

**U.S. Army Corps of Engineers  
Omaha District**

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**Technical Project Planning  
Meeting Package  
Fort Flagler Military Reservation  
FUDS ID F10WA0316**

**Site Inspections at Multiple Sites, NWO Region  
Formerly Used Defense Sites, Military Munitions  
Response Program**

**Contract No. W912DY-04-D-0010  
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**July 20, 2006**

  
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**Technical Project Planning Memorandum**

**Site Inspection  
Fort Flagler Military Reservation  
Formerly Used Defense Site  
FUDS ID F10WA0316**

**Military Munitions Response Program**

Documentation for Technical Project Planning Meeting  
Bureau of Land Management  
Lacey, Washington  
July 24, 2006

Hosted by U.S. Army Corps of Engineers

Prepared by Shaw Environmental, Inc.

July 20, 2006

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## ABBREVIATIONS AND ACRONYMS

AOC	area of concern
ASR	Archives Search Report
Ft. Flagler	Fort Flagler Military Reservation
CSM	Conceptual Site Model
DoD	Department of Defense
DQO	Data Quality Objective
°F	degrees Fahrenheit
ft	foot or feet
FUDS	Formerly Used Defense Site
GPS	global positioning system
HRS	Hazard Ranking System
INPR	Inventory Project Report
MC	munitions constituents
MEC	munitions and explosives of concern
mm	millimeter
MMRP	Military Munitions Response Program
MRSPP	Munitions Response Site Prioritization Protocol
NDAI	No Department of Defense Action Indicated
PCOC	potential contaminant of concern
RAC	Risk Assessment Code
RI/FS	Remedial Investigation/Feasibility Study
Shaw	Shaw Environmental, Inc.
SI	Site Inspection
SSWP	Site-Specific Work Plan
State Parks	Washington State Parks Department
TCRA	time-critical removal action
TPP	Technical Project Planning
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
UXO	unexploded ordnance
Work Plan	<i>Type I Work Plan, Site Inspections at Multiple Sites</i>

# ***Administrative Information***

***Site Inspection  
Ft. Flagler Military Reservation***

***Technical Project Planning Meeting  
July 24, 2006***

The Technical Project Planning (TPP) Memorandum is one in a series of documents used during the Site Inspection (SI) process to document the information collected and processes used to evaluate Formerly Used Defense Sites (FUDS) for the possible presence of munitions and explosives of concern (MEC) and/or munitions constituents (MC). TPP meeting information provided in the Memorandum reflects both the original version of information shared with meeting participants, as well as changes/updates to site-specific information obtained during the TPP meeting.

The TPP meeting for the former Fort Flagler Military Reservation (Ft. Flagler) will be conducted on July 24, 2006 at the Washington Department of Ecology office in Lacey, Washington. Representatives from the U.S. Army Corps of Engineers (USACE) – Omaha Design Center and Seattle District, the Washington Department of Ecology, Washington State Parks Department (State Parks), and Shaw Environmental, Inc. (Shaw) will be in attendance. By agreement with the USACE, nearby landowners (other than State Parks) will not be present at this meeting. A separate meeting with nearby landowners will be held in the evening on the same day at Ft. Flagler State Park. A site tour may be conducted as part of this meeting.

The TPP Memorandum documents discussions for the TPP meeting and includes the sections described below:

- **Administrative Information:** includes meeting logistics and the list of attendees;
- **Site Inspection Objectives:** provides the goal and objectives of the SI, roles and responsibilities, the SI process, and the TPP process;
- **Background Information:** includes site and project history, area physical setting, a summary of previous environmental work, and an introduction to the areas of concern (AOCs) addressed by the SI;
- **Conceptual Site Model (CSM):** identifies environmental attributes, potential human and ecological receptors in the area's environment, and the relationships between these factors;
- **Proposed Sampling Scheme:** describes the type and quantity of samples to be taken, and the analytical methods to be used for characterizing the AOC;
- **TPP Notes and Data Quality Objectives (DQOs):** captures project and site-specific information as discussed during the TPP meeting to ensure the necessary and appropriate information is shared among meeting participants, and that meeting participants concur with the identified goal, objectives, and approach used to complete the SI process; and
- **Worksheets:** includes the **Site Information Worksheet, Draft Munitions Response Site Prioritization Protocol (MRSPP) Data Gaps, and Hazard Ranking System (HRS) Data Gaps.**

# *Site Inspection Objectives*

*Site Inspection  
Ft. Flagler Military Reservation*

*Technical Project Planning Meeting  
July 24, 2006*

## Goal

- The USACE is conducting SIs of FUDS properties to determine if any MEC or related MC are present on property formerly owned or leased by the Department of Defense (DoD).

## Objectives

- Determine if the site requires further response action due to the presence of MEC/MC.
- Collect minimum information needed to:
  - Eliminate a site from further consideration if:
    - No evidence of MEC and/or
    - Concentrations of MC in samples are below risk-based action levels, or below background concentrations; or
  - Determine the potential need for removal action or initiation of the Remedial Investigation/Feasibility Study (RI/FS) if:
    - MEC identified and/or
    - Concentrations of MC in samples exceed risk-based action levels and background concentrations.
  - Provide sufficient data for the U.S. Environmental Protection Agency (USEPA) and the Army to prioritize future actions using the HRS and MRSPP.

## Roles & Responsibilities

- **USACE:** Acts as the executing agency for the DoD with regard to the FUDS program. In this role, the USACE has decision making authority and is responsible for ensuring work is conducted in accordance with applicable USACE and federal guidance. Additionally, USACE coordinates and works with project team members to meet needs expressed by regulatory agencies and stakeholders to the extent possible within programmatic guidelines.
- **Regulatory Agency:** Participates in planning of SI activities to ensure the project meets applicable state standards and requirements.
- **Property Owner(s):** Provides available and pertinent information about the area, provides insight on current and anticipated future land uses for the property, and participates in project team discussions.
- **Shaw:** As a contractor to the USACE, conducts work on behalf of the USACE, provides TPP materials, makes site information available to the project team through a web-based information portal, and conducts and reports SI activities.

## **Site Inspection Process**

- Data review,
- TPP,
- Site-Specific Work Plan (SSWP),
- SI field activities – reconnaissance, sampling, and analysis, and
- SI Report.

## **Technical Project Planning Process**

- Conduct TPP meeting(s)\* with key organizations and stakeholders;
- Identify stakeholder(s) concerns;
- Identify all AOCs for this SI;
- Review site information;
- Verify current and anticipated future land use;
- Develop CSM;
- Identify data gaps;
- Plan how to address data gaps;
- Develop DQOs for meeting SI requirements; and
- Concur on SI field work approach.

\* Second TPP meeting to be determined by team members during the first TPP meeting.

# ***Background Information***

***Site Inspection  
Ft. Flagler Military Reservation***

***Technical Project Planning Meeting  
July 24, 2006***

## **Site Description and Regulatory History**

Historical information (including references to interviews and historical documents) contained in this package was obtained from the *Archives Search Report* (ASR) (USACE, 2005) and *Inventory Project Report* (INPR) *Supplement* (USACE, 2004) for Ft. Flagler.

Ft. Flagler was originally used (1899 through 1946) as a coastal artillery battery to protect Puget Sound from enemy ships. Following World War II, the site was used for training engineers and amphibious units.

### **Site Location**

- The former Ft. Flagler is located in Jefferson County, Washington, near Port Townsend, Washington on the west side of Puget Sound (Figure 1).
- Ft. Flagler occupied 812.7 acres that were acquired between 1866 and 1952.

### **Physical Setting**

- Ft. Flagler lies within the Puget Trough Section of the Pacific Border Physiographic Province.
- The elevation of the area ranges from approximately sea level to 180 feet (ft).
- Ft. Flagler is a forested site containing conifers (fir and cedar) and deciduous (alder and oak) trees.
- The site is currently a state park, with campgrounds, picnic areas, buildings, and visitor facilities.
- Port Townsend, Washington, is the nearest incorporated community (approximately 18 miles by road and 4 miles by water) with a population of 8,810 (2004 estimated census).
- The climate at Ft. Flagler is a west coast marine type with comparatively cool, dry summers and mild but wet and cloudy winters. The area is within the “rain shadow” of the Olympic Mountains and is the driest area in western Washington State. The wettest months are generally November and December, with the driest months being July and August. The highest monthly average temperature for Port Townsend is 72.2 degrees Fahrenheit (°F) in August and the lowest monthly average temperature is 36.3 °F in January. Port Townsend’s average annual precipitation is 19.12 inches per year, with an average annual snowfall of 4 inches.
- Ft. Flagler FUDS is currently owned by the Washington State Parks Department and the United States Geological Survey, which maintains an experimental station at the site.
- Site access is uncontrolled.
- The former Ft. Flagler has six AOCs that include the Range Complex, Transition Range 1, Gas Chamber, Rocket Range, Transition Range 2, and Rifle Range.

**Previous Investigations and Regulatory History**

- Ft. Flagler was certified as being decontaminated in 1954 and again in 1959.
- A Findings and Determination of Eligibility and an INPR was completed in 1991, which concluded that Ft. Flagler had been formerly used by the War Department.
- In 1992, a time-critical removal action (TCRA) was completed to remove anti-tank rockets and other MEC from the rocket range.
- Thirteen underground fuel tanks were removed under the Hazardous, Toxic, and Radioactive Waste program (undated). MEC or MC related items were not address in the project.
- The USACE issued an INPR Supplement in 2004, which compiled available information for Ft. Flagler and identified AOCs. The INPR Supplement identified three AOCs: the Range Complex, the Rocket Range, and Transition Range 2 (location unknown). The Range Complex consisted of nine artillery batteries, Transition Range 1, and the Gas Chamber.
- The USACE issued an ASR in April 2005 that compiled available information on the history and use of Ft. Flagler, with emphasis on types and areas of ordnance use and disposal. The ASR included a visit to the site in July 2003. The primary purpose of the site visit was to assess the presence of MEC through non-intrusive means. The ASR identified two additional AOCs: the Rifle Range and the Quartermaster Wharf Disposal Area.
- A Risk Assessment Code (RAC) scoring was included in the ASR. The areas scored were grouped by site usage rather than by AOC name. Possible scores range from 5 (no risk) to 1 (high risk). Below are the RAC scores.

<b>Area</b>	<b>RAC Score</b>	<b>MEC Found</b>
Rocket Range	5	No
Rifle Range	5	No
Transition Range	5	No
Disposal Site (Quartermaster Wharf)	3	Yes – small arms
Remaining Lands	5	No
Offshore Ordnance Area	5	No

# **Operational History and MEC/MC Characteristics**

## **Historic Military Operations**

- The first 550 acres of land for Ft. Flagler was acquired by the government in 1866. Construction of the first coastal batteries did not begin until 1897. Additional acreage was acquired over the years until the site grew to 809 acres.
- Between 1900 and 1946, the site was used as a coastal defense installation.
- During World War II, the Navy also operated an underwater listening station at Ft. Flagler.
- In 1950, all harbor defenses around Puget Sound were abolished including Ft. Flagler. The site was used for amphibious training and maneuvers after the coastal artillery weapons were removed.
- In 1953, Ft. Flagler was closed and the property was eventually (1954) transferred to the State of Washington for use as a state park.

## **MEC/MC Characteristics**

- The MEC used at Ft. Flagler consisted of:
  - Coastal artillery batteries ranging in size from 3-inch to 12-inch,
  - Small arms,
  - 37 mm portable anti-aircraft guns,
  - .50 caliber machineguns, and
  - 2.36-inch and 3.5-inch anti-tank rockets.

## **Groundwater**

- The geology of the area is controlled by the last glaciation period between 12,000 and 15,000 years ago. Glacial deposits consist of thick sequences of glacial till and sand and gravel.
- Soil at the site consists of coastal beaches, Whidbey gravelly sandy loam, and Dick loamy sand.
- The depth to water, based on wells immediately south of the park is between 58 to 125 ft.

## **Surface Water**

- There are no streams or fresh surface water on the site.
- Puget Sound, a inner coastal waterway (salt water) surrounds the site on three sides (north, east, and west)

## **Terrestrial Exposure**

- Based on the size and population of Jefferson County, Washington, the population density is approximately 10 persons per square mile.
- Ft. Flagler has permanent residents (park employees) and offers camping facilities to recreational users.
- The area south of Ft. Flagler is populated with private residences.
- The ASR identified only occasional transient bald eagles as the only protected species. The Washington Department of Fish and Wildlife and the U.S. Fish and Wildlife Service have been contacted to provide specific information about the site.
- There is one known archeological site located within at Ft. Flagler. The specific location is not known. The office of Archaeology and Historic Preservation will be contacted to provide up-to-date information on the site.
- Ft. Flagler is listed on both the National Register of Historic Places and on the Washington Heritage Register.

## **Air**

- Ft. Flagler State Park has full and part-time residents on site.
- The town of Port Townsend is approximately 4 miles to the west of the site.

# *Conceptual Site Model*

*Site Inspection  
Ft. Flagler Military Reservation*

*Technical Project Planning Meeting  
July 24, 2006*

## Overview

A site-specific CSM summarizes available site information and identifies relationships between exposure pathways and associated receptors. A CSM is used to determine the data types necessary to describe site conditions and quantify receptor exposure, and discusses the following information:

- Current site conditions and future land use;
- Potential contaminant sources (e.g., lead projectiles in an impact berm);
- Affected media;
- Governing fate and transport processes (e.g., surface water runoff and/or groundwater migration);
- Exposure media (i.e., media through which receptors could contact site-related contamination);
- Routes of exposure (e.g., inhalation, incidental ingestion, and dermal contact); and
- Potential human and/or representative ecological receptors at the exposure point. Receptors likely to be exposed to site contaminants are identified based on current and expected future land uses.

The CSM is evaluated for completeness and further developed as needed through TPP meetings. Based on a review of documents and the discussion during the TPP meeting, following AOCs and subranges are identified within the Ft. Flagler FUDS:

- Range Complex:
  - Battery Bankhead,
  - Battery Calwell,
  - Battery Downes,
  - Battery Gratton,
  - Battery Lee,
  - Battery Rawlins (includes Anti-torpedo Boat Battery),
  - Battery Revere,
  - Battery Wansboro,
  - Battery Wilhelm, and
  - Anti-Aircraft Artillery Battery.
- Transition Range 1,
- Gas Chamber,
- Rocket Range,
- Transition Range 2 (included in Rocket Range), and
- Rifle Range.

CSMs are provided for these AOCs. MEC and MC are analyzed individually within the CSM.

The location of two potential AOCs could not be identified. The pistol range has not been located, but it is suspected that it was collocated with the rifle range. The locations of the 37 mm mobile artillery and caliber .50 machine guns is unknown. The ASR stated that the assessment team thought that the likely locations of the 37 mm artillery and machine guns were at gun batteries that were abandoned prior to World War II.

The Off Shore Ordnance Area consists of the impact areas used for test firing the artillery guns. The impacts areas are within Puget Sound at least several hundred years offshore. The offshore area is not discussed in this TPP package.

## **Conceptual Site Model – Range Complex AOC**

The CSM evaluates potential exposure pathways related to range operation and configuration relative to physical features and land use. Based on the CSM, sampling schemes are proposed for each area to evaluate potential human health and ecological impacts. Historical photos of the ranges (if available) are carefully examined for possible disturbances or other site features of interest in order to focus the efforts on areas where MC contamination is most likely to occur.

The Range Complex AOC consists of 10 coastal artillery batteries. Figures 2, 3, and 4 show the locations of the batteries. The batteries include:

- Battery Bankhead,
- Battery Calwell,
- Battery Downes,
- Battery Gratton,
- Battery Lee,
- Battery Rawlins,
- Battery Revere (Anti-Torpedo Boat Battery),
- Battery Wansboro,
- Battery Wilhelm, and
- Anti-Aircraft Artillery Battery.

### **Current and Future Land Use**

- Currently, the site is used as a State Park that offers camping, boating, fishing, shoreline use, hiking, and historical interpretive information.
- The use as a State Park will likely continue into the foreseeable future.

### **Potential Contaminant Sources – Range Complex**

- The ASR identified that the Range Complex AOC was used as a coastal defense battery. The range fans for the batteries were out over Puget Sound beyond the FUDS boundary and no firing onto land occurred. The Anti-Torpedo Boat Battery was located at Battery Revere after the original 10-inch gun tubes were removed in 1941. It is unknown how often the artillery guns were fired or whether the firing included high explosive rounds in addition to inert practice rounds. In a report dated 1933, it was stated that the two guns at Battery Revere were fired 111 and 94 times, respectively, as part of a testing program.

## **MEC Evaluation**

### **Types of MEC**

- Potential MEC within the Range complex are listed on Table 1 and include propellant charges, artillery shells, and projectiles. An explosive hazard could exist if artillery shells or propellant charges were improperly handled at the batteries and discarded nearby. However, based on over 50 years of park use surrounding the batteries, no evidence of MEC has been reported. MEC is not expected at the coastal batteries.

### **Surface Exposure Pathway**

- Because of the unlikely occurrence of MEC at the batteries, the surface exposure pathway is considered incomplete.

### **Subsurface Exposure Pathway**

- Because of the unlikely occurrence of MEC at the batteries, the subsurface exposure pathway is considered incomplete.

### **MEC Evaluation/Investigation Needed**

- Since there is no complete pathway for MEC at the Range Complex, visual reconnaissance surveys will not be performed.

## **MC Evaluation**

### **Types of MC**

- The anticipated MC at the Ft. Flagler Range Complex are explosives and lead and steel from projectiles.
- The propellants were either single-base (nitrocellulose) or double-base type (nitrocellulose and nitroglycerine).
- Explosives from projectiles (TNT and ammonium picrate).

### **Overview of Pathways**

Affected media and potential pathways for MC include:

- **Soil:** At the Range Complex, soil is the primary medium of concern because of possible MC in the soil from training activities. The soil also serves as a secondary source of potential air, sediment, surface water, or groundwater contamination.
- **Sediment/Surface Water:** Metals and explosives may accumulate in sediments, which may impact surface water. Surface water may act as a migration pathway to humans and ecological receptors from potential sources in soils and sediments. However, there is no developed surface water drainage at Ft. Flagler. The primary surface water at Ft. Flagler consists of Puget Sound, a very large, tidal, saltwater body that contains abundant ecological receptors. Surface water will be evaluated via sediments
- **Groundwater:** Groundwater is considered a potentially affected media because it is present within 100 ft of ground surface. However, the groundwater pathway may not be complete as there are no downgradient groundwater users.

- Air: Air is a potential medium of concern due to the possibility of inhalation of contaminated soil particles. However, air is not an affected media under current land use, thus the pathway is incomplete.

Exposure media at the Ft. Flagler Range Complex AOC include soil and sediment/surface water. A pathway evaluation for each media is discussed below and provided in Table 2.

## **Soil Exposure Pathway**

### **Exposure Routes**

- The potential routes of human exposure to contaminated soils include incidental ingestion of and dermal contact with contaminated media, as well as inhalation of soil particulates during intrusive work.
- The potential routes of wildlife exposure to contaminated soils include ingestion of and direct contact with contaminated media. Plants may uptake MC and then subsequently be eaten by wildlife. Burrowing animals may ingest MC-contaminated soil and subsequently be eaten by predators.

### **Receptors**

- Park workers and visitors.
- Wildlife.

### **MC Soil Evaluation/Investigation Needed**

- One composite soil sample is proposed to be collected from each of the ten artillery batteries. Samples will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives.

## **Sediment/Surface Water Exposure Pathway**

### **Exposure Routes**

- The potential routes of human exposure to contaminated sediment/surface water include incidental ingestion and dermal contact with sediments.
- The potential routes of wildlife (including aquatic organisms) exposure to contaminated sediment/surface water include ingestion of and direct contact with sediment.

### **Receptors**

- Park workers and visitors.
- Wildlife.

### **MC Sediment/Surface Water Evaluation/Investigation Needed**

- One sediment sample will be collected from water collection areas near two of the artillery batteries. Sediment samples to be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives.
- No surface water samples will be collected. Any release of potential contaminants to Puget Sound would not be expected to persist in detectable concentrations.

## **Conceptual Site Model – Transition Range 1 AOC**

The CSM evaluates potential exposure pathways related to range operation and configuration relative to physical features and land use. Based on the CSM, sampling schemes are proposed for each area to evaluate potential human health and ecological impacts. Historical photos of the ranges (if available) are carefully examined for possible disturbances or other site features of interest in order to focus the efforts on areas where MC contamination is most likely to occur.

The Transition Range 1 is a single AOC shown on Figure 5. The outline of this AOC is taken from the ASR rather than the earlier published INPR Supplement and is considered more representative of the AOC extent.

### **Current and Future Land Use**

- Currently, the AOC is part of the State Park, and is located south of the Cantonment Area, park administrative offices, and visitor areas.
- The AOC has hiking trails traversing through it.
- The use as a State Park will likely continue into the foreseeable future.

### **Potential Contaminant Sources – Transition Range 1**

- The INPR Supplement identified that the Transition Range 1 was used between 1942 and 1954 for small arms use.

### **MEC Evaluation**

#### **Types of MEC**

- Because this AOC was used for small arms only, MEC (other than small arms) is not expected to be present. The potential for live small arms rounds exists, but these do not pose a significant explosive hazard.

#### **Surface Exposure Pathway**

- Because there is no MEC at this AOC, the surface exposure pathway is considered incomplete.

#### **Subsurface Exposure Pathway**

- Because there is no MEC at this AOC, the subsurface exposure pathway is considered incomplete.

#### **MEC Evaluation/Investigation Needed**

- No visual reconnaissance surveys will be completed within the Transition Range 1 AOC as there is no MEC expected to be present.

## **MC Evaluation**

### **Types of MC**

- The anticipated MC at the Ft. Flagler Transition Range 1 AOC is lead from small arms. Propellants (single- or double-base powder) for the small arms are not thought to pose a significant impact.

### **Overview of Pathways**

Affected media and potential pathways for MC include:

- **Soil:** At the Transition Range 1 AOC, soil is the primary medium of concern because of possible MC in the soil from training activities. The soil also serves as a secondary source of potential air, sediment, surface water, or groundwater contamination.
- **Sediment/Surface Water:** Sediments may accumulate in the area through ponding of precipitation. Sediment also serves as a secondary source for surface water and groundwater contamination. There is no established surface water drainage at the AOC. The only nearby surface water is Puget Sound, a very large, tidal, saltwater body that contains abundant ecological receptors. Surface water will be evaluated via sediments.
- **Groundwater:** Groundwater is considered a potentially affected media because it is present within 100 ft of ground surface. However, the groundwater pathway is not complete as there are no downgradient groundwater users in the area.
- **Air:** Air is a potential medium of concern due to the possibility of inhalation of contaminated soil particles. However, air is not an affected media under current land use, thus the pathway is incomplete.

Exposure media at the Transition Range 1 AOC include soil and sediments/surface water. A pathway evaluation for each media is discussed below and provided in Table 2.

Figure 6 illustrates the CSM for the Transition Range 1 and potential pathway of MC contamination.

### **Soil Exposure Pathway**

#### **Exposure Routes**

- The potential routes of human exposure to contaminated soils include incidental ingestion of and dermal contact with contaminated media, as well as inhalation of soil particulates during intrusive work.
- The potential routes of wildlife exposure to contaminated soils include ingestion of and direct contact with contaminated media. Plants may uptake MC and then subsequently be eaten by wildlife. Burrowing animals may ingest MC-contaminated soil and subsequently be eaten by predators.

#### **Receptors**

- Park workers and visitors.
- Wildlife.

### **MC Soil Evaluation/Investigation Needed**

- Two composite soil samples are proposed to be collected from this AOC near the location of the target berm. Samples will be analyzed for lead only.

### **Sediment/Surface Water Exposure Pathway**

#### **Exposure Routes**

- The potential routes of human exposure to contaminated sediment include incidental ingestion and dermal contact with sediments/surface water.
- The potential routes of wildlife (including aquatic organisms) exposure to contaminated sediment include ingestion of and direct contact with sediment/surface water.

#### **Receptors**

- Park workers and visitors.
- Wildlife.

### **MC Sediment Evaluation/Investigation Needed**

- One sediment samples will be collected from a water collection area within the AOC. The sample will be analyzed for lead only.
- No surface water sample will be collect from Puget Sound. Because of the length of time since the DoD use of this AOC and the size of the body of water, any accumulation of contaminants in the water is expected to be below analytical detection limits.

## **Conceptual Site Model – Gas Chamber AOC**

The CSM evaluates potential exposure pathways related to range operation and configuration relative to physical features and land use. Based on the CSM, sampling schemes are proposed for each area to evaluate potential human health and ecological impacts. Historical photos of the ranges (if available) are carefully examined for possible disturbances or other site features of interest in order to focus the efforts on areas where MC contamination is most likely to occur.

The Gas Chamber is a single AOC and was located within the bunkered area of Battery Wansboro once the artillery guns were removed. The AOC location is shown on Figure 7. The outline of the AOC is from the INPR Supplement.

### **Current and Future Land Use**

- Currently, the AOC is part of the State Park and is within Battery Wansboro on the southeast side of the FUDS.
- The AOC is used by visitors on a daily basis.
- The use as a State Park will likely continue into the foreseeable future.

### **Potential Contaminant Sources – Gas Chamber**

- The INPR Supplement identified that the Gas Chamber was used between 1942 and 1954 for gas training of troops.

### **MEC Evaluation**

#### **Types of MEC**

- The only munitions identified as used at this AOC were gas grenades containing riot control agent CN-1. There is minimal explosive hazard associated with this munitions.

#### **Surface Exposure Pathway**

- Because there is no MEC at this AOC, the surface exposure pathway is incomplete.

#### **Subsurface Exposure Pathway**

- Because there is no MEC at this AOC, the subsurface exposure pathway is incomplete.

#### **MEC Evaluation/Investigation Needed**

- No visual reconnaissance surveys will be completed within the Gas Chamber AOC as there is no MEC expected to be present.

### **MC Evaluation**

#### **Types of MC**

- The MC at the Ft. Flagler Gas Chamber AOC is riot control agent CN-1. CN-1 is an irritant that is similar to mace.

## Overview of Pathways

Affected media and potential pathways for MC include:

- **Soil:** Soil is the primary medium of concern because of possible MC in the soil from training activities. However, riot control agents are not persistent and any release to soil would be expected to be neutralized by weathering and time and not be present in the soil today. There is no complete soil pathway.
- **Sediment/Surface Water:** Sediments may accumulate in the area through ponding of precipitation. There is no established surface water drainage at the AOC. The only surface water is Puget Sound. Riot control agents are not persistent and any release to sediment or surface water would be expected to be neutralized by weathering and time and not be present today. There is no complete sediment/surface water pathway.
- **Groundwater:** Groundwater is considered a potentially affected media because it is present within 100 ft of ground surface. However, riot control agents are not persistent and any release to soil and eventually groundwater would be expected to be neutralized by weathering and time and not be present in the soil today. There is no complete groundwater pathway.
- **Air:** Air is a potential medium of concern due to the possibility of inhalation of contaminated soil particles. However, air is not an affected media under current land use, thus the pathway is incomplete.

There are no complete exposure pathways for the Ft. Flagler Gas Chamber AOC.

## **Conceptual Site Model – Rocket Range AOC**

The CSM evaluates potential exposure pathways related to range operation and configuration relative to physical features and land use. Based on the CSM, sampling schemes are proposed for each area to evaluate potential human health and ecological impacts. Historical photos of the ranges (if available) are carefully examined for possible disturbances or other site features of interest in order to focus the efforts on areas where MC contamination is most likely to occur.

The Rocket Range is a single AOC and is shown on Figure 8. The Transition Range 2 AOC is also considered to be included within the footprint of the Rocket Range AOC; however, its location cannot be confirmed. The ASR suggested that it may have been located in the same area as the Rocket Range based on the finding of spent .30-caliber cartridges during the 1992 removal action and on aerial photo analysis that indicated very little cleared open ground that would be used as a transition range, other than the Rocket Range, between 1942 and 1954.

A portion of this AOC was cleared of unexploded ordnance (UXO) in 1992. The area cleared is shown on Figure 8. Throughout most of the clearance area, all vegetation (except standing trees) was removed and 100 percent of the ground surface was cleared using a handheld magnetometer. The eastern leg of the clearance area did not receive a 100 percent clearance due to heavy forestation and downed trees.

### **Current and Future Land Use**

- Currently, the AOC is part of the State Park and a camping area is located within this AOC. In addition, boating, fishing, shoreline use, and hiking occurs in this area.
- The use as a State Park will likely continue into the foreseeable future.

### **Potential Contaminant Sources – Rocket Range**

- The ASR identified that the Rocket Range was used between 1942 and 1954 for amphibious assault exercises. Munitions used included 3.5-inch and 2.36-inch rockets and small arms.
- During the 1992 UXO clearance the following MEC and MEC debris were recovered:
  - 172, 2.36-inch expended rocket motors
  - 3, 2.36 rockets with live warhead
  - 2, 2.36-inch rockets with live fuse
  - 2, 3.5-inch expended rocket motors
  - 1 live training hand grenade
  - 1 Bangalore torpedo fuse housing, inert
  - 12, Anti-tank/anti-vehicle mines, inert
  - 16 empty .30 caliber casings

## **MEC Evaluation**

### **Types of MEC**

- Potential MEC within the Range complex are listed on Table 1 and include rockets, hand grenades, mines, and, small arms. Explosive hazards from the mines and small arms are not expected.

### **Surface Exposure Pathway**

- The potential route of human exposure to MEC or munitions debris includes direct contact by vehicles, foot traffic, or handling. This would include park workers and visitors.
- The potential route of wildlife exposure to MEC or munitions debris would be by directly walking on them.

### **Subsurface Exposure Pathway**

- The potential routes of human exposure to MEC or munitions debris would be by intrusive drilling or digging activities. This includes park workers and visitors.
- The potential route of wildlife exposure to MEC or munitions debris would be by burrowing activities.

An analysis of the exposure pathways and receptors for MEC is provided in Table 2.

### **MEC Evaluation/Investigation Needed**

- A visual reconnaissance survey aided by a handheld magnetometer will be completed within the Rocket Range AOC. Based on the 1992 UXO clearance, there is a possibility that MEC is present in the eastern portion of the clearance area, which was not cleared to 100 percent due to heavy vegetation and downed trees.

## **MC Evaluation**

### **Types of MC**

- The anticipated MC at the Ft. Flagler Rocket Range AOC is steel from rockets, lead from small arms, propellant from the rocket motors, and explosives.
- The propellant for the 3.5-inch rockets likely contained potassium perchlorate.

### **Overview of Pathways**

Affected media and potential pathways for MC include:

- Soil: At the Rocket Range, soil is the primary medium of concern because of possible MC in the soil from training activities. The soil also serves as a secondary source of potential air, sediment, surface water, or groundwater contamination.
- Sediment/Surface Water: Sediments may accumulate in the area in small ponds or puddles. Sediment serves as a potential source for surface water, groundwater, and air

contamination. There is no established surface water drainage at the AOC. The only surface water is Puget Sound. Surface water will be evaluated via sediments.

- Groundwater: Groundwater is considered a potentially affected media because it is present within 100 ft of ground surface. However, the groundwater pathway is not complete as there are no downgradient groundwater users in the area.
- Air: Air is a potential medium of concern due to the possibility of inhalation of contaminated soil particles. However, air is not an affected media under current land use, thus the pathway is incomplete.

Exposure media at the Ft. Flagler Rocket Range AOC include only soil and sediment. A pathway evaluation for each media is discussed below and provided in Table 2.

## **Soil Exposure Pathway**

### **Exposure Routes**

- The potential routes of human exposure to contaminated soils include incidental ingestion of and dermal contact with contaminated media, as well as inhalation of soil particulates during intrusive work.
- The potential routes wildlife exposure to contaminated soils include ingestion of and direct contact with contaminated media. Plants may uptake MC and then subsequently be eaten by wildlife. Burrowing animals may ingest MC-contaminated soil and subsequently be eaten by predators.

### **Receptors**

- Park workers and visitors.
- Wildlife.

### **MC Soil Evaluation/Investigation Needed**

- Three composite soil samples are proposed to be collected from this AOC. Two of the samples will be collected at locations of expended rocket motors removed during the 1992 clearance action. The third sample will be randomly located in the eastern portion of the clearance area.
- Samples will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives.

## **Sediment Exposure Pathway**

### **Exposure Routes**

- The potential routes of human exposure to contaminated sediment include incidental ingestion and dermal contact with sediments.
- The potential routes of wildlife (including aquatic organisms) exposure to contaminated sediment include ingestion of and direct contact with sediment.

### **Receptors**

- Park workers and visitors.

- Wildlife.

#### **MC Sediment Evaluation/Investigation Needed**

- One sediment samples will be collected from a water collection area within the AOC. The sample will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives.
- No surface water sample will be collected. Because of the length of time since DoD use of this AOC, any accumulation of contaminants in Puget Sound is expected to be below analytical detection limits.

## **Conceptual Site Model – Rifle Range AOC**

The CSM evaluates potential exposure pathways related to range operation and configuration relative to physical features and land use. Based on the CSM, sampling schemes are proposed for each area to evaluate potential human health and ecological impacts. Historical photos of the ranges (if available) are carefully examined for possible disturbances or other site features of interest in order to focus the efforts on areas where MC contamination is most likely to occur.

The Rifle Range AOC is shown on Figure 4. The outline of this AOC is taken from the ASR and was not identified in the earlier published INPR Supplement. The ASR identified that there was a rifle range near the lighthouse when Ft. Flagler was first built. The butt to this range was torn down in 1932 to salvage lead and copper from the expended bullets. A new range was built on the same location during World War II.

### **Current and Future Land Use**

- Currently, the AOC is part of the State Park, near the lighthouse at Marrowstone Point.
- The AOC has hiking trails traversing through it.
- The use as a State Park will likely continue into the foreseeable future.

### **Potential Contaminant Sources – Rifle Range**

- The ASR identified that the Rifle Range was used between 1942 and 1954 for small arms use.

### **MEC Evaluation**

#### **Types of MEC**

- Because this AOC was used for small arms only, MEC (other than small arms) is not expected to be present. The potential for live small arms rounds exists, but these do not pose a significant explosive hazard.

#### **Surface Exposure Pathway**

- Because there is no MEC at this AOC, the surface exposure pathway is incomplete.

#### **Subsurface Exposure Pathway**

- Because there is no MEC at this AOC, the subsurface exposure pathway is incomplete.

#### **MEC Evaluation/Investigation Needed**

- No visual reconnaissance surveys will be completed within the Rifle Range AOC as there is no MEC expected to be present.

## **MC Evaluation**

### **Types of MC**

- The anticipated MC at the Ft. Flagler Rifle Range AOC is lead from small arms. Propellants (single- or double-base powder) for the small arms are not thought to pose a significant impact.

### **Overview of Pathways**

Affected media and potential pathways for MC include:

- **Soil:** At the Rifle Range AOC, soil is the primary medium of concern because of possible MC in the soil from training activities. The soil also serves as a secondary source of potential air, sediment, surface water, or groundwater contamination.
- **Sediment/Surface Water:** Sediments may accumulate in the area through ponding of precipitation. The sediment also serves as a secondary source for surface water and groundwater contamination. There is no established surface water drainage at this AOC. The only surface water is Puget Sound. Surface water will be evaluated via sediments.
- **Groundwater:** Groundwater is considered a potentially affected media because it is present within 100 ft of ground surface. However, the groundwater pathway is not complete as there are no downgradient groundwater users in the area.
- **Air:** Air is a potential medium of concern due to the possibility of inhalation of contaminated soil particles. However, air is not an affected media under current land use, thus the pathway is incomplete.

Exposure media at the Ft. Flagler Rifle Range AOC include only soil and sediments. A pathway evaluation for each media is discussed below and provided in Table 2.

Figure 9 illustrates the CSM for the Rifle Range and potential pathway of MC contamination.

### **Soil Exposure Pathway**

#### **Exposure Routes**

- The potential routes of human exposure to contaminated soils include incidental ingestion of and dermal contact with contaminated media, as well as inhalation of soil particulates during intrusive work.
- The potential routes of wildlife exposure to contaminated soils include ingestion of and direct contact with contaminated media. Plants may uptake MC and then subsequently be eaten by wildlife. Burrowing animals may ingest MC-contaminated soil and subsequently be eaten by predators.

#### **Receptors**

- Park workers and visitors.
- Wildlife.

### **MC Soil Evaluation/Investigation Needed**

- Two composite soil samples are proposed to be collected from this AOC near the location of the target berm. Samples will be analyzed for lead only.

### **Sediment/Surface Water Exposure Pathway**

#### **Exposure Routes**

- The potential routes of human exposure to contaminated sediment include incidental ingestion and dermal contact with sediments.
- The potential routes of wildlife (including aquatic organisms) exposure to contaminated sediment include ingestion of and direct contact with sediment.

#### **Receptors**

- Park workers and visitors.
- Wildlife.

### **MC Sediment Evaluation/Investigation Needed**

- One sediment samples will be collected from a water collection area within the AOC. The sample will be analyzed for lead only.

## Data Gaps

- The SI being performed at Ft. Flagler will identify MEC and MC impacts to soil and sediments at the FUDS.
- The presence of MEC was established at the Ft. Flagler Rocket Range following a clearance action in 1992 by the discovery of live 2.36-inch rockets and MEC debris. It is uncertain whether additional MEC is present south of the area cleared at the Rocket Range.
- No other MEC has been reported.

Results of the current status of data requirements with respect to MEC and MC for the AOCs are summarized below:

<b>AOC</b>	<b>Presence of MEC</b>	<b>Presence of MC</b>	<b>Proposed Inspection Activities</b>
Range Complex	None	Unknown	Collect soil samples from 10 battery locations, collect 2 sediment samples. Analyze for select metals and explosives.
Transition Range 1	Small arms	Unknown	Collect two soil samples and one sediment sample. Analyze for lead.
Gas Chamber	None	None	None
Rocket Range	Unknown	Unknown	Collect three soil samples and one sediment sample. Analyze for select metals and explosives.
Rifle Range	Small arms	Unknown	Collect two soil samples and one sediment sample. Analyze for lead.

# *Proposed Sampling Scheme*

*Site Inspection  
Ft. Flagler Military Reservation*

*Technical Project Planning Meeting  
July 24, 2006*

## **Proposed Field Investigation**

The proposed field investigation sampling to be conducted at Ft. Flagler is detailed below. The investigation approach will be defined in more detail in an SSWP that will be submitted to Washington Department of Ecology and other stakeholders for review. The SSWP will reference technical details including sampling and analytical methods that are described in the *Type I Work Plan, Site Inspections at Multiple Sites* (Work Plan) prepared by Shaw and submitted to USACE as final in February 2006.

### **Reconnaissance**

A visual reconnaissance of portions of the Rocket Range will be performed to assess the presence/absence of MEC within the eastern portion of the AOC. The inspection will be conducted by a qualified UXO technician, with the aid of a handheld magnetometer to assess the presence or absence of MEC within a portion of the AOC. Several transects will be walked during which visual observations and magnetic anomalies will be noted. Transects will be recorded using a global positioning system (GPS), and appropriate features influencing the survey will be noted, such as vegetation density and type, topography, etc. If MEC is found, the qualified UXO technician will attempt to make a determination of the hazard, and appropriate notifications will be made as detailed in the Work Plan and SSWP.

A visual reconnaissance, aided by a magnetometer, of AOCs will be performed prior to any sampling. Although MEC is not expected to be present on the land surface, a magnetometer-assisted, visual inspection will be conducted by a qualified UXO technician at suspect locations within the AOC. A GPS will be used to record discovered MEC, munitions debris, and sample point locations. Digital photographs will be taken to document significant features.

### **Soils**

Surface soil samples will be collected at a depth of approximately 0 to 6 inches below ground surface. Surface soil samples will be composite samples (7-point, wheel pattern with 2-foot radius). The proposed soil sampling for the AOCs at Ft. Flagler is shown in Table 3.

### **Sediment**

Sediment samples will be collected from 0 to 2 inches depth but will be discrete samples in order to retrieve material from specific, localized, water collection areas. The proposed sediment sampling for the AOCs at Ft. Flagler is shown in Table 3.

### **Analyses**

Soil samples will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) or lead by USEPA SW-846 Method 6020A. Sediment samples will also be analyzed for the same metals or lead by Method 6020A. Soil and sediment samples may have been impacted by small arms fire; samples will be passed through an ASTM No. 10 (2-mm) wire mesh sieve at the laboratory prior to analysis for metals in order to remove coarser particles and foreign objects, including large metallic fragments from bullets, which have

a low degree of bioavailability (Interstate Technical and Regulatory Council, 2003, *Characterization and Remediation of Soils at Closed Small Arms Firing Ranges*).

Soil and sediment samples will be analyzed for explosives by USEPA SW-846 Method 8330A.

### **Background Sampling**

Ten background soil and one background sediment samples will be collected. The composite soil sample locations will be determined in the field in areas that do not appear to have been impacted by past site operations. The soil background samples will be used to develop an upper tolerance limit for comparison of metals soil concentrations at the target areas. The background sediment sample data will provide data to compare sediment samples to background values. The proposed background sampling is summarized in Table 3.

***TPP Meeting Notes  
and Data Quality Objectives***

***Site Inspection  
Ft. Flagler Military Reservation***

***Technical Project Planning Meeting  
July 24, 2006***

## Technical Project Planning and Development of Data Quality Objectives

- The USACE TPP process is a four-phase process:
  - Identify the current project,
  - Determine data needs,
  - Develop data collection options, and
  - Finalize data collection program.
- The purpose of TPP is to develop DQOs that document how the project makes decisions.
- DQOs are intended to capture project-specific information such as the intended data use(s), data needs, and how these items will be achieved.
- Information captured through DQOs will be used as a benchmark for determining whether identified objectives are met.

## TPP Phases

### Phase I: Identify the Current Project

1. Team members identified to date include: USACE – representatives from the Omaha Design Center and the Seattle District, Shaw as a USACE contractor, Washington Department of Ecology, Washington State Parks, and USEPA Region 10.

**Question: Is there any person or organization missing from this Team?**

2. The AOCs are identified as:
  - Range Complex
    - Battery Bankhead
    - Battery Calwell
    - Battery Downes
    - Battery Gratton
    - Battery Lee
    - Battery Rawlins (Anti-torpedo Boat Battery)
    - Battery Revere
    - Battery Wansboro
    - Battery Wilhelm
    - Anti-Aircraft Artillery Battery

- Transition Range 1
- Gas Chamber
- Rocket Range
- Transition Range 2
- Rifle Range

**Question: Are there any other AOCs to be identified?**

The ASR identified the Quartermaster Wharf Beach as a potential AOC. The area appears to be a disposal site where unwanted supplies were discarded on the beach. A park volunteer found two, five-round .30 caliber ammunition clips on the beach. No other MEC has been located.

3. Based on information available about the site and shared through discussions with USACE, are there concerns about this area that have been expressed by the Washington Department of Ecology, USEPA, or Washington State Parks, as well as by landowners.

**Question: Are there additional concerns or issues from landowners or other stakeholders regarding the Ft. Flagler area?**

**Question: Are there any administrative or stakeholder concerns or constraints that would prevent site inspection activities from going forward on the decision path for this site?**

## **Phase II: Determine Data Needs**

4. Existing site information includes an INPR Supplement and ASR both prepared by the USACE in 2004 and 2005, respectively. In addition, a TCRA was completed in 1992 at the Rocket Range.

**Question: Are there any other pertinent documents relating to the site available?**

5. The site-specific approach for this SI involves collating and assessing available site information, to include site geology, hydrogeology, groundwater, surface water, ecological information, human use/access, and current and future land uses, as well as considering conduct of site inspection and sampling activities.

**Question: Are there any other site aspects/information that should be considered?**

6. Based on site use, soil is the primary affected medium at Ft. Flagler. Sediment/surface water is a potential pathway of MC because of the contact with park workers and visitors and wildlife and impacts to Puget Sound. Groundwater is not considered a pathway as there are no nearby downgradient wells. Air is also a potential pathway if soil particles become airborne. Considering current and future land use, primary receptors of any contaminants that may be present would most likely be individuals and animals using the area.

**Question: Do team members concur with the CSM?**

- **MEC will only be evaluated at the Rocket Range.**
  - **MC will be evaluated at the Range Complex, Transition Range 1, Rocket Range, and Rifle Range.**
  - **MC contaminants of concern are select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives at the Range Complex and Rocket Range, and lead only at the Transition Range 1 and Rifle Range.**
  - **No sampling at the Gas Chamber.**
  - **Exposure pathways are through soils and sediments/surface water.**
7. Technical considerations and/or constraints need to be identified and addressed before conducting any additional sampling, and would depend on the approach and additional data needs decided upon by team members.

**Questions:**

- **Are any data missing?**
- **What is the nature of needed data?**
- **What information is necessary to support a decision of No Department of Defense Action Indicated (NDAI) or further action with regards to MEC? Is reconnaissance during the SI, together with the historical record of a munitions clearance at the time of range closure and a period of approximately 50 years without known MEC-related incidents, considered sufficient to determine the need for NDAI versus further action with respect to MEC?**
- **What data gaps would additional data meet for making a decision about the site?**
- **Are there any considerations/constraints that need to be addressed for collecting additional data?**

### **Phase III: Develop Data Collection Options**

8. Proposed approach:

1. Conduct surface reconnaissance with magnetometer at Rocket Range for MEC.
2. Find suitable soil background sample locations (10 total) and sample.
3. Find suitable sediment background sample location (1 total) and sample.
4. Collect composite soil samples and analyze for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives at the Range Complex and Rocket Range, and lead only at the Transition Range 1 and Rifle Range.
5. Collect discrete sediment samples from water collection areas at two locations in the Range Complex, and one location each at the Transition Range 1, Rocket Range, and Rifle Range. Analyze for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives at the Range Complex and Rocket Range and lead only at the Transition Range 1 and Rifle Range.

**Question: Based on the desired decision endpoints and information known to date, what additional information is needed to reach a determination of NDAI or further action?**

- The following reconnaissance results would support a recommendation for further action with respect to MEC:
  - Direct evidence is found of the presence of MEC, other than small arms, or evidence of potential MEC that is inconsistent with the Rocket Range CSM (e.g., debris from rockets, hand grenades, land mines.
  - Direct evidence of MEC is not found, but abundant munitions debris ( other than from small arms) and/or magnetic anomalies are identified suggesting a potential for the presence of unexploded spotting charges or other MEC.
- The following reconnaissance results would support a recommendation for NDAI with respect to MEC:
  - Direct evidence of MEC is not found; isolated munitions debris and/or magnetic anomalies consistent with the Rocket Range CSM are identified.
  - No evidence of MEC, munitions debris, or magnetic anomalies are identified.

**Question: Are the stakeholders in agreement with the sampling approach program?**

**Question: Are the stakeholders in agreement with the proposed approach for collecting background data?**

## Phase IV: Finalize Data Collection Program

9. What concentrations of PCOCs (metals and explosives) lead to decision end-points?

Note: Washington State standards are provided in Tables 4, 5, and 6.

**Question: Are these the correct standards to be applied as screening values for human health and ecological risk assessment?**

**Question: Are there any additional sampling and analysis methodologies needed for all team members to arrive at a decision end-point?**

**Question: Given the additional sampling and analysis methodologies, are there impacts to the project schedule that need to be accommodated?**

## Data Quality Objectives

Upon agreement at the TPP meeting, the following decision rules will be applied with regard to MC sampling results:

- Below risk-based screening levels = NDAI;
- Above risk-based screening levels and background = RI/FS.

The following expanded project objectives have been developed.

**Objective 1: Determine if the site requires additional investigation or can be recommended for NDAI based on the presence or absence of MEC.**

DQO #1 – Utilizing trained UXO personnel and handheld magnetometers, a visual search of the Rocket Range will be conducted searching for physical evidence to indicate the presence of MEC (rockets, hand grenades, land mines), MEC on the surface, munitions debris, and soil discoloration indicative of explosives). The visual search will consist of a meandering path survey along trails and in accessible areas. The following decision rules will apply:

- The following reconnaissance results would support a recommendation for further action with respect to MEC:
  - Direct evidence is found of the presence of MEC, other than incidental small arms rounds, or evidence of potential MEC that is inconsistent with the rocket range

CSM (e.g., debris from munitions other than rockets, hand grenades, or land mines).

- Direct evidence of MEC is not found, but abundant munitions debris and/or magnetic anomalies, other than from small arms, are identified suggesting a potential for the presence of unexploded MEC.
- The following reconnaissance results would support a recommendation for NDAI with respect to MEC:
  - Direct evidence of MEC is not found; isolated munitions debris and/or magnetic anomalies consistent with the air-to-ground gunnery range CSM are identified.
  - No evidence of MEC, munitions debris, or magnetic anomalies are identified.
- If there is indication of an imminent MEC hazard, the site may be recommended for a TCRA.

**Objective 2: Determine if the site requires additional investigation or can be recommended for NDAI based on the presence or absence of MC above screening values.**

DQO#2 – Soil and sediment samples will be collected and analytical results will be compared to screening values for human health and ecological risk assessment, and to background values for naturally occurring substances. The following decision rules will apply:

- If sample results are less than human health and ecological screening values, the site will be recommended for NDAI relative to MC.
- If sample results exceed both human health screening values and background values, the site will be recommended for additional investigation.
- If sample results do not exceed human health screening values but do exceed both ecological screening values and background values, additional evaluation of the data will be conducted in conjunction with the stakeholders to determine if additional investigation is warranted.

**Objective 3: Obtain data required for HRS scoring.**

Data required for HRS scoring are identified in the HRS Data Gaps worksheet.

**Objective 4: Obtain data required for MRSPP ranking.**

Data required for MRSPP ranking are identified in the MRSPP worksheet.

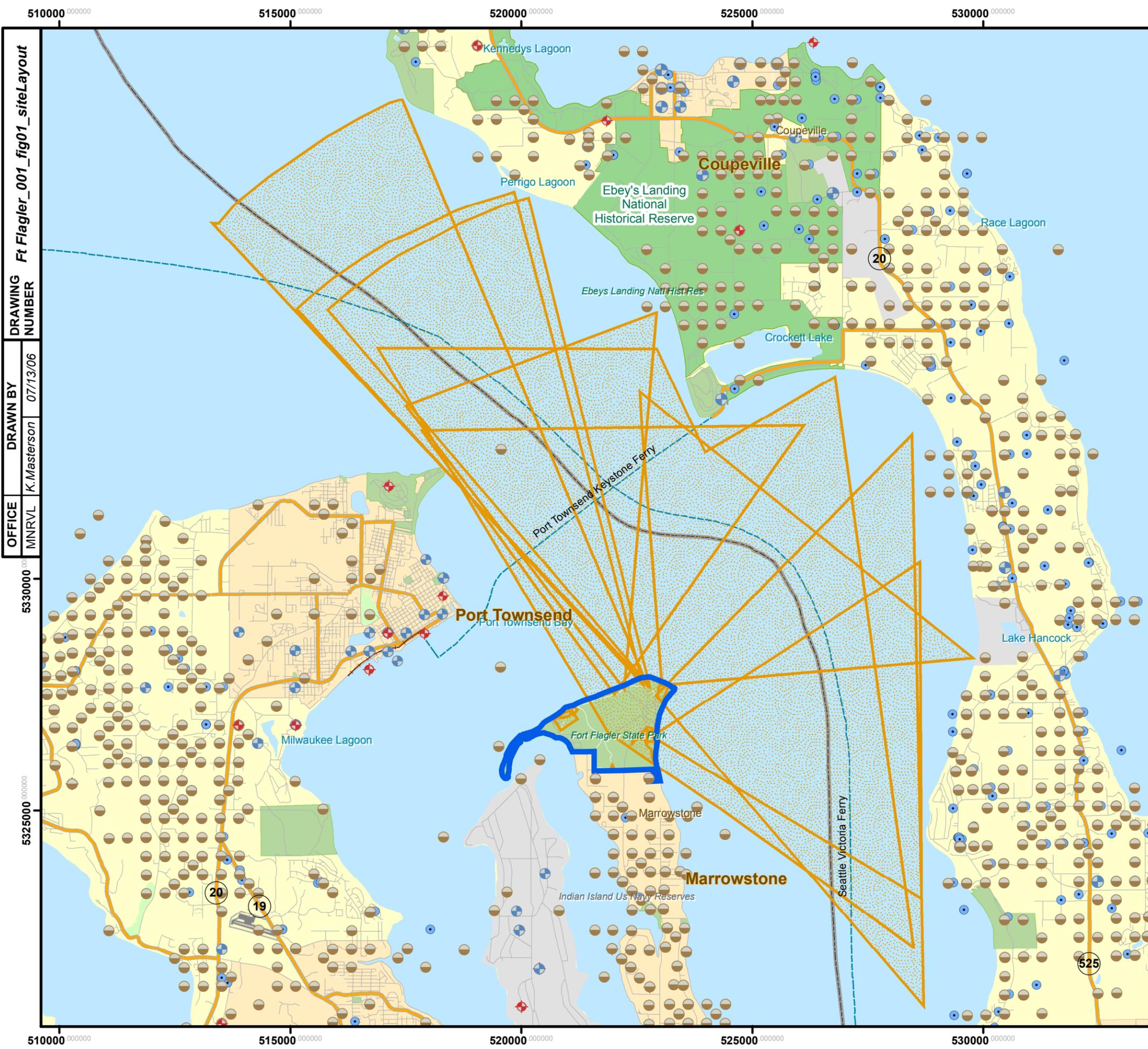
## **Next Steps**

- Scheduling of a 2nd TPP meeting will occur as agreed upon by team members.
- Shaw will prepare the TPP Memorandum and distribute for concurrence.
- Shaw will prepare the SSWP for review and comment.
- USACE will obtain necessary ROEs.
- Shaw will collect samples.
- Shaw will prepare the SI Report.

# *Figures*

*Site Inspection  
Ft. Flagler Military Reservation*

*Technical Project Planning Meeting  
July 24, 2006*



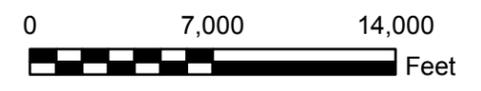
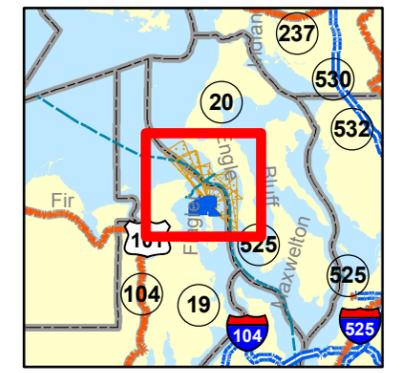
DRAWING NUMBER: Ft Flagler\_001\_fig01\_siteLayout  
 DRAWN BY: K. Masterson  
 DATE: 07/13/06  
 OFFICE: MNRVL

**Legend**

- Fort Flagler Military Reserve Property Boundary
- Fort Flagler Area of Concern
- Dept. of Health Water Source
- + Abandoned Well
- + Resource Protection
- Water Well

**NOTES:**

- 1) AOC boundaries were derived from the Fort Flagler Military Reservation ASR and INPR Supplement.
- 2) Groundwater well data were obtained from Washington State Dept. of Ecology and DOH.
- 3) This property is located within the Puget Sound Watershed.



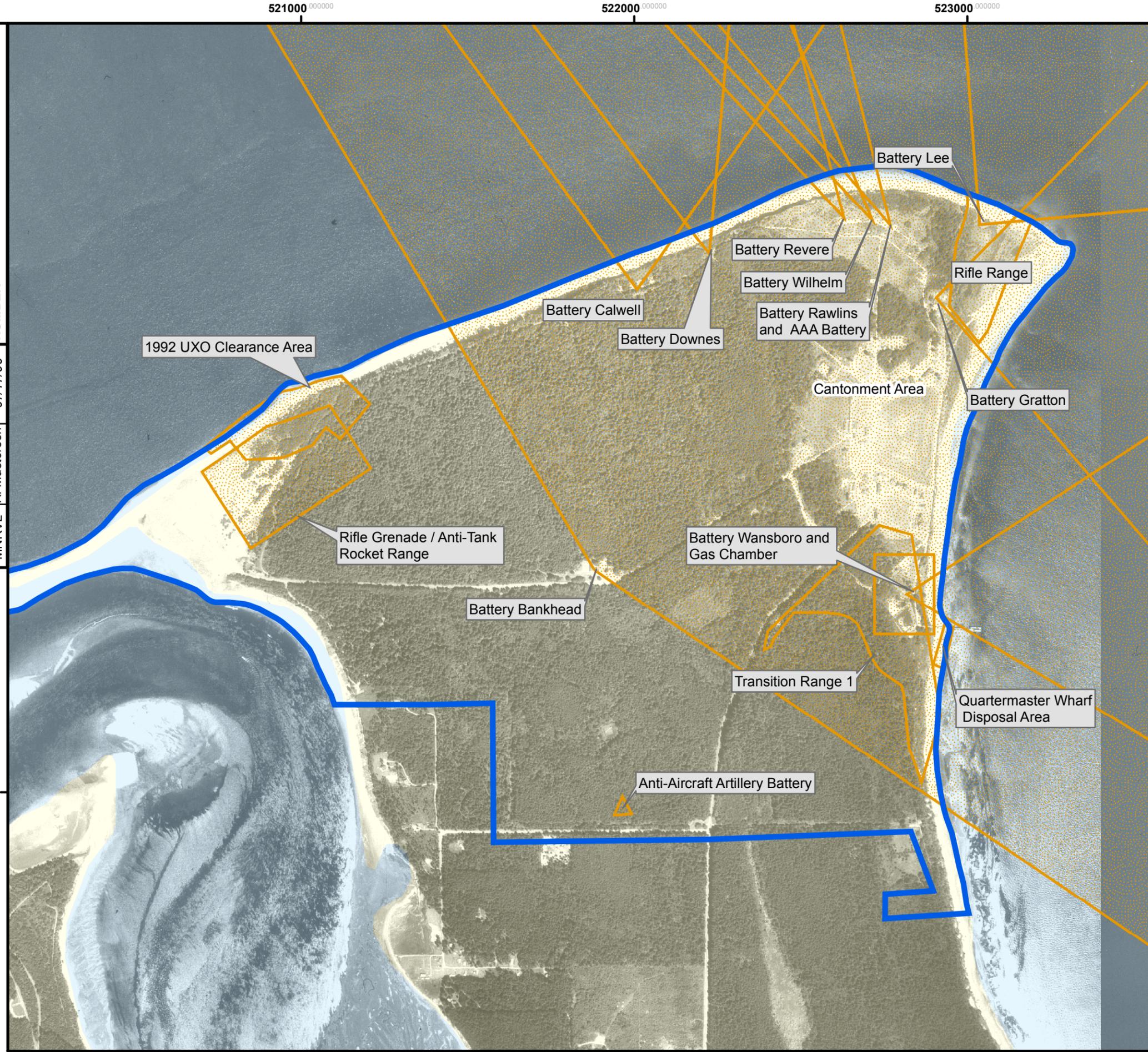
REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

**U.S. ARMY CORPS OF ENGINEERS**  
 OMAHA DESIGN CENTER

**FIGURE 1**  
**SITE LAYOUT**  
 FORT FLAGLER MILITARY RESERVATION

**Shaw** Shaw Environmental, Inc.

DRAWING NUMBER: Ft Flagler\_002\_fig02\_park  
 DRAWN BY: K. Masterson  
 DATE: 07/17/06  
 OFFICE: MNRVL



**Legend**

- Fort Flagler Military Reserve Property Boundary
- Fort Flagler Area of Concern

**NOTES:**  
 1) AOC boundaries were derived from the Fort Flagler Military Reservation ASR and INPR Supplement.  
 2) The aerial photo was obtained from TerraServer (1-meter resolution); the photo is dated June 21, 1990.



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N



U.S. ARMY CORPS OF ENGINEERS  
 OMAHA DESIGN CENTER

**FIGURE 2**  
**FT. FLAGLER MILITARY RESERVATION**  
**AOC LOCATION MAP**

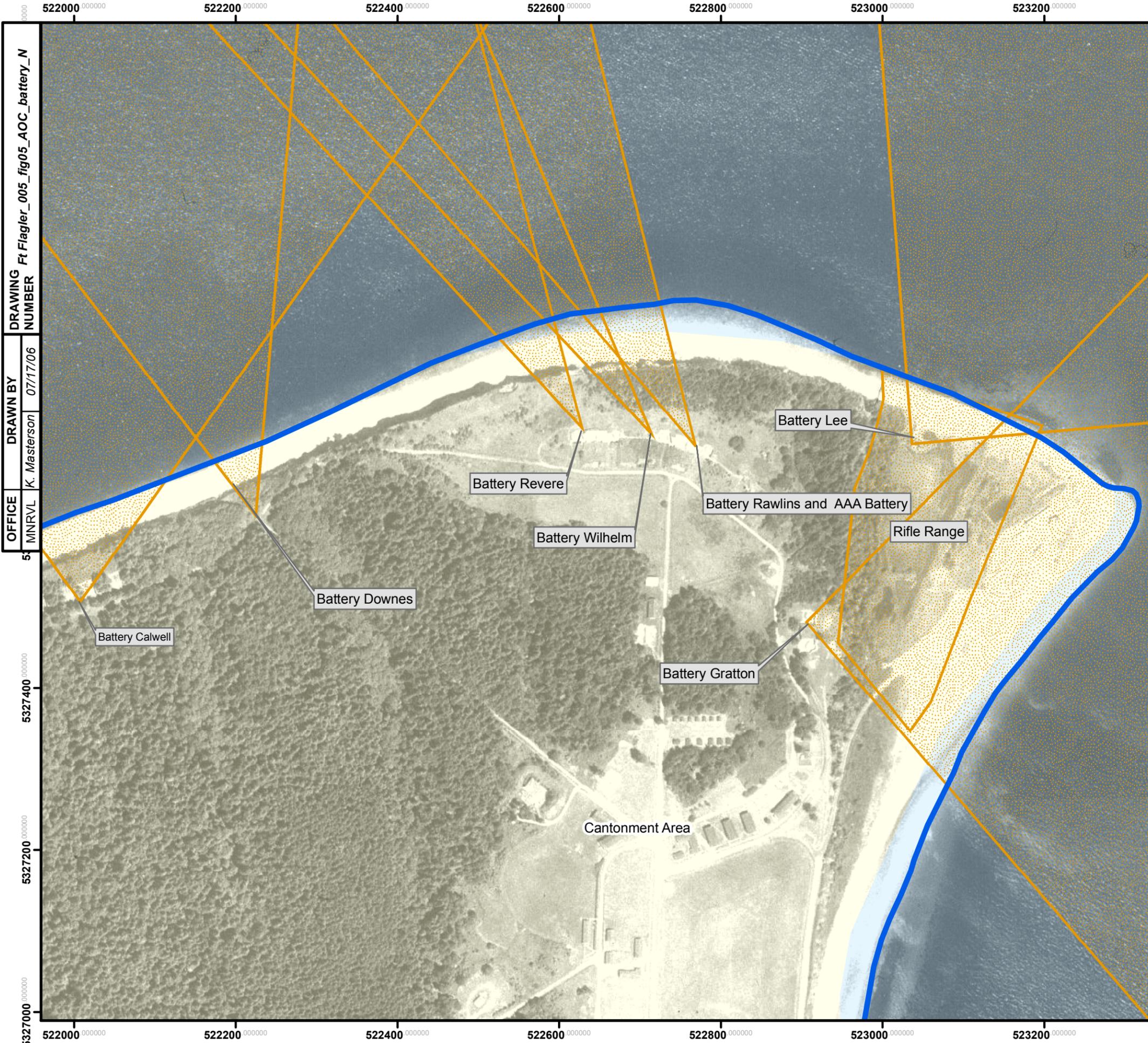
FORT FLAGLER MILITARY RESERVATION



521000 000000 522000 000000 523000 000000

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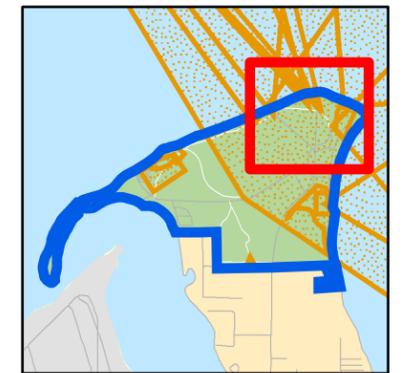
DRAWING NUMBER: Ft Flagler\_005\_fig05\_AOC\_battery\_N  
 DRAWN BY: K. Masterson  
 DATE: 07/17/06  
 OFFICE: MNRVL

**Legend**

- Fort Flagler Military Reserve Property Boundary
- Fort Flagler Area of Concern

**NOTES:**

- 1) AOC boundaries were derived from the Fort Flagler Military Reservation ASR and INPR Supplement.
- 2) The aerial photo was obtained from TerraServer (1-meter resolution); the photo is dated June 21, 1990.



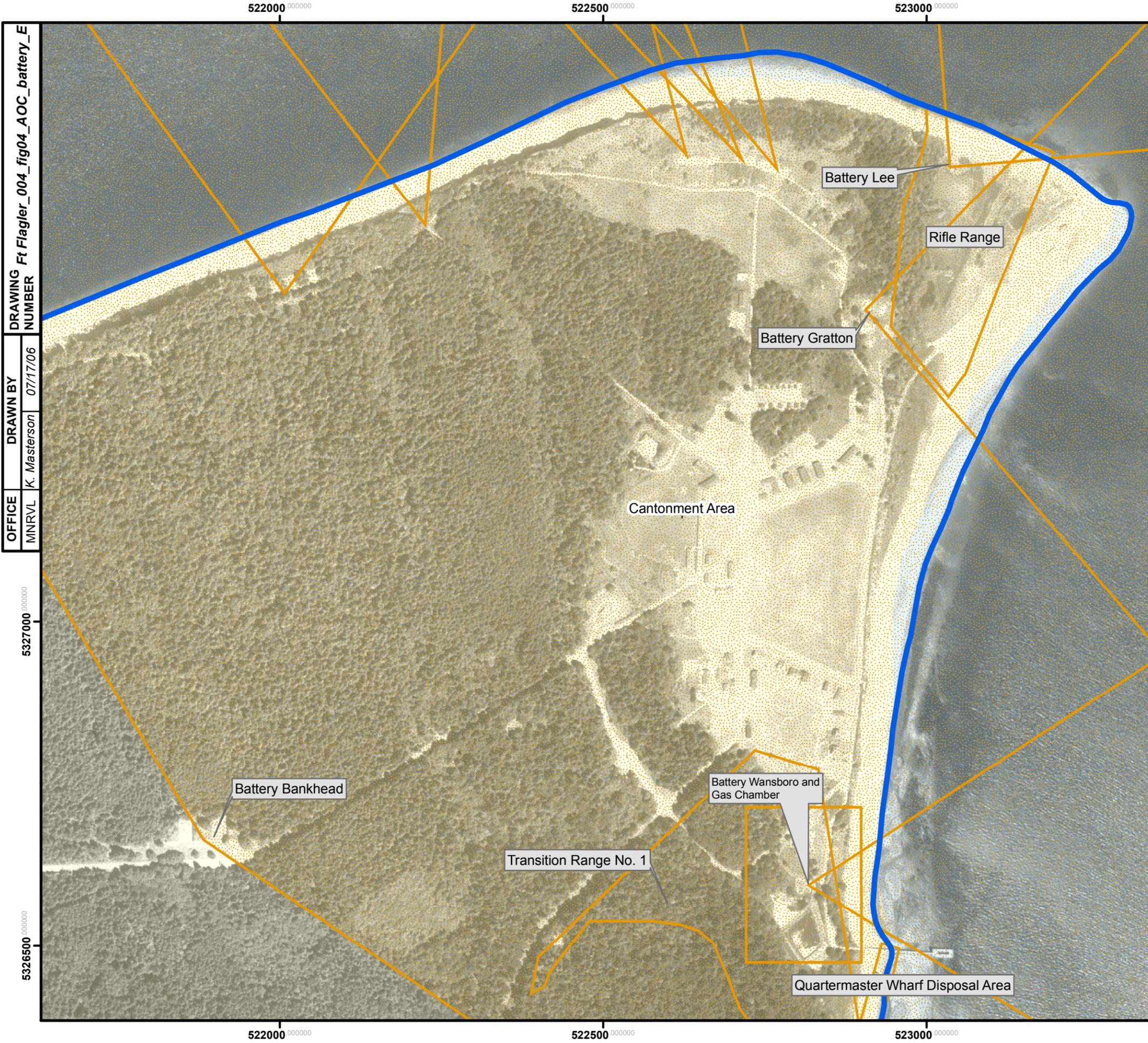
REFERENCE/PROJECTION: NAD 83 UTM Zone 10N



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**FIGURE 3**  
**RANGE COMPLEX AREA OF CONCERN**  
**NORTH-FACING BATTERIES**  
 FORT FLAGLER MILITARY RESERVATION





DRAWING NUMBER: Ft Flagler\_004\_fig04\_AOC\_battery\_E  
 DRAWN BY: K. Masterson  
 DATE: 07/17/06  
 OFFICE: MNRVL

**Legend**

- Fort Flagler Military Reserve Property Boundary
- Fort Flagler Area of Concern

**NOTES:**

- 1) AOC boundaries were derived from the Fort Flagler Military Reservation ASR and INPR Supplement.
- 2) The aerial photo was obtained from TerraServer (1-meter resolution); the photo is dated June 21, 1990.



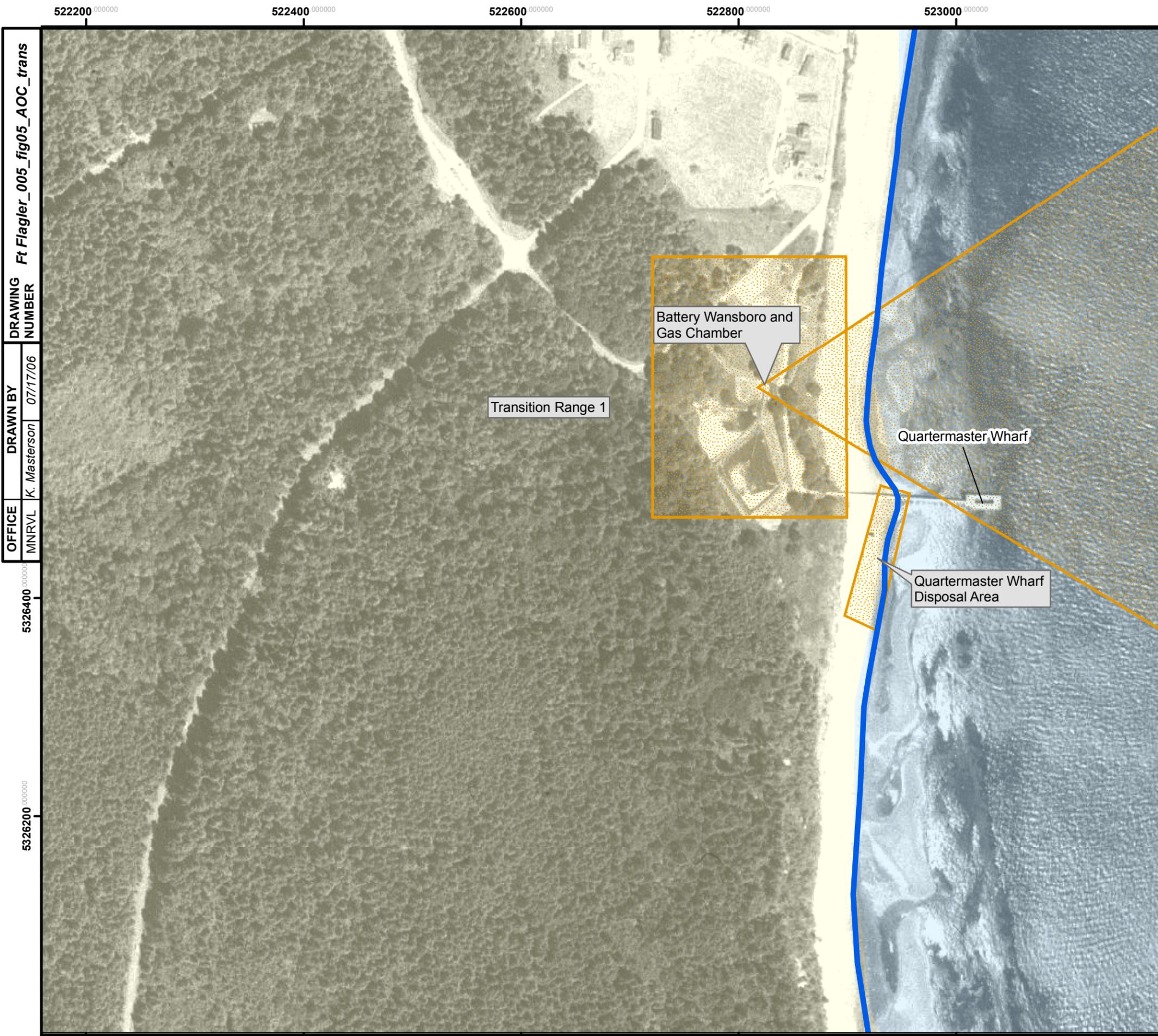
REFERENCE/PROJECTION: NAD 83 UTM Zone 10N



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 OMAHA DESIGN CENTER

**FIGURE 4**  
**RANGE COMPLEX AREA OF CONCERN**  
**EAST-FACING BATTERIES**  
 FORT FLAGLER MILITARY RESERVATION





OFFICE: MNRVL  
 DRAWN BY: K. Masterson  
 DRAWING NUMBER: Ft Flagler\_005\_fig05\_AOC\_trans

5326400  
 5326200

**Legend**

- Fort Flagler Military Reserve Property Boundary
- Fort Flagler Area of Concern

**NOTES:**

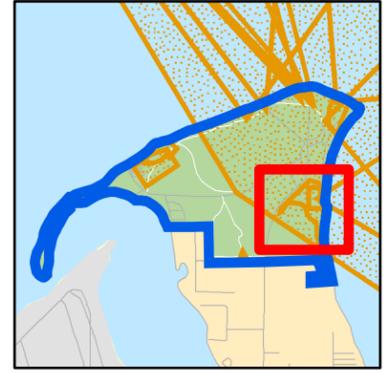
- 1) AOC boundaries were derived from the Fort Flagler Military Reservation ASR and INPR Supplement.
- 2) The aerial photo was obtained from TerraServer (1-meter resolution); the photo is dated June 21, 1990.

Transition Range 1

Battery Wansboro and Gas Chamber

Quatermaster Wharf

Quatermaster Wharf Disposal Area



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N



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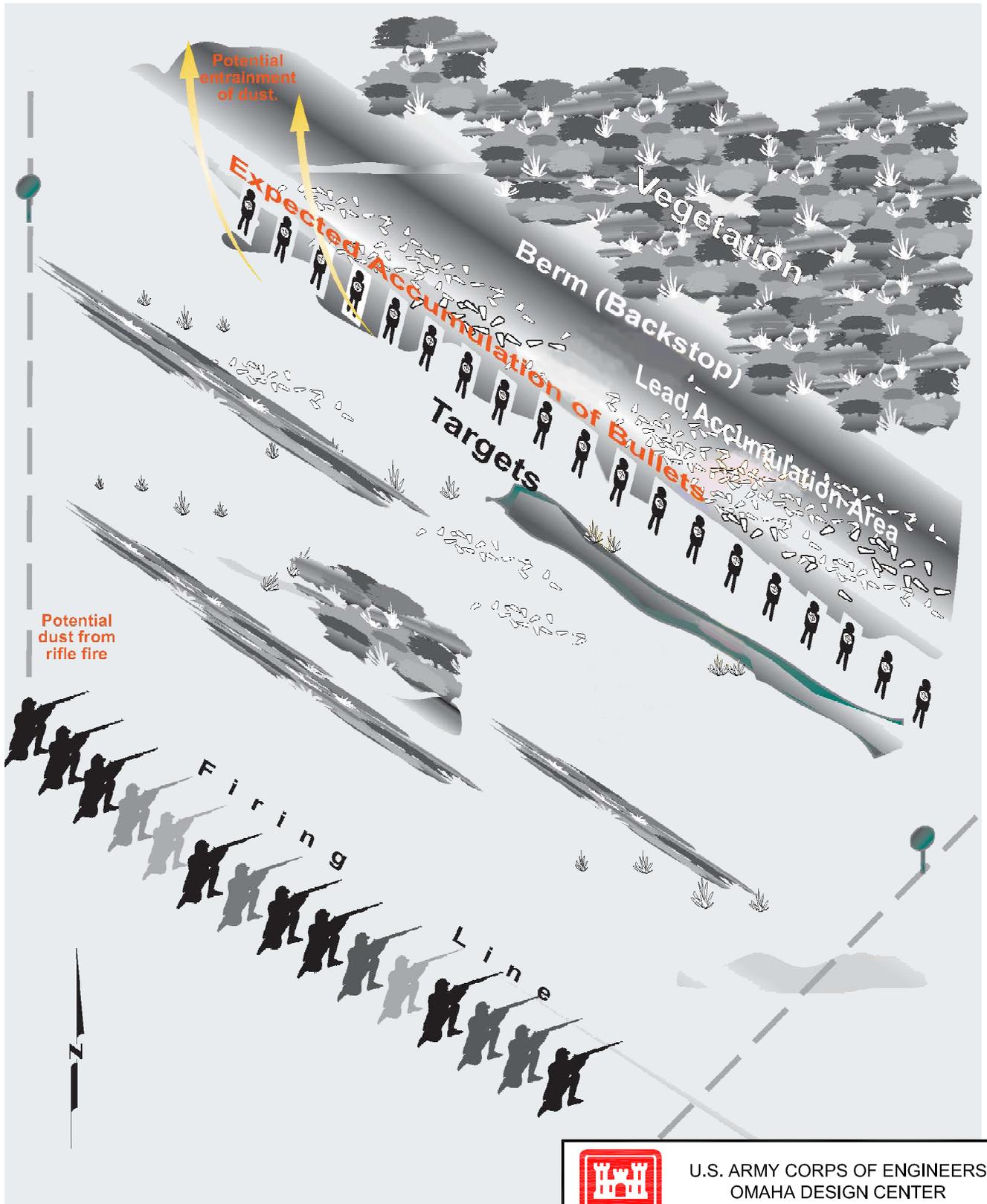
**FIGURE 5**  
**AREA OF CONCERN**  
**TRANSITION RANGE 1**

FORT FLAGLER MILITARY RESERVATION



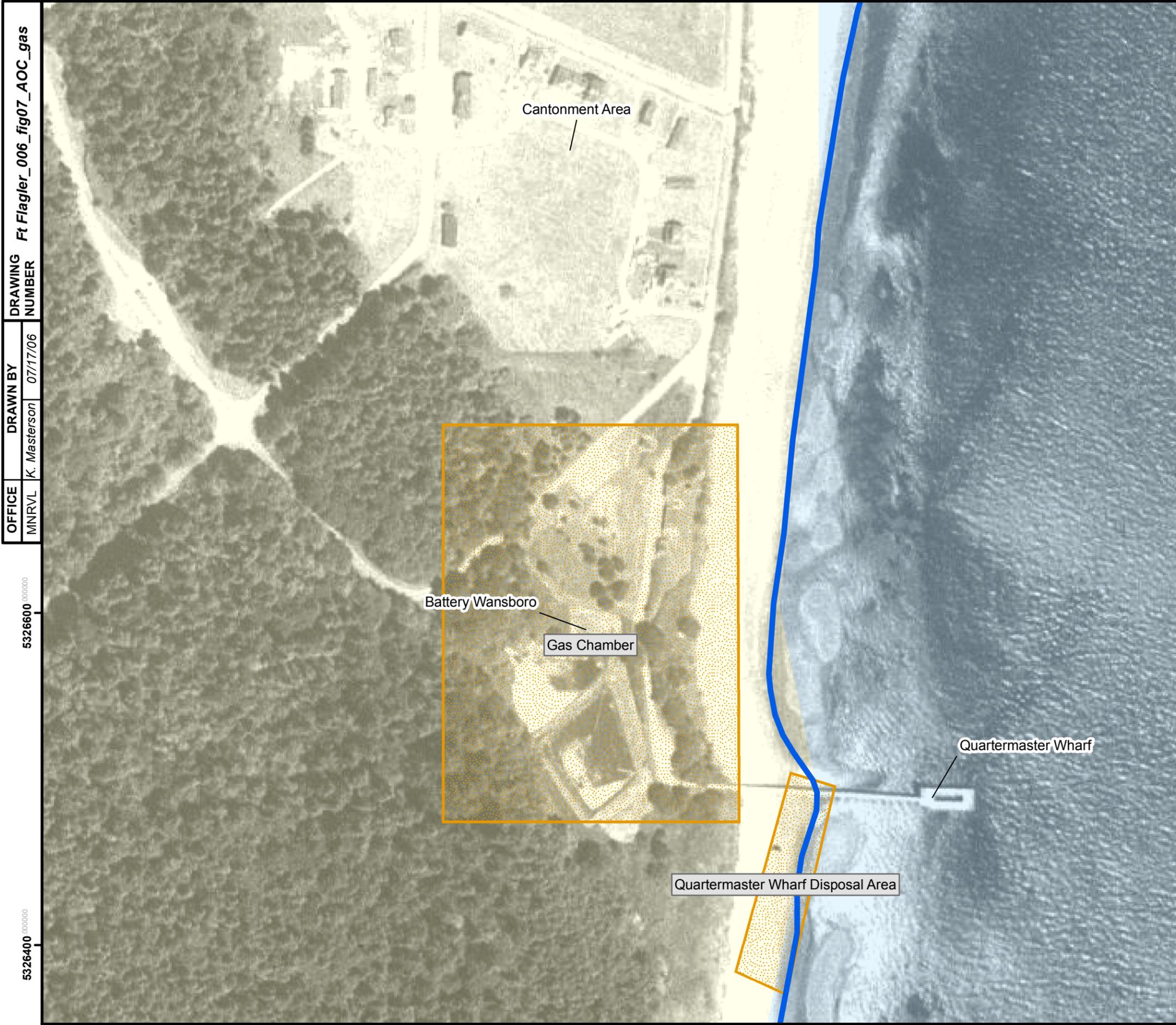
522200 522400 522600 522800 523000

OFFICE	DRAWN BY	DRAWING NUMBER
SJ	K. Black	116188SJ-A56
		07/19/06



U.S. ARMY CORPS OF ENGINEERS  
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FIGURE 6  
CONCEPTUAL SITE MODEL  
RIFLE RANGE WITH BERM  
FORT FLAGLER MILITARY RESERVATION



OFFICE: MNRVL  
 DRAWN BY: K. Masterson  
 DRAWING NUMBER: Ft Flagler\_006\_fig07\_AOC\_gas  
 5326600  
 5326400

522600 000000      522800 000000      523000 000000

522600 000000      522800 000000      523000 000000

**Legend**

- Fort Flagler Military Reserve Property Boundary
- Fort Flagler Area of Concern

**NOTES:**

- 1) AOC boundaries were derived from the Fort Flagler Military Reservation ASR and INPR Supplement.
- 2) The aerial photo was obtained from TerraServer (1-meter resolution); the photo is dated June 21, 1990.



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N



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**FIGURE 7**  
**AREA OF CONCERN**  
**GAS CHAMBER**

FORT FLAGLER MILITARY RESERVATION





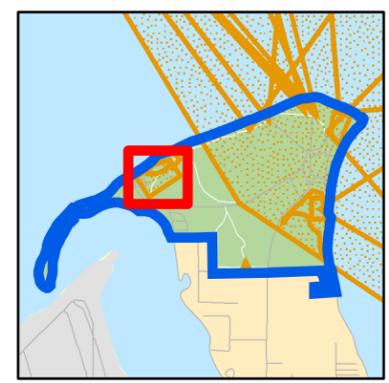
OFFICE: MNRVL  
 DRAWN BY: K. Masterson  
 DRAWING NUMBER: Ft Flagler\_008\_fig08\_AOC\_rifle  
 DATE: 07/17/06

**Legend**

- Fort Flagler Military Reserve Property Boundary
- Fort Flagler Area of Concern

**NOTES:**

- 1) AOC boundaries were derived from the Fort Flagler Military Reservation ASR and INPR Supplement.
- 2) The aerial photo was obtained from TerraServer (1-meter resolution); the photo is dated June 21, 1990.



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N



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**FIGURE 8**  
**AREA OF CONCERN**  
**ROCKET RANGE**

FORT FLAGLER MILITARY RESERVATION

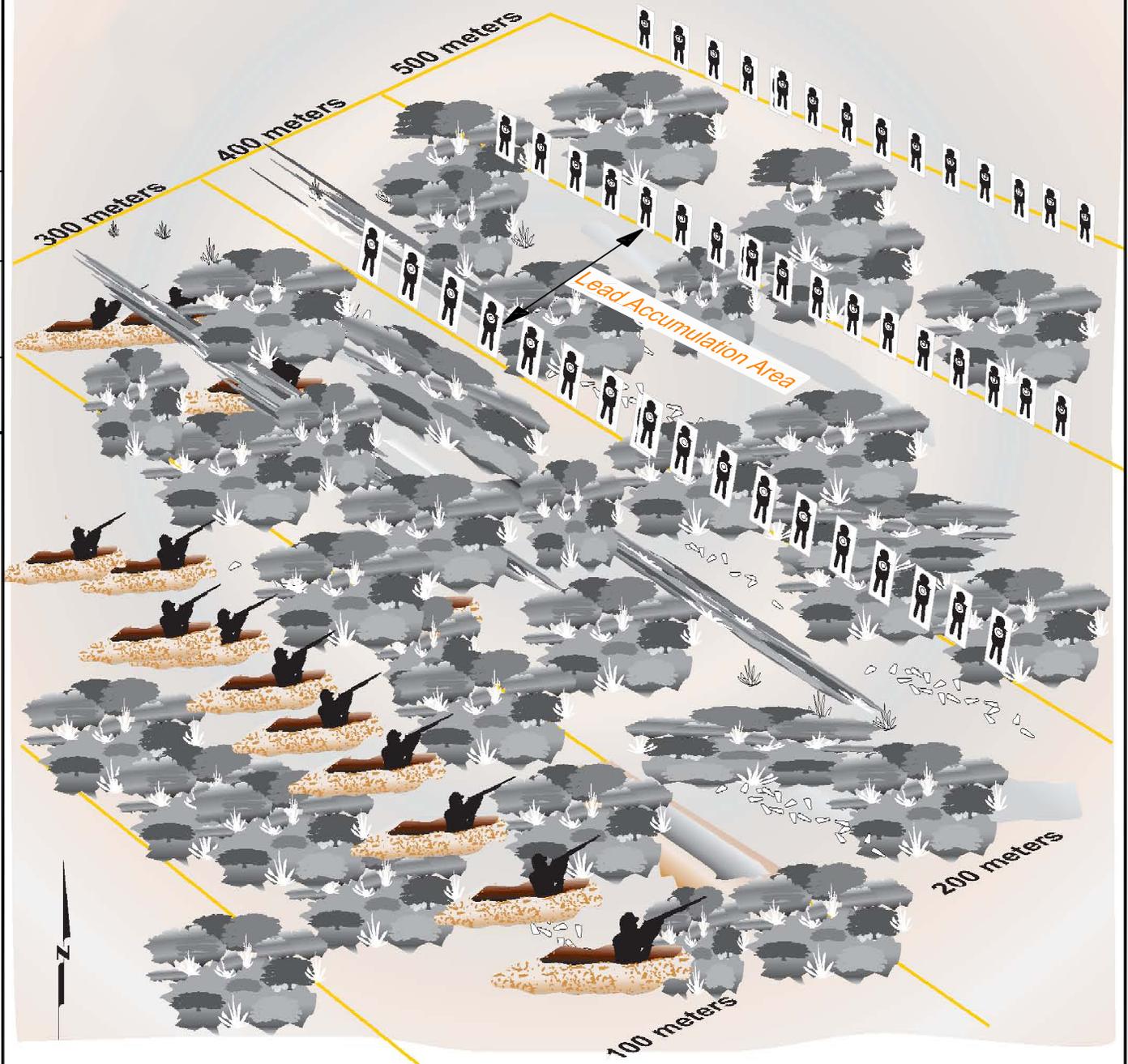


116188SJ-A57

DRAWING NUMBER

DRAWN BY  
K. Black

07/19/06  
SJ



U.S. ARMY CORPS OF ENGINEERS  
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FIGURE 9  
CONCEPTUAL SITE MODEL  
TRANSITION RANGE  
FORT FLAGLER MILITARY RESERVATION

# *Tables*

*Site Inspection  
Ft. Flagler Military Reservation*

*Technical Project Planning Meeting  
July 24, 2006*

**Table 1**  
**Potential MEC and MC at Ft. Flagler Military Reservation**

<b>AOC</b>	<b>Subrange</b>	<b>Munitions</b>	<b>Munitions Constituents</b>	<b>Land Use Controls</b>
Range Complex	Battery Bankhead	12-inch Mortar, M1889 MI	Propellant (nitrocellulose), HE Projectile - Explosive D (Ammonium picrate)	No
	Battery Calwell	6-inch rapid file, M1903	Propellant (nitrocellulose) Steel double-base (nitrocellulose and nitroglycerin), Practice projectile – inert, HE projectile - TNT	
	Battery Downes	3-inch, M1903	Propellant (nitrocellulose), HE Projectile –TNT	
	Battery Gratton	6-inch rapid file, M1903	Propellant (nitrocellulose), Practice projectile – inert, HE Projectile - Explosive D (Ammonium picrate)	
	Battery Lee	5-inch rapid file, M1897	Propellant (nitrocellulose), projectile - unknown	
	Battery Rawlins	10-inch Rifle, MII	Propellant (nitrocellulose), projectile - unknown	
	Battery Revere	10-inch Rifle, MII	Propellant (nitrocellulose), projectile - unknown	
	Battery Wansboro	3-inch, M1903	Propellant (nitrocellulose), Practice Projectile – inert, HE Projectile –TNT	
	Battery Wilhelm	12-inch Rifle, M1888 MII	Propellant (nitrocellulose), HE Projectile - Explosive D (Ammonium picrate)	
	Anti-Torpedo Boat Battery	90-mm M1	Propellant single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin)	
Anti-Aircraft Artillery Battery	3-inch, M1917M1A2	Propellant (nitrocellulose), Practice projectile – inert, HE Projectile - Explosive D (Ammonium picrate)		
Transition Range 1	NA	Small arms	Lead, single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin) propellant	No
Gas Chamber	NA	Hand grenade, riot, ABC-M25A1	CN	No
Rocket Range	NA	Rocket M28, 3.5-inch	Nitroglycerin, nitrocellulose, potassium perchlorate, RDX, TNT	No
		Rocket practice, M29, 3.5-inch	Nitroglycerin, nitrocellulose, potassium perchlorate	

**Table 1 (Cont.)  
Potential MEC and MC at Ft. Flagler Military Reservation**

AOC	Subrange	Munitions	Munitions Constituents	Land Use Controls
		Rocket M6A1, 2.36-inch Anti-Tank	Ballistite (nitrocellulose and nitroglycerin), Pentolite (TNT & PETN)	
		Rocket Practice M7A1, 2.36-inch Anti-Tank	Ballistite (nitrocellulose and nitroglycerin)	
Rifle Range	NA	Small arms	Lead, single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin)	No

**Table 2  
MEC and MC Exposure Pathway Analysis**

Range Area & Type	MMRP Concern	Potential Contaminant of Concern (PCOCs)	Affected Media (Potential Contaminant Sources) (Fate and Transport)	Exposure Routes and Potential Receptors			Data Gaps	Activities to Address Data Gaps (i.e., Sampling)
				Site Workers/ Contractor Personnel	Residents/ General Public	Ecological (Biota)		
Range Complex	MEC	MEC in the form of unfired propellant cartridges or discarded HE projectiles.	<b>Surface Soil</b> <ul style="list-style-type: none"> <li>MEC (unfired propellant charges) are a hazard.</li> <li>No MEC found.</li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes                             <ul style="list-style-type: none"> <li>Vehicle and foot traffic.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes                             <ul style="list-style-type: none"> <li>Foot traffic.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes                             <ul style="list-style-type: none"> <li>Foot traffic.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>None; very low likelihood of finding MEC after 50 years of heavy use.</li> </ul>
			<b>Subsurface Soil</b> <ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable.</li> </ul>	<ul style="list-style-type: none"> <li>None; subsurface burial not documented.</li> </ul>	<ul style="list-style-type: none"> <li>Historical documents does not indicate ranges have buried MEC.</li> </ul>
	MC	Metals from discarded projectiles, explosives (nitrocellulose, nitroglycerin, TNT, ammonium picrate).	<b>Soil</b> <ul style="list-style-type: none"> <li>Directly affected media.</li> <li>Potential metals and explosives contamination at batteries.</li> <li>Fate &amp; Transport: Secondary source of potential surface water, sediment, and air contamination.</li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes:                             <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of soil particulates during intrusive work.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes:                             <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of soil particulates during intrusive work.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes:                             <ul style="list-style-type: none"> <li>Ingestion, and</li> <li>Direct contact by area fauna.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Analytical data for metals and explosives in soil do not exist.</li> </ul>	<ul style="list-style-type: none"> <li>Collect one soil sample at each of the 10 batteries.</li> <li>Analyze samples for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives.</li> </ul>
			<b>Sediment/Surface Water</b> <ul style="list-style-type: none"> <li>Potentially affected media – ponds.</li> <li>Potential metal and explosive contamination.</li> <li>Fate &amp; Transport: Via surface runoff from impacted soil.</li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes:                             <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of surface water.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes:                             <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of surface water.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes:                             <ul style="list-style-type: none"> <li>Ingestion,</li> <li>Direct contact by area fauna and aquatic organisms.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Analytical data for metals in sediment/surface water do not exist.</li> </ul>	<ul style="list-style-type: none"> <li>Collect one sediment sample from two battery locations.</li> <li>Analyze samples for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives.</li> </ul>
			<b>Groundwater</b> <ul style="list-style-type: none"> <li>Potentially affected media.</li> <li>Potential metals and explosives contamination.</li> <li>Fate &amp; Transport: Migration of metals directly to groundwater is unlikely due to relatively low mobility of metals lead in soil.</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.                             <ul style="list-style-type: none"> <li>No local wells.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.                             <ul style="list-style-type: none"> <li>No local wells.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.                             <ul style="list-style-type: none"> <li>No local wells.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>No groundwater analytical data exist for metals.</li> </ul>	<ul style="list-style-type: none"> <li>No groundwater samples will be collected.</li> </ul>
			<b>Air</b> <ul style="list-style-type: none"> <li>Not an affected media under current land use.</li> </ul>	Incomplete Pathway	Incomplete Pathway	Incomplete Pathway	None	None

**Table 2 (Cont.)  
MEC and MC Exposure Pathway Analysis**

Range Area & Type	MMRP Concern	Potential Contaminant of Concern (PCOCs)	Affected Media (Potential Contaminant Sources) (Fate and Transport)	Exposure Routes and Potential Receptors			Data Gaps	Activities to Address Data Gaps (i.e., Sampling)
				Site Workers/ Contractor Personnel	Residents/ General Public	Ecological (Biota)		
Transition Range 1	MEC	MEC in the form of unfired small arms rounds are a potential hazard. Low explosive hazard.	<b>Surface Soil</b> <ul style="list-style-type: none"> <li>MEC (unfired ammunition) are a hazard.</li> <li>No MEC found.</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>None; very low likelihood of finding MEC after 50 years of heavy use.</li> </ul>
			<b>Subsurface Soil</b> <ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable.</li> </ul>	<ul style="list-style-type: none"> <li>None; subsurface burial not documented.</li> </ul>	<ul style="list-style-type: none"> <li>Historical documents do not indicate ranges have buried MEC.</li> </ul>
	MC	Lead from bullets.	<b>Soil</b> <ul style="list-style-type: none"> <li>Directly affected media.</li> <li>Potential lead from bullets.</li> <li>Fate &amp; Transport: Secondary source of potential surface water, sediment, and air contamination.</li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes: <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of soil particulates during intrusive work.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes: <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of soil particulates during intrusive work.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes: <ul style="list-style-type: none"> <li>Ingestion, and</li> <li>Direct contact by area fauna.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Analytical data for lead in soil do not exist.</li> </ul>	<ul style="list-style-type: none"> <li>Collect two soil samples from location of backstop berm and analyze for lead only.</li> </ul>
			<b>Sediment/Surface Water</b> <ul style="list-style-type: none"> <li>Potentially affected media – ponds.</li> <li>Potential lead contamination.</li> <li>Fate &amp; Transport: Via surface runoff from impacted soil.</li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes: <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of surface water.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes: <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of surface water.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes: <ul style="list-style-type: none"> <li>Ingestion,</li> <li>Direct contact by area fauna and aquatic organisms.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Analytical data for lead in sediment/surface water do not exist.</li> </ul>	<ul style="list-style-type: none"> <li>Collect one sediment sample from water collection area and analyze for lead only.</li> </ul>
			<b>Groundwater</b> <ul style="list-style-type: none"> <li>Potentially affected media.</li> <li>Potential metals and explosives contamination.</li> <li>Fate &amp; Transport: Migration of metals directly to groundwater is unlikely due to relatively low mobility of metals lead in soil.</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway. <ul style="list-style-type: none"> <li>No local wells.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway. <ul style="list-style-type: none"> <li>No local wells.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway. <ul style="list-style-type: none"> <li>No local wells.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>No groundwater analytical data exist for metals.</li> </ul>	<ul style="list-style-type: none"> <li>No groundwater samples will be collected.</li> </ul>
			<b>Air</b> <ul style="list-style-type: none"> <li>Not an affected media under current land use.</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete Pathway</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete Pathway</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete Pathway</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>

**Table 2 (Cont.)  
MEC and MC Exposure Pathway Analysis**

Range Area & Type	MMRP Concern	Potential Contaminant of Concern (PCOCs)	Affected Media (Potential Contaminant Sources) (Fate and Transport)	Exposure Routes and Potential Receptors			Data Gaps	Activities to Address Data Gaps (i.e., Sampling)
				Site Workers/ Contractor Personnel	Residents/ General Public	Ecological (Biota)		
Gas Chamber	MEC	MEC not anticipated (riot control gas grenades).	<b>Surface Soil</b> <ul style="list-style-type: none"> <li>• MEC - none.</li> <li>• No MEC found.</li> </ul>	• Incomplete pathway.	• Incomplete pathway.	• Incomplete pathway.	• None	• None.
			<b>Subsurface Soil</b> <ul style="list-style-type: none"> <li>• None</li> </ul>	• Incomplete pathway.	• Incomplete pathway.	• Not applicable.	• None	• None.
	MC	Riot Gas (CN-1).	<b>Soil</b> <ul style="list-style-type: none"> <li>• Directly affected media.</li> <li>• Potential CN-1 residue; however, CN-1 not expected to persist over 50 years in soil</li> <li>• Fate &amp; Transport: Secondary source of potential surface water, sediment, and air contamination.</li> </ul>	• Incomplete pathway.	• Incomplete pathway.	• Incomplete pathway.	• None	• None.
			<b>Sediment/Surface Water</b> <ul style="list-style-type: none"> <li>• Potentially affected media – ponds.</li> <li>• Potential CN-1 residue; however, CN-1 not expected to persist over 50 years.</li> <li>• Fate &amp; Transport: Via surface runoff from impacted soil.</li> </ul>	• Incomplete pathway.	• Incomplete pathway.	• Incomplete pathway.	• None	• None.
			<b>Groundwater</b> <ul style="list-style-type: none"> <li>• Potentially affected media.</li> <li>• Potential CN-1 residue; however, CN-1 not expected to persist for over 50 years.</li> <li>• Fate &amp; Transport: Migration of metals directly to groundwater is unlikely due to relatively low mobility of metals lead in soil</li> </ul>	• Incomplete pathway. - No local wells.	• Incomplete pathway. - No local wells.	• Incomplete pathway. - No local wells.	• No groundwater analytical data exist for metals.	• No groundwater samples will be collected.
			<b>Air</b> <ul style="list-style-type: none"> <li>• Not an affected media under current land use.</li> </ul>	Incomplete Pathway	Incomplete Pathway	Incomplete Pathway	None	None

**Table 2 (Cont.)  
MEC and MC Exposure Pathway Analysis**

Range Area & Type	MMRP Concern	Potential Contaminant of Concern (PCOCs)	Affected Media (Potential Contaminant Sources) (Fate and Transport)	Exposure Routes and Potential Receptors			Data Gaps	Activities to Address Data Gaps (i.e., Sampling)
				Site Workers/ Contractor Personnel	Residents/ General Public	Ecological (Biota)		
Rocket Range	MEC	MEC in the form of 2.36-inch and 3.5-inch rockets, hand grenades, land mines are a potential hazard.	<b>Surface Soil</b> <ul style="list-style-type: none"> <li>MEC in the form of unexploded rockets, hand grenades, and land mines are a hazard.</li> <li>MEC found historically, cleanup in 1992, may still be MEC in unsurveyed areas.</li> </ul>	<ul style="list-style-type: none"> <li>Complete pathway.</li> <li>Exposure routes                             <ul style="list-style-type: none"> <li>Vehicle and foot traffic.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Complete pathway.                             <ul style="list-style-type: none"> <li>Exposure routes                                     <ul style="list-style-type: none"> <li>Foot traffic.</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Complete pathway.</li> <li>Exposure routes                             <ul style="list-style-type: none"> <li>Foot traffic.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Occurrence of MEC in area south of Fire Break Road in eastern AOC is unknown.</li> </ul>	<ul style="list-style-type: none"> <li>Visual survey with magnetometer will be conducted to:                             <ul style="list-style-type: none"> <li>Assess MEC occurrence.</li> <li>Practice MEC avoidance.</li> </ul> </li> </ul>
			<b>Subsurface Soil</b> <ul style="list-style-type: none"> <li>MEC in the form of unexploded rockets, hand grenades, and land mines are a hazard.</li> <li>MEC found historically, cleanup in 1992, may still be MEC in unsurveyed areas.</li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes                             <ul style="list-style-type: none"> <li>Intrusive activities.</li> <li>Geologic instability.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes                             <ul style="list-style-type: none"> <li>Intrusive activities.</li> <li>Geologic instability.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes                             <ul style="list-style-type: none"> <li>Intrusive activities.</li> <li>Geologic instability.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Occurrence of MEC in area south of Fire Break Road in eastern AOC is unknown.</li> </ul>	<ul style="list-style-type: none"> <li>Visual survey with magnetometer will be conducted to:                             <ul style="list-style-type: none"> <li>Assess MEC occurrence.</li> <li>Practice MEC avoidance.</li> </ul> </li> </ul>
	MC	Metals from rockets, grenades, etc., explosives (nitroglycerin, nitrocellulose, TNT, RDX), potassium perchlorate.	<b>Soil</b> <ul style="list-style-type: none"> <li>Directly affected media.</li> <li>Potential metals and explosives contamination.</li> <li>Fate &amp; Transport: Secondary source of potential surface water, sediment, and air contamination.</li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes:                             <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of soil particulates during intrusive work.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes:                             <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of soil particulates during intrusive work.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes:                             <ul style="list-style-type: none"> <li>Ingestion, and</li> <li>Direct contact by area fauna.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Analytical data for metals and explosives in soil do not exist.</li> </ul>	<ul style="list-style-type: none"> <li>Collect three soil samples. Two at documented MEC locations from 1992 clearance and one from a location to be determined.</li> <li>Analyze samples for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives.</li> </ul>
			<b>Sediment/Surface Water</b> <ul style="list-style-type: none"> <li>Potentially affected media – ponds.</li> <li>Potential metal and explosive contamination.</li> <li>Fate &amp; Transport: Via surface runoff from impacted soil.</li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes:                             <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of surface water.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes:                             <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of surface water.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes:                             <ul style="list-style-type: none"> <li>Ingestion,</li> <li>Direct contact by area fauna and aquatic organisms.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Analytical data for metals in sediment/surface water do not exist.</li> </ul>	<ul style="list-style-type: none"> <li>Collect one sediment sample from water collection area.</li> <li>Analyze samples for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives.</li> </ul>
			<b>Groundwater</b> <ul style="list-style-type: none"> <li>Potentially affected media.</li> <li>Potential metals and explosives contamination.</li> <li>Fate &amp; Transport: Migration of metals directly to groundwater is unlikely due to relatively low mobility of metals lead in soil</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.                             <ul style="list-style-type: none"> <li>No local wells.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.                             <ul style="list-style-type: none"> <li>No local wells.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.                             <ul style="list-style-type: none"> <li>No local wells.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>No groundwater analytical data exist for metals.</li> </ul>	<ul style="list-style-type: none"> <li>No groundwater samples will be collected.</li> </ul>
			<b>Air</b> <ul style="list-style-type: none"> <li>Not an affected media under current land use.</li> </ul>	Incomplete Pathway	Incomplete Pathway	Incomplete Pathway	None	None

**Table 2 (Cont.)  
MEC and MC Exposure Pathway Analysis**

Range Area & Type	MMRP Concern	Potential Contaminant of Concern (PCOCs)	Affected Media (Potential Contaminant Sources) (Fate and Transport)	Exposure Routes and Potential Receptors			Data Gaps	Activities to Address Data Gaps (i.e., Sampling)
				Site Workers/ Contractor Personnel	Residents/ General Public	Ecological (Biota)		
Rifle Range	MEC	MEC in the form of unfired small arms rounds are a potential hazard. Low explosive hazard.	<b>Surface Soil</b> <ul style="list-style-type: none"> <li>MEC (unfired ammunition) are a hazard.</li> <li>No MEC found.</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>None; very low likelihood of finding MEC after 50 years of heavy use.</li> </ul>
			<b>Subsurface Soil</b> <ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway.</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable.</li> </ul>	<ul style="list-style-type: none"> <li>None; subsurface burial not documented.</li> </ul>	<ul style="list-style-type: none"> <li>Historical documents does not indicate ranges have buried MEC.</li> </ul>
	MC	Lead from bullets.	<b>Soil</b> <ul style="list-style-type: none"> <li>Directly affected media.</li> <li>Potential lead from bullets.</li> <li>Fate &amp; Transport: Secondary source of potential surface water, sediment, and air contamination.</li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes: <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of soil particulates during intrusive work.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes: <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of soil particulates during intrusive work.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes: <ul style="list-style-type: none"> <li>Ingestion, and</li> <li>Direct contact by area fauna.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Analytical data for lead in soil do not exist.</li> </ul>	<ul style="list-style-type: none"> <li>Collect two soil samples from location of backstop berm and analyzed for lead only.</li> </ul>
			<b>Sediment/Surface Water</b> <ul style="list-style-type: none"> <li>Potentially affected media – ponds.</li> <li>Potential lead contamination.</li> <li>Fate &amp; Transport: Via surface runoff from impacted soil.</li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes: <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of surface water.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes: <ul style="list-style-type: none"> <li>Incidental ingestion,</li> <li>Dermal contact, and</li> <li>Inhalation of surface water.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Potentially complete pathway.</li> <li>Exposure routes: <ul style="list-style-type: none"> <li>Ingestion,</li> <li>Direct contact by area fauna and aquatic organisms.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Analytical data for lead in sediment/surface water do not exist.</li> </ul>	<ul style="list-style-type: none"> <li>Collect one sediment sample from water collection area and analyzed for lead only.</li> </ul>
			<b>Groundwater</b> <ul style="list-style-type: none"> <li>Potentially affected media.</li> <li>Potential metals and explosives contamination.</li> <li>Fate &amp; Transport: Migration of metals directly to groundwater is unlikely due to relatively low mobility of metals lead in soil</li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway. <ul style="list-style-type: none"> <li>No local wells.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway. <ul style="list-style-type: none"> <li>No local wells.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Incomplete pathway. <ul style="list-style-type: none"> <li>No local wells.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>No groundwater analytical data exist for metals.</li> </ul>	<ul style="list-style-type: none"> <li>No groundwater samples will be collected.</li> </ul>
			<b>Air</b> <ul style="list-style-type: none"> <li>Not an affected media under current land use.</li> </ul>	Incomplete Pathway	Incomplete Pathway	Incomplete Pathway	None	None

**Table 3  
Proposed Sampling Approach**

AOC	Media	Contaminants of Concern			Comments
		Lead	Metals*	Explosives	
<b>Range Complex</b>	Soil	--	10	10	Collect samples from 10 battery locations.
	Sediment	--	2	2	Collect samples from water collection areas at 2 battery locations.
<b>Transition Range 1</b>	Soil	2	--	--	Samples from backstop berm.
	Sediment	1	--	--	Collect sample from water collection area.
<b>Gas Chamber</b>	Soil	--	--	--	No complete pathway
	Sediment	--	--	--	No complete pathway
<b>Rocket Range</b>	Soil	--	3	3	Collect 2 samples from known MEC location, collect one sample from random location
	Sediment	--	1	1	Collect sample from water collection area
<b>Rifle Range</b>	Soil	2	--	--	Samples from backstop berm.
	Sediment	1	--	--	Collect sample from water collection area.
<b>Background</b>	Soil	--	10		A series of background samples will be collected in area undisturbed by past operations to establish a baseline for metals.
	Sediment	--	1		
<b>Sample Totals</b>		6	27	16	

Notes:

\* Metals to be analyzed include aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel.

Quality control samples will be addressed in the SSWP.

Surface soil samples are composite samples (7-point, wheel pattern with 2-foot radius). All other samples are discrete grab samples.

**DRAFT Table 4**  
**Human Health Screening Criteria for Soil/Sediment at Fort Flagler, WA <sup>a</sup>**

Analyte	Abbreviation	CAS No.	Region 9 Residential PRGs <sup>b</sup> (mg/kg)	Region 9 Industrial PRGs <sup>b</sup> (mg/kg)	Washington Department of Ecology - Soil Cleanup Levels <sup>c</sup>				
					Method B Level - Unrestricted <sup>d</sup> (mg/kg)	Leaching - Phase 3 Model - Unrestricted <sup>e</sup> (mg/kg)	Method B Level - Industrial <sup>f</sup> (mg/kg)	Leaching - Phase 3 Model - Industrial <sup>g</sup> (mg/kg)	Natural Background Level <sup>h</sup> (mg/kg)
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	4.4	16					
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0	3,100	31,000					
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	16	57					
1,3,5-Trinitrobenzene	1,3,5-TNB	99-35-4	1,800	18,000					
1,3-Dinitrobenzene	1,3-DNB	99-65-0	6.1	62					
2,4-Dinitrotoluene <sup>i</sup>	2,4-DNT	121-14-2	0.72	2.5					
2,6-Dinitrotoluene <sup>i</sup>	2,6-DNT	606-20-2	0.72	2.5					
2-Amino-4,6-dinitrotoluene	2-Am-DNT	35572-78-2	12	120					
2-Nitrotoluene	2-NT	88-72-2	0.88	2.2					
3-Nitrotoluene	3-NT	99-08-1	730	1,000					
4-Amino-2,6-dinitrotoluene	4-Am-DNT	19406-51-0	12	120					
4-Nitrotoluene	4-NT	99-99-0	12	30					
Nitrobenzene	NB	98-05-3	20	100					
Nitroglycerin	NG	55-63-0	35	120					
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	479-45-8	610	6,200					
Pentaerythritol tetranitrate	PENT	78-11-5							
Aluminum	Al	7429-90-5	76,000	100,000					32,600
Antimony	Sb	7440-36-0	31	410					
Arsenic	As	7440-38-2	0.39	1.6	0.62(C)	2.92	38.84(C)	2.92	7 <sup>j</sup>
Barium	Ba	7440-38-2	5,400	67,000					
Beryllium	Be	7440-41-7	150	1,900					0.6
Cadmium	Cd	7440-43-9	37	450	74(N)	0.69	1,460(N)	0.69	1
Calcium	Ca	7440-70-2							
Chromium (Total)	Cr	7440-47-3	210	450					48
Chromium III	Cr	7440-47-3	100,000	100,000	44,571(N)	2,000	352,726(N)	2,000	
Chromium VI	Cr	7440-47-3	30	64	128(N)	19	1,226(N)	19	
Cobalt	Co	7440-48-4	900	1,900					
Copper	Cu	7440-50-8	3,100	41,000					36
Iron	Fe	7439-89-6	23,000	100,000					58,700
Lead	Pb	7439-92-1	400	800		3,000		3,000	24
Magnesium	Mg	7439-95-4							
Manganese	Mn	7439-96-5	1,800	19,000					1,200
Molybdenum	Mo	7439-98-7	390	5,100					
Nickel	Ni	7440-02-0	1,600	20,000					48
Potassium	K	7440-09-7							
Selenium	Se	7782-49-2	390	5,100					
Silver	Ag	7440-22-4	390	5,100					
Sodium	Na	7440-23-5							
Strontium	Sr	7440-24-6	47,000	100,000					

**DRAFT Table 4**  
**Human Health Screening Criteria for Soil/Sediment at Fort Flagler, WA <sup>a</sup>**

Analyte	Abbreviation	CAS No.	Region 9 Residential PRGs <sup>b</sup> (mg/kg)	Region 9 Industrial PRGs <sup>b</sup> (mg/kg)	Washington Department of Ecology - Soil Cleanup Levels <sup>c</sup>				
					Method B Level - Unrestricted <sup>d</sup> (mg/kg)	Leaching - Phase 3 Model Unrestricted <sup>e</sup> (mg/kg)	Method B Level - Industrial <sup>f</sup> (mg/kg)	Leaching - Phase 3 Model Industrial <sup>g</sup> (mg/kg)	Natural Background Level <sup>h</sup> (mg/kg)
Thallium	Tl	7440-28-0	5.2	67					
Titanium	Ti	7440-32-6	100,000	100,000					
Vanadium	V	7440-62-2	78	1,000					
Zinc	Zn	7440-66-6	23,000	100,000					85
Zirconium	Zr	7440-67-7							
Mercury	Hg	7439-97-6	23	310	18(N)	2.09	252(N)	2.09	0.07
Phosphorus (white)	WP or P <sub>4</sub>	7723-14-0	1.6	20					

CLARC = Cleanup Level and Risk Calculation  
WAC = Washington Administrative Code  
mg/kg = milligrams per kilogram

C = Value for carcinogen  
N = Value for noncarcinogen

<sup>a</sup> If laboratory cannot meet any of the preferred QLs with routine SW 846 methodology (as supported by MDLs that are no greater than 1/3 QL), laboratory's QL must be identified in laboratory submittal as failing to meet the QL. Some screening values cannot be obtained with routine methodology to the QL. In those cases, the QL achievable with a routine SW 846 methodology would be accepted.

<sup>b</sup> Region 9 Preliminary Remediation Goals (PRG) table; October 2004. Values are based on residential and industrial exposure to single chemicals.

<sup>c</sup> Cleanup levels are established under the Model Toxics Control Act (MCTA) Cleanup Regulation. Chapter 173-340 WAC.

<sup>d</sup> Values from Notes on Method A Cleanup Levels WAC 173-340-720, 740, and 745. Table 740-1, Table 5: Method B Calculations for Carcinogens for Soil Ingestion Plus Dermal Contact and Table 6: Method B Calculations for Carcinogens for Soil Ingestion Plus Dermal Contact. Based on unrestricted land use. From CLARC Notes updated on November 23, 2004.

<sup>e</sup> Values from Notes on Method A Cleanup Levels WAC 173-340-720, 740, and 745, Table 740-1, Table 7: 3-Phase Model Assumptions and Results. Based on protection of groundwater. From CLARC Notes updated on November 23, 2004.

<sup>f</sup> Values from Notes on Method A Cleanup Levels WAC 173-340-720, 740, and 745, Table 745-1, Table 5: Method C Industrial Calculations for Carcinogens for Soil Ingestion Plus Dermal Contact and Table 6: Method C Industrial Calculations for Carcinogens for Soil Ingestion Plus Dermal Contact. Based on industrial land use. From CLARC Notes updated on November 23, 2004.

<sup>g</sup> Values from Notes on Method A Cleanup Levels WAC 173-340-720, 740, and 745, Table 745-1, Table 7: 3-Phase Model Assumptions and Results. Based on protection of groundwater. From CLARC Notes updated on November 23, 2004.

<sup>h</sup> Values from "Natural Background Soil Metals Concentrations in Washington State", Publication #94-115, October 1994. Based on data for Puget Sound.

<sup>i</sup> Carcinogenic DNT mixture values used if more conservative than noncarcinogenic isomer-specific values.

<sup>j</sup> Based on graphite furnace atomic absorption (GFAA) analysis.

**Table 5**  
**Ecological Risk-Based Soil Screening Concentrations for Washington Sites**

Table 5 is pending.

**Table 6**  
**Ecological Risk-Based Sediment Screening Concentrations for Washington Sites**

Table 6 is pending.

# ***Draft Worksheets***

## ***Site Information Worksheet*** ***MRSPP Data Gaps*** ***HRS Data Gaps***

***Site Inspection***  
***Ft. Flagler Military Reservation***

***Technical Project Planning Meeting***  
***July 24, 2006***

**Site Information Worksheet**

**Site:** Range Complex, Transition Ranges 1 & 2, Gas Chamber, Rocket Range, Rifle Range

**Project:** Ft. Flagler Military Reservation

	<b>Site Information Needed<sup>a</sup></b>	<b>Suggested Means to Obtain Site Information</b>	<b>Potential Source(s) of Site Information</b>	<b>Responsible for Obtaining</b>	<b>Deadline for Obtaining Site Information</b>
<b>1</b>	Use existing background values from work being performed nearby	WDOE	WDOE	WDOE	For inclusion in TPP Memo
<b>2</b>	Background sampling requirements for metals	WDEQ protocol	WDOE guidance document	WDEQ	For inclusion in TPP Memo
<b>3</b>	Background metals data	Sampling	Add more samples to field program	Shaw	For inclusion in TPP Memo
<b>4</b>	Locate MEC at Rocket Range	Site recon	Historical aerial photos/review historical documents	Shaw	For inclusion in Site Specific Work Plan
<b>5</b>	Schedule for sampling Washington sites	Consultation	BLM	Shaw	Prior to field work
<b>6</b>	Additional historical information	Records review	USACE Seattle and Portland Districts	Shaw	For inclusion in Site Specific Work Plan
<b>7</b>	Washington HH Screening Standards	WDOE regulations	WDOE	Shaw	For inclusion in TPP Memo
<b>8</b>	Washington Ecological Screening Standards	WDOE regulations	WDOE	Shaw	For inclusion in TPP Memo
<b>9</b>	Point of contact for community	Not applicable	USACE Seattle District	USACE	Before start of field work
<b>10</b>	Access agreements	Letters, call, or visit stakeholders	Letters/conversations with stakeholders	USACE	Before start of field work
<b>11</b>	Conceptual site model	Report review	CSMs prepared for AOCs	WDOE	For inclusion in TPP Memo
<b>12</b>	Threatened or endangered species within AOC	Phone	WA Fish and Wildlife U.S. Fish and Wildlife	Shaw	For inclusion in TPP Memo
<b>13</b>	Areas of cultural significance within AOC	SHPO	Phone SHPO	Shaw	For inclusion in TPP Memo

<sup>a</sup> Refer to EM 200-1-2, Paragraphs 1.1.3 and 2.2.

**Munitions Response Site Prioritization Protocol (MRSPP) Data Gaps**  
**32 CFR Part 179**

Installation: Ft. Flagler Military Reservation  
AOC: Range Complex  
RMIS Range ID: F10WA0316

Module	Table No.	Table Description	Data Gap	Potential Source of Information to Fill Data Gap	No Data Gap	Description of Known Data
Explosive Hazard Evaluation (EHE)	1	Munitions Type			x	Propellant
	2	Source of Hazard			x	Former ground to sea and air to air artillery batteries
	3	Location of Munitions			x	No munitions reported from this MRA
	4	Ease of Access			x	No barrier
	5	Status of Property			x	Non-DoD control
	6	Population Density			x	< 100 persons per square mile
	7	Population Near Hazard			x	26 or more structure
	8	Activities/Structures			x	Parks and recreational areas
	9	Ecological and/or Cultural Resources	x	U.S. Fish and Wildlife, SHPO		
	<b>10</b>	<b>EHE Module Score</b>				<b>60 to 70 EHE Rating D (Preliminary)</b>
Chemical Warfare Materiel (CWM) Hazard Evaluation (CHE)	11	CWM Configuration			x	Historical evidence indicates that CWM are not present
	12	Sources of CWM			x	Historical evidence indicates that CWM are not present
	13	Location of CWM			x	Historical evidence indicates that CWM are not present
	14	Ease of Access			x	No barrier
	15	Status of Property			x	Non-DoD control
	16	Population Density			x	< 100 persons per square mile
	17	Population Near Hazard			x	0 inhabited structures w/in 2 miles
	18	Activities/Structures			x	Agricultural - livestock grazing
	19	Ecological and/or Cultural Resources			x	Ecological resources present
	<b>20</b>	<b>CHE Module Score</b>				<b>&lt; 38 CHE Rating G (Preliminary)</b>
Health Hazard Evaluation (HHE)	21	Groundwater Data Element			x	Groundwater not a pathway
	22	Surface Water (Human Endpoint) Data Element			x	Surface Water not a pathway
	23	Sediment (Human Endpoint) Data Element Table	x	Evaluation Pending		
	24	Surface Water (Ecological Endpoint) Data Element	x	Evaluation Pending		
	25	Sediment (Ecological Endpoint) Data Element	x	Evaluation Pending		
	26	Surface Soil Data Element	x	Evaluation Pending		
	27	Supplemental Contaminant Hazard Factor	x	Evaluation Pending		
	<b>28</b>	<b>HHE Module Score</b>	<b>x</b>	<b>Module Score Pending</b>		
MRS Priority	<b>29</b>	<b>MRS Priority (Based on Highest Hazard Evaluation Module Rating)</b>	<b>x</b>	<b>Final Score Pending</b>		
	<b>A</b>	<b>MRS Background Information</b>	<b>x</b>	<b>Pending</b>		

**Munitions Response Site Prioritization Protocol (MRSPP) Data Gaps**  
**32 CFR Part 179**

Installation: Ft. Flagler Military Reservation  
AOC: Transition Range  
RMIS Range ID: F10WA0316

Module	Table No.	Table Description	Data Gap	Potential Source of Information to Fill Data Gap	No Data Gap	Description of Known Data
Explosive Hazard Evaluation (EHE)	1	Munitions Type			x	Small Arms
	2	Source of Hazard			x	Transition Range - small arms
	3	Location of Munitions			x	No munitions reported from this MRA
	4	Ease of Access			x	No barrier
	5	Status of Property			x	Non-DoD control
	6	Population Density			x	< 100 persons per square mile
	7	Population Near Hazard			x	26 or more structure
	8	Activities/Structures			x	Parks and recreational areas
	9	Ecological and/or Cultural Resources	x	U.S. Fish and Wildlife, SHPO		
	<b>10</b>	<b>EHE Module Score</b>				
Chemical Warfare Materiel (CWM) Hazard Evaluation (CHE)	11	CWM Configuration			x	Historical evidence indicates that CWM are not present
	12	Sources of CWM			x	Historical evidence indicates that CWM are not present
	13	Location of CWM			x	Historical evidence indicates that CWM are not present
	14	Ease of Access			x	No barrier
	15	Status of Property			x	Non-DoD control
	16	Population Density			x	< 100 persons per square mile
	17	Population Near Hazard			x	0 inhabited structures w/in 2 miles
	18	Activities/Structures			x	Agricultural - livestock grazing
	19	Ecological and/or Cultural Resources			x	Ecological resources present
	<b>20</b>	<b>CHE Module Score</b>				
Health Hazard Evaluation (HHE)	21	Groundwater Data Element			x	Groundwater not a pathway
	22	Surface Water (Human Endpoint) Data Element			x	Surface Water not a pathway
	23	Sediment (Human Endpoint) Data Element Table	x	Evaluation Pending		
	24	Surface Water (Ecological Endpoint) Data Element	x	Evaluation Pending		
	25	Sediment (Ecological Endpoint) Data Element	x	Evaluation Pending		
	26	Surface Soil Data Element	x	Evaluation Pending		
	27	Supplemental Contaminant Hazard Factor	x	Evaluation Pending		
	<b>28</b>	<b>HHE Module Score</b>	x	<b>Module Score Pending</b>		
MRS Priority	<b>29</b>	<b>MRS Priority (Based on Highest Hazard Evaluation Module Rating)</b>	x	<b>Final Score Pending</b>		
	<b>A</b>	<b>MRS Background Information</b>	x	<b>Pending</b>		

**Munitions Response Site Prioritization Protocol (MRSPP) Data Gaps**  
**32 CFR Part 179**

Installation: Ft. Flagler Military Reservation  
AOC: Gas Chamber  
RMIS Range ID: F10WA0316

Module	Table No.	Table Description	Data Gap	Potential Source of Information to Fill Data Gap	No Data Gap	Description of Known Data
Explosive Hazard Evaluation (EHE)	1	Munitions Type			x	Riot Control
	2	Source of Hazard			x	Evidence of no munitions
	3	Location of Munitions			x	No munitions reported from this MRA
	4	Ease of Access			x	No barrier
	5	Status of Property			x	Non-DoD control
	6	Population Density			x	< 100 persons per square mile
	7	Population Near Hazard			x	26 or more structure
	8	Activities/Structures			x	Parks and recreational areas
	9	Ecological and/or Cultural Resources	x	U.S. Fish and Wildlife, SHPO		
	<b>10</b>	<b>EHE Module Score</b>				
Chemical Warfare Materiel (CWM) Hazard Evaluation (CHE)	11	CWM Configuration			x	Evidence of no CWM
	12	Sources of CWM			x	Former Training facility
	13	Location of CWM			x	Historical evidence indicates that CWM are not present
	14	Ease of Access			x	No barrier
	15	Status of Property			x	Non-DoD control
	16	Population Density			x	< 100 persons per square mile
	17	Population Near Hazard			x	26 or more structure
	18	Activities/Structures			x	Parks and recreational areas
	19	Ecological and/or Cultural Resources	x	Ecological resources present		
	<b>20</b>	<b>CHE Module Score</b>				
Health Hazard Evaluation (HHE)	21	Groundwater Data Element			x	Groundwater not a pathway
	22	Surface Water (Human Endpoint) Data Element			x	Surface Water not a pathway
	23	Sediment (Human Endpoint) Data Element Table				Sediment not a pathway
	24	Surface Water (Ecological Endpoint) Data Element				Surface Water not a pathway
	25	Sediment (Ecological Endpoint) Data Element				Sediment not a pathway
	26	Surface Soil Data Element				Soil not a pathway
	27	Supplemental Contaminant Hazard Factor				No complete pathways
	<b>28</b>	<b>HHE Module Score</b>	x	<b>Module Score Pending</b>		
MRS Priority	<b>29</b>	<b>MRS Priority (Based on Highest Hazard Evaluation Module Rating)</b>	x	<b>Final Score Pending</b>		
	<b>A</b>	<b>MRS Background Information</b>	x	<b>Pending</b>		

**Munitions Response Site Prioritization Protocol (MRSPP) Data Gaps**  
**32 CFR Part 179**

Installation: Ft. Flagler Military Reservation  
AOC: Rocket Range  
RMIS Range ID: F10WA0316

Module	Table No.	Table Description	Data Gap	Potential Source of Information to Fill Data Gap	No Data Gap	Description of Known Data
Explosive Hazard Evaluation (EHE)	1	Munitions Type			x	High Explosive, propellant
	2	Source of Hazard			x	Former Range
	3	Location of Munitions			x	Suspected (historical evidence)
	4	Ease of Access			x	No barrier
	5	Status of Property			x	Non-DoD control
	6	Population Density			x	< 100 persons per square mile
	7	Population Near Hazard			x	26 or more structure
	8	Activities/Structures			x	Parks and recreational areas
	9	Ecological and/or Cultural Resources	x	U.S. Fish and Wildlife, SHPO		
	<b>10</b>	<b>EHE Module Score</b>				
Chemical Warfare Materiel (CWM) Hazard Evaluation (CHE)	11	CWM Configuration			x	Historical evidence indicates that CWM are not present
	12	Sources of CWM			x	Historical evidence indicates that CWM are not present
	13	Location of CWM			x	Historical evidence indicates that CWM are not present
	14	Ease of Access			x	No barrier
	15	Status of Property			x	Non-DoD control
	16	Population Density			x	< 100 persons per square mile
	17	Population Near Hazard			x	0 inhabited structures w/in 2 miles
	18	Activities/Structures			x	Agricultural - livestock grazing
	19	Ecological and/or Cultural Resources			x	Ecological resources present
	<b>20</b>	<b>CHE Module Score</b>				
Health Hazard Evaluation (HHE)	21	Groundwater Data Element			x	Groundwater not a pathway
	22	Surface Water (Human Endpoint) Data Element			x	Surface Water not a pathway
	23	Sediment (Human Endpoint) Data Element Table	x	Evaluation Pending		
	24	Surface Water (Ecological Endpoint) Data Element			x	Surface Water not a pathway
	25	Sediment (Ecological Endpoint) Data Element	x	Evaluation Pending		
	26	Surface Soil Data Element	x	Evaluation Pending		
	27	Supplemental Contaminant Hazard Factor	x	Evaluation Pending		
	<b>28</b>	<b>HHE Module Score</b>	<b>x</b>	<b>Module Score Pending</b>		
MRS Priority	<b>29</b>	<b>MRS Priority (Based on Highest Hazard Evaluation Module Rating)</b>	<b>x</b>	<b>Final Score Pending</b>		
	<b>A</b>	<b>MRS Background Information</b>	<b>x</b>	<b>Pending</b>		

**Munitions Response Site Prioritization Protocol (MRSPP) Data Gaps**  
**32 CFR Part 179**

Installation: Ft. Flagler Military Reservation  
AOC: Rifle Range  
RMIS Range ID: F10WA0316

Module	Table No.	Table Description	Data Gap	Potential Source of Information to Fill Data Gap	No Data Gap	Description of Known Data
Explosive Hazard Evaluation (EHE)	1	Munitions Type			x	Small Arms
	2	Source of Hazard			x	Former small arms range
	3	Location of Munitions			x	No munitions reported from this MRA
	4	Ease of Access			x	No barrier
	5	Status of Property			x	Non-DoD control
	6	Population Density			x	< 100 persons per square mile
	7	Population Near Hazard			x	26 or more structure
	8	Activities/Structures			x	Parks and recreational areas
	9	Ecological and/or Cultural Resources	x	U.S. Fish and Wildlife, SHPO		
	<b>10</b>	<b>EHE Module Score</b>				
Chemical Warfare Materiel (CWM) Hazard Evaluation (CHE)	11	CWM Configuration			x	Historical evidence indicates that CWM are not present
	12	Sources of CWM			x	Historical evidence indicates that CWM are not present
	13	Location of CWM			x	Historical evidence indicates that CWM are not present
	14	Ease of Access			x	No barrier
	15	Status of Property			x	Non-DoD control
	16	Population Density			x	< 100 persons per square mile
	17	Population Near Hazard			x	0 inhabited structures w/in 2 miles
	18	Activities/Structures			x	Agricultural - livestock grazing
	19	Ecological and/or Cultural Resources			x	Ecological resources present
	<b>20</b>	<b>CHE Module Score</b>				
Health Hazard Evaluation (HHE)	21	Groundwater Data Element			x	Groundwater not a pathway
	22	Surface Water (Human Endpoint) Data Element			x	Surface Water not a pathway
	23	Sediment (Human Endpoint) Data Element Table	x	Evaluation Pending		
	24	Surface Water (Ecological Endpoint) Data Element	x	Evaluation Pending		
	25	Sediment (Ecological Endpoint) Data Element	x	Evaluation Pending		
	26	Surface Soil Data Element	x	Evaluation Pending		
	27	Supplemental Contaminant Hazard Factor	x	Evaluation Pending		
	<b>28</b>	<b>HHE Module Score</b>	<b>x</b>	<b>Module Score Pending</b>		
MRS Priority	<b>29</b>	<b>MRS Priority (Based on Highest Hazard Evaluation Module Rating)</b>	<b>x</b>	<b>Final Score Pending</b>		
	<b>A</b>	<b>MRS Background Information</b>	<b>x</b>	<b>Pending</b>		

## Fort Flagler Military Reservation HRS Data Gaps

Information required to complete the MEC-HRS data collection form:

Item	Number	Comment – Missing Data Element
1	1.8	Confirm the latitude / longitude of potential source(s) and the accuracy of the information (in meters)
2		Source scale (i.e., 1:24,000, etc.)
3	1.12	Site Permits
4	6	Water use (GW within 4 miles, SW within 15 miles)
5	6.1	Total drinking water population served
6	6.2	Type of drinking water supply system (GW or SW?)
7	6.3	Other water uses of GW within 4 miles
8	6.4	Depth to Aquifer
9	6.5	Other surface water uses
10	7.1	Existence of sensitive or potentially vulnerable environment