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MCB CAMP LEJUENE  
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FINAL FOCUSED PRELIMINARY ASSESSMENT/SITE INSPECTION WORK PLAN  
ADDENDUM CAMP DEVIL DOG CONSTRUCTION AREA MILITARY MUNITIONS RESPONSE  
PROGRAM UNEXPLODED ORDNANCE 19 MCB CAMP LEJEUNE NC  
03/01/2011  
CH2M HILL

Final

**Focused Preliminary Assessment/Site Inspection  
Work Plan Addendum  
Camp Devil Dog Construction Area  
Military Munitions Response Program UXO-19**

Marine Corps Base Camp Lejeune  
Jacksonville, North Carolina



Prepared for

**Department of the Navy**

**Naval Facilities Engineering Command  
Mid-Atlantic Division**

Contract No.  
N62470-08-D-1000  
CTO-140 & CTO-WE33

**March 2011**

Prepared by

**CH2MHILL**

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Prepared by



**CH2MHILL**

**Charlotte, North Carolina**

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# Acronyms and Abbreviations

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AAR	After Action Report
AHA	Activity Hazard Analysis
ASR	Archives Search Report
bgs	below ground surface
BIP	blow-in-place
C/D	class/division
CDA	controlled detonation area
CDCA	Camp Devil Dog Construction Area
CFR	Code of Federal Regulations
CTO	Contract Task Order
CWM	chemical warfare materiel
DDESB	Department of Defense Explosives Safety Board
DFOW	definable features of work
DGM	digital geophysical mapping
DoD	Department of Defense
DOT	Department of Transportation
EME	earth-moving equipment
ESQD	explosive safety quantity distance
ESS	Explosives Safety Submission
EZ	exclusion zone
FTL	Field Team Leader
GIP	Geophysical Investigation Plan
GIS	Geographical Information System
GPO	Geophysical Prove-out
GPS	global positioning system
HE	high explosive
HSP	Health and Safety Plan
IBD	inhabited building distance
IDW	investigation-derived waste
lb	pound, pounds
m	meter
MARCORSYSCOM	Marine Corps Systems Command
MC	munitions constituents
MCAS	Marine Corps Air Station
MCB CamLej	Marine Corps Base Camp Lejeune
MDAS	material documented as safe
MEC	munitions and explosives of concern

# Introduction

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The Camp Devil Dog Construction Area (CDCA) Munitions Response Site (MRS), also known as Marine Corps Military Munitions Response Program (MMRP) Site UXO-19, is located on Marine Corps Base Camp Lejeune (MCB CamLej) south of Marine Corps Air Station (MCAS) New River and east of the town of Verona (**Figure 1-1**). MCB CamLej is planning military construction (MILCON) projects at the CDCA. Several former ranges or portions thereof were identified in the vicinity of the CDCA and were the subject of a Preliminary Assessment (PA)/Site Inspection (SI) (CH2M HILL, 2010) conducted between 2009 and 2010.

The PA/SI did not identify any unacceptable risks to human health or ecological receptors due to munitions constituents (MC) in environmental media. However, due to the confirmed presence of munitions and explosives of concern (MEC) and material potentially presenting an explosive hazard (MPPEH) in the subsurface, further investigation is planned to include 100 percent digital geophysical mapping (DGM) and 100 percent MEC intrusive investigation.

The investigation will be completed in phases, designated as Phase I through Phase V (**Figure 1-2**). Phase I will be completed under Contract Task Order (CTO) 140. Phases II through V will be completed under CTO-WE33.

## 1.1 Project Objective

The objective of this investigation is to evaluate the presence and nature of potential MEC within the CDCA MRS.

## 1.2 Work Plan Addendum Scope and Organization

The following investigative activities will be performed in within the CDCA MRS in accordance with methods and procedures detailed in the *MCB Camp Lejeune Munitions Response Program Master Project Plans* (MRP MPP) (CH2M HILL, 2008a) and *Master Project Plans, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina* (MPP) (CH2M HILL, 2008b) to accomplish the objective described in Section 1.1:

- Conduct an expanded archival records search on ranges adjacent to the CDCA MRS and not included in the PA/SI
- Clear vegetation and trees less than 6 inches in diameter within the CDCA MRS in preparation for DGM
- Perform DGM over 100 percent of the CDCA MRS
- Reacquire and intrusively investigate all geophysical anomalies identified by the DGM activities that represent potential subsurface MEC
- Verify removal of anomaly sources

- Perform demilitarization of all MEC and MPPEH identified during the intrusive activity
- Collect and analyze post-detonation soil samples for the presence of MC contamination
- Manage investigation derived waste (if generated)
- Validate laboratory data
- Prepare a Focused PA/SI Report Addendum and an After Action Report (AAR)

An Explosives Safety Submission (ESS) dated May 2009 was submitted to Marine Corps System Command (MARCORSYSCOM) and was approved by MARCORSYSCOM and the Department of Defense Explosives Safety Board (DDESB) on July 22, 2009. Amendment No. 1 was submitted in January 2010 to incorporate munitions found during the site preparation activities. Amendment No. 1 was given service approval by MARCORSYSCOM on March 10, 2010. Amendment No. 2 has been prepared and submitted to MARCORSYSCOM to expand the MRS, incorporate the munitions found during the 10 percent investigation, add lighting requirements for non-daylight working hours, add a MEC storage area, and add the use of mechanized equipment.

### 1.3 Work Plan Addendum Organization

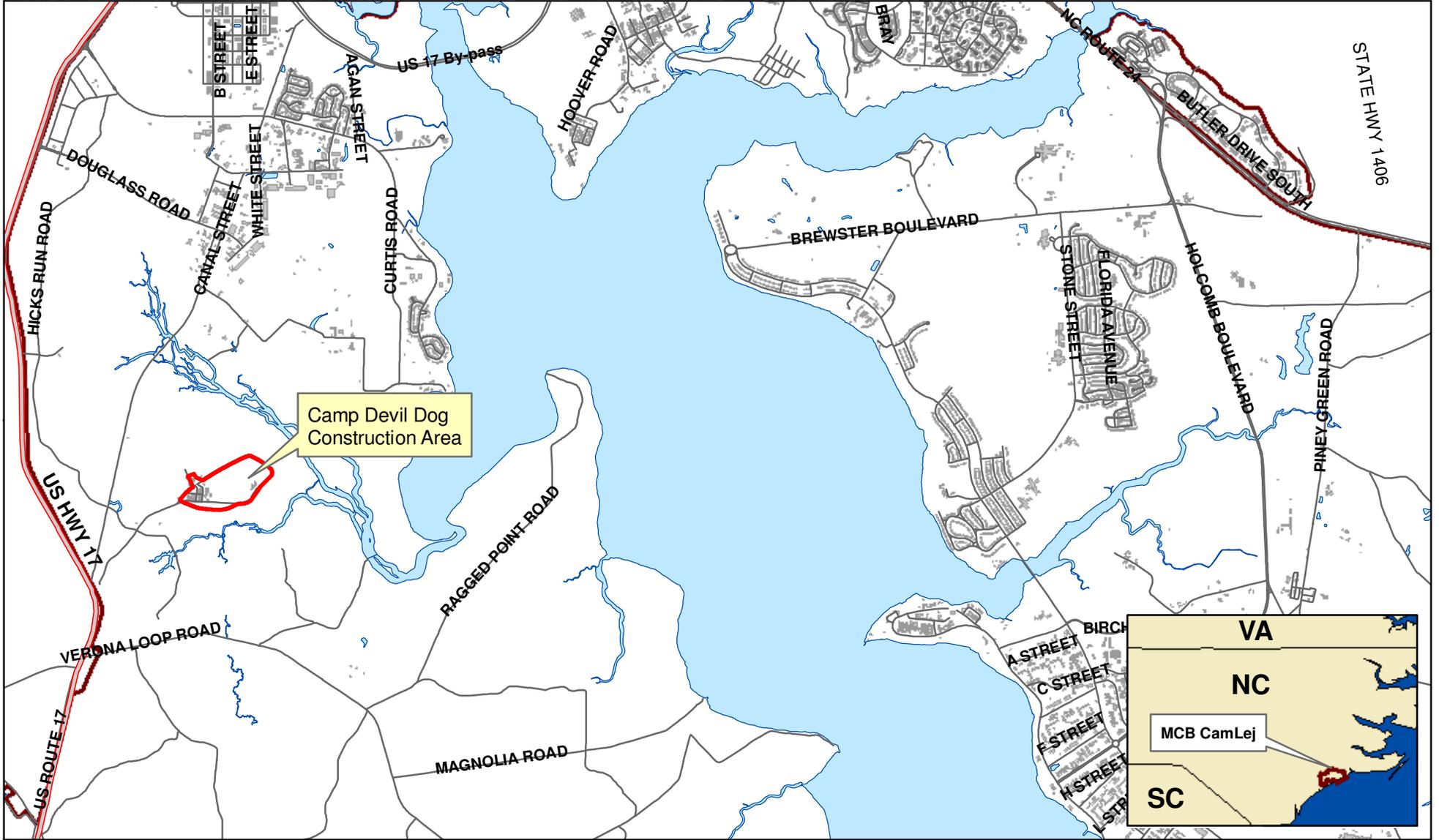
This Work Plan Addendum is divided into sections providing information on the detailed approach, including procedures to be employed during the execution of the project. Appendices to the Work Plan Addendum provide supporting documentation that details specific procedures for the execution of the project.

This Work Plan Addendum is organized as follows:

- **Section 1, Introduction**, provides a general introduction, scope, objectives, and Work Plan Addendum organization.
- **Section 2, Site Background**, provides the known range history within and adjacent to the investigation area and a summary of the previous investigation conducted within the CDCA.
- **Section 3, Technical Management Plan**, identifies the technical approach, methods, and operational procedures that will be used to execute the Intrusive Investigation.
- **Section 4, Field Investigation Plan**, identifies the technical approach, methods, and operational procedures that will be used to execute the field investigation activities, including mobilization and demobilization, land surveying, vegetation clearing, DGM, and soil sampling.
- **Section 5, MEC Intrusive Investigation Plan**, identifies the technical approach, methods, and operational procedures that will be used to execute the MEC intrusive investigation including demolition of MEC and MPPEH.
- **Section 6, Explosives Management Plan**, provides details for management of explosives in accordance with applicable regulations.

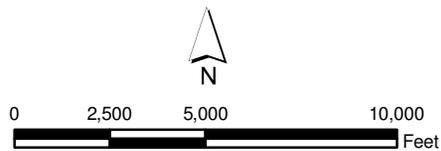
- **Section 7, Explosives Siting Plan**, provides explosives safety criteria for planning and siting explosives operations.
- **Section 8, Quality Control Plan (QCP)**, provides details of the approach, methods, and operational procedures to be employed for quality control (QC) of the Intrusive Investigation.
- **Section 9, Environmental Protection Plan**, describes the approach, methods, and operational procedures to be employed to protect the natural environment during the performance of all Intrusive investigation tasks.
- **Section 10, References**, lists the references cited in the preceding sections.
- **Appendix A, Expanded Archive Records Search Report**
- **Appendix B, Site Health and Safety Plan (HSP)**
- **Appendix C, Quality Assurance Project Plan (QAPP)**

During the initial PA/SI, MEC that was not specifically identified under the ESS and ESS Amendment No. 1 (CH2M HILL, 2009b) was discovered within the MRS. ESS Amendment No. 2 was prepared to expand the defined MRS and included known munitions used at ranges adjacent to the CDCA. The ESS Amendment was submitted for review by MARCORSYSCOM and DDESB for conformance with applicable United States Marine Corps, Department of the Navy (Navy), and Department of Defense (DoD) requirements for the safe handling of MEC and explosives. ESS Amendment No. 2 will be approved by these agencies prior to the start of intrusive investigation activities outside of the original MRS.



**Legend**

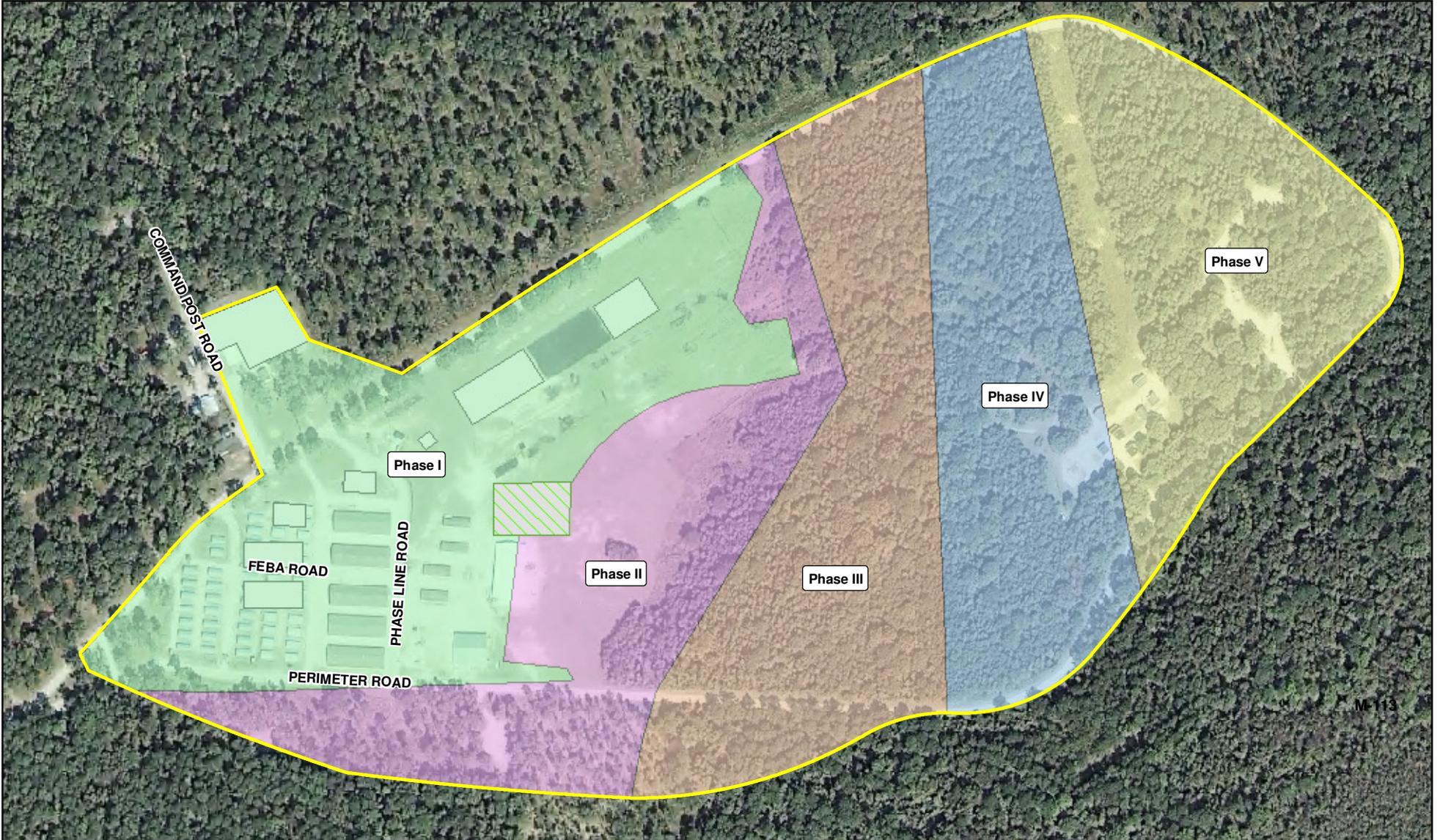
- Road
- ▭ Camp Devil Dog Construction Area
- ▭ Buildings
- ▨ Demolished Buildings
- ▭ Installation Boundary



1 inch = 5,000 feet

Figure 1-1  
Site Location Map  
Focused PA/SI Work Plan Addendum  
Camp Devil Dog Construction Area  
MCB CamLej  
North Carolina





M 113

**Legend**

- Phase I
- Phase II
- Phase III
- Phase IV
- Phase V
- 100% already completed
- 0.6 acre MILCON Footprint
- Camp Devil Dog Munitions Response Site



1 inch = 350 feet

Figure 1-2  
Site Map  
Focused PA/SI Work Plan Addendum  
Camp Devil Dog Construction Area  
MCB CamLej  
North Carolina



# Site Background

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The CDCA MRS is located on MCB CamLej just south of MCAS New River (**Figure 1-1**) and is accessed from US Highway 17 near the town of Verona via unnamed and unpaved roads. An Archival Records Search Report, included in the *Site-Specific Work Plan Addendum for Focused Preliminary Assessment/ Site Inspection, Camp Devil Dog Construction Area* (CH2M HILL, 2009a) identified several former ranges either wholly or partially located within the MRS. The range boundaries located within the Camp Devil Dog Construction Area were originally used to define the MRS. Based on the recommendations in the PA/SI report, the MRS boundary was expanded to include approximately 83 acres, shown on **Figure 1-2**.

## 2.1 Site History

Camp Devil Dog (also known as Camp Devildog) is presently the center of the Marine Combat Training at the School of Infantry. Facilities include billeting, training classrooms, and messing, and this location is the main base camp for training that takes place in the surrounding training areas. Each year, roughly 21,000 Marines pass through Camp Devil Dog, receiving training including land navigation, first aid, defensive combat, offensive combat, and night maneuvers. No live fire takes place, but large amounts of blank ammunition are used (Richardson, 2008a). One area on the western portion of the MRS is used as a training facility for military operations on urbanized terrain (MOUT). The MOUT training facility includes outdoor classrooms, mock buildings, and other urban training facilities where military personnel train with pyrotechnics and blanks.

### 2.1.1 Former Ranges Located within the CDCA MRS

All or portions of eight former ranges lie within the expanded MRS boundary, as shown on **Figure 2-1**, and include:

- K-22 Hand Grenade Course (Archive Search Report [ASR] #2.111)
- M-4 Rifle Grenade Range (ASR #2.104)
- M-113 Hand Grenade Range (ASR #2.167)
- M-115 Hand Grenade Range (ASR #2.168)
- M-109 Infiltration Range (ASR #2.165)
- M-110 Demolitions and Booby Trap Range (ASR #2.166)
- M-107 Hand Grenade Range
- M-118 Individual Movement Day Range

Based on correspondence with the Base safety specialist (Richardson, 2008b), and the United States Army Corps of Engineers (USACE) (2001), the following information was collected about the following former ranges. Two of the ranges, the M-107 Hand Grenade Range and the M-118 Individual Movement Day Range were not addressed in the Range Assessment Report.

### **K-22 Hand Grenade Course (ASR #2.111)**

The K-22 Hand Grenade Course operated between 1950 and 1960 and was used to practice grenade throwing techniques prior to throwing live grenades. Facilities at the K-22 Hand Grenade Course included one bunker and one foxhole. The estimated depth of potential munitions on the K-22 Hand Grenade Course is expected to be several inches below ground surface (bgs).

### **M-4 Rifle Grenade Range (ASR #2.104)**

The M-4 Rifle Grenade Range at Camp Devil Dog was heavily used from 1950 to 1960. The M-4 Rifle Grenade Range would have been well defined and limited to a relatively small area. Reported munitions used at the M-4 Rifle Grenade Range include M28 and M29 rifle grenades, white phosphorus (WP) hand and rifle grenades, pyrotechnics, and demolition materials. The estimated depth of potential munitions at the M-4 Rifle Grenade Range is expected to be several inches bgs.

### **M-113 Hand Grenade Range (ASR #2.167)**

The M-113 Hand Grenade Range was utilized from 1970 to 1977 for practice and demonstration operations. General types of hand grenades used included incendiary M14, illumination MK 1, Smoke M18, WP M15 (for demonstration only), and practice hand grenades. The estimated depth of potential munitions on the M-113 Hand Grenade Range is expected to be on or near the surface.

### **M-115 Hand Grenade Range (ASR #2.168)**

The M-115 Hand Grenade Range was heavily used from 1970 to 1977. Munitions used on the range included live high explosive (HE) hand grenades. The range consisted of six throwing pits, six control pits, and a barricade with two observation ports, one for the officer in charge and the other for five students. The estimated depth of potential munitions on the M-115 Hand Grenade Range is expected to be 0 to several inches bgs.

### **M-109 Infiltration Range (ASR #2.165)**

The M-109 Infiltration Course was heavily used from approximately 1970 to 1974. Munitions used on the range included small arms ammunition and demolition charges. The range consisted of machine guns firing from fixed positions and demolition pits. The estimated depth of potential munitions on the M-109 Infiltration Course is expected to be 0 to several inches bgs.

### **M-110 Demolitions and Booby Trap Range (ASR #2.166)**

M-110 Demolitions and Booby Trap Range operations were conducted from 1960 to 1979. Demolitions, not to exceed a 20-pound (lb) trinitrotoluene (TNT) net equivalent weight (NEW), and a variety of land mine and booby trap simulators were utilized as well as practice hand grenades.

### **M-107 Hand Grenade Range and M-118 Individual Movement Day Range**

No additional information was discovered concerning the M-107 Hand Grenade Range or M-118 Individual Movement Day Range. The M-109 Hand Grenade Range is expected to be similar to the M-115 Hand Grenade Range and may have included the use of live HE hand grenades. The M-109 Infiltration Course is assumed to have used fixed position machine

guns to provide live fire over maneuvering troops to simulate combat situations. The M-118 Individual Movement Day range is assumed to have trained Marines in movement techniques (i.e., crawling with weaponry).

### **M-5 Artillery Range (ASR #2.75) and M-5A Artillery Range (ASR #2.76)**

In addition to the above, the MRS is located between the M-5/M-5A Artillery Ranges and the K-2 Impact Area, as shown on **Figure 2-2**. According to the USACE (2001), munitions would likely be found only at the gun positions and within the impact area. Due to the distance of the MRS from the gun positions (approximately 8,200 to 9,800 feet and impact area (approximately 23,000 feet), it is unlikely that the MRS has been impacted by activities at these locations. The area between the M-5/M-5A Gun Positions and the north edge of the K-2 Impact Area has historically been used as a maneuver area. No information on previous discoveries of MEC related to training at M-5/M-5A has been identified and the risk of encountering MEC is considered to be low. The M-5/M-5A Artillery Ranges were used in approximately 1953.

## **2.1.2 Former Ranges Located Adjacent to the CDCA MRS**

Nine former ranges were identified during an expanded archive records search as being located adjacent to the CDCA MRS (**Figure 2-1**). These former ranges include:

- M-9 Combat Village Area (ASR #2.114)
- M-17 Practice Hand and Rifle Grenade Course (ASR #2.121)
- M-4A Practice Hand Grenade Course (ASR #2.113)
- M-122 Flame Thrower Range (ASR #2.169)
- M-1 Mortar Range (ASR #2.25)
- M-104 Demolitions and Land Mines (ASR #2.164)
- M-15 Mine and Booby Trap Display Area (ASR #2.115)
- M-6 Infiltration Course (ASR #2.106)
- M-7 1000-inch Machine Gun Range and Landscaping Range (ASR #2.107)

Based on correspondence with the Base safety specialist (Richardson, 2008b), and USACE (2001), the following information was collected about the former ranges.

### **M-9 Combat Village Area (ASR #2.114)**

The M-9 Combat Village Area was heavily used from approximately 1970 to 1974. Munitions used on the range included small arms ammunition and demolition charges. The range consisted of machine guns firing from fixed positions and demolition pits. The estimated depth of potential munitions on the M-109 Infiltration Course is expected to be 0 to several inches bgs.

### **M-17 Practice Hand and Rifle Grenade Course (ASR #2.121)**

The M-117 Practice Hand and Rifle Grenade Course was used in approximately 1958. Munitions used on the range may have included practice grenades, live HE grenades, and M29 rifle grenades. The estimated depth of potential munitions on the M-17 Practice hand and Rifle Grenade Course is expected to be 0 to several inches bgs.

### **M-4A Practice Hand Grenade Course (ASR #2.113)**

The M-4A Practice Hand Grenade Course was used in approximately 1960. Munitions used on the range included likely included practice hand grenades with the possibility of live HE grenades. The range consisted of one bunker and two foxholes. The estimated depth of potential munitions on the M-115 Hand Grenade Range is expected to be 0 to several inches bgs.

### **M-122 Flame Thrower Range (ASR #2.169)**

The M-122 Flame Thrower Range was used from approximately 1970 to 1977. There was no known munitions usage on this range, only flame fuels used in flame throwers. The range included a tank turret as a target.

### **M-1 Mortar Range (ASR #2.25)**

The M-1 Mortar Range was used from 1943 to 1945. Potential munitions used on the range included 60mm Mortar (HE and Illumination) and 81mm Mortar (HE, WP, and practice). The estimated depth of potential munitions on Mortar Range M-1 is expected to be 0 to 2.7 feet bgs (based on maximum penetration in sand).

### **M-104 Demolition Range (ASR #2.164)**

M-104 demolitions and land mines operations were conducted in 1970. Demolition charges, not to exceed a 5-lb 2,4,6-TNT NEW per shot, were used in three demolitions pits.

### **M-15 Mine and Booby Trap Display Area (ASR #2.115)**

The M-15 Mine and Booby Trap Display Area operations were conducted from 1957 to 1961. Practice mines, improvised mines, and booby traps were utilized at two practice minefields.

### **M-6 Infiltration Course (ASR #2.106)**

The M-6 Infiltration course operated from 1957 to 1961. Munitions employed consisted of small arms and demolitions (0.25-lb TNT NEW).

### **M-7 Landscape Range (ASR #2.107)**

The M-7 Landscape Range operated from 1957 to 1961 and consisted of 15 firing points and 15 landscape target carriers. Munitions employed included small arms. Small arms ammunition explosive hazards exist only with complete rounds. Complete rounds of small arms would only be found at or near firing line.

## **2.2 Previous Investigations**

The focused PA/SI (CH2M HILL, 2010) is the only investigation previously performed within the CDCA MRS. This investigation was conducted to support ongoing MILCON activities at the CDCA.

During the PA/SI, environmental samples including; 160 surface soil samples, 53 subsurface soil samples, and 27 groundwater samples were collected and analyzed for select metals (lead, antimony, copper, zinc, and arsenic) and MC including explosives and perchlorate. Metals and MC were not detected at concentrations posing ecological and human health risks.

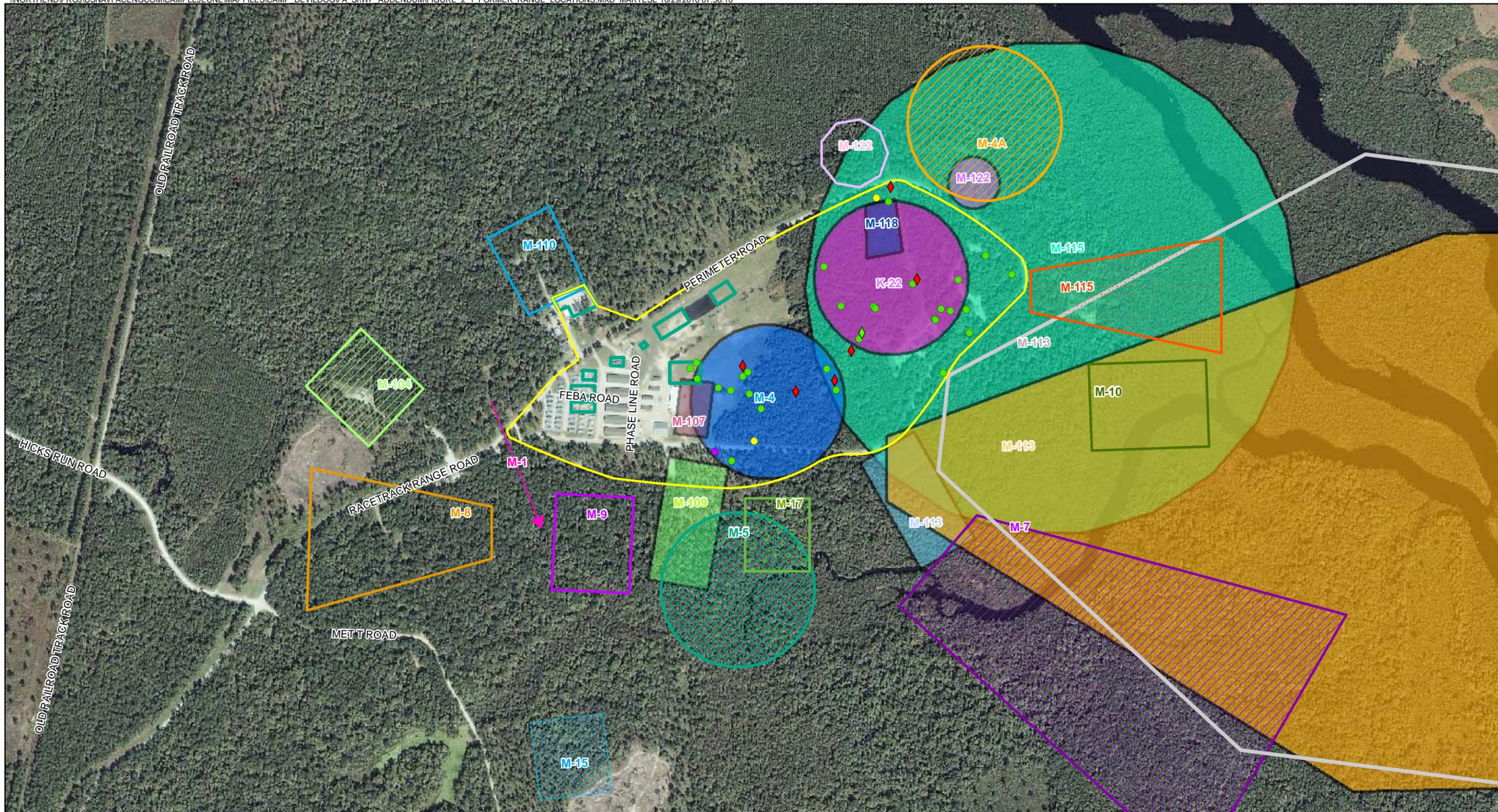
DGM was performed over 10 percent of the original MRS and 100 percent of a 0.6-acre MILCON Footprint, located adjacent to the MRS (**Figure 1-2**). DGM identified 4,417 geophysical anomalies representing potential subsurface MEC. The anomalies were intrusively investigated, resulting in the identification of 42 total MEC items. The types and quantities of MEC discovered are listed below and their locations are shown on **Figure 2-1**:

- (1) M49 series trip flare
- (1) MK1 series practice hand grenade
- (3) M8 smoke grenades
- (2) M20A1 rifle grenades
- (1) M3 mouse trap
- (9) M43 series 81 millimeter (mm) mortar cartridges
- (21) M49A2 series 60mm mortar cartridges
- (2) M57 WP series 81mm mortar cartridges
- (1) M67 practice grenade
- (1) MK2 practice grenade

## 2.3 Site Lithology

The observed lithology at the MRS is limited to a depth of 24 feet bgs within the Undifferentiated Formation. The shallow soils encountered at the CDCA consisted of poorly graded sands, sands with variable amounts of silt and clay, and occasional clay lenses ranging from 3 inches to over 9 feet thick, where encountered.

The munition with the greatest fragmentation distance (MGFD), the M43 81mm Mortar, has a maximum ordnance penetration of 2.7 feet according to the EM 1110-1-4009, Table 7.3 (USACE, 2000). The maximum depth of the intrusive investigation will be 3 feet based on the types of munitions used, the soil type at the CDCA, and the expected future land use at the CDCA.



- |   |  |  |  |
|---|--|--|--|
| <ul style="list-style-type: none"> <li>◆ Flare</li> <li>◆ Grenade</li> <li>● Rifle Grenade</li> <li>● Mouse Trap</li> <li>● Mortar Cartridge</li> <li>➤ M-1 Mortar Range</li> <li>▭ MILCON Footprint</li> </ul> | <ul style="list-style-type: none"> <li>▭ Camp Devil Dog Munitions Response Site/UXO-19</li> <li>▭ M-15 Mine, Booby Trap Display Area</li> <li>▭ M-9 Combat Village Area</li> <li>▭ M-4A Practice Hand Grenade Course</li> <li>▭ M-17 Practice Hand and Rifle Grenade Range</li> <li>▭ M-122 Flame Thrower Range</li> <li>▭ M-115 Hand Grenade Range</li> <li>▭ M-113 Hand Grenade Range (Practice) Demonstrator</li> <li>▭ M-110 Demolitions And Booby Trap Range</li> </ul> | <ul style="list-style-type: none"> <li>▭ M-104 Demolition Range</li> <li>▭ M-10 Hand Grenade Range</li> <li>▭ M-5 Practice Rifle Grenade Range</li> <li>▭ M-7 Landscape Range</li> <li>▭ M-8 Assault of a Fortified Position Range</li> <li>▭ M-4 Rifle Grenade Range</li> <li>▭ K-22 Hand Grenade Course</li> <li>▭ M-113 Hand Grenade Range</li> <li>▭ M-115 Hand Grenade Range</li> </ul> | <ul style="list-style-type: none"> <li>▭ M-107 Hand Grenade Range</li> <li>▭ M-109 Infiltration Range</li> <li>▭ M-113 Battle Sites Range</li> <li>▭ M-118 Individual Movement Range</li> <li>▭ M-122 Flame Thrower Range</li> </ul> |
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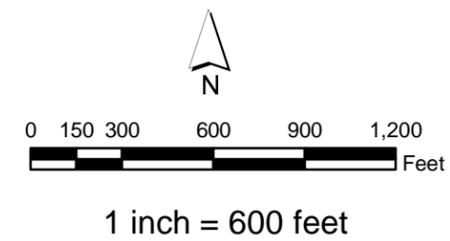
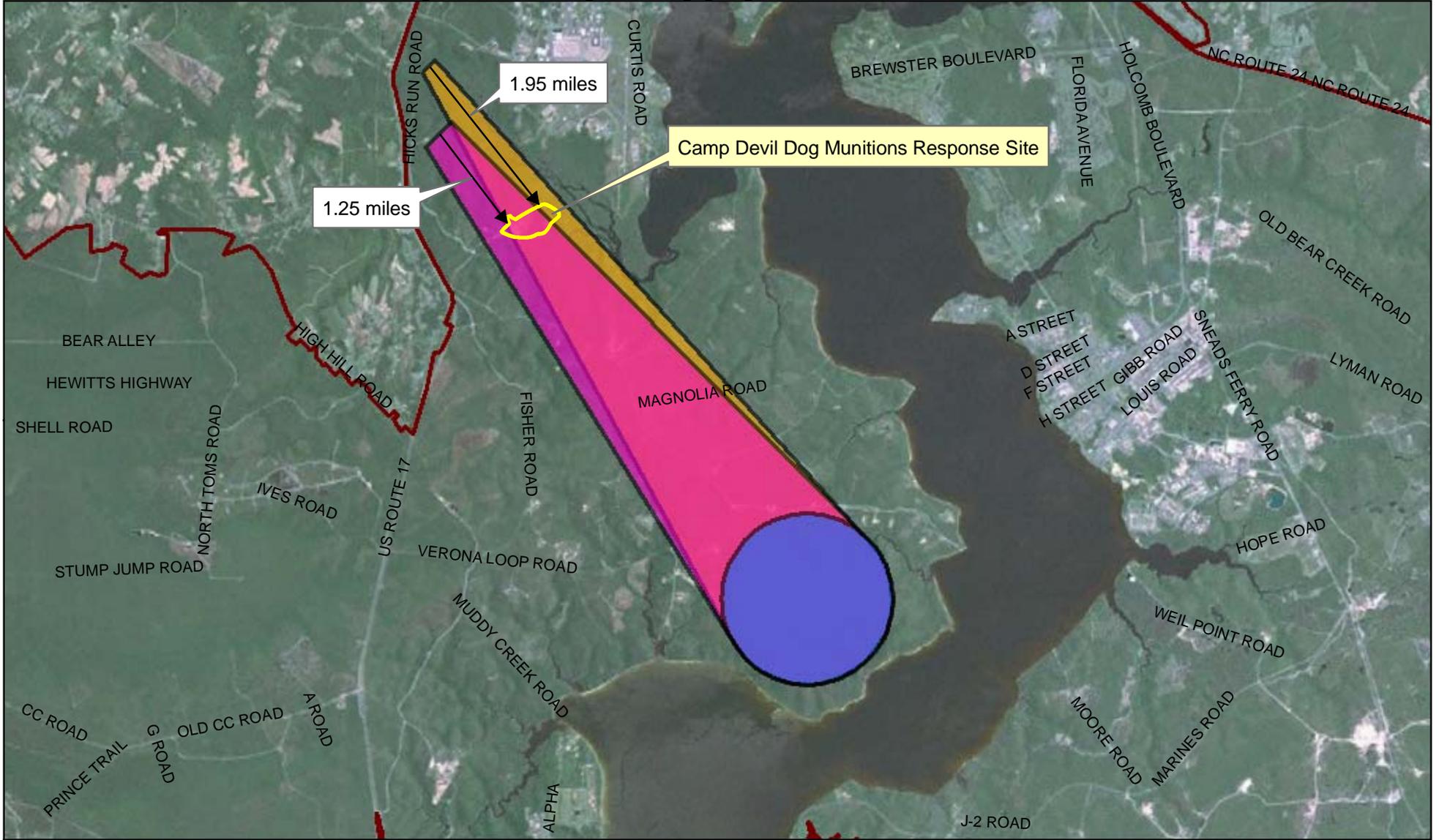


Figure 2-1  
Range Location Map  
Focused PA/SI Work Plan Addendum  
Camp Devil Dog Construction Area  
MCB CamLej  
North Carolina





- Legend**
- K-2 Impact Area
  - Camp Devil Dog Munitions Response Site
  - M-5A Artillery Range
  - M-5 Artillery Range
  - Installation Boundary

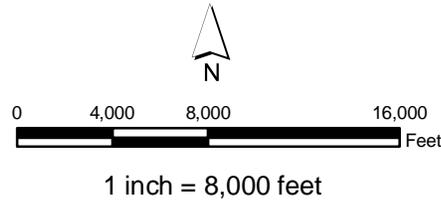


Figure 2-2  
 M-5/M-5A Range Location Map  
 Focused PA/SI Work Plan Addendum  
 Camp Devil Dog Construction Area  
 MCB CamLej  
 North Carolina



# Technical Management Plan

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## 3.1 Munitions Response Guidance, Regulations, and Policy

The munitions response (MR) intrusive investigation within the MRS will be conducted under the guidance documents, regulations, and polices described in Section 2.1 of the MRP MPP (CH2M HILL, 2008a).

## 3.2 MEC Contingency Procedures

Based on the documented historical activities conducted at, and in, the vicinity of CDCA, it is anticipated that additional MEC will be discovered during the investigation. MEC that is discovered will be destroyed onsite. Therefore, alternatives to onsite disposal are not identified in this Work Plan Addendum. If MEC is discovered that cannot be identified, or if identified MEC exceeds the contingency MGFDF described in the ESS Amendment No. 2, work will be suspended until the ESS can be amended to reflect the most current MGFDF.

## 3.3 Chemical Warfare Materiel Contingency Procedures

Based on the documented historical activities conducted at, and in, the vicinity of CDCA, it is not anticipated that chemical warfare materiel (CWM) will be discovered. If CWM is encountered, all work will immediately cease and CWM contingency procedures will be conducted in accordance with Section 2.3 of the MRP MPP (CH2M HILL, 2008a).

## 3.4 Project Personnel, Organization, and Schedule

### 3.4.1 Project Organization

The key organizations involved in this project are Naval Facilities Engineering Command (NAVFAC), MCB CamLej, the North Carolina Department of Environment and Natural Resources (NCDENR), United States Environmental Protection Agency (USEPA), and CH2M HILL.

Project execution will be conducted by CH2M HILL and its subcontractors; specific duties for CH2M HILL and its subcontractors are described in Section 2.4 of the MRP MPP (CH2M HILL, 2008a). CH2M HILL will issue subcontracts for MEC support, vegetation clearance, DGM, and land surveying.

### 3.4.2 Project Personnel

The reporting relationship between key project personnel and the roles and responsibilities of the key personnel are discussed in Section 2.4 of the MRP MPP (CH2M HILL, 2008a). Contact information for key project personnel is shown in **Table 3-1**.

### 3.4.3 Project Schedule

**Figure 3-1** presents the projected schedule, including key milestones.

## 3.5 Technical Approach

This section discusses the technical approach for each task necessary to complete the investigation.

### 3.5.1 Task 1—Project Planning

This task includes project management, meetings, an expanded archive search, Work Plan Addendum preparation, ESS Amendment preparation, and subcontractor procurement.

Project management includes all work necessary for controlling the project budget and schedule. This includes monthly status reports and invoicing, as well as all other administrative tasks needed for project performance.

Meetings are planned throughout the course of this project. The meetings will be held to discuss proposed work, present investigation findings, and discuss project status. The meetings are planned to be held at MCB CamLej, CH2M HILL's Charlotte office, or at other locations as necessary.

An expanded archive search was conducted in July 2010 to include former ranges adjacent to the CDCA. The findings of the expanded archive search have been summarized in the Expanded Archival Records Search Report included in this Work Plan Addendum as **Appendix A**.

Three versions of the Work Plan Addendum will be prepared under this task. A draft Work Plan Addendum will be submitted electronically for NAVFAC and MCB CamLej review. A revised Work Plan Addendum will be submitted to NAVFAC, MCB CamLej, USEPA, and NCDENR for review upon incorporating comments from NAVFAC and MCB CamLej. A final Work Plan Addendum will be prepared that will address all comments on the draft document.

Subcontractor procurement is also included under this task. Anticipated subcontractor services include MEC support, vegetation clearance, DGM, and land surveying.

### 3.5.2 Task 2—Intrusive Investigation Preparation

All field activities required to prepare for the MEC intrusive investigation will be performed under this task. The primary field activities include:

- MEC avoidance and surface clearance
- Vegetation clearance
- Land Surveying
- DGM

The MEC intrusive investigation will be performed under Task 4 (Section 3.5.4).

### 3.5.3 Task 3—Data Analysis and Data Management

This task includes the management of data collected during all aspects of the investigation and includes, but is not limited to; land survey data, post-blow-in-place (post-BIP) sample data, and DGM data.

All DGM data will be collected in preparation for the creation of a geographical information system (GIS) tailored for the site investigative needs. All digital data will be created using a software platform that will allow it to be loaded directly into the GIS. The main purpose of the GIS is to assemble all the data required to associate the non-intrusive subsurface geophysics investigative data with its correct geographical location, the relational database, mapping, and remote sensing data. The GIS tools are used to manage the project, assemble data, and help determine areas requiring further investigation.

CH2M HILL will also provide the site GIS data for upload into the existing MCB CamLej GIS. This data will include ArcView project and shape files that best delineate the area on the basis of uses, site conditions, and other information gathered during the study.

Specifics for this task are provided in the Section 8.1 of the MRP MPP (CH2M HILL, 2008a).

### **3.5.4 Task 4—MEC Intrusive Investigation**

Geophysical anomalies identified during DGM activities will be intrusively investigated. The scope of the MEC intrusive investigation and the technical approach are presented in **Section 5**. The primary intrusive investigation activities include the following:

- Site preparation
- Anomaly reacquisition/detection
- Intrusive investigation of anomalies (to a depth of 3 feet)
- Anomaly identification and verification
- MEC/MPPEH demilitarization
- Soil sampling
- Investigation-derived waste (IDW) management (if generated)
- Scrap disposal

### **3.5.5 Task 5—Reporting**

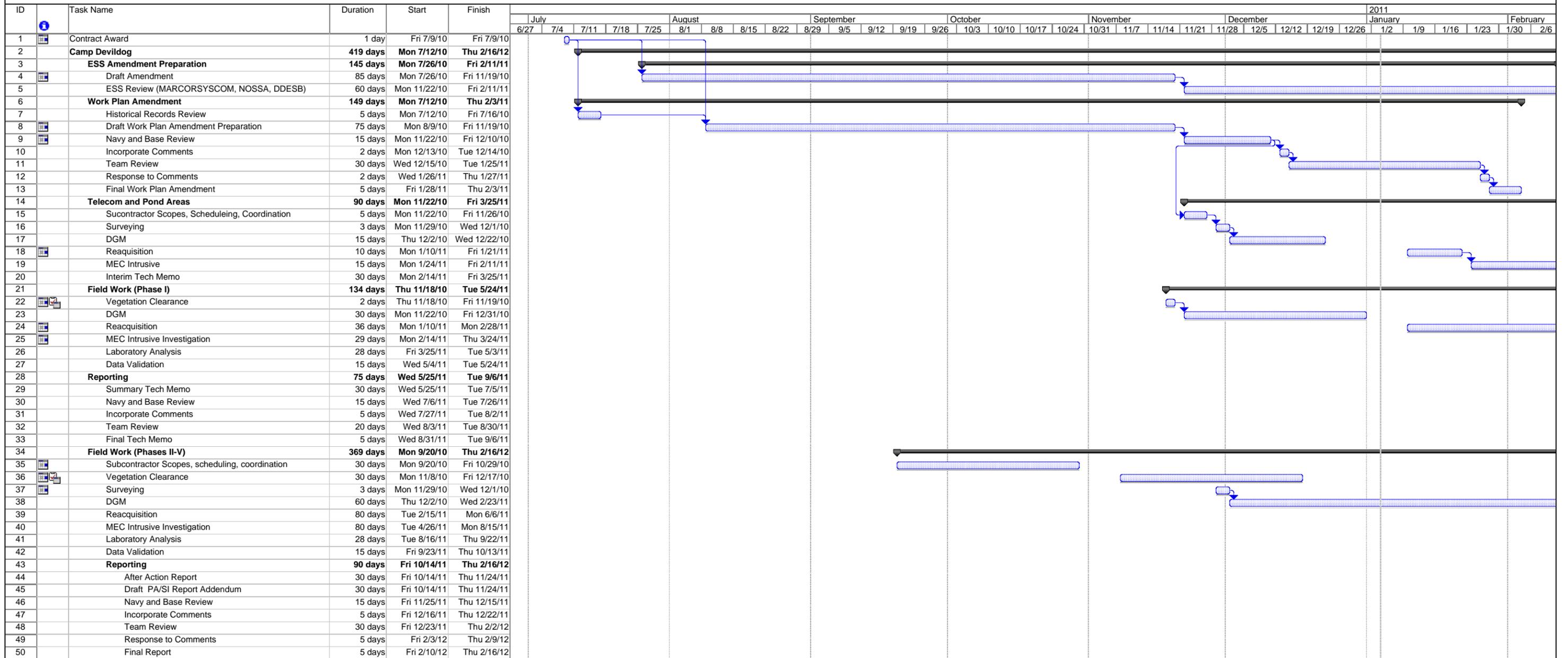
Post investigation reporting will include a Focused PA/SI Report Addendum, an AAR, and if requested, a Technical Memorandum summarizing preliminary findings of the investigation. The Focused PA/SI Report Addendum will include a description of all field activities, investigation findings, and conclusions. The draft focused PA/SI Report Addendum will be submitted electronically for NAVFAC and MCB CamLej review prior to preparing the draft focused PA/SI report addendum for USEPA and NCDENR for review and comment. Comments will be addressed and a final focused PA/SI Report Addendum will be submitted to NAVFAC, MCB CamLej, USEPA, and NCDENR.

An AAR will be prepared for each phase (Phase I through Phase V) in accordance with Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8020.15B (2009). Each AAR will provide a summary of all MEC found within that phase during the investigations, summarize all MEC removal activities, request the cancellation of the explosive safety quantity distance (ESQD) arcs within that phase, and provide an evaluation of the selected removal methods and relative effectiveness. The AARs will be submitted to NAVFAC and MCB CamLej for submittal to MARCORSSCOM for review and approval.

TABLE 3-1  
 Project Personnel Contact Information  
*Focused PA/SI Work Plan Addendum*  
*Camp Devil Dog Construction Area*  
*MCB CamLej*  
*North Carolina*

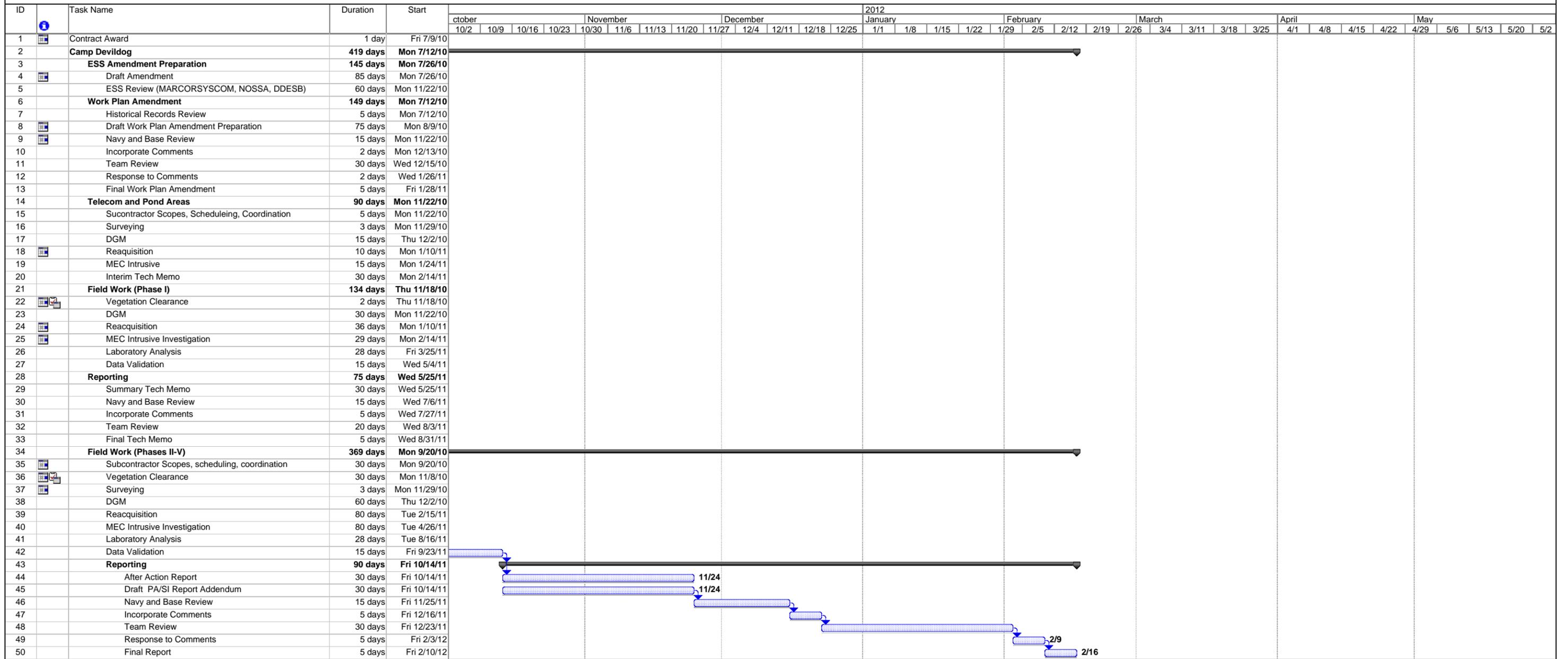
<b>Name/Title/Organization</b>	<b>Mailing Address</b>	<b>Telephone/Fax/E-mail</b>
Doug Dronfield Program Manager	CH2M HILL 15010 Conference Center Dr. Suite 200 Chantilly, VA 20151	703-376-5090 (office) 703-376-5010 (fax) <a href="mailto:Doug.Dronfield@ch2m.com">Doug.Dronfield@ch2m.com</a>
Keri Hallberg, P.E. Project Manager	CH2M HILL 11301 Carmel Commons Blvd Suite 304 Charlotte, NC 28226	704-543-3260 (office) 704-544-4041 (fax) <a href="mailto:Keri.Hallberg@ch2m.com">Keri.Hallberg@ch2m.com</a>
Matt Louth Activity Manager	CH2M HILL 5700 Cleveland Street Suite 101 Virginia Beach, VA 23462	757-518-9666 (office) 757-460-4592 (fax) <a href="mailto:Matt.Louth@ch2m.com">Matt.Louth@ch2m.com</a>
Thomas M. Roth, P.E. Senior Consultant	CH2M HILL 2607 Lavista Road Decatur, GA 30033-1725	404-474-7640 (office) 404-259-6674 (cell) 770-604-9183 (fax) <a href="mailto:Tom.Roth@ch2m.com">Tom.Roth@ch2m.com</a>
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Carl Woods Program H&S Manager	CH2M HILL 10123 Alliance Road Suite 300 Cincinnati, OH 45242	513-889-5771 (office) <a href="mailto:Carl.Woods@ch2m.com">Carl.Woods@ch2m.com</a>
Ben Redmond Munitions Response Market Segment Director	CH2M HILL 2035 Lakeside Centre Way Suite 200 Knoxville, TN 37922	865-560-2801 (office) 865-560-2802 (fax) <a href="mailto:Ben.Redmond@ch2m.com">Ben.Redmond@ch2m.com</a>
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George DeMetropolis MR QC and Safety Officer	CH2M HILL 402 West Broadway, Ste. 1450 San Diego, CA 92101	619-687-0120 (office) <a href="mailto:George.DeMetropolis@ch2m.com">George.DeMetropolis@ch2m.com</a>
Kevin Lombardo MR Operations Manager	CH2M HILL 15010 Conference Center Dr. Suite 200 Chantilly, VA 20151	703-376-5175 (office) 703-608-8247 (cell) <a href="mailto:Kevin.Lombardo@ch2m.com">Kevin.Lombardo@ch2m.com</a>

**Figure 3-1**  
**Project Schedule**  
**Focused PA/SI Work Plan Addendum**  
**Camp Devil Dog Construction Area**  
**MCB CamLej, North Carolina**





**Figure 3-1**  
**Project Schedule**  
**Focused PA/SI Work Plan Addendum**  
**Camp Devil Dog Construction Area**  
**MCB CamLej, North Carolina**



# Field Investigation Plan

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## 4.1 Field Investigation Approach

The following field activities will be conducted to meet the objectives described in Section 1.1. All field activities will be conducted in accordance with the standard operating procedures (SOPs) provided in the MRP MPP (CH2M HILL, 2008a).

### 4.1.1 Mobilization

Mobilization will include identifying, briefing, and mobilizing staff, as well as securing and deploying equipment.

#### General Activities

- Identify/procure, package, ship, and inventory project equipment, including geophysical instrumentation, hand tools and supplies, and vegetation clearance equipment
- Coordinate with local agencies, including MCB CamLej Base Range Control, police, hospital, and fire department, as appropriate
- Test and inspect equipment
- Conduct site-specific training on the Work Plan Addendum and MEC procedures and hazards
- Review subcontractor Activity Hazard Analysis (AHA) forms
- Verify that all forms and project documentation are in order and project team members understand their responsibilities regarding completing project-reporting requirements

#### Kickoff/Safety Meeting

During mobilization, a kickoff and site safety meeting will be conducted. This meeting will include a review of this Work Plan Addendum by all site personnel. Additional meetings will occur as needed, as new personnel, visitors, and/or subcontractors arrive at the site.

### 4.1.2 Vegetation Clearing

Approximately 52 acres within the CDCA MRS will be cleared of all brush and trees less than 6-inches in diameter in order to facilitate 100 percent DGM. All vegetation will be cut and mulched onsite and tree stumps will be ground to within 6-inches of the ground surface. Root balls will be left intact and will not be removed. During the vegetation removal process, Unexploded Ordnance (UXO) Technicians will conduct MEC avoidance activities in accordance with the MEC avoidance procedures included in the HSP (Appendix B).

### 4.1.3 Site Survey

Land surveying services will be conducted post vegetation clearance by a professional land surveyor licensed in the State of North Carolina in accordance with Section 7.4 of the MRP MPP (CH2M HILL, 2008a). The surveying services will be completed under two mobilizations:

- **Mobilization 1** will establish the MRS boundaries the DGM grids. The investigation area will be divided into 50 meter (m) × 50 m survey grids coinciding with the existing Base-wide grid system previously established for MR investigations to correspond with the North American Datum of 1983 Universal Transverse Mercator, Zone 18, meters. The four corners of each survey grid will be marked with non-metallic stakes. Each corner stake will be marked with the grid number and the compass direction (e.g., NE, SW) indicating which grid corner is represented.
- **Mobilization 2** will occur post DGM and will involve surveying and marking of the locations of geophysical anomalies detected by DGM.

MEC avoidance will be performed during the surveying activities. UXO Technicians will escort surveying personnel while onsite, and will clear all locations where stakes are driven.

### 4.1.4 Digital Geophysical Mapping

Prior to DGM activities, a Geophysical Prove-out (GPO) will be performed to validate the DGM systems utilized during the DGM activities. Details of the GPO for the MRS are provided in Appendix B of the Work Plan Addendum (CH2M HILL, 2009a).

DGM will be conducted over 100 percent of the 83-acre MRS. The DGM will be conducted using a single coil Geonics EM61-MK2 instrument to map geophysical anomalies that could potentially represent subsurface MEC within the subject site. In areas where DGM cannot be conducted due to site conditions (i.e., areas with rough terrain or a high density of trees greater than 3 inches) handheld magnetometers will be used to locate anomalies. The EM61-MK2 is a high-resolution time-domain electromagnetic instrument designed to detect, with high spatial resolution, shallow ferrous and non-ferrous metallic objects.

A Geophysical Investigation Plan (GIP) is provided in Appendix C of the Work Plan Addendum (CH2M HILL, 2009a) and provides details of the equipment, approach, methods, operational procedures and QC to be used in performing the geophysical investigations at the MRS.

### 4.1.5 Site Restoration and Demobilization

Damage caused by equipment or other site activities (e.g., deep ruts) will be repaired and re-vegetated as necessary to prevent erosion.

Full demobilization will occur when the project is completed and appropriate quality assurance (QA)/QC checks have been performed. The following activities will occur prior to demobilization:

- Confirmation that DGM is complete
- Verification of adequate site restoration
- All field equipment will be inspected, packaged, and shipped to the appropriate location

## 4.2 Geospatial Information and Electronic Submittals

Methods, equipment, accuracy, and submittal requirements for location surveys and mapping are described in Section 7.4 of the MRP MPP (CH2M HILL, 2008a).

## 4.3 Data Documentation and Processing Procedures

Documentation and processing of investigation data and results will be completed in accordance with Section 7.2 of the MRP MPP (CH2M HILL, 2008a).

## 4.4 Field Sampling Plan

The potential for MC contamination across the entire CDCA has been assessed as documented in the PA/SI report (CH2M HILL, 2010). However, additional soil sampling will be conducted at the following locations:

- Where there is visual evidence of a release of MC in soil beneath MPPEH or safe-to-move MEC if there is visual evidence of a release of MC.
- Where MEC is found and blow-in-place (BIP) operations are conducted.
- At the Controlled Detonation Area (CDA) at the conclusion of the intrusive investigation. The CDA is where MEC that is safe to move and MPPEH is disposed of through controlled detonation events.

### 4.4.1 Visual Evidence of Release Soil Sampling

Soil samples will be collected from locations beneath MPPEH or safe-to-move MEC if there is visual evidence of a release of MC (e.g., stained soil, explosives residue visible in the soil, etc.). The TR-02-01 sampling approach will be utilized to a depth of 0-2 inches below/beside the found item.

Samples will be analyzed by a fixed base laboratory for the following parameters (Tables 4-1 through Table 4-3):

- Explosives residues (SW-846 USEPA Method 8330), including PETN and nitroglycerine
- Perchlorate (SW-846 USEPA Method 6850)
- TAL metals (SW-846 USEPA Method 6010B/6020)

Sample analysis will be conducted in accordance with the QAPP (Appendix C).

### 4.4.2 Post-BIP Surface Soil Sampling

#### Crater Samples (TR-02-1 Sampling Approach)

Surface soil samples from the crater of the BIP event will be collected using the TR-02-1 approach described in the USACE Technical Report ERDC/CRREL TR-02-1, *Guide for Characterization of Sites Contaminated with Energetic Materials* (Thiboutot, Ampleman, and Hewitt, 2002). Each sampling location will be defined as an area measuring 1 m × 1 m.

**TABLE 4-1**  
 Summary of Sampling Program  
 Focused PA/SI Work Plan Addendum  
 Camp Devil Dog Construction Area  
 MCB CamLej  
 Jacksonville, North Carolina

Sample Media	Sample ID Number	Sample Depth/Location and Rationale	Analysis		
			TAL Metals	Nitroaromatics and Nitramines, including PETN and Nitroglycerin	Perchlorate
Surface Soil	CDCA-SS01 to CDCA-SS80	The TR-02-01 methodology will be used to collect soil from 0 – 2 inches bgs for post-BIP samples. The Incremental sampling approach will be used to sample the soil ejecta around the BIP location (from 0 – 2 inches bgs). The TR-02-01 methodology will be used to collect soil from 0 – 2 inches bgs at the MEC item location if filler from the MEC item appears to have been released.	80	80	80
Surface Soil	CDCA-SS81 to CDCA-SS89	The Incremental sampling approach will be used to collect composite samples from 0 – 1 ft bgs at the CDA.	9	9	9
Subsurface Soil	CDCA-IS01	The Incremental sampling approach will be used to collect a composite sample from 2 – 4 ft bgs at the CDA.	1	1	1

Notes and Abbreviations:  
 bgs = below ground surface

**TABLE 4-2**

Analyses, Bottleware, Preservation, and Holding Time Requirements  
*Focused PA/SI Work Plan Addendum*  
*Camp Devil Dog Construction Area*  
*MCB CamLej*  
*Jacksonville, North Carolina*

<b>Media</b>	<b>Analysis</b>	<b>Method</b>	<b>Container</b>	<b>Preservation &amp; Storage</b>	<b>Holding Times</b>
	TAL Metals	SW846 6010B/6020	1x4 oz glass/plastic jar	4°C	6 months, Mercury: 28 days
Solids	Perchlorate	USEPA 6850	1x8-oz bottle, Teflon cap	4°C	14 days to extraction, 40 days from extraction to analysis
	Explosive Residues (including PETN and Nitroglycerin)	SW-846 8330	1x8-oz glass bottle, Teflon cap (8330) or 2x16 oz wide mouth glass jars (8330B)	4°C	7 days to extraction, 40 days from extraction to analysis

Notes: L = Liter, mL = milliliter, oz = ounce, HNO<sub>3</sub> = nitric acid

**TABLE 4-3**  
 Required QA/QC Samples  
*Focused PA/SI Work Plan Addendum*  
*Camp Devil Dog Construction Area*  
*MCB CamLej*  
*Jacksonville, North Carolina*

<b>Sample Type</b>	<b>Description</b>	<b>Frequency</b>	<b>Analytes</b>
Equipment Blank	Designed to detect contamination of environmental samples caused by contamination of sampling equipment. An equipment blank is analyte-free water that is poured into or pumped through the sampling device, transferred to a sample bottle, and transported to a sample bottle, and transported to the laboratory for analysis.	One per each day of sampling	All laboratory analyses requested for environmental samples collected at the site on that day
Field Duplicate	Designed to check precision of data in the laboratory. A field duplicate is a sample collected in addition to the native sample at the same sampling location during the same sampling event.	10%	Same parameters as native sample
MS/MSD	Designed to evaluate potential matrix interferences, accuracy, and precision. Three aliquots of a single sample—one native and two spiked with the same concentration of matrix spike compounds—are analyzed.	5%	Same parameters as native sample

**TABLE 4-4**  
 Sample Collection Frequencies  
*Focused PA/SI Work Plan Addendum*  
*Camp Devil Dog Construction Area*  
*MCB CamLej*  
*Jacksonville, North Carolina*

<b>Analysis</b>	<b>Sample Matrix</b>	<b>Field Samples</b>	<b>Field Duplicates</b>	<b>Equipment Blanks</b>	<b>MS/MSDs</b>
<b>Surface Soil Samples</b>					
TAL Metals		89	9	9	5
Nitroaromatics and Nitramines	Solid	89	9	9	5
Perchlorate		89	9	9	5
<b>Subsurface Soil Samples</b>					
Total Metals		1	1	1	1
Nitroaromatics and Nitramines	Solid	1	1	1	1
Perchlorate		1	1	1	1

Notes:

MS/MSD = Matrix Spike and Matrix Spike Duplicate pair

Field duplicates are collected at the rate of 1 for every 10 environmental samples

Equipment rinsate blanks are typically collected at the rate of 1 per day per media

MS/MSDs are collected at the rate of 1 for every 20 samples

# MEC Intrusive Investigation Plan

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A 100 percent MEC intrusive investigation of geophysical anomalies detected during DGM activities will be conducted to evaluate the presence and nature of potential MEC. The equipment, approach, methods, operation procedures, and QC to be used during the MEC intrusive investigation are detailed below.

## 5.1 Planning

The following actions require advanced planning and will be conducted prior to mobilization:

- Finalize procurement actions for items and services needed during the mobilization.
- Hold a pre-mobilization meeting and Operations Readiness Review with the project team.
- Coordinate with NAVFAC Project Manager (PM) and Base Point of Contact on notification to local stakeholders of upcoming project activities.
- Reconfirm site personnel documentation of proper training, certifications, and medical monitoring.

## 5.2 Site Preparation

The following subsections describe the procedures associated with site preparation, including mobilization of personnel and equipment and the activities required to prepare the site for intrusive activities.

### 5.2.1 Mobilization

A mobilization period will include identifying, briefing, and mobilizing staff and securing and deploying equipment. Mobilization activities include general activities, establishing a command post, and a kickoff and safety meeting.

#### General Activities

- Identify/procure, package, ship, and inventory project equipment, including geophysical detection equipment, hand tools and supplies, excavator (if necessary), portable toilets, and any other miscellaneous supplies
- Coordinate with local agencies, including police, hospital, and fire department, as appropriate
- Finalize operating schedules
- Establish MEC and MPPEH storage areas
- Organize support facilities and test communication equipment

- Test and inspect equipment
- Assemble and transport the work force
- Conduct site-specific training on the Work Plan Addendum, HSP, and MEC procedures and hazards
- Verify that all forms and project documentation are in order and project team members understand their responsibilities with regard to completion of project reporting requirements

### **Command Post**

- A project command post will be established in an area that is convenient to the investigation area, but outside the exclusion zones (EZs), if required
- Lockable storage will be provided, in storage trailers, for portable field equipment

### **Kickoff/Safety Meeting**

During mobilization, a kickoff and site safety meeting will be conducted. This meeting will include a review of this Work Plan Addendum by all site personnel. Additional meetings will occur as needed, as new personnel, visitors, and/or subcontractors arrive at the site.

## **5.3 MEC Removal Operations**

Anomaly reacquisition/intrusive investigation is the only MEC removal technique anticipated to be employed during the MEC intrusive investigation at the MRS. This operation will be performed using hand excavation tools to identify the source of individual anomalies following reacquisition operations. Where hand excavation tools are insufficient to excavate individual DGM anomalies, heavy equipment will be used to remove overburden.

### **5.3.1 Anomaly Reacquisition/Intrusive Investigation**

All geophysical anomalies identified for excavation will be reacquired by an intrusive investigation team, composed of UXO Technicians. After locating the anomaly position with survey equipment, a magnetometer will be used to confirm the exact position of the anomaly. If the anomaly is not immediately intrusively investigated, the location will be flagged using a polyvinyl chloride (PVC) flag with the unique identifier number recorded in indelible ink. The location will be flagged 1 foot north of the actual field location of each reacquired anomaly shown on the tracking sheet.

Excavation of individual geophysical anomalies will be performed by UXO Technicians. The UXO teams performing this work will be composed of UXO Technicians supervised by a UXO Technician III. Excavations shall be by manual methods; however, mechanical means may be used to remove overburden only where required, such as gravel roads that are too dense for manual methods under MEC avoidance. Qualified UXO personnel will conduct “mag and dig” operations on each geophysical mapping identified anomaly until the target area is determined to be clear of anomalies. Once an area has been cleared of anomalies, Earth-moving equipment (EME) may be used to aid the intrusive investigation by removing

layers of soil in up to 1-foot lifts. The minimum amount of overburden needed to continue with manual methods of intrusive investigation operations will be moved.

The following basic technique will be used for anomaly excavation:

- The UXO Technician will investigate within a 1-m radius of the anomaly location (1 foot south of the emplaced flag) with the assistance of a Schonstedt GA-52Cx or equivalent to pinpoint the anomaly source.
- Until identified otherwise, the anomaly is assumed to be MEC. Excavation will be initiated adjacent to the subsurface anomaly. The excavation will continue until the excavated area has reached a depth below the top of the anomaly as determined by frequent inspection with an appropriate geophysical instrument.
- Using progressively smaller and more delicate tools to remove the soil carefully, the excavation team will expand the sidewall to expose the metallic item for inspection and identification without moving or disturbing the item.
- Once the item is exposed for inspection, the excavation team will determine whether the item is MEC, MPPEH, or other debris.
  - If the item is MEC, a positive identification will be documented and confirmed by a UXO Technician III. If confirmed, the MEC item will be blown-in-place or consolidated for detonation. Following demolition of the MEC item, the area will be rechecked with an EM61-MK2 to ensure that another item was not hidden beneath the removed item. The excavation team will then record the results of the excavation, backfill the hole, and move on to the next marked subsurface anomaly location.
  - If the item is other debris, it will be collected and segregated away from MPPEH.
  - If the item is MPPEH, the procedures presented in **Sections 5.6** will be followed.
- Following MPPEH removal or MEC demolition, the area will be rechecked with the Schonstedt GA-52Cx or the EM61-MK2 to ensure that another item was not hidden beneath the removed item. The excavation team will then annotate the results of the excavation on the dig sheet and move on to the next marked geophysical anomaly.

### 5.3.2 MEC and MPPEH Storage

MPPEH may be collected at temporary MPPEH collection areas within each active grid or transect. If temporary collection points are used, the MPPEH will be moved to the sited MPPEH Storage Area upon conclusion of work at the grid or transect, or at the end of the work day, whichever is sooner. MPPEH will not be left on the grid or transect overnight and the appropriate ESQD arcs will remain in effect until the MPPEH has been removed from the grid or transect.

MPPEH will be stored in a locked and secured container at the MPPEH Collection Point shown on **Figure 5-1**. This container will be labeled “MPPEH”. EZs for the MPPEH Collection Point are based on a NEW of 6 pounds of class/division (C/D) 1.1 explosives. Therefore, the inhabited building distance (IBD) EZ associated with the MPPEH collection area is 433 feet, while the public traffic route (PTR) has an EZ of 260 feet (OP 5 Paragraphs 14-11.11.3.c[2] and 7-6.2.1.6, Table 7-9 [NAVSEA, 2004]).

MEC that is found will either be blown-in-place or consolidated for detonation the day it is found, guarded in-place until BIP operations are ready to proceed, or MEC that is safe to move may be moved to the MEC Storage Area.

MEC will be stored in a locked, secured, ATF Type II magazine (5-foot × 5-foot × 5-foot) at the MEC Storage Area shown on **Figure 5-1**. This container will be labeled “MEC”. EZs for the MEC Storage Area are based on a NEW of 50 lbs of C/D 1.1 explosives. Therefore, the IBD EZ associated with the MEC collection area is 601 feet, while the PTR has an EZ of 361 feet (OP 5 Paragraphs 14-11.11.3.c[2] and 7-6.2.1.6, Table 7-9, [NAVSEA, 2004]). The magazine will be grounded for lightning protection in accordance with OP-5, Chapter 6 (NAVSEA, 2007) and secured by a 10-foot × 10-foot × 10-foot fence. The MEC Storage area and MPPEH Collection Point will be separated by a minimum of the K11 distance (41 feet) (OP-5, Table 7-13) (NAVSEA, 2007). Intrusive investigations will not occur within the K18 distance of the MEC Storage Area (66 feet) (OP-5, Table 7-10)(NAVSEA, 2007).

A separate locked and secured container will be used for storage of material documented as safe (MDAS). This container will be labeled “MDAS” and will be separated from the MEC and MPPEH storage containers by a minimum of 50 feet. Items in the MDAS container will only contain items that have undergone two 100-percent visual inspections by qualified personnel (Section 6.4.2) and have been documented as not presenting an explosive hazard. Chain-of-custody will be maintained on the MDAS container until it is transported off-Base.

## 5.4 Removal Verification

The following is the procedure to be followed for QC inspections of the MEC intrusive investigation:

- After the dig team intrusively investigates an anomaly location, the hole is to be left open to the depth investigated and the PVC flag placed in the hole or bent after the investigation is completed.
- The UXO QC Specialist (UXOQCS) will inspect at least 10 percent of the intrusively investigated anomaly locations using a Schonstedt GA-52Cx or an EM61-MK2 to determine whether the anomalies have been removed. The locations checked will be distributed in a spatially representative sample across each grid.
- All holes related to intrusive investigations will be filled back to original grade or covered before departing the project site each day.
- Anomaly locations inspected, along with results of the inspection and corrective actions planned in the event that the UXOQCS determines that inspection results require a change in intrusive team procedures or a re-performance of any work, will be documented by the subcontractor and provided to the CH2M HILL geophysicist.
- Additional QC analysis of intrusive results vs. original amplitude of geophysical anomalies will be performed by the CH2M HILL geophysicist. Anomaly locations that are determined to need re-investigation through this process will be re-inspected.

## 5.5 Demobilization

Full demobilization will occur when the project is completed and appropriate QA/QC checks have been performed. Personnel who are no longer needed during the course of field operations may be demobilized prior to the final project completion date. The following will occur prior to demobilization:

- All areas to be investigated will be verified as completed.
- Restoration of the site to an appropriate level will be verified.
- All equipment will be inspected, packaged, and shipped to the appropriate location.
- All facilities-support infrastructures will be dismantled and shipped to the appropriate location, and the field site will be returned to the original condition prior to mobilization.

## 5.6 Procedures for Reporting and Disposition of MEC and MPPEH Items

This section discusses the procedures for reporting and disposing of MEC and MPPEH items encountered during the project, including the responsibilities of personnel, overall safety precautions, data reporting, transportation, safe holding areas, operations in populated areas, demolition operations, and required engineering controls and EZs for intrusive operations and intentional detonations.

### 5.6.1 Responsibilities of Personnel

The general responsibilities of project personnel are described Section 2.4 of the MRP MPP (CH2M HILL, 2008a).

### 5.6.2 Overall Safety Precautions

The overall safety precautions described in Section 2.5.1 of the MRP MPP (CH2M HILL, 2008a) will be adhered to during the intrusive investigation.

### 5.6.3 Data Reporting

Data reporting for each geophysical anomaly will be done in accordance with Section 2.5.2 of the MRP MPP (CH2M HILL, 2008a).

### 5.6.4 Operations in Populated and Sensitive Areas

There are populated areas within the MRS and around the perimeter that could be impacted by intrusive operations. If the MEC intrusive operations proceed towards areas containing transportation routes which fall within the PTR distance, the FTL will coordinate with Base operations to implement traffic controls. Such controls may include temporarily closing unpaved access roads located throughout the MRS during intrusive or detonation operations in which the PTR distance arc intersects the roadway.

If detonation of recovered MEC or MPPEH is required, these detonations may impact inhabitants of buildings. The EZ for intentional detonation will be determined for each

detonation operation. If an inhabited building is impacted, the demolition team will attempt to mitigate this impact through the use of engineering controls. If engineering controls do not adequately reduce the EZ, the FTL will coordinate with Base operations to evacuate the inhabited buildings. If possible, demolition operations will be performed after regular building occupation hours. There are no sensitive habitats or threatened and endangered species located within the project area.

Intrusive operations may be scheduled for off-hours, such as weekends, holidays, and evenings, due to the potential presence of active military personnel using Camp Devil Dog. In some instances, it may be necessary to conduct intrusive operations in non-daylight hours. Under these circumstances, operations will have at least 10 candles of illumination per square foot of operational area (not including personnel’s own illumination devices)(29 CFR 1926.56).

### 5.6.5 Exclusion Zones and Separation Distance

Based on the types of munitions discovered within the MRS, the MGFDF is based on the M43 81 mm Mortar. ESQD arcs were developed based on the primary MGFDF calculations and are shown on **Figure 5-1**. Primary ESQD values are identified on **Tables 5-1**.

If, during the course of this project, a MEC item with a greater fragmentation distance than that of the primary MGFDF is encountered, work at the site will be suspended until the ESS can be amended.

**TABLE 5-1**  
EZs for the Camp Devil Dog MRS

MGFDs		EZs (ft) <sup>1</sup>				
Primary MGFDF						
Description	NEW (lb)	Fragmentation Effects	Blast Overpressure Effects			
		HFD <sup>2</sup>	MFD-H <sup>3</sup>	K328	K40	K24
M43 81mm Mortar <sup>1</sup>	1.23	209	1579	351	43	26

Table Notes:

1. From Fragmentation Data Review Form, Updated September 30, 2010
2. HFD = hazard fragmentation distance
3. MFD-H = maximum fragmentation distance-horizontal.

### 5.6.6 MEC Disposition

MEC will be disposed of by controlled detonation. If the item is not safe to move, it will be BIP. If the item is safe to move, it may be transferred to a consolidation trench located within the MRS or stored in the MEC storage area, as shown on **Figure 5-1**.

If MEC is found to be within 200 feet of a building and is unsafe to move, the item will not be BIP until appropriate engineering controls can be put in place to reduce potential for building damage.

For MEC that is not safe to move and must be blown-in-place, every effort will be made to complete explosive demolition operations by the end of the day. If explosive demolition

operations cannot be completed guards will be posted to secure the item, and the disposal will occur as soon as possible.

Demolition operations will be conducted in accordance with EODB 60A 1-1-31 and OP-5 Volume I (NAVSEA, 2007). If engineering controls are used, they will conform to DDESB TP-16 Revision 2 and United States Army Corps of Engineers, Huntsville Center (USAESCH) guidance entitled *Use of Sandbags for Mitigation of Fragment and Blast Effects Due to Intentional Detonation of Munitions*, HNC-ED-CS-S-98-7 (1998).

Donor explosives will not be stored onsite. A local vendor will provide explosives on an on-call basis and will remove all unused explosives from the site following demolition activities. The explosives vendor will follow all applicable Department of Transportation (DOT) regulations regarding the transportation of explosives, and the vendor's employees will have the proper training and certifications. The contractor (or their UXO subcontractor) will not transport explosives. The CH2M HILL will coordinate with the installation's Explosives Safety Officer to obtain proper approvals to bring civilian explosives onto the installation.

Prior to intentional detonation, the exclusion zone will be marked off and evacuated. Appropriate personnel will be notified to block any public traffic routes that may be impacted.

### **5.6.7 MPPEH Disposition**

MPPEH will be visually inspected and independently re-inspected for explosives hazards in accordance with the requirements of DoDI 4140.62 (DoD, 2008), DoD 4160.21-M, Chapter 4, Paragraph B (DoD, 1997), and OP-5 Volume 1, Chapters 13–15 (NAVSEA, 2004).

Only UXO-qualified personnel will perform these inspections. A UXO Technician III will perform the 100 percent inspection and document that the MPPEH is free of explosive hazards. Per OP-5, Section 13-15.7.2 (NAVSEA, 2007) and/or DoDI 4140.62 (DoD, 2008), the UXOQCS will conduct the re-inspection and document that the MPPEH is free of explosive hazards. With these two visual inspections, the MPPEH becomes MDAS.

If necessary, demilitarization of the MDAS will be conducted. DD Form 1348-1 (series) will be used as 100 percent inspection/100 percent re-inspection documentation. All DD Form 1348-1 (series) forms will clearly show the following information in typed or printed letters:

- Name of Senior UXO Supervisor (SUXOS) and the Government representative
- Organization
- Two signatures not in the same chain of command (i.e., UXO Technician III and UXOQCS)
- Contractor's office
- Field office phone number(s) of the persons certifying and verifying the MDAS
- Basic material content (type of metal - for example, steel or mixed)
- Estimated weight

- Unique identification of each sealed container
- Location where MDAS was obtained
- Seal identification, if different from the unique identification of the sealed container

As part of the transfer of MDAS to an off-Base facility for final disposition, the following statement will be entered on each DD Form 1348-1 (series) and will be signed by the SUXOS and the UXOQCS:

*"This certifies that materially potentially presenting an explosive hazard listed has been 100 percent properly inspected and to the best of our knowledge and belief, is inert and/or free of explosives or related materials."*

## **5.7 Scrap and Munitions Debris Disposition**

### **5.7.1 Inspection and Segregation**

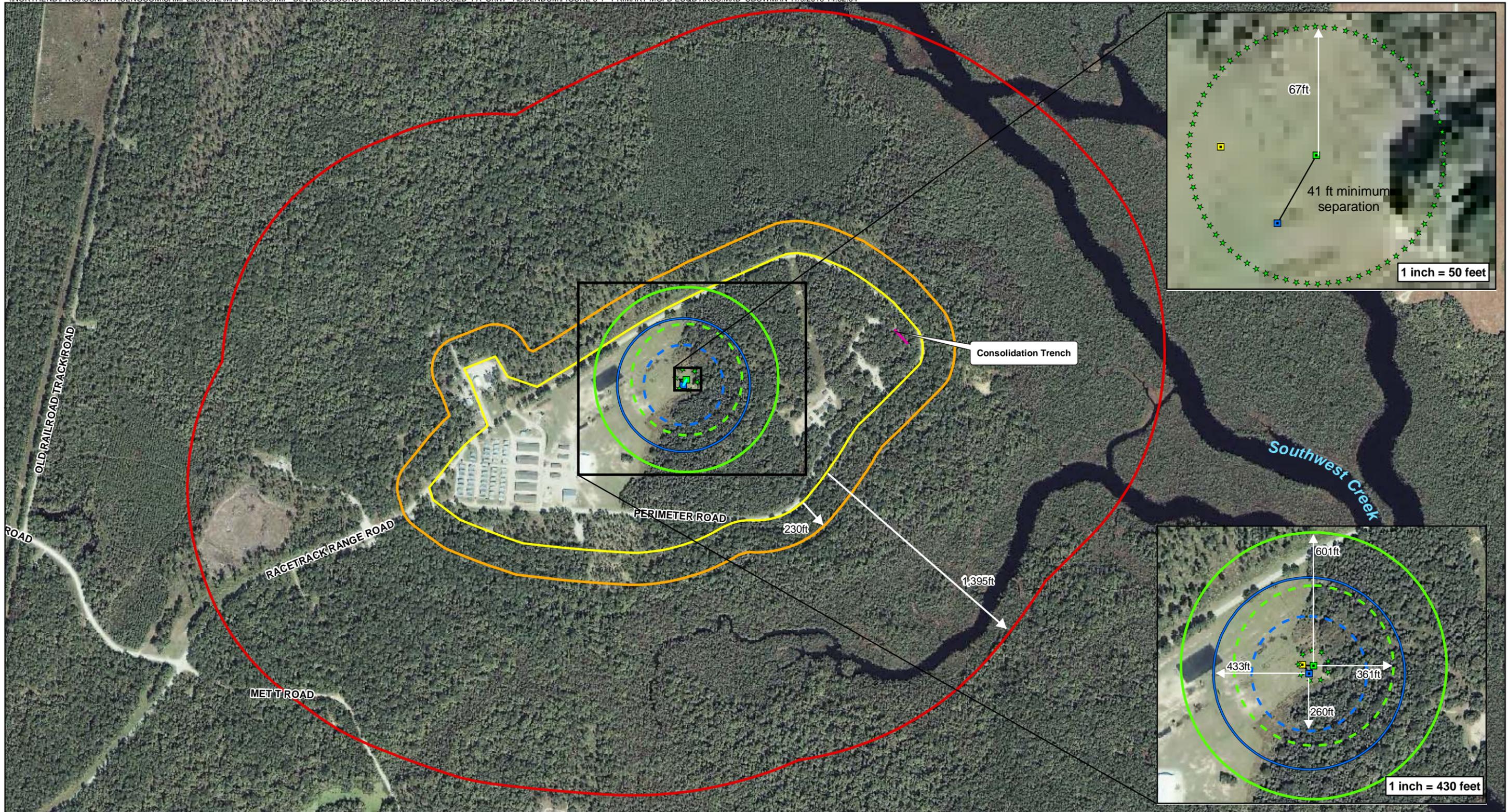
The approach for collecting, inspecting, and segregating site debris is discussed in Section 2.6.1 of the MRP MPP (CH2M HILL, 2008a). If the item is identified as MEC, it is handled as described in **Section 6**.

### **5.7.2 Inspection, Certification, and Verification**

MPPEH will be inspected, certified, and verified in accordance with Section 2.6.2 of the MRP MPP (CH2M HILL, 2008a). MPPEH that cannot be certified and verified as "Safe" will remain at the grid collection point and will be treated in the same manner as MEC (**Section 6**).

### **5.7.3 Recording, Reporting, and Implementation of Lessons Learned during the Project**

Lessons learned will be performed in accordance with Section 2.7 of the MRP MPP (CH2M HILL, 2008a).



**Legend**

- MEC Storage Area
- MDAS Collection Point
- MPPEH Collection Point
- Consolidation Trench
- Unintentional Detonation for M43 81mm Mortar, Public and Non-Essential Personnel (209 ft)
- Intentional Detonation for M43 81mm Mortar, All Personnel (1579 ft)
- Camp Devil Dog Munitions Response Site
- MEC Storage Area IBD (601 ft)
- - - MEC Storage Area Magazine PTR (361 ft)
- \* \* \* Intrusive Investigation Separation Distance (67 ft), K18 distance for the mec Storage Area
- - - MMPEH Collection Point PTR (260 ft)
- MMPEH Collection Point IBD (433 ft)

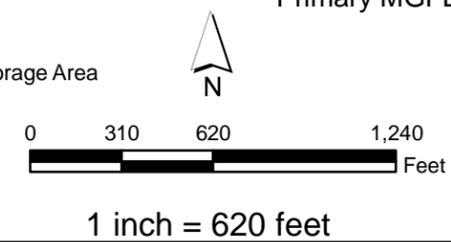


Figure 5-1  
 Primary MGF D Explosives Safety Quantity-Distance (ESQD) Arcs  
 Focused PA/SI Work Plan Addendum  
 Camp Devil Dog Construction Area  
 MCB CamLej  
 North Carolina



SECTION 6

# Explosives Management Plan

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The management of explosives to support the removal and disposal of MEC and MPPEH items that may be discovered during the investigation within the MRS will be conducted in accordance with Section 3 of the MRP MPP (CH2M HILL, 2008a).

SECTION 7

# Explosives Siting Plan

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Planning and siting explosives operations for the MEC removal action within the MRS will be done in accordance with Section 4 of the MRP MPP (CH2M HILL, 2008a). ESQD arcs for the primary and contingency MGFD are shown on **Figures 5-1 and 5-2**, respectively. Primary and contingency ESQD values are identified on **Tables 5-1**.

SECTION 8

# Quality Control Plan

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All applicable work conducted by CH2M HILL and its subcontractors at the MRS will be performed in accordance with the QCP in Section 8 of the MRP MPP (CH2M HILL, 2008a) and the Work Plan Addendum (CH2M HILL, 2009a).

The specific QC audit procedures for the definable features of work (DFOWs) to be employed at the CDCA, including the phase during which it is performed, the frequency of performance, the pass/fail criteria, and actions to take if failure occurs, are presented in **Table 8-1**.

TABLE 8-1  
 Definable Features of Work Auditing Procedures  
 Focused Preliminary Assessment/Site Inspection Work Plan Addendum  
 Camp Devil Dog Construction Area Military Munitions Response Site UXO-19  
 MCB Camp Lejeune  
 Jacksonville, North Carolina

Definable Feature of Work with Auditable Function	Responsible Person(s) <sup>1</sup>	Audit Procedure <sup>2</sup>	QC Phase <sup>3</sup>	Freq. of Audit	Pass/Fail Criteria	Action if Failure Occurs
Planning						
Geographical Information System (GIS) Setup (Pre-mobilization Activities)	Project GIS Manager	Verify GIS system has been set up and is ready for site data.	PP	O	GIS system has been set up and is ready for site data.	Do not proceed with field activities until criterion is passed.
Document management and control (Pre-mobilization Activities)	Project Manager	Verify appropriate measures are in place to manage and control project documents.	PP	O	Appropriate measures are in place to manage and control project documents.	Do not proceed with field activities until criterion is passed.
Data Management (Pre-mobilization Activities)	Project Manager, Data Manager	Verify appropriate measures are in place to manage and control project data.	PP	O	Appropriate measures are in place to manage and control project data.	Do not proceed with field activities until criterion is passed.
Subcontracting (Pre-mobilization Activities)	Project Manager, Site Manager	Verify subcontractor qualifications, training, and licenses.	PP/IP	O	Subcontractors' qualifications, training, and licenses are up to date and acceptable.	Ensure subcontractor provides the qualifications, training, and licenses or change subcontractor.
Technical and Operational approach (Technical Project Planning)	Project Manager	Verify technical and operational approaches have been agreed on by the project team.	PP/IP	O	Technical and operational approaches have been agreed on by project team and incorporated into the Work Plans.	Do not proceed with field activities until criterion is passed
GPO Prove-out Plan preparation and approval	Project Manager	Verify GPO Plan has been prepared and approved.	PP/IP	O	GPO Plan has been approved.	Do not proceed with field activities until criterion is passed.
GPO Execution	Project Manager, Project Geophysicist	Verify DQOs established in GPO Plan have been accomplished.	PP/IP	O	DQOs identified in GPO Plan have been achieved.	Continue with GPO until DQOs are achieved.
GPO Report	Project Manager, Project Geophysicist	Verify recommendations in GPO Report for DGM system and associated DQOs have been approved	PP/IP	O	Recommendations for DGM equipment and associated DQOs are approved by USACE	Do not proceed with DGM field activities until recommendations of GPO Report are approved.
Work Plan and ESS preparation and approval	Project Manager	Verify Work Plan and ESS prepared and approved.	PP/IP	O	Work Plan and ESS has been approved	Do not proceed with field activities (excluding site mobilization) until criterion is passed.
Field Operations						
Site preparation (Mobilization)	Site Manager	Verify local agencies are coordinated.	PP/IP	O	Local agencies are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	Site Manager	Verify equipment has been inspected and tested.	PP/IP	E	Equipment passes inspection and testing.	Proceed only with activities for which equipment has passed inspection and testing.
Site preparation (Mobilization)	Site Manager	Verify communications and other logistical support are coordinated.	PP/IP	O	Communications and other logistical support are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	Site Manager	Verify emergency services have been coordinated.	PP/IP	O	Emergency services are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	Site Manager	Verify site-specific training is performed and acknowledged.	PP/IP	O	Site-specific training is performed and acknowledged	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	Site Manager	Hold pre-mobilization meeting and Operations Readiness Review (ORR) with the project team.	PP/IP	O	Project plans are reviewed and acknowledged by team members.	Do not proceed with field activities until criterion is passed.

TABLE 8-1  
 Definable Features of Work Auditing Procedures  
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 Camp Devil Dog Construction Area Military Munitions Response Site UXO-19  
 MCB Camp Lejeune  
 Jacksonville, North Carolina

Definable Feature of Work with Auditable Function	Responsible Person(s) <sup>1</sup>	Audit Procedure <sup>2</sup>	QC Phase <sup>3</sup>	Freq. of Audit	Pass/Fail Criteria	Action if Failure Occurs
Site Preparation (Site Survey)	Project Manager	Verify surveyor qualifications.	PP/IP	O	Surveyor's qualifications are up to date and acceptable.	Ensure surveyor provides the qualifications prior to starting work or change surveyor.
Site Preparation (Site Survey)	Project Manager	Verify surveyor's licenses are up to date and acceptable.	PP/IP	O	Surveyor's licenses are up to date and acceptable.	Ensure surveyor provides the licenses prior to starting work or change surveyor.
Site Preparation (Site Survey)	Site Manager	Verify benchmarks for survey have been established and documented.	PP/IP	O	Benchmarks for survey have been established and documented.	Ensure benchmarks for survey are established and documented prior to performing survey.
Site Preparation (Site Survey)	Site Manager	Verify site boundaries and grids have been established.	PP/IP	O	Site boundaries and grids have been established.	Do not proceed with dependent field activities until criterion is passed.
Site Preparation (Site Survey)	Site Manager	Verify surveyor notes are legible, accurate, and complete.	IP	O	Surveyor notes are legible, accurate and complete.	Ensure surveyor replaces deficient notes with legible, accurate and complete notes.
Site Preparation (Vegetation Removal)	Site Manager	Verify environmental controls are correct and functional.	IP/FP	O	Environmental controls are correct and functional.	Ensure that appropriate environmental controls are in place prior to proceeding with vegetation removal.
Site Preparation (Vegetation Removal)	Site Manager	Verify vegetation removal is conducted according to the Field Investigation Plan (Section 4.0 of Work Plan).	FP	D	Verify vegetation removal is conducted according to the Field Investigation Plan (Section 4.0 of Work Plan).	Stop vegetation removal activities until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary.
DGM Survey	Project Geophysicist	Verify DGM Survey conducted in accordance with Geophysical Investigation Plan (Appendix C) (CH2M HILL, 2009a) and DGM SOPs:  EM61-MK2 Metal Detection Munition Response Surveys Geophysical Surveying with EM61-MK2 Configuration and Operation of the GPS Base-Station System Configuration and Operation of the GPS Rover System Field Methodology and Survey Setup	IP/FP	O/D	DGM Survey conducted in accordance with Geophysical Investigation Plan (Appendix C) (CH2M HILL, 2009a) and DGM SOPs.	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary.
DGM Survey	Project Geophysicist	Check results of QC tests performed as specified in the QCP and DGM SOPs.	FP	E	QC tests must pass in accordance with standards determined during the GPO and referenced SOPs.	If a QC test does not pass, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.
DGM Survey	Project Geophysicist	Confirm that DGM survey DQOs established during GPO are being met.	FP	E	DGM survey DQOs are being met.	If a If the DQOs are not being met, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.
DGM Data processing	Project Geophysicist	Verify data checks specified in QCP and SOPs: EM61-MK2 Data Processing and Database management Uploading and Downloading Data to the FTP Site	FP	E	Data checks must pass in accordance with standards determined during the GPO and referenced SOPs.	If a QC test does not pass, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.
Reacquisition Accuracy	Project Geophysicist/UXOQCS	Confirm that anomalies are located within a 1-meter radius of flagged location as selected by DGM.	FP	E	Anomaly located within 1-meter radius of flag	If anomalies are being located beyond 1-meter radius of flag or are not being located within 1-meter radius of the flag, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.

TABLE 8-1  
 Definable Features of Work Auditing Procedures  
 Focused Preliminary Assessment/Site Inspection Work Plan Addendum  
 Camp Devil Dog Construction Area Military Munitions Response Site UXO-19  
 MCB Camp Lejeune  
 Jacksonville, North Carolina

Definable Feature of Work with Auditable Function	Responsible Person(s) <sup>1</sup>	Audit Procedure <sup>2</sup>	QC Phase <sup>3</sup>	Freq. of Audit	Pass/Fail Criteria	Action if Failure Occurs
Intrusive Investigation	UXOQCS	Verify equipment tested in accordance with (IAW) the ESS.	IP/FP	D	Equipment testing performed and tests passed	Repair or replace instrument.
Intrusive Investigation	UXOQCS	Verify team separation distance is as established in the ESS.	IP/FP	D	Team separation distance is appropriate for work being performed	Stop activities until appropriate separation distance is being followed
Intrusive Investigation	Site Manager/Project Manager/UXOQCS	Verify that the item recovered during intrusive excavations is appropriate to the amplitude of the initial anomaly detected during the DGM.	IP/FP	D	Recovered item is appropriate to the amplitude of the initial anomaly detected during the DGM.	Return to the location of the item excavation to determine if additional anomalies are present. If item being recovered continue to be inappropriate for the amplitude as detected during the DGM, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.
Intrusive Investigation	QC Geophysicist/UXOQCS	QC seed items recovered	IP/FP	E	All QC seed items in area of operation recovered.	A root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action
Intrusive Investigation	UXOQCS	Verify operations are conducted IAW Work Plan, MEC Removal SOPs, ESS, and the HSP: - Survey/Sweeps - MEC Surface Sweeps - Analog Detection and Removal Actions - DGM Anomaly Investigation - Ammunition and Explosives Transportation - Explosives Storage and Accountability - Disposal/Demolition Operations - Scrap Inspection Operations	IP/FP	D	Work performed IAW Work Plan, referenced MEC SOPs, ESS and the HSP.	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary. If necessary the UXOQCS may issue a nonconformance report and root cause analysis performed.
MPPEH/MD Management	UXOQCS	Verify inspections conducted IAW the ESS	IP/FP	D/E	Inspections being conducted IAW the ESS.	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
MPPEH/MD Management	UXOQCS	Verify certification conducted IAW the ESS.	IP/FP	D/E	Certification is conducted IAW the ESS.	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
MPPEH/MD Management	UXOQCS	Verify disposal is conducted IAW the ESS.	IP/FP	D/E	Disposal is conducted IAW the ESS.	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Demobilization	Project Manager	Verify facilities-support infrastructures are dismantled and shipped to appropriate location and area is returned to original condition.	FP	O	Facilities-support infrastructures are dismantled and shipped to appropriate location and site is returned to original condition.	Ensure that all support facilities are removed and that the site is returned to original condition.
<b>Final Project Reports and Closeout</b>						
Site Specific Final Report preparation and approval	Project Manager	Verify all phases of environmental investigation were performed correctly and are complete.	FP	O	Investigation performed is accurate and complete.	Investigation performed is accurate and complete
Site Specific Final Report preparation and approval	Project Manager, Project Geophysicist	Verify tabulations of all material identified/recovered during the field actions are accurate and complete.	IP	O	Tabulations of all material identified/recovered during the field actions are accurate and complete.	Ensure tabulations of all material identified/recovered during the field actions are accurate and complete.
Site Specific Final Report preparation and approval	Project Manager, Project Geophysicist	Verify all dig sheets where geophysical mapping and investigation performed are accurate and complete.	FP	O	All dig sheets where geophysical mapping and investigation performed are accurate and complete.	Ensure all dig sheets where geophysical mapping and investigation performed are accurate and complete
Archiving	GIS Manager	Verify data back-up systems are in place.	IP	O	Data back-up systems are in place	Ensure data back-up systems are in place

TABLE 8-1  
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Definable Feature of Work with Auditable Function	Responsible Person(s) <sup>1</sup>	Audit Procedure <sup>2</sup>	QC Phase <sup>3</sup>	Freq. of Audit	Pass/Fail Criteria	Action if Failure Occurs
Project Closeout	Project Manager	Verify purchase orders have been closed out.	IP	O	Purchase orders have been closed out	Ensure purchase orders are closed out
Project Closeout	Project Manager	Verify invoices completed and approved.	IP	O	Invoices completed and approved	Ensure invoices are completed and approved

Notes:  
 IAW = in accordance with

<u>QC Phase</u>	<u>Frequency</u>
PP = Preparatory Phase	O = Once
IP = Initial Phase	D = Daily
FP = Follow-up Phase	W = Weekly
	E = Each occurrence

<sup>1</sup> The responsible person (if other than the UXOQCS) is the individual with whom the UXOQCS will coordinate with to ensure compliance with requirements and to verify that any necessary follow-up actions are taken.

<sup>2</sup> Where appropriate, a reference has been included referring the reader to a more detailed description of the procedures being audited.

<sup>3</sup> Documentation to be in accordance with the three-phase control process as outlined in the Quality Control Plan.

SECTION 9

# Environmental Protection Plan

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The environmental protection plan for the MRS is included in Section 8 of the Work Plan Addendum (CH2M HILL, 2009a).

# References

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**Appendix A**  
**Expanded Archive Records Search**

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# Camp Devil Dog Expanded Archival Records Search Report

PREPARED BY: CH2M HILL

DATE: August 25, 2010

ATTACHMENTS: Attachment 1 – Range Overlay Maps  
Attachment 2 – Training Areas and Facilities, 1953  
Attachment 3 – MCB CamLej Technical Records

## Objective

The Camp Devil Dog Expanded Archival Records Search Report (ARSR) was conducted to investigate the potential sources of unexploded ordnance (UXO) items (60mm and 81mm mortar cartridges) found during preliminary assessment/site investigation (PA/SI) field activities within the Camp Devil Dog Construction Area (CDCA) located north of Verona Loop Road on the Air Station side of Marine Corps Base Camp Lejeune (MCB CamLej) (**Figure 1**). Based on the original *Archival Records Search Report Camp Devil Dog* (CH2M HILL, 2009) there were no historical records of mortar use on ranges within the CDCA boundary, as a result, an investigation into ranges adjacent to the CDCA was conducted. This technical memorandum was prepared under the Naval Facilities Engineering Command (NAVFAC) Atlantic, Comprehensive Long-term Environmental Action – Navy (CLEAN) 1000 Contract N62470-08-D-1000, Contract Task Order 140.

All available historical maps and documents were reviewed and Marine Corps Base Camp Lejeune (MCB CamLej) Range Control Safety Officer Duane Richardson was contacted and interviewed. Primary resources reviewed during this expanded ARSR include:

- United States Marine Corps (USMC), Overlay of Training Areas and Facilities, February 16, 1953
- MCB CamLej, Technical Records. Master Shore Station Development Plans: 1957, 1958, 1959, 1960
- MCB CamLej, Technical Records. Race Course Area showing conditions on June 30, 1979
- United States Army Corps of Engineers (USACE). Range Identification Preliminary Range Assessment Marine Corps Base Camp Lejeune. December 2001.
- USACE. Archives Search Report Marine Corps Base Camp Lejeune. December 2001.

A detailed history of the CDCA is provided in the *Archival Records Search Report Camp Devil Dog* (CH2M HILL, 2009). The following sections provide information about ranges adjacent to, and overlapping, the CDCA which may be sources of UXO within the CDCA boundary.

## Range Review

Based on historical records the Camp Devil Dog area has been in use since the 1950's and is still currently in use for Marine Combat Training at the School of Infantry (SOI) East. Many of the ranges at Camp Devil Dog were used for multiple training purposes; consequently, several different types of munitions may be present at each range including live and practice hand and rifle grenades, small arms ammunition, pyrotechnics, demolitions and mines, and mortar cartridges. Additionally, the "M" area was also used as an impact area for artillery training. **Figure 2** shows all historical ranges overlaying the current aerial view of the CDCA, historical maps and figures from primary sources are provided in Attachments 1 through 3. Some ranges that appear on the historical figures did not employ munitions and explosives (i.e. M-122 flame thrower range, M-18 combat conditioning course, M-14 camouflage display, and M-13 field fortification display) and are not included in this review.

All historical ranges that employed munitions and explosives are summarized in the following sections which provide the range number, description, years of operation (estimated from historical maps and [USACE, 2001]), types of munitions employed, target types, and references to historical maps (provided in Attachments 1, 2, and 3). Multi-use ranges are associated with the munition with the highest safety concern. Some ranges, particularly those found in Attachment 3; appear to be located south of the CDCA. However, they are included in this review because range descriptions are similar to other historical ranges that overlap or are adjacent to the CDCA.

### Impact Area "M" and Artillery Ranges M-5 and M-5a

A 1941 map indicates that the M area, where the CDCA is currently located, was used as an artillery impact area until it was disestablished in 1946. The firing position is located in the south eastern area of the base near Onslow Beach. The fan extends across the New River and into the M area, however it does not appear to overlap the CDCA area (Attachment 1: Plate 2). Plate 4 in Attachment 1 indicates the entire "M" area as an impact area, labeled feature number 9 on the 1945 Range Overlay Map.

According to the Range Identification Preliminary Range Assessment (USACE, 2001a) the following munitions were employed and could potentially be present in the M impact area:

Small Arms	105mm Howitzer
Hand Grenades, all types	155mm Howitzer and Gun, all types
Rifle Grenades, all types	57mm Recoilless Rifle, all types
60mm and 81mm Mortars, all types	75mm Recoilless Rifle, all types
37mm Gun, all types	90mm Recoilless Rifle, all types
40mm Gun, all types	2.36 Inch Rocket, HEAT and Practice
75mm Howitzer, all types	

No information is available that provides an estimated quantity of munitions in this area.

The CDCA is located between the firing position and impact area (K) of two artillery ranges (M-5 and M-5a, Plate 6 in Attachment 1 and in Attachment 2). The M-5 and M-5a ranges were "controlled fire" ranges where rounds fired were observed and adjusted; as a result, UXO issues from these ranges are not likely (Richardson, 2010).

## Mortar Range M-1

Mortar Range M-1 is the only known mortar range in the vicinity of the CDCA. The firing position appears to be located on the western edge of the CDCA perimeter with a southern direction of fire (Plate 4 in Attachment 1). Records indicate the range was in use between 1945 and 1946. There are no records available specifying the types of munitions used at mortar range M-1; however, 60mm high explosive (HE) and illumination Mortars, and 81mm practice, HE, and white phosphorous (WP) Mortars were likely employed on this range (USACE, 2001a). Specific safety issues associated with this site are related to WP which reacts with air, and sensitive fuzing which may explode when disturbed.

An aerial photo review was conducted by the USACE in support of the 2001 Archives Search Report (ASR) for MCB CamLej. According to the ASR "A large cleared area, labeled Mortar Range M-1 on 1945-map source is heavily cratered ([military grid location] 75 40). A berm is visible at the western terminus of the range. This range is immediately east of the town of Verona. This area is the current SOI Camp." (USACE, 2001b).

## Grenade Ranges

Several ranges within and adjacent to the CDCA employed the use of various types of grenades (**Table 1**). Grenades are primarily found in the surface, however maneuvering activities may have caused them to be buried or moved from the designated impact area. Specific safety issues are related to WP which burns upon contact with air, and sensitive fuzing in shaped charges which may detonate if disturbed (USACE, 2001a).

## Small Arms and Demolitions Ranges

Small arms and demolitions were used in several training areas around the CDCA. The entire southern area of the CDCA was indicated as a "Small Arms Danger Area" on a 1960 map (Attachment 3). Mines, booby traps, and demolitions were used in infiltration tactics and war simulation training. Signal charges and explosives residues may remain where booby traps were used on mines (USACE, 2001a). Additional safety hazards include pyrotechnics which are extremely sensitive to heat and friction. The Combat Village Area (Ranges M-9 and M-112) is included in the Grenade Range summary; however small arms, booby traps, land mines, and demolitions were also employed at these ranges. A summary of small arms and demolitions ranges is provided in **Table 2**.

**Table 1**

Grenade Ranges  
 Camp Devil Dog Construction Area  
 Expanded ARSR  
 MCB CamLej  
 North Carolina

Range Number	Description	Years of Operation	Munitions Employed (USACE, 2001a)	Target Types (USACE, 2001a)	Historical Figure Reference
M-4	Rifle grenade range	1960	M28 and M29 Rifle Grenades, WP Hand and Rifle Grenades, Pyrotechnics, and Demolitions	3 Tank Mockups and 1 Tank	Attachment 1 (Plate 15)
M-4a	Practice hand grenade course	1960	practice hand grenades	Unknown, facilities consisted of one Bunker and two Foxholes	Attachment 1 (Plate 15)
M-5	Practice rifle grenade range	1960	M29 Practice Rifle Grenade	3 Bunkers	Attachment 1 (Plate 15)
M-8 M-11	Assault on a fortified position area	1957 to 1959	Blank Ammunition, 3.5" Practice Rockets M28, Demolitions, M29 Practice Rifle Grenades, M19 WP Rifle Grenades and Smoke Grenades	Unknown	Attachment 1 (Plate 10), Attachment 3 (1957, 1958, 1959)
M-9	Combat village area	1957 to 1961	Small Arms (Blanks), Boobytrap Devices, Practice Hand Grenades and Land Mines, Pyrotechnics, Smoke Grenades.	Unknown, facilities include 7 buildings	Attachment 1 (Plate 10), Attachment 3 (1957, 1958, 1959)
M-10	Live hand grenade range	1957 to 1961	WP and HE Hand Grenades	Improvised	Attachment 1 (Plate 10), Attachment 3 (1957, 1958, 1959)
M-17	Practice hand and rifle grenade range	1957 to 1959	practice hand and rifle grenades	Unknown	Attachment 1 (Plate 10), Attachment 3 (1957, 1958, 1959)
K-22	Practice hand grenade range	1960	practice hand grenades	Unknown, facilities included one Bunker and two Foxholes	Attachment 1 (Plate 15)
M-104	Assault on fortified position	1960	Not present in USACE, 2001 as this particular type of range. Assume same as M-8 and M-11	Unknown	Attachment 3 (1960)
M-107	Hand grenade	1979	Not present in USACE, 2001a. Assume same as M-115	Unknown	Attachment 3 (1979)
M-112	Combat village	1960	Not present in USACE, 2001a. Assume same as M-9	Unknown	Attachment 3 (1960)
M-113	Hand grenade range (practice) demonstrator	1970 to 1977	Hand grenades: M14, MK 1, M18, WP M15 (demo only), and practice	Unknown	Attachment 1 (Plates 13 and 16)
M-115	Hand grenade	1960 to 1977	HE hand grenades	Unknown	Attachment 1 (Plates 13 and 16)

**Table 2**

Small Arms and Demolitions Ranges  
 Camp Devil Dog Construction Area  
 Expanded ARSR  
 MCB CamLej  
 North Carolina

Range Number	Description	Years of Operation	Munitions Employed (USACE, 2001a)	Target Types (USACE, 2001a)	Historical Figure Reference
M-6	Infiltration course	1957 to 1961	Small arms and demolitions (1/4 lb TNT equivalent)	Not applicable	Attachment 1 (Plate 10), Attachment 3 (1957, 1958, 1959)
M-7	1000" machine gun range, Landscape Range	1957 to 1961	Small arms	15 firing points and 15 landscape target carriers	Attachment 3 (1957, 1958, 1959)
M-15	Mine, booby trap display area	1957 to 1961	Practice Mines, Improvised Mines, and Booby Trap Devices	Two practice minefields	Attachment 1 (Plate 10), Attachment 3 (1957, 1958, 1959)
M-104	Demolitions and land mines	1970	Demolition charges not exceeding 5 pound net TNT equivalent per shot	Three demolition pits	Attachment 1 (Plate 15)
M-109	Infiltration	1960 to 1979	Small arms and demolitions	None	Attachment 1 (Plate 13), Attachment 3 (1960, 1979)
M-110	Demolition and booby traps	1960 to 1979	Demolitions not exceeding 20 lbs net TNT equivalent, all types of land mine and booby trap simulators, and practice hand grenades	Not applicable	Attachment 1 (Plate 13), Attachment 3 (1960, 1979)
Unnamed	Small arms danger area	1960	Small arms	Unknown (the danger area covers the entire south portion of CDCA)	Attachment 3 (1960)

## Findings

Based on the historical records review, there are several potential munitions-related safety hazards in the CDCA. Based on the location of historical range fans, the variety of munitions employed at each range, it can reasonably be assumed that any area of the CDCA may possess a UXO hazard. Specific hazards identified in the *Range Identification Preliminary Range Assessment* include:

- **WP filler** burns on contact with air,
- **sensitive fuzing** may detonate if disturbed,
- **pyrotechnics** extremely sensitive to heat and friction,
- **booby trap devices** present a hazard due to their design to function when disturbed

## References

CH2M HILL. 2009. *Archival Records Search Report Camp Devil Dog*, Marine Corps Base Camp Lejeune, Onslow, North Carolina. January 2009.

MCB CamLej. 1957. "Master Shore Station Development Plans - Training Facilities", Marine Corps Base Camp Lejeune, North Carolina. Showing conditions as of December 31, 1957

MCB CamLej. 1958. "Master Shore Station Development Plans - Training Facilities", Marine Corps Base Camp Lejeune, North Carolina. Showing conditions as of December 31, 1958

MCB CamLej. 1959. "Master Shore Station Development Plans - Training Facilities", Marine Corps Base Camp Lejeune, North Carolina. Showing conditions as of December 31, 1959

MCB CamLej. 1960. "Master Shore Station Development Plans - Training Facilities", Marine Corps Base Camp Lejeune, North Carolina. Showing conditions as of December 31, 1960

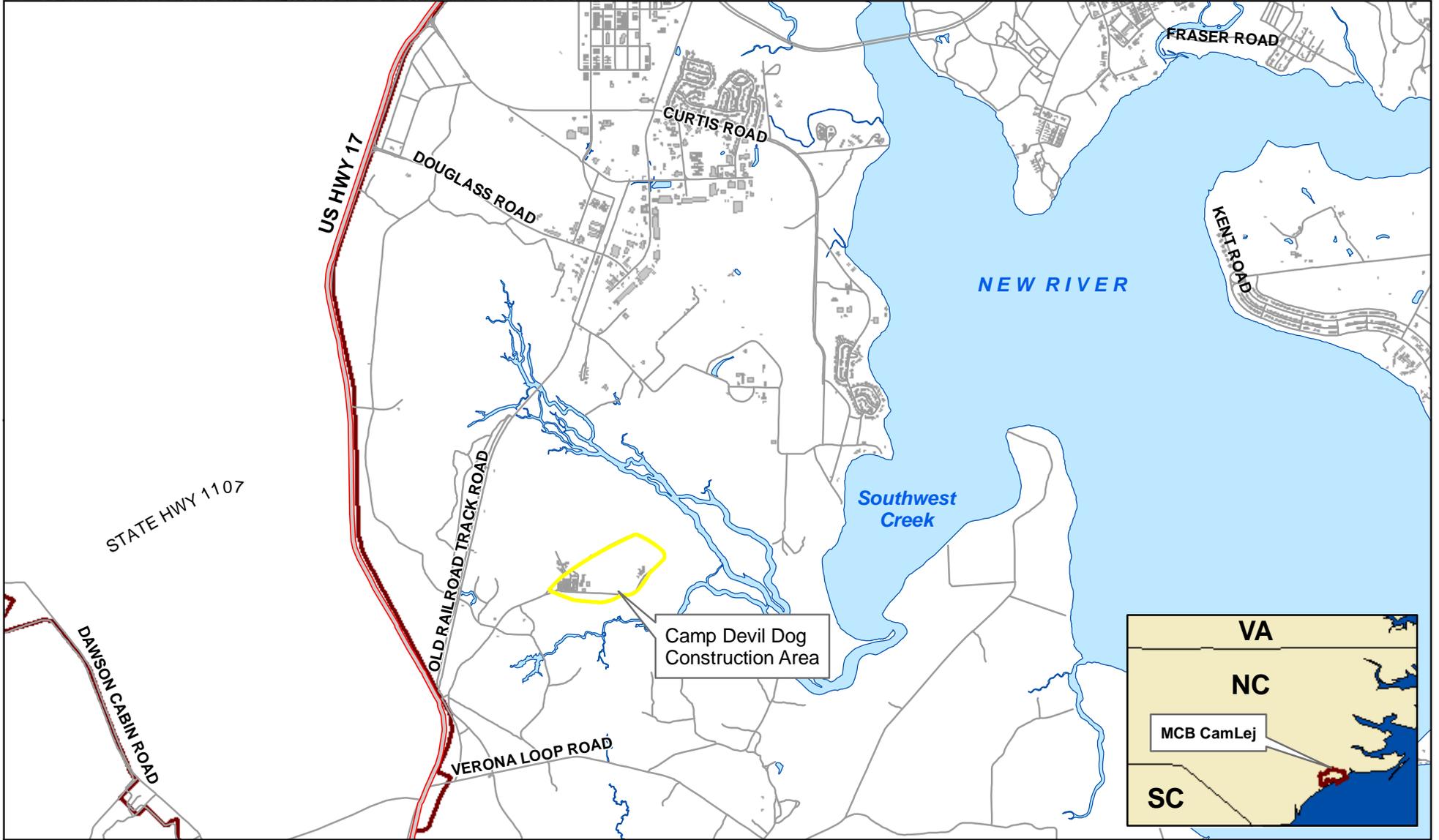
MCB CamLej. 1979. "Map of Race Course Area", Marine Corps Base Camp Lejeune, North Carolina. Showing conditions on June 30, 1979

Richardson, Duane, MCB CamLej Range Safety Officer. 2010. Personal Correspondence. August 16, 2010.

United States Army Corps of Engineers (USACE), 2001a. St. Louis District. *Final Range Identification and Preliminary Range Assessment*, Marine Corps Base Camp Lejeune, Onslow, North Carolina, December 2001.

USACE, 2001b. St. Louis District. *Final Range Archives Search Report*, Marine Corps Base Camp Lejeune, Onslow, North Carolina, December 2001.

USMC. 1953. "Overprint, Training Area and Facilities" Marine Corps Base Camp Lejeune. February 16, 1953



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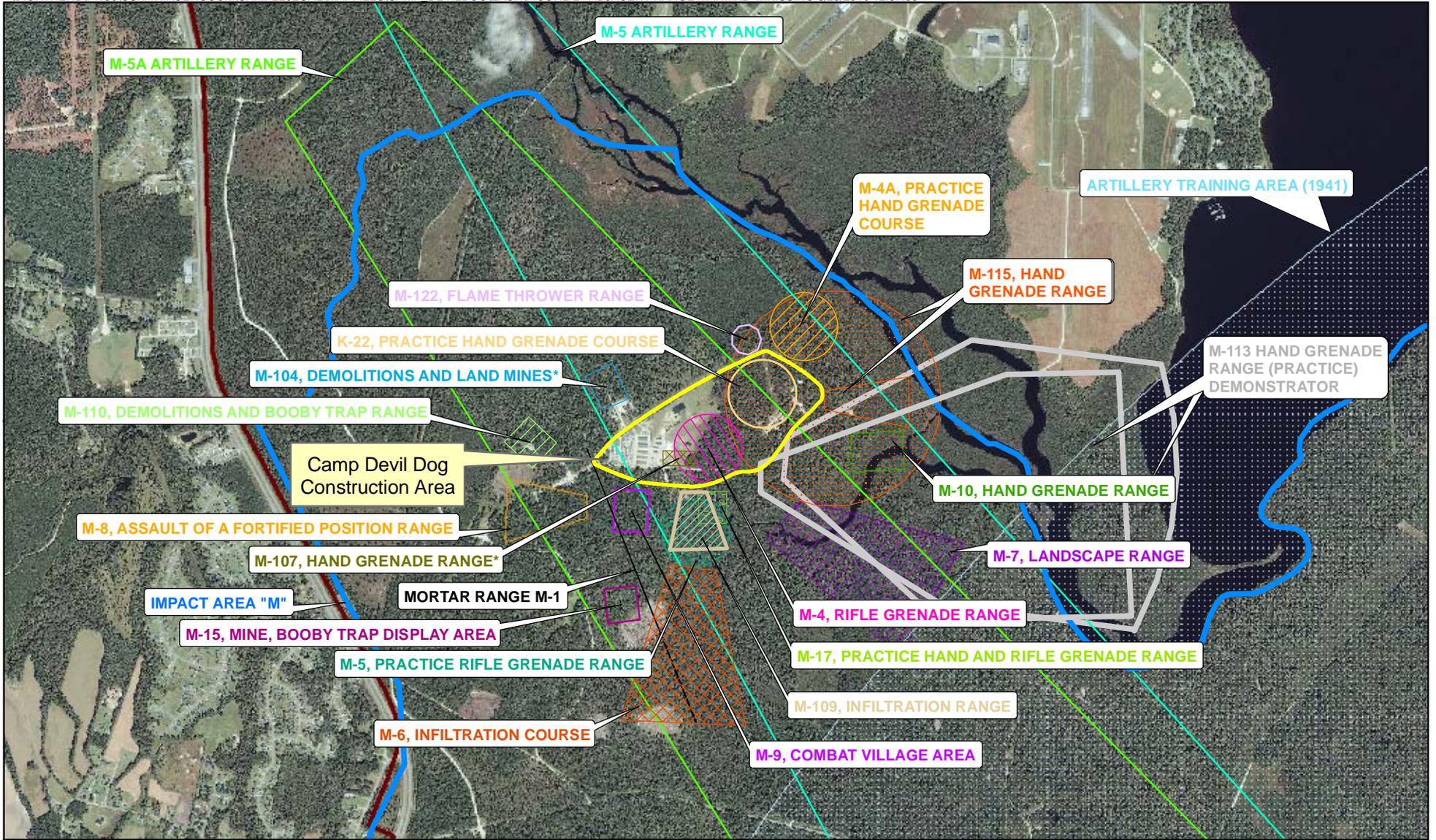
- Road
- Camp Devil Dog Construction Area
- Buildings
- ▭ Installation Boundary



1 inch = 4,000 feet

Figure 1  
Site Location Map  
Camp Devil Dog Construction Area  
Expanded ARSR  
MCB CamLej  
North Carolina





**Legend**

- Camp Devil Dog Construction Area
- Installation Boundary



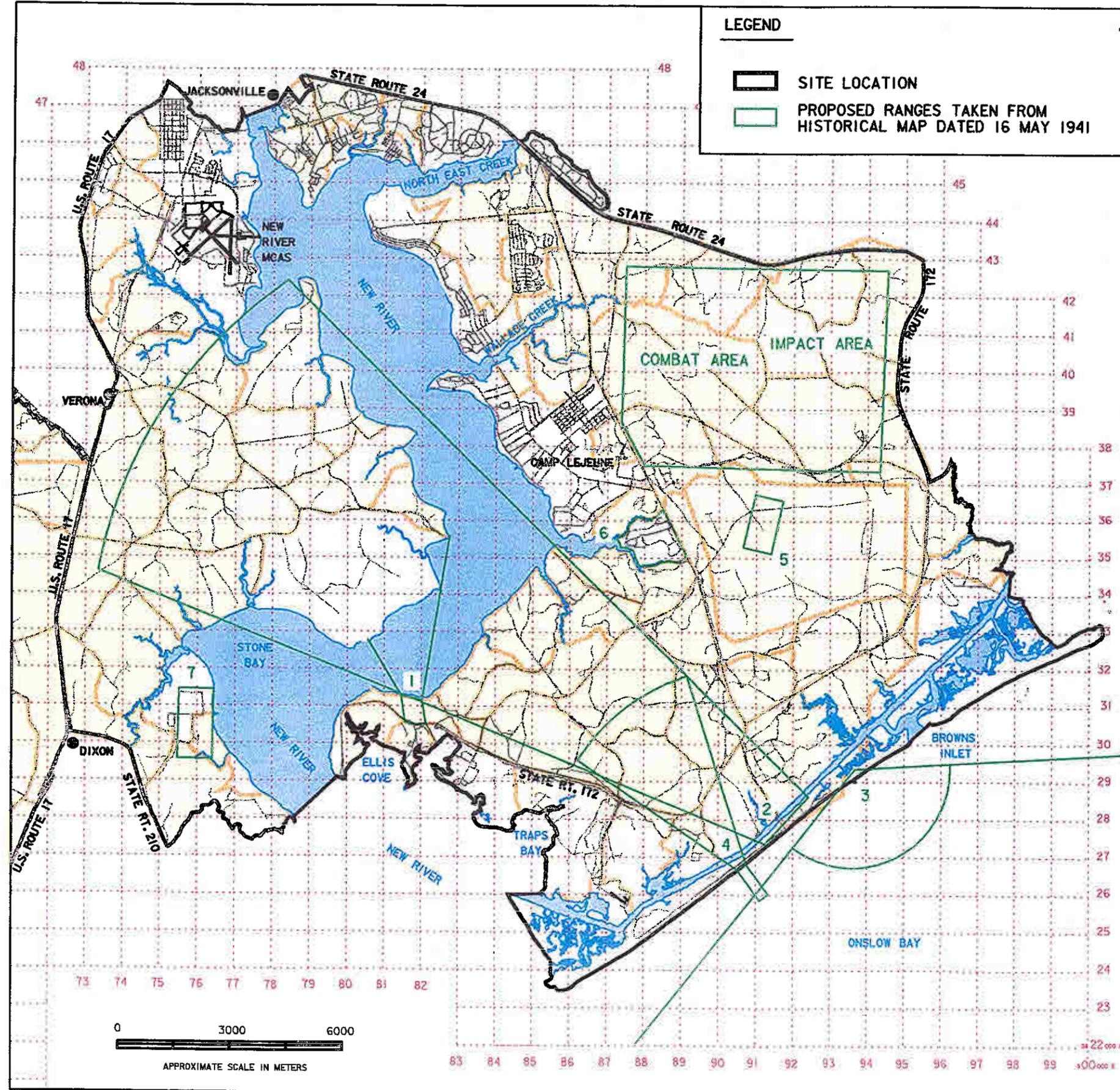
1 inch = 2,000 feet

Figure 2  
Adjacent Ranges Map  
Camp Devil Dog Construction Area  
Expanded ARSR  
MCB CamLej  
North Carolina



\* Location approximate

**Attachment 1**  
**Range Overlay Maps**



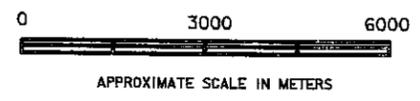
**LEGEND**

- SITE LOCATION
- PROPOSED RANGES TAKEN FROM HISTORICAL MAP DATED 16 MAY 1941

**KEY TO FEATURES:**

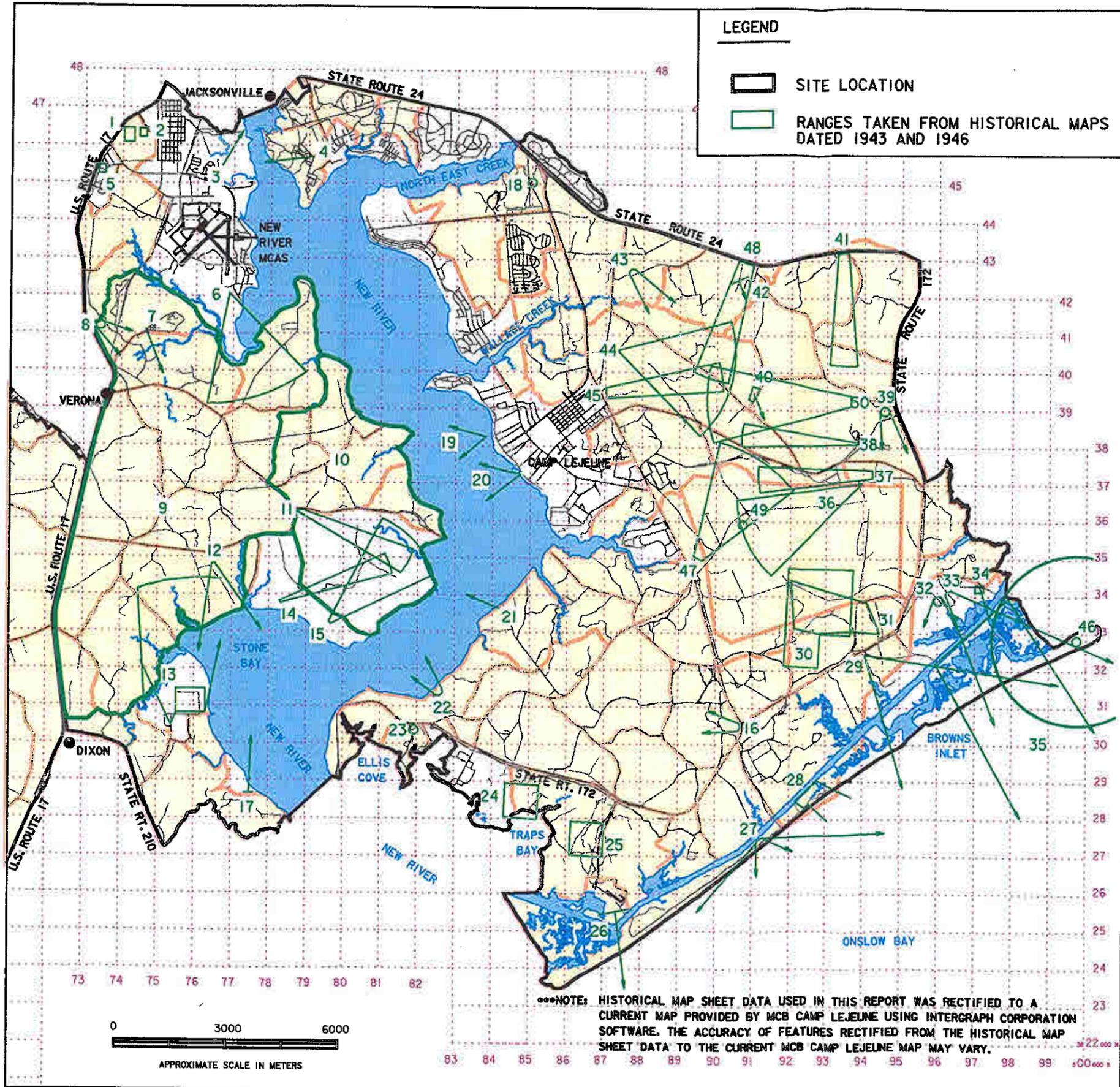
FEATURE NUMBER	FEATURE DESCRIPTION
1.	ANTI-MECHANIZED RANGE
2.	ARTILLERY TRAINING AREA (1941)
3.	ONSLOW BEACH / HURST BEACH FIRING AREA
4.	BOAT GUN RANGE 'J' LOCATION
5.	RIFLE RANGE
6.	MAGAZINE AREA
7.	RIFLE RANGE

\*\*\*NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.



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ST. LOUIS DISTRICT

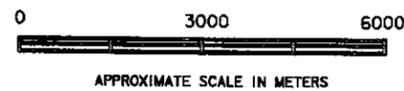
**MARINE CORPS BASE  
(MCB) CAMP LEJEUNE  
JACKSONVILLE, NORTH CAROLINA  
ONSLOW COUNTY  
RANGE OVERLAY MAP - MAY 1941**



**KEY TO FEATURES:**

FEATURE NUMBER	FEATURE DESCRIPTION
1.	1000 INCH RANGE (TENT CAMP AREA 1943)
2.	MINIATURE ANTI-AIRCRAFT (TENT CAMP AREA 1943)
3.	LIVE AMMUNITION INDOCRINATION COURSE (1945)
4.	1000 INCH RANGE, MONFORD POINT (1946)
5.	MINIATURE ANTI-TANK RANGE (TANK BATTALION TENT CAMP-1943)
6.	INFANTRY WEAPONS DEMOLITION COURSE (1946)
7.	MORTAR RANGE M-1 (1945)
8.	ARTILLERY FIRING POINT #7 (1946)
9.	IMPACT AREA (1945)
10.	IMPACT AREA K (1946)
11.	MUSKETRY RANGE E (1945)
12.	MORTAR RANGE L-1 (1946)
13.	RIFLE RANGE (1943)
14.	MACHINE GUN RANGE D (1943)
15.	MUSKETRY RANGE D (1943)
16.	ARTILLERY FIRING POINT #4 (1943)
17.	MORTAR RANGE L-2 (1945)
18.	LIVE HAND GRENADE COURSE (1945)
19.	DEMOLITION FIRING POINT #1 (1945)
20.	FIRING POINT #5 (1945)
21.	ARTILLERY FIRING POINT #10 (1945)
22.	ARTILLERY FIRING POINT #6 (1946)
23.	1000 INCH RANGE (AMPHIBIAN BASE AREA-1946)
24.	ENGINEER FIRING AREA (1947)
25.	ENGINEER FIRING AREA (1947)
26.	ARTILLERY FIRING POINT #2 (1945)
27.	ARTILLERY FIRING POINT #5 (1946)
28.	ENGINEER BEACH DEMOLITIONS AND TRAINING AREA (1946)
29.	ANTI-TANK RANGE (1943)
30.	ENGINEER FIRING RANGE (1947)
31.	ENGINEER FIRING RANGE (1946)
32.	ARTILLERY FIRING POINT #3 (1946)
33.	DIRECT FIRE ARTILLERY RANGE (1947)
34.	BEACH ARTILLERY FIRING POINT (1945)
35.	STRAFING TARGET #2 (1946)
36.	MUSKETRY RANGE C-1 (1943)
37.	MUSKETRY RANGE C (1943)
38.	MACHINE GUN RANGE C (1943)
39.	ARTILLERY FIRING POINT #2 (1946)
40.	ARTILLERY FIRING POINT #14 (1945)
41.	MACHINE GUN RANGE A (1943)
42.	ARTILLERY FIRING POINT #8 (1945)
43.	ARTILLERY FIRING POINT #1 (1946)
44.	MUSKETRY RANGE B (1943)
45.	MACHINE GUN RANGE B (1943)
46.	ROCKET RANGE #1 (1946)
47.	MINIATURE ANTI-AIRCRAFT RANGE (AREA D AND F 1943)
48.	MUSKETRY RANGE A (1943)
49.	OC BATTALION FIELD FIRING RANGE (1943)
50.	MUSKETRY RANGE C-2

\*\*\*NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.



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**MARINE CORPS BASE  
(MCB) CAMP LEJEUNE  
JACKSONVILLE, NORTH CAROLINA  
ONSLow COUNTY  
RANGE OVERLAY MAP-1946**

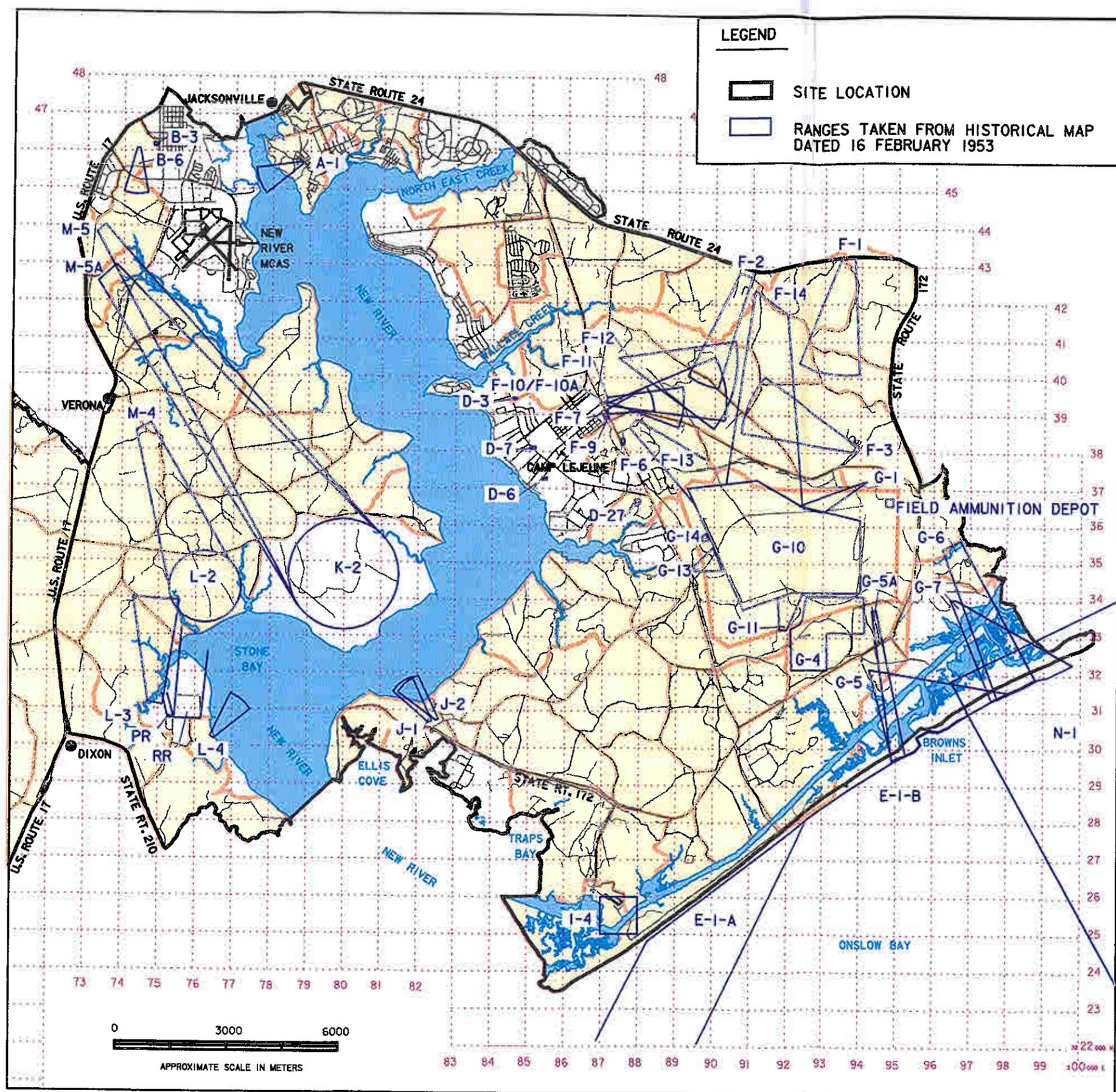
**KEY TO FEATURES:**

FEATURE NUMBER	FEATURE DESCRIPTION
A-1	50 FOOT .22 CALIBER RANGE
B-3	GAS CHAMBER
B-6	1000 INCH RANGE
D-3	PRACTICE HAND GRENADE COURSE
D-6	PRACTICE HAND GRENADE COURSE
D-7	GAS CHAMBER
D-27	FORTIFIED BEACH ASSAULT AREA
E-1A	AAA AND ANTI-BOAT RANGE
E-1B	AAA AND ANTI-BOAT RANGE
F-1	FIELD FIRING RANGE
F-2	FIELD FIRING RANGE
F-3	FIELD FIRING RANGE
F-6	LIVE HAND GRENADE RANGE
F-7	1000 INCH RANGE
F-9	TRIANGULATION RANGE
F-10	MACHINE GUN QUALIFICATION RANGE
F-10A	1000 INCH RANGE
F-11	PISTOL RANGE
F-12	FIELD FIRING RANGE
F-13	FIELD FIRING RANGE
F-14	FIELD FIRING RANGE
G-1	COMBAT RANGE
G-4	ASSAULT DEMO. AREA
G-5	ANTI-TANK RANGE
G-5A	MECHANIZED ANTI-TANK RANGE
G-6	ARTILLERY RANGE
G-7	DIRECT FIRE ARTILLERY RANGE
G-10	IMPACT AREA
G-11	BATTLE INDOCTRINATION RANGE
G-13	MINIATURE ANTI-AIRCRAFT RANGE
G-14	TANK MACHINE GUN RANGE
I-4	DEMOLITION AREA
J-1	1000 INCH RANGE
J-2	1000 INCH RANGE
K-2	IMPACT AREA
L-2	IMPACT AREA
L-3	MACHINE GUN TRANSITION RANGE
L-4	1000 INCH RANGE
M-4	FIELD FIRING RANGE
M-5	ARTILLERY RANGE
M-5A	ARTILLERY RANGE
N-1	DANGER AREA
PR	PISTOL RANGE
RR	RIFLE RANGE

\*\*\*NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.

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-  RANGES TAKEN FROM HISTORICAL MAP DATED 16 FEBRUARY 1953

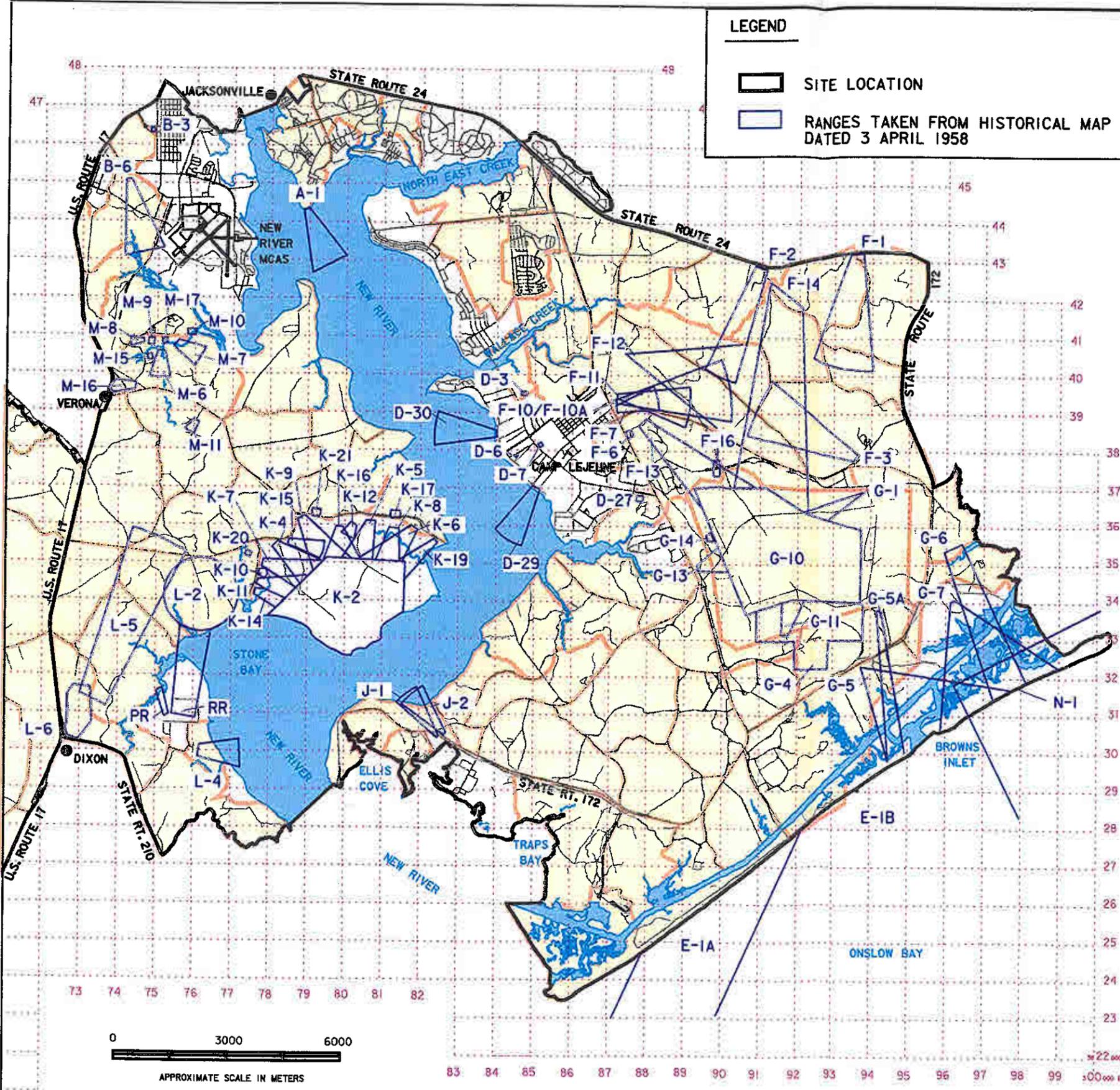




U.S. ARMY CORPS OF ENGINEERS  
ST. LOUIS DISTRICT

**MARINE CORPS BASE  
(MCB) CAMP LEJEUNE  
JACKSONVILLE, NORTH CAROLINA  
ONSLow COUNTY  
RANGE OVERLAY MAP-FEBRUARY 1953**





**LEGEND**

SITE LOCATION  
 RANGES TAKEN FROM HISTORICAL MAP DATED 3 APRIL 1958

**KEY TO FEATURES:**

FEATURE NUMBER	FEATURE DESCRIPTION
A-1	50 FOOT .22 CALIBER RANGE
B-3	GAS CHAMBER
B-6	50 FOOT SMALL ARMS RANGE
D-3	GAS CHAMBER
D-6	PRACTICE HAND GRENADE RANGE
D-7	GAS CHAMBER
D-27	FORTIFIED BEACH ASSAULT AREA
D-29	50 FOOT SMALL BORE RANGE
D-30	50 FOOT SMALL BORE RANGE
E-1A	AAA AND ANTI-BOAT FIRING RANGE
E-1B	AAA AND ANTI-BOAT FIRING RANGE
F-1	FIELD FIRING RANGE
F-2	FIELD FIRING RANGE
F-3	FIELD FIRING RANGE
F-6	LIVE HAND GRENADE RANGE
F-7	.22 CALIBER RANGE, 1000 INCH
F-10	MACHINE GUN QUALIFICATION RANGE
F-10A	1000 INCH RANGE
F-11	PISTOL RANGE
F-12	FIELD FIRING RANGE
F-13	FIELD FIRING RANGE
F-14	FIELD FIRING RANGE
F-16	COMBAT VILLAGE
G-1	COMBAT RANGE
G-4	DEMOLITION ASSAULT AREA
G-5	ANTI-TANK RANGE
G-5A	MECHANIZED ANTI-TANK RANGE
G-6	ARTILLERY RANGE
G-7	DIRECT FIRE ARTILLERY RANGE
G-10	IMPACT AREA
G-11	BATTLE INDOCTRINATION COURSE
G-13	MINIATURE ANTI-AIRCRAFT RANGE
G-14	TANK MACHINE GUN RANGE
J-1	1000 INCH RANGE
J-2	1000 INCH RANGE
K-2	IMPACT AREA
K-4	TRANSITION FIRING RANGE
K-5	COMBAT FIRING RANGE
K-6	TRANSITION RANGE
K-7	COMBAT FIRING RANGE
K-8	CLOSE COMBAT COURSE
K-9	3.5 INCH ROCKET FIELD FIRING RANGE
K-10	RIFLE GRENADE FIELD FIRING RANGE
K-11	INFILTRATION COURSE
K-14	CLOSE COMBAT COURSE

**KEY TO FEATURES:**

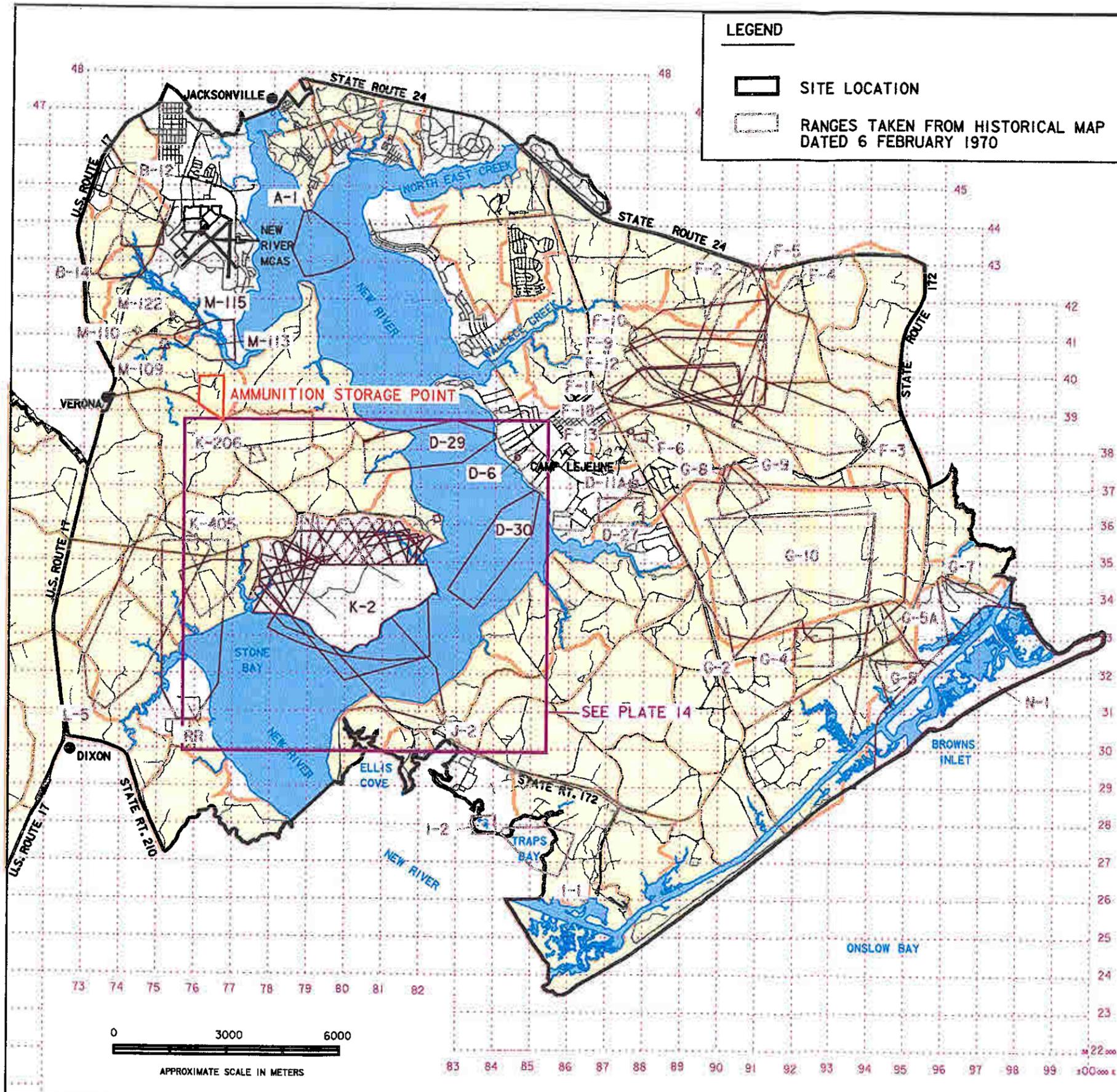
FEATURE NUMBER	FEATURE DESCRIPTION
K-15	MACHINE GUN FIELD FIRING RANGE 500' AND 1000'
K-16	INFANTRY WEAPONS DEMONSTRATION RANGE
K-17	PRACTICE HAND GRENADE COURSE
K-19	300 YARD BATTLESIGHT RANGE
K-20	HAND GRENADE RANGE
K-21	FLAME THROWER RANGE
L-2	IMPACT AREA
L-4	1000 INCH RANGE
L-5	MULTI-PURPOSE MACHINE GUN RANGE
L-6	MINE WARFARE AND DEMOLITION AREA
M-6	INFILTRATION COURSE
M-7	LANDSCAPE RANGE
M-8	ASSAULT OF A FORTIFIED POSITION RANGE
M-9	COMBAT VILLAGE AREA
M-10	HAND GRENADE RANGE
M-11	ASSAULT OF A FORTIFIED POSITION AREA
M-15	MINE, BOOBYTRAP DISPLAY AREA
M-16	OUTDOOR CLASSROOM
M-17	PRACTICE HAND AND RIFLE GRENADE RANGE
N-1	IMPACT AREA
PR	PISTOL RANGE
RR	RIFLE RANGE

\*\*\*NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.



U.S. ARMY CORPS OF ENGINEERS  
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**MARINE CORPS BASE  
(MCB) CAMP LEJEUNE  
JACKSONVILLE, NORTH CAROLINA  
ONSLOW COUNTY  
RANGE OVERLAY MAP-APRIL 1958**



**LEGEND**

- SITE LOCATION
- RANGES TAKEN FROM HISTORICAL MAP DATED 6 FEBRUARY 1970

**KEY TO FEATURES:**

FEATURE NUMBER	FEATURE DESCRIPTION
A-1	PISTOL AND SHOTGUN RANGE
B-12	BAFFLED PISTOL RANGE
B-14	ASSAULT OF A FORTIFIED POSITION RANGE
D-6	50 FOOT INDOOR SMALL BORE RIFLE AND PISTOL RANGE
D-11A	FLAME TANK AND FLAME THROWER RANGE
D-27	FORTIFIED BEACH ASSAULT AREA
D-29	50 FOOT SMALL BORE RANGE
D-30	50 FOOT SMALL BORE RANGE
F-2	FIELD FIRING RANGE
F-3	FIELD FIRING RANGE
F-4	FIRE CONTROL RANGE
F-5	SQUAD LIVE FIRE AND MANEUVER COURSE
F-6	LIVE HAND GRENADE RANGE
F-9	BATTLE SIGHT RANGE
F-10	MACHINE GUN QUALIFICATION RANGE
F-11	PISTOL RANGE
F-12	FIELD FIRING RANGE
F-13	FLAME THROWER RANGE
F-18	MACHINE GUN FIELD FIRING RANGE
G-2	INFILTRATION RANGE
G-4	DEMOLITION ASSAULT COURSE
G-5	ANTI-TANK RANGE
G-5A	MECHANIZED ANTI-TANK RANGE
G-7	DIRECT FIRE ARTILLERY RANGE
G-8	GRENADE LAUNCHER RANGE
G-9	LIGHT ANTI-ARMOR WEAPONS AND SHOULDER LAUNCHED MULTI-PURPOSE ASSAULT WEAPONS RANGE
G-10	IMPACT AREA
I-1	50 FOOT SMALL BORE RANGE
I-2	DEMOLITION AREA
J-2	1000 INCH RANGE
K-2	IMPACT AREA - SEE NOTE BELOW
K-206	UNKNOWN RANGE
K-405	COMBAT PISTOL MARKSMANSHIP RANGE
L-5	MULTI-PURPOSE MACHINE GUN RANGE
M-109	INFILTRATION RANGE
M-110	DEMOLITIONS AND BOOBY TRAP RANGE
M-113	HAND GRENADE RANGE (PRACTICE) DEMONSTRATOR
M-115	HAND GRENADE RANGE
M-122	FLAME THROWER RANGE
N-1	IMPACT AREA
RR	RIFLE RANGE

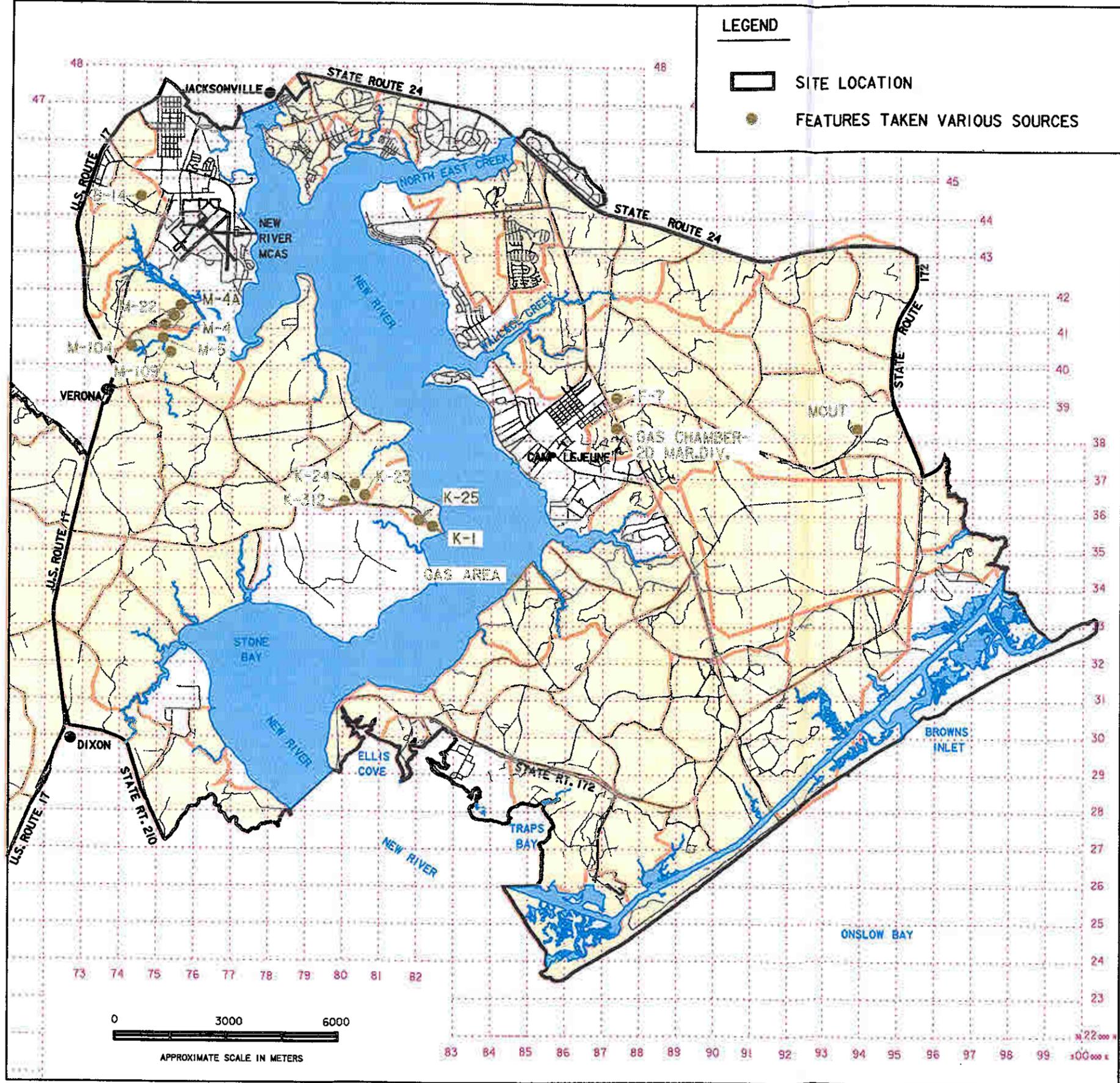
\*\*\*NOTE: SEE PLATE 14 FOR FEATURE NUMBERS AND FEATURE DESCRIPTIONS ON K RANGES.

\*\*\*NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.



U.S. ARMY CORPS OF ENGINEERS  
ST. LOUIS DISTRICT

**MARINE CORPS BASE  
(MCB) CAMP LEJEUNE  
JACKSONVILLE, NORTH CAROLINA  
ONSLOW COUNTY  
RANGE OVERLAY MAP-FEBRUARY 1970**



**LEGEND**

SITE LOCATION  
 FEATURES TAKEN VARIOUS SOURCES

**KEY TO FEATURES:**

FEATURE NUMBER	FEATURE DESCRIPTION
K-24	DEMOLITION RANGE (1960)
K-25	ASSAULT OF A FORTIFIED POSITION RANGE (1960)
M-4	RIFLE GRENADE RANGE (1960)
M-5	PRACTICE RIFLE GRENADE RANGE (1960)
M-22	PRACTICE HAND GRENADE COURSE (1960)
K-23	GAS CHAMBER (1960)
M-4A	PRACTICE HAND GRENADE COURSE (1960)
K-1	81MM MORTAR FIELD FIRING RANGE (1960)
F-7	FLAME THROWER RANGE (1960)
M-104	DEMOLITIONS RANGE (1970)
M-109	INFILTRATION RANGE (1970)
MOUT	MOUT ASSAULT COURSE (1994)
B-14	ABC WARFARE AREA (1960)
GC	GAS CHAMBER (2D MAR. DIV.) (1970)
K-312	GAS CHAMBER (1970)
GAS AREA	GAS TRAINING AREA (1945)

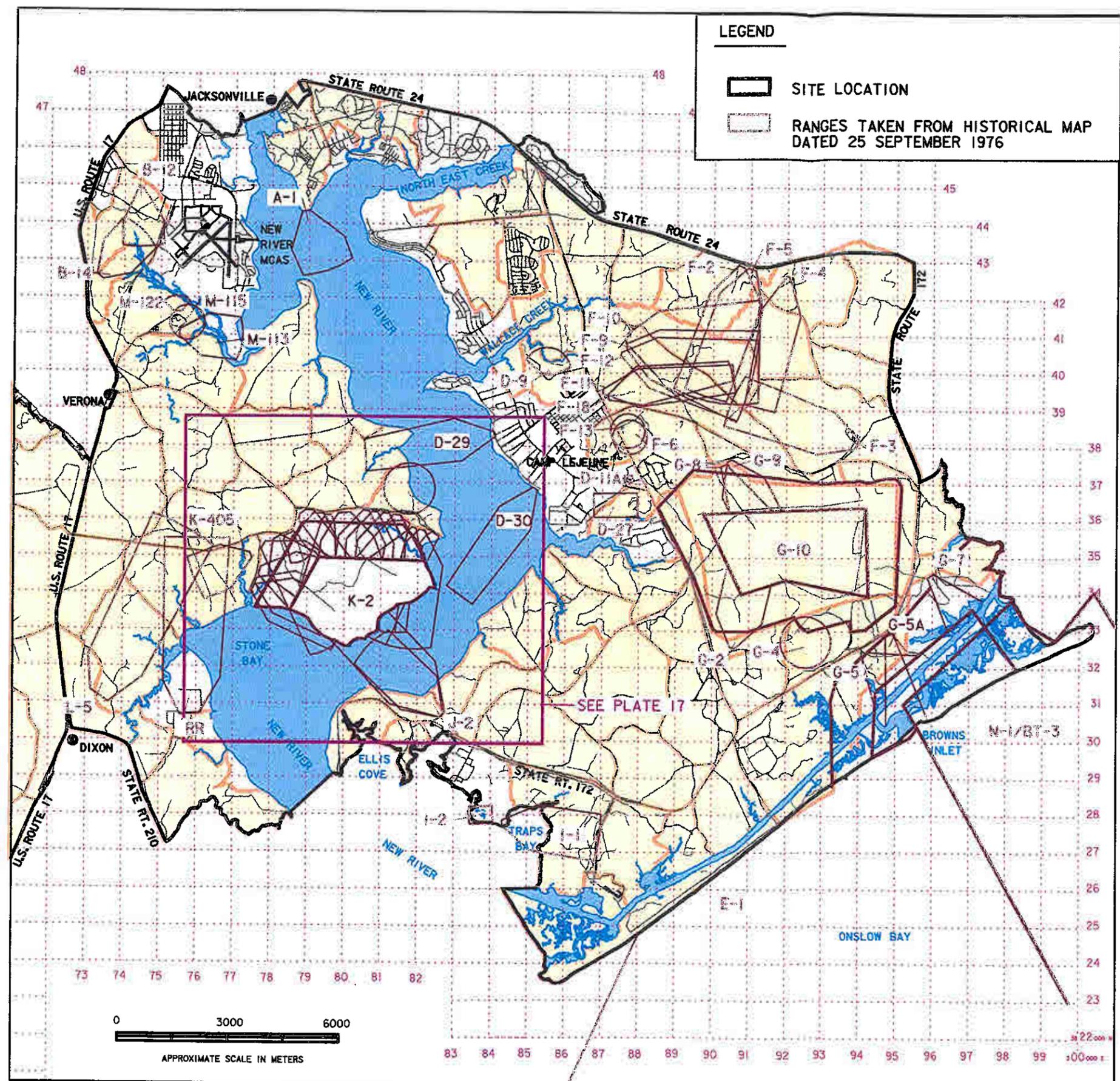
\*\*\*NOTE: THESE LOCATIONS ARE APPROXIMATE. NO PRECISE LOCATIONS WERE FOUND IN THE DOCUMENTATION.

\*\*\*NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.



U.S. ARMY CORPS OF ENGINEERS  
ST. LOUIS DISTRICT

**MARINE CORPS BASE  
(MCB) CAMP LEJEUNE  
JACKSONVILLE, NORTH CAROLINA  
ONSLow COUNTY  
MISCELLANEOUS RANGE FEATURES**



**LEGEND**

 **SITE LOCATION**  
 **RANGES TAKEN FROM HISTORICAL MAP DATED 25 SEPTEMBER 1976**

**KEY TO FEATURES:**

FEATURE NUMBER	FEATURE DESCRIPTION
A-1	PISTOL AND SHOTGUN RANGE
B-12	BAFFLED PISTOL RANGE
B-14	ASSAULT OF A FORTIFIED POSITION RANGE
D-9	SKEET RANGE
D-11A	FLAME TANK AND FLAME THROWER RANGE
D-27	FORTIFIED BEACH ASSAULT AREA
D-29	50 FOOT SMALL BORE RANGE
D-30	50 FOOT SMALL BORE RANGE
E-1	AIR DEFENSE FIRING RANGE
F-2	FIELD FIRING RANGE
F-3	FIELD FIRING RANGE
F-4	FIRE CONTROL RANGE
F-5	SQUAD LIVE FIRE AND MANEUVER COURSE
F-6	LIVE HAND GRENADE RANGE
F-9	BATTLE SIGHT RANGE
F-10	MACHINE GUN QUALIFICATION RANGE
F-11	PISTOL RANGE
F-12	FIELD FIRING RANGE
F-13	FLAME THROWER RANGE
F-18	MACHINE GUN FIELD FIRING RANGE
G-2	INFILTRATION RANGE
G-4	DEMOLITION ASSAULT COURSE
G-5	ANTI-TANK RANGE
G-5A	MECHANIZED ANTI-TANK RANGE
G-7	DIRECT FIRE ARTILLERY RANGE
G-8	GRENADE LAUNCHER RANGE
G-9	LIGHT ANTI-ARMOR WEAPONS AND SHOULDER LAUNCHED MULTI-PURPOSE ASSAULT WEAPONS RANGE
G-10	IMPACT AREA
I-1	50 FOOT SMALL BORE RANGE
I-2	DEMOLITION AREA
J-2	1000 INCH RANGE
K-2	IMPACT AREA - SEE NOTE BELOW
K-405	COMBAT PISTOL MARKSMANSHIP RANGE
L-5	MULTI-PURPOSE MACHINE GUN RANGE HAND GRENADE RANGE (PRACTICE) DEMONSTRATOR
M-115	HAND GRENADE RANGE
M-122	FLAME THROWER RANGE
N-1/BT-3	IMPACT AREA
RR	RIFLE RANGE

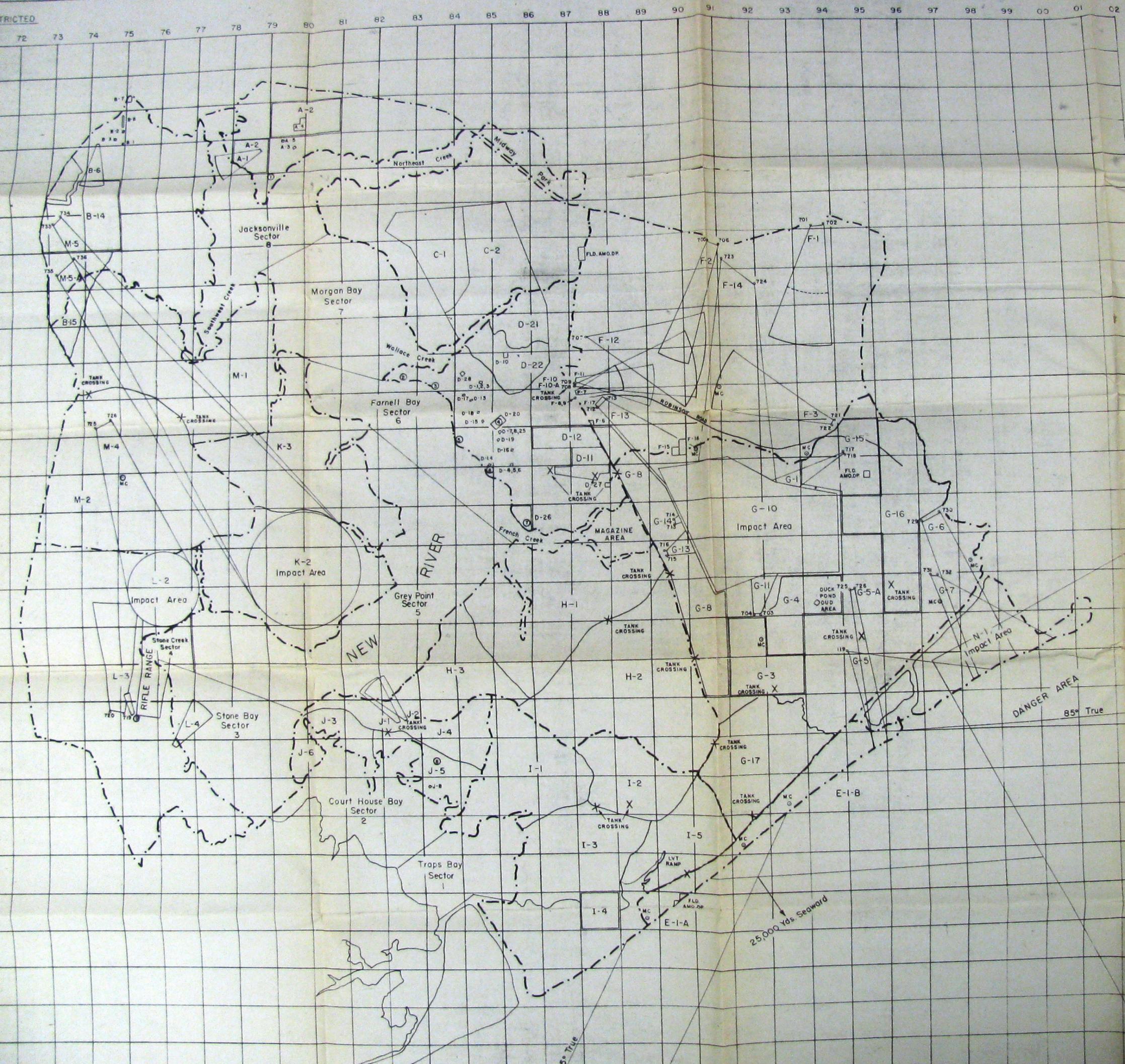
\*\*\*NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.

\*\*\*NOTE: SEE PLATE 17 FOR FEATURE NUMBERS AND FEATURE DESCRIPTIONS ON K RANGES.

	<b>U.S. ARMY CORPS OF ENGINEERS</b> <b>ST. LOUIS DISTRICT</b>	
	<b>MARINE CORPS BASE</b> <b>(MCB) CAMP LEJEUNE</b> <b>JACKSONVILLE, NORTH CAROLINA</b> <b>ONSLow COUNTY</b> <b>RANGE OVERLAY MAP-SEPTEMBER 1976</b>	
PROJ. DATE: SEPT. 1980 15-FEB-2000 1345	DATE OF BASE MAP: 1990 ndoe#nor1hooa#lejeune#25SEP76.DGN	<b>PLATE NO. 16</b>



**Attachment 2**  
**Training Areas and Facilities, 1953**



FIRING AREAS

- F-1 Field Firing Range One Company
- F-2 Field Firing Range One Company
- F-3 Field Firing Range One Company
- F-12 Field Firing Range One Company
- F-13 Field Firing Range One Company
- F-14 Field Firing Range One Company
- M-4 Field Firing Range One Company
- G-13 Field Firing Range One Battalion
- F-6 Live Hand Grenade Range One Platoon
- B-14 Tank M.G. Range Two Tank Companies
- A-1 1000' Range One Company
- B-6 1000' Range One Company
- F-7 1000' Range Two Companies
- F-10-A 1000' Range One Battalion
- J-1 1000' Range Two Companies
- J-2 1000' Range One Battalion
- L-4 1000' Range One Battalion
- F-11 Pistol Range One Battalion
- G-4 Battle Instruction Course Two Platoons
- I-4 Assault Demolition Area One Company
- D-27 Fortified Beach Assault Area One Battalion
- F-10 M.G. Qualification Range Two Companies
- L-3 M.G. Transition Range One Battalion
- G-1 Combat Range One Battalion
- G-5 Mechanized AT Range Two Platoons
- G-5-A Mechanized AT Range Two Batteries
- E-1-A AAA and Anti Boat Range One Tank Company
- E-1-B AAA and Anti Boat Range One A.A. Battalion
- G-6 Artillery Range One A.A. Battalion
- G-7 Artillery Range One Battalion
- M-5 Artillery Range One Battery
- M-5-A Artillery Range One Battalion

\*Controlled Firing Areas (See Note 1 of Enclosure No. 1 To Camp General Order Number 414)

NON FIRING AREAS

- A-2 Maneuver Area (Special See Encl. (1) CGO No. 414) One Battalion
- B-14 Maneuver Area One Battalion
- C-1 Maneuver Area One Battalion
- C-2 Maneuver Area One Battalion
- D-21 Maneuver Area One Battalion
- D-22 Maneuver Area One Company
- D-26 Maneuver Area One Company
- G-1 Maneuver Area One Company
- G-2 Maneuver Area One Company
- G-3 Maneuver Area One Company
- G-4 Maneuver Area One Company
- G-5 Maneuver Area One Company
- G-6 Maneuver Area One Battalion
- G-7 Maneuver Area One Battalion
- H-1 Maneuver Area One Regiment
- H-2 Maneuver Area One Battalion
- H-3 Maneuver Area One Battalion
- I-1 Maneuver Area One Battalion
- I-2 Maneuver Area One Company
- I-3 Maneuver Area One Battalion
- I-4 Maneuver Area One Battalion
- I-5 Maneuver Area One Company
- J-1 Maneuver Area One Platoon
- J-2 Maneuver Area One Platoon
- J-3 Maneuver Area One Platoon
- J-4 Maneuver Area One Platoon
- J-5 Maneuver Area One Platoon
- J-6 Maneuver Area One Platoon
- K-1 Maneuver Area, Battlefield Target One Regiment
- K-2 Training Area One Regiment
- K-3 Maneuver Area One Regiment
- M-1 Maneuver Area One Regiment
- M-2 Maneuver Area One Regiment
- D-3 Practice Hand Grenade Course One Company
- D-6 Practice Hand Grenade Course One Platoon
- D-2 Bayonet Obstacle Course One Company
- D-5 Bayonet Obstacle Course One Company
- D-20 Parade Ground One Division
- D-8 Dry Net Mock Up One Company
- F-17 Dry Net Mock Up One Battalion
- A-4 Combat Conditioning Course One Company
- D-1 Combat Conditioning Course One Company
- D-4 Combat Conditioning Course One Company
- B-3 Gas Chamber One Battalion
- D-7 Gas Chamber One Company
- D-10 Aircraft Mock Up One Company
- D-26 Shore Party Staging Area One Battalion
- F-16 Combat Village One Platoon
- F-15 Camouflage School One Platoon
- D-28 Field Sanitation Demonstration One Battalion
- F-9 Triangulation Range Two Platoons
- B-7 Snapping in Range Two Platoons
- B-8 Snapping in Range One Company
- F-8 Snapping in Range One Company
- B-15 Combat Vehicle Driving Course One Company
- D-12 Combat Vehicle Driving Course One Company
- D-11 Tank Driving Course One Company

INDOOR INSTRUCTION AREAS

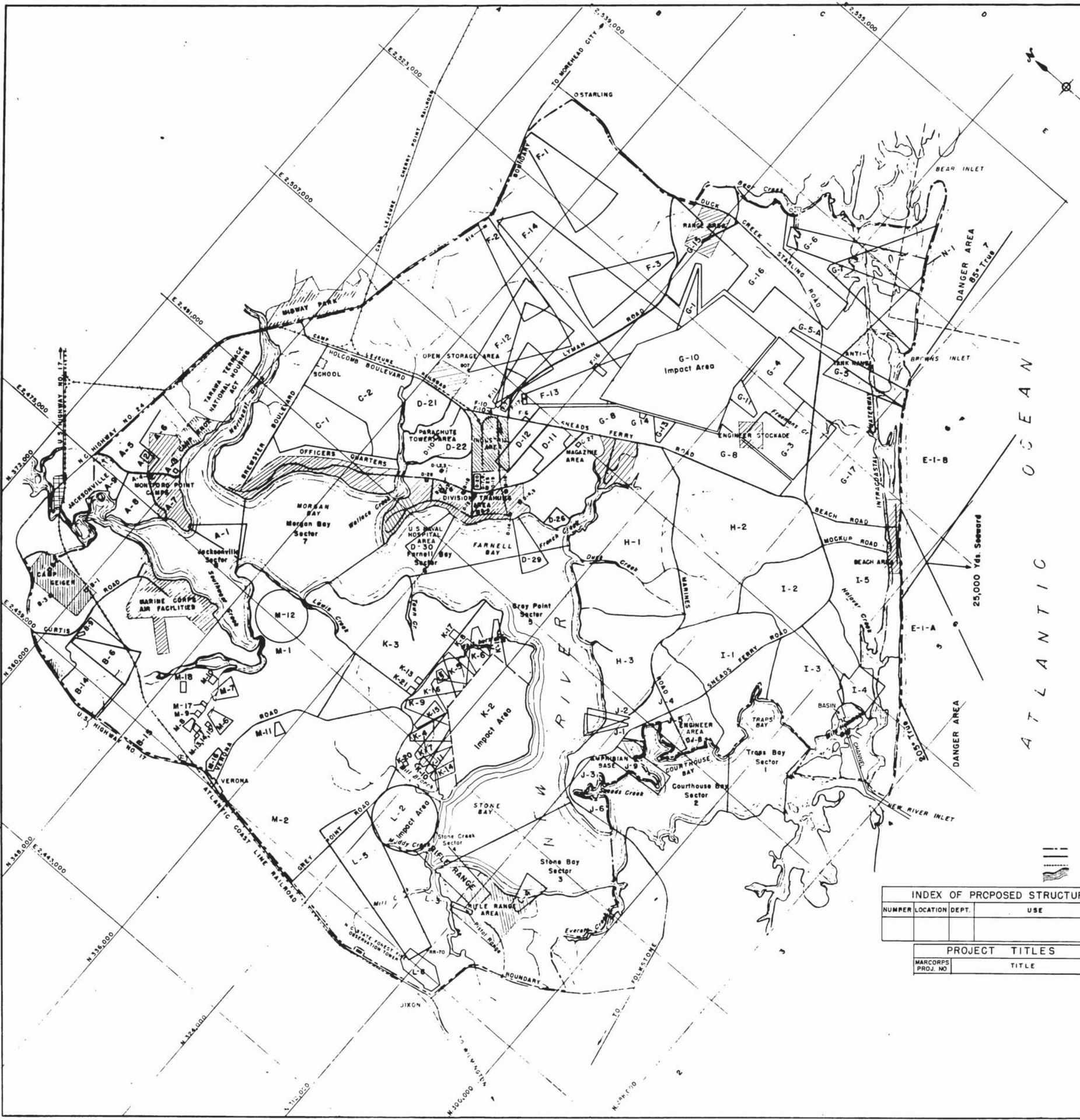
- A-5 Theatre One Battalion
- B-2 Theatre One Battalion
- D-15 Theatre One Battalion
- D-16 Theatre One Battalion
- J-8 Theatre One Company
- B-1 Gymnasium One Company
- D-17 Gymnasium One Company
- D-18 Gymnasium One Company
- D-19 Gymnasium One Platoon
- A-3 Swimming Pool One Platoon
- D-13 Swimming Pool One Platoon
- D-14 Swimming Pool One Platoon
- D-25 Puff Board One Platoon

OVERPRINT  
**TRAINING AREAS & FACILITIES**  
 To Accompany Map  
 H.O. Misc. 15,042-50-1A

Drawn By: J. Mackey Cpl. Approved By: *[Signature]*  
 Major General Commanding

G-3 Range Office 16 Feb. 1953

**Attachment 3**  
**MCB CamLej Technical Records**



INDEX OF EXISTING STRUCTURES				
NUMBER	LOCATION	DEPT.	USE	FLOOR ELEV.
RR-70	E-2	MCB	RANGE HOUSE (RANGE L-8)	88.98
807	C-4	-	RANGE HOUSE (RANGE P-18)	38.77
B-14	D-8	-	RANGE HOUSE (RANGE P-8)	41.01

INDEX OF EXISTING TRAINING FACILITIES			
A-1	50 FOOT 22 RANGE	G-1	COMBAT RANGE
A-2	COMBAT CONDITIONING COURSE	G-3	MANEUVER AREA
A-3	SWIMMING POOL	G-4	DEMOLITION ASSAULT AREA
A-4	THEATRE, MONTFORD POINT	G-5	MECHANIZED ANTI-TANK RANGE
A-5	MANEUVER AREA (PRISONER TRAINING)	G-5-A	TANK MANEUVER AREA
A-6	MANEUVER AREA	G-6	ARTILLERY RANGE
A-7	MANEUVER AREA	G-7	ARTILLERY RANGE
A-8	MANEUVER AREA	G-8	MANEUVER AREA
A-9	MANEUVER AREA	G-10	IMPACT AREA
B-1	RECREATION BUILDING, CAMP GEIGER	G-11	BATTLE INFILTRATION COURSE
B-2	RECREATION BUILDING, CAMP GEIGER	G-13	MINIATURE ANTI-AIRCRAFT RANGE
B-3	GAS CHAMBER, CAMP GEIGER	G-14	1000' TANK MG RANGE
B-6	50 FOOT 22 RANGE	G-15	MANEUVER AREA
B-8	DRY NETS, MOCK-UP AREA	G-16	MANEUVER AREA
B-14	MANEUVER AREA	G-17	MANEUVER AREA
B-15	COMBAT VEHICLE DRIVING COURSE	H-1	MANEUVER AREA
C-1	MANEUVER AREA	H-2	MANEUVER AREA
C-2	MANEUVER AREA	H-3	MANEUVER AREA
D-1	COMBAT CONDITIONING COURSE	I-1	MANEUVER AREA
D-2	BAYONET OBSTACLE COURSE	I-2	MANEUVER AREA
D-3	PRACTICE HAND GRENADE RANGE	I-3	MANEUVER AREA
D-4	COMBAT CONDITIONING COURSE	I-4	AIR DELIVERY DROP ZONE
D-5	BAYONET OBSTACLE COURSE	J-1	50 FOOT 22 RANGE
D-6	50 FT. INDOOR SMALL BORE RIFLE AND PISTOL RANGE	J-2	50 FOOT 22 RANGE
D-7	GAS CHAMBER	J-3	MANEUVER AREA
D-8	DRY NET MOCK-UP	J-4	MANEUVER AREA
D-10	MANEUVER AREA	J-5	MANEUVER AREA
D-11	TANK DRIVING COURSE	J-6	MANEUVER AREA
D-12	COMBAT VEHICLE DRIVING COURSE	J-8	THEATRE, COURTHOUSE BAY
D-13	SWIMMING POOL, AREA NO. 2	K-2	IMPACT AREA
D-14	SWIMMING POOL, AREA NO. 3	K-3	MANEUVER AREA
D-15	REGIMENTAL THEATRE, AREA NO. 3	K-4	TRANSITION FIRING RANGE
D-16	-	K-5	COMBAT FIRING RANGE
D-17	-	K-6	TRANSITION RANGE
D-18	-	K-7	COMBAT FIRING RANGE
D-19	-	K-8	CLOSE COMBAT RANGE
D-20	CAMP PARADE GROUND	K-9	COMBINED INFANTRY WEAPONS RANGE
D-21	MANEUVER AREA	K-10	PRACTICE HAND GRENADE RANGE
D-22	MANEUVER AREA AND HELICOPTER LANDING ZONE (TRAINING)	K-11	INFILTRATION RANGE
D-25	PUFF BOARD	K-12	COMBAT CONDITIONING COURSE
D-26	SHORE PARTY STAGING AREA	K-13	ASSAULT BAYONET RANGE
D-27	FORTIFIED BEACH ASSAULT AREA	K-14	CLOSE COMBAT COURSE
D-28	FIELD SANITATION DISPLAY	K-15	LANDSCAPE TARGET 1000' RANGE
E-1-A	AAA AND ANTI-BOT FIRMING RANGE	K-16	DEMONSTRATION RANGE
E-1-B	AAA AND ANTI-BOT FIRMING RANGE	K-17	PRACTICE HAND GRENADE RANGE
F-1	FIELD FIRING RANGE	K-19	300 YARD RANGE - ZERO OF BATTLE SIGHTS
F-2	30 CAL. ELECTRIC POP-UP RANGE	K-20	LIVE HAND GRENADE RANGE
F-3	FIELD FIRING RANGE	L-1	FLAME THROWER RANGE
F-4	HAND GRENADE RANGE	L-2	IMPACT AREA
F-7	50 FOOT 22 RANGE	L-4	1000' AND 80 FOOT RANGE
F-10	MACHINE GUN QUALIFICATION RANGE	L-5	30 CAL. ELECTRIC POP-UP RANGE
F-10-A	1000' MACHINE GUN RANGE	L-6	MINE WARFARE AND DEMOLITION AREA
F-11	PISTOL QUALIFICATION RANGE	M-1	MANEUVER AREA
F-12	30 CAL. ELECTRIC POP-UP RANGE	M-2	MANEUVER AREA
F-13	MORTAR RANGE	M-6	INFILTRATION COURSE
F-14	FIELD FIRING RANGE	M-7	1000' MACHINE GUN RANGE
F-16	COMBAT VILLAGE	M-8	ASSAULT ON A FORTIFIED POSITION AREA
F-17	DRY NET MOCK-UP	M-9	COMBAT VILLAGE AREA
D-29	50 FT. 22 RANGE	M-10	LIVE HAND GRENADE RANGE
D-30	50 FT. 22 RANGE	M-11	ASSAULT ON A FORTIFIED POSITION AREA
J-9	AMPHIBIOUS VEHICLE DRIVING COURSE	M-12	AIR DELIVERY DROP ZONE
		M-13	FIELD FORTIFICATION DISPLAY
		M-14	CAMOUFLAGE DISPLAY
		M-15	MINE FIELD DISPOSAL
		M-16	OUTDOOR CLASSROOM, 30 CAL. BLANKS AND PYROTECHNICS
		M-17	PRACTICE HAND AND RIFLE GRENADE RANGE
		M-18	COMBAT CONDITIONING COURSE
		N-1	IMPACT AREA

**LEGEND**  
 --- PROPERTY BOUNDARY LINE  
 --- EXISTING ROAD  
 --- EXISTING RAILROAD  
 --- SHORE



INDEX OF PROPOSED STRUCTURES				
NUMBER	LOCATION	DEPT.	USE	MARCORPS PROJ. NO.

PROJECT TITLES	
MARCORPS PROJ. NO.	TITLE

SYMBOL	DESCRIPTION	DATE	APPROVAL

**REVISIONS**

P.W. DRAWING NO.	DEPARTMENT OF THE NAVY BUREAU OF YARDS & DOCKS
<b>8927</b>	<b>MARINE CORPS BASE CAMP LEJEUNE, N.C.</b>
<b>MASTER SHORE STATION DEVELOPMENT PLAN</b>	
PART III - SECTION 2	
GENERAL DEVELOPMENT PLAN	
CONDITIONS AS OF 31 DEC. 1957	
TRAINING FACILITIES	

DESIGNED BY	
DRWN BY	
TR BY	
CHK BY	
SUPV BY	
IN CHARGE	

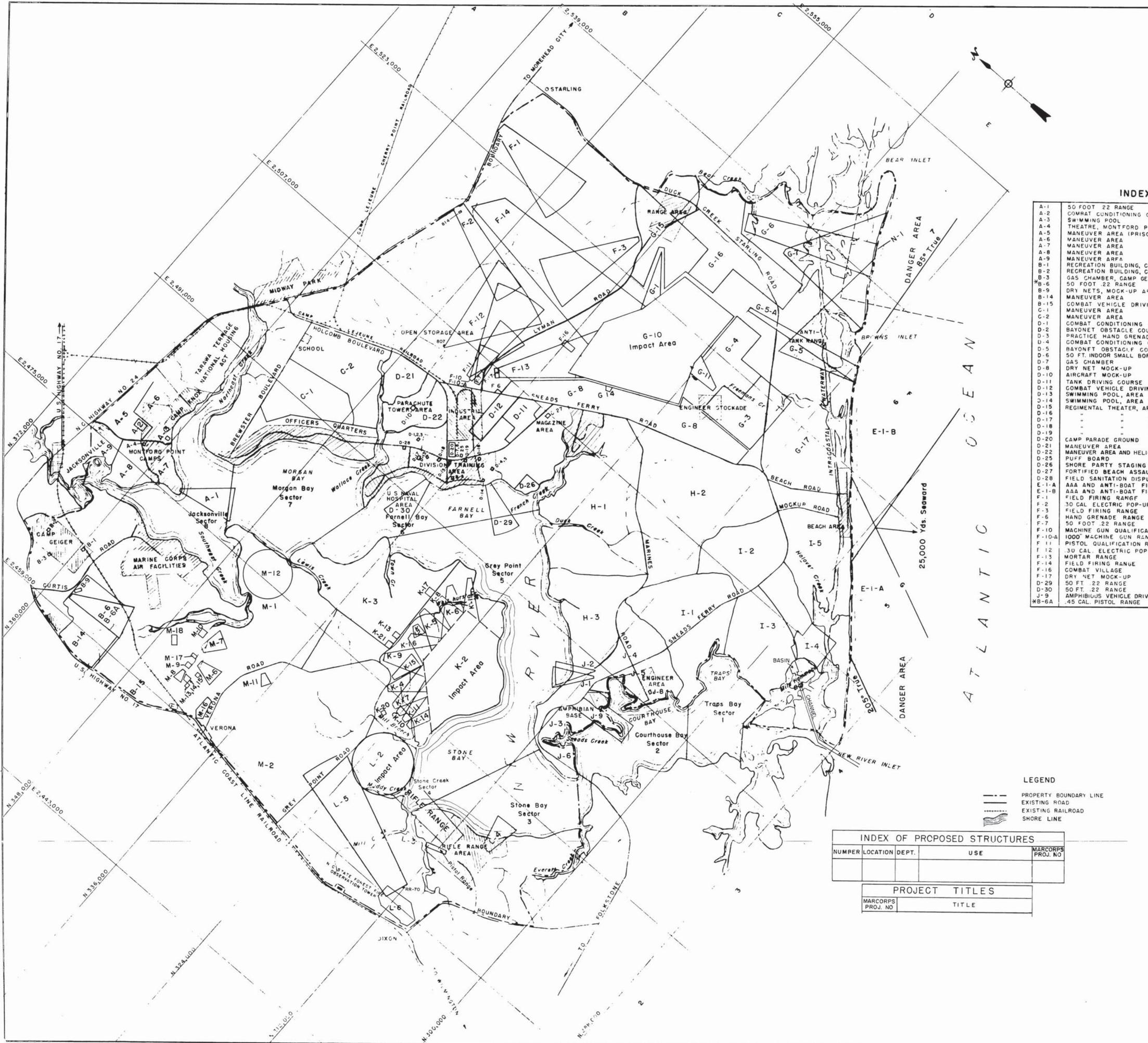
APPROVED	DATE	SCALE	GRAPHIC
	FEBRUARY 1958		
		SHEET	OF
		32	34

COMMANDING GENERAL  
 Y. & D. DWG. NO. **567027**

INDEX OF EXISTING STRUCTURES				
NUMBER	LOCATION	DEPT.	USE	FLOOR ELEV.
RR-70	E-2	MCB	RANGE HOUSE (RANGE L-5)	56.58
807	C-4	-	RANGE HOUSE (RANGE F-12)	38.77
814	B-5	-	RANGE HOUSE (RANGE F-2)	41.01

INDEX OF EXISTING TRAINING FACILITIES

A-1	50 FOOT 22 RANGE	G-1	COMBAT RANGE
A-2	COMBAT CONDITIONING COURSE	G-3	MANEUVER AREA
A-3	SWIMMING POOL	G-4	DEMOLITION ASSAULT AREA
A-4	THEATRE, MONTFORD POINT	G-5	MECHANIZED ANTI-TANK RANGE
A-5	MANEUVER AREA (PRISONER TRAINING)	G-5-A	TANK MANEUVER AREA
A-6	MANEUVER AREA	G-6	ARTILLERY RANGE
A-7	MANEUVER AREA	G-7	ARTILLERY RANGE
A-8	MANEUVER AREA	G-8	MANEUVER AREA
A-9	MANEUVER AREA	G-10	IMPACT AREA
B-1	RECREATION BUILDING, CAMP GEIGER	G-11	BATTLE INFILTRATION COURSE
B-2	RECREATION BUILDING, CAMP GEIGER	G-12	1000' TANK MG RANGE
B-3	GAS CHAMBER, CAMP GEIGER	G-14	MANEUVER AREA
B-4	50 FOOT 22 RANGE	G-15	MANEUVER AREA
B-5	DRY NETS, MOCK-UP AREA	G-16	MANEUVER AREA
B-6	MANEUVER AREA	G-17	MANEUVER AREA
B-7	COMBAT VEHICLE DRIVING COURSE	H-1	MANEUVER AREA
B-8	MANEUVER AREA	H-2	MANEUVER AREA
B-9	MANEUVER AREA	H-3	MANEUVER AREA
B-10	MANEUVER AREA	H-4	MANEUVER AREA
B-11	COMBAT CONDITIONING COURSE	H-5	MANEUVER AREA
B-12	BAYONET OBSTACLE COURSE	I-1	MANEUVER AREA
B-13	PRACTICE HAND GRENADE RANGE	I-2	MANEUVER AREA
B-14	COMBAT CONDITIONING COURSE	I-3	MANEUVER AREA
B-15	BAYONET OBSTACLE COURSE	I-4	AIR DELIVERY DROP ZONE
C-1	50 FT. INDOOR SMALL BORE RIFLE AND PISTOL RANGE	I-5	MANEUVER AREA
C-2	GAS CHAMBER	J-1	50 FOOT 22 RANGE
C-3	DRY NET MOCK-UP	J-2	50 FOOT 22 RANGE
C-4	AIRCRAFT MOCK-UP	J-3	MANEUVER AREA
C-5	TANK DRIVING COURSE	J-4	MANEUVER AREA
C-6	COMBAT VEHICLE DRIVING COURSE	J-5	MANEUVER AREA
C-7	SWIMMING POOL, AREA No. 2	J-6	MANEUVER AREA
C-8	SWIMMING POOL, AREA No. 5	J-8	THEATRE, COURTHOUSE BAY
C-9	REGIMENTAL THEATRE, AREA No. 3	K-1	IMPACT AREA
C-10	MANEUVER AREA	K-2	MANEUVER AREA
C-11	MANEUVER AREA	K-3	MANEUVER AREA
C-12	MANEUVER AREA	K-4	TRANSITION FIRING RANGE
C-13	MANEUVER AREA	K-5	COMBAT FIRING RANGE
C-14	MANEUVER AREA	K-6	TRANSITION RANGE
C-15	MANEUVER AREA	K-7	COMBAT FIRING RANGE
C-16	MANEUVER AREA	K-8	CLOSE COMBAT RANGE
C-17	MANEUVER AREA	K-9	COMBINED INFANTRY WEAPONS RANGE
C-18	MANEUVER AREA	K-10	PRACTICE HAND GRENADE RANGE
C-19	MANEUVER AREA	K-11	INFILTRATION RANGE
C-20	MANEUVER AREA	K-12	COMBAT CONDITIONING COURSE
C-21	MANEUVER AREA	K-13	ASSAULT BAYONET COURSE
C-22	MANEUVER AREA	K-14	CLOSE COMBAT COURSE
C-23	MANEUVER AREA	K-15	LANDSCAPE TARGET 1000' RANGE
C-24	MANEUVER AREA	K-16	DEMONSTRATION RANGE
C-25	MANEUVER AREA	K-17	PRACTICE HAND GRENADE RANGE
C-26	MANEUVER AREA	K-18	81 MIL. MORTAR RANGE
C-27	MANEUVER AREA	K-19	LIVE HAND GRENADE RANGE
C-28	MANEUVER AREA	K-20	FLAME THROWER RANGE
C-29	MANEUVER AREA	K-21	IMPACT AREA
C-30	MANEUVER AREA	L-1	1000' AND 50 FOOT RANGE
C-31	MANEUVER AREA	L-2	30 CAL. ELECTRIC POP-UP RANGE
C-32	MANEUVER AREA	L-3	30 CAL. ELECTRIC POP-UP RANGE
C-33	MANEUVER AREA	L-4	MINE WAREFARE AND DEMOLITION AREA
C-34	MANEUVER AREA	L-5	MANEUVER AREA
C-35	MANEUVER AREA	M-1	MANEUVER AREA
C-36	MANEUVER AREA	M-2	MANEUVER AREA
C-37	MANEUVER AREA	M-3	INFILTRATION COURSE
C-38	MANEUVER AREA	M-4	1000' MACHINE GUN RANGE
C-39	MANEUVER AREA	M-5	ASSAULT ON A FORTIFIED POSITION AREA
C-40	MANEUVER AREA	M-6	FIELD FORTIFICATION DISPLAY
C-41	MANEUVER AREA	M-7	CAMOUFLAGE DISPLAY
C-42	MANEUVER AREA	M-8	MINE FIELD DISPOSAL
C-43	MANEUVER AREA	M-9	OUTDOOR CLASSROOM, 30 CAL. BLANKS AND PYROTECHNICS
C-44	MANEUVER AREA	M-10	PRACTICE HAND AND RIFLE GRENADE RANGE
C-45	MANEUVER AREA	M-11	COMBAT CONDITIONING COURSE
C-46	MANEUVER AREA	M-12	IMPACT AREA
C-47	MANEUVER AREA	M-13	IMPACT AREA
C-48	MANEUVER AREA	M-14	IMPACT AREA
C-49	MANEUVER AREA	M-15	IMPACT AREA
C-50	MANEUVER AREA	M-16	IMPACT AREA
C-51	MANEUVER AREA	M-17	IMPACT AREA
C-52	MANEUVER AREA	M-18	IMPACT AREA
C-53	MANEUVER AREA	M-19	IMPACT AREA
C-54	MANEUVER AREA	M-20	IMPACT AREA
C-55	MANEUVER AREA	M-21	IMPACT AREA
C-56	MANEUVER AREA	M-22	IMPACT AREA
C-57	MANEUVER AREA	M-23	IMPACT AREA
C-58	MANEUVER AREA	M-24	IMPACT AREA
C-59	MANEUVER AREA	M-25	IMPACT AREA
C-60	MANEUVER AREA	M-26	IMPACT AREA
C-61	MANEUVER AREA	M-27	IMPACT AREA
C-62	MANEUVER AREA	M-28	IMPACT AREA
C-63	MANEUVER AREA	M-29	IMPACT AREA
C-64	MANEUVER AREA	M-30	IMPACT AREA
C-65	MANEUVER AREA	M-31	IMPACT AREA
C-66	MANEUVER AREA	M-32	IMPACT AREA
C-67	MANEUVER AREA	M-33	IMPACT AREA
C-68	MANEUVER AREA	M-34	IMPACT AREA
C-69	MANEUVER AREA	M-35	IMPACT AREA
C-70	MANEUVER AREA	M-36	IMPACT AREA
C-71	MANEUVER AREA	M-37	IMPACT AREA
C-72	MANEUVER AREA	M-38	IMPACT AREA
C-73	MANEUVER AREA	M-39	IMPACT AREA
C-74	MANEUVER AREA	M-40	IMPACT AREA
C-75	MANEUVER AREA	M-41	IMPACT AREA
C-76	MANEUVER AREA	M-42	IMPACT AREA
C-77	MANEUVER AREA	M-43	IMPACT AREA
C-78	MANEUVER AREA	M-44	IMPACT AREA
C-79	MANEUVER AREA	M-45	IMPACT AREA
C-80	MANEUVER AREA	M-46	IMPACT AREA
C-81	MANEUVER AREA	M-47	IMPACT AREA
C-82	MANEUVER AREA	M-48	IMPACT AREA
C-83	MANEUVER AREA	M-49	IMPACT AREA
C-84	MANEUVER AREA	M-50	IMPACT AREA
C-85	MANEUVER AREA	M-51	IMPACT AREA
C-86	MANEUVER AREA	M-52	IMPACT AREA
C-87	MANEUVER AREA	M-53	IMPACT AREA
C-88	MANEUVER AREA	M-54	IMPACT AREA
C-89	MANEUVER AREA	M-55	IMPACT AREA
C-90	MANEUVER AREA	M-56	IMPACT AREA
C-91	MANEUVER AREA	M-57	IMPACT AREA
C-92	MANEUVER AREA	M-58	IMPACT AREA
C-93	MANEUVER AREA	M-59	IMPACT AREA
C-94	MANEUVER AREA	M-60	IMPACT AREA
C-95	MANEUVER AREA	M-61	IMPACT AREA
C-96	MANEUVER AREA	M-62	IMPACT AREA
C-97	MANEUVER AREA	M-63	IMPACT AREA
C-98	MANEUVER AREA	M-64	IMPACT AREA
C-99	MANEUVER AREA	M-65	IMPACT AREA
C-100	MANEUVER AREA	M-66	IMPACT AREA



LEGEND

- PROPERTY BOUNDARY LINE
- EXISTING ROAD
- EXISTING RAILROAD
- SHORE LINE



INDEX OF PROPOSED STRUCTURES			
NUMBER	LOCATION	DEPT.	USE

PROJECT TITLES	
MARCORPS PROJ. NO.	TITLE

REVISIONS			
SYMBOL	DESCRIPTION	DATE	APPROVAL

P. W. DRAWING NO.	DEPARTMENT OF THE NAVY BUREAU OF YARDS & DOCKS
<b>8927</b>	<b>MARINE CORPS BASE CAMP LEJEUNE, N.C.</b>
DES <i>V. J. Taylor</i>	<b>MASTER SHORE STATION</b>
DRWN <i>V. J. Taylor</i>	<b>DEVELOPMENT PLAN</b>
TR <i>V. J. Taylor</i>	PART II - SECTION 2
CHK <i>V. J. Taylor</i>	GENERAL DEVELOPMENT PLAN
SUPV <i>V. J. Taylor</i>	CONDITIONS AS OF 31 DEC. 1952
	TRAINING FACILITIES
IN CHARGE <i>V. J. Taylor</i>	
APPROVED <i>V. J. Taylor</i>	DATE <b>1 FEBRUARY 1959</b>
	SCALE <b>GRAPHIC</b>
	SHEET <b>42 OF 44</b>
	Y. & D. DWG. NO. <b>567027</b>

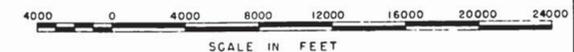
INDEX OF EXISTING STRUCTURES					
NUMBER	LOCATION	DEPT	USE	FLOOR	ELEV.
RR-70	E-2	MCB	RANGE HOUSE (RANGE L-5)	58	58
807	C-4	-	RANGE HOUSE (RANGE P-18)	58	77
B14	B-5	-	RANGE HOUSE (RANGE P-8)	41	01
820	D-2	-	RANGE HOUSE (RANGE K-7)	37	50

INDEX OF EXISTING TRAINING FACILITIES

A-1	50 FOOT .22 RANGE	G-1	COMBAT RANGE
A-2	COMBAT CONDITIONING COURSE	G-2	MANEUVER AREA
A-3	SWIMMING POOL	G-4	DEMOLITION ASSAULT AREA
A-4	THEATRE, MONTFORD POINT	G-5	MECHANIZED ANTI-TANK RANGE
A-5	MANEUVER AREA (PRISONER TRAINING)	G-5-A	TANK MANEUVER AREA
A-6	MANEUVER AREA	G-6	ARTILLERY RANGE
A-7	MANEUVER AREA	G-7	ARTILLERY RANGE
A-8	MANEUVER AREA	G-8	MANEUVER AREA
A-9	MANEUVER AREA	G-10	IMPACT AREA
B-1	RECREATION BUILDING, GEIGER AREA	G-11	BATTLE INFILTRATION COURSE
B-2	RECREATION BUILDING, GEIGER AREA	G-12	MANEUVER AREA
B-6	50 FOOT .22 RANGE	G-14	1000' TANK
B-6A	.45 CAL PISTOL RANGE	G-15	MANEUVER AREA
B-9	DRY NETS, MOCK-UP AREA	G-16	MANEUVER AREA
B-15	COMBAT VEHICLE DRIVING COURSE	G-17	MANEUVER AREA
C-1	MANEUVER AREA	G-18	MANEUVER AREA
C-2	MANEUVER AREA	G-19	MANEUVER AREA
D-1	COMBAT CONDITIONING COURSE	G-20	MANEUVER AREA
D-2	BAYONET OBSTACLE COURSE	I-1	MANEUVER AREA
D-3	PRACTICE HAND GRENADE RANGE	I-2	MANEUVER AREA
D-4	COMBAT CONDITIONING COURSE	I-3	MANEUVER AREA
D-5	BAYONET OBSTACLE COURSE	I-4	AIR DELIVERY DROP ZONE
D-6	50 FT INDOOR SMALL BORE RIFLE AND PISTOL RANGE	I-5	MANEUVER AREA
D-7	GAS CHAMBER	J-1	50 FOOT .22 RANGE
D-8	DRY NET MOCK-UP	J-2	50 FOOT .22 RANGE
D-10	AIRCRAFT MOCK-UP	J-3	MANEUVER AREA
D-11	TANK DRIVING COURSE	J-4	MANEUVER AREA
D-12	COMBAT VEHICLE DRIVING COURSE	J-5	MANEUVER AREA
D-13	SWIMMING POOL, AREA NO. 2	J-8	THEATRE, COURTHOUSE BAY
D-14	SWIMMING POOL, AREA NO. 5	K-2	IMPACT AREA
D-15	REGIMENTAL THEATRE, AREA NO. 3	K-3	MANEUVER AREA
D-16	-	K-4	TRANSITION FIRING RANGE
D-17	-	K-5	COMBAT FIRING RANGE
D-18	-	K-6	TRANSITION RANGE
D-19	-	K-7	COMBAT FIRING RANGE
D-20	CAMP PARADE GROUND	K-8	CLOSE COMBAT RANGE
D-21	MANEUVER AREA	K-9	COMBINED INFANTRY WEAPONS RANGE
D-22	MANEUVER AREA AND HELICOPTER LANDING ZONE (TRAINING)	K-10	PRACTICE HAND GRENADE RANGE
D-25	PUFF BOARD	K-11	INFILTRATION RANGE
D-26	SHORE PARTY STAGING AREA	K-12	COMBAT CONDITIONING COURSE
D-27	FORTIFIED BEACH ASSAULT AREA	K-13	ASSAULT BAYONET RANGE
D-28	FIELD SANITATION DISPLAY	K-14	CLOSE COMBAT COURSE
E-1-A	AAA AND ANTI-BOAT FIRING RANGE	K-15	LANDSCAPE TARGET 1000' RANGE
E-1-B	AAA AND ANTI-BOAT FIRING RANGE	K-16	DEMONSTRATION RANGE
F-1	FIELD FIRING RANGE	K-17	PRACTICE HAND GRENADE RANGE
F-2	30 CAL ELECTRIC POP-UP RANGE	K-19	81 MIL MORTAR RANGE
F-3	FIELD FIRING RANGE	K-20	LIVE HAND GRENADE RANGE
F-5	MACHINE GUN FIELD FIRING RANGE	K-21	FLAME THROWER RANGE
F-6	HAND GRENADE RANGE	L-2	IMPACT AREA
F-10	MACHINE GUN QUALIFICATION RANGE	L-4	1000' AND 50 FOOT RANGE
F-10-A	1000' MACHINE GUN RANGE	L-5	30 CAL ELECTRIC POP-UP RANGE
F-11	PISTOL QUALIFICATION RANGE	L-6	MANEUVER AREA AND DEMOLITION AREA
F-12	30 CAL ELECTRIC POP-UP RANGE	M-1	MANEUVER AREA
F-13	MORTAR RANGE	M-2	MANEUVER AREA
F-14	FIELD FIRING RANGE	M-6	INFILTRATION COURSE
F-17	DRY NET MOCK-UP	M-7	1000' MACHINE GUN RANGE
D-29	50 FT .22 RANGE	M-8	ASSAULT ON A FORTIFIED POSITION AREA
D-30	50 FT .22 RANGE	M-10	LIVE HAND GRENADE RANGE
J-9	AMPHIBIOUS VEHICLE DRIVING COURSE	M-11	ASSAULT ON A FORTIFIED POSITION AREA
		M-12	AIR DELIVERY DROP ZONE
		M-13	FIELD FORTIFICATION DISPLAY
		M-14	CAMOUFLAGE DISPLAY
		M-15	MINE FIELD DISPOSAL
		M-16	OUTDOOR CLASSROOM, 30 CAL. BLANKS AND PYROTECHNICS
		M-17	PRACTICE HAND AND RIFLE GRENADE RANGE
		M-18	COMBAT CONDITIONING COURSE
		N-1	IMPACT AREA

LEGEND

---	PROPERTY BOUNDARY LINE
---	EXISTING ROAD
---	EXISTING RAILROAD
---	SHORE LINE
MCB	MARINE CORPS BASE



SYMBOL	DESCRIPTION	DATE	APPROVAL
REVISIONS			
P. W. DRAWING NO.	DEPARTMENT OF THE NAVY BUREAU OF YARDS & DOCKS		
8927	MARINE CORPS BASE CAMP LEJEUNE, N.C.		
DES <i>V. T. Taya</i>	<b>MASTER SHORE STATION DEVELOPMENT PLAN</b>		
DRWN <i>V. T. Taya</i>	PART II - SECTION 2		
TR <i>V. T. Taya</i>	GENERAL DEVELOPMENT PLAN		
CHK <i>V. T. Taya</i>	CONDITIONS AS OF 31 DEC. 1959		
SUPV <i>V. T. Taya</i>	TRAINING FACILITIES		
IN CHARGE <i>V. T. Taya</i>			
APPROVED	1 FEBRUARY 1960	SCALE	GRAPHIC
<i>Robert F. Lucas</i>	DATE	SHEET	42 OF 44
FOR COMMANDING GENERAL		Y. & D. DWG. NO.	567027

FOR OFFICIAL USE ONLY

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INDEX OF EXISTING TRAINING FACILITIES

NUMBER	LOC.	DEPT.	CAT. CODE	USE	NUMBER	LOC.	DEPT.	CAT. CODE	USE
A-1	3-B	BG-3	179	RANGE, SOFT. SMALL BORE	K-206	2-D	BG-3	179	RANGE, RIFLE GRENADE
B-012	2-B	"	"	" SOFT SMALL BORE	K-211	3-D	"	"	" M. G. FIELD FIRING
D-9	4-C	"	"	" SKEET	K-212	3-D	"	"	" TRANSITION & NIGHT DEFENSIVE FIRING
D-11A	4-D	"	"	" FLAME TANK	K-301	3-D	"	"	" 35 ROCKY FIELD FIRING
D-27	4-D	"	"	" FORTIFIED BEACH ASSAULT	K-303	3-D	"	"	" 75 METER SMALL ARMS
D-29	4-C	"	"	" 50 FT. SMALL ARMS	K-305	3-D	"	"	" BN. WEAPONS DEMONSTRATION
D-30	4-D	"	"	" 50 FT. SMALL ARMS	K-306	3-D	"	"	" RIFLE GRENADE
F-1	6-B	"	"	" INFANTRY WEAPONS	K-309	3-D	"	"	" FIRE AND MOVEMENT
F-2	5-B	"	"	" SQUAD DEFENSE FIRING	K-311	3-D	"	"	" 81 MM MORTAR FIELD FIRING
F-3	6-C	"	"	" FIELD FIRING	K-314	3-D	"	"	" DEMOLITION
F-4	5-B	"	"	" SQUAD INDEPENDENT ACTION	K-315	3-D	"	"	" COMBAT FIELD FIRING
F-5	5-B	"	"	" M. G. TRAINING	X-317	3-D	"	"	" CLOSE COMBAT
F-6	4-C	"	"	" HAND GRENADE	K-319	3-D	"	"	" ASSAULT FIRING
F-7	4-C	"	"	" FLAMETHROWER	K-321	3-D	"	"	" TRANSITION
F-10	4-C	"	"	" 500", 1000" MACHINE GUN, 75 METER (BATTLE SITE) UNDER CONSTR.	K-325	3-D	"	"	" 300 YD. KNOWN DISTANCE
F-11	4-C	"	"	" PISTOL QUALIFICATION	K-327	3-D	"	"	" ASSAULT ON FORTIFIED POSITION
F-12	4-C	"	"	" SQUAD ASSAULT	K-401	2-D	"	"	" HAND GRENADE
G-4	6-E	"	"	" ASSAULT DEMOLITION	K-402	2-D	"	"	" FIRE AND MOVEMENT
G-5	6-E	"	"	" MECHANIZED ANTI-TANK	K-406	2-E	"	"	" INFILTRATION & NIGHT DEFENSIVE FIRING
G-7	6-D	"	"	" FIELD FIRING	K-408	2-E	"	"	" CLOSE COMBAT
G-11	5-E	"	"	" INFILTRATION	L-3	2-F	"	"	" PISTOL
I-1	4-F	"	"	" SMALL BORE	L-4	2-F	"	"	" 50 FT. SMALL ARMS
I-2	4-F	"	"	" DEMOLITION	L-5	2-E	"	"	" SQUAD OFFENSE
J-2	5-E	"	"	" 50 FT. SMALL BORE	L-6	2-E	"	"	" SMALL ARMS
S-K-4-A	3-D	BG-3	890	OBSERVATION TOWER	L-7	2-E	"	"	" SMALL ARMS
S-K-5-A	3-D	"	"	"	L-8	2-E	"	"	" SMALL ARMS
S-K-6-A	3-D	"	"	"	M-104	2-C	"	"	" ASSAULT ON FORTIFIED POSITION
S-K-7-A	3-D	"	"	"	M-109	2-C	"	"	" INFILTRATION
S-K-11-A	2-E	"	"	"	M-110	2-C	"	"	" DEMOLITION AND BOOBY TRAPS
S-K-25-A	3-D	"	"	"	M-112	2-C	"	"	" COMBAT VILLAGE
S-M-6-A	2-C	"	"	"	M-113	2-C	"	"	" 75 METER FIRING
					M-115	2-C	"	"	" HAND GRENADE
					M-122	2-C	"	"	" RANGE FLAMETHROWER

LEGEND  
 --- PROPERTY BOUNDARY LINE  
 --- EXISTING ROAD  
 --- EXISTING RAILROAD  
 --- SHORE LINE  
 BG-3 BASE ASSISTANT CHIEF OF STAFF G-3

INDEX OF PLANNED STRUCTURES

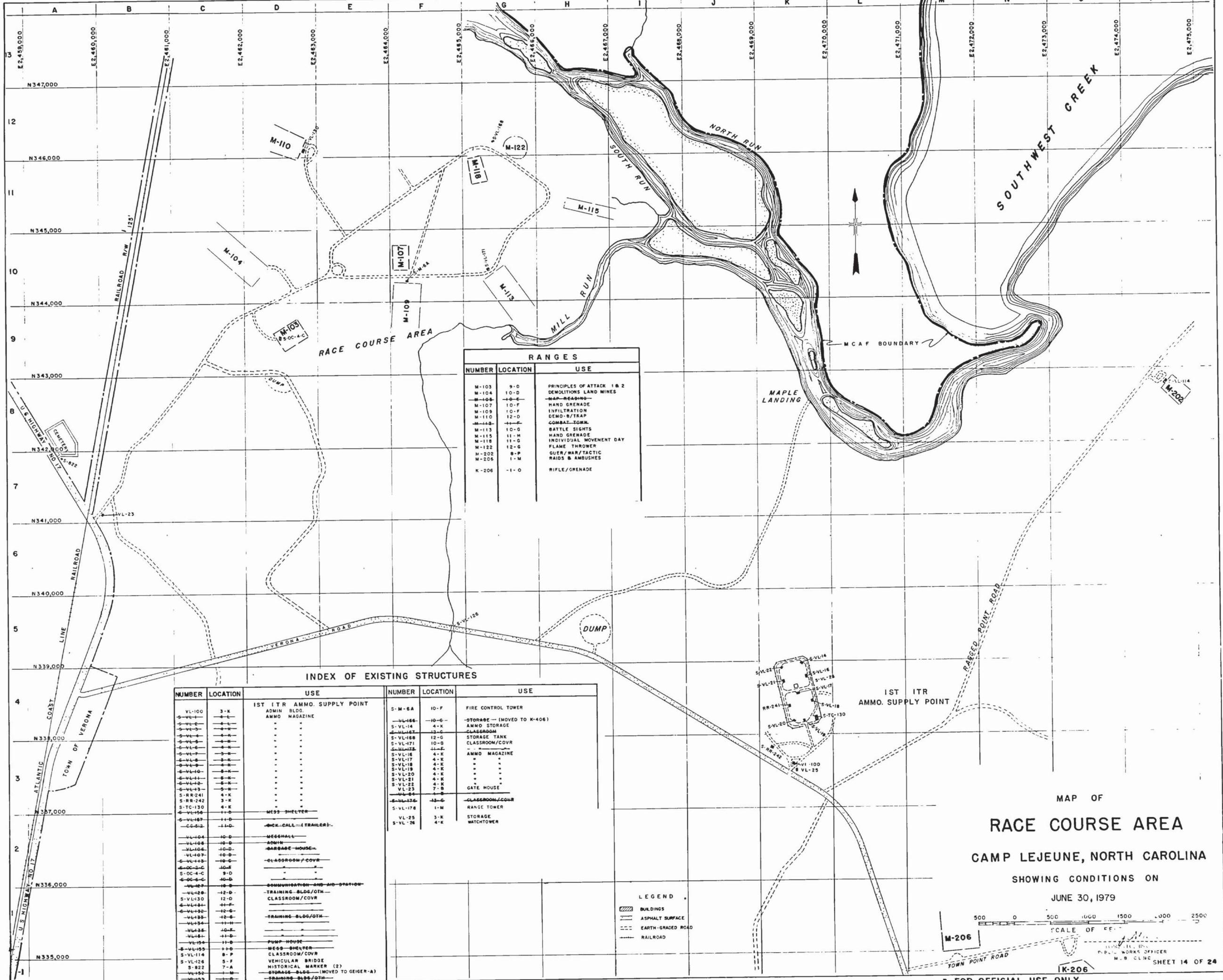
CAT. CODE	NUMBER	LOC.	DEPT.	USE	SIZE OR CAPACITY	MARCORPS PROJ. NO.
179	PR-1	5-C	BG-3	TRANSITION FIRING RANGE F-15	75 Targets	
179	PR-2	4-C	BG-3	COMBAT TOWN	28 Bldgs.	
179	PR-3	6-E	BG-3	RAILROAD	6,000 LF	
179	PR-4	6-D	BG-3	GARAGE	2,400 SF	
179	PR-5	6-D	BG-3	TOWER	25' High	

PROJECT TITLES

MARCORPS PROJ. NO.	TITLE
	TRANSITION FIRING RANGE F-15
	COMBAT TOWN
	RECOILLESS RIFLE RANGE G-7



SYMBOL	DESCRIPTION	DATE	APPROVAL
REVISIONS			
P. W. DRAWING NO.	DEPARTMENT OF THE NAVY BUREAU OF YARDS & DOCKS		
8927	MARINE CORPS BASE CAMP LEJEUNE, N.C.		
DES	<b>MASTER SHORE STATION DEVELOPMENT PLAN</b> PART II - SECTION 2 GENERAL DEVELOPMENT PLAN CONDITIONS AS OF 31 DEC. 1960 TRAINING FACILITIES		
DRWN			
TR			
CHK			
SUPV			
IN CHARGE <i>[Signature]</i>		APPROVED	5 MAY 1961
		DATE	SCALE GRAPHIC
		<i>[Signature]</i>	SHEET 42 OF 44
		COMMANDING GENERAL	Y. & D. DWG. NO. 567027



RANGES		
NUMBER	LOCATION	USE
M-103	9-D	PRINCIPLES OF ATTACK 1 & 2
M-104	10-D	DEMOLITIONS LAND MINES
M-106	10-E	MAP-READING
M-107	10-F	HAND GRENADE
M-109	10-F	INFILTRATION
M-110	12-D	DEMO-B/TRAP
M-113	10-D	COMBAT ZONE
M-115	11-G	BATTLE SIGHTS
M-118	11-G	HAND GRENADE
M-122	12-G	INDIVIDUAL MOVEMENT DAY
M-202	8-P	FLAME THROWER
M-206	1-M	GUER/WAR/TACTIC RAIDS & AMBUSHES
K-206	1-O	RIFLE/GRENADE

INDEX OF EXISTING STRUCTURES					
NUMBER	LOCATION	USE	NUMBER	LOCATION	USE
VL-100	3-K	IST ITR AMMO SUPPLY POINT	S-M-6A	10-F	FIRE CONTROL TOWER
VL-101	4-L	ADMIN BLDG	S-VL-166	10-G	STORAGE (MOVED TO K-406)
VL-102	4-L	AMMO MAGAZINE	S-VL-174	4-K	AMMO STORAGE
VL-103	4-K	"	S-VL-175	12-C	CLASSROOM
VL-104	4-K	"	S-VL-168	12-G	STORAGE TANK
VL-105	4-K	"	S-VL-171	10-D	CLASSROOM/COVR
VL-106	4-K	"	S-VL-172	11-E	CLASSROOM/COVR
VL-107	4-K	"	S-VL-173	4-K	AMMO MAGAZINE
VL-108	4-K	"	S-VL-176	4-K	"
VL-109	4-K	"	S-VL-177	4-K	"
VL-110	4-K	"	S-VL-178	4-K	"
VL-111	4-K	"	S-VL-179	4-K	"
VL-112	4-K	"	S-VL-180	4-K	"
VL-113	4-K	"	S-VL-181	4-K	"
VL-114	4-K	"	S-VL-182	4-K	"
VL-115	4-K	"	S-VL-183	4-K	"
VL-116	4-K	"	S-VL-184	4-K	"
VL-117	4-K	"	S-VL-185	4-K	"
VL-118	4-K	"	S-VL-186	4-K	"
VL-119	4-K	"	S-VL-187	4-K	"
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VL-133	4-K	"	S-VL-201	4-K	"
VL-134	4-K	"	S-VL-202	4-K	"
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VL-187	4-K	"	S-VL-255	4-K	"
VL-188	4-K	"	S-VL-256	4-K	"
VL-189	4-K	"	S-VL-257	4-K	"
VL-190	4-K	"	S-VL-258	4-K	"
VL-191	4-K	"	S-VL-259	4-K	"
VL-192	4-K	"	S-VL-260	4-K	"
VL-193	4-K	"	S-VL-261	4-K	"
VL-194	4-K	"	S-VL-262	4-K	"
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**Appendix B**  
**Site Health and Safety Plan**

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# **Camp Devil Dog Munitions Response**

Prepared for  
**Department of the Navy, Naval Facilities Engineering Command,  
Atlantic Division - Norfolk, Virginia**

September 2010



Charlotte Office  
11301 Carmel Commons Blvd  
Suite 304  
Charlotte, NC 28226

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## **ATTACHMENTS**

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Attachment 2	Chemical Inventory/Register Form
Attachment 3	Chemical-Specific Training Form
Attachment 4	Project Activity Self-Assessment Checklists/Forms/Permits
Attachment 5	Behavior Based Loss Prevention Forms
Attachment 6	Material Safety Data Sheets/Fact Sheets
Attachment 7	Working Alone Standard
Attachment 8	Tick Fact Sheet
Attachment 9	Observed Hazard Form
Attachment 10	Stop Work Order Form

# Approval

---

This site-specific Health and Safety Plan (HSP) has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions and identified scope(s) of work and must be amended if those conditions or scope(s) of work change.

By approving this HSP, the Responsible Health and Safety Manager (RHSM) certifies that the personal protective equipment has been selected based on the project-specific hazard assessment.

## Original Plan

**RHSM Approval:** Carl Woods

**Date:** September 23, 2010

---

**Field Operations Manager Approval:**

**Date:**

---

## Revisions

**Revisions Made By:**

**Date:**

---

**Description of Revisions to Plan:**

---

**Revisions Approved By:**

**Date:**

---

# 1.0 Introduction

**CH2MHILL**

**HSSE**  
**TargetZero**  
World-Class Performance



## Health, Safety, Security, and Environment Policy

Protection of people and the environment is a CH2M HILL core value. It is our vision to create a culture within CH2M HILL that empowers employees to drive this value into all global operations and achieve excellence in health, safety, security, and environment (HSSE) performance. CH2M HILL deploys an integrated, enterprise-wide behavior-based HSSE management system to fulfill our mission and the expectations of our clients, staff, and communities based on the following principles:

- We require all management and supervisory personnel to provide the leadership and resources to inspire and empower our employees to take responsibility for their actions and for the actions of their fellow employees to create a safe, healthy, secure, and environmentally-responsible workplace.
- We provide value to clients by tailoring HSSE processes to customer needs and requiring all CH2M HILL employees and subcontractors to deliver projects with agility, personal service, and responsiveness and in compliance with HSSE requirements and company standards to achieve health, safety, security, and pollution prevention excellence. Our performance will aspire to influence others and continually redefine world-class HSSE excellence.
- We systematically evaluate our design engineering and physical work environment to verify safe and secure work conditions and practices are established, consistently followed, and timely corrected.
- We continually assess and improve our HSSE program to achieve and maintain world-class performance by setting and reviewing objectives and targets, reporting performance metrics, and routinely reviewing our progress.
- We care about the safety and security of every CH2M HILL employee and expect all employees to embrace our culture, share our core value for the protection of people and the environment, understand their obligations, actively participate, take responsibility, and "walk the talk" on and off the job.

The undersigned pledge our leadership, commitment, and accountability for making this policy a reality at CH2M HILL.

Dated the 1<sup>st</sup> day of October 2009.

Lee A. McIntire  
Chief Executive Officer

Garry Higdem  
President, Energy Division

Jacqueline Rast  
President, Major Programs Group

Robert C. Allen  
Chief Human Resources Officer

Mark Lasswell  
President, Transportation Business Group

Catherine Santee  
Chief Financial Officer

Bob Card  
President, Facilities & Infrastructure Division

Margaret McLean  
Chief Legal Officer

Thomas G. Searle  
President, International Division

Bill Dehn  
Senior Vice President, Special Projects

Michael E. McKelvy  
President, Government, Environment,  
and Nuclear Division

Nancy R. Tuor  
Vice-Chair, International

Keith Christopher  
Senior Vice President, Health, Safety,  
Security, and Environment

## 1.1 CH2M HILL Policy and Commitment

### 1.1.1 Safe Work Policy

It is the policy of CH2M HILL to perform work in the safest manner possible. Safety must never be compromised. To fulfill the requirements of this policy, an organized and effective safety program must be carried out at each location where work is performed.

CH2M HILL believes that all injuries are preventable, and we are dedicated to the goal of a safe work environment. To achieve this goal, every employee on the project must assume responsibility for safety.

Every employee is empowered to:

- Conduct their work in a safe manner;
- Stop work immediately to correct any unsafe condition that is encountered; and
- Take corrective actions so that work may proceed in a safe manner.

Safety, occupational health, and environmental protection will not be sacrificed for production. These elements are integrated into quality control, cost reduction, and job performance, and are crucial to our success.

### 1.1.2 Health and Safety Commitment

CH2M HILL has embraced a philosophy for health and safety excellence. The primary driving force behind this commitment to health and safety is simple: employees are CH2M HILL's most significant asset and CH2M HILL management values their safety, health, and welfare. Also, top management believes that all injuries are preventable. CH2M HILL's safety culture empowers employees at all levels to accept ownership for safety and take whatever actions are necessary to eliminate injury. Our company is committed to world-class performance in health and safety and also understands that world-class performance in health and safety is a critical element in overall business success.

CH2M HILL is committed to the prevention of personal injuries, occupational illnesses, and damage to equipment and property in all of its operations; to the protection of the general public whenever it comes in contact with the Company's work; and to the prevention of pollution and environmental degradation.

Company management, field supervisors, and employees plan safety into each work task in order to prevent occupational injuries and illnesses. The ultimate success of CH2M HILL's safety program depends on the full cooperation and participation of each employee.

CH2M HILL management extends its full commitment to health and safety excellence.

### 1.1.3 Project-Specific Health, Safety, and the Environment Goals

All management and employees are to strive to meet the project-specific Health, Safety, and the Environment (HSE) goals outlined below. The team will be successful only if everyone makes a concerted effort to accomplish these goals. The goals allow the project to stay focused on optimizing the health and safety of all project personnel and, therefore, making the project a great success.

The Project has established eleven specific goals and objectives:

- Create an injury-free environment;
- Have zero injuries or incidents;
- Provide management leadership for HSE by communicating performance expectations, reviewing and tracking performance, and leading by example;

- Ensure effective implementation of the HSP through education, delegation, and team work;
- Ensure 100 percent participation in HSE compliance;
- Continuously improve our safety performance;
- Maintain free and open lines of communication;
- Make a personal commitment to safety as a value;
- Focus safety improvements on high-risk groups;
- Continue strong employee involvement initiatives; and
- Achieve health and safety excellence.

## 2.0 Applicability

This HSP applies to:

- All CH2M HILL staff, including subcontractors and tiered subcontractors of CH2M HILL working on the site; and
- All visitors to the construction site in the custody of CH2M HILL (including visitors from the Client, the Government, the public, and other staff of any CH2M HILL company).

This HSP does not apply to the third-party contractors, their workers, their subcontractors, their visitors, or any other persons not under the direct control or custody of CH2M HILL.

This HSP defines the procedures and requirements for the health and safety of CH2M HILL staff and visitors when they are physically on the work site. The work site includes the project area (as defined by the contract documents) and the project offices, trailers, and facilities thereon.

This HSP will be kept onsite during field activities and will be reviewed as necessary. The HSP will be amended or revised as project activities or conditions change or when supplemental information becomes available. The HSP adopts, by reference, the Enterprise-wide Core Standards and Standard Operating Procedures (SOPs), as appropriate. In addition, the HSP may adopt procedures from the project Work Plan and any governing regulations. If there is a contradiction between this HSP and any governing regulation, the more stringent and protective requirement shall apply.

All CH2M HILL staff and subcontractors must sign the employee sign-off form included in this document as Attachment 1 to acknowledge review of this document. Copies of the signature page will be maintained onsite by the Safety Coordinator (SC).

## 3.0 General Project Information

### 3.1 Project Information and Background

**PROJECT NO:** 405181

**CLIENT:** Department of the Navy, Naval Facilities Engineering Command, Atlantic Division  
Norfolk, Virginia

**PROJECT/SITE NAME:** Camp Devil Dog Munitions Response

**SITE ADDRESS:** Located along Perimeter Road just south of MCAS New River.

**CH2M HILL PROJECT MANAGER:** Keri Hallberg

**CH2M HILL OFFICE:** CLT

**DATE HEALTH AND SAFETY PLAN PREPARED:** December 16, 2008

**DATE(S) OF SITE WORK:** September 2010 through December 2011

### 3.2 Site Background and Setting

Camp Devil Dog presently is the center of the Marine Combat Training at the School of Infantry (SOI EAST). Facilities include billeting, training classrooms, messing and is the main base camp for training that takes place in the surrounding training areas. About 21,000 to 25,000 Marines per year spend about 21 days straight days in the training cycle prior to prior to commencing their marine specialized training (Richardson, 2008b). No live fire takes place, but large amounts of blank ammunition are used (Richardson, 2008b). Classes including Land Navigation, First Aid, Defense Combat, Offensive Combat, Night Training and a host of other activities take place at Camp Devil Dog.

See Site Map for work area.

### 3.3 Description of Tasks

Refer to project documents (i.e., Work Plan) for detailed task information. Tasks other than those listed below require an approved amendment or revision to this plan before tasks begin. Refer to the "Site Control" section of this HSP for procedures related to "clean" tasks that do not involve hazardous waste operations and emergency response (HAZWOPER).

The following objectives will be accomplished during the focused Preliminary Assessment/Site Inspection (PA/SI) activities:

1. Identify historical activities at the Camp Devil Dog Construction Area (CDCA) that may have resulted in environmental contamination with munitions and explosives of concern (MEC) and/or munitions constituents (MC) by researching archival records and interviewing current and former installation personnel.
2. Evaluate the presence and nature of MC contamination that may exist at the Camp Devil Dog Munitions Response Area (MRA) by conducting an investigation of soil and groundwater.
3. Conduct ecological and human health risk screenings using analytical data collected at the Camp Devil Dog MRA.
4. Conduct digital geophysical mapping (DGM) and perform a MEC intrusive investigation of geophysical anomalies that may represent subsurface MEC. Based on the results of the MEC intrusive investigation, additional MEC activities may be required, including removal actions and/or construction support.

### 3.3.1 Hazwoper-Regulated Tasks

- Well installation
- Groundwater monitoring
- DPT boring
- Groundwater monitoring
- Underground Utility Locating
- Surface water sampling
- Sediment sampling
- Surface soil sampling
- MEC Intrusive Investigation

### 3.3.2 Non-Hazwoper-Regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hazwoper-trained personnel. **Contact the Responsible Health and Safety Manager prior to using non-Hazwoper-trained personnel for the following tasks when working on a regulated hazardous waste site.**

#### **TASKS**

- Surveying (Surface)
- 
- 
- 
- 
- 

#### **CONTROLS**

- Brief on hazards, limits of access, and emergency procedures.
- Post areas of contamination as appropriate.
- Perform air sampling/monitoring as specified in this HSP.

## Site Map

**This page is reserved for a Site Map.**

**Note locations of Support, Decontamination, and Exclusion Zones; site telephone; first aid station; evacuation routes; and assembly areas.**

## 4.0 Project Organization and Responsibilities

### 4.1 Client

Contact Name: Bryan Beck, Navy Technical Representative

Phone: (757) 322-4734

Facility Contact Name: Bob Lowder

Phone: (910) 451-9607

### 4.2 CH2M HILL

#### 4.2.1 Project Manager

Project Manager Name: Keri Hallberg

Job Title: Project Manager

CH2M HILL Office: Charlotte

Telephone Number: (704) 543-3260

Cellular Number: (704) 975-9381

The project manager (PM) is responsible for providing adequate resources (budget and staff) for project-specific implementation of the HSE management process. The PM has overall management responsibility for the tasks listed below. The PM may explicitly delegate specific tasks to other staff, as described in sections that follow, but retains ultimate responsibility for completion of the following in accordance with this document:

- Incorporate standard terms and conditions, and contract-specific HSE roles and responsibilities in contract and subcontract agreements (including flow-down requirements to lower-tier subcontractors).
- Select safe and competent subcontractors by:
  - Choosing potential subcontractors based on technical ability and HSE performance;
  - Implementing the subcontractor prequalification process;
  - Ensuring that acceptable certificates of insurance, including CH2M HILL as named additional insured, are secured as a condition of subcontract award; and
  - Ensuring HSE submittals, subcontract agreements, and appropriate site-specific safety procedures are in place and accepted prior field mobilization.
- Ensure copies of training and medical monitoring records, and site-specific safety procedures are being maintained in the project file accessible to site personnel.
- Provide oversight of subcontractor HSE practices per the site-specific safety plans and/or procedures.
- Manage the site and interfacing with 3<sup>rd</sup> parties in a manner consistent with the contract and subcontract agreements and the applicable standard of reasonable care.
- Ensure that the overall, job-specific, HSE goals are fully and continuously implemented.
- Support and implement use of stop-work orders when subcontractor safety performance is not adequate.

#### 4.2.2 CH2M HILL Responsible Health and Safety Manager

RHSM Name: Carl Woods

Job Title: Health and Safety Manager

CH2M HILL Office: Cincinnati

Telephone Number: (513) 889-5771

Cellular Number: (513) 319-5771

The RHSM is responsible for the following:

- Review and evaluate subcontractor HSE performance using the pre-qualification process;
- Approve HSP and its revisions as well as Activity Hazard Analyses (AHA);
- Review and evaluate subcontractor site-specific safety procedures for adequacy prior to start of subcontractor's field operations;
- Support the oversight (or SC's direct oversight) of subcontractor and tiered subcontractor HSE practices;
- Permit upgrades/downgrades in respiratory protection after reviewing analytical data;
- Conduct audits as determined by project schedule and coordination with PM; and
- Participate in incident investigations, lessons learned, loss/near loss reporting.

#### 4.2.3 CH2M HILL Safety Coordinator

SC Name:

Job Title:

CH2M HILL Office:

Telephone Number:

Cellular Number:

The SC is responsible for verifying that the project is conducted in a safe manner including the following specific obligations:

- Verify this HSP is current and amended when project activities or conditions change;
- Verify CH2M HILL site personnel and subcontractor personnel read the HSP and sign the Employee Sign-Off Form, prior to commencing field activities;
- Verify CH2M HILL site personnel have completed any required specialty training (for example, fall protection, confined space entry, among others) and medical surveillance as identified in this HSP;
- Verify that project files available to site personnel include copies of executed subcontracts and subcontractor certificates of insurance (including CH2M HILL as named additional insured), bond, contractor's license, training and medical monitoring records, and accepted site-specific safety procedures prior to start of subcontractor's field operations;
- Act as the project "Hazard Communication Coordinator" and perform the responsibilities outlined in the HSP;
- Act as the project "Emergency Response Coordinator" and perform the responsibilities outlined in the HSP;
- Post the Occupational Safety and Health Administration (OSHA) job-site poster; the poster is required at sites where project field offices, trailers, or equipment-storage boxes are established;
- Hold and/or verify that safety meetings are conducted and documented in the project file initially and as needed throughout the course of the project (as tasks or hazards change);

- Verify that project health and safety forms and permits are being used as outlined this HSP;
- Perform oversight and assessments of subcontractor HSE practices per the site-specific safety plan and verify that project activity self-assessment checklists are being used as outlined this HSP;
- Coordinate with the RHSM regarding CH2M HILL and subcontractor operational performance, and 3<sup>rd</sup> party interfaces;
- Verify appropriate personal protective equipment (PPE) use, availability, and training;
- Ensure that the overall, job-specific, HSE goals are fully and continuously implemented;
- Conduct accident investigations including root cause analysis;
- Calibrate and conduct air monitoring in accordance with the HSP; maintain all air monitoring records in project file;
- Maintain HSE records and documentation;
- Facilitate OSHA or other government agency inspections including accompanying inspector and providing all necessary documentation and follow-up;
- Deliver field HSE training as needed based on project-specific hazards and activities;
- Contact the RHSM and PM in the event of an incident;
- When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors, notify subcontractor safety representative, stop affected work until adequate corrective measures are implemented, and notify the PM and RHSM as appropriate; and
- Document all oral health and safety-related communications in project field logbook, daily reports, or other records.

### 4.3 CH2M HILL Subcontractors

(Reference CH2M HILL SOP HSE-215, *Contracts and Subcontracts*)

Subcontractor:

Subcontractor Contact Name:

Telephone:

Subcontractor:

Subcontractor Contact Name:

Telephone:

Subcontractors must comply with the following activities, and are responsible to:

- Comply with all local, state, and federal safety standards;
- Comply with project and owner safety requirements;
- Actively participate in the project safety program and either hold or attend and participate in all required safety meetings;
- Provide a qualified safety representative to interface with CH2M HILL;
- Maintain safety equipment and PPE for their employees;
- Maintain and replace safety protection systems damaged or removed by the subcontractor's operations;
- Notify the SC of any accident, injury, or incident immediately and submit reports to CH2M HILL within 24 hours;

- Install contractually required general conditions for safety (for example, handrail, fencing, fall protection systems, floor opening covers);
- Conduct and document weekly safety inspections of project-specific tasks and associated work areas;
- Conduct site-specific and job-specific training for all subcontractor employees, including review of the CH2M HILL HSP, subcontractor HSPs, and subcontractor AHAs and sign appropriate sign-off forms; and
- Determine and implement necessary controls and corrective actions to correct unsafe conditions.

The subcontractors listed above may be required to submit their own site-specific HSP and other plans such as lead or asbestos abatement compliance plans. Subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit their plans to CH2M HILL for review and acceptance before the start of field work.

Subcontractors are also required to prepare AHAs before beginning each activity posing hazards to their personnel. The AHA shall identify the principle steps of the activity, potential health and safety hazards for each step and recommended control measures for each identified hazard. In addition, a listing of the equipment to be used to perform the activity, inspection requirements, and training requirements for the safe operation of the equipment listed must be identified.

## 4.4 Employee Responsibilities

All personnel are assigned responsibility for safe and healthy operations. This concept is the foundation for involving all employees in identifying hazards and providing solutions. For any operation, individuals have full authority to stop work and initiate immediate corrective action or control. In addition, each worker has a right and responsibility to report unsafe conditions or practices. This right represents a significant facet of worker empowerment and program ownership. Through shared values and a belief that all accidents are preventable, our employees accept personal responsibility for working safely.

Each employee is responsible for the following performance objectives:

- Perform work in a safe manner and produce quality results;
- Perform work in accordance with company policies, and report injuries, illnesses, and unsafe conditions;
- Complete work without injury, illness, or property damage;
- Report all incidents immediately to supervisor, and file proper forms with a human resources representative;
- Report all hazardous conditions and/or hazardous activities immediately to supervisor for corrective action; and
- Complete an HSE orientation prior to being authorized to enter the project work areas.

### 4.4.1 Employee Authority

Each employee on the project has the obligation and authority to shut down any perceived unsafe work and during employee orientation, each employee will be informed of their authority to do so.

## 4.5 Client Contractors

(Reference CH2M HILL SOP HSE-215, *Contracts, Subcontracts and HSE Management Practices*)

Contractor:

Contact Name:

Telephone:

Contractor Task(s):

Contractor:

Contact Name:

Telephone:

Contractor Task(s):

This HSP does not cover contractors that are contracted directly to the client or the owner. CH2M HILL is not responsible for the health and safety or means and methods of the contractor's work, and we must never assume such responsibility through our actions (such as advising on health and safety issues). In addition to these instructions, CH2M HILL team members should review contractor safety plans so that we remain aware of appropriate precautions that apply to us. Self-assessment checklists are to be used by the SC and CH2M HILL team members to review the contractor's performance only as it pertains to evaluating CH2M HILL exposure and safety. The RHSM is the only person who is authorized to comment on or approve contractor safety procedures.

Health and safety-related communications with contractors should be conducted as follows:

- Request the contractor to brief CH2M HILL team members on the precautions related to the contractor's work;
- When an apparent contractor non-compliance or unsafe condition or practice poses a risk to CH2M HILL team members:
  - Notify the contractor safety representative;
  - Request that the contractor determine and implement corrective actions;
  - If necessary, stop affected CH2M HILL work until contractor corrects the condition or practice; and
  - Notify the client, PM, and RHSM as appropriate.

If apparent contractor non-compliance or unsafe conditions or practices are observed, inform the contractor safety representative (CH2M HILL's obligation is limited strictly to informing the contractor of the observation; the contractor is solely responsible for determining and implementing necessary controls and corrective actions).

If an apparent imminent danger is observed, immediately warn the contractor employee(s) in danger and notify the contractor safety representative (CH2M HILL's obligation is limited strictly to immediately warning the affected individual(s) and informing the contractor of the observation; the contractor is solely responsible for determining and implementing necessary controls and corrective actions).

All verbal health and safety-related communications will be documented in project field logbook, daily reports, or other records.

## 5.0 Standards of Conduct

All individuals associated with this project must work injury-free and drug-free and must comply with the following standards of conduct, the HSP, and the safety requirements of CH2M HILL. Commonly accepted standards of conduct help maintain good relationships between people. They promote responsibility and self-development. Misunderstandings, frictions, and disciplinary action can be avoided by refraining from thoughtless or wrongful acts.

### 5.1 Standards of Conduct Violations

All individuals associated with this project are expected to behave in a professional manner. Violations of the standards of conduct would include, but not be limited to:

- Failure to perform work;
- Inefficient performance, incompetence, or neglect of work;
- Willful refusal to perform work as directed (insubordination);
- Negligence in observing safety regulations, poor housekeeping, or failure to report on-the-job injuries or unsafe conditions;
- Unexcused or excessive absence or tardiness;
- Unwillingness or inability to work in harmony with others;
- Discourtesy, irritation, friction, or other conduct that creates disharmony;
- Harassment or discrimination against another individual;
- Failure to be prepared for work by wearing the appropriate construction clothing or bringing the necessary tools; or
- Violation of any other commonly accepted reasonable rule of responsible personal conduct.

### 5.2 Disciplinary Actions

The Environmental Services (ES) business group employees, employees working on ES business group projects, and subcontractor employees are subject to disciplinary action for not following HSE rules and requirements. Potential disciplinary action is equally applicable to all employees including management and supervision. Disciplinary action may include denial of access to the worksite, warnings, reprimands, and other actions up to and including termination depending on the specific circumstances.

### 5.3 Subcontractor Safety Performance

CH2M HILL should continuously endeavor to observe subcontractors' safety performance and adherence to their plans and AHAs. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL is not responsible for exhaustive observation for hazards and unsafe practices. CH2M HILL oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

### 5.3.1 Observed Hazard Form

When apparent non-compliance or unsafe conditions or practices are observed, notify the subcontractor's supervisor or safety representative verbally, and document using the Observed Hazard Form, included as an attachment to this HSP, and require corrective action.

If necessary, stop subcontractor's work using the Stop Work Order Form until corrective actions is implemented for observed serious hazards or conditions. Update the Observed Hazard Form to document corrective actions have been taken. The subcontractor is responsible for determining and implementing necessary controls and corrective actions.

### 5.3.2 Stop Work Order

CH2M HILL has the authority, as specified in the contract, and the responsibility to stop work in the event any CH2M HILL employee observes unsafe conditions or failure of the subcontractor to adhere to its safe-work practices. This authority and action does not in any way relieve the subcontractor of its responsibilities for the means and methods of the work or, therefore, of any corrective actions. Failure to comply with safe work practices can be the basis for restriction or removal of the subcontractor staff from the job site, termination of the subcontract, restriction from future work, or all three.

When an apparent imminent danger is observed, immediately stop work and alert all affected individuals. Remove all affected CH2M HILL employees and subcontractor staff from the danger, notify the subcontractor's supervisor or safety representative, and do not allow work to resume until adequate corrective measures are implemented. Notify the PM, Contract Administrator (KA) and RHSM.

When repeated non-compliance or unsafe conditions are observed, notify the subcontractor's supervisor or safety representative and stop affected work by completing and delivering the Stop Work Order Form (attached to this HSP) until adequate corrective measures are implemented. Consult the KA to determine what the contract dictates for actions to pursue in event of subcontractor non-compliance including work stoppage, back charges, progress payments, removal of subcontractor manager, monetary penalties, or termination of subcontractor for cause.

## 5.4 Incentive Program

Each project is encouraged to implement a safety incentive program that rewards workers for exhibiting exemplary safety behaviors. Actions that qualify are those that go above and beyond what is expected. Actions that will be rewarded include spotting and correcting a hazard, bringing a hazard to the attention of your foreman, telling your foreman about an incident, coming up with a safer way to get the work done, or stopping a crew member from doing something unsafe. The program will operate throughout the project, covering all workers. The incentive program will be communicated to all employees during the project employee orientation and project safety meetings.

## 5.5 Reporting Unsafe Conditions/Practices

Responsibility for effective health and safety management extends to all levels of the project and requires good communication between employees, supervisors, and management. Accident prevention requires a pro-active policy on near misses, close calls, unsafe conditions, and unsafe practices. All personnel must report any situation, practice, or condition which might jeopardize the

safety of our projects. All unsafe conditions or unsafe practices will be corrected immediately. CH2M HILL has zero tolerance of unsafe conditions or unsafe practices.

No employee or supervisor will be disciplined for reporting unsafe conditions or practices. Individuals involved in reporting the unsafe conditions or practices will remain anonymous.

The following reporting procedures will be followed by all project employees:

- Upon detection of any unsafe condition or practice, the responsible employee will attempt to safely correct the condition;
- The unsafe condition or practice will be brought to the attention of the worker's direct supervisor, unless the unsafe condition or practice involves the employee's direct supervisor. If so, the SC needs to be notified at once by the responsible employee;
- Either the responsible employee or responsible employee's direct supervisor is responsible for immediately reporting the unsafe condition or practice to the SC;
- The SC will act promptly to correct the unsafe condition or practice; and
- Details of the incident or situation will be recorded by the SC in the field logbook or use the Observed Hazard Form if subcontractor was involved.

## 6.0 Safety Planning and Change Management

### 6.1 Daily Safety Meetings and Pre-Task Safety Plans

Daily safety meetings are to be held with all project personnel in attendance to review the hazards posed and required HSE procedures and AHAs that apply for each day's project activities. The Pre-Task Safety Plans (PTSPs) serve the same purpose as these general assembly safety meetings, but the PTSPs are held between the crew supervisor and their work crews to focus on those hazards posed to individual work crews.

At the start of each day's activities, the crew supervisor completes the PTSP, provided as an attachment to this HSP, with input from the work crew, during their daily safety meeting. The day's tasks, personnel, tools and equipment that will be used to perform these tasks are listed, along with the hazards posed and required HSE procedures, as identified in the HSP and AHA. The use of PTSPs promotes worker participation in the hazard recognition and control process while reinforcing the task-specific hazard and required HSE procedures with the crew each day.

### 6.2 Change Management

The evaluation form below should be reviewed on a continuous basis to determine if the current site health and safety plan adequately addresses ongoing project work, and should be completed whenever new tasks are contemplated or changed conditions are encountered.

**PROJECT HSE Change Management Form**

Project Task: **PA/SI Activities**

Project/Task Manager: Keri Hallberg

Project Number: **405181**

Project Name: Camp Devil Dog

<b>Evaluation Checklist</b>		Yes	No
1.	Has the CH2M HILL staff listed in the original HSP changed?		
2.	Has a new subcontractor been added to the project?		
3.	Is any chemical or product to be used that is not listed in Attachment 2 of the plan?		
4.	Have additional tasks been added which were not originally addressed in the "Project Information" section of this HSP?		
5.	Have new contaminants or higher than anticipated levels of original contaminants been encountered?		
6.	Has other safety, equipment, activity or environmental hazards been encountered that are not addressed in this HSP?		

*If the answer is "YES" to the questions above, HSP revision may be needed. For questions 2-6, contact RHSM prior to continuing work. In addition to contacting the RHSM, the following actions can be taken for questions 1-3:*

- Confirm that staff's medical and training status is current – check training records at: <http://www.int.ch2m.com/hands> (or contact your regional safety program assistant [SPA]), and confirm subcontractor qualifications.
- Confirm with the project RHSM that subcontractor safety performance has been reviewed and is acceptable.
- Confirm with the RHSM that subcontractor safety procedures, plans, and/or AHAs have been reviewed and are acceptable.
- Add the new chemical or product information to the Chemical Inventory Form, inform the RHSM, and ensure that personnel handling the chemical or product have been trained, and that training is documented using the Chemical-Specific Training Form included as an attachment to this HSP. Add the Material Safety Data Sheet(s) (MSDS) for chemicals handled or used at the project to this HSP. AHAs may need to be developed or amended to account for new chemicals. The RHSM shall review the AHAs prior to the chemical use.

## 7.0 Project Hazard Analysis

A health and safety risk analysis (Table 1) has been performed for each task. In the order listed below, the RHSM considers the various methods for mitigating the hazards. Employees are trained on this hierarchy of controls during their hazardous waste training and reminded of them throughout the execution of projects:

- Elimination of the hazards (use remote sampling methodology to avoid going into a confined space);
- Substitution (reduce exposure to vapors by using of a geoprobe instead of test pitting);
- Engineering controls (ventilate a confined space to improve air quality);
- Warnings (establish exclusion zones to keep untrained people away from hazardous waste work);
- Administrative controls (implement a work-rest schedule to reduce chance of heat stress); or
- Use of PPE (use of respirators when action levels are exceeded).

The hazard controls and safe work practices are summarized in the following sections of this HSP:

- General hazards and controls;
- Project-specific hazards and controls;
- Physical hazards and controls;
- Biological hazards and controls; and
- Contaminants of concern

### 7.1 Activity Hazard Analysis

An AHA defines the activity being performed, the hazards posed and control measures required to perform the work safely. Workers are briefed on the AHA before doing the work and their input is solicited prior, during, and after the performance of work to further identify the hazards posed and control measures required. The AHA shall identify the work tasks required to perform each activity, along with potential HSE hazards and recommended control measures for each hazard. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified. The following hazard controls and applicable CH2M HILL core standards and SOPs should be used as a basis for preparing AHAs.

AHAs must be prepared for CH2M HILL activities and included as an attachment to this HSP.

### 7.2 Subcontractor Activity Hazard Analysis

CH2M HILL subcontractors are required to provide AHAs specific to their scope of work on the project for acceptance by CH2M HILL. Each subcontractor shall submit AHAs for their field activities, as defined in their scope of work, along with their project-specific safety plan and/or procedures. Additions or changes in field activities, equipment, tools, or material used to perform work or hazards not addressed in existing AHAs requires either a new AHA to be prepared or an existing AHA to be revised.

**Table 1 Hazard Analysis**

(Refer to Section 9.0 for Hazard Controls)

POTENTIALHAZARDS	Project Activities				
	Drilling/Well Installation	Surveying	Utility Locating	Soil Sampling	MEC Intrusive Investigation
Arsenic	X			X	X
Chemical Hazard-Dermal/Inhalation	X			X	
Compressed Gas Cylinders	X			X	X
Drilling	X				
Electrical Safety	X				
Excavations					X
Fire Prevention	X	X	X	X	X
Hand & Power Tools	X	X		X	
Heavy Equipment	X			X	X
Hoists					X
Lead	X			X	X
Lockout /Tagout	X				X
Manual Lifting	X	X	X	X	X
Noise	X			X	X
Pressure Washing/Equip Decon	X			X	X
Pressurized Lines/Equipment	X				X
Slips, Trips and Falls	X	X	X	X	X
Utilities (underground/overhead)	X		X		X
Vehicle Traffic	X	X	X	X	X
Visible Lighting	X	X	X	X	X
Working Alone					

## 8.0 General Hazards and Controls

### 8.1 General Practices and Housekeeping

The following are general requirements applicable to all portions of the work:

- Site work should be performed during daylight hours whenever possible;
- Good housekeeping must be maintained at all times in all project work areas;
- Common paths of travel should be established and kept free from the accumulation of materials;
- Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions;
- Provide slip-resistant surfaces, ropes, or other devices to be used;
- Specific areas should be designated for the proper storage of materials;
- Tools, equipment, materials, and supplies shall be stored in an orderly manner;
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area;
- Containers should be provided for collecting trash and other debris and shall be removed at regular intervals;
- All spills shall be quickly cleaned up; oil and grease shall be cleaned from walking and working surfaces;
- Review the safety requirements of each job you are assigned to with your supervisor. You are not expected to perform a job that may result in injury or illness to yourself or to others;
- Familiarize yourself with, understand, and follow jobsite emergency procedures;
- Do not fight or horseplay while conducting the firm's business;
- Do not use or possess firearms or other weapons while conducting the firm's business;
- Report unsafe conditions or unsafe acts to your supervisor immediately;
- Report emergencies, occupational illnesses, injuries, vehicle accidents, and near misses immediately;
- Do not remove or make ineffective safeguards or safety devices attached to any piece of equipment;
- Report unsafe equipment, defective or frayed electrical cords, and unguarded machinery to your supervisor;
- Shut down and lock out machinery and equipment before cleaning, adjustment, or repair. Do not lubricate or repair moving parts of machinery while the parts are in motion;
- Do not run in the workplace;
- When ascending or descending stairways, use the handrail and take one step at a time;
- Do not apply compressed air to any person or clothing;
- Do not wear steel taps or shoes with metal exposed to the sole at any CH2M HILL project location;
- Do not wear finger rings, loose clothing, wristwatches, and other loose accessories when within arm's reach of moving machinery;
- Remove waste and debris from the workplace and dispose of in accordance with federal, state, and local regulations;

- Note the correct way to lift heavy objects (secure footing, firm grip, straight back, lift with legs), and get help if needed. Use mechanical lifting devices whenever possible; and
- Check the work area to determine what problems or hazards may exist.

## 8.2 Driving Safety

Follow the guidelines below when operating a vehicle:

- Refrain from using a cellular phone while driving. Pull off the road, put the vehicle in park and turn on flashers before talking on a cellular phone;
- Never operate a personal digital assistant (PDA), or other device with e-mail, internet, or text messaging function while driving a vehicle;
- Obey speed limits; be aware of blind spots or other hazards associated with low visibility. Practice defensive driving techniques, such as leaving plenty of room between your vehicle and the one ahead of you;
- Do not drive while drowsy. Drowsiness can occur at any time, but is most likely after 18 hours or more without sleep;
- Maintain focus on driving. Eating, drinking, smoking, adjusting controls can divert attention from the road. Take the time to park and perform these tasks when parked rather than while driving; and
- Ensure vehicle drivers are familiar with the safe operation of vehicles of the type and size to be operated. Large vehicles such as full size vans and pick-ups have different vision challenges and handling characteristics than smaller vehicles.

## 8.3 Personal Hygiene

Good hygiene is essential for personal health and to reduce the potential of cross-contamination when working on a hazardous waste site. Implement the following:

- Keep hands away from nose, mouth, and eyes during work;
- Keep areas of broken skin (chapped, burned, etc.) covered; and
- Wash hands with soap and water prior to eating, smoking, or applying cosmetics.

## 8.4 Bloodborne Pathogens

(Reference CH2M HILL SOP HSE-202, *Bloodborne Pathogens*)

Exposure to bloodborne pathogens may occur when rendering first aid or cardiopulmonary resuscitation (CPR), or when coming into contact with landfill waste or waste streams containing potentially infectious material (PIM).

Employees trained in first-aid/CPR or those exposed to PIM must complete CH2M HILL's 1-hour bloodborne pathogens computer-based training module annually. When performing first-aid/CPR the following shall apply:

- Observe universal precautions to prevent contact with blood or other PIMs. Where differentiation between body fluid types is difficult or impossible, consider all body fluids to be potentially infectious materials;
- Always wash your hands and face with soap and running water after contacting PIMs. If washing facilities are unavailable, use an antiseptic cleanser with clean paper towels or moist towelettes; and

- If necessary, decontaminate all potentially contaminated equipment and surfaces with chlorine bleach as soon as possible. Use one part chlorine bleach (5.25 percent sodium hypochlorite solution) diluted with 10 parts water for decontaminating equipment or surfaces after initially removing blood or other PIMs. Remove contaminated PPE as soon as possible before leaving a work area.

CH2M HILL will provide exposed employees with a confidential medical examination should an exposure to PIM occur. This examination includes the following procedures:

- Documenting the exposure;
- Testing the exposed employee's and the source individual's blood (with consent); and
- Administering post-exposure prophylaxis.

## 8.5 Hazard Communication

(Reference CH2M HILL SOPs HSE-107, *Hazard Communication* and HSE-403, *Hazardous Material Handling*)

The hazard communication coordinator is to perform the following:

- Complete an inventory of chemicals brought on site by CH2M HILL using the chemical inventory form included as an attachment to this HSP;
- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available;
- Request or confirm locations of material safety data sheets (MSDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed;
- Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical and include on the chemical inventory sheet (attached to this HSP) and add the MSDS to the MSDS attachment section of this HSP;
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly;
- Give employees required chemical-specific HAZCOM training using the chemical-specific training form included as an attachment to this HSP; and
- Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

The following are general guidelines for storing chemicals and other hazardous materials:

- Keep acids away from bases;
- Keep oxidizers (nitric acid, nitrates, peroxides, chlorates) and organics away from inorganic reducing agents (metals);
- Keep flammables and corrosives in appropriate storage cabinets;
- Do not store paper or other combustibles near flammables;
- Use secondary containment and lipped shelving that is secured; and
- Have a fire suppression system available.

## 8.6 Substance Abuse

(Reference CH2M HILL SOP HSE-105, *Drug-Free Workplace* )

Employees who work under the influence of controlled substances, drugs, or alcohol may prove to be dangerous or otherwise harmful to themselves, other employees, clients, the company, the company's assets and interests, or the public. CH2M HILL does not tolerate illegal drug use, or any use of drugs, controlled substances, or alcohol that impairs an employee's work performance or behavior.

Prohibitions onsite include:

- Use or possession of intoxicating beverages while performing CH2M HILL work;
- Abuse of prescription or nonprescription drugs;
- Use or possession of illegal drugs or drugs obtained illegally;
- Sale, purchase, or transfer of legal, illegal or illegally obtained drugs; and
- Arrival at work under the influence of legal or illegal drugs or alcohol.

Drug and/or alcohol testing is applicable under CH2M HILL Constructors, Inc. and munitions response projects performed in the United States. In addition, employees may be required to submit to drug and/or alcohol testing as required by clients. When required, this testing is performed in accordance with SOP HSE-105, *Drug-Free Workplace*. Employees who are enrolled in drug or alcohol testing are required to complete annual training located on the CH2M HILL Virtual Office (VO).

## 8.7 Shipping and Transportation of Chemical Products

(Reference CH2M HILL's Procedures for Shipping and Transporting Dangerous Goods)

Chemicals brought to the site might be defined as hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the RHSM or the Warehouse Coordinator for additional information.

## 9.0 Project-Specific Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the work or the particular hazard. Each person onsite is required to abide by the hazard controls. Consult the appropriate CH2M HILL SOP to ensure all requirements are implemented. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the RHSM for clarification.

### 9.1 Arsenic

(Reference CH2M HILL, SOP HSE-501, *Arsenic*)

Arsenic is considered a “Confirmed Human Carcinogen.” CH2M HILL is required to control employee exposure to arsenic when exposures are at or above 5.0 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ), or if there is the possibility of skin or eye irritation from arsenic. The elements of the CH2M HILL arsenic program include the following:

- Exposure monitoring;
- Methods of control, including PPE and respirators;
- Medical surveillance;
- Training on hazards of arsenic and control measures (includes project-specific training and the computer-based training on CH2M HILL’s Virtual Office, *Arsenic Exposure*); and
- Recordkeeping requirements.

If air monitoring indicates there is potential exposure at the action level concentrations, notify the RHSM to ensure the above have been adequately addressed. Full implantation of SOP HSE-501, *Arsenic*, will be required. Other exposure control measures include:

- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met;
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas;
- Avoid skin and eye contact with liquid and particulate arsenic or arsenic trichloride;
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person; and
- Review the fact sheet included as an attachment to this HSP.

### 9.2 Compressed Gas Cylinders

(Reference CH2M HILL SOP HSE-403, *Hazardous Materials Handling*)

Below are the hazard controls and safe work practices to follow when working around or using compressed gas cylinders. Ensure the requirements in the referenced SOP are followed.

- Cylinders and pressure-controlling apparatus shall be inspected for defects and leakage prior to use. Damaged or defective items shall not be used. If a cylinder is found to be defective, the gas distributor shall be notified and subsequent instructions followed. If a leak should develop at a fuse plug or other safety device, the cylinder shall be removed from the work area.

- Cylinders shall be labeled with the identity of the contents. Cylinders not labeled shall be sent back to the cylinder distributor. The color of the cylinder shall not be used exclusively to identify cylinder contents.
- Valve caps must be in place when cylinders are transported, moved, or stored.
- Cylinders must be secured in an upright position at all times.
- Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
- Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings.
- Eye protection (safety glasses or goggles) shall be worn when using cylinders.
- Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knocked over; contacting electrical circuits; or exposed to extreme heat sources.
- Cylinders inside buildings shall be stored in dry, well-ventilated locations at least 20 feet (6.1 meters) from highly combustible materials. Cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways. Assigned storage areas shall be located where cylinders will not be knocked over or damaged.
- Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials by a minimum of 20 feet (6.1 meters) or by a noncombustible barrier at least 5 feet (1.5 meters) high, having a fire resistance rating of at least 0.5 hour.
- Signs indicating no smoking shall be provided for storage areas containing flammable gas cylinders.
- Complete the self-assessment checklist for compressed gas cylinders are being used.

### 9.3 Drilling Safety

(Reference CH2M HILL SOP HSE-204, *Drilling*)

Below are the hazard controls and safe work practices to follow when working around or performing drilling. Ensure the requirements in the referenced SOP are followed.

- The drill rig is not to be operated in inclement weather.
- The driller is to verify that the rig is properly leveled and stabilized before raising the mast.
- Personnel should be cleared from the sides and rear of the rig before the mast is raised.
- The driller is not to drive the rig with the mast in the raised position.
- The driller must check for overhead power lines before raising the mast. A minimum distance of 10 feet (3 meters) between mast and overhead lines (<50 kV) is recommended. Increased separation may be required for lines greater than 50 kV.
- Personnel should stand clear before rig startup.
- The driller is to verify that the rig is in neutral when the operator is not at the controls.
- Become familiar with the hazards associated with the drilling method used (cable tool, air rotary, hollow-stem auger, etc.).
- Do not wear loose-fitting clothing, watches, etc., that could get caught in moving parts.
- Do not smoke or permit other spark-producing equipment around the drill rig.

- The drill rig must be equipped with a kill wire or switch, and personnel are to be informed of its location.
- Be aware and stand clear of heavy objects that are hoisted overhead.
- The driller is to verify that the rig is properly maintained in accordance with the drilling company's maintenance program.
- The driller is to verify that all machine guards are in place while the rig is in operation.
- The driller is responsible for housekeeping (maintaining a clean work area).
- The drill rig should be equipped with at least one fire extinguisher.
- If the drill rig comes into contact with electrical wires and becomes electrically energized, do not touch any part of the rig or any person in contact with the rig, and stay as far away as possible. Notify emergency personnel immediately.
- Use the drilling self-assessment checklist attached to this HSP to evaluate drilling operations.

## 9.4 Earthmoving Equipment (Heavy Equipment)

(Reference CH2M HILL, SOP HSE-306, *Earthmoving Equipment*)

Below are the hazard controls and safe work practices to follow when working around or operating heavy equipment. Ensure the requirements in the referenced SOP are followed.

- CH2M HILL authorizes only those employees qualified by training or previous experience to operate material handling equipment.
- CH2M HILL employees must be evaluated prior to operating earthmoving equipment by a CH2M HILL earthmoving equipment operator evaluation designated person. This evaluation will be documented according to SOP HSE-306, Earthmoving Equipment.
- Equipment must be checked at the beginning of each shift to ensure the equipment is in safe operating condition and free of apparent damage. The check should include: service brakes, parking brakes, emergency brakes, tires, horn, back-up alarm, steering mechanism, coupling devices, seat belts and operating controls. All defects shall be corrected before the equipment is placed in service. Documentation of this inspection must be maintained onsite at all times (use the Earthmoving Equipment Inspection form if operated by CH2M HILL).
- Equipment must be on a stable foundation such as solid ground or cribbing; outriggers are to be fully extended.
- Equipment must not be used to lift personnel; loads must not be lifted over the heads of personnel.
- Equipment, or parts thereof, which are suspended must be substantially blocked or cribbed to prevent shifting before personnel are permitted to work under or between them. All controls shall be in a neutral position, with the motors stopped and brakes set.
- Equipment which is operating in reverse must have a reverse signal alarm distinguishable from the surrounding noise or a signal person when the operators view is obstructed.
- When equipment is used near energized powerlines, the closest part of the equipment must be at least 10 feet (3 meters) from the powerlines less than 50 kilovolts (kV). Provide an additional 4 feet (1.2 meters) for every 10 kV over 50 kV. A person must be designated to observe clearances and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. All overhead powerlines must be considered to be an energized until the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded.

- Underground utility lines must be located before excavation begins; refer to the Utilities (underground) section.
- Operators loading and unloading from vehicles are responsible for seeing that vehicle drivers are in the vehicle cab or in a safe area.
- The parking brake shall be set whenever equipment is parked; wheels must be chocked when parked on inclines.
- When not in operation, the blade or bucket must be blocked or grounded; the master clutch must be disengaged when the operator leaves the cab. When equipment is unattended, power must be shut off, brakes set, blades or buckets landed and shift lever in neutral.

## 9.5 Electrical Safety

(Reference CH2M HILL SOP HSE-206, *Electrical Safety*)

Below are the hazard controls and safe work practices to follow when using electrical tools, extension cords, and/or other electrical-powered equipment or when exposed to electrical hazards. Ensure the requirements of the referenced SOP are followed.

### 9.5.1 General Electrical Safety

- Only qualified personnel are permitted to work on unprotected energized electrical systems.
- Only authorized personnel are permitted to enter high-voltage areas.
- CH2M HILL employees who might from time to time work in an environment influenced by the presence of electrical energy must complete Awareness Level Electrical Safety Training located on the CH2M HILL Virtual Office.
- Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until lockout/tagout procedures are implemented.
- Inspect electrical equipment, power tools, and extension cords for damage prior to use. Do not use defective electrical equipment, remove from service.
- CH2M HILL has selected Ground Fault Circuit Interrupters (GFCIs) as the standard method for protecting employees from the hazards associated with electric shock.
  - GFCIs shall be used on all 120-volt, single phase 15 and 20-ampere receptacle outlets which are not part of the permanent wiring of the building or structure.
- An assured equipment grounding conductor program may be required under the following scenarios:
  - GFCIs can not be utilized;
  - Client requires such a program to be implemented; or
  - Business group decides to implement program in addition to GFCI protection.
- Extension cords must be equipped with third-wire grounding. Cords passing through work areas must be covered, elevated or protected from damage. Cords should not be routed through doorways unless protected from pinching. Cords should not be fastened with staples, hung from nails, or suspended with wire.
- Electrical power tools and equipment must be effectively grounded or double-insulated and Underwriters Laboratory (UL) approved.
- Operate and maintain electric power tools and equipment according to manufacturers' instructions.

- Maintain safe clearance distances between overhead power lines and any electrical conducting material unless the power lines have been de-energized and grounded, or where insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet (3 meters) from overhead power lines for voltages of 50 kV or less, and 10 feet (3 meters) plus ½ inch (1.27 cm) (for every 1 kV over 50 kV).
- Temporary lights shall not be suspended by their electric cord unless designed for suspension. Lights shall be protected from accidental contact or breakage.
- Protect all electrical equipment, tools, switches, and outlets from environmental elements.

### 9.5.2 Portable Generator Hazards

- Portable generators are useful when temporary or remote electric power is needed, but they also can be hazardous. The primary hazards to avoid when using a generator are carbon monoxide (CO) poisoning from the toxic engine exhaust, electric shock or electrocution, and fire.
- NEVER use a generator indoors or in similar enclosed or partially-enclosed spaces. Generators can produce high levels of carbon monoxide (CO) very quickly. When you use a portable generator, remember that you cannot smell or see CO. Even if you can't smell exhaust fumes, you may still be exposed to CO.
- If you start to feel sick, dizzy, or weak while using a generator, get to fresh air RIGHT AWAY. DO NOT DELAY. The CO from generators can rapidly lead to full incapacitation and death.
- If you experience serious symptoms, get medical attention immediately. Inform project staff that CO poisoning is suspected. If you experienced symptoms while indoors have someone call the fire department to determine when it is safe to re-enter the building.
- Follow the instructions that come with your generator. Locate the unit outdoors and away from doors, windows, and vents that could allow CO to come indoors.
- Keep the generator dry and do not use in rain or wet conditions. To protect from moisture, operate it on a dry surface under an open, canopy-like structure. Dry your hands if wet before touching the generator.
- Plug appliances directly into the generator. Or, use a heavy duty, outdoor-rated extension cord that is rated (in watts or amps) at least equal to the sum of the connected appliance loads. Check that the entire cord is free of cuts or tears and that the plug has all three prongs, especially a grounding pin.
- Most generators come with Ground Fault Circuit Interrupters (GFCI). Test the GFCIs daily to determine whether they are working
- If the generator is not equipped with GFCI protected circuits plug a portable GFCI into the generator and plug appliances, tools and lights into the portable GFCI.
- Never store fuel near the generator or near any sources of ignition.
- Before refueling the generator, turn it off and let it cool down. Gasoline spilled on hot engine parts could ignite.

## 9.6 Excavation Activities

(Reference CH2M HILL SOP HSE-307, *Excavation and Trenching Safety*)

The requirements in this section shall be followed whenever excavation is being performed. Refer to the Earthmoving Equipment section and SOP for additional requirements applicable to operating/oversight of earthmoving equipment. Below are the hazard controls and safe work practices to follow when

working around or performing excavation. Ensure the requirements in the referenced SOP are followed.

- Do not enter the excavations unless completely necessary, and only after the excavation competent person has completed their daily inspection and has authorized entry. An inspection shall be conducted by the competent person prior to the start of work, as needed throughout the shift, after every rainstorm, and after any hazard increasing occurrence. Documentation of the inspection must be maintained onsite at all times.
- Follow all excavation entry requirements established by the excavation competent person and any excavation permit being used.
- Sloping, benching, shoring, shielding, or other protective systems are required to protect personnel from cave-ins except when the excavation is made entirely in stable rock or is less than 5 feet deep (1.5 meters) and there is no indication of possible cave-in, as determined by the excavation competent person. Protective systems for excavations deeper than 20 feet (6.1 meters) must be designed or approved by a registered professional engineer.
- Trenches greater than 4 feet (1.2 meters) deep shall be provided with a ladder, stairway, or ramp positioned so that the maximum lateral travel distance is no more than 25 feet (7.6 meters).
- The atmosphere of excavations greater than 4 feet (1.2 meters) deep shall be tested prior to entry when a hazardous atmosphere exists or could reasonably be expected to exist, such as excavating landfills, hazardous waste dumps; or areas containing sewer or gas utility systems, petroleum distillates, or areas where hazardous substances are stored nearby.
- Spoil piles, material, and equipment must be kept at least 2 feet (61 centimeters) from the edge of the excavation, or a retaining device must be used to prevent the material from falling into the excavation.
- Excavations shall not be entered when:
  - Protective systems are damaged or unstable;
  - Objects or structures above the work location may become unstable and fall into the excavation;
  - The potential for a hazardous atmosphere exists, unless the air has been tested and found to be at safe levels; or
  - Accumulated water exists in the excavation, unless precautions have been taken to prevent excavation cave-in.
- The excavation self-assessment checklist shall be used to evaluate excavations prior to entry.

## 9.7 Field Vehicles

- Field vehicles may be personal vehicles, rental vehicles, fleet vehicles, or project vehicles.
- Maintain a first aid kit, bloodborne pathogen kit, and fire extinguisher in the field vehicle at all times.
- Utilize a rotary beacon on vehicle if working adjacent to active roadway.
- Car rental must meet the following requirements:
  - Dual air bags
  - Antilock brakes
  - Be midsize or larger
- Familiarize yourself with rental vehicle features prior to operating the vehicle:

- Vision Fields and Blind Spots
  - Vehicle Size
  - Mirror adjustments
  - Seat adjustments
  - Cruise control features, if offered
  - Pre-program radio stations and Global Positioning System (GPS), if equipped
- Always wear seatbelt while operating vehicle.
  - Adjust headrest to proper position.
  - Tie down loose items if utilizing a van or pick-up truck.
  - Close car doors slowly and carefully. Fingers can get pinched in doors.
  - Park vehicle in a location where it can be accessed easily in the event of an emergency. If not possible, carry a phone.
  - Have a designated place for storing the field vehicle keys when not in use.
  - Ensure back-up alarms are functioning, if equipped. Before backing a vehicle, take a walk around the vehicle to identify obstructions or hazards. Use a spotter when necessary to back into or out of an area.

## 9.8 Fire Prevention

(Reference CH2M HILL SOP HSE-403, *Hazardous Material Handling*)

Follow the fire prevention and control procedures listed below.

### 9.8.1 Fire Extinguishers and General Fire Prevention Practices

- Fire extinguishers shall be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet (30.5 meters). When 5 gallons (19 liters) or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet (15.2 meters). Extinguishers must:
  - be maintained in a fully charged and operable condition;
  - be visually inspected each month; and
  - undergo a maintenance check each year.
- The area in front of extinguishers must be kept clear.
- Post “Exit” signs over exiting doors, and post “Fire Extinguisher” signs over extinguisher locations.
- Combustible materials stored outside should be at least 10 feet (3 meters) from any building.
- Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.

### 9.8.2 Storage of Flammable/Combustible Liquids

- Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids.
- Approved safety cans shall be used for the handling and use of flammable liquids in quantities of 5 gallons (22.7 liters) or less. Do not use plastic gas cans.
- For quantities of 1 gallon (4.5 liters) or less, the original container may be used for storage and use of flammable liquids.

- Flammable or combustible liquids shall not be stored in areas used for stairways or normally used for the passage of people.

### 9.8.3 Indoor Storage of Flammable/Combustible Liquids

- No more than 25 gallons (113.7 liters) of flammable or combustible liquids shall be stored in a room outside of an approved storage cabinet.
- Quantities of flammable and combustible liquids in excess of 25 gallons (113.7 liters) shall be stored in an acceptable or approved cabinet.
- Cabinets shall be conspicuously lettered: "FLAMMABLE: KEEP FIRE AWAY."
- Not more than 60 gallons (272.8 liters) of flammable or 120 gallons (545.5 liters) of combustible liquids shall be stored in any one storage cabinet. Not more than three such cabinets may be located in a single storage area.

### 9.8.4 Outside Storage of Flammable/Combustible Liquids

- Storage of containers (not more than 60 gallons [272.8 liters] each) shall not exceed 1,100 gallons (5000 liters) in any one area. No area shall be within 20 feet (6.1 meters) of any building.
- Storage areas shall be graded to divert spills away from buildings and surrounded by an earthen dike.
- Storage areas shall be free from weeds, debris, and other combustible materials.
- Outdoor portable tanks shall be provided with emergency vent devices and shall not be closer than 20 feet (6.1 meters) to any building.
- Signs indicating no smoking shall be posted around the storage area.

### 9.8.5 Dispensing of Flammable/Combustible Liquids

- Areas in which flammable or combustible liquids are dispensed in quantities greater than 5 gallons (22.7 liters) (shall be separated from other operations by at least 25 feet (7.6 meters).
- Drainage or other means shall be provided to control spills.
- Adequate natural or mechanical ventilation shall be provided to maintain the concentration of flammable vapor at or below 10 percent of the lower flammable limit.
- Dispensing of flammable liquids from one container to another shall be done only when containers are electrically interconnected (bonded).
- Dispensing flammable or combustible liquids by means of air pressure on the container or portable tanks is prohibited.
- Dispensing devices and nozzles for flammable liquids shall be of an approved type.

## 9.9 Groundwater Sampling/Water Level Measurements

Below are the hazard controls and safe work practices to follow when personnel or subcontractors are performing groundwater sampling and/or water level measurements.

- Full coolers are heavy. Plan in advance to have two people available at the end of the sampling effort to load full coolers into vehicles. If two people won't be available use several smaller coolers instead of fewer large ones.
- Wear the appropriate PPE when sampling, including safety glasses, nitrile gloves, and steel toe boots (see PPE section of this HSP).

- Monitor headspace of wells prior to sampling to minimize any vapor inhalation (refer to the “Site Monitoring” section of this HSP).
- Use caution when opening well lids. Wells may contain poisonous spiders and hornet or wasp nests.
- Use the appropriate lifting procedures (see CH2M HILL SOP HSE-112) when unloading equipment and sampling at each well.
- Avoid sharp edges on well casings.
- If dermal contact occurs with groundwater or the acid used in sample preservation, immediately wash all affected skin thoroughly with soap and water.
- Avoid eating and drinking on site and during sampling.
- Use ear plugs during sampling if sampling involves a generator.
- Containerize all purge water and transport to the appropriate storage area.
- Use two people to transport full coolers/containers whenever possible. If two people are not available use a dolly to move coolers. If the coolers weigh more than 40 pounds Attachment 1 of the HSE-112, *Manual Lifting*, shall be completed by the SC. If the coolers weigh more than 50 pounds they should never be lifted by one person.

## 9.10 Hand and Power Tools

(Reference CH2M HILL, SOP HSE-210, *Hand and Power Tools*)

Below are the hazard controls and safe work practices to follow when personnel or subcontractors are using hand and power tools. Ensure the requirements in the referenced SOP are followed.

- Tools shall be inspected prior to use and damaged tools will be tagged and removed from service.
- Hand tools will be used for their intended use and operated in accordance with manufacturer’s instructions and design limitations;
- Maintain all hand and power tools in a safe condition.
- Use PPE (such as gloves, safety glasses, earplugs, and face shields) when exposed to a hazard from a tool.
- Do not carry or lower a power tool by its cord or hose.
- Portable power tools will be plugged into GFCI protected outlets; and
- Portable power tools will be Underwriters Laboratories (UL) listed and have a three-wire grounded plug or be double insulated.
- Disconnect tools from energy sources when they are not in use, before servicing and cleaning them, and when changing accessories (such as blades, bits, and cutters).
- Safety guards on tools must remain installed while the tool is in use and must be promptly replaced after repair or maintenance has been performed.
- Store tools properly in a place where they will not be damaged or come in contact with hazardous materials.
- If a cordless tool is connected to its recharge unit, both pieces of equipment must conform strictly with electrical standards and manufacturer’s specifications.
- Tools used in an explosive environment must be rated for work in that environment (that is, intrinsically safe, spark-proof, etc.).

- Working with manual and pistol-grip hand tools may involve highly repetitive movement, extended elevation, constrained postures, and/or awkward positioning of body members (for example, hand, wrist, arm, shoulder, neck, etc.). Consider alternative tool designs, improved posture, the selection of appropriate materials, changing work organization, and sequencing to prevent muscular, skeletal, repetitive motion, and cumulative trauma stressors.

## Machine Guarding

- Ensure that all machine guards are in place to prevent contact with drive lines, belts, chains, pinch points or any other sources of mechanical injury.
- Unplugging jammed equipment will only be performed when equipment has been shut down, all sources of energy have been isolated and equipment has been locked/tagged and tested.
- Maintenance and repair of equipment that results in the removal of guards or would otherwise put anyone at risk requires lockout of that equipment prior to work.

## 9.11 Knife Use

Open-bladed knives (for example, box cutters, utility knives, pocket knives, machetes, and multi-purpose tools with fixed blades such as a Leatherman™) are prohibited at worksites except where the following three conditions are met:

- The open-bladed knife is determined to be the best tool for the job;
- An approved Activity Hazard Analysis (AHA) or written procedure is in place that covers the necessary safety precautions (work practices, PPE, and training); and
- Knife users have been trained and follow the AHA.

## 9.12 Lead

(Reference CH2M HILL SOP HSE-508, *Lead*)

CH2M HILL is required to control employee exposure to lead when exposures are at or above 30 µg/m<sup>3</sup> by implementing a program that meets the requirements of the OSHA Lead standard, 29 CFR 1910.1025 and 29 CFR 1926.62. The elements of the CH2M HILL lead program include the following:

- Exposure monitoring;
- Methods of control, including personal protective equipment (PPE) and respirators;
- Medical surveillance;
- Training on hazards of lead and control measures (includes project-specific training and the computer-based training on CH2M HILL's Virtual Office, *Lead Exposure Training*); and
- Record keeping requirements.

If air monitoring indicates there is potential exposure at the action level concentrations above, notify the RHSM to ensure the above have been adequately addressed. Other exposure control measures include:

- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met;
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas;
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person; and

- Review the fact sheet included as an attachment to this HSP.

## 9.13 Lockout/Tagout Activities

(Reference CH2M HILL SOP HSE-310, *Lockout and Tagout*)

Lockout/tagout (LO/TO) shall be performed whenever service or maintenance is necessary on equipment that could cause injury to personnel from the unexpected equipment energizing or start-up or unexpected release of stored energy. Energy sources requiring lockout/tagout may include electrical, pneumatic, kinetic, and potential.

If work on energized electrical systems is necessary – contact the RHSM. Specific training and procedures are required to be followed before any work on energized electrical systems can be performed and are NOT covered in this section. Energized electrical work is defined as work performed **on or near** energized electrical systems or equipment with exposed components operating at 50 volts or greater. Working near energized live parts is any activity inside a Limited Approach Boundary (anywhere from 3.5 feet to 24 feet [1 meter 7.3 meters] depending on voltage). Examples of energized electrical work include using a voltmeter to troubleshoot electrical systems and changing out controllers.

When lockout/tagout is necessary to perform maintenance/repair of a system, all the requirements of SOP HSE-310, Lockout and Tagout, shall be met including the following bulleted items:

- When CH2M HILL controls the work, CH2M HILL must verify that subcontractors affected by the unexpected operation of equipment develop a written lockout/tagout program, provide training on lockout/tagout procedures and coordinate its program with other affected subcontractors. This may include compliance with the owner or facility lockout/tagout program.
- When CH2M HILL personnel are affected by the unexpected operation of equipment they must complete the electrical safety awareness module on the VO. Authorized personnel shall inform the affected personnel of the LO/TO. Affected personnel shall not tamper with LO/TO devices.
- Standard lockout/tagout procedures include the following six steps: 1) notify all personnel in the affected area of the lockout/tagout, 2) shut down the equipment using normal operating controls, 3) isolate all energy sources, 4) apply individual lock and tag to each energy isolating device, 5) relieve or restrain all potentially hazardous stored or residual energy, and 6) verify that isolation and deenergization of the equipment has been accomplished. Once verified that the equipment is at the zero energy state, work may begin.
- All safe guards must be put back in place, all affected personnel notified that lockout has been removed and controls positioned in the safe mode prior to lockout removal. Only the individual who applied the lock and tag may remove them.
- CH2M HILL authorized employees shall complete the LO/TO training module on the VO and either the electrical safety training module on the VO or 10-hour construction training. The authorized employee must also be trained and qualified on the system they are working on (e.g., qualified electrician for working on electrical components of a system).
- When equipment-specific LO/TO procedures are not available or when existing procedures are determined to be insufficient, CH2M HILL authorized employees shall also complete the Equipment-Specific LO/TO Procedure Development Form, provided as an attachment to this HSP, to create an equipment-specific lockout/tagout procedure.

## 9.14 Manual Lifting

(Reference CH2M HILL SOP HSE-112, *Manual Lifting*)

Back injuries are the leading cause of disabling work and most back injuries are the result of improper lifting techniques or overexertion. Use the following to mitigate the hazards associated with lifting:

- When possible, the task should be modified to minimize manual lifting hazards;
- Lifting of loads weighing more than 40 pounds (18 kilograms) shall be evaluated by the SC using the Lifting Evaluation Form contained in SOP HSE-112;
- Using mechanical lifting devices is the preferred means of lifting heavy objects such as forklifts; cranes, hoists, and rigging; hand trucks; and trolleys;
- Personnel shall seek assistance when performing manual lifting tasks that appear beyond their physical capabilities;
- In general, the following steps must be practiced when planning and performing manual lifts: Assess the situation before you lift; ensure good lifting and body positioning practices; ensure good carrying and setting down practices; and
- All CH2M HILL workers must have training in proper manual lifting training either through the New Employee Orientation or through Manual Lifting module located on the VO.

## 9.15 Avoidance of Munitions and Explosives of Concern (MEC) and/or Materials Potentially Posing an Explosives Hazard (MPPEH)

### 9.15.1 General Information and Discovery Procedures

Any CH2M HILL project located on a present or former Department of Defense (DOD) facility, even if it is now under the control of a city, state, or private owner, should plan on the potential to encounter MEC/MPPEH.

If field activities unearth this type of material, the following actions will be taken by CH2M HILL personnel:

- STOP - Do NOT touch or move any suspected MEC/MMPEH;
- DO NOT transmit on a radio within 150 feet of suspected MEC/MMPEH;
- Evacuate all personnel within 300 meters of the suspected MEC/MMPEH;
- Contact appropriate client personnel as required by your contract; and
- Call a member of the CH2M HILL Ordnance Explosives (OE) Team for further assistance and guidance. Call the client contacts as well.

**MEC Avoidance Procedures.** MEC avoidance operations will be required during sampling operations. Avoidance operations will consist of a team composed of one or more UXO Technicians. A single-person team will consist of a UXO Technician III. Additional personnel will be UXO Technician III or less. **Contact with MEC is prohibited.** The UXO Team will not destroy any MEC encountered. All MEC contacts and suspected MEC anomalies will be reported to the site manager who will in turn notify MCB Camp Lejeune personnel in accordance with contractual requirements.

- **Access routes to sampling locations.** Prior to sampling, the UXO Technicians will conduct a reconnaissance of the sampling area. The reconnaissance will include locating the designated sampling or drilling location(s) and insuring that they are free of surface MEC. If surface MEC is

detected the point will be relocated as directed. Once the designated point has been cleared, an access route for the sampling crew's vehicles and equipment will be cleared for surface MEC. The access route, at a minimum will be twice the width of the widest vehicle and the boundaries will be clearly marked to prevent personnel from straying into non cleared areas. If surface MEC is encountered, the UXO Team will mark and report the item and divert the approach path around the MEC.

- **Soil Sampling Sites.** The UXO Technicians will clear the surface area of the work site for soil samples and clearly mark the boundaries. The area will be large enough to accommodate the direct push equipment and provide a work area for the crews. As a minimum, the cleared area will be a square, with a side dimension equal to twice the length of the largest vehicle or piece of equipment for use on site. If a pre-selected area indicates magnetic anomalies, a new sampling / drill site will be chosen.
- **Borehole Sampling.** If surface samples are required they will be obtained prior to the start of boring. The borehole procedures will be completed using direct push technology (DPT) equipment. Prior to DPT sampling of Site UXO-08, an UXO Technician will advance a borehole using a hand auger, and check the borehole with a down hole magnetometer a minimum of every one foot, to the deepest sampling depth or a maximum of 5 feet to ensure that smaller items of MEC, undetectable from the surface will be detected. The anticipated depth of potential MEC items is anywhere from near-surface to < 1 ft, based on penetration calculations of the types of ammunition potentially used on the site. Should any other MEC item other than the aforementioned items be identified during DPT sampling, work will stop and the depth of down hole sampling will be re-evaluated.
- **Excavation.** Excavations shall be by manual methods; however, mechanical means may be used to remove overburden only where required, such as gravel roads that are too dense for manual methods under MEC avoidance. Qualified UXO personnel will conduct mag and dig operations until the area is determined to be clear of anomalies. Once an area has been cleared of anomalies, Earth-moving equipment (EME) may be used to aid the intrusive investigation by removing layers of soil in up to 2-foot lifts. The minimum amount of overburden needed to continue with manual methods of intrusive investigation operations will be moved.

## 9.16 Methylene Chloride

(Reference CH2M HILL SOP HSE-509, *Methylene Chloride*)

Methylene chloride has a faint, sweet odor which is not noticeable at dangerous concentrations. Methylene chloride is shipped as liquefied compressed gas and will cause frostbite on contact.

CH2M HILL is required to control employee workplace exposure to methylene chloride when personal exposures are at or above 12.5 parts per million (ppm) as an 8-hour time-weighted average (TWA) or above 125 ppm short-term exposure limit (STEL) by implementing a program that meets the requirements of the OSHA Methylene Chloride standard, 29 *Code of Federal Regulations* (CFR) 1910.1052. The elements of the CH2M HILL methylene chloride program include the following:

- Exposure monitoring;
- Methods of control, including personal protective equipment (PPE) and respirators;
- Medical surveillance;
- Training on hazards of methylene chloride and control measures (includes project-specific training and the computer-based training on CH2M HILL's Virtual Office, *Methylene Chloride*) and;
- Recordkeeping requirements.

If air monitoring indicates there is potential exposure at the action level concentrations above, notify the RHSM to ensure the above have been adequately addressed. Other exposure control measures include:

- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met;
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas;
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person;
- Appropriate **air-supplied respirators** must be used when methylene chloride exposures exceed PEL or STEL;
- Air supplied to respirators must meet Grade D breathing air requirements; and
- Review the fact sheet included as an attachment to this HSP.

## 9.17 Traffic Control

(Reference CH2M HILL SOP HSE-216, *Traffic Control*)

The following precautions must be taken when working around traffic, and in or near an area where traffic controls have been established by a sub contractor. Ensure the requirements in the referenced SOP are followed.

- Exercise caution when exiting traveled way or parking along street – avoid sudden stops, use flashers, etc.
- Park in a manner that will allow for safe exit from vehicle, and where practicable, park vehicle so that it can serve as a barrier.
- All staff working adjacent to traveled way or within work area must wear reflective/high-visibility safety vests.
- Eye protection should be worn to protect from flying debris.
- Remain aware of factors that influence traffic related hazards and required controls – sun glare, rain, wind, flash flooding, limited sight-distance, hills, curves, guardrails, width of shoulder (i.e., breakdown lane), etc.
- Always remain aware of an escape route (e.g., behind an established barrier, parked vehicle, guardrail, etc).
- Always pay attention to moving traffic – never assume drivers are looking out for you.
- Work as far from traveled way as possible to avoid creating confusion for drivers.
- When workers must face away from traffic, a “buddy system” should be used, where one worker is looking towards traffic.
- When working on highway projects, obtain a copy of the contractor’s traffic control plan.
- Work area should be protected by a physical barrier – such as a K-rail or Jersey barrier.
- Review traffic control devices to ensure that they are adequate to protect your work area. Traffic control devices should: 1) convey a clear meaning, 2) command respect of road users, and 3) give adequate time for proper traffic response. The adequacy of these devices are dependent on limited sight distance, proximity to ramps or intersections, restrictive width, duration of job, and traffic volume, speed, and proximity.

- Either a barrier or shadow vehicle should be positioned a considerable distance ahead of the work area. The vehicle should be equipped with a flashing arrow sign and truck-mounted crash cushion (TMCC). All vehicles within 40 feet (12.2 meters) of traffic should have an orange flashing hazard light atop the vehicle.
- Except on highways, flaggers should be used when 1) two-way traffic is reduced to using one common lane, 2) driver visibility is impaired or limited, 3) project vehicles enter or exit traffic in an unexpected manner, or 4) the use of a flagger enhances established traffic warning systems.
- Lookouts should be used when physical barriers are not available or practical. The lookout continually watches approaching traffic for signs of erratic driver behavior and warns workers.
- Vehicles should be parked at least 40 feet (12.2 meters) away from the work zone and traffic. Minimize the amount of time that you will have your back to oncoming traffic.
- Traffic control training module on the VO shall be completed when CH2M HILL workers who work in and around roadways and who exposed to public vehicular traffic.

## 9.18 Utilities (underground)

An assessment for underground utilities must be conducted where there is a potential to contact underground utilities or similar subsurface obstructions during intrusive activities. Intrusive activities include excavation, trenching, drilling, hand augering, soil sampling, or similar activities.

The assessment must be conducted before any intrusive subsurface activity and must include at least the following elements:

1. A background and records assessment of known utilities or other subsurface obstructions.
2. Contacting and using the designated local utility locating service.
3. Conducting an independent field survey to identify, locate, and mark potential underground utilities or subsurface obstructions. *Note: This is independent of, and in addition to, any utility survey conducted by the designated local utility locating service above.*
4. A visual survey of the area to validate the chosen location.

When any of these steps identifies an underground utility within 5 feet (1.5 meters) of intrusive work, then non-aggressive means must be used to physically locate the utility before a drill rig, backhoe, excavator or other aggressive method is used.

Aggressive methods are never allowed within 2 feet of an identified high risk utility (see paragraph below).

Any deviation from these requirements must be approved by the Responsible HS Manager and the Project Manager.

### Background and Records Assessment of Known Utilities

Identify any client- or location-specific permit and/or procedural requirements (e.g., dig permit or intrusive work permit) for subsurface activities. For military installations, contact the Base Civil Engineer and obtain the appropriate form to begin the clearance process.

Obtain available utility diagrams and/or as-built drawings for the facility.

Review locations of possible subsurface utilities including sanitary and storm sewers, electrical lines, water supply lines, natural gas lines, fuel tanks and lines, communication lines, lighting protection systems, etc. Note: Use caution in relying on as-built drawings as they are rarely 100 percent accurate.

Request that a facility contact with knowledge of utility locations review and approve proposed locations of intrusive work.

### **Designated Local Utility Locating Service**

Contact your designated local utility locating service (e.g., Dig-Safe, Blue Stake, One Call) to identify and mark the location of utilities. Call 811 in the US or go to [www.call811.com](http://www.call811.com) to identify the appropriate local service group. Contacting the local utility locating service is a legal requirement in most jurisdictions.

### **Independent Field Survey (Utility Locate)**

The organization conducting the intrusive work (CH2M HILL or subcontractor) shall arrange for an independent field survey to identify, locate, and mark any potential subsurface utilities in the work area. This survey is in addition to any utility survey conducted by the designated local utility locating service.

The independent field survey provider shall determine the most appropriate instrumentation/technique or combinations of instrumentation/techniques to identify subsurface utilities based on their experience and expertise, types of utilities anticipated to be present, and specific site conditions.

A CH2M HILL or subcontractor representative must be present during the independent field survey to observe the utility locate and verify that the work area and utilities have been properly identified and marked. If there is any question that the survey was not performed adequately or the individual was not qualified, then arrangements must be made to obtain a qualified utility locate service to re-survey the area. Obtain documentation of the survey and clearances in writing and signed by the party conducting the clearance. Maintain all documentation in the project file.

If the site owner (military installation or client) can provide the independent field survey, CH2M HILL or the subcontractor shall ensure that the survey includes:

- Physically walking the area to verify the work location and identify, locate, and mark underground utility locations:
- Having qualified staff available and instrumentation to conduct the locate;
- Agreeing to document the survey and clearances in writing.

Should any of the above criteria not be met, CH2M HILL or subcontractor must arrange for an alternate independent utility locate service to perform the survey.

The markings from utility surveys must be protected and preserved until the markings are no longer required. If the utility location markings are destroyed or removed before intrusive work commences or is completed, the PM, SC, or designee must notify the independent utility locate service or the designated local utility locating service to resurvey and remark the area.

### **Visual Assessment before and during Intrusive Activities**

Perform a "360 degree" assessment. Walk the area and inspect for utility-related items such as valve caps, previous linear cuts, patchwork in pavement, hydrants, manholes, utility vaults, drains, and vent risers in and around the dig area.

The visual survey shall include all surface landmarks, including manholes, previous liner cuts, patchwork in pavement, pad-mounted transformers, utility poles with risers, storm sewer drains, utility vaults, and fire hydrants.

If any unanticipated items are found, conduct further research before initiating intrusive activities and implement any actions needed to avoid striking the utility or obstruction.

### **Subsurface Activities within 5 feet of an Underground Utility or if there is Uncertainty**

When aggressive intrusive activities will be conducted within 5 feet (1.5 meters) of an underground utility or when there is uncertainty about utility locations, locations must be physically verified by non-aggressive means such as air or water knifing, hand digging, or human powered hand augering. Non-conductive tools must be used if electrical hazards may be present. If intrusive activities are within 5 feet (1.5 meters) and parallel to a marked existing utility, the utility location must be exposed and verified by non-aggressive methods every 100 feet (30.5 meters). Check to see if the utility can be isolated during intrusive work.

### **Intrusive Activities within 2 feet of an Underground Utility**

Use non-aggressive methods (hand digging, vacuum excavation, etc.) to perform intrusive activities within 2 feet of a high risk utility (i.e., a utility that cannot be de-energized or would cause significant impacts to repair/replace). Hazardous utilities shall be de-energized whenever possible.

### **Spotter**

A spotter shall be used to monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon, presence of pea gravel or sand in soils, presence of concrete or other debris in soils, refusal of auger or excavating equipment). If any suspicious conditions are encountered stop work immediately and contact the PM or RHSM to evaluate the situation. The spotter must have a method to alert an operator to stop the intrusive activity (e.g., air horn, hand signals).

## **9.19 Utilities (overhead)**

### **Proximity to Power Lines**

No work is to be conducted within 50 feet (15.2 meters) of overhead power lines without first contacting the utility company to determine the voltage of the system. No aspect of any piece of equipment is to be operated within 50 feet (15.2 meters) of overhead power lines without first making this determination.

**Operations adjacent to overhead power lines are PROHIBITED unless one of the following conditions is satisfied:**

- Power has been shut off, positive means (such as lockout) have been taken to prevent the lines from being energized, lines have been tested to confirm the outage, and the utility company has provided a signed certification of the outage.
- The minimum clearance from energized overhead lines is as shown in the table below, or the equipment will be repositioned and blocked to ensure that no part, including cables, can come within the minimum clearances shown in the table.

### MINIMUM DISTANCES FROM POWERLINES

Powerlines Nominal System Kv	Minimum Required Distance, Feet (Meters)
0-50	10 (3.0)
51-100	12 (3.7)
101-200	15 (4.6)
201-300	20 (6.1)
301-500	25 (7.6)
501-750	35 (10.7)
751-1000	45 (13.7)

*(These distances have been determined to eliminate the potential for arcing based on the line voltage.)*

- The power line(s) has been isolated through the use of insulating blankets which have been properly placed by the utility. If insulating blankets are used, the utility will determine the minimum safe operating distance; get this determination in writing with the utility representative's signature.
- All inquiries regarding electric utilities must be made in writing and a written confirmation of the outage/isolation must be received by the PM prior to the start of work.

## 9.20 Visible Lighting

Lighting shall be evaluated when conducting work inside buildings, confined spaces, or other areas/instances where supplemental light may be needed (e.g., work before sunrise or after sunset). A light meter can be used to evaluate the adequacy of lighting. The following are common requirements for lighting and the conditions/type of work being performed.

- While work is in progress outside construction areas shall have at least 33 lux (lx).
- Construction work conducted inside buildings should be provided with at least 55 lux light.
- The means of egress shall be illuminated with emergency and non-emergency lighting to provide a minimum 11 lx measured at the floor. Egress illumination shall be arranged so that the failure of any single lighting unit, including the burning out of an electric bulb will not leave any area in total darkness.

## 9.21 Working Around Material Handling Equipment

When CH2M HILL personnel are exposed to material handling equipment, the following safe work practices/hazard controls shall be implemented:

- Never approach operating equipment from the rear. Always make positive contact with the operator, and confirm that the operator has stopped the motion of the equipment.
- Never approach the side of operating equipment; remain outside of the swing and turning radius.
- Maintain distance from pinch points of operating equipment.
- Never turn your back on any operating equipment.
- Never climb onto operating equipment or operate contractor/subcontractor equipment.
- Never ride contractor/subcontractor equipment unless it is designed to accommodate passengers and equipped with firmly attached passenger seat.
- Never work or walk under a suspended load.

- Never use equipment as a personnel lift; do not ride excavator buckets or crane hooks.
- Always stay alert and maintain a safe distance from operating equipment, especially equipment on cross slopes and unstable terrain.

## 9.22 Working Alone

(Reference CH2M HILL Core Standard, *Working Alone*)

Personnel can only be tasked to work alone by the Project Manager who shall assess potential hazards and appropriate control measures, with assistance from the Responsible Health and Safety Manager (RHSM).

“Lone workers” with an accountability system in place is permitted, depending on the hazards presented during the execution of the task. Reference the “Lone Worker Protocol” included as an attachment to this HSP.

The employee shall at all times be equipped with a working voice communication device such as a cellular phone or two-way radio to check-in to their project contact (s) at pre-determined times.

Call in contact name:	•
Phone numbers (office and cell):	•

Check-in or contact times must be based on the risk associated with the task, or the timeframe expected to complete the task, but at a minimum of at least two times during an 8 hour work shift.

Call in contact Form shall be completed by lone worker and given to call in contact prior to going into the field. Refer to the “Lone Worker Protocol” attached to this HSP.

Work tasks will cease if communication is lost during work day. Work may resume when communication is re-established.

## 10.0 Physical Hazards and Controls

### 10.1 Noise

(Reference CH2M HILL SOP HSE-108, *Hearing Conservation*)

CH2M HILL is required to control employee exposure to occupational noise levels of 85 decibels, A-weighted, (dBA) and above by implementing a hearing conservation program that meets the requirements of the OSHA Occupational Noise Exposure standard, 29 CFR 1910.95. A noise assessment may be conducted by the RHSM or designee based on potential to emit noise above 85 dBA and also considering the frequency and duration of the task.

- Areas or equipment emitting noise at or above 90dBA shall be evaluated to determine feasible engineering controls. When engineering controls are not feasible, administrative controls can be developed and appropriate hearing protection will be provided.
- Areas or equipment emitting noise levels at or above 85 dBA, hearing protection must be worn.
- Employees exposed to 84 dBA or a noise dose of 50% must participate in the Hearing Conservation program including initial and annual (as required) audiograms.
- The RHSM will evaluate appropriate controls measures and work practices for employees who have experienced a standard threshold shift (STS) in their hearing.
- Employees who are exposed at or above the action level of 85 dBA are required to complete the online Noise Training Module located on CH2M HILL's virtual office.
- Hearing protection will be maintained in a clean and reliable condition, inspected prior to use and after any occurrence to identify any deterioration or damage, and damaged or deteriorated hearing protection repaired or discarded.
- In work areas where actual or potential high noise levels are present at any time, hearing protection must be worn by employees working or walking through the area.
- Areas where tasks requiring hearing protection are taking place may become hearing protection required areas as long as that specific task is taking place.
- High noise areas requiring hearing protection should be posted or employees must be informed of the requirements in an equivalent manner.

### 10.2 Ultraviolet Radiation (sun exposure)

Health effects regarding ultraviolet (UV) radiation are confined to the skin and eyes. Overexposure can result in many skin conditions, including erythema (redness or sunburn), photoallergy (skin rash), phototoxicity (extreme sunburn acquired during short exposures to UV radiation while on certain medications), premature skin aging, and numerous types of skin cancer. Implement the following controls to avoid sunburn.

#### Limit Exposure Time

- Rotate staff so the same personnel are not exposed all of the time.
- Limit exposure time when UV radiation is at peak levels (approximately 2 hours before and after the sun is at its highest point in the sky).
- Avoid exposure to the sun, or take extra precautions when the UV index rating is high.

## Provide Shade

- Take lunch and breaks in shaded areas.
- Create shade or shelter through the use of umbrellas, tents, and canopies.
- Fabrics such as canvas, sailcloth, awning material and synthetic shade cloth create good UV radiation protection.
- Check the UV protection of the materials before buying them. Seek protection levels of 95 percent or greater, and check the protection levels for different colors.

## Clothing

- Reduce UV radiation damage by wearing proper clothing; for example, long sleeved shirts with collars, and long pants. The fabric should be closely woven and should not let light through.
- Head protection should be worn to protect the face, ears, and neck. Wide-brimmed hats with a neck flap or “Foreign Legion” style caps offer added protection.
- Wear UV-protective sunglasses or safety glasses. These should fit closely to the face. Wrap-around style glasses provide the best protection.

## Sunscreen

- Apply sunscreen generously to all exposed skin surfaces at least 20 minutes before exposure, allowing time for it to adhere to the skin.
- Re-apply sunscreen at least every 2 hours, and more frequently when sweating or performing activities where sunscreen may be wiped off.
- Choose a sunscreen with a high sun protection factor (SPF). Most dermatologists advocate SPF 30 or higher for significant sun exposure.
- Waterproof sunscreens should be selected for use in or near water, and by those who perspire sufficiently to wash off non-waterproof products.
- Check for expiration dates, because most sunscreens are only good for about 3 years. Store in a cool place out of the sun.
- No sunscreen provides 100 percent protection against UV radiation. Other precautions must be taken to avoid overexposure.

## 10.3 Temperature Extremes

Each employee is responsible for the following:

- Recognizing the symptoms of heat or cold stress;
- Taking appropriate precautionary measures to minimize their risk of exposure to temperature extremes (see following sections); and
- Communicating any concerns regarding heat and cold stress to their supervisor or SC.

### 10.3.1 Heat

Heat-related illnesses are caused by more than just temperature and humidity factors.

**Physical fitness** influences a person's ability to perform work under heat loads. At a given level of work, the more fit a person is, the less the physiological strain, the lower the heart rate, the lower the

body temperature (indicates less retained body heat – a rise in internal temperature precipitates heat injury), and the more efficient the sweating mechanism.

**Acclimatization** is the degree to which a worker's body has physiologically adjusted or acclimatized to working under hot conditions. Acclimatization affects their ability to do work. Acclimatized individuals sweat sooner and more profusely than un-acclimatized individuals. Acclimatization occurs gradually over 1 to 2 weeks of continuous exposure, but it can be lost in as little as 3 days in a cooler environment.

**Dehydration** reduces body water volume. This reduces the body's sweating capacity and directly affects its ability to dissipate excess heat.

The ability of a body to dissipate heat depends on the ratio of its surface area to its mass (surface area/ weight). **Heat dissipation** is a function of surface area, while heat production depends on body mass. Therefore, overweight individuals (those with a low ratio) are more susceptible to heat-related illnesses because they produce more heat per unit of surface area than if they were thinner. Monitor these persons carefully if heat stress is likely.

When wearing **impermeable clothing**, the weight of an individual is not as important in determining the ability to dissipate excess heat because the primary heat dissipation mechanism, evaporation of sweat, is ineffective.

SYMPTOMS AND TREATMENT OF HEAT STRESS					
	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool–but not cold–water. Call ambulance, and get medical attention immediately!

### Precautions

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°Fahrenheit (10 degrees Celsius [C]) to 60°Fahrenheit (F) (15.6 degrees C) should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons (7.5 liters) per day. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours.
- Acclimate yourself by slowly increasing workloads (do not begin with extremely demanding activities).
- Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.

- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
- Provide adequate shade to protect personnel against radiant heat (sun, flames, hot metal).
- Maintain good hygiene standards by frequently changing clothing and showering.
- Observe one another for signs of heat stress. PREVENTION and communication is key.

### Thermal Stress Monitoring

The following procedures should be implemented when the ambient air temperature exceeds 70° F (21 degrees C), the relative humidity is high (greater than 50 percent), or when the workers exhibit symptoms of heat stress.

- The heart rate should be measured by the radial pulse for 30 seconds, as early as possible in the resting period.
- The heart rate at the beginning of the rest period should not exceed 110 beats per minute, or 20 beats per minute above resting pulse.
- If the heart rate is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same.
- If the pulse rate still exceeds 110 beats per minute at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent.
- Continue this procedure until the rate is maintained below 110 beats per minute, or 20 beats per minute above resting pulse.
- Alternately, the oral temperature can be measured before the workers have something to drink.
- If the oral temperature exceeds 99.6 degrees F (37.6 degrees C) at the beginning of the rest period, the following work cycle should be shortened by 33 percent.
- Continue this procedure until the oral temperature is maintained below 99.6 degrees F (37.6 degrees C). While an accurate indication of heat stress, oral temperature is difficult to measure in the field.

### 10.3.2 Cold

#### General

Low ambient temperatures increase the heat lost from the body to the environment by radiation and convection. In cases where the worker is standing on frozen ground, the heat loss is also due to conduction.

Wet skin and clothing, whether because of water or perspiration, may conduct heat away from the body through evaporative heat loss and conduction. Thus, the body cools suddenly when chemical protective clothing is removed if the clothing underneath is perspiration soaked.

Movement of air across the skin reduces the insulating layer of still air just at the skin's surface. Reducing this insulating layer of air increases heat loss by convection.

Non-insulating materials in contact or near-contact with the skin, such as boots constructed with a metal toe or shank, conduct heat rapidly away from the body.

Certain common drugs, such as alcohol, caffeine, or nicotine, may exacerbate the effects of cold, especially on the extremities. These chemicals reduce the blood flow to peripheral parts of the body, which are already high-risk areas because of their large surface area to volume ratios. These substances may also aggravate an already hypothermic condition.

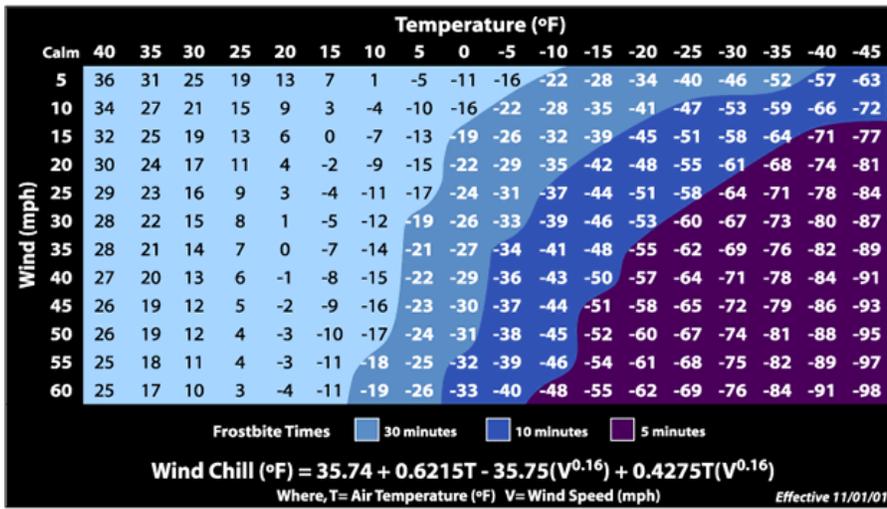
### Precautions

- Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in wet weather.
- Consider monitoring the work conditions and adjusting the work schedule using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- Wind-Chill Index (below) is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.
- NSC Guidelines for Work and Warm-Up Schedules can be used with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; workers should be monitored for symptoms of cold-related illnesses. If symptoms are not observed, the work duration can be increased.
- Persons who experience initial signs of immersion foot, frostbite, and/or hypothermia should report it immediately to their supervisor/PM to avoid progression of cold-related illness.
- Observe one another for initial signs of cold-related disorders.
- Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

SYMPTOMS AND TREATMENT OF COLD STRESS			
	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm—but <b>not</b> hot–water. Have victim drink warm fluids, but <b>not</b> coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but <b>not</b> coffee or alcohol. Get medical attention.



# Wind Chill Chart



## 10.4 Radiological Hazards

Refer to CH2M HILL's Core Standard, Radiological Control and Radiological Controls Manual for additional requirements.

### Hazards

None Known

### Controls

None Required

## 11.0 Biological Hazards and Controls

Biological hazards are everywhere and change with the region and season. If you encounter a biological hazard that has not been identified in this plan, contact the RHSM so that a revision to this plan can be made. Whether it is contact with a poisonous plant, a poisonous snake, or a bug bite, do not take bites or stings lightly. If there is a chance of an allergic reaction or infection, or to seek medical advice on how to properly care for the injury, contact the occupational nurse at 1-866-893-2514.

### 11.1 Bees and Other Stinging Insects

Bees and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform your supervisor and/or a buddy. If you are stung, contact the occupational nurse at 1-866-893-2514. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for an allergic reaction if you have never been stung before. Call 911 if the reaction is severe.

### 11.2 Bird Droppings

Large amounts of bird droppings may present a disease risk. The best way to prevent exposure to fungus spores in bird droppings is to avoid disturbing it. A brief inhalation exposure to highly contaminated dust may be all that is needed to cause infection and subsequent development of fungal disease.

If disturbing the droppings or if removal is necessary to perform work, follow these controls:

- Use dust control measures (wetting with water or HEPA vacuuming) for all activities that may generate dust from the accumulated droppings.
- Wear Tyvek with hoods, disposable gloves and booties, and air-purifying respirators with a minimum N95 rating.
- Put droppings into plastic/poly bags and preferably into a 55-gallon drum to prevent bag from ripping.

### 11.3 Feral Dogs

Avoid all dogs – both leashed and stray. Do not disturb a dog while it is sleeping, eating, or caring for puppies. If a dog approaches to sniff you, stay still. An aggressive dog has a tight mouth, flattened ears and a direct stare. If you are threatened by a dog, remain calm, do not scream and avoid eye contact. If you say anything, speak calmly and firmly. Do not turn and run, try to stay still until the dog leaves, or back away slowly until the dog is out of sight or you have reached safety (e.g. vehicle). If attacked, retreat to vehicle or attempt to place something between you and the dog. If you fall or are knocked to the ground, curl into a ball with your hands over your head and neck and protect your face. If bitten, contact the occupational nurse at 1-866-893-2514. Report the incident to the local authorities.

### 11.4 Mosquito Bites

Due to the recent detection of the West Nile Virus in the southwestern United States it is recommended that preventative measures be taken to reduce the probability of being bitten by mosquitoes whenever possible. Mosquitoes are believed to be the primary source for exposure to the West Nile Virus as well as several other types of encephalitis. The following guidelines should be followed to reduce the risk of these concerns for working in areas where mosquitoes are prevalent:

- Stay indoors at dawn, dusk, and in the early evening;

- Wear long-sleeved shirts and long pants whenever you are outdoors;
- Spray clothing with repellents containing permethrin or N,N-diethyl-meta-toluamide (DEET) since mosquitoes may bite through thin clothing;
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35% DEET. Repellents may irritate the eyes and mouth, so avoid applying repellent to the hands; and
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's DIRECTIONS FOR USE, as printed on the product.

Vitamin B and "ultrasonic" devices are NOT effective in preventing mosquito bites.

### Symptoms of Exposure to the West Nile Virus

Most infections are mild, and symptoms include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death.

The West Nile Virus incubation period is from 3 to 15 days.

Contact the project RHSM with questions, and immediately report any suspicious symptoms to your supervisor, PM, and contact the occupational nurse at 1-866-893-2514.

### 11.5 Poison Ivy, Poison Oak, and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Shrubs are usually 12 to 30 inches high, or can also be a tree-climbing vine, with triple leaflets and short, smooth hair underneath. Plants are red and dark green in spring and summer, with yellowing leaves anytime especially in dry areas. Leaves may achieve bright reds in fall, but plants lose its (yellowed, then brown) leaves in winter, leaving toxic stems. All parts of the plant remain toxic throughout the seasons. These plants contain urushiol a colorless or pale yellow oil that oozes from any cut or crushed part of the plant, including the roots, stems and leaves and causes allergic skin reactions when contacted. The oil is active year round.

Become familiar with the identity of these plants (see below). Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

*Poison Ivy*



*Poison Sumac*



*Poison Oak*



Contamination with poison ivy, sumac or oak can happen through several pathways, including:

- Direct skin contact with any part of the plant (even roots once above ground foliage has been removed).
- Contact with clothing that has been contaminated with the oil.
- Contact from removing shoes that have been contaminated (shoes are coated with urishol oil).
- Sitting in a vehicle that has become contaminated.
- Contact with any objects or tools that have become contaminated.
- Inhalation of particles generated by weed whacking, chipping, vegetation clearing.

If you must work on a site with poison ivy, sumac or oak the following precautions are necessary:

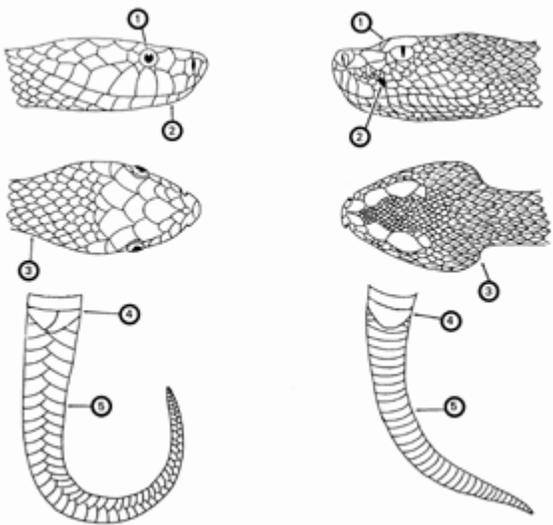
- Do not drive vehicles onto the site where it will come into contact with poison ivy, sumac or oak. Vehicles which need to work in the area, such as drill rigs or heavy equipment must be washed as soon as possible after leaving the site.
- All tools used in the poison ivy, sumac or oak area, including those used to cut back poison oak, surveying instruments used in the area, air monitoring equipment or other test apparatus must be decontaminated before they are placed back into the site vehicle. If on-site decontamination is not possible, use plastic to wrap any tools or equipment until they can be decontaminated.
- Personal protective equipment, including Tyvek coveralls, gloves, and boot covers must be worn. PPE must be placed into plastic bags and sealed if they are not disposed immediately into a trash receptacle.
- As soon as possible following the work, shower to remove any potential contamination. Any body part with suspected or actual exposure should be washed with Zanfel, Tecnu or other product designed for removing urushiol. If you do not have Zanfel or Tecnu wash with cold water. Do not take a bath, as the oils can form an invisible film on top of the water and contaminate your entire body upon exiting the bath.
- Tecnu may also be used to decontaminate equipment.
- Use IvyBlock or similar products to prevent poison oak, ivy and sumac contamination. Check with the closest CH2M HILL warehouse to see if these products are available. Follow all directions for application.

If you do come into contact with one of these poisonous plants and a reaction develops, contact your supervisor and the occupational nurse 1-866-893-2514.

## 11.6 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Call the occupational nurse at 1-866-893-2514 immediately. Do not apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings. Below is a guide to identifying poisonous snakes from non-poisonous snakes.

## Identification of Poisonous Snakes

Major Identification Features Non-venomous Snake	Major Identification Features Venomous Snake
<ol style="list-style-type: none"> <li>1. Round pupils</li> <li>2. No sensing pit</li> <li>3. Head slightly wider than neck</li> <li>4. Divided anal plate</li> <li>5. Double row of scales on the underside of the tail</li> </ol>	<ol style="list-style-type: none"> <li>1. Elliptical pupils</li> <li>2. Sensing pit between eye and nostril</li> <li>3. Head much wider than neck</li> <li>4. Single anal plate</li> <li>5. Single scales on the underside of the tail</li> </ol>
	

### 11.7 Spiders - Brown Recluse and Widow

The Brown Recluse spider can be found most anywhere in the United States. It varies in size in shape, but the distinguishing mark is the violin shape on its body. They are typically non-aggressive. Keep an eye out for irregular, pattern-less webs that sometimes appear almost tubular built in a protected area such as in a crevice or between two rocks. The spider will retreat to this area of the web when threatened.

The Black Widow, Red Widow and the Brown Widow are all poisonous. Most have globose, shiny abdomens that are predominantly black with red markings (although some may be pale or have lateral stripes), with moderately long, slender legs. These spiders are nocturnal and build a three-dimensional tangled web, often with a conical tent of dense silk in a corner where the spider hides during the day.

#### Hazard Controls

- Inspect or shake out any clothing, shoes, towels, or equipment before use.
- Wear protective clothing such as a long-sleeved shirt and long pants, hat, gloves, and boots when handling stacked or undisturbed piles of materials.
- Minimize the empty spaces between stacked materials.
- Remove and reduce debris and rubble from around the outdoor work areas.

- Trim or eliminate tall grasses from around outdoor work areas.
- Store apparel and outdoor equipment in tightly closed plastic bags.
- Keep your tetanus boosters up-to-date (every 10 years). Spider bites can become infected with tetanus spores.

If you think you have been bit by a poisonous spider, immediately call the occupational nurse at 1-866-893-2514 and follow the guidance below:

- Remain calm. Too much excitement or movement will increase the flow of venom into the blood;
- Apply a cool, wet cloth to the bite or cover the bite with a cloth and apply an ice bag to the bite;
- Elevate the bitten area, if possible;
- Do not apply a tourniquet. Do not try to remove venom; and
- Try to positively identify the spider to confirm its type. If the spider has been killed, collect it in a plastic bag or jar for identification purposes. Do not try to capture a live spider – especially if you think it is a poisonous spider.

Black Widow



Red Widow



Brown Widow



Brown Recluse



## 11.8 Scorpions

Scorpions usually hide during the day and are active at night. They may be hiding under rocks, wood, or anything else lying on the ground. Some species may also burrow into the ground. Most scorpions live in dry, desert areas; however, some species can be found in grasslands, forests, and inside caves.

When entering an area that has the potential to contain scorpions, the following PPE is recommended: long pants, long sleeved shirts with collars, leather work gloves and leather work boots. Reaching into enclosures or recesses without prior visual inspection is not recommended. Thoroughly inspect each area before accessing. Shake out clothing, jackets, shoes or boots prior to putting them on.

If you are stung by a scorpion, call the occupational nurse 1-866-893-2514 and try to note the description of the scorpion. Cleanse the sting area and apply ice.



## 11.9 Ticks

Every year employees are exposed to tick bites at work and at home putting them at risk of illness. Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch (6.4 mm) in size.

In some geographic areas exposure is not easily avoided. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray only outside of clothing with permethrin or permethrin and spray skin with only DEET; and check yourself frequently for ticks.

Where site conditions (vegetation above knee height, tick endemic area) or when tasks (e.g., having to sit or kneel in vegetation) diminish the effectiveness of the other controls mentioned above, bug-out suits (check with your local or regional warehouse) or Tyvek shall be used. Bug-out suits are more breathable than Tyvek.

Take precautions to avoid exposure by including pre-planning measures for biological hazards prior to starting field work. Avoid habitats where possible, reduce the abundance through habitat disruption or application of acaricide. If these controls aren't feasible, contact your local or regional warehouse for preventative equipment such as repellants, protective clothing and tick removal kits. Use the buddy system and perform tick inspections prior to entering the field vehicle. If ticks were not planned to be encountered and are observed, do not continue field work until these controls can be implemented.

See Tick Fact Sheet attached to this HSP for further precautions and controls to implement when ticks are present. If bitten by a tick, follow the removal procedures found in the tick fact sheet, and call the occupational nurse at 1-866-893-2514.

Be aware of the symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme disease is a rash that might appear that looks like a bullseye with a small welt in the center. RMSF is a rash of red spots under the skin 3 to 10 days after the tick bite. In both RMSF and Lyme disease, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, again contact the occupational nurse at 1-866-893-2514.

Be sure to complete an Incident Report (either use the Hours and Incident Tracking System [HITS] system on the VO) if you do come in contact with a tick.

## 12.0 Contaminants of Concern

The table below summarizes the potential contaminants of concern (COC) and their occupational exposure limit and signs and symptoms of exposure. The table also includes the maximum concentration of each COC and the associated location and media that was sampled (groundwater, soil boring, surface soil). These concentrations were used to determine engineering and administrative controls described in the "Project-Specific Hazard Controls" section of this HSP, as well as PPE and site monitoring requirements.

Contaminants of Concern					
Contaminant	Location and Maximum <sup>a</sup> Concentration (ppm)	Exposure Limit <sup>b</sup>	IDLH <sup>c</sup>	Symptoms and Effects of Exposure	PIP <sup>d</sup> (eV)
Antimony	GW: SB: SS:	0.5 mg/m <sup>3</sup>	50 mg/m <sup>3</sup>	Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly	NA
Arsenic	GW: SB: SS:	0.01 mg/m <sup>3</sup>	5 Ca	Ulceration of nasal septum, respiratory irritation, dermatitis, gastrointestinal disturbances, peripheral neuropathy, hyperpigmentation	NA
2,4-Dinitrotoluene	GW: SB: SS:	1.5 mg/m <sup>3</sup>	50 mg/m <sup>3</sup>	Anoxia, cyanosis; anemia, jaundice; reproductive effects; [potential occupational carcinogen]	UK
Bis-(2-ethylhexyl)phthalate (DEHP, DOP)	GW: SB: SS:	5 mg/m <sup>3</sup>	5,000 Ca	Eye and mucous membrane irritant	UK
Lead	GW: SB: SS:	0.05 mg/m <sup>3</sup>	100	Weakness lassitude, facial pallor, pal eye, weight loss, malnutrition, abdominal pain, constipation, anemia, gingival lead line, tremors, paralysis of wrist and ankles, encephalopathy, kidney disease, irritated eyes, hypertension	NA
Mercury	GW: SB: SS:	0.05 mg/m <sup>3</sup>	10	Skin and eye irritation, cough, chest pain, difficult breathing, bronchitis, pneumonitis, tremors, insomnia, irritability, indecision, headache, fatigue, weakness, GI disturbance	
PNAs (Limits as Coal Tar Pitch)	GW: SB: SS:	02 mg/m <sup>3</sup>	80 Ca	Dermatitis and bronchitis	UK
Lead	GW: SB: SS:	0.05 mg/m <sup>3</sup>	100	Weakness lassitude, facial pallor, pal eye, weight loss, malnutrition, abdominal pain, constipation, anemia, gingival lead line, tremors, paralysis of wrist and ankles, encephalopathy, kidney disease, irritated eyes, hypertension	NA
Footnotes:					
<sup>a</sup> Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), SS (Surface Soil), SL (Sludge), SW (Surface Water). <sup>b</sup> Appropriate value of permissible exposure limit (PEL), recommended exposure limit (REL), or threshold limit valute (TLV) listed. <sup>c</sup> IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen. <sup>d</sup> PIP = photoionization potential; NA = Not applicable; UK = Unknown.  eV = electron volt mg/kg = milligram per kilogram mg/m <sup>3</sup> = milligrams per cubic meter ug/m <sup>3</sup> = micrograms per cubic meter					
Potential Routes of Exposure					
<b>Dermal:</b> Contact with contaminated media. This route of exposure is minimized through use of engineering controls, administrative controls and proper use of PPE.		<b>Inhalation:</b> Vapors and contaminated particulates. This route of exposure is minimized through use of engineering controls, administrative controls and proper use of respiratory protection when other forms of control do not reduce the potential for exposure.		<b>Other:</b> Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking).	

# 13.0 Site Monitoring

(Reference CH2M HILL SOP HSE-207, *Exposure Monitoring for Airborne Chemical Hazards*)

When performing site monitoring, record all the information, such as in a field logbook. Note date and time, describe monitoring location (for example, in breathing zone, at source and site location), and what the reading is. If any action levels are reached, note it in the field logbook and note the action taken.

Exposure records (air sampling) must be preserved for the duration of employment plus thirty years. Ensure that copies of the field log book are maintained in the project file.

Copies of all project exposure records (e.g., copies of field logbook pages where air monitoring readings are recorded and associated calibration) shall be sent to the regional SPA for retention and maintained in the project files.

## 13.1 Direct Reading Monitoring Specifications

Instrument	Tasks	Action Levels <sup>a</sup>	Action to be Taken when Action Level reached	Frequency <sup>b</sup>	Calibration
<b>FID:</b> OVA model 128 or equivalent	Well installation	< 1 ppm	Level D	Initially and periodically during task	Daily
	Drilling/Boring	1 to 10 ppm	Level C		
	Ground water and soil sampling	> 10 ppm	Evacuate work area and contact HSM		
<b>CGI:</b> MSA model 260 or 261 or equivalent	Well installation	0-10% :	No explosion hazard	Continuous during advancement of boring or trench	Daily
	Drilling/Boring	10-25% LEL:	Potential explosion hazard		
	Ground water and soil sampling	>25% LEL:	Explosion hazard; evacuate or vent		
<b>O<sub>2</sub>Meter:</b> MSA model 260 or 261 or equivalent	Well installation	>25% <sup>c</sup> O <sub>2</sub> :	Explosion hazard; evacuate or vent	Continuous during advancement of boring or trench	Daily
	Drilling/Boring	20.9% <sup>c</sup> O <sub>2</sub> :	Normal O <sub>2</sub>		
	Ground water and soil sampling	<19.5% <sup>c</sup> O <sub>2</sub> :	O <sub>2</sub> deficient; evacuate work area and vent.		
<b>Detector Tubes:</b>  Arsenic  Methyl Chloride  Lead	All Intrusive Activities	B.G-0.5 ppm .5--5 ppm 5> ppm	Level D Level C Level B, Not Authorized, Evacuate and contact HSM	Periodically during task, when FID sustains a reading of 1PPM for 5 minutes	Not applicable
<b>Nose-Level Monitor<sup>d</sup></b>	All Heavy Equipment Operations	<85 dB(A)	No action required	Initially and periodically during task	Daily
		85-120 dB(A)	Hearing protection required		
		120 dB(A)	Stop; re-evaluate		

<sup>a</sup> Action levels apply to sustained breathing-zone measurements above background.

<sup>b</sup> The exact frequency of monitoring depends on field conditions and is to be determined by the SC; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate.

<sup>c</sup> If the measured percent of O<sub>2</sub> is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent O<sub>2</sub> action levels apply only to ambient working atmospheres, and not to confined-space entry. More-stringent percent LEL and O<sub>2</sub> action levels are required for confined-space entry.

<sup>d</sup>Noise monitoring and audiometric testing also required.

## 13.2 Calibration Specifications

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

<b>Instrument</b>	<b>Gas</b>	<b>Span</b>	<b>Reading</b>	<b>Method</b>
<b>FID:</b> OVA	100 ppm methane	3.0 ± 1.5	100 ppm	1.5 lpm reg T-tubing
<b>FID:</b> TVA 1000	100 ppm methane	NA	100 ppm	2.5 lpm reg T-tubing
<b>CGI:</b> MSA 260, 261, 360, or 361	0.75% pentane	N/A	50% LEL ± 5% LEL	1.5 lpm reg direct tubing

Calibrate air monitoring equipment daily (or prior to use) in accordance with the instrument's instructions. Document the calibration in the field logbook (or equivalent) and include the following information:

- Instrument name
- Serial Number
- Owner of instrument (for example, CH2M HILL, HAZCO)
- Calibration gas (including type and lot number)
- Type of regulator (for example, 1.5 lpm)
- Type of tubing (for example, direct or T-tubing)
- Ambient weather condition (for example, temperature and wind direction)
- Calibration/instrument readings
- Operator's name and signature
- Date and time

## 13.3 Integrated Personal Air Sampling

Sampling, in addition to real-time monitoring, may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the RHSM immediately if these contaminants are encountered.

### Method Description

Not Anticipated at this time

### Personnel and Areas

Results must be sent immediately to the RHSM. Regulations may require reporting to monitored personnel. Results reported to:

RHSM: Carl Woods/CIN

Other: Mark Orman/MKE

# 14.0 Personal Protective Equipment

(Reference CH2M HILL- SOP HSE-117, *Personal Protective Equipment*)

## 14.1 Required Personal Protective Equipment

PPE must be worn by employees when actual or potential hazards exist and engineering controls or administrative practices cannot adequately control those hazards.

A PPE assessment has been conducted by the RHSM based on project tasks (see PPE specifications below). Verification and certification of assigned PPE by task is completed by the RHSM that approved this plan. Below are items that need to be followed when using any form of PPE:

- Employees must be trained to properly wear and maintain the PPE;
- In work areas where actual or potential hazards are present at any time, PPE must be worn by employees working or walking through the area;
- Areas requiring PPE should be posted or employees must be informed of the requirements in an equivalent manner;
- PPE must be inspected prior to use and after any occurrence to identify any deterioration or damage;
- PPE must be maintained in a clean and reliable condition;
- Damaged PPE shall not be used and must either be repaired or discarded; and
- PPE shall not be modified, tampered with, or repaired beyond routine maintenance.

The table below outlines PPE to be used according to task based on project-specific hazard assessment. If a task other than the tasks described in this table needs to be performed, contact the RHSM so this table can be updated.

### Project-Specific Personal Protective Equipment Requirements<sup>a</sup>

Task	Level	Body	Head	Respirator <sup>b</sup>
General site entry Surveying Utility Locating	D	Work clothes; safety toed leather work boots and gloves	Hardhat <sup>c</sup> Safety glasses with side shields Ear protection <sup>d</sup>	None required
Surface soil sampling Geoprobe Boring/Drilling Groundwater Sampling	Modified D	Work clothes or cotton coveralls <b>Boots:</b> Safety-toe, chemical-resistant boots OR Safety -toe, leather work boots with outer rubber boot covers <b>Gloves:</b> Outer chemical-resistant nitrile gloves.	Hardhat <sup>c</sup> Safety glasses with side shields Ear protection <sup>d</sup>	None required
Work near vehicular traffic ways or earth moving equipment.	All	Appropriate level of ANSI/ISEA 107-2004 high-visibility safety vests.	Work near vehicular traffic ways or earth moving equipment.	
Equipment decontamination if using pressure washer	Modified D with splash protection	<b>Coveralls:</b> Polycoated Tyvek® <b>Boots:</b> 16-inch-high steel-toed rubber boots <b>Gloves:</b> Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat <sup>c</sup> Splash shield <sup>c</sup> over safety glasses with side shields or splash goggles Ear protection <sup>d</sup>	None required.

Tasks requiring upgrade	C	<b>Coveralls:</b> Polycoated Tyvek® <b>Boots:</b> Safety -toe, chemical-resistant boots OR Safety -toe, leather work boots with outer rubber boot covers <b>Gloves:</b> Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat <sup>c</sup> Splash shield <sup>c</sup> Ear protection <sup>d</sup> Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; GME-H cartridges or equivalent <sup>e</sup> .
Tasks requiring upgrade	B	<b>Coveralls:</b> Polycoated Tyvek® <b>Boots:</b> Safety -toe, chemical-resistant boots OR Safety -toe, leather work boots with outer rubber boot covers <b>Gloves:</b> Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat <sup>c</sup> Splash shield <sup>c</sup> Ear protection <sup>d</sup> Spectacle inserts	Positive-pressure demand self-contained breathing apparatus (SCBA); MSA Ultralite, or equivalent.

## Reasons for Upgrading or Downgrading Level of Protection (with approval of the RHSM)

Upgrade <sup>f</sup>	Downgrade
<ul style="list-style-type: none"> <li>Request from individual performing tasks.</li> <li>Change in work tasks that will increase contact or potential contact with hazardous materials.</li> <li>Occurrence or likely occurrence of gas or vapor emission.</li> <li>Known or suspected presence of dermal hazards.</li> <li>Instrument action levels in the “Site Monitoring” section exceeded.</li> </ul>	<ul style="list-style-type: none"> <li>New information indicating that situation is less hazardous than originally thought.</li> <li>Change in site conditions that decrease the hazard.</li> <li>Change in work task that will reduce contact with hazardous materials.</li> </ul>

<sup>a</sup> Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

<sup>b</sup> No facial hair that would interfere with respirator fit is permitted.

<sup>c</sup> Hardhat and splash-shield areas are to be determined by the SC.

<sup>d</sup> Ear protection should be worn when conversations cannot be held at distances of 3 feet (1 meter) or less without shouting.

<sup>e</sup> See cartridge change-out schedule.

<sup>f</sup> Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the RHSM, and an SC qualified at that level is present.

## 14.2 Respiratory Protection

(Reference CH2M HILL SOP HSE-121, *Respiratory Protection*)

Implement the following when using respiratory protection:

- Respirator users must have completed appropriate respirator training within the past 12 months. Level C training is required for air-purifying respirators (APR) use and Level B training is required for supplied-air respirators (SAR) and self-contained breathing apparatus (SCBA) use. Specific training is required for the use of powered air-purifying respirators (PAPR).
- Respirator users must complete the respirator medical monitoring protocol and been approved for the specific type of respirator to be used.
- Tight-fitting facepiece respirator (negative or positive pressure) users must have passed an appropriate fit test within past 12 months.
- Respirator use shall be limited to those activities identified in this plan. If site conditions change that alters the effectiveness of the specified respiratory protection, the RHSM shall be notified to amend the written plan.
- Tight-fitting facepiece respirator users shall be clean-shaven and shall perform a user seal check before each use.

- Canisters/cartridges shall be replaced according to the change-out schedule specified in this plan. Respirator users shall notify the SC or RHSM of any detection of vapor or gas breakthrough. The SC shall report any breakthrough events to the RHSM for schedule upgrade.
- Respirators in regular use shall be inspected before each use and during cleaning
- Respirators in regular use shall be cleaned and disinfected as often as necessary to ensure they are maintained in a clean and sanitary condition.
- Respirators shall be properly stored to protect against contamination and deformation.
- Field repair of respirators shall be limited to routine maintenance. Defective respirators shall be removed from service.
- When breathing air is supplied by cylinder or compressor, the SC or RHSM shall verify the air meets Grade D air specifications.
- The SC or designee shall complete the H&S Self-Assessment Checklist – Respiratory Protection included in as attachment to this plan to verify compliance with CH2M HILL’s respiratory protection program.

### Respirator Change-Out Schedule

Contaminant	Change-Out Schedule
Methylene Chloride	Canisters may only be used for emergency escape and must be replaced after use

## 15.0 Worker Training and Qualification

### 15.1 CH2M HILL Worker Training

(Reference CH2M HILL SOP HSE-110, *Training*)

#### 15.1.1 Hazardous Waste Operations Training

All employees engaging in hazardous waste operations or emergency response shall receive appropriate training as required by 29 CFR 1910.120 and 29 CFR 1926.65. At a minimum, the training shall have consisted of instruction in the topics outlined in 29 CFR 1910.120 and 29 CFR 1926.65. Personnel who have not met these training requirements shall not be allowed to engage in hazardous waste operations or emergency response activities.

##### 15.1.1.1 Initial Training

General site workers engaged in hazardous waste operations shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations, unless otherwise noted in the above-referenced standards.

Employees who may be exposed to health hazards or hazardous substances at treatment, storage, and disposal (TSD) operations shall receive a minimum of 24 hours of initial training to enable the employee to perform their assigned duties and functions in a safe and healthful manner.

Employees engaged in emergency response operations shall be trained to the level of required competence in accordance with 29 CFR 1910.120.

##### 15.1.1.2 Three-Day Actual Field Experience

General site workers for hazardous waste operations shall have received three days of actual experience (on-the-job training) under the direct supervision of a trained, qualified supervisor and shall be documented. If the field experience has not already been received and documented at a similar site, this supervised experience shall be accomplished and documented at the beginning of the assignment of the project.

##### 15.1.1.3 Refresher Training

General site workers and TSD workers shall receive 8-hours of refresher training annually (within the previous 12-month period) to maintain qualifications for fieldwork. Employees engaged in emergency response operations shall receive annual refresher training of sufficient content and duration to maintain their competencies or shall demonstrate competency in those areas at least annually.

##### 15.1.1.4 Eight-Hour Supervisory Training

On site management or supervisors who will be directly responsible for, or supervise employees engaged in hazardous waste site operations, will have received at least 8 hours of additional specialized training on managing such operations. Employees designated as Safety Coordinator – Hazardous Waste are considered 8-hour HAZWOPER Site Safety Supervisor trained.

### 15.1.2 First Aid/Cardiopulmonary Resuscitation

First aid and CPR training consistent with the requirements of a nationally recognized organization such as the American Red Cross Association or National Safety Council shall be administered by a certified trainer. A minimum of two personnel per active field operation will have first aid and CPR training. Bloodborne pathogen training located on CH2M HILL's Virtual Office is also required for those designated as first aid/CPR trained.

### 15.1.3 Safety Coordinator Training

SCs are trained to implement the HSE program on CH2M HILL field projects. A qualified SC is required to be identified in the site-specific HSP for CH2M HILL field projects. SCs must also meet the requirements of the worker category appropriate to the type of field project (construction or hazardous waste). In addition, the SCs shall have completed additional safety training required by the specific work activity on the project that qualifies them to implement the HSE program (for example, fall protection, excavation).

### 15.1.4 Site-Specific Training

Prior to commencement of field activities, all field personnel assigned to the project will have completed site-specific training that will address the contents of applicable HSPs, including the activities, procedures, monitoring, and equipment used in the site operations. Site-specific training will also include site and facility layout, potential hazards, risks associated with identified emergency response actions, and available emergency services. This training allows field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and work operations for their particular activity.

### 15.1.5 Project-Specific Training Requirements

Project-specific training for this project includes:

- Training on CH2M HILL HSP and AHAs;
- Training on subcontractor AHAs;
- Qualified drill rig operator (subcontractor);
- Excavation Competent Person Training (subcontractor);

The training listed below is required computer-based training located on CH2M HILL's Virtual Office (VO) at

[https://www.int.ch2m.com/safety%5Fcounts/Training/Computer\\_Based\\_Courses.asp](https://www.int.ch2m.com/safety%5Fcounts/Training/Computer_Based_Courses.asp)

- Lifting training (part of new employee orientation training or available on the Virtual Office);
- Noise training (on the Virtual Office)

## 16.0 Medical Surveillance and Qualification

All site workers participating in hazardous waste operations or emergency response will maintain an adequate medical surveillance program in accordance with 29 CFR 1910.120 or 29 CFR 1926.65 and other applicable OSHA standards. Documentation of employee medical qualification (e.g., physician's written opinion) will be maintained in the project files and made available for inspection.

### 16.1 Hazardous Waste Operations and Emergency Response

CH2M HILL personnel expected to participate in on site hazardous waste operations or emergency response are required to have a current medical qualification for performing this work. Medical qualification shall consist of a qualified physician's written opinion regarding fitness for duty at a hazardous waste site, including any recommended limitations on the employee's assigned work. The physician's written opinion shall state whether the employee has any detected medical conditions that would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use.

### 16.2 Job or Site-Specific Medical Surveillance

Due to the nature of hazards for a particular job or work site, specialized medical surveillance may be necessary. This surveillance could include biological monitoring for specific compounds, or specialized medical examinations.

- N/A

### 16.3 Respirator User Qualification

Personnel required to wear respirators must have a current medical qualification to wear respirators. Medical qualification shall consist of a qualified physician's written opinion regarding the employee's ability to safely wear a respirator in accordance with 29 CFR 1910.134.

### 16.4 Hearing Conservation

Personnel working in hazardous waste operations or operations that fall under 29 CFR 1910.95 and exposed to noise levels in excess of the 85dBA time-weighted average shall be included in a hearing conservation program that includes annual audiometric testing.

## 17.0 Site-Control Plan

### 17.1 Site-Control Procedures

(Reference CH2M HILL SOP HSE-218, *Hazardous Waste Operations*)

- The SC will implement site control procedures.
- The SC will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of HSP, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
- The SC records attendance at safety briefings in a logbook and documents the topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location in accordance with CH2M HILL Core Standard, *OSHA Postings*.
- Establish support, contamination reduction, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
  - Line-of-sight and hand signals
  - Air horn
  - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the “buddy system.”
- Initial air monitoring is conducted by the SC in appropriate level of protection.
- The SC is to conduct periodic inspections of work practices to determine the effectiveness of this plan. Deficiencies are to be noted, reported to the RHSM, and corrected.

### 17.2 Hazwoper Compliance Plan

(Reference CH2M HILL SOP HSE-218 *Hazardous Waste Operations*)

Certain parts of the site work are covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated Hazwoper tasks listed in the “General Project Information” section of this HSP might occur consecutively or concurrently with respect to non-Hazwoper tasks (also specified in the “General Project Information” section).

This section outlines procedures to be followed when approved the approved non-Hazwoper activities do not require 24- or 40-hour training. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements.

- In many cases, air sampling, in addition to real-time monitoring, must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site, or while non-Hazwoper-trained staff is working in proximity to Hazwoper activities. Other data (e.g., soil) also must document that there is no potential for exposure. The RHSM must approve the interpretation of these data.
- When non-Hazwoper-trained personnel are at risk of exposure, the SC must post the exclusion zone and inform non-Hazwoper-trained personnel of the:
  - nature of the existing contamination and its locations

- limitations of their access
  - emergency action plan for the site
- Periodic air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to airborne contaminants.
- When exposure is possible, non-Hazwoper-trained personnel must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.
- Remediation treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hour of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must not enter the TSDF area of the site.

## 18.0 Decontamination

(Reference CH2M HILL SOP HSE-218, *Hazardous Waste Operations*)

The SC must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SC. The SC must ensure that procedures are established for disposing of materials generated on the site.

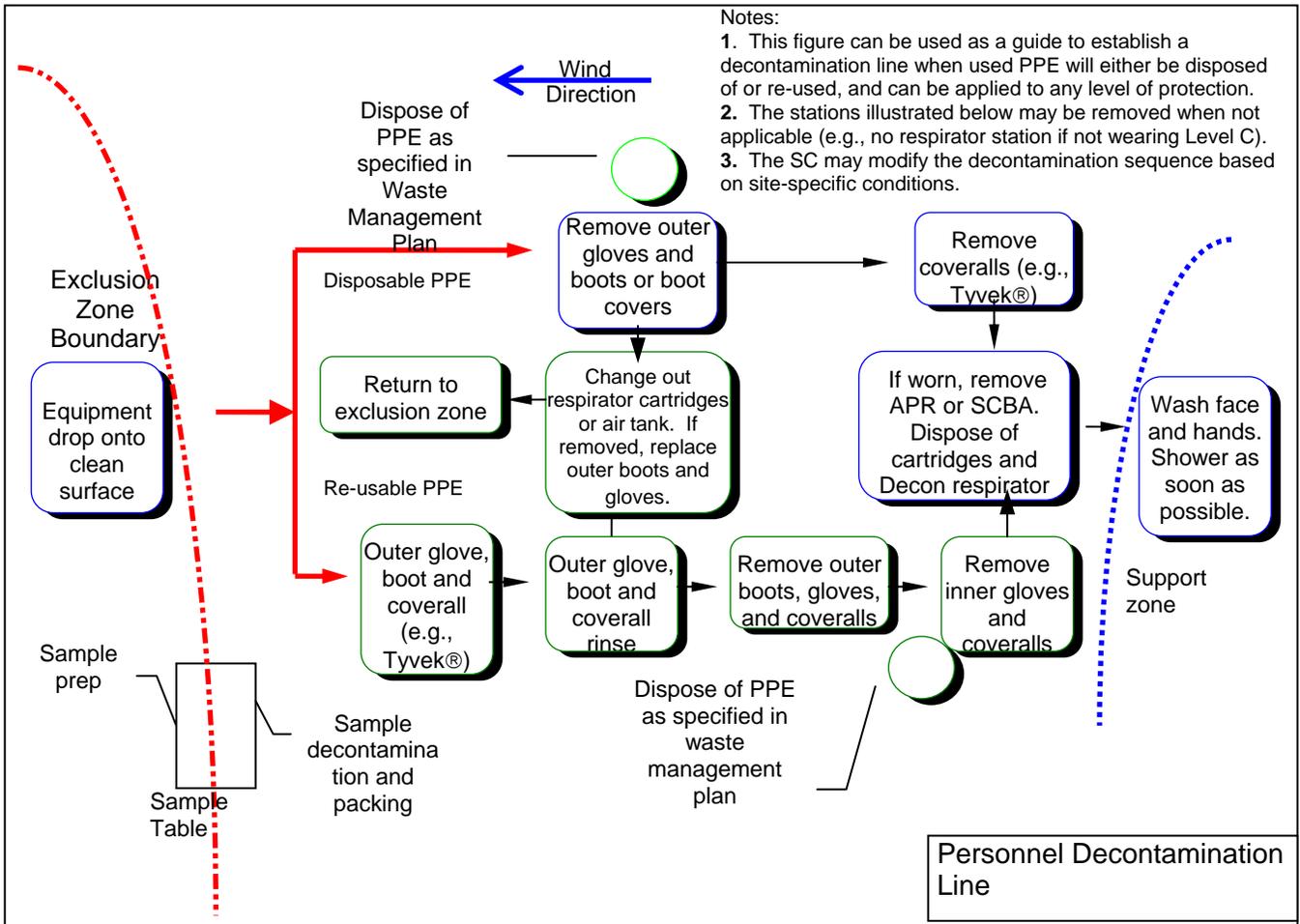
### 18.1 Decontamination Specifications

<b>Personnel</b>	<b>Sample Equipment</b>	<b>Heavy Equipment</b>
<ul style="list-style-type: none"><li>• Boot wash/rinse</li><li>• Glove wash/rinse</li><li>• Outer-glove removal</li><li>• Body-suit removal</li><li>• Inner-glove removal</li><li>• Respirator removal</li><li>• Hand wash/rinse</li><li>• Face wash/rinse</li><li>• Shower ASAP</li><li>• Dispose of PPE in municipal trash, or contain for disposal</li><li>• Dispose of personnel rinse water to facility or sanitary sewer, or contain for offsite disposal</li></ul>	<ul style="list-style-type: none"><li>• Wash/rinse equipment</li><li>• Solvent-rinse equipment</li><li>• Contain solvent waste for offsite disposal</li></ul>	<ul style="list-style-type: none"><li>• Power wash</li><li>• Steam clean</li><li>• Dispose of equipment rinse water to facility or sanitary sewer, or contain for offsite disposal</li></ul>

### 18.2 Diagram of Personnel-Decontamination Line

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SC should establish areas for eating, drinking, and smoking.

The following figure illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SC to accommodate task-specific requirements.



# 19.0 Emergency Response Plan

(Reference CH2M HILL SOP HSE-106, *Emergency Planning*)

## 19.1 Pre-Emergency Planning

- The Emergency Response Coordinator (ERC), typically the SC or designee, performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate. Pre-Emergency Planning activities performed by the ERC include:
- Review the facility emergency and contingency plans where applicable.
- Determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Determine what offsite communication equipment is needed (e.g., nearest telephone, cell phone).
- Confirm and post the “Emergency Contacts” page and route to the hospital located in this section in project trailer(s) and keep a copy in field vehicles along with evacuation routes and assembly areas. Communicate the information to onsite personnel and keep it updated.
- Field Trailers: Post “Exit” signs above exit doors, and post “Fire Extinguisher” signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases.
- Rehearse the emergency response plan before site activities begin, including driving route to hospital. Drills should take place periodically but no less than once a year.
- Brief new workers on the emergency response plan.
- The ERC will evaluate emergency response actions and initiate appropriate follow-up actions.

## 19.2 Emergency Equipment and Supplies

The ERC should mark the locations of emergency equipment on the site map and post the map.

<b>Emergency Equipment and Supplies</b>	<b>Location</b>
20 (or two 10) class A,B,C fire extinguisher	Support zone, field vehicle on drill rig
First aid kit	Support zone, field vehicle
Eye wash	Support zone, field vehicle
Potable water	Support zone, field vehicle
Bloodborne-pathogen kit	Support zone, field vehicle
Additional equipment (specify): cell phone, spill kit	Support zone, field vehicle

## 19.3 Incident Response

In fires, explosions, or chemical releases, actions to be taken include the following:

- Notify appropriate response personnel.
- Shut down CH2M HILL operations and evacuate the immediate work area.
- Account for personnel at the designated assembly area(s).
- Assess the need for site evacuation, and evacuate the site as warranted.
- Implement HSE-111, Incident Notification, Reporting and Investigation.
- Notify and submit reports to clients as required in contract.

Small fires or spills posing minimal safety or health hazards may be controlled with onsite spill kits or fire extinguishers without evacuating the site. When in doubt evacuate. Follow the incident reporting procedures in the “Incident Notification, Reporting, and Investigation” section of this HSP.

## 19.4 Emergency Medical Treatment

Emergency medical treatment is needed when there is a life-threatening injury (such as severe bleeding, loss of consciousness, breathing/heart has stopped). When in doubt if an injury is life-threatening or not, treat it as needing emergency medical treatment.

- Notify 911 or other appropriate emergency response authorities as listed in the “Emergency Contacts” page located in this section.
- The ERC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury, perform decontamination (if applicable) where feasible; lifesaving and first aid or medical treatment takes priority.
- Initiate first aid and CPR where feasible.
- Notify supervisor and if the injured person is a CH2M HILL employee, the supervisor will call the occupational nurse at 1-866-893-2514 and make other notifications as required by HSE SOP-111, *Incident Notification, Reporting and Investigation*.
- Make certain that the injured person is accompanied to the emergency room.
- Follow the Serious Incident Reporting process in HSE SOP-111, Incident Notification, Reporting and Investigation, and complete incident report using the HITS system on the Virtual Office or if not feasible, use the hard copy forms provided as an attachment to this HSP.
- Notify and submit reports to client as required in contract.

## 19.5 Evacuation

- Evacuation routes, assembly areas, and severe weather shelters (and alternative routes and assembly areas) are to be specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the ERC or designee before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The ERC and a “buddy” will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.

- The ERC will account for all personnel in the onsite assembly area.
- A designated person will account for personnel at alternate assembly area(s).
- The ERC will follow the incident reporting procedures in the “Incident Notification, Reporting and Investigation” section of this HSP.

## 19.6 Evacuation Signals

Signal	Meaning
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

## 19.7 Inclement Weather

Sudden inclement weather can rapidly encroach upon field personnel. Preparedness and caution are the best defenses. Field crew members performing work outdoors should carry clothing appropriate for inclement weather. Personnel are to take heed of the weather forecast for the day and pay attention for signs of changing weather that indicate an impending storm. Signs include towering thunderheads, darkening skies, or a sudden increase in wind. If stormy weather ensues, field personnel should discontinue work and seek shelter until the storm has passed.

Protective measures during a lightning storm include seeking shelter; avoiding projecting above the surrounding landscape (don't stand on a hilltop--seek low areas); staying away from open water, metal equipment, railroad tracks, wire fences, and metal pipes; and positioning people several yards apart. Some other general precautions include:

- Know where to go and how long it will take to get there. If possible, take refuge in a large building or vehicle. Do not go into a shed in an open area.
- The inclination to see trees as enormous umbrellas is the most frequent and most deadly mistake. Do not go under a large tree that is standing alone. Likewise, avoid poles, antennae and towers.
- If the area is wide open, go to a valley or ravine, but be aware of flash flooding.
- If you are caught in a level open area during an electrical storm and you feel your hair stand on end, drop to your knees, bend forward and put your hands on your knees or crouch. The idea is to make yourself less vulnerable by being as low to the ground as possible and taking up as little ground space as possible. Lying down is dangerous, since the wet earth can conduct electricity. Do not touch the ground with your hands.
- Do not use telephones during electrical storms, except in the case of emergency

Remember that lightning may strike several miles from the parent cloud, so work should be stopped/restarted accordingly. The lightning safety recommendation is 30-30: Seek refuge when thunder sounds within 30 seconds after a lightning flash; and do not resume activity until 30 minutes after the last thunder clap.

High winds can cause unsafe conditions, and activities should be halted until wind dies down. High winds can also knock over trees, so walking through forested areas during high-wind situations should be avoided. If winds increase, seek shelter or evacuate the area. Proper body protection should be worn in case the winds hit suddenly, because body temperature can decrease rapidly.

## Emergency Contacts

**24-hour CH2M HILL Injury Reporting– 1-866-893-2514**

**24-hour CH2M HILL Serious Incident Reporting Contact – 720-286-4911**

<p><b>Medical Emergency – 911</b>  Hospital ER (On-Base) #: (910) 451-4840  (910) 451-4841  (910) 451-4842  Onslow County ER (Off-Base) #: (910) 577-2240  Ambulance (On-Base) #: (910) 451-3004  (910) 451-3005  Ambulance (Public) #: (910) 451-9111  LEPC (Poison Control)#: (800) 222-1222</p>	<p><b>CH2M HILL- Medical Consultant</b>  WorkCare  Dr. Peter Greaney M.D.  300 S. Harbor Blvd, Suite 600  Anaheim , CA 92805  800-455-6155/866-893-2514  714-978-7488</p>
<p><b>Fire/Spill Emergency – 911</b>  Base Fire Response #: (910) 451-9111</p>	<p><b>CH2M HILL Director – Health, Safety, Security &amp; Environment</b>  Andy Strickland/DEN  (720) 480-0685 (cell) or (720) 286-2393 (office)</p>
<p><b>Security &amp; Police – 911</b>  Base Security #: (910) 451-2555</p>	<p><b>CH2M HILL Responsible Health and Safety Manager (RHSM)</b>  Name: Carl Woods  Phone: 513-889-5771 office; 513-319-5771 cell</p>
<p><b>Utilities Emergency Phone Numbers</b>  Water: Contact Base EMD  Gas: Contact Base EMD  Electric: Contact Base EMD</p>	<p><b>CH2M HILL Human Resources Department</b>  Name: Mary Jo Jordan  Phone: 352-335-5877 office; 352-213-4587 cell</p>
<p><b>Project Manager</b>  Name: Keri Hallberg  Phone: (704) 543-3260</p>	<p><b>CH2M HILL Worker’s Compensation:</b>  Contact Business Group HR dept. to have form completed or contact Jennifer Rindahl after hours: (720)891-5382</p>
<p><b>CH2M HILL Safety Coordinator (SC)</b>  Name: TBD  Phone:</p>	<p><b>Media Inquiries Corporate Strategic Communications</b>  Name: John Corsi  Phone: (720) 286-2087</p>
<p><b>CH2M HILL Project Environmental Manager</b>  Name: Hope Oaks  Phone: 678-530-4226 office; 678-656-5411 cell</p>	<p><b>Automobile Accidents</b>  Rental: Jennifer Rindahl/DEN: 720-286-2449  CH2M HILL owned vehicle: Linda George/DEN: 720-286-2057</p>
<p><b>Federal Express Dangerous Goods Shipping</b>  Phone: 800/238-5355</p>	<p><b>CHEMTEL (hazardous material spills)</b>  <b>Phone: 800/255-3924</b></p>
<p><b>Facility Alarms: TBD</b></p>	<p><b>Evacuation Assembly Area(s): TBD by the SC-HW.</b></p>

**Facility/Site Evacuation Route(s):** Follow main roads towards access gates and off the Base

## Directions to Local Hospital

**Nearest On-Base hospital:**

Base Naval Hospital (only to be used in extreme emergency)  
Building NH100  
100 Brewster Blvd.  
Camp Lejeune, NC 28547  
Phone: (910) 451-4840, (910) 451-4841, (910) 451-4842

**Local hospital:**

Onslow County Memorial Hospital  
317 Western Boulevard  
Jacksonville, NC 28546  
Phone: (910) 577-2240

**Local ambulance service:**

Base Ambulance: (910) 451-3004, (910) 451-3005  
Public Ambulance: (910) 451-9111

**From Marine Corps Base Camp Lejeune**

Directions to the **Base Naval Hospital** (Building NH100)  
(nearest hospital; only to be used in an extreme emergency)

1. Proceed north to Holcomb Boulevard (towards Highway 24).
2. Turn left onto Brewster Boulevard (heading west)
3. Continue on Brewster Boulevard until intersection with the driveway to the Naval Hospital.
4. Turn onto Hospital driveway, and proceed to emergency room.

**Directions to Onslow County Memorial Hospital :**

1. From Holcomb Boulevard, exit Base through main gate.
2. Follow Highway 24 west until intersecting with Western Boulevard.
3. Turn right onto Western Boulevard.
4. The Onslow County Memorial Hospital is on the left, approximately 2 miles (fifth stop light) from Highway 24.
5. Follow the signs to the emergency room.

**From Air Station and Camp Geiger**

Directions to **Onslow County Memorial Hospital**:

1. Proceed through the main gate, turn right, and head north on Ocean Highway 17.
2. Follow Ocean Highway 17 north to Highway 24 and head east.
3. Travel east until Western Boulevard, turn left onto Western Boulevard.
4. The Onslow County Memorial Hospital is on the left, approximately 2 miles (fifth stop light) from Highway 24.
5. Follow the signs to the emergency room.

## 20.0 Spill Containment Procedures

CH2M HILL and subcontractor personnel working at the project site shall be knowledgeable of the potential health, safety and environmental concerns associated with petroleum and other hazardous substances that could potentially be released at the project site.

The following is a list of criteria that must be addressed in CH2M HILL's or the subcontractor's plans in the event of a spill or release. In the event of a large quantity spill notify emergency services. Personnel discovering a spill shall (only if safe to do so):

- Stop the spill immediately (if possible) or note source. If unsafe conditions exist, then leave the area, call emergency services, inform nearby personnel, notify the site supervisors, and initiate incident reporting process. The SC shall be notified immediately.
- Extinguish sources of ignition (e.g., flames, sparks, hot surfaces, cigarettes, etc.)
- Clear personnel from the spill location and barricade the area.
- Utilize available spill control equipment in an effort to ensure that fires, explosions, and releases do not occur, recur, or spread.
- Use sorbent materials to control the spill at the source.
- Construct a temporary containment dike of sorbent materials, cinder blocks, bricks or other suitable materials to help contain the spill.
- Attempt to identify the character, exact source, amount, and extent of the released materials. Identification of the spilled material should be made as soon as possible so that the appropriate cleanup procedure can be identified.
- Assess possible hazards to human health or the environment as a result of the release, fire or explosion.
- A Spill Report shall be completed, including a description of the event, root causes, and corrective actions.

# 21.0 Inspections

## 21.1 Project Activity Self-Assessment Checklists

In addition to the hazard controls specified in this document, Project Activity Self-Assessment Checklists are contained as an attachment to this HSP. The Project-Activity Self-Assessment Checklists are based upon minimum regulatory compliance and some site-specific requirements may be more stringent. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. The self-assessment checklists, including documented corrective actions, shall be made part of the permanent project records and maintained by the SC.

The self-assessment checklists will also be used by the SC in evaluating the subcontractors and any client contractors' compliance on site.

The self-assessment checklists for the following tasks and exposures are required when the task or exposure is initiated and weekly thereafter while the task or exposure is taking place. The checklists shall be completed by the SC or other CH2M HILL representative and maintained in project files.

- Biological Exposure Prevention;
- Drilling;
- Hand and Power Tools;
- Lifting;
- PPE; and
- Traffic Control.

## 21.2 Safe Behavior Observations

Safe Behavior Observations (SBOs) shall be conducted by SC or designee for specific work tasks or operations comparing the actual work process against established safe work procedures identified in the project-specific HSP and AHAs. SBOs are a tool to be used by supervisors to provide positive reinforcement for work practices performed correctly, while also identifying and eliminating deviations from safe work procedures that could result in a loss. The SC or designee shall perform at least one SBO each week for tasks/operations addressed in the project-specific HSP or AHA.

The SC or designee shall complete the SBO form (attached to this HSP) when there is a subcontractor onsite or when two or more people are performing field work. The completed SBO forms shall be submitted electronically by e-mailing them to the address, "CH2M HILL ES FED Safe Behavior Observations," when connected to the network or at [CH2MHILLESFEDSafeBehaviorObservation@ch2m.com](mailto:CH2MHILLESFEDSafeBehaviorObservation@ch2m.com).

## 22.0 Incident Notification, Reporting, and Investigation

(Reference CH2M HILL SOP HSE-111, *Incident Notification, Reporting and Investigation*)

### 22.1 General Information

This section applies to the following:

- All injuries involving employees, third parties, or members of the public
- Damage to property or equipment
- Interruptions to work or public service (e.g., hitting a utility)
- Incidents which attract negative media coverage
- Near misses
- Spills, leaks, or regulatory violations
- Motor vehicle accidents

Documentation, including incident reports, investigation, analysis and corrective measure taken, shall be kept by the SC and maintained onsite for the duration of the project.

### 22.2 Section Definitions

**Incident:** an undesired event which results or could have resulted in loss through injury, damage to assets or environmental harm. This includes all of the definitions below.

**Accident:** an incident involving actual loss through injury, damage to assets, or environmental harm.

**Near Miss:** an unsafe act or incident which, in other circumstances, could have resulted in loss through injury, damage to assets, or environmental harm.

**Serious Incident:**

- All fatalities including contractors, subcontractors, third parties, or members of the public
- Kidnap/Missing Person
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$ 500,000 in damage.
- Acts or threats of terrorism
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

### 22.3 Reporting Requirements

All employees and subcontractors' employees shall immediately report any incident (including "near misses," as defined in the section above) in which they are involved or witness to their supervisor.

The CH2M HILL or Subcontractor supervisor, upon receiving an incident report, shall inform his immediate superior and the CH2M HILL SC.

The SC shall immediately report the following information to the RHSM and PM by phone and e-mail:

- Project Name/Site Manager
- Date and time of incident

- Description of incident
- Extent of known injuries/damage
- Level of medical attention
- Preliminary root cause/corrective actions

The SC shall complete an entry into the Hours and Incident Tracking System (HITS) database system located on CH2M HILL's Virtual Office (or if VO not available, use the hard copy Incident Report Form and Root Cause Analysis Form and forward it to the RHSM) within 24 hours and finalize those forms within 3 calendar days.

The CH2M HILL team shall comply with all applicable statutory incident reporting requirements such as those to OSHA and the police.

## 22.4 HITS System and Incident Report Form (IRF)

It is the policy of CH2M HILL to maintain a HITS entry and/or Incident Report Form (IRF) for all work-related injuries and illnesses sustained by its employees in accordance with recordkeeping and insurance requirements. A HITS entry and/or IRF will also be maintained for other incidents (property damage, fire or explosion, spill, release, potential violation, and near misses) as part of our loss prevention and risk reduction initiative.

## 22.5 Injury Management/Return-to-Work (for CH2M HILL Staff Only)

(Reference CH2M HILL, SOP HSSE-124, Injury Management/Return-to-Work)

### 22.5.1 Background

The Injury Management Program has been established to provide orderly, effective and timely medical treatment and return-to-work transition for an employee who sustains a work-related injury or illness. It also provides guidance and assistance with obtaining appropriate treatment to aid recovery, keep supervisors informed of employee status, and to quickly report and investigate work-related injury/illnesses to prevent recurrence.

To implement the Injury Management/Return-to-Work Program successfully, supervisors and/or SC should:

- Ensure employees are informed of the Injury Management/Return-to-Work Program.
- Become familiar with the Notification Process (detailed below).
- Post the Injury Management/Return-to-Work Notification Poster.

### 22.5.2 The Injury Management/Return-to-Work Notification Process:

- Employee informs their Supervisor.
- Employee calls the Injury Management Program toll free number 1-866-893-2514 immediately and speaks with the Occupational Injury Nurse. This number is operable 24 hours per day, 7 days a week.
- Supervisor ensures employee immediately calls the Injury Management Program number. Supervisor makes the call with the injured worker or for the injured worker if needed.
- Nurse assists employee with obtaining appropriate medical treatment, as necessary schedules clinic visit for employee (calls ahead, and assists with any necessary follow up treatment) with the

supervisor or SC accompany the employee if a clinic visit is necessary to ensure that employees receive appropriate and timely care.

- Supervisor/SC completes the HITS entry or Incident Report Form immediately (within 24 hours) and forwards it to the Project Manager and RHSM.
- Nurse notifies appropriate CH2M HILL staff by e-mail (supervisor, Health & Safety, Human Resources, Workers' Compensation).
- Nurse communicates and coordinates with and for employee on treatment through recovery.
- Supervisor ensures suitable duties are identified and available for injured/ill workers who are determined to be medically fit to return to work on transitional duty (temporary and progressive).
- Supervisor ensures medical limitations prescribed (if any) by physician are followed until the worker is released to full duty.

## 22.6 Serious Incident Reporting Requirements

(Reference CH2M HILL SOP HSE-111, *Incident Reporting, Notification and Investigation*)

The Serious Incident Reporting Requirements ensures timely notification and allows for positive control over flow of information so that the incident is handled effectively, efficiently, and in conjunction with appropriate corporate entities. This standard notification process integrates Health, Safety, Security and Environment (HSSE) and Firm Wide Security Operations (FWSO) requirements for the consistent reporting of and managing of serious events throughout our operations.

### 22.6.1 Serious Incident Determination

The following are general criteria for determining whether an incident on CH2M HILL owned or managed facilities or program sites is considered serious and must be immediately reported up to Group President level through the reporting/notification process:

- Work related death, or life threatening injury or illness of a CH2M HILL employee, subcontractor, or member of the public
- Kidnap/missing person
- Acts or threats of terrorism
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$ 500,000 in damage.
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

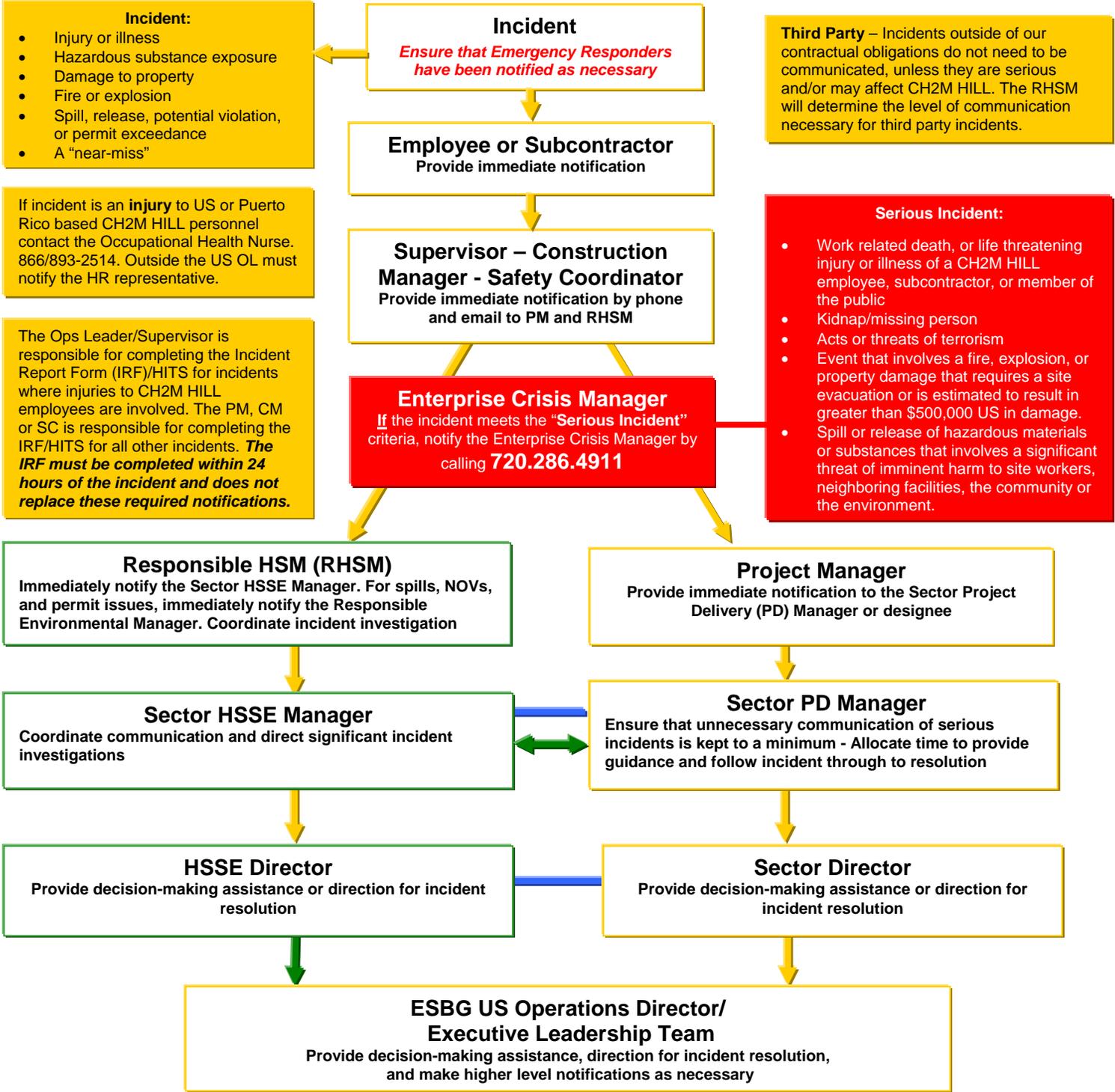
### 22.6.2 Serious Incident Reporting

***If an incident meets the "Serious Incident" criteria, the Project Manager is to immediately contact the Crisis Manager at 720-286-4911, then follow the standard incident reporting procedure.***

For all serious incidents this standard reporting process is implemented immediately so as to ultimately achieve notification to the Business Group President within 2 hours of incident onset or discovery, and notification to appropriate corporate Crisis Management Support Team.

# ESBG US Operations Incident Reporting Flow Diagram

Individual Programs may have additional or alternate reporting procedures



**Incident:**

- Injury or illness
- Hazardous substance exposure
- Damage to property
- Fire or explosion
- Spill, release, potential violation, or permit exceedance
- A "near-miss"

If incident is an **injury** to US or Puerto Rico based CH2M HILL personnel contact the Occupational Health Nurse. 866/893-2514. Outside the US OL must notify the HR representative.

The Ops Leader/Supervisor is responsible for completing the Incident Report Form (IRF)/HITS for incidents where injuries to CH2M HILL employees are involved. The PM, CM or SC is responsible for completing the IRF/HITS for all other incidents. **The IRF must be completed within 24 hours of the incident and does not replace these required notifications.**

**Third Party** – Incidents outside of our contractual obligations do not need to be communicated, unless they are serious and/or may affect CH2M HILL. The RHSM will determine the level of communication necessary for third party incidents.

**Serious Incident:**

- Work related death, or life threatening injury or illness of a CH2M HILL employee, subcontractor, or member of the public
- Kidnap/missing person
- Acts or threats of terrorism
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$500,000 US in damage.
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

**Post-emergency incident communications regarding serious incidents at a CH2M HILL office or project (regardless of the party involved) shall be considered sensitive in nature and must be controlled in a confidential manner.**

## 22.7 Incident Root Cause Analysis

The accident analysis is essential if all causes of the incident are to be identified for the correct remedial actions to be taken to prevent the same and similar type of incident from recurring. The investigation team will consist of the SC (with support from RHSM), appropriate subcontractor personnel as necessary, the PM, and the responsible supervisor. More participants may be involved as needed to complete the investigation.

The Root Cause Analysis Form must be completed for all Loss Incidents and Near Loss Incidents. This form must be submitted to the investigation team for review.

For minor losses or near losses, the information may be gathered by the supervisor or other personnel immediately following the loss. Based on the complexity of the situation, this information may be all that is necessary to enable the investigation team to analyze the loss, determine the root cause, and develop recommendations. More complex situations may require the investigation team to revisit the loss site or re-interview key witnesses to obtain answers to questions that may arise during the investigation process.

Photographs or videotapes of the scene and damaged equipment should be taken from all sides and from various distances. This point is especially important when the investigation team will not be able to review the loss scene.

The investigation team must use the Root Cause Analysis Flow Chart to assist in identifying the root cause(s) of a loss. Any loss may have one or more root causes and contributing factors. The root cause is the primary or immediate cause of the incident, while a contributing factor is a condition or event that contributes to the incident happening, but is not the primary cause of the incident. Root causes and contributing factors that relate to the person involved in the loss, his or her peers, or the supervisor should be referred to as "personal factors." Causes that pertain to the system within which the loss or injury occurred should be referred to as "job factors."

### 22.7.1 Personal Factors

- Lack of skill or knowledge
- Correct way takes more time and/or requires more effort
- Short-cutting standard procedures is positively reinforced or tolerated
- Person thinks there is no personal benefit to always doing the job according to standards

### 22.7.2 Job Factors

- Lack of or inadequate operational procedures or work standards
- Inadequate communication of expectations regarding procedures or standards
- Inadequate tools or equipment

The root cause(s) could be any one or a combination of these seven possibilities or some other uncontrollable factor. In the vast majority of losses, the root cause is very much related to one or more of these seven factors. Uncontrollable factors should be used rarely and only after a thorough review eliminates all seven other factors.

### 22.7.3 Corrective Actions

Include all corrective actions taken or those that should be taken to prevent recurrence of the incident. Include the specific actions to be taken, the employer and personnel responsible for implementing the actions, and a timeframe for completion. Be sure the corrective actions address the causes.

Once the investigation report has been completed, the PM shall hold a review meeting to discuss the incident and provide recommendations. The responsible supervisors shall be assigned to carry out the recommendations, and shall inform the SC upon successful implementation of all recommended actions.

- The RHSM will inform the Responsible Environmental Manager (REM) of any environmental incidents.
- Evaluation and follow-up of the IRF will be completed by the type of incident by the RHSM, REM, or FWSO. The Business Group (BG) HSE Lead will review all BG incidents and modify as required.
- Incident Investigations must be initiated and completed as soon as possible but no later than 72 hours after the incident.

## 23.0 Records and Reports

An organized project filing system is essential for good documentation and recordkeeping. There are many benefits to an organized filing system:

- Other CH2M HILL employees can easily and quickly find documents
- Records are readily available for review
- Records may be needed during OSHA investigations, audits, or other legal matters
- Records may be needed on short notice in case of an accident, illness or other emergency
- Systematic recordkeeping aids in overall project organization

The project filing system shall be established at the beginning of the project and maintained throughout all phases of construction and archived in accordance with CH2M HILL's Records Retention Policy. The information contained in the filing system shall be updated regularly and/or as specified in this document. The PM and SC are responsible for collecting documentation, including subcontractor documentation, and maintaining a complete and organized filing system.

Below are examples of records that must be maintained as the project progresses:

- Exposure records includes air monitoring data (including calibration records), MSDSs, exposure modeling results.
- Physical hazard exposure records include noise, ionizing radiation, non-ionizing radiation, vibration, and lasers exposure assessments and measurements.
- Respiratory Fit Test Records
- Training Records
- Injury/illness reports and investigations
- Federal or State Agency Inspection Records
- Other Records
  - Ergonomic evaluations
  - HSE audits and assessments
  - Project-Specific HSE Plans
  - Confined Space Entry Permits
  - Equipment inspections
  - Equipment maintenance
  - SBOs
  - Self-Assessment Checklists

**CH2M HILL Health and Safety Plan**  
**Attachment 1**

**Health and Safety Plan Employee Sign-off Form**



**CH2M HILL Health and Safety Plan**  
**Attachment 2**

**Chemical Inventory/Register Form**



**CH2M HILL Health and Safety Plan**  
**Attachment 3**

**Chemical-Specific Training Form**

**CHEMICAL-SPECIFIC TRAINING FORM**

Refer to SOP HSE-107 Attachment 1 for instructions on completing this form.

Location:	Project # :
HCC:	Trainer:

**TRAINING PARTICIPANTS:**

NAME	SIGNATURE	NAME	SIGNATURE

**REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:**


The HCC shall use the product MSDS to provide the following information concerning each of the products listed above.

- Physical and health hazards
- Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)
- Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

# **CH2M HILL Health and Safety Plan**

## **Attachment 4**

### **Project Activity Self-Assessment Checklists/Permits/Forms**

# CH2MHILL

## HS&E Self-Assessment Checklist: PPERSONAL PROTECTIVE EQUIPMENT

Page 1 of 3

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where CH2M HILL employees are required to wear PPE or are required to perform oversight of a subcontractor using PPE or both.

CH2M HILL staff shall not direct the means and methods of subcontractor use of PPE nor direct the details of corrective actions. The subcontractor must determine how to correct deficiencies and CH2M HILL staff must carefully rely on their expertise. Conditions considered to be imminently dangerous (possibility of serious injury or death) must be corrected immediately or all exposed personnel must be removed from the hazard until corrected.

Project Name: \_\_\_\_\_ Project No.: \_\_\_\_\_

Location: \_\_\_\_\_ PM: \_\_\_\_\_

Auditor: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

This specific checklist has been completed to (check only one of the boxes below):

- Evaluate CH2M HILL compliance with its PPE program (SOP HSE-117)
- Evaluate a CH2M HILL subcontractor's compliance with its PPE program  
 Subcontractor's Name: \_\_\_\_\_

Check the appropriate box, as follows:

- Check "Yes" if an assessment item is complete or correct.
- Check "No" if an item is incomplete or deficient. Section 2 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-121.

### **SECTION 1**

#### **GENERAL**

	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
1. Required PPE listed in HSP FSI or AHA.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. PPE available for use by employees.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. PPE cleaning supplies available for use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. PPE stored appropriately to prevent deformation or distortion.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. PPE written certification has been completed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### **EYEWEAR (Glasses/Goggles/Face Shields)**

6. Eyewear cleaning supplies available.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Safety glasses in good condition and lenses free of scratches.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Goggles adjustment strap not cracked or frayed, not deformed, or lenses not scratched.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Face shields in good condition, including adjustment band, and free of scratches or chips.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**CH2MHILL**

**HS&E Self-Assessment Checklist: PERSONAL PROTECTIVE EQUIPMENT**

<b>SECTION 1 (Continued)</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>N/O</b>
<b>HEAD PROTECTION</b>				
10. Hard hat bill and suspension attached as allowed by manufacturer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Shell is pliable, free of dents, cracks, nicks, or any damage due to impact.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Suspension maintained at 1.25 inches from inside of shell.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Suspension free of cuts or fraying, torn headband, adjustment strap workable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Electrical hard hat matched to hazard classification.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Dated to determine whether within manufacturer's allowable 5-year use time period.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>HAND PROTECTION</b>				
16. Available in sizes matched to employee.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Gloves free of rips tears, abrasions, or holes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Matched to manufacturer's specification for chemicals used onsite.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Electrical gloves matched to hazard and periodically inspected for insulating rating.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Maintained in a clean and sanitary condition, decontaminated or disposed properly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>BODY PROTECTION</b>				
21. Available in sizes matched to employee.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Maintained in a clean and sanitary condition, decontaminated or disposed properly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Vapor-tight fully encapsulated suits tested at required periodic intervals.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Flame-resistant clothing matched to electrical hazard and arc flash rating.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Welding gear matched to degree of hazard and free of cuts, tears or burn holes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Flotation gear available for work near or on water and in good condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>HOT AND COLD BODY PROTECTION</b>				
27. Cooling gear available based on degree of heat stress hazard.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Cooling gear in operable, clean, and sanitary condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Cold-weather gear provided based on needs assessment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Cold-weather gear available in sizes to match employees.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Cold-weather gear is in free of tears, rips, or holes and in maintained in a clean condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>TRAINING</b>				
32. Initial PPE training completed by employees.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Training conducted when new types or styles of PPE are issued.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. PPE selection, use, and maintenance reviewed at daily safety briefings.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# HS&E Self-Assessment Checklist—Excavations

This checklist shall be used by CH2M HILL personnel only and shall be completed at the frequency specified in the project’s Health and Safety Plan/Field Safety Instruction (HSP/FSI).

This checklist is to be used at locations where: 1) CH2M HILL employees enter excavations (complete Sections 1 and 3), and/or 2) CH2M HILL oversight of an excavation subcontractor is required (complete entire checklist).

The SSC may consult with excavation subcontractors when completing this checklist, but shall not direct the means and methods of excavation operations nor direct the details of corrective actions. Excavation subcontractors shall determine how to correct deficiencies and we must rely on their expertise. Conditions considered imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazardous area until the situation is corrected.

Project Name: \_\_\_\_\_ Project No.: \_\_\_\_\_

Location: \_\_\_\_\_ PM: \_\_\_\_\_

Auditor: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

This specific checklist has been completed to:

Evaluate CH2M HILL employee exposures to excavation hazards

Evaluate a CH2M HILL subcontractor’s compliance with excavation HS&E requirements

Subcontractor Name: \_\_\_\_\_

- Check “Yes” if an assessment item is complete/correct.
- Check “No” if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the excavation subcontractor. Section 3 must be completed for all items checked “No.”
- Check “N/A” if an item is not applicable.
- Check “N/O” if an item is applicable but was not observed during the assessment.

	<u>SECTION 1</u>	<u>Yes</u>	<u>No</u>
	<u>N/A</u>	<u>N/O</u>	
<b>EXCAVATION ENTRY REQUIREMENTS (4.1)</b>			
1. Personnel have completed excavation safety training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Competent person has completed daily inspection and has authorized entry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Personnel are aware of entry requirements established by competent person	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Protective systems are free from damage and in stable condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Surface objects/structures secured from falling into excavation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Potential hazardous atmospheres have been tested and found to be at safe levels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Precautions have been taken to prevent cave-in from water accumulation in the excavation	<input type="checkbox"/>	<input type="checkbox"/>
8. Personnel wearing appropriate, PPE per HSP/SI	<input type="checkbox"/>	<input type="checkbox"/>

<b>SECTION 2</b>		<b>Yes</b>	<b>No</b>
<b><u>N/A</u></b>		<b><u>N/O</u></b>	
<b>GENERAL (4.2.1)</b>			
9. Daily safety briefing/meeting conducted with personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Excavation and protective systems adequately inspected by competent person	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Defective protective systems or other unsafe conditions corrected before entry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Guardrails provided on walkways over excavation 6 ft (1.8m) or deeper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Barriers provided at excavations 6 ft or deeper when excavation not readily visible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Barriers or covers provided for wells, pits, shafts, or similar excavation 6 ft (1.8 m) or deeper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Earthmoving equipment operated safely (use earthmoving equipment checklist in HSE-306)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>PRIOR TO EXCAVATING (4.2.2)</b>			
16. Dig Permit obtained where required by client/facility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Location of underground utilities and installations identified	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>EXCAVATING ACTIVITIES (4.2.3)</b>			
26. Rocks, trees, and other unstable surface objects removed or supported	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Exposed underground utility lines supported	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Undermined surface structures supported or determined to be in safe condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Warning system used to remind equipment operators of excavation edge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>EXCAVATION ENTRY (4.2.4)</b>			
32. Trenches > 4 ft (1.2 m) deep provided with safe means of egress within 25 ft (7.6 m)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Structure ramps designed and approved by competent person	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Potential hazardous atmospheres tested prior to entry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Rescue equipment provided where potential for hazardous atmosphere exists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Ventilation used to control hazardous atmosphere and air tested frequently	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

37. Appropriate respiratory protection used when ventilation does not control hazards <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Precautions taken to prevent cave-in resulting from water accumulation in excavation <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Precautions taken to prevent surface water from entering excavation <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Protection provided from falling/rolling material originating from excavation face <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Spoil piles, equipment, materials restrained or kept at least 2 ft (61 cm) from excavation edge <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>EXCAVATION PROTECTIVE SYSTEMS (4.2.5)</b>		
42. Protective systems used for excavations 5 ft (1.5 m) or deeper, unless in stable rock <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Protective systems for excavation deeper than 20 ft (6.1 m) designed by registered PE <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. If soil unclassified, maximum allowable slope is 34 degrees <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Protective systems free from damage <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Protective system used according to manufacturer's recommendations and not subjected to loads exceeding design limits <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Protective system components securely connected to prevent movement or failure <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Cave-in protection provided while entering/exiting shielding systems <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Personnel removed from shielding systems when installed, removed, or if vertical movement <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>N/A</u>	<u>Yes</u>	<u>No</u>
	<u>N/O</u>	
<b>PROTECTIVE SYSTEM REMOVAL AND BACKFILLING (4.2.6)</b>		
50. Protective system removal starts and progresses from excavation bottom <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Protective systems removed slowly and cautiously <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. Temporary structure supports used if failure of remaining components observed <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Backfilling takes place immediately after protective system removal <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# CH2MHILL

## HSE Self-Assessment Checklist—HAND AND POWER TOOLS

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project’s HSP/FSI.

This checklist is to be used at locations where: (1) CH2M HILL employees are exposed to hand and power tool hazards and/or (2) CH2M HILL provides oversight of subcontractor personnel who are exposed to hand and power tool hazards.

SC may consult with subcontractors when completing this checklist, but shall not direct the means and methods of hand and power tool use nor direct the details of corrective actions. Subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Project Name: \_\_\_\_\_ Project No.: \_\_\_\_\_

Location: \_\_\_\_\_ PM: \_\_\_\_\_

Auditor: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

This specific checklist has been completed to:

Evaluate CH2M HILL employee exposure to hand and power tool hazards.

Evaluate a CH2M HILL subcontractor’s compliance with hand and power tool requirements.

Subcontractors Name: \_\_\_\_\_

- Check “Yes” if an assessment item is complete/correct.
  - Check “No” if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the subcontractor. Section 3 must be completed for all items checked “No.”
  - Check “N/A” if an item is not applicable.
  - Check “N/O” if an item is applicable but was not observed during the assessment.
- Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-210.

<u><b>SECTION 1</b></u>		<u><b>Yes</b></u>	<u><b>No</b></u>	<u><b>N/A</b></u>	<u><b>N/O</b></u>
<b>SAFE WORK PRACTICES (5.1)</b>					
1.	All tools operated according to manufacturer’s instructions and design limitations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	All hand and power tools maintained in a safe condition and inspected and tested before use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	Defective tools are tagged and removed from service until repaired.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	PPE is selected and used according to tool-specific hazards anticipated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Power tools are not carried or lowered by their cord or hose.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	Tools are disconnected from energy sources when not in use, servicing, cleaning, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	Safety guards remain installed or are promptly replaced after repair.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	Tools are stored properly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	Cordless tools and recharging units both conform to electrical standards and specifications.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	Tools used in explosive environments are rated for such use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	Knife or blade hand tools are used with the proper precautions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.	Consider controls to avoid muscular skeletal, repetitive motion, and cumulative trauma stressors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**SECTION 2**

**Yes No N/A N/O**

**GENERAL (5.2.2)**

- 13. PPE is selected and used according to tool-specific hazards anticipated.
- 14. Tools are tested daily to assure safety devices are operating properly.
- 15. Damaged tools are removed from service until repaired.
- 16. Power operated tools designed to accommodate guards have guards installed.
- 17. Rotating or moving parts on tools are properly guarded.
- 18. Machines designed for fixed locations are secured or anchored.
- 19. Floor and bench-mounted grinders are provided with properly positioned work rests.
- 20. Guards are provided at point of operation, nip points, rotating parts, etc.
- 21. Fluid used in hydraulic-powered tools is approved fire-resistant fluid.

**ELECTRIC-POWERED TOOLS (5.2.3)**

- 22. Electric tools are approved double insulated or grounded and used according to SOP HSE-206.
- 23. Electric cords are not used for hoisting or lowering tools.
- 24. Electric tools are used in damp/ wet locations are approved for such locations or GFCI installed.
- 25. Hand-held tools are equipped with appropriate on/off controls appropriate for the tool.
- 26. Portable, power-driven circular saws are equipped with proper guards.

**ABRASIVE WHEEL TOOLS (5.2.4)**

- 27. All employees using abrasive wheel tools are wearing eye protection.
- 28. All grinding machines are supplied with sufficient power to maintain spindle speed.
- 29. Abrasive wheels are closely inspected and ring-tested before use.
- 30. Grinding wheels are properly installed.
- 31. Cup-type wheels for external grinding are protected by the proper guard or flanges.
- 32. Portable abrasive wheels used for internal grinding are protected by safety flanges.
- 33. Safety flanges are used only with wheels designed to fit the flanges.
- 34. Safety guards on abrasive wheel tools are mounted properly and of sufficient strength.

**PNEUMATIC-POWERED TOOLS (5.2.5)**

- 35. Tools are secured to hoses or whip by positive means to prevent disconnection.
- 36. Safety clips or retainers are installed to prevent attachments being expelled.
- 37. Safety devices are installed on automatic fastener feed tools as required.
- 38. Compressed air is not used for cleaning unless reduced to < 30 psi, with PPE, and guarded.
- 39. Manufacturer’s safe operating pressure for hoses, pipes, valves, etc. are not exceeded.
- 40. Hoses are not used for hoisting or lowering tools.
- 41. All hoses >1/2-inch diameter have safety device at source to reduce pressure upon hose failure.
- 42. Airless spray guns have required safety devices installed.
- 43. Blast cleaning nozzles are equipped with operating valves, which are held open manually.
- 44. Supports are provided for mounting nozzles when not in use.
- 45. Air receiver drains, handholes, and manholes are easily accessible.
- 46. Air receivers are equipped with drainpipes and valves for removal of accumulated oil and water.
- 47. Air receivers are completely drained at required intervals.
- 48. Air receivers are equipped with indicating pressure gauges.
- 49. Safety, indicating, and controlling devices are installed as required.
- 50. Safety valves are tested frequently and at regular intervals to assure good operating condition.

**SECTION 2 (continued)**

**Yes No N/A N/O**

**LIQUID FUEL-POWERED TOOLS (5.2.6)**

- 51. Liquid fuel-powered tools are stopped when refueling, servicing, or maintaining.  Yes  No  N/A  N/O
- 52. Liquid fuels are stored, handled, and transported in accordance with SOP HSE-403  Yes  No  N/A  N/O
- 53. Liquid fuel-powered tools are used in confined spaces in accordance with SOP HSE-203.  Yes  No  N/A  N/O
- 54. Safe operating pressures of hoses, valves, pipes, filters, and other fittings are not exceeded.  Yes  No  N/A  N/O

**POWDER-ACTUATED TOOLS (5.2.7)**

- 55. Only trained employee operates powder-actuated tools.  Yes  No  N/A  N/O
- 56. Powder-actuated tools are not loaded until just prior to intended firing time.  Yes  No  N/A  N/O
- 57. Tools are not pointed at any employee at any time.  Yes  No  N/A  N/O
- 58. Hands are kept clear of open barrel end.  Yes  No  N/A  N/O
- 59. Loaded tools are not left unattended.  Yes  No  N/A  N/O
- 60. Fasteners are not driven into very hard or brittle materials.  Yes  No  N/A  N/O
- 61. Fasteners are not driven into easily penetrated materials unless suitable backing is provided.  Yes  No  N/A  N/O
- 62. Fasteners are not driven into spalled areas.  Yes  No  N/A  N/O
- 63. Powder-actuated tools are not used in an explosive or flammable atmosphere.  Yes  No  N/A  N/O
- 64. All tools are used with correct shields, guards, or attachments recommended by manufacturer.  Yes  No  N/A  N/O

**JACKING TOOLS (5.2.8)**

- 65. Rated capacities are legibly marked on jacks and not exceeded.  Yes  No  N/A  N/O
- 66. Jacks have a positive stop to prevent over-travel.  Yes  No  N/A  N/O
- 67. The base of jacks are blocked or cribbed to provide a firm foundation, when required.  Yes  No  N/A  N/O
- 68. Wood blocks are place between the cap and load to prevent slippage, when required.  Yes  No  N/A  N/O
- 69. After load is raised, it is cribbed, blocked, or otherwise secured immediately.  Yes  No  N/A  N/O
- 70. Antifreeze is used when hydraulic jacks are exposed to freezing temperatures.  Yes  No  N/A  N/O
- 71. All jacks are properly lubricated.  Yes  No  N/A  N/O
- 72. Jacks are inspected as required.  Yes  No  N/A  N/O
- 73. Repair or replacement parts are examined for possible defects.  Yes  No  N/A  N/O
- 74. Jacks not working properly are removed from service and repaired or replaced.  Yes  No  N/A  N/O

**HAND TOOLS (5.2.9)**

- 75. Wrenches are not used when jaws are sprung to the point of slippage.  Yes  No  N/A  N/O
- 76. Impact tools are kept free of mushroomed heads.  Yes  No  N/A  N/O
- 77. Wooden handles of tools are kept free of splinters or cracks and are tightly fitted in tool.  Yes  No  N/A  N/O

**CHAIN SAWS (5.2.10)**

- 78. Chainsaw equipped with spark arrestor and fully functioning chain brake  Yes  No  N/A  N/O
- 79. Chainsaw operator's manual readily available  Yes  No  N/A  N/O
- 80. Fully stocked first aid kit and multipurpose fire extinguisher available  Yes  No  N/A  N/O
- 81. Appropriate personal protective equipment available and worn  Yes  No  N/A  N/O
- 82. Clothing free of loose edges that could become entangled in the saw  Yes  No  N/A  N/O
- 83. Chainsaw handles kept dry, clean, and free of oil or fuel mixture  Yes  No  N/A  N/O
- 84. Chainsaws held firmly with both hands and used right-handed  Yes  No  N/A  N/O
- 85. Operator standing to the left of the saw out of the plane of the chain  Yes  No  N/A  N/O
- 86. Saw used between the waist and mid-chest level  Yes  No  N/A  N/O
- 87. Full throttle maintained while cutting  Yes  No  N/A  N/O
- 88. Operator aware of position of guide bar tip, does not contact tip with anything being cut  Yes  No  N/A  N/O
- 89. Bumper spikes maintained as close to the object as possible  Yes  No  N/A  N/O
- 90. Operator aware of what is in the saw's downward path after the cut  Yes  No  N/A  N/O
- 91. No attempt to made to cut material that is larger than the guide bar of the saw  Yes  No  N/A  N/O
- 92. Cuts avoided that will cause chain to jam  Yes  No  N/A  N/O
- 93. Non-metallic wedges used to prevent compression cuts from jamming the blade  Yes  No  N/A  N/O
- 94. Bystanders and helpers kept at a safe distance from operation  Yes  No  N/A  N/O
- 95. Chainsaw not operated when fatigued  Yes  No  N/A  N/O
- 96. Fire extinguisher present when operating the chainsaw in forest or brushy areas  Yes  No  N/A  N/O

This checklist is provided as a method of verifying compliance with regulations pertaining to the handling of hazardous materials. It shall be used at locations where CH2M HILL employees handle hazardous materials, or are required to perform oversight of subcontractor personnel handling hazardous materials, or both.

CH2M HILL staff shall not direct the means and methods of subcontractor operations nor direct the details of corrective actions. The subcontractor must determine how to correct deficiencies, and CH2M HILL staff must carefully rely on the subcontractor's expertise. Items considered imminently dangerous (possibility of serious injury or death) must be corrected immediately, or all exposed personnel must be removed from the hazard until it is corrected.

Completed checklists must be sent to the appropriate regional health and safety program manager for review.

Project Name: \_\_\_\_\_ Project No.: \_\_\_\_\_  
 Location: \_\_\_\_\_ PM: \_\_\_\_\_  
 Auditor: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

This specific checklist has been completed to (check only one of the boxes below):

- Evaluate CH2M HILL compliance with hazardous material handling requirements (SOP HSE-403)
- Evaluate a CH2M HILL subcontractor's compliance with hazardous material requirements  
 Subcontractor's Name: \_\_\_\_\_

- Check "Yes" if an assessment item is complete or correct.
- Check "No" if an item is incomplete or deficient. Section 2 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-403.

<u>SECTION 1</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
<b>PROCEDURES FOR HAZARDOUS MATERIAL HANDLING (6.0)</b>				
<b>GENERAL GUIDELINES (6.1)</b>				
1. Acids are stored away from bases.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Oxidizers and organics are stored away from inorganic reducing agents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Flammables and corrosives are stored in appropriate storage cabinets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Paper and other combustibles are not stored near flammables.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Secondary containment and lipped shelving are in place in storage areas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. A fire suppression system is available.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>SPILL CONTROL/CLEANUP (6.2)</b>				
7. Spill control materials are located on the project site.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>HAZARDOUS CHEMICAL INVENTORY REPORTING (6.3)</b>				
8. Reporting is required if the project site handles and stores 10,000 lb or more of a hazardous chemical.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Or 500 lb or the threshold planning quantity (TPQ) of an extremely hazardous substance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Regional ECC has been consulted for hazardous chemical inventory reporting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>TOXIC CHEMICAL RELEASE REPORTING</b>				
11. Reporting requirements for toxic chemical release reporting have been followed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>SECTION 1 (continued)</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
<b>FLAMMABLE AND COMBUSTIBLE LIQUIDS (6.5)</b>				
<b>GENERAL STORAGE (6.5.1)</b>				
12. Only approved containers/portable tanks used to store flammable and combustible liquids.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Approved safety cans used for handling flammable liquids in quantities 1-5 gallons.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. For quantities of one gallon or less, the original container must be used for storage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Flammable or combustible liquids are not stored in stairways or personnel passageways.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>INDOOR STORAGE (6.5.2)</b>				
16. Quantities of flammable or combustible liquids > 25 gallons stored in approved storage cabinet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. No more than 25 gallons of flamm. or comb. liquids can be stored outside an approved cabinet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Cabinets are labeled with "FLAMMABLE: KEEP FIRE AWAY."	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. No more than 60 gallons of flamm. or 120 gallons of comb. liquids stored in one storage cabinet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Not more than three cabinets located in a single storage area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>OUTSIDE STORAGE (6.5.3)</b>				
21. Storage of containers (not more than 60 gallons each) do not exceed 1,100 gallons in any area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Storage areas are not within 20 feet of any building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Storage areas graded to divert spills away from buildings and surrounded by an earth dike.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Storage areas are free from weeds, debris, and other combustible materials.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Outdoor portable tanks are provided with emergency vent devices.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Outdoor portable tanks are no closer than 20 feet from any building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Signs indicating no smoking are posted around the storage area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>DISPENSING (6.5.4)</b>				
28. Areas where liquids are dispensed in >5-gal quantities are separated from other operations by 25'.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Drainage or other means provided to control spills.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Adequate natural or mechanical ventilation provided to maintain concentration of flammable vapor < 10% of the lower flammable limit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Dispensing of flammable liquids from one container to another is done only when containers are electrically interconnected (bonded).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Dispensing flammable or combustible liquids by means of air pressure on the container or portable tanks prohibited.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Dispensing devices and nozzles for flammable liquids are of an approved type.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>USE (6.5.5)</b>				
34. Flammable liquids are kept in closed containers when not in actual use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Leakage or spillage of flammable or combustible liquids is disposed of promptly and safely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Sources of ignition are kept at least 50 feet from flammable liquids.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>LIQUID PETROLEUM GAS (6.6)</b>				
37. LPG containers meet DOT requirements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Each container or system has a safety relief device or valve in good working order.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Portable heaters using LPG have an automatic shutoff device in the event of flame failure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Storage of LPG within buildings is prohibited.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. LPG storage location has at least one portable fire extinguisher rated not less than 20-B:C.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>SECTION 1 (continued)</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
<b>COMPRESSED GAS CYLINDERS (6.7)</b>				
<b>GENERAL (6.7.1)</b>				
42. Cylinders and apparatus inspected for defects and leakage prior to use. Damaged items not used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Gas distributor notified and subsequent instructions followed for defective cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. Leaking cylinders removed from the work area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Cylinder users do not modify, tamper, or attempt repair on cylinders or apparatus.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Only cylinder owners or authorized agent refill cylinders or attempt to mix gases in a cylinder.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Cylinders labeled with the identity of the contents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>TRANSPORTING (6.7.2)</b>				
48. Cylinders not rolled in the horizontal position or dragged; suitable material-handling device used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Cylinders being transported have valve protection caps installed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. Cylinders in vertical position when transported by motor vehicle, hoisted, or carried.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Cylinders hoisted by a cradle or pallet designed for such use, and not by magnets, slings, or their valve protection caps.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>STORAGE (6.7.3)</b>				
52. Cylinders are stored in the vertical position with valve protection caps installed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Cylinders are secured from being knocked over by a chain or other stabilizing device.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. Cylinders are stored away from readily ignitable substances.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. Cylinders are protected from exposure to temperature extremes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. Oxygen cylinders in storage are separated from fuel gas cylinders or combustible materials > 20' or by a ½-hour fire-resistant barrier at least 5' high.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57. Cylinders inside buildings are stored in dry, well-ventilated locations > 20' from comb. materials.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. Cylinders are stored in definitely assigned places away from elevators, stairs, or gangways.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59. Signs indicating no smoking are provided for storage areas containing flammable gas cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>PLACEMENT FOR USAGE (6.7.4)</b>				
60. Cylinders are located where they will not be knocked over or damaged.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61. Cylinders are secured in the vertical position.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62. Cylinders are not placed where they can become part of an electrical circuit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63. Cylinders are kept far enough away from welding and cutting operations to prevent sparks, hot slag, or flames from reaching them. When impractical, fire resistant shields are provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64. Cylinders are not taken into confined spaces.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>CYLINDER CONNECTIONS (6.7.5)</b>				
65. Pressure-controlling apparatus is compatible with the particular gas used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66. Cylinders and pressure-controlling apparatus are kept free of oil and grease.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
67. Pressure-controlling apparatus is kept gastight to prevent leakage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68. Cylinders not attached to process where backflow could occur unless check valves or traps used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
69. Manifolds designed for product used at the appropriate temperatures, pressures, and flow rates.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
70. Manifolds are labeled and placed in well-ventilated and accessible locations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
71. Cylinders are not cross-connected with plant air lines.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
72. Flash arrestors or reverse flow check valves are installed on all flammable gas cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>USAGE (6.7.6)</b>				
73. Eye protection (safety glasses or goggles) is worn when using cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
74. Cylinder valve and regulator are inspected for foreign material before connecting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
75. If cylinders are frozen, warm (not boiling) water is used to thaw cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
76. Cylinder valve remains closed except when the cylinder is in use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
77. Fuel gas cylinder valves are not opened more than 1½ turns, for quick closing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
78. If a special wrench is used to open a cylinder valve, it is left in position on the valve.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>SECTION 1 (continued)</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
<b>USAGE (continued) (6.7.6)</b>				
79. Acetylene cylinders are used in the vertical position.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
80. Acetylene cylinders are not used > 15 psig or > 30 psia.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
81. Copper pipe or fittings are not used with acetylene systems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
82. Compressed gas is not used to dust off clothing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
83. Cylinder valve closed and regulator relieved of internal pressure before regulators are removed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>EXPLOSIVES (6.8)</b>				
84. Written authorization provided by Munitions Market Segment Leader designating individuals who can store or use high explosives under the authority of the CH2M HILL BATF Type 33 User of High Explosives License/permit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
85. Written authorization provided by Munitions Market Segment Leader designating individuals who can manufacture high explosives under the authority of the CH2M HILL BATF Type 20 Manufacturer of High Explosives License/permit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
86. Approved Explosive Siting Plan (ESP).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
87. Approved Explosive Management Plan (EMP).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
88. Sources of ignition are not brought in or near storage magazines, or within 50' of an area where explosives are being handled, transported, or used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
89. Radio transmitting or receiving equipment is not brought within 1,000' of blasting activities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
90. Transportation and storage of explosives comply with local, state, and federal regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
91. Vehicles transporting explosives are placarded and displayed according to DOT regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
92. Detonators or blasting caps are not stored with explosive charges.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
93. Explosives are stored in storage magazines as required by local, state, and federal regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
94. Contact the Munitions Response market Segment Leader for additional instructions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>PROCEDURES FOR HAZARDOUS MATERIALS SHIPPING (7.0)</b>				
1. Only dangerous goods shippers are permitted to ship dangerous goods (CH2M HILL only).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Dangerous goods are shipped or transported in accordance with CH2M HILL's procedures.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. All personnel shipping dangerous goods have completed the computer-based training (CH2M HILL only)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Dangerous goods are stored only in the equipment warehouse prior to shipping.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Written authorization provided by Munitions Market Segment Leader designating individuals who can "offer explosives for shipment" under the authority of the CH2M HILL Department of Transportation Hazardous Materials Certificate of Registration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>SHIPPING BY AIR (7.1)</b>				
5. Shipments for Federal Express meet IATA requirements for dangerous goods.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Before shipping, packages are clearly identified, packed, marked, labeled, and documented.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The quantity does not exceed IATA regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Packaging meets IATA requirements and withstand transport by air.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Shipper classifies each item into one of the 9 hazard classes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Inner packages are packed to prevent breaking or leaking during shipping.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Absorbent or cushioning material does not react with the contents of the inner package.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Outer packages in fiberboard, a plastic case, or other sturdy container.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Package is capable of withstanding 4' drop test with no damage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Package is marked with: proper shipping name of contents, technical name, UN number, total net. quantity, and the name and address of the shipper and recipient.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Irrelevant labels have been removed from package.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Hazard label and handling label are secured in correct locations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Dangerous goods airbill has been completed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. Dangerous goods are not shipped via UPS.

**SECTION 1 (continued)**

**SHIPPING BY HIGHWAY (7.2)**

19. Use Federal Express packaging and paperwork requirements that comply with DOT regs for ground transportation of dangerous goods.

20. Consult with local state highway police if route includes vehicular tunnels.

21. Inner packaging prevents breakage or leakage under normal conditions of transport.

22. Absorbent/cushioning material does not react with contents of the package.

23. Labels for highway transportation are the same as those for air transportation.

24. Engine turned off, brake set during loading and unloading.

**Yes    No    N/A    N/O**

**EMERGENCY RESPONSE (7.3)**

25. Appropriate emergency response information available not on the package, within reach of driver.

26. Information includes copy of pages from *Emergency Response Guidebook* for each item.

27. An MSDS for each item must also be included.

28. Emergency response information must also include the information found on the shipping papers.

29. CH2M HILL's 24-hour EMERGENCY RESPONSE TELEPHONE NUMBER, (800) 255-3954, is included, as required.

30. In the event of an accident, keep other individuals, except response workers, from the vicinity.

31. In case of breakage, spillage, or leakage, use means to prevent spreading and contain the spill.

32. Care taken during the handling of cargo to minimize hazards.

33. MSDS is consulted for safe handling procedures.

34. Wash the area of the vehicle where the dangerous goods may have spilled.

35. Consult your supervisor in the event of a spill.

36. Ask your supervisor to call CHEM-TEL of the local HAZMAT unit if the spill poses a danger.





# **CH2M HILL Health and Safety Plan**

## **Attachment 5**

### **Behavior Based Loss Prevention System Forms**

**Activity Hazard Analysis**

**Pre-Task Safety Plans**

**Safe Behavior Observation**

**Incident Report and Investigation**

**(use electronic form when possible)**

[HITS](#)



ACTIVITY HAZARD ANALYSIS

<b>Work Activity Sequence</b> (Identify the principal steps involved and the sequence of work activities)	<b>Potential Health and Safety Hazards</b> (Analyze each principal step for potential hazards)	<b>Hazard Controls</b> (Develop specific controls for each potential hazard)

<b>Equipment to be used</b> (List equipment to be used in the work activity)	<b>Inspection Requirements</b> (List inspection requirements for the work activity)	<b>Training Requirements</b> (List training requirements including hazard communication)

ACTIVITY HAZARD ANALYSIS

PRINT NAME

SIGNATURE

Supervisor Name: \_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

Safety Officer Name: \_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

Employee Name(s): \_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_



**CH2MHILL**

**DAILY SAFETY MEETING SIGN-IN SHEET**

Date: \_\_\_\_\_ Project Name/Location: \_\_\_\_\_

Company: \_\_\_\_\_ Person Conducting \_\_\_\_\_

Briefing: \_\_\_\_\_

**1. AWARENESS (e.g., special HSE concerns, observations from yesterday, recent incidents, etc.):**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**2. OTHER ISSUES (HASp changes, new AHAs, attendee comments, etc.):**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**3. DISCUSSION OF DAILY ACTIVITIES/TASKS AND SAFETY MEASURES TO BE USED:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**4. ATTENDEES (Print Name):**

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.
11.	12.
13.	14.
15.	16.
17.	18.

# PRE-TASK SAFETY PLAN

Project: \_\_\_\_\_ Location: \_\_\_\_\_ Date: \_\_\_\_\_

Supervisor: \_\_\_\_\_ Job Activity: \_\_\_\_\_

Task Personnel:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

List Tasks:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Tools/Equipment required for Tasks (ladders, scaffolds, fall protection, cranes/rigging, heavy equipment, power tools):

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Potential H&S Hazards, including chemical, physical, safety, biological and environmental (Check all that apply):

<input type="checkbox"/> Chemical burns/contact	<input type="checkbox"/> Trench, excavations, cave-ins	<input type="checkbox"/> Ergonomics
<input type="checkbox"/> Pressurized lines/equipment	<input type="checkbox"/> Overexertion	<input type="checkbox"/> Chemical splash
<input type="checkbox"/> Thermal burns	<input type="checkbox"/> Pinch points	<input type="checkbox"/> Poisonous plants/insects
<input type="checkbox"/> Electrical	<input type="checkbox"/> Cuts/abrasions	<input type="checkbox"/> Eye hazards/flying projectile
<input type="checkbox"/> Weather conditions	<input type="checkbox"/> Spills	<input type="checkbox"/> Inhalation hazard
<input type="checkbox"/> Heights/fall > 6'	<input type="checkbox"/> Overhead Electrical hazards	<input type="checkbox"/> Heat/cold stress
<input type="checkbox"/> Noise	<input type="checkbox"/> Elevated loads	<input type="checkbox"/> Water/drowning hazard
<input type="checkbox"/> Explosion/fire	<input type="checkbox"/> Slips, trip and falls	<input type="checkbox"/> Heavy equipment
<input type="checkbox"/> Radiation	<input type="checkbox"/> Manual lifting	<input type="checkbox"/> Aerial lifts/platforms
<input type="checkbox"/> Confined space entry	<input type="checkbox"/> Welding/cutting	<input type="checkbox"/> Demolition

Other Potential Hazards (Describe):

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**CH2MHILL****PRE-TASK SAFETY PLAN**

Hazard Control Measures (Check all that apply):

PPE <input type="checkbox"/> Thermal/lined <input type="checkbox"/> Eye <input type="checkbox"/> Dermal/hand <input type="checkbox"/> Hearing <input type="checkbox"/> Respiratory <input type="checkbox"/> Reflective vests <input type="checkbox"/> Flotation device	Protective Systems <input type="checkbox"/> Sloping <input type="checkbox"/> Shoring <input type="checkbox"/> Trench box <input type="checkbox"/> Barricades <input type="checkbox"/> Competent person <input type="checkbox"/> Locate buried utilities <input type="checkbox"/> Daily inspections	Fire Protection <input type="checkbox"/> Fire extinguishers <input type="checkbox"/> Fire watch <input type="checkbox"/> Non-spark tools <input type="checkbox"/> Grounding/bonding <input type="checkbox"/> Intrinsically safe equipment	Electrical <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Grounded <input type="checkbox"/> Panels covered <input type="checkbox"/> GFCI/extension cords <input type="checkbox"/> Power tools/cord inspected
Fall Protection <input type="checkbox"/> Harness/lanyards <input type="checkbox"/> Adequate anchorage <input type="checkbox"/> Guardrail system <input type="checkbox"/> Covered opening <input type="checkbox"/> Fixed barricades <input type="checkbox"/> Warning system	Air Monitoring <input type="checkbox"/> PID/FID <input type="checkbox"/> Detector tubes <input type="checkbox"/> Radiation <input type="checkbox"/> Personnel sampling <input type="checkbox"/> LEL/O2 <input type="checkbox"/> Other	Proper Equipment <input type="checkbox"/> Aerial lift/ladders/scaffolds <input type="checkbox"/> Forklift/ Heavy equipment <input type="checkbox"/> Backup alarms <input type="checkbox"/> Hand/power tools <input type="checkbox"/> Crane w/current inspection <input type="checkbox"/> Proper rigging <input type="checkbox"/> Operator qualified	Welding & Cutting <input type="checkbox"/> Cylinders secured/capped <input type="checkbox"/> Cylinders separated/upright <input type="checkbox"/> Flash-back arrestors <input type="checkbox"/> No cylinders in CSE <input type="checkbox"/> Flame retardant clothing <input type="checkbox"/> Appropriate goggles
Confined Space Entry <input type="checkbox"/> Isolation <input type="checkbox"/> Air monitoring <input type="checkbox"/> Trained personnel <input type="checkbox"/> Permit completed <input type="checkbox"/> Rescue	Medical/ER <input type="checkbox"/> First-aid kit <input type="checkbox"/> Eye wash <input type="checkbox"/> FA-CPR trained personnel <input type="checkbox"/> Route to hospital	Heat/Cold Stress <input type="checkbox"/> Work/rest regime <input type="checkbox"/> Rest area <input type="checkbox"/> Liquids available <input type="checkbox"/> Monitoring <input type="checkbox"/> Training	Vehicle/Traffic <input type="checkbox"/> Traffic control <input type="checkbox"/> Barricades <input type="checkbox"/> Flags <input type="checkbox"/> Signs
Permits <input type="checkbox"/> Hot work <input type="checkbox"/> Confined space <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Excavation <input type="checkbox"/> Demolition <input type="checkbox"/> Energized work	Demolition <input type="checkbox"/> Pre-demolition survey <input type="checkbox"/> Structure condition <input type="checkbox"/> Isolate area/utilities <input type="checkbox"/> Competent person <input type="checkbox"/> Hazmat present	Inspections: <input type="checkbox"/> Ladders/aerial lifts <input type="checkbox"/> Lanyards/harness <input type="checkbox"/> Scaffolds <input type="checkbox"/> Heavy equipment <input type="checkbox"/> Cranes and rigging	Training: <input type="checkbox"/> Hazwaste <input type="checkbox"/> Construction <input type="checkbox"/> Competent person <input type="checkbox"/> Task-specific (THA) <input type="checkbox"/> Hazcom

FieldNotes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Supervisor signature: \_\_\_\_\_

Date: \_\_\_\_\_

## Safe Behavior Observation Form

 Federal or  Commercial Sector (check one)

 Construction or  Consulting (check one)

Project Number:

Client/Program:

Project Name:

Observer:

Date:

 Position/Title of  
worker observed:

 Background Information/  
comments:

 Task/Observation  
Observed:

- ❖ Identify and reinforce safe work practices/behaviors
- ❖ Identify and improve on at-risk practices/acts
- ❖ Identify and improve on practices, conditions, controls, and compliance that eliminate or reduce hazards
- ❖ Proactive PM support facilitates eliminating/reducing hazards (do you have what you need?)
- ❖ Positive, corrective, cooperative, collaborative feedback/recommendations

Actions & Behaviors	Safe	At-Risk	Observations/Comments
Current & accurate Pre-Task Planning/Briefing (Project safety plan, STAC, AHA, PTSP, tailgate briefing, etc., as needed)			<b>Positive Observations/Safe Work Practices:</b>
Properly trained/qualified/experienced			
Tools/equipment available and adequate			
Proper use of tools			<b>Questionable Activity/Unsafe Condition Observed:</b>
Barricades/work zone control			
Housekeeping			
Communication			
Work Approach/Habits			
Attitude			<b>Observer's Corrective Actions/Comments:</b>
Focus/attentiveness			
Pace			
Uncomfortable/unsafe position			
Inconvenient/unsafe location			
Position/Line of fire			<b>Observed Worker's Corrective Actions/Comments:</b>
Apparel (hair, loose clothing, jewelry)			
Repetitive motion			
Other...			

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For CNR ES staff please email completed forms to: [cnressafe@ch2m.com](mailto:cnressafe@ch2m.com)

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# CH2MHILL

Incident Report Form (Hardcopy) Use only if no access to HITS system on VO (contact RHSM)

## 2.2.1 Type of Incident (Select at least one)

- |   |  |  |
|---|--|--|
| <input type="checkbox"/> Injury/Illness             | <input type="checkbox"/> Property Damage | <input type="checkbox"/> Spill/Release |
| <input type="checkbox"/> Environmental/Permit Issue | <input type="checkbox"/> Near Miss       | <input type="checkbox"/> Other         |

## 2.2.2 General Information (Complete for all incident types)

Preparer's Name: \_\_\_\_\_ Preparer's Employee Number: \_\_\_\_\_  
Date of Report: \_\_\_\_\_ Date of Incident: \_\_\_\_\_ Time of Incident: \_\_\_\_\_ am/pm

### Verbal Notification (Complete for all incident types)

CH2M HILL PM/CM Notified: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_  
CH2M HILL HS&E Notified: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_  
Client Notified: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_

### Type of Activity (Provide activity being performed that resulted in the incident)

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> Asbestos Work                     | <input type="checkbox"/> Excavation Trench-Haz Waste | <input type="checkbox"/> Other (Specify) _____     |
| <input type="checkbox"/> Confined Space Entry              | <input type="checkbox"/> Excavation Trench-Non Haz   |  |
| <input type="checkbox"/> Construction Mgmt- Haz Waste      | <input type="checkbox"/> Facility Walk Through       | <input type="checkbox"/> Process Safety Management |
| <input type="checkbox"/> Construction Mgmt - Non-Haz Waste | <input type="checkbox"/> General Office Work         | <input type="checkbox"/> Tunneling                 |
| <input type="checkbox"/> Demolition                        | <input type="checkbox"/> Keyboard Work               | <input type="checkbox"/> Welding                   |
| <input type="checkbox"/> Drilling-Haz Waste                | <input type="checkbox"/> Laboratory                  | <input type="checkbox"/> Wetlands Survey           |
| <input type="checkbox"/> Drilling-Non Haz Waste            | <input type="checkbox"/> Lead Abatement              | <input type="checkbox"/> Working from Heights      |
| <input type="checkbox"/> Drum Handling                     | <input type="checkbox"/> Motor Vehicle Operation     | <input type="checkbox"/> Working in Roadways       |
| <input type="checkbox"/> Electrical Work                   | <input type="checkbox"/> Moving Heavy Object         | <input type="checkbox"/> WWTP Operation            |

### Location of Incident (Select one)

- Company Premises - CH2M HILL Office: \_\_\_\_\_
- Field - Project #: \_\_\_\_\_ Project/Site Name: \_\_\_\_\_  
Location: \_\_\_\_\_ Client: \_\_\_\_\_
- In Transit - Traveling from: \_\_\_\_\_ Traveling to: \_\_\_\_\_
- At Home
- Other - Address \_\_\_\_\_

### Geographic Location of Incident (Select region/company where the incident occurred) CH2M HILL Company

- |                                    |                                    |   |                                    |
|------------------------------------|------------------------------------|---|------------------------------------|
| <input type="checkbox"/> Northeast | <input type="checkbox"/> Southwest | <input type="checkbox"/> Asia Pacific       | <input type="checkbox"/> CH2M HILL |
| <input type="checkbox"/> Southeast | <input type="checkbox"/> Corporate | <input type="checkbox"/> Latin America      | <input type="checkbox"/> CCI       |
| <input type="checkbox"/> Northwest | <input type="checkbox"/> Canadian  | <input type="checkbox"/> Europe Middle East | <input type="checkbox"/> CHIL      |

---

## 2.2.3 Incident Investigation (Complete for all incident types)

Describe the Incident (Provide a brief description of the incident and how it occurred)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Task Location: \_\_\_\_\_

Job/Task Assignment: \_\_\_\_\_

Specific activity the employee was engaged in when the incident occurred:

\_\_\_\_\_

Activity was a Routine Task: Yes  No

All equipment, materials, or chemicals the employee was using when the incident occurred:

\_\_\_\_\_

Equipment Malfunction : Yes  No

Root Causes and Contributing Factors (**COMPLETE ROOT CAUSE ANALYSIS FORM**)

\_\_\_\_\_

Describe how you may have prevented this injury: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Witnesses** (Complete for all incident types)

Witness Information (First Witness)

Name: \_\_\_\_\_

Employee Number (CH2M HILL): \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_

Zip Code: \_\_\_\_\_

Phone: \_\_\_\_\_

Witness Information (Second Witness)

Name: \_\_\_\_\_

Employee Number (CH2M HILL): \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_

Zip Code: \_\_\_\_\_

Phone : \_\_\_\_\_

**2.2.4 Property Damage** (Complete for Property Damage incidents only)

Property Damaged: \_\_\_\_\_ Property Owner: \_\_\_\_\_

Damage Description: \_\_\_\_\_

Estimated Amount: \$ \_\_\_\_\_

**2.2.5 Spill or Release** (Complete for Spill/Release incidents only)

Substance (attach MSDS): \_\_\_\_\_ Estimated Quantity: \_\_\_\_\_

Facility Name, Address, Phone No.: \_\_\_\_\_

Did the spill/release move off the property where work was performed?: \_\_\_\_\_

Spill/Release From: \_\_\_\_\_ Spill/Release To: \_\_\_\_\_

**2.2.6 Environmental/Permit Issue** (Complete for Environmental/Permit Issue incidents only)

Describe Environmental or Permit Issue: \_\_\_\_\_

Permit Type: \_\_\_\_\_

Permitted Level or Criteria (e.g., discharge limit): \_\_\_\_\_

Permit Name and Number (e.g., NPDES No. ST1234): \_\_\_\_\_

Substance and Estimated Quantity: \_\_\_\_\_

Duration of Permit Exceedence: \_\_\_\_\_

2.2.7 **Injury Information** (Complete for Injury/Illness incidents only)

If CH2M HILL employee injured

Employee Name: \_\_\_\_\_ Employee Number: \_\_\_\_\_

If CH2M HILL Subcontractor employee injured

Employee Name: \_\_\_\_\_ Company: \_\_\_\_\_

Subcontractor Contact: \_\_\_\_\_ Phone number: \_\_\_\_\_

**Injury Type**

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Allergic Reaction         | <input type="checkbox"/> Electric Shock      | <input type="checkbox"/> Multiple (Specify) _____ |
| <input type="checkbox"/> Amputation                | <input type="checkbox"/> Foreign Body in eye | <input type="checkbox"/> Muscle Spasms            |
| <input type="checkbox"/> Asphyxia                  | <input type="checkbox"/> Fracture            | <input type="checkbox"/> Other (Specify) _____    |
| <input type="checkbox"/> Bruise/Contusion/Abrasion | <input type="checkbox"/> Freezing/Frost Bite | <input type="checkbox"/> Poisoning (Systemic)     |
| <input type="checkbox"/> Burn (Chemical)           | <input type="checkbox"/> Headache            | <input type="checkbox"/> Puncture                 |
| <input type="checkbox"/> Burn/Scald (Heat)         | <input type="checkbox"/> Hearing Loss        | <input type="checkbox"/> Radiation Effects        |
| <input type="checkbox"/> Cancer                    | <input type="checkbox"/> Heat Exhaustion     | <input type="checkbox"/> Strain/Sprain            |
| <input type="checkbox"/> Carpal Tunnel             | <input type="checkbox"/> Hernia              | <input type="checkbox"/> Tendonitis               |
| <input type="checkbox"/> Concussion                | <input type="checkbox"/> Infection           | <input type="checkbox"/> Wrist Pain               |
| <input type="checkbox"/> Cut/Laceration            | <input type="checkbox"/> Irritation to eye   |   |
| <input type="checkbox"/> Dermatitis                | <input type="checkbox"/> Ligament Damage     |   |
| <input type="checkbox"/> Dislocation               |  |   |

**Part of Body Injured**

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Abdomen         | <input type="checkbox"/> Hand(s)                  | <input type="checkbox"/> Neck                  |
| <input type="checkbox"/> Ankle(s)        | <input type="checkbox"/> Head                     | <input type="checkbox"/> Nervous System        |
| <input type="checkbox"/> Arms (Multiple) | <input type="checkbox"/> Hip(s)                   | <input type="checkbox"/> Nose                  |
| <input type="checkbox"/> Back            | <input type="checkbox"/> Kidney                   | <input type="checkbox"/> Other (Specify) _____ |
| <input type="checkbox"/> Blood           | <input type="checkbox"/> Knee(s)                  | <input type="checkbox"/> Reproductive System   |
| <input type="checkbox"/> Body System     | <input type="checkbox"/> Leg(s)                   | <input type="checkbox"/> Shoulder(s)           |
| <input type="checkbox"/> Buttocks        | <input type="checkbox"/> Liver                    | <input type="checkbox"/> Throat                |
| <input type="checkbox"/> Chest/Ribs      | <input type="checkbox"/> Lower (arms)             | <input type="checkbox"/> Toe(s)                |
| <input type="checkbox"/> Ear(s)          | <input type="checkbox"/> Lower (legs)             | <input type="checkbox"/> Upper Arm(s)          |
| <input type="checkbox"/> Elbow(s)        | <input type="checkbox"/> Lung                     | <input type="checkbox"/> Upper Leg(s)          |
| <input type="checkbox"/> Eye(s)          | <input type="checkbox"/> Mind                     | <input type="checkbox"/> Wrist(s)              |
| <input type="checkbox"/> Face            |   |  |
| <input type="checkbox"/> Finger(s)       | <input type="checkbox"/> Multiple (Specify) _____ |  |
| <input type="checkbox"/> Foot/Feet       |   |  |

**Nature of Injury**

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Absorption                                 | <input type="checkbox"/> Inhalation               | <input type="checkbox"/> Overexertion             |
| <input type="checkbox"/> Bite/Sting/Scratch                         | <input type="checkbox"/> Lifting                  | <input type="checkbox"/> Repeated Motion/Pressure |
| <input type="checkbox"/> Cardio-Vascular/Respiratory System Failure | <input type="checkbox"/> Mental Stress            | <input type="checkbox"/> Rubbed/Abraded           |
| <input type="checkbox"/> Caught In or Between                       | <input type="checkbox"/> Motor Vehicle Accident   | <input type="checkbox"/> Shock                    |
| <input type="checkbox"/> Fall (From Elevation)                      | <input type="checkbox"/> Multiple (Specify) _____ | <input type="checkbox"/> Struck Against           |
| <input type="checkbox"/> Fall (Same Level)                          | <input type="checkbox"/> Other (Specify) _____    | <input type="checkbox"/> Struck By                |
| <input type="checkbox"/> Ingestion                                  |   | <input type="checkbox"/> Work Place Violence      |

Initial Diagnosis/Treatment Date: \_\_\_\_\_

## Type of Treatment

- Admission to hospital/medical facility
- Application of bandages
- Cold/Heat Compression/Multiple Treatment
- Cold/Heat Compression/One Treatment
- First Degree Burn Treatment
- Heat Therapy/Multiple treatment
- Multiple (Specify) \_\_\_\_\_
- Heat Therapy/One Treatment
- Non-Prescriptive medicine
- None
- Observation
- Other (Specify) \_\_\_\_\_
- Prescription- Multiple dose
- Prescription- Single dose
- Removal of foreign bodies
- Skin Removal
- Soaking therapy- Multiple Treatment
- Soaking Therapy- One Treatment
- Stitches/Sutures
- Tetanus
- Treatment for infection
- Treatment of 2<sup>nd</sup> /3<sup>rd</sup> degree burns
- Use of Antiseptics - multiple treatment
- Use of Antiseptics - single treatment
- Whirlpool bath therapy/multiple treatment
- Whirlpool therapy/single treatment
- X-rays negative
- X-rays positive/treatment of fracture



# Root Cause Analysis Form

Root Cause Analysis (RCA)							
<p><b>Root Cause Categories (RCC):</b> Select the RCC numbered below that applies for the root cause (RC) and/or contributing factor (CF) in the first column, then describe the specific root cause and corrective actions in each column.</p> <ol style="list-style-type: none"> <li>Lack of skill or knowledge</li> <li>Lack of or inadequate operational procedures or work standards</li> <li>Inadequate communication of expectations regarding procedures or work standards</li> <li>Inadequate tools or equipment</li> <li>Correct way takes more time and/or requires more effort</li> <li>Short-cutting standard procedures is positively reinforced or tolerated</li> <li>Person thinks there is no personal benefit to always doing the job according to standards</li> </ol>							
RCC #	Root Cause(s)	Corrective Actions	RC <sup>1</sup>	CF <sup>2</sup>	Due Date	Date Completed	Date Verified
<sup>1</sup> RC = Root Cause; <sup>2</sup> CF = Contributing Factors (check which applies)							
Investigation Team Members							
Name		Job Title			Date		
Results of Solution Verification and Validation							
Reviewed By							
Name		Job Title			Date		

## Determination of Root Cause(s)

For minor losses or near losses the information may be gathered by the supervisor or other personnel immediately following the loss. Based on the complexity of the situation, this information may be all that is necessary to enable the investigation team to analyze the loss, to determine the root cause, and to develop recommendations. More complex situations may require the investigation team to revisit the loss site or re-interview key witnesses to obtain answers to questions that may arise during the investigation process.

Photographs or videotapes of the scene and damaged equipment should be taken from all sides and from various distances. This point is especially important when the investigation team will not be able to review the loss scene.

The investigation team must use the Root Cause Analysis Flow Chart to assist in identifying the root cause(s) of a loss. Any loss may have one or more "root causes" and "contributing factors". The "root cause" is the primary or immediate cause of the incident, while a "contributing factor" is a condition or event that contributes to the incident happening, but is not the primary cause of the incident. Root causes and contributing factors that relate to the *person* involved in the loss, his or her peers, or the supervisor should be referred to as "personal factors". Causes that pertain to the *system* within which the loss or injury occurred should be referred to as "job factors".

### Personal Factors

- Lack of skill or knowledge
- Correct way takes more time and/or requires more effort
- Short-cutting standard procedures is positively reinforced or tolerated
- Person thinks that there is no personal benefit to always doing the job according to standards

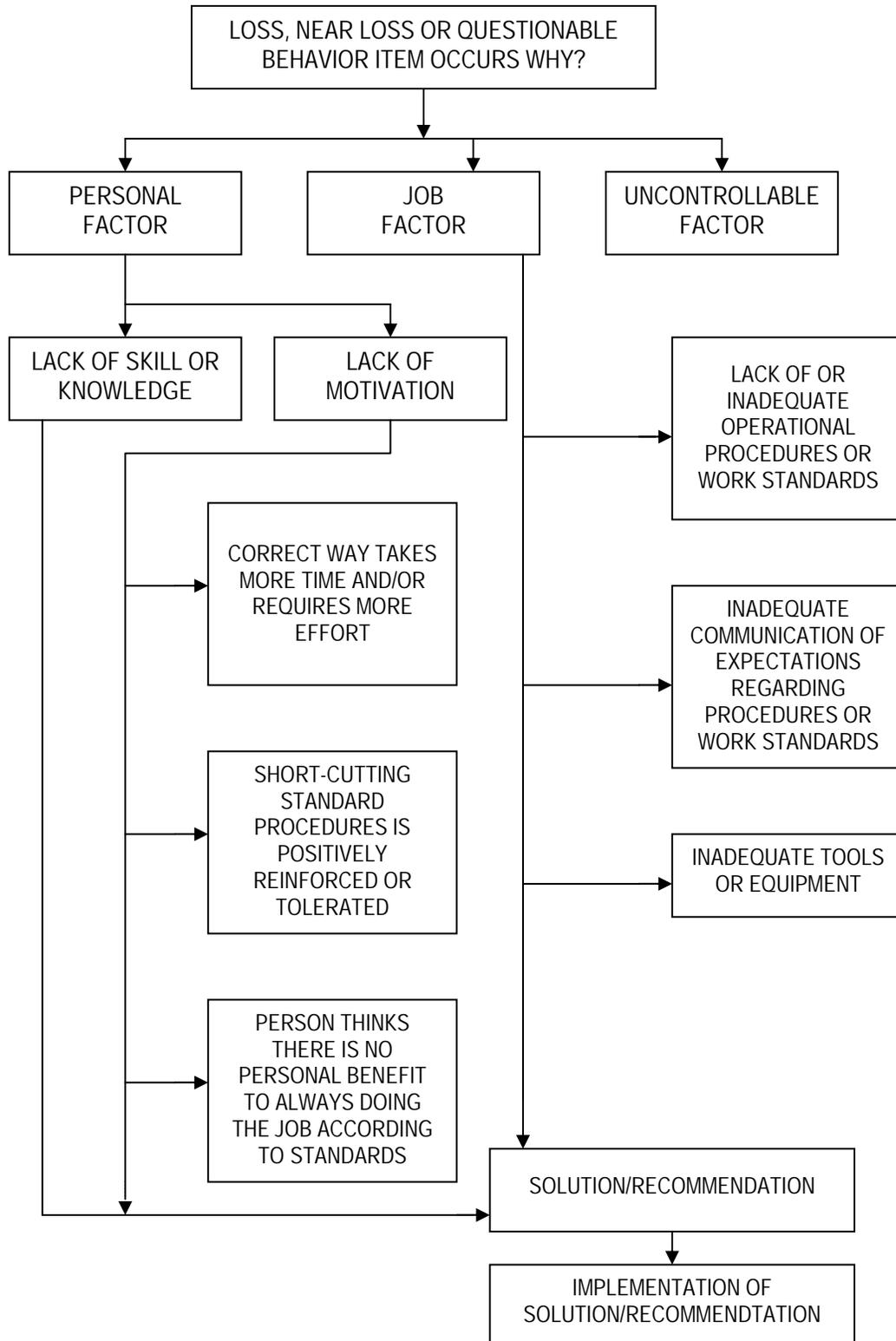
### Job Factors

- Lack of or inadequate operational procedures or work standards.
- Inadequate communication of expectations regarding procedures or standards
- Inadequate tools or equipment

The root cause(s) could be any one or a combination of these seven possibilities or some other "uncontrollable factor". In the vast majority of losses, the root cause is very much related to one or more of these seven factors. Uncontrollable factors should be used rarely and only after a thorough review eliminates "all" seven other factors.

Root Cause Analysis  
Flow Chart

**CH2MHILL**



**Lessons Learned – Health, Safety, and Environment—INSTRUCTIONS/EXAMPLE**

Subject	A brief description of the event, condition, practice or experience that led to the event. Example: Lifting and Transporting Heavy Object (Slide Hammer) Across Rough and Uneven Terrain
CH2M HILL Project?	Yes/No
Situation	Explain what happened? <b>Example:</b> An employee lifted and attempted to carry a heavy (45-lb.) slide hammer from a sampling location to the project support vehicle. The project was in a jungle area with rough and uneven terrain. He experienced sudden back pain when carrying the slide hammer and was subsequently diagnosed with a back strain by the local emergency room physician.
Lessons Learned	<ul style="list-style-type: none"> <li>Lessons Learned: List issues or concerns that were raised or identified to prompt issuing this document</li> </ul>
Recommendation/ Comment	<ul style="list-style-type: none"> <li>Actions which may prevent a similar event. <b>For example:</b></li> <li>Ensure that lifting or carrying tasks involving heavy objects or unusual situations (rough and uneven terrain) are identified in the project planning stages.</li> <li>Evaluate lifting and carrying tasks using the Lift Evaluation Form contained in HSE SOP 112, Manual Lifting.</li> <li>Consider using a lighter weight hammer, improving paths of travel, using mechanical means (such as a dolly or all-terrain vehicle) to transport heavy items, and fabrication of a device allowing for a safe two-person carry.</li> <li>Include safe lifting and carrying techniques in the project safety plan or Job Hazard Analysis.</li> <li>Provide training (Computer-based Manual Lifting Training on the VO, and safety plan/JHA) for employees performing lifting and carrying tasks.</li> </ul>
Date Submitted	Date
Submitted By	Your Name
Submit To	Please send this to HSEQ BG Lead, Regional Shared Services HSEQ Staff and Petra Scotti/SCO
Additional Information Contact(s)	

**CH2M HILL Health and Safety Plan**  
**Attachment 6**

**Material Safety Data Sheets**  
**&**  
**Fact Sheets**

**CH2M HILL Health and Safety Plan**  
**Attachment 7**

**Working Alone Standard**

## CALL - IN CONTACT FORM

Date of site work: \_\_\_\_\_ Expected start time: \_\_\_\_\_

Name of CH2M HILL employee in the field: \_\_\_\_\_

Name of CH2M HILL employee responsible to receive contact:

Client Emergency Contact (if any):

CH2M HILL employee's contact numbers:

Radio # \_\_\_\_\_

Cell Phone # \_\_\_\_\_

Address and Location of work: \_\_\_\_\_

Directions/Map:

Planned Activity: \_\_\_\_\_

Specified Frequency and time for call in: \_\_\_\_\_

Time

Verified

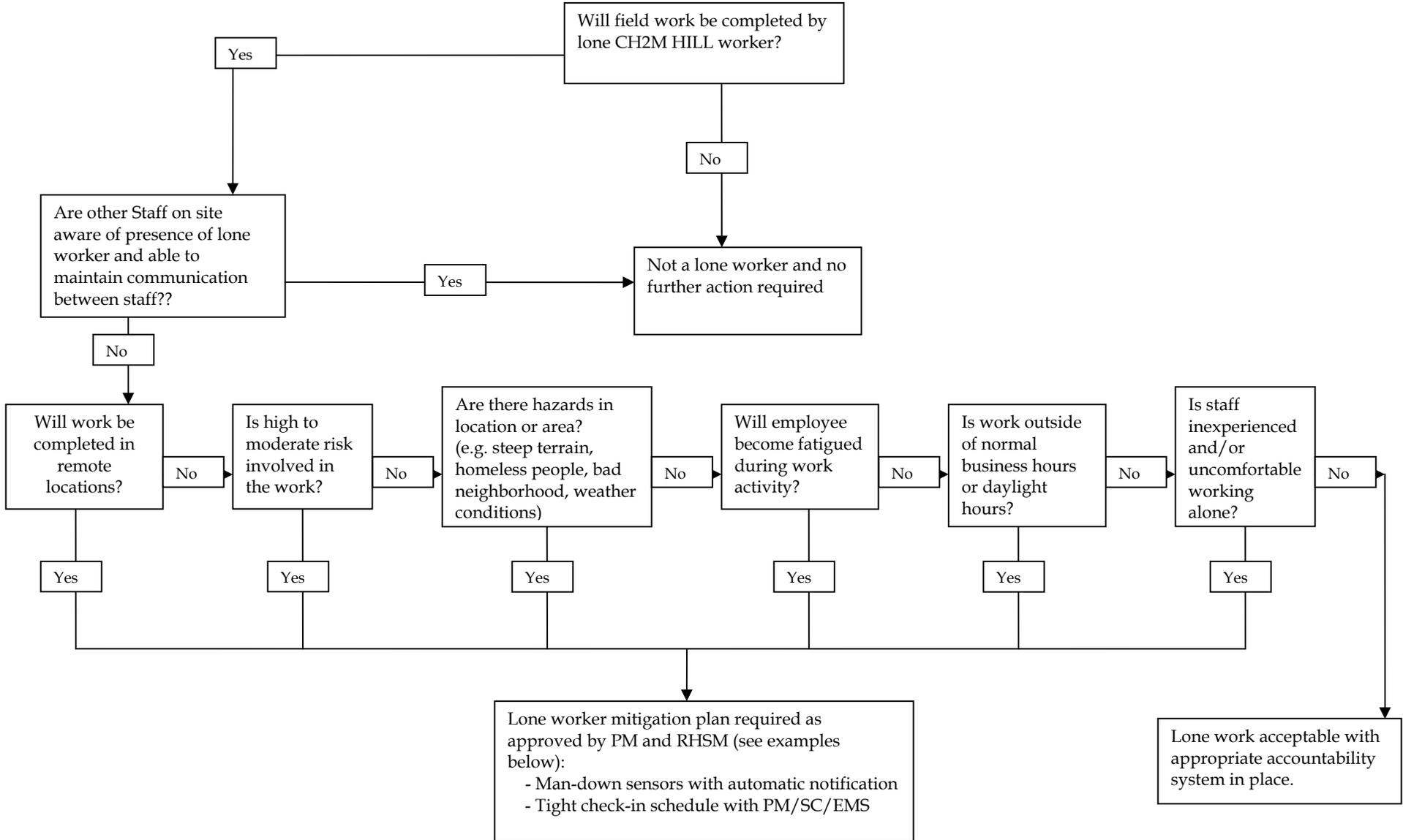
Location

If lone worker fails to call in at specified frequency/time:

- 1) Call worker's radio and cell to determine if an emergency exists.
- 2) If no reply, immediately call Client security/emergency service if there is one at the site.

- 3) If there is no client security call Emergency Services (911). Inform the dispatcher there is a lone worker that cannot be contacted and there may be an emergency on site. Provide the lone worker's name, their last known location, and your contact information.
- 4) After Emergency Services have been contacted, call the other emergency contacts, Project Manager, and Responsible Health and Safety Manager.

# Lone Worker Protocol



# **CH2M HILL HEALTH AND SAFETY PLAN**

## **Attachment 8**

### **Tick Fact Sheet**

## Tick-Borne Pathogens — A Fact Sheet

Most of us have heard of Lyme disease or Rocky Mountain Spotted Fever (RMSF), but there are actually six notifiable tick-borne pathogens that present a significant field hazard. In some areas, these account for more than half of our serious field incidents. The following procedures should be applied during any field activity—even in places that are predominantly paved with bordering vegetation.

### Hazard Recognition

An important step in controlling tick related hazards is understanding how to identify ticks, their habitats, their geographical locations, and signs and symptoms of tick-borne illnesses.

### Tick Identification

There are five varieties of hard-bodied ticks that have been associated with tick-borne pathogens. These include:

- Deer (Black Legged) Tick (eastern and pacific varieties)
- Lone Star Tick
- Dog Tick
- Rocky Mountain Wood Tick

These varieties and their geographical locations are illustrated on the following page.

### Tick Habitat

In eastern states, ticks are associated with deciduous forest and habitat containing leaf litter. Leaf litter provides a moist cover from wind, snow, and other elements. In the north-central states, is generally found in heavily wooded areas often surrounded by broad tracts of land cleared for agriculture.

On the Pacific Coast, the bacteria are transmitted to humans by the western black-legged (deer) tick and habitats are more diverse. For this region, ticks have been found in habitats with forest, north coastal scrub, high brush, and open grasslands. Coastal tick populations thrive in areas of high rainfall, but ticks are also found at inland locations.

### Illnesses and Signs & Symptoms

There are six notifiable tick-borne pathogens that cause human illness in the United States. These pathogens may be transmitted during a tick bite—normally hours after attachment. The illnesses, presented in approximate order of most common to least, include:

- Lyme (bacteria)
- RMSF (bacteria)
- Ehrlichiosis (bacteria)
- STARI (Southern Tick-Associated Rash Illness) (bacteria)
- Tularemia (Rabbit Fever) (bacteria)
- Babesia (protozoan parasite)

Symptoms will vary based on the illness, and may develop in infected individuals typically between 3 and 30 days after transmission. Some infected individuals will not become ill or may develop only mild symptoms. These illnesses present with some or all of the following signs & symptoms: fever, headache, muscle aches, stiff neck, joint aches, nausea, vomiting, abdominal pain, diarrhea, malaise, weakness, small solid, ring-like, or spotted rashes. The bite site may be red, swollen, or develop ulceration or lesions. For Lyme disease, the bite area will sometimes resemble a target pattern. A variety of long-term symptoms may result if the illness is left untreated, including debilitating effects and death.



Deer Tick



Distribution of Deer Tick (dark green)



From Left: adult female, adult male, nymph, and larvae Deer Tick (cm scale)



Distribution of Pacific Deer Tick (dark green)



Lone Star Tick



Distribution of Lone Star Tick (Green)



Dog Tick



Yellow indicates approximate distribution area



Rocky Mountain Wood Tick



Yellow indicates approximate distribution area

---

## Hazard Control

The methods for controlling exposure to ticks include, in order of most- to least-preferred:

- Avoiding tick habitats and ceasing operations in heavily infested areas
- Reducing tick abundance through habitat disruption or application of acaricide
- Personal protection through use of repellants and protective clothing
- Frequent tick inspections and proper hygiene

Vaccinations are not available and preventative antibiotic treatment after a bite is generally not recommended.

## Avoidance and Reduction of Ticks

To the extent practical, tick habitats should be avoided. In areas with significant tick infestation, consider stopping work and withdrawing from area until adequate tick population control can be achieved. Stopping and withdrawing should be considered as seriously as entering an area without proper energy control or with elevated airborne contaminants—tick-borne pathogens present risk of serious illness!

In areas where significant population density or infestation exists, tick reduction should be considered. Tick reduction can be achieved by disrupting tick habitats and/or direct population reduction through the use of tick-toxic pesticides (Damminix, Dursban, Sevin, etc.).

Habitat disruption may include only simple vegetative maintenance such as removing leaf litter and trimming grass and brush. Tick populations can be reduced by between 72 and 100 percent when leaf litter alone is removed. In more heavily infested areas, habitat disruption may include grubbing, tree trimming or removal, and pesticide application (Damminix, Dursban, Sevin, etc.). This approach is practical in smaller, localized areas or perimeter areas that require occasional access. Habitat controls are to be implemented with appropriate health and safety controls, in compliance with applicable environmental requirements, and may be best left to the property owner or tenant or to a licensed pesticide vendor. Caution should be exercised when using chemical repellents or pesticides in or around areas where environmental or industrial media samples will be collected for analysis.

## Personal Protection

After other prevention and controls are implemented, personal protection is still necessary to control exposure to ticks. Personal protection must include all of the following steps:

- So that ticks may be easily seen, wear light-colored clothing. Full-body New Tyvek (paper-like disposable coveralls) may also be used
- To prevent ticks from getting underneath clothing tuck pant legs into socks or tape to boots
- Wear long-sleeved shirts, a hat, and high boots
- Apply DEET repellent to exposed skin or clothing per product label
- Apply permethrin repellent to the outside of boots and clothing before wearing, per product label
- Frequently check for ticks and remove from clothing
- At the end of the day, search your entire body for ticks (particularly groin, armpits, neck, and head) and shower
- To prevent pathogen transmission through mucous membranes or broken/cut skin, wash or disinfect hands and/or wear surgical-style nitrile gloves any time ticks are handled

Pregnant individuals and individuals using prescription medications should consult with their physician and/or pharmacists before using chemical repellents. Because human health effects may not be fully known, use of chemical repellents should be kept to a minimum frequency and quantity. Always follow manufacturers' use instructions and precautions. Wash hands after handling, applying, or removing protective gear and clothing. Avoid situations such as hand-to-face contact, eating, drinking, and smoking when applying or using repellents.

Remove and wash clothes per repellent product label. Chemical repellents should not be used on infants and children.

Vaccinations are generally not available for tick-borne pathogens. Although production of the LYMErix™ Lyme disease vaccination has been ceased, vaccination may still be considered under specific circumstances and with concurrence from the consulting physician.

### Tick Check

A tick check should be performed after field survey before entering the field vehicle (you do not want to infest your field vehicle with ticks). Have your field partner check your back; the backs of your legs, arms, and neck; and your hairline. Shake off clothing as thorough as possible before entering the vehicle. Once the field day is complete, repeat this procedure and perform a thorough self check.

If a tick has embedded itself into the skin, remove the tick as described below.

### Tick Removal

1. Use the tick removal kit obtained through the CH2M HILL Milwaukee warehouse, or a fine-tipped tweezers or shield your fingers with a tissue, paper towel, or nitrile gloves.



Tick Bites\Tick Remover.pdf

2. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with tweezers. Consult your healthcare provider if infection occurs.



3. Avoid squeezing, crushing or puncturing the body of the tick because its fluids (saliva, hemolymph, gut contents) may contain infectious organisms. Releasing these organisms to the outside of the tick's body or into the bite area may increase the chance of infectious organism transmission.

4. Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin. This precaution is particularly directed to individuals who remove ticks from domestic animals with unprotected fingers. Children, elderly persons, and immunocompromised persons may be at greater risk of infection and should avoid this procedure.

5. After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.

6. Should you wish to save the tick for identification, place it in a plastic bag, with the date of the tick bite, and place in your freezer. It may be used at a later date to assist a physician with making an accurate diagnosis (if you become ill).

**Note:** Folklore remedies such as petroleum jelly or hot matches do little to encourage a tick to detach from skin. In fact, they may make matters worse by irritating the tick and stimulating it to release additional saliva, increasing the chances of transmitting the pathogen. These methods of tick removal should be avoided. In addition, a number of tick removal devices have been marketed, but none are better than a plain set of fine tipped tweezers.

#### First-Aid and Medical Treatment

Tick bites should always be treated with first-aid. Clean and wash hands and disinfect the bite site after removing embedded tick. Individuals previously infected with Lyme disease does not confer immunity—re-infection from future tick bites can occur even after a person has contracted a tick-borne disease.

The employee should contact the Injury Management/Return To Work provider (IMRTW), WorkCare using the toll-free number 866-893-2514 to report the tick bite. WorkCare will follow-up with each CH2M Hill employee who reports a tick bite and is at risk of developing Lyme disease by monitoring for symptoms up to 45 days, and will refer the employee to a medical provider for evaluation and treatment as necessary.

## Personal Protection Measures in the Prevention of Biological Incidents

TO: NAVFACLANT CLEAN Members

COPIES: Mark Orman/MKE  
Mike Goldman/ATL

FROM: Ray Tyler/VBO, NAVFACLANT Program Manager

DATE: March 4, 2010  
1 Attachment

NAVFACLANT CLEAN members, you are to be commended in reducing the number of biological incidents over the past years, particularly those related to tick bites. Our goal is to have zero biological and other safety incidents on the CLEAN program. To achieve Target Zero and to make sure that no one is injured on the job or at home, this memo outlines the procedures in selecting the appropriate clothing, treatment options, and inspection procedures which must be followed on CLEAN projects to prevent biological incidents.

### Clothing & Insect Repellant Requirements

The selection of which clothing to utilize will depend on several factors including weather conditions, site vegetation and tasks to be completed. The table below provides the type of protection to be applied for each staff member conducting field work (including site inspections) on Navy CLEAN projects. Any deviations from the below table should be discussed with the PM and the Program H&S Manager, Mark Orman/MKE.

Body Part	Protective Measure
Head	Light colored hat with wide all-around brim (required) Treat neck with DEET (required)
Upper Body	Light colored long sleeve shirt (required) Treat exposed skin with DEET (required) One of the following must be worn: 1) Pre-treated or self-applied Permethrin clothing 2) Tyvek® coverall 3) Bug Suit
Lower Body	Light colored long pants tucked into socks and taped to prevent any entry points (required) One of the following must be followed: 1) Pre-treated or self-applied Permethrin clothing treatment 2) Tyvek® coverall 3) Bug suit
Feet	White socks (recommended) Taped pant cuffs to boots (required) Pants tucked into socks (required) Permethrin gaiters (optional)

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A checklist has been developed for staff to remind us of the procedures that should be followed each day staff are working in an environment where contact with biological is expected (Attachment 1). This checklist should be filled out daily for each team and will become part of the project file and will be asked for if a biological incident occurs.

As with personal clothing as well as suits, it is critical that the user remove the clothing as soon as possible and properly handle the used clothing. Shortening the time the clothing is worn reduces the chances from ticks to make their way from your clothes to your skin.

### **Self Applied Permethrin Clothing Treatment**

Permethrin based repellents (i.e., Permanone) have proven to be highly effective in preventing tick bites. Permethrin is actually an insecticide, rather than a traditional repellent, and works primarily by killing ticks on contact with the clothes (although it also has some repellent properties).

Repellents containing Permethrin are for use on clothing only, and **are not intended for skin application**. These products are formulated as aerosol sprays or pumps, and will typically provide up to 2 weeks of protection from a single treatment (lasting through several washings). Typically, these products are applied in a well ventilated area, and allowed to dry for 2-4 hours (more time is required for higher humidity environments). Costs for these repellents generally run from \$7 to \$20.

While skin reactions are not common, it is recommended to avoid contact with face eyes or skin when treating clothing. If a reaction is noticed, remove the clothing and shower as quickly as is possible. All chemical treatments, either for clothing or for skin, should follow the manufacturer's instructions. Additional information on the application of repellents can be found on the Center for Disease Control (CDC) website:

<http://www.cdc.gov/ncidod/dvbid/westnile/repellentupdates.htm>

### **Pretreated Permethrin Clothing**

There are some manufacturers which produce clothing that has already been treated with repellents, such as Permethrin. Typically, the fibers are impregnated with the repellent, reportedly making them able to withstand up to 70 wash cycles. While there is likely some variability in how long these clothing remain effective, they could also be retreated to prolong their effectiveness. Purchasing pre-treated clothing is one alternative to applying a Permethrin based repellent to your clothing. However, the costs of these clothes can range from \$20 to \$50. Staff should discuss the need for such clothing with their PMs.

### **Bug Suits**

Bug Suits (aka Bug-Out-Suits), are garments which are assembled with a mesh foundation woven throughout the pants and jacket, along with a mesh/fabric hood. These provide a physical barrier to small insects. Typically, these garments are not treated with repellents and still are susceptible to infiltration through seams.

Bug Suits add an additional layer of clothing to the wearer when used properly. Drawbacks to the use of the suits may include an increase of tripping hazards if not properly sized, impaired vision, and an increase risk of heat related illnesses. The suits should not be used around heavy equipment or moving parts that could catch the material and pull an individual into the equipment. Frequent inspections of the suit is required to ensure that no tears have developed or separations of seams. Additional rest breaks and increased personal monitoring is necessary during their use. Bug Suits should be ordered and charged to the projects they are being used on.

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## **Tyvek®**

Tyvek® suits provide a continuous physical barrier for the legs and torso, which makes it very difficult for ticks to infiltrate. The light color also makes it easier to see ticks that have transferred onto the body. The disposable nature of the suits also reduces the hazard associated with ticks which go undetected in clothing at the end of the day. Tyvek® clothing does present an additional heat stress hazard for employees. Additional rest breaks and increased personal monitoring is necessary during their use.

## **Skin Treatment**

The use of skin applied repellants is required when working in areas where the presence of ticks is anticipated. While other repellants may provide some level of protection, DEET (*N,N*-Diethyl-*meta*-toluamide) based repellants are required for use on CH2M HILL projects.

These repellants must be reapplied periodically in accordance with manufacturer's recommendations. The effectiveness of DEET on the skin is influenced by the concentration of DEET, absorption through the skin, evaporation, sweating, air temperature, wind and abrasion of the treated surface by rubbing or washing. Studies have shown that 100% DEET may offer up to 12 hours of protection, while lower concentrations of DEET (20%-34%) may provide between 3 to 6 hours of protection. The Centers for Disease Control and Prevention (CDC) recommends repellents with between 20%-30% DEET content. Some non-DEET repellent products also provide some level of protection, but those products have been found to offer a lesser degree of protection than DEET based products. It should be noted that while DEET will repel ticks and decrease the chance of a tick bite, it may not deter a tick from walking across the skin to unexposed and untreated areas.

## **Tick Checks and Response to Tick Bites**

The use of protective clothing and application of repellents is only part of preventing a biological incident. No one should be under the false impression that by using the appropriate clothing and applying adequate repellent that they are immune to tick bites. By conducting routine tick checks, reducing the time which ticks have to find a pathway to your skin, we can further reduce the risk.

### **Tick Checks**

By checking ourselves and others for ticks, we are able to find ticks before they have a chance to attach or transfer diseases. Field staff will conduct personal checks as often as possible, but no less than once at lunch and at the end of the day. The inspection at the end of the day should include an unclothed tick check. Personal checks should be conducted using a mirror to look over areas that are not able to be seen by just one person. Clothing should be turned inside-out and thoroughly inspected.

It is also recommended that if facilities are available, that a second set of clothes be brought to change into. The clothing worn during the day should be placed in a plastic trash bag and taped closed. The bag should be transported separate from the passenger area of the vehicle (i.e. in trunk, back of pick-up truck).

### **Personal Hygiene**

In addition to removing clothing as soon as is practical, it is also important to practice good and immediate hygiene following field work. By washing shortly after tasks are complete, not only are you washing away any site dirt, you are also removing the applied repellent. Showering is the recommended method for removing residual repellent and provides an additional opportunity for personal check. If showering is not readily available, the minimum requirement is to wash the hands and face prior to eating or drinking.

---

## Tick Bite and Removal

If bitten by a tick, act promptly. Remove the tick immediately using tweezers pulling gently at the point of attachment (head). Tick removal kits may also be ordered through the equipment warehouse. It is essential to remove the tick as soon as possible (best if found and removed within 24 hours of attachment).

The tick should be placed in a Ziploc bag for testing at a later date, if deemed necessary by the Occ. Nurse. As with any incident, contact the PM, HSM and the WorkCare Occupational Health Nurse at **1-866-893-2514** as soon as possible, and provide as much information as possible regarding the date, time and location of the bite. Follow the nurse's advice regarding monitoring symptoms and follow-up contact.

Complete HITS (incident report) or designate a person to complete the form as soon as possible, but no more than 24-hours after identifying the bite. *Remember, time is your enemy. The longer you wait to inspect for a tick, the longer it takes for you to communicate a tick bite, the more likely it is that a tick can transfer a blood borne illness.*

## Final Words

I am asking all of you to follow the steps described in this memo and really try to modify your behavior and continuously strive for our "Target Zero" goal of no incidents or accidents. This isn't easy, I know. Pleasing the client, meeting deadlines, and staying within budget compete with our time to embrace the H&S culture, but each of us must work harder to push past simply complying with H&S. You need to make an individual commitment to incorporate H&S into every activity you involve yourself with, at work and at home. Thank you all for what you do every day. Be safe.

---

# **CH2M HILL HEALTH AND SAFETY PLAN**

## **Attachment 9**

### **Observed Hazard Form**

**OBSERVED HAZARD FORM**

Name/Company of Observer (*optional*):

Date reported: \_\_\_\_\_

Time reported: \_\_\_\_\_

Contractor/s performing unsafe act or creating unsafe condition:

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_

Unsafe Act or Condition:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Location of Unsafe Act or Condition:

**Name of CH2M HILL Representative:**

\_\_\_\_\_

Corrective Actions Taken:

Date: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Project Safety Committee Evaluation:

Date: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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# **CH2M HILL HEALTH AND SAFETY PLAN**

## **Attachment 10**

### **Stop Work Order Form**

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**CH2MHILL**

# Stop Work Order

**REPORT PREPARED BY:**

Name:	Title:	Signature:	Date:

---

**ISSUE OF NONPERFORMANCE:**

Description:	Date of Nonperformance:

**SUBCONTRACTOR SIGNATURE OF NOTIFICATION:**

Name:	Title:	Signature:	Date:

---

*\* Corrective action is to be taken immediately. Note below the action taken, sign and return to CCI.\* Work may not resume until authorization is granted by CH2M HILL Constructors, Inc. Representative,*

**SUBCONTRACTOR'S CORRECTIVE ACTION**

Description:	Date of Nonperformance:

**SUBCONTRACTOR SIGNATURE OF CORRECTION**

Name:	Title:	Signature:	Date:

**Appendix C**  
**Quality Assurance Project Plan**

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The Quality Assurance Project Plan (QAPP) will be issued as an addendum at a later date.