**DEPARTMENT OF THE ARMY**
US ARMY DEFENSE AMMUNITION CENTER
1 C TREE ROAD
MCALESTER, OKLAHOMA 74501-9053

REPLY TO
ATTENTION OF:

SJMAC-ESM 18 February 2009

MEMORANDUM FOR Department of Defense Explosives Safety Board (DDESB-PE/Mr. Alchowiak), 2461 Eisenhower Avenue, Alexandria, VA 22331-0600

SUBJECT: Amendment 6 to the Explosives Safety Submission (ESS) for the Munitions and Explosives of Concern (MEC) Removal Action at Fort McClellan, AL

1. References:

a. Memorandum, Joint Powers Authority, (Matrix Environmental Services, LLC/Mr. Satkin), 6 Feb 098, subject: Transmittal of Amendment 6 to Conventional Explosives Safety Submission (ESS) McClellan (enclosed).

b. DOD 6055.09-STD, Ammunition and Explosives Safety Standards, dated 29 Feb 2008.

c. Memorandum, Department of Defense Explosives Safety Board, DDESB-PE, 16 May 06, subject: Explosives Safety Submission (ESS) for Portions of Alpha and Bravo Munitions Response Areas, Fort McClellan, AL.

d. Memorandum, Department of Defense Explosives Safety Board, DDESB-PE, 7 Aug 06, subject: Amendment 1 to the Explosives Safety Submission (ESS) for Portions of Alpha and Bravo Munitions Response Areas, Fort McClellan, AL.

e. Memorandum, Department of Defense Explosives Safety Board, DDESB-PE, 23 Jul 07, subject: Amendment 2 to the Explosives Safety Submission (ESS) for Portions of Alpha and Bravo Munitions Response Areas, Fort McClellan, AL.

f. Memorandum, Department of Defense Explosives Safety Board, DDESB-PE, 24 Jan 08, subject: DDESB Approval of Transmittal of Amendment 3 to Conventional Explosives Safety Submission (ESS), McClellan.

g. Memorandum, Department of Defense Explosives Safety Board, DDESB-PE, 4 Mar 08, subject: DDESB Approval of Transmittal of Amendment 4 to Conventional Explosives Safety Submission (ESS), McClellan, AL.

h. Memorandum, Department of Defense Explosives Safety Board, DDESB-PE, 17 Jul 08, subject: DDESB Approval of Transmittal of Amendment 5 to the Explosives Safety Submission (ESS) for Munitions and Explosives of Concern (MEC) Removal Action at McClellan, AL.

SJMAC-ESM
SUBJECT: Amendment 6 to the Explosives Safety Submission (ESS) for the Munitions and Explosives of Concern (MEC) Removal Action at Fort McClellan, AL

2. Reference 1.a with enclosed Amendment 5 is provided for your review IAW with chapter 12 of reference 1.b. It amends the basic ESS, which your office approved in reference 1.c. In addition, your office approved Amendments 1 thru 5 in references 1.d thru 1.h respectively. We have reviewed the enclosed amendment and find it acceptable as written. Please furnish your comments and/or approval to us by 31 Mar 09, so we can make any changes required and forward final approval.

3. This amendment adds an additional Munitions Response Site (MRS-8) to the project. It also adds an additional intentional detonation area and a magazine for the storage of MEC items that are determined safe to move. All other aspects of the original ESS with Amendments 1 thru 5 are unchanged.

4. The POC is Mr. James Toburen, SJMAC-ESM, DSN 956-8784, or COMML (918) 420-8784, email james.toburen@us.army.mil.

FOR THE DIRECTOR:

TOBUREN.JAMES.E.1231125198

Digitally signed by TOBUREN.JAMES.E.1231125198
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1 Encl
as

for/CLIFFORD H. DOYLE
MEC Team Leader
Explosives Safety Knowledge, OE and Chemical Division
US Army Technical Center for Explosives Safety

CF (w/encl):
Office of the Director of Army Safety (DACS-SF/Mr. Patton), 223 23rd Street, Crystal Plaza 5, Suite 980, Arlington, VA 22202
Office of the Deputy Assistant Secretary of the Army for Environment, Safety, and Occupational Health, Special Assistant for Munitions, (DASA-DESOH/Mr. King), 110 Army Pentagon, Washington, DC 20310-0110
Office of the Assistant Chief of Staff for Installation Management, Base Realignment and Closure Office (DAIM-BD/Mr. Haughs), 600 Army Pentagon, Washington, DC 20310-0600
Matrix Environmental Services, LLC., (Mr. Richard Satkin, P.G.), 283 Rucker Street, Anniston, AL 36205

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February 6, 2009

Mr. James E. Toburen
Defense Ammunition Center
US Army Technical Center for Explosives Safety
ATTN: SJMAC-ESM (Mr. Toburen)
Building 35, 1C Tree Road
McAlester, OK, 74501-9053

Subject: Transmittal of Amendment 6 to Conventional Explosives Safety Submission (ESS) McClellan

Dear Mr. Toburen:

Munitions and explosives of concern (MEC) remediation is being conducted for specific munitions response sites at the former Fort McClellan in Anniston, Alabama. Fort McClellan was closed under the Base Realignment and Closure Act (BRAC) as recommended by the 1995 Defense Base Closure Realignment Commission. This MEC remediation work is being conducted to clear land for use in redevelopment, which is covered and funded in accordance with an Environmental Services Cooperative Agreement (ESCA) No. DASW01-03-2-001 between the Department of the Army and the McClellan Development Authority (MDA), formerly the Anniston-Calhoun County Fort McClellan Development Joint Powers Authority (JPA). Provisions in the ESCA required the preparation and approval of an ESS through USATCES and DDESB. This amendment adds an additional munitions response site (MRS-8) and adds an additional intentional detonation area and portable magazine in which to dispose of unfuzed MEC items deemed safe to move.

Matrix Environmental Services, LLC. is submitting this ESS amendment on behalf of the MDA. Please contact me at richard_satkin@matrixdesigngroup.com or (256) 847-0780 if you have any questions on this amendment. Thank you very much.

Best regards,

MATRIX ENVIRONMENTAL SERVICES, LLC.

Richard L. Satkin, P.G.
Senior Project Manager

c: Miki Schneider – MDA

# Amendment 06
# Explosives Safety Submission (Conventional)

## MEC Remediation at McClellan
## MRS - 8
## Anniston, Alabama

Prepared for the McClellan Development Authority

Matrix Environmental Services, L.L.C.
*Integrated Environmental Solutions*

Prepared by:
Matrix Environmental Services, LLC
February 2009

# Table of Contents



# List of Figures



# List of Tables

# LIST OF ACRONYMS

| | |
|---|---|
| DDESB | Department of Defense Explosives Safety Board |
| DoD | Department of Defense |
| EBP | Eastern Bypass |
| EE/CA | Engineering Evaluation/Cost Analysis |
| ESS | Explosives Safety Submission |
| EZ | Exclusion Zone |
| ft | Foot / Feet |
| HE | High Explosive |
| HEAT | High Explosive Anti-Tank |
| IBD | Inhabited Building Distance |
| JPA | Joint Powers Authority |
| MDA | McClellan Development Authority |
| MEC | Munitions and Explosives of Concern |
| Mk | Mark |
| mm | Millimeter |
| MGFD | Munition with the Greatest Fragmentation Distance |
| MRA | Munitions Response Area |
| MRS | Munitions Response Site |
| MSD | Minimum Separation Distance |
| NEW | Net Explosive Weight |
| Q-D | Quantity-Distance |
| STD | Standard |
| TSD | Team Separation Distance |
| TTFWI | Tetra Tech Foster Wheeler, Inc. |
| USACE | United States Army Corps of Engineers |
| USATCES | U.S. Army Technical Center for Explosives Safety |
| UXO | Unexploded Ordnance |

## 1.0 PURPOSE OF AMENDMENT

This amendment to the approved Explosives Safety Submission (ESS) for Munitions and Explosives of Concern (MEC) remediation at McClellan (USATCES approval memo dated 22 May 2006) is being submitted primarily to add an additional munitions response site (MRS) MRS-8 to be remediated in the Bravo munitions response area (MRA) and secondarily to add an intentional detonation area and a portable magazine in which to stage MEC items deemed acceptable to move in order to facilitate work planning and improve the operational logistics at the site.

## 2.0 PHYSICAL CHANGES FROM APPROVED ESS

### 2.1 MRS-8

MRS-8 is 178 acres in size and is located in the eastern portion of the Bravo MRA west of MRS-2 (see Figure 2-1). MRS-8 encompasses what was previously referred to as Planning Area 4 in the approved ESS. The MRS will be cleared to depth in locations not designated as part of the McClellan Park System (future land use designation) and cleared to one-foot using mag/dig methods in locations designated as McClellan Park System. The McClellan Park System will be a wildlife habitat/conservation area and land use controls prohibiting digging (which will include signage prohibiting digging) will be implemented for this area.

Grids, delineation transects and mountain transects were previously used to characterize this area in the Draft Bravo EE/CA (TTFWI 2004). Based on this EE/CA data, the munition with the greatest fragmentation distance (MGFD) selected for this MRS is the **Projectile, 37mm, HE, MKII.** Below is a summary of the EE/CA findings in the three Army-designated sectors that overlap with MRS-8.

The A1 Reconnaissance Area D sector which consists of approximately 160 acres along the northern border of the Bravo Area, borders the northern portion of the Industrial Access Road and overlaps the western portion of MRS-2. Grids and delineation transects were previously used to characterize this area. MEC items were found on the surface and to depths of 15 inches during field activities in this sector. A large amount of MEC scrap was also found on the surface and to depths of 36 inches. The following types of MEC and MEC scrap items were identified (detailed list in Draft Bravo EE/CA, TTFWI 2004):

- Projectile, 75mm shrapnel, MKI
- Projectile, 3.8in shrapnel, MKI
- Projectile, 37mm, practice, MKII A1 w/LE charge
- Grenade, 40mm
- Mortar, 3in Stokes, MKI,
- Signal, illumination, ground, M127 series

The M3-1L Suspect Area 1-PR consists of approximately 193 acres in Bravo, lies south of the A1 Reconnaissance Area D sector. Six MEC items were identified on the surface during previous site characterization work. Eight MEC items were found at shallow depths of less than 4 inches. A large amount of MEC scrap was found on the surface and to a maximum depth of 18 inches. The following types of MEC and MEC Scrap items were identified (detailed list in Draft Bravo EE/CA, TTFWI 2004):

- Fuze, powder train time, M1907
- Projectile, 75mm shrapnel, MKI
- Projectile, 37mm HE MKII
- Projectile, 37mm, TPT, M51A2
- Mortar, 60mm smoke, WP M302

The M3-2M Hand Grenade Area-PR sector consists of approximately 70 acres along the northern border of the Bravo MRA to the west of A1 Reconnaissance Area D sector. Grids and delineation transects were previously used to characterize this area. Three MEC items were found on the surface during field activities in this sector. The following types of MEC items were identified (detailed list in Draft Bravo EE/CA, TTFWI 2004):

- Rocket, 2.36inch HEAT, M6
- Projectile, 37mm, HE, M54

## 2.2 MRS-8 Hazard Assessment

Considering the MEC items found in this area previously a single MGFD, the **Projectile, 37mm, HE, MKII** is being selected and will be used for the corresponding exclusion zone for MRS-8. The minimum separation distance (MSD, the distance that must be maintained between MEC operations and nonessential personnel) will also be the daily exclusion zone (EZ) for removal activities.

USACE has intrusively investigated millions of surface MEC items and subsurface anomalies that have the potential to be unexploded ordnance over the past 15 years on more than 1,000 project locations for FUDS, BRAC, and Active installations. These are extremely conservative estimates. On one project alone, USACE investigated over 3,000,000 anomalies, of which approximately 1.67% were UXO with no accidents or unintentional detonations. For these reasons, the probability of an unintentional detonation, due to project activities, is assessed to be "Extremely Low" and the use of the Hazardous Fragment Distance (HFD) for the MSD for non-essential personnel for unintentional detonations is warranted and authorized.

The Fragmentation Data Review Form for the Projectile, 37mm, HE, MKII is provided in Table 2-1. The MGFD and corresponding exclusion zone (EZ) distances for MRS-8 are shown in Figure 2-1. The EZ and MSD for an unintentional detonation during intrusive operations is 90 feet and represents the Quantity-Distance (Q-D) Arc based on the HFD of the Projectile, 37mm, HE, MKII.

The maximum fragment range for this MGFD is 980 feet and is the EZ and MSD for intentional detonations. For any intentional detonation where any portion of the 980 foot arc would extend offsite engineering controls will be used to reduce the EZ and MSD and to mitigate the potential fragmentation and blast hazards. The EZ and MSD for an intentional detonation with engineering controls is 200 feet. Engineering controls for intentional detonations will be used as described in the *Use of Sand Bags for Mitigation of Fragmentation and Blast Effects due to Intentional Detonation of Munitions*, HNC-ED-CS-S-98-7 dated August 1998 or in the *Use of Water for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions*, HNC-ED-CS-S-00-3, dated September 2000.

Only one inhabited building is present within the EZ and it is also noted on Figure 2-1. This building is used occasionally by Matrix Environmental Services, LLC who is providing program management and oversight on the project; therefore coordination on when the building is being used will not be an issue during MEC operations in MRS-8.

We propose to utilize a team separation distances (TSD) of 16 feet in accordance with the September 11, 2007 Technical Update, Implementation of DDESB Guidance on Minimum Separation Distances for Unintentional Detonations. This TSD is based on the K40 distance for the MGFD obtained from the Fragmentation Database (database was provided by Lea Ann Cotton, DDESB on November 7, 2007) as shown in Table 2-1.

There is no change in the step-out procedures from the approved ESS. The step-out areas are shown in Figure 2-1.

## 3.0 PROCESS CHANGES FROM APPROVED ESS

### 3.1 MRS Specific

The approved Amendments 1 and 3 to the ESS provide for intentional detonation areas located on the east and west sides of the Bravo MRA. Because concurrent clearance activities will be conducted in the central portions of the Bravo MRA a third intentional detonation area has been designated in the location shown on Figure 3-1. Using the guidance from Paragraph C9.8.4 of the current DoD 6055.9-STD, "DoD Ammunition and Explosives Safety Standards," dated February 29, 2008, the minimum separation distance between intentional detonation areas and non-essential personnel is the larger of the following distances:

1. $d=328w^{1/3}$, where d is the distance in feet and w is the net explosive weight in pounds,
2. 1,250 ft, or
3. MGFD

From the approved ESS, the munition with the largest NEW is the 75mm HE, M48 at 1.47 lbs. Using the equation above the distance d calculated would be 373 feet. The MGFD for the 75mm HE, M48 is 1701 feet and therefore the MSD for the intentional detonation area will be 1701 feet as is shown in Figure 3-1. If rounds larger than the 75mm HE, M48 are moved to the intentional detonation area, the QD arc will be adjusted accordingly.

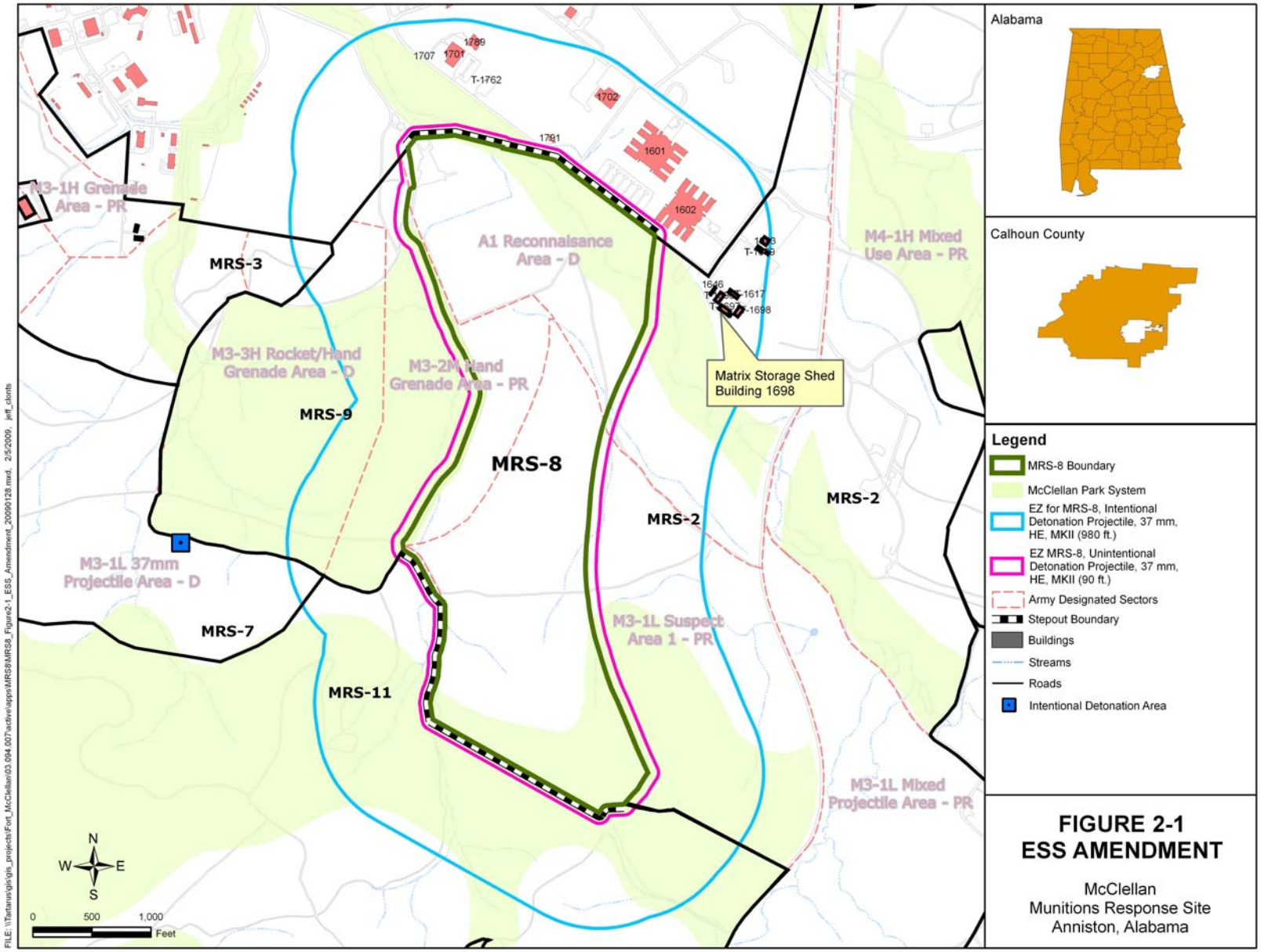
### 3.2 MEC Storage

The approved Amendments 2 and 3 to the ESS provides for BATF Type II portable magazines for storage of up to 100 pounds net explosive weight (NEW) of Hazard Division (HD) 1.1 materials on the east and west sides of the Bravo MRA. Given the large separation distance of where concurrent clearance activities will be conducted it makes sense from an operational standpoint to stage a third BATF Type II portable magazine to store MEC items found in the central portion of the Bravo MRA near the third proposed intentional detonation area. The portable explosives storage magazine will be built to meet BATF specifications (see design drawing in Figure 3-2) and stored at least 500 feet from the intentional detonation area.

A NEW limit of 100 lbs will be used for the third portable magazine and its placement will be near the proposed second intentional detonation area. An MSD for non-essential personnel will be established at 658 feet as specified in 6055.9 STD, Table C9.T2. Figure 3-1 shows the site where this portable magazine will be placed and the corresponding MSD arc. This magazine is exempt from lightning protection system requirement stipulated in EM 1110-1-4009 since it is constructed of ¼-inch plate steel, which is above the 3/16-inch wall thickness stipulated in the engineering

manual reference for the exemption. The magazine will be grounded and locked using two BATF-approved locks.

MEC items deemed acceptable to move will be transported in closed vehicles whenever possible to the portable magazine and they will not travel any public roadways. The load will be well-braced and, except when in closed vehicles, covered with a fire-resistant tarpaulin or in an appropriate shipping container.


MRS-1
MRS-2
MRS-3
MRS-7
MRS-8
MRS-9
MRS-11
M3-1H Grenade Area - PR
M3-3H Rocket/Hand Grenade Area - D
M3-2M Hand Grenade Area - PR
M3-1L 37mm Projectile Area - D
A1 Reconnaisance Area - D
M3-1L Suspect Area 1 - PR
M4-1H Mixed Use Area - PR
M3-1L Mixed Projectile Area - PR
Matrix Storage Shed Building 1698
1707
1701
1789
T-1762
1702
1791
1601
1602
1646
1617
1698
N
W
E
S
0
500
1,000
Feet
Alabama
Calhoun County
Legend
MRS-8 Boundary
McClellan Park System
EZ for MRS-8, Intentional Detonation Projectile, 37 mm, HE, MKII (980 ft.)
EZ MRS-8, Unintentional Detonation Projectile, 37 mm, HE, MKII (90 ft.)
Army Designated Sectors
Stepout Boundary
Buildings
Streams
Roads
Intentional Detonation Area
FIGURE 2-1
ESS AMENDMENT
McClellan
Munitions Response Site
Anniston, Alabama

## Table 2-1 Fragmentation Data Review Form for Projectile, 37mm, HE, MKII

# FRAGMENTATION DATA REVIEW FORM

Database Revision Date 12/31/07

| | | | |
|---|---|---|---|
| Category: | HE Rounds | DODIC: | |
| Munition: | 37 mm MK II (0.053lb) | Date Record Created: | 7/30/2004 |
| | | Last Date Record Updated: | 7/9/2007 |
| Primary Database Category: | projectile | Individual Last Updated Record: | Crull |
| Secondary Database Category: | 37 mm | Date Record Retired: | |
| Munition Case Classification: | Extremely Heavy C | | |

**Munition Information and Fragmentation Characteristics**

| | |
|---|---|
| Explosive Type: | TNT |
| Explosive Weight (lb): | 0.05300 |
| Diameter (in): | 1.4567 |
| Max Fragment Weight (lb): | 0.024500 |
| Critical Fragment Velocity (fps): | 3302 |

**Theoretical Calculated Fragment Range**

| | |
|---|---|
| HFD [Range to No More Than 1 Hazardous Fragment per 600 Square Feet] (ft): | 90 |
| MFR-V [Vertical Range of Max Weight Fragment] (ft): | 754 |
| MFR-H [Horizontal Range of Maximum Weight Fragment] (ft): | 980 |

**Overpressure Distances**

| | |
|---|---|
| Inhabited Building Distance (12 psi), K40 Distance: | 16 |
| Inhabited Building Distance (09 psi), K50 Distance: | 20 |
| Intentional MSD (0065 psi), K328 Distance: | 131 |

**Minimum Thickness to Prevent Perforation**

| | |
|---|---|
| 4000 psi Concrete (Prevent Spall): | 2.00 |
| Mild Steel: | 0.37 |
| Hard Steel: | 0.30 |
| Aluminum: | 0.79 |
| LEXAN: | 3.25 |
| Plexi-glass: | 1.94 |
| Bullet Resist Glass: | 1.51 |

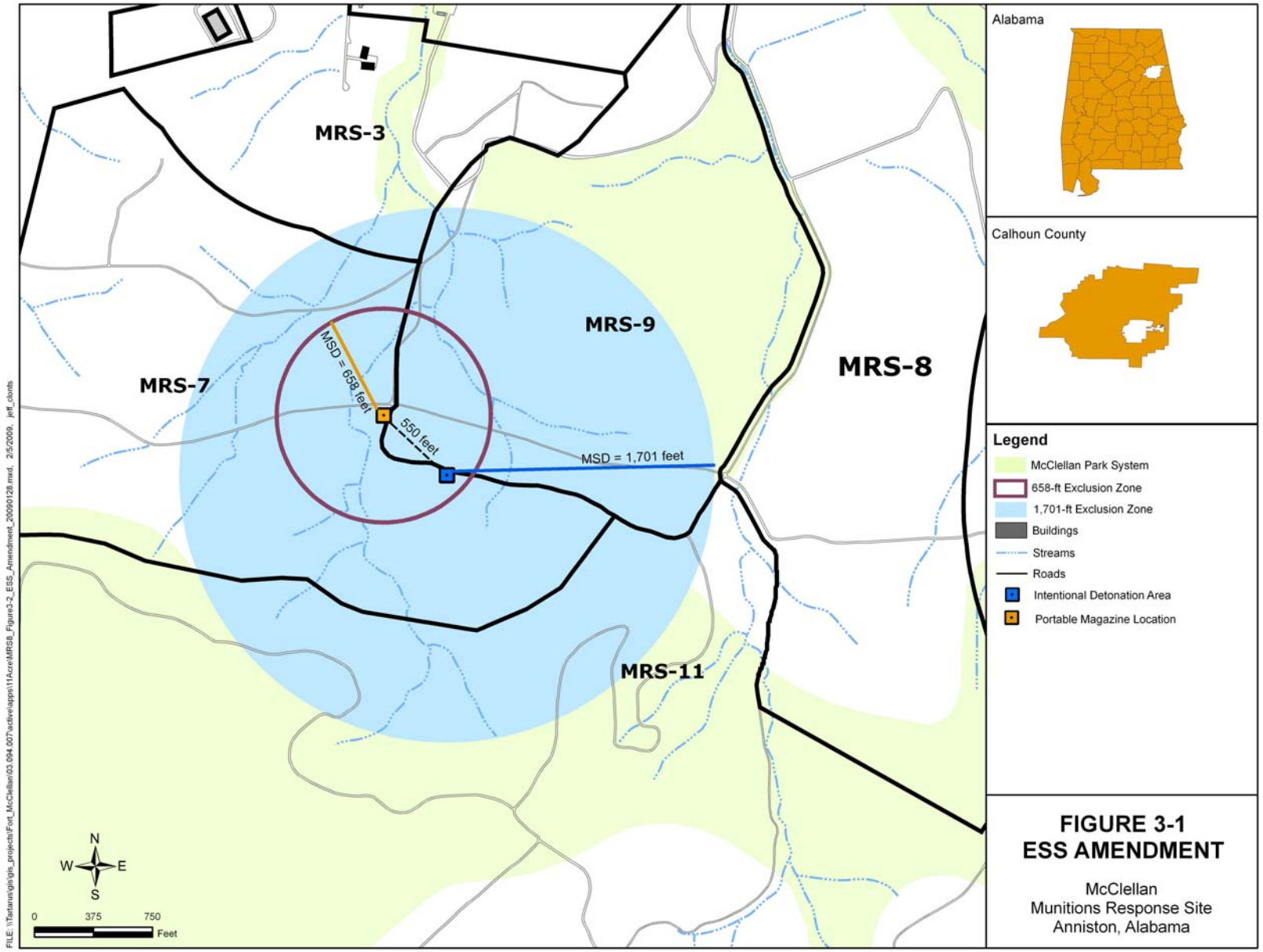
**Required Sandbag Thickness**

| | |
|---|---|
| Max Fragment Weight (lb)SB: | 0.024500 |
| Critical Fragment Velocity (fps)SB: | 3302 |
| Kinetic Energy 106 (lb-ft2/s2)SB: | 0.1336 |
| Required Wall Roof Sandbag Thickness (in)SB: | 12 |
| Expected Maximum Sandbag Throw Distance (ft)SB: | 25 |
| Minimum Separation Distance (ft)SB: | 200 |

**Water Containment System and Minimum Separation Distance:**

| | |
|---|---|
| Max Fragment Weight (lb)W: | 0.024500 |
| Critical Fragment Velocity (fps)W: | 3302 |
| Kinetic Energy 106 (lb-ft2/s2)W: | 0.1336 |
| Water Containment System: | 5 gal carboys/ inflatable pool |
| Minimum Separation Distance (ft)W: | 200/200 |

◄ ► Print This Form Close Form


MRS-3
MRS-9
MRS-7
MRS-8
MRS-11
MSD = 658 feet
550 feet
MSD = 1,701 feet
Alabama
Calhoun County
Legend
McClellan Park System
658-ft Exclusion Zone
1,701-ft Exclusion Zone
Buildings
Streams
Roads
Intentional Detonation Area
Portable Magazine Location
N
W
E
S
0
375
750
Feet
FIGURE 3-1
ESS AMENDMENT
McClellan
Munitions Response Site
Anniston, Alabama

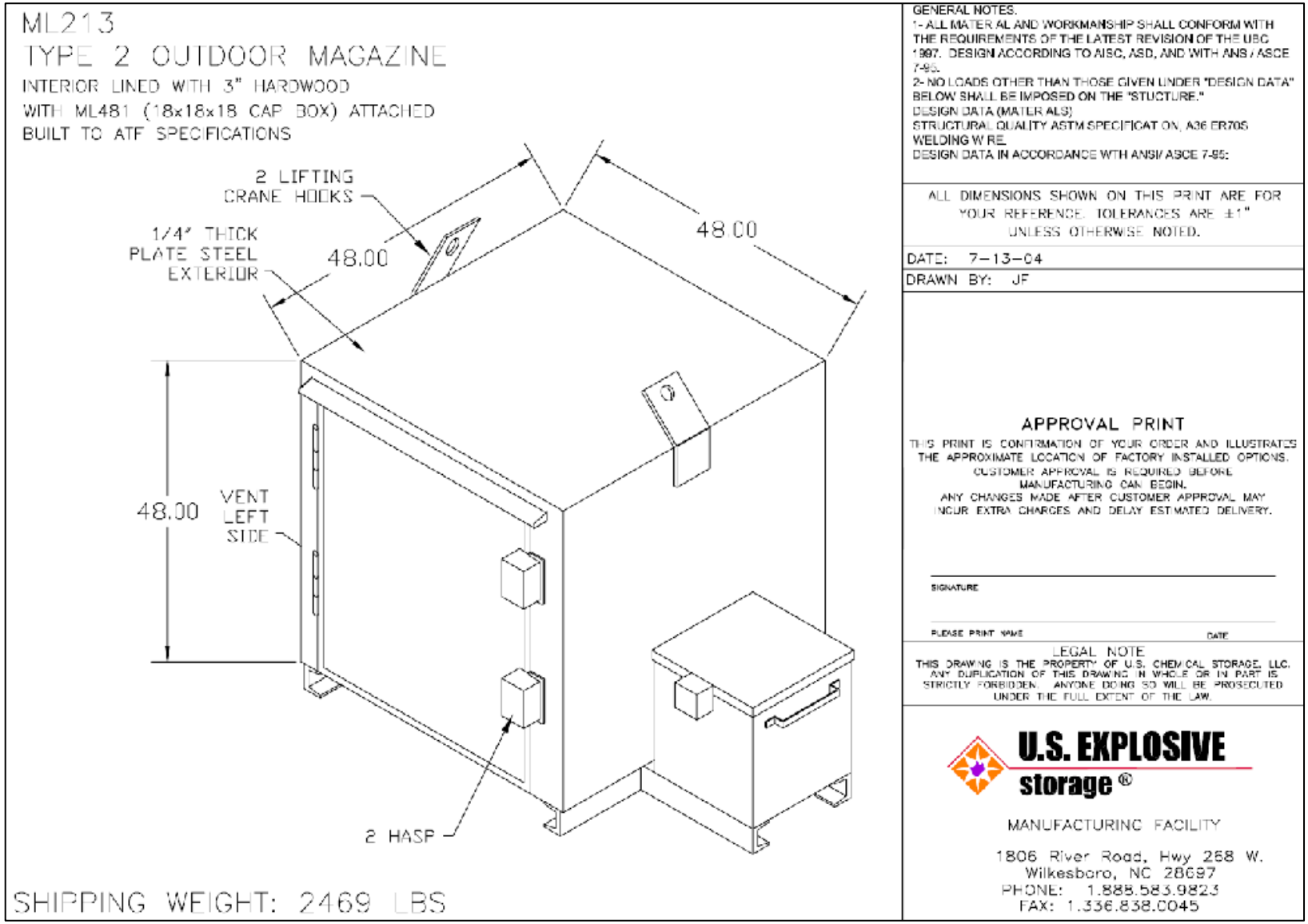



Figure 3-2 Portable Explosive Storage Magazine Design Drawing