 268.45, or 268.49. This determination can be made concurrently with the hazardous waste determination required in 40 CFR 262.11 in each two ways: testing the waste or using knowledge of the waste.	If hazardous waste is being land disposed, this is **Applicable**.	40 CFR 268.7(a) (*Testing, Tracking, and Recordkeeping Requirements for Generators, Treaters, and Disposal Facilities*)

Table 3-1
ARARs
Site UXO 02, NASWF

Action/Media	Requirement	Prerequisite	Citation(s)
Management of hazardous waste (cont'd)	Must comply with the special requirements of 40 CFR 268.9 in addition to 268.7.	If waste displays a hazardous characteristic of ignitability, corrosivity, reactivity, or toxicity, this is **Applicable**.	40 CFR 268.7(a) (*Testing, Tracking, and Recordkeeping Requirements for Generators, Treaters, and Disposal Facilities*)
Temporary storage of hazardous waste on site	Hazardous waste may be accumulated on site without a permit or without having interim status provided that: (1) the waste is placed in containers and the generator complies with applicable requirements in 40 CFR 265 subparts I, AA, BB and CC; (2) the date upon which each period of accumulation begins is clearly marked and visible for inspection on each container; (3) while being accumulated on site, each container is marked clearly with the words "Hazardous Waste" or with other words that identify the contents of the containers.	If 55 gallons or less of hazardous waste, or one quart of acutely hazardous waste, is accumulated on site for 90 days or less, this is **Applicable**.	40 CFR 262.34(a)(1)(i), (a)(2) and (a)(3) (*Accumulation Time*); 40 CFR 262(c)(1)(ii) (*Labeling of Satellite Accumulation Containers*)
Condition and management of hazardous waste containers	If a container holding hazardous waste is not in good condition, or if it begins to leak, the hazardous waste must be transferred from this container to a container that is in good condition (40 CFR 265.171). Must use a container made of or lined with materials which will not react with, and are otherwise compatible with, the hazardous waste to be stored, so that the ability of the container to contain the waste is not impaired (40 CFR 265.172). Containers holding hazardous waste must always be closed during storage, except when it is necessary to add or remove waste (40 CFR 265.173(a)). Containers holding hazardous waste must not be opened, handled, or stored in a manner which may rupture the container or cause it to leak (40 CFR 265.173(b)).	If hazard waste is stored in containers, this is **Applicable**.	40 CFR 265.171 (*Condition of Containers*) and 172 (*Compatibility of Waste with Container*); 40 CFR 265.173(a) and (b) (*Management of Containers*)

Table 3-1
ARARs
Site UXO 02, NASWF

Action/Media	Requirement	Prerequisite	Citation(s)
Hazardous waste storage in container area	Container storage areas must have a containment system that is designed and operated in accordance with 409 CFR 264.175(b).	If hazardous wastes is stored in containers and contains free liquids, this is **Applicable**.	40 CFR 264.175(a) and (b) (*Containment*)
	The storage area is sloped or is otherwise designated and operated to drain and remove liquids resulting from precipitation (40 CFR 264.175(c)(1)), or the containers are elevated or are otherwise protected from contact with accumulated liquid (40 CFR 264.175(c)(2)).	If hazardous waste is stored in containers and does not contain free liquids (unless containing wastes FO20, FO21, FO22, FO23, FO26, and FO27), this is **Applicable**.	40 CFR 264.175(c)(1) and (2) (*Containment*)
Closure of hazardous waste container storage area	The owner or operator must close the facility in a manner that: (a) minimizes the need for further maintenance; and (b) controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere; and (c) complies with the closure requirements of 40 CFR 264, including, but not limited to, the requirements of 264.178, 264.197, 264.228, 264.258, 264.280, 264.310, 264.351, 264.601 through 264.603, and 264.1102.	If hazardous waste is stored in container storage area, this is **Applicable**.	40 CFR 264.111 (*Closure Performance Standards*)

Table 3-1
ARARs
Site UXO 02, NASWF

Action/Media	Requirement	Prerequisite	Citation(s)
Closure of hazardous waste containment system	At closure, all hazardous waste and hazardous waste residues must be removed from the containment system. Remaining containers, liners, bases, and soil containing or contaminated with hazardous waste or hazardous waste residues must be decontaminated or removed. [*Comment: At closure, as throughout the operating period, unless the owner or operator can demonstrate in accordance with 40 CFR 261.3(d) of this chapter that the solid waste removed from the containment system is not a hazardous waste, the owner or operator becomes a generator of hazardous waste and must manage it in accordance with all applicable requirements of 40 CFR 262 through 266*].	If hazardous waste is stored in containers in a containment system, this is **Applicable**.	40 CFR 264.178 (*Closure*)
Storage, processing and disposal of non-hazardous solid waste	Prohibits storage, processing, or disposal except at a permitted solid waste management facility. Waste generated on site and deemed nonhazardous solid waste will be stored, transported, and disposed of properly.	If managing non-hazardous solid waste, this is **Applicable**.	Chapter 62-701.300, Florida Administrative Code (F.A.C.) *Florida Solid Waste Management Facilities Regulations*
On-site transportation of hazardous waste	The manifesting requirements of 40 CFR 262.20 and 262.32(b) do not apply. The generator or transporter must comply with the requirements in 40 CFR 263.30 (packaging) and 263.31 (labeling) in the event of a discharge of hazardous waste on a public or private right-of-way.	If transporting hazardous waste on a public or private right-of-way within or along the border of contiguous property under control of the same person, even if such contiguous property is divided by a public or private right-of-way, this is **Applicable**.	40 CFR 262.20(f) (*General Requirements*)

Table 4-1
Description of NCP Criteria for EE/CAs
Site UXO 02, NAS Whiting Field

Criterion	Description
Effectiveness	
Protection of human health and the environment	The assessment describes how the action achieves and maintains protection of human health and the environment and achieves site-specific RAO both during and after implementation.
Compliance with ARARs	An alternative is assessed in terms of its compliance with ARARs, or if a waiver is required, how it is justified.
Short-term effectiveness	An action is assessed in terms of its effectiveness in protecting human health and the environment during the implementation of a remedy before RAO has been met. The duration of time until the RAO is met is also factored into this criterion.
Long-term effectiveness and permanence	An action is assessed in terms of its long-term effectiveness in maintaining protection of human health and the environment after RAOs have been met. The magnitude of residual risk and adequacy and reliability of post-remedial/removal site controls are taken into consideration.
Reduction of toxicity, mobility or volume	An action is assessed in terms of anticipated performance of the specific remedial removal technologies it employs. Factors such as volume of MPPEH removed or destroyed and the degree of expected reductions in exposure to hazards within the removal action site.
Implementability	
Technical feasibility	The ability of the technology to implement the remedy is evaluated.
Administrative feasibility	The administrative feasibility factor evaluates requirements for permits, zoning variances, impacts on adjoining property, and the ability to impose institutional controls.
Availability of services and materials	The availability of off-site treatment, storage, and disposal capacity, personnel, services, and materials, and other resources necessary to implement the alternative will be evaluated.
State and community acceptance	The anticipated acceptability of an alternative to the state agency and the community will be evaluated.
Cost	
Direct and indirect capital costs	Includes the capital costs for implementing an alternative.
Operations and maintenance costs	Includes ongoing operating, monitoring, and maintenance costs for a specific period of time.

Table 4-2
Detailed Analysis of Alternatives for Effectiveness
Site UXO 02, NASWF

Criterion	Alternative 1: No Action	Alternative 2: Land Use Controls	Alternative 3: MPPEH Clearance and MC Removal
Protection of human health	Does not provide protection of human health and the environment. Does not meet the RAOs.	Would meet the RAOs and would reduce but not eliminate risks to human health through the implementation of LUCs. LUCs will limit direct exposure of MPPEH and MC-contaminated soils, if present, to grounds maintenance workers by erecting a fence around the site, providing training to grounds maintenance workers, developing SOPs and THAs, and updating internal databases that identify land use restrictions for the area occupied by Site UXO 02.	Would meet the RAOs and is the most protective of human health because MPPEH and MC-contaminated soils co-located with MPPEH, if present, would be removed, thereby eliminating any potentially complete exposure pathways. Although not anticipated, LUCs may be required under Alternative 3 depending on the results of the removal action.
Compliance with ARARs	Does not satisfy all ARARs since no action is taken.	The establishment of LUCs would be in compliance with ARARs.	The performance of the MPPEH clearance and removal of MC-contaminated soil co-located with MPPEH would be in compliance with ARARs.
Short-term effectiveness	Provides short-term effectiveness because workers and the community will not be exposed since no action will be taken.	Provides some short-term effectiveness because the application of LUCs would be protective; however, intrusive activities associated with the construction of the fence would pose a potential risk to site workers from contact with MPPEH and MC-contaminated soil, if present. Potential short-term risks to site workers would be mitigated through the adherence to well-developed health and safety documents, SOPs, THAs, and MEC avoidance procedures.	Alternative 3 provides some short-term effectiveness. Short-term risks are expected to be similar as Alternative 2 because intrusive activities will be performed as part of the removal action. Potential short-term risks to site workers would be mitigated through the adherence to well-developed health and safety documents, SOPs, THAs, and MEC avoidance procedures.

Table 4-2
Detailed Analysis of Alternatives for Effectiveness
Site UXO 02, NASWF

Criterion	Alternative 1: No Action	Alternative 2: Land Use Controls	Alternative 3: MPPEH Clearance and MC Removal
Long-term effectiveness and permanence	Provides no long-term effectiveness and permanence. MPPEH and MC, if present, will remain in soil and may not be protective of human health.	Provides some long-term effectiveness, although the area occupied by Site UXO 02 could not be redeveloped unless a removal action is performed. Annual/periodic inspections of institutional controls would be required indefinitely. RAOs would be achieved and site conditions would be improved with respect to the protection of the community and industrial/occupational/construction workers.	Provides very good long-term effectiveness because MPPEH and co-located MC-contaminated soil, if present, would be removed. RAOs would be achieved and site conditions would be improved with respect to the protection of the community and industrial/occupational/construction workers.
Reduction of toxicity, mobility or volume	Would not reduce toxicity, mobility, or volume of contaminants within Site UXO 02 since MPPEH and MC-contaminated soil, if present, would not be removed.	Would not reduce toxicity, mobility, or volume of contaminants within Site UXO 02 since MPPEH and MC-contaminated soil, if present, would not be removed.	"Treatment" of MPPEH and co-located MC-contaminated soil, if present, will be accomplished through removal. Surface water removed from the drainage ditch will not be treated as IDW because the water will be discharged to an area immediately downgradient of the drainage ditch which lies within the same stormwater management system.

Table 4-3
Detailed Analysis of Alternatives for Implementability
Site UXO 02, NAS Whiting Field

Criterion	Alternative 1: No Action	Alternative 2: Land Use Controls	Alternative 3: MEC Removal and Land Use Controls
Technical feasibility	Technically implementable since no action would be taken.	Technically implementable since LUCs are relatively simple to implement.	Technically implementable although will require careful planning, scheduling, and reporting.
Administrative feasibility	Administratively implementable since no action would be taken.	Administratively implementable. Would require administrative coordination related to the implementation of the LUCs, as well as the development of SOPs and THAs and the training for the site maintenance workers.	Administratively implementable. Would require administrative coordination related to development of detailed planning and health and safety documents.
Availability of services and materials	Services and materials are not required.	Services and materials are readily available.	Services and materials are readily available.
State and community acceptance	Not evaluated at this time pending regulator and community review. However, anticipate acceptance is not likely.	Not evaluated at this time pending regulator and community review. However, anticipate acceptance to be moderately likely.	Not evaluated at this time pending regulator and community review. However, anticipate acceptance.

Table 4-4
Summary of Present Worth Costs
Site UXO 02, NAS Whiting Field

Alternative	Estimated Cost
Alternative 1 – No Action	$0
Alternative 2 – Land Use Controls	$303,000
Alternative 3 – MPPEH Clearance and MC Removal	$365,000

FIGURES

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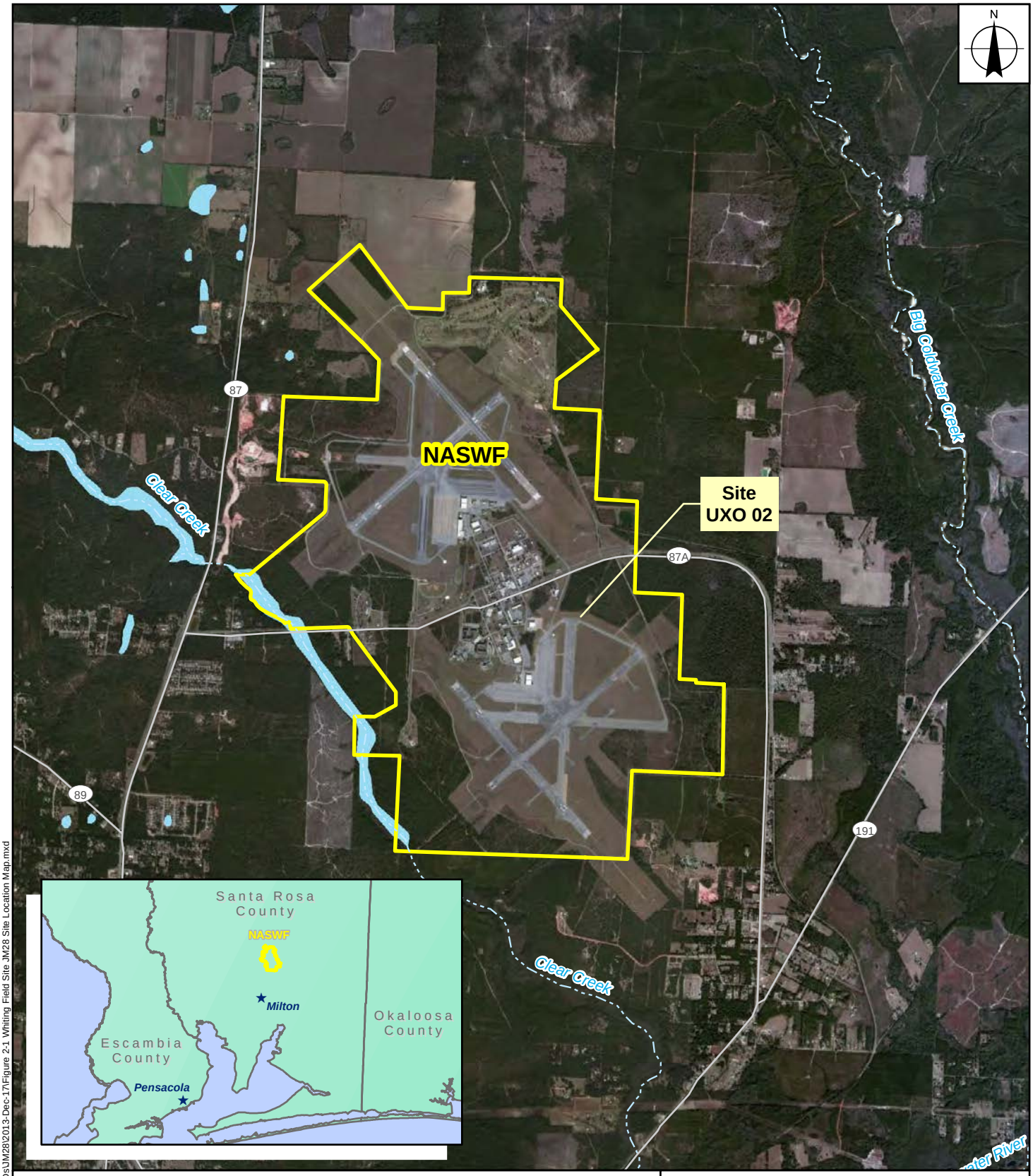


0 4,000 8,000 Feet

Legend

- Streams and Rivers
- Major Roads
- Surface Water Body or Floodplain

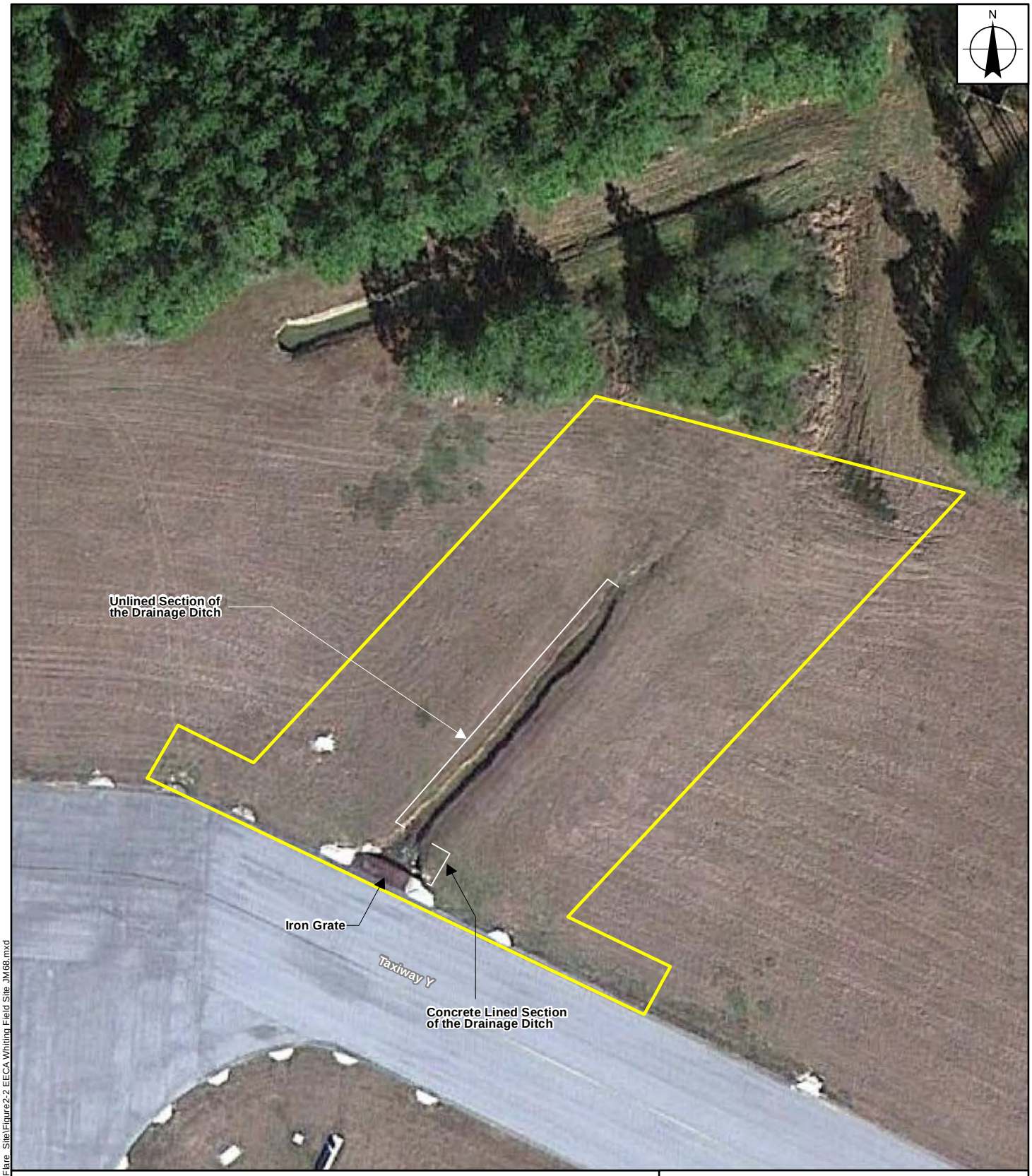
FIGURE 2-1
SITE LOCATION MAP
SITE UXO 02
NASWF - MILTON, FLORIDA

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: Trent Sims	DATE: 12/17/2013
DRAWN BY: Tammy Godfrey	TASK ORDER NUMBER:CTO JM68

L:\Group\IT_GIS\GIS Projects\NAVFAC\MXDs\JM28\2013-Dec-17\Figure 2-1 Whiting Field Site JM28 Site Location Map.mxd



Legend

Site UXO 02

0 30 60 120 Feet

FIGURE 2-2
SITE LAYOUT
SITE UXO 02
NASWF - MILTON, FLORIDA

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: T SIMS	DATE: 12/16/2013
DRAWN BY: J CHASTAIN	TASK ORDER NUMBER: CTO JM68

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Legend

Site UXO 02

—171— Topographic Contour (feet above mean sea level)

0 25 50 100 Feet

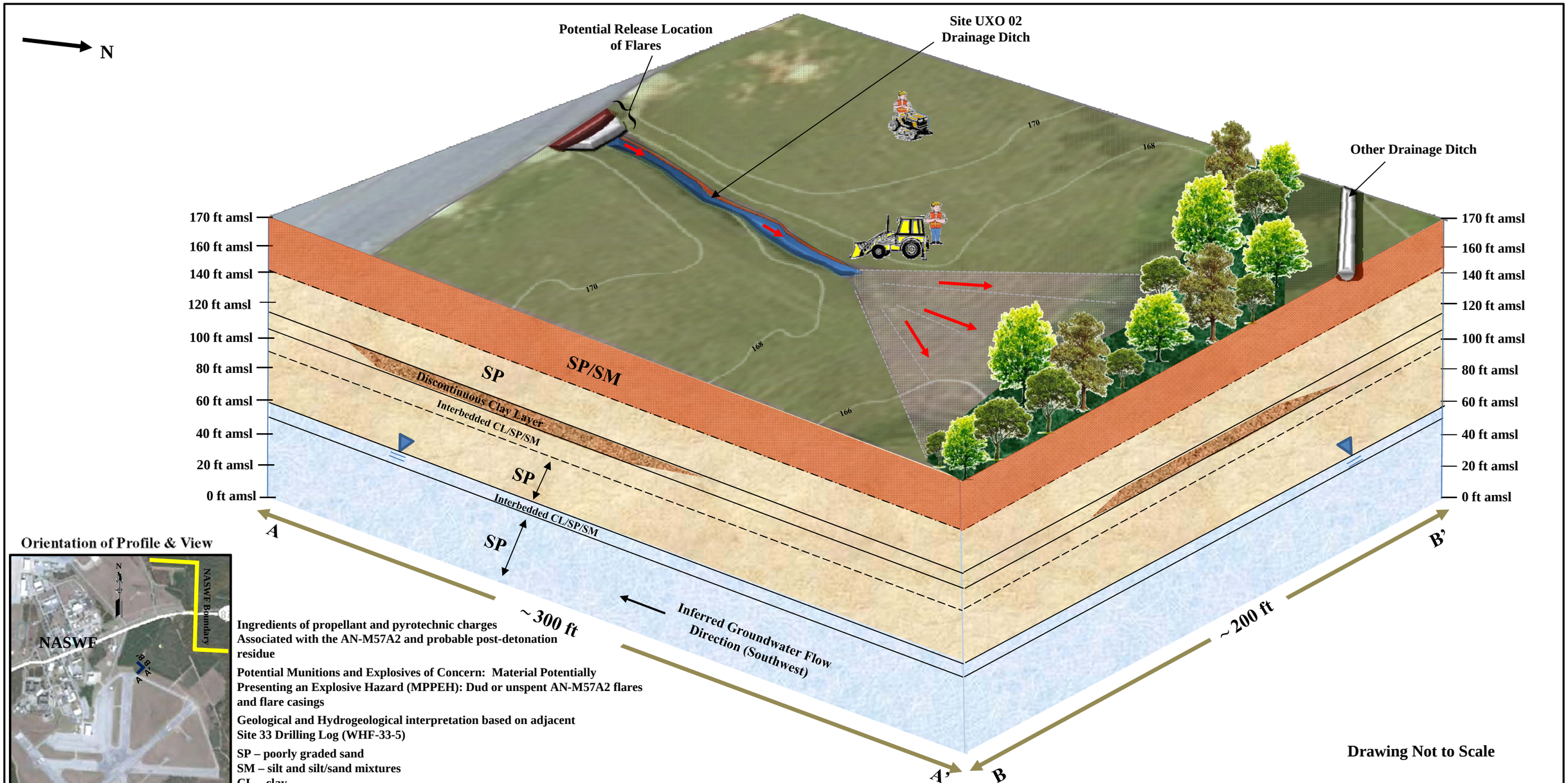
FIGURE 2-3
SURFACE TOPOGRAPHY
SITE UXO 02
NASWF - MILTON, FLORIDA

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: T SIMS	DATE: 12/16/2013
DRAWN BY: J CHASTAIN	TASK ORDER NUMBER: CTO JM68

L:\work\IT\GIS\Projects\NAVY\Site_Specific\Flare_Site\2013Apr24\Figure 2-3 Whiting Field Site JM28 Surface Topography.mxd



LEGEND

- Groundwater Table (Estimated)
- Saturated Zone
- Taxiway Y
- Iron Grate
- Concrete
- Radial Discharge Area
- Grass
- Woods or Heavily Vegetated Area
- Unsaturated Zone
- Surface Water Transport Direction
- 168 - Topographic contour and elevation in feet amsl

POTENTIAL EXPOSURE PATHWAYS AND RECEPTORS

Human Receptors:

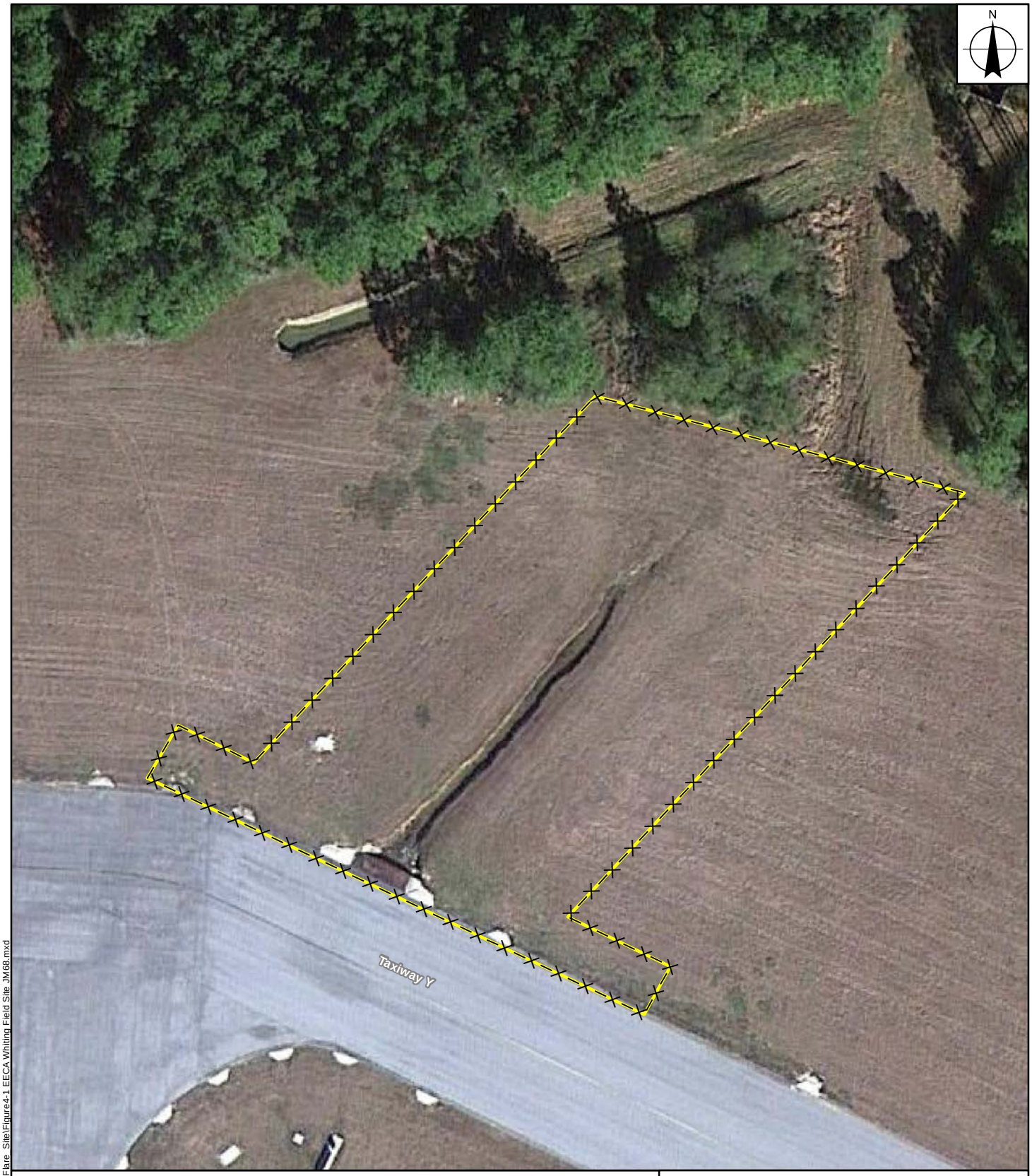
Current and future industrial/occupational workers (grounds maintenance workers): Incidental ingestion, dermal contact, and inhalation of soil from the 0 to 2-foot bgs interval and incidental ingestion and dermal contact of surface water are potentially complete exposure pathways. Direct contact with soils containing MPPEH is a potentially complete exposure pathway.

Future construction workers: Incidental ingestion, dermal contact, and inhalation of soil from the 0 to 10-foot bgs interval and incidental ingestion and dermal contact of surface water are potentially complete exposure pathways. Direct contact with soils containing MPPEH is a potentially complete exposure pathway.

FIGURE 2-4
CONCEPTUAL SITE MODEL
SITE UXO 02
NASWF – MILTON, FLORIDA

NAVFAC Naval Facilities Engineering Command
RESOLUTION CONSULTANTS

REQUESTED BY: Trent Sims	DATE: December 2013
DRAWN BY: JWilson	TASK ORDER NUMBER: CTO JM68



Legend

Proposed Fence

Site UXO 02

0 30 60 120 Feet

FIGURE 4-1
ALTERNATIVE #2 - LAND USE CONTROLS
SITE UXO 02
NASWF - MILTON, FLORIDA

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: T SIMS	DATE: 2/6/2014
DRAWN BY: J Clauson	TASK ORDER NUMBER: CTO JM68

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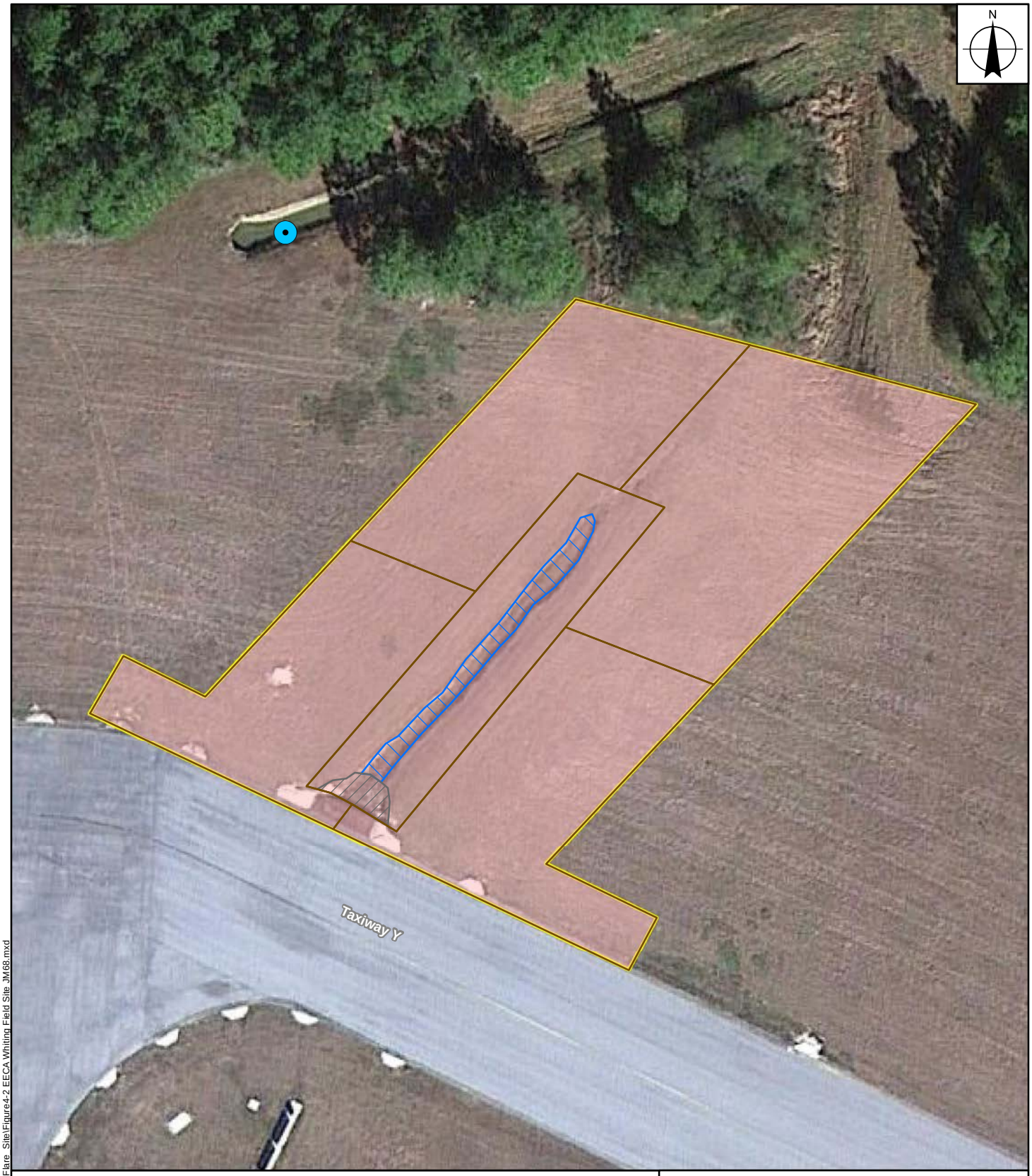

Legend

- Proposed Surface Water Discharge Location
- Concrete Removal Area
- Surface Water Removal Area
- MEC Clearance Grid
- MEC Clearance Area
- Site UXO 02

0 25 50 100 Feet

FIGURE 4-2
ALTERNATIVE #3 - MPPEH CLEARANCE
AND MC CONFIRMATORY SAMPLING
SITE UXO 02
NASWF - MILTON, FLORIDA

NAVFAC Naval Facilities Engineering Command
RESOLUTION CONSULTANTS

REQUESTED BY: T SIMS	DATE: 2/6/2014
DRAWN BY: J Clauson	TASK ORDER NUMBER: CTO JM68

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APPENDIX A

DETAILED COST ESTIMATES

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Table A-1
Detailed Cost Estimate
Alternative 2 - Land Use Controls
Site UXO 02, NASWF, FL

Cost Estimate Assumptions	
Linear feet of fence	500
Number of gates	2
Number of signs	5
Installation ft/day with signs	125
Number of days to install	4
Fencing subcontractor (crews)	2
UXO Technicians (person)	2
Oversight/supervision (person)	1
Field work labor (10 hours per day)	40

Task Description	Unit	Quantity	Cost	Total
1.0 Planning documents				**$23,000**
1.1 Work Plan	LS	1	$13,000	$13,000
1.2 HASP	LS	1	$10,000	$10,000
2.0 Implementation				**$86,824**
2.1 Mobilization/Demobilization	LS	1	$2,000	$2,000
2.2 Fence Installation and Signage	DAY	4	$10,200	$40,800
2.3 Oversight/Supervision	DAY	4	$1,500	$6,000
2.4 Operation & Maintenance (recurring)	YEAR	1	$2,000	$2,000
Operation & Maintenance (present worth value of recurring costs - 30 years)[1]				$38,024
3.0 Reporting				**$190,120**
3.1 Annual Report	YEAR	1	$10,000	$10,000
Reporting (present worth value of recurring costs - 30 years)[1]				$190,120
4.0 Per diem				**$3,200**
4.1 M&IE	DAY	4	$300	$1,200
4.2 Lodging	DAY	4	$500	$2,000
TOTAL COST				**$303,144**

[1]PWF = Present Worth Factor for a periodic cost is a single series amount $1/(1+i)^{n.}$

Where: i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 7% - inflation rate of 4% = 3%.

n = number of years

Present worth value costs were only calculated for cost that would be incurred for more than one year.

Table A-2
Detailed Cost Estimate
Alternative 3 - MPPEH Clearance and MC Removal
Site UXO 02, NASWF, FL

Cost Estimate Assumptions

LUCs not required	
Hand clearing to a maximum depth of 4 ft bgs	
Treatment of MEC to occur at NASWF	
Area to be cleared of MPPEH using AGM techniques (acre)	1
Quantity MDAS scrap management/disposal (lbs.)	unknown
Quantity non-MEC scrap disposal (lbs.)	unknown
UXO Technicians (person)	2
Oversight/Supervision/Engineer (person)	1
Total UXO Tech hours (10 hours/day)	500

Task Description	Unit	Quantity	Cost	Total
1.0 Planning documents				**$110,000**
1.1 Action Memo	LS	1	$13,000	$13,000
1.2 Community Relations Work Plan	LS	1	$20,000	$20,000
1.3 NTCRA Work Plan and HASP (APP/SSHP)	LS	1	$42,000	$42,000
1.4 Safety Submission	LS	1	$15,000	$15,000
1.5 MEC Management Contingency Plan & Siting Plan	LS	1	$20,000	$20,000
2.0 Implementation				**$230,000**
2.1 UXO Surface Clearance/Avoidance	LS	1	$45,000	$45,000
2.3 Excavation and Removal (Intrusive Activities)	LS	1	$105,000	$105,000
2.4 MEC & Non-MEC Debris Disposal & Site Restoration	LS	1	$80,000	$80,000
3.0 Reporting	**LS**	**1**	**$25,000**	**$25,000**
TOTAL COST				**$365,000**