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## Explosive Site Plan

CHARLIE AREA SUPPLEMENTAL MEC SAMPLING

Fort McClellan, AL

DECEMBER 2009

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Prepared by

**U.S. Army and Engineering Center, Huntsville**

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**1. Site:**

- a. Name: Fort McClellan, Charlie Area
- b. State: Alabama
- c. This Supplemental Munitions and Explosives of Concern (MEC) Sampling is being performed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and is part of the overall Remedial Action Process. Subsequent removal responses may be dictated in the future during the remainder of the remedial response process, as determined by action memoranda or other decision documents. Based on the results of this characterization and subsequent decision document, an Explosives Safety Submission (ESS) will be submitted in accordance with DoD 6055.09-STD.

**2. Anticipated Dates:**

- a. Start: 03/25/10
- b. Complete: 05/03/10

**3. Purpose:**

- a. Supplemental sampling for MEC and subsequent document revision in order to finalize the existing Draft Final Charlie Area Engineering Evaluation/Cost Analysis (EE/CA) and all necessary activities required to accomplish this objective.
- b. Achieve regulatory and stakeholder concurrence so that Fort McClellan redevelopment can continue.
- c. Clarifies that qualified EOD Technology, Inc. (EODT) personnel will perform all explosive ordnance disposal (EOD) activities at the site.

**4. Site Background and Current Conditions:**

- a. Fort McClellan has been used for artillery training of troops and the National Guard as early as 1898 to early WW II. In 1941, McClellan became the site of the Chemical Corps Training Command. In 1962, the U.S. Army Combat Developments Command Chemical Biological-Radiological Agency moved to Fort McClellan. In 1973, the Chemical Corps School along with the U.S. Army Combat Developments Command Chemical Biological-Radiological Agency was moved to Edgewood Arsenal. In 1979, the U.S. Army Chemical Corps School re-established along with a Training Brigade for Basic Training. Fort McClellan was closed in September 1999 under the BRAC program.
- b. The US Army Corps of Engineers (USACE) contracted to complete site characterization activities and EE/CA document production for the site in 2002.

The US Fish and Wildlife Service (USFWS) review of the Draft Final EE/CA (December 2004) resulted in postponement of the final EE/CA. USFWS concerns have been resolved; however the Final EE/CA is postponed pending completion of supplemental MEC sampling requirements requested by the Alabama Department of Environmental Management (ADEM).

**5. Executing Agencies:**

- a. Fort McClellan Transition Force, Fort McClellan, AL
- b. US Army Corps of Engineers, Huntsville Center
- c. EODT

**6. Scope of Investigative/Characterization Action:**

- a. USACE examined the existing EE/CA information in order to determine potential data gaps. Six (6) areas located in the Charlie Area at Fort McClellan are proposed for supplemental MEC sampling in order to complete the Charlie Area EE/CA. Areas 1-4 in the Risk Sector FWS-1L-FM, Area 5 in Risk Sector FWS-2L-FM, and Area 6 located southwest of the originally investigated EE/CA Sector FWS-3M-FM. The sampling will consist of digging anomalies along transects and within grids. The USACE analysis resulted in the following sampling:
  - Reacquisition and investigation of anomalies in six (6) grids (C102, C116, C118, C131, C140 and A044) that were not previously investigated, in Areas 1 and 3.
  - Investigation of anomalies in an additional two (2) new grids in Areas 1 and 2.
  - Investigation of new transects in Areas 1, 2, 3, 4, 5, and 6
- b. Table 7-1 displays the Areas, and the munitions with the greatest fragmentation distance (MGFD) that are included in this Explosives Site Plan (ESP). This ESP only addresses those areas shown in orange, and delineated as "Sampling Boundaries" on Figure 6-1.
- c. The purpose of this ESP is to ensure that all areas included in this investigative action are covered by this ESP.
- d. The investigative action will identify possible future remedial action areas for this site.
- e. The selected investigative technique for conducting the investigation for contaminants is a surface sweep and intrusive investigation of potential MEC,

debris, and other contaminants to depth of detection. If heavy equipment is used, excavation will stop 1 foot from the anomaly, and then be manually dug by hand.

- f. All areas will be investigated either using geophysical mapping (grids), or analog method (transects).

## **7. Safety Criteria:**

- a. The munitions with the greatest fragmentation distance (MGFD) in Areas 1-5 are based on the nearest FWS risk sectors that are currently included in the ESS for the MEC Removal Action at the Choccolocco Area, U.S. Fish and Wildlife Transfer, and its amendments. The MEC possibly associated with Area 6 is not available. Therefore, the MGFD is based on the nearest transects investigated during prior Charlie Area EE/CA investigation activities. The MGFDs are identified in Table 7-1. During the course of this investigation, if a MEC item with a greater fragmentation distance is encountered, the minimum separation distance (MSD) will be adjusted in accordance with DDESB Technical Paper 16 (Revision 3), operations will continue, and an amendment to this ESP submitted expeditiously for approval. The Quantity-Distance (Q-D) Arcs for all areas are shown in Appendix A, Figures 7-1 through 7-6.
- b. See Appendix B for Fragmentation Data Sheets.
- c. See Table 7-1 for Minimum Separation Distances.
- d. Any occupied buildings or public roadways in the MSD areas during MEC operations will be evacuated and/or roadways blocked to prevent non-essential personnel from entering during the conduct of MEC operations. Alternatively, engineering controls may be used as follows: Miniature Open Front Barricade (MOFB) or Open Front Barricade (OFB) for intrusive operations, the Buried Explosion Module (BEM) (see DDESB Technical Paper 16), Sandbag Mitigation or Water Mitigation for disposal operations (see notes in Table 7-1 for appropriate reports governing the use of these engineering controls). The appropriate reports will be available on site for all engineering controls used.
- e. All Material Potentially Presenting an Explosive Hazard (MPPEH) and munitions debris (MD) will be inspected, certified, verified and disposed of in accordance with DOD Instruction 4140.62, *Management and Disposition of MPPEH* and EM

1110-1-4009, *Military Munitions Response Actions* and Errata Sheet No. 2. This inspection will be certified and verified on DD Form 1348-1 as follows:

*“This certifies and verifies that the Material Documented as Safe (MDAS) listed has been 100 percent properly inspected and, to the best of our knowledge and belief, is free of explosive hazards.”*

Table 7-1 Minimum Separation Distances (MSD)							
AREA	MEC	MSD (ft) <sup>1</sup>					
		For Unintentional Detonations			For Intentional Detonations		
		Team Separation Distance (K40)	Hazardous Fragment Distance (HFD)	To Sides and Rear using MOFB or OFB <sup>2</sup>	Without Engineering Controls (MFD-H)	Using Sandbag Mitigation <sup>3</sup>	Using Water Mitigation <sup>3</sup>
Area 1 <sup>4</sup>	155mm M107	112	447	300 <sup>A</sup>	2577	220	275 <sup>***</sup>
Area 2 <sup>4</sup>	81mm M43	49	230	200 <sup>B</sup>	1395	200	264/200 <sup>**</sup>
Area 3 <sup>4</sup>	81mm M43	49	230	200 <sup>B</sup>	1395	200	264/200 <sup>**</sup>
Area 4 <sup>4</sup>	81mm M43	49	230	200 <sup>B</sup>	1395	200	264/200 <sup>**</sup>
Area 5 <sup>4</sup>	155mm M107	112	447	300 <sup>A</sup>	2577	220	275 <sup>***</sup>
Area 6 <sup>5</sup>	75mm Mkl Shrapnel	18	200	200 <sup>B</sup>	743	200	200/200 <sup>**</sup>

Notes:  
<sup>1</sup>See Appendix B for calculation sheets documenting MSD.  
<sup>2</sup>A = OFB - Open Front Barricade (HNC-ED-CS-S-99-1) ; B = MOFB - Miniature Open Front Barricade (HNC-ED-CS-S-98-8).  
<sup>3</sup>See Appendix B for required sandbag thickness (HNC-ED-CS-S-98-7) and water containment system (HNC-ED-CS-S-00-3).  
<sup>4</sup>Types of MEC were chosen for this area using the largest MGF of adjacent FWS risk sectors.  
<sup>5</sup>The MGF for this area is based on the nearest transects investigated during prior Charlie Area EE/CA investigation activities.  
<sup>\*\*</sup> 5 gallon carboys/inflatable pool  
<sup>\*\*\*</sup> 1100 gallon tank

## 8. Methods of Disposal:

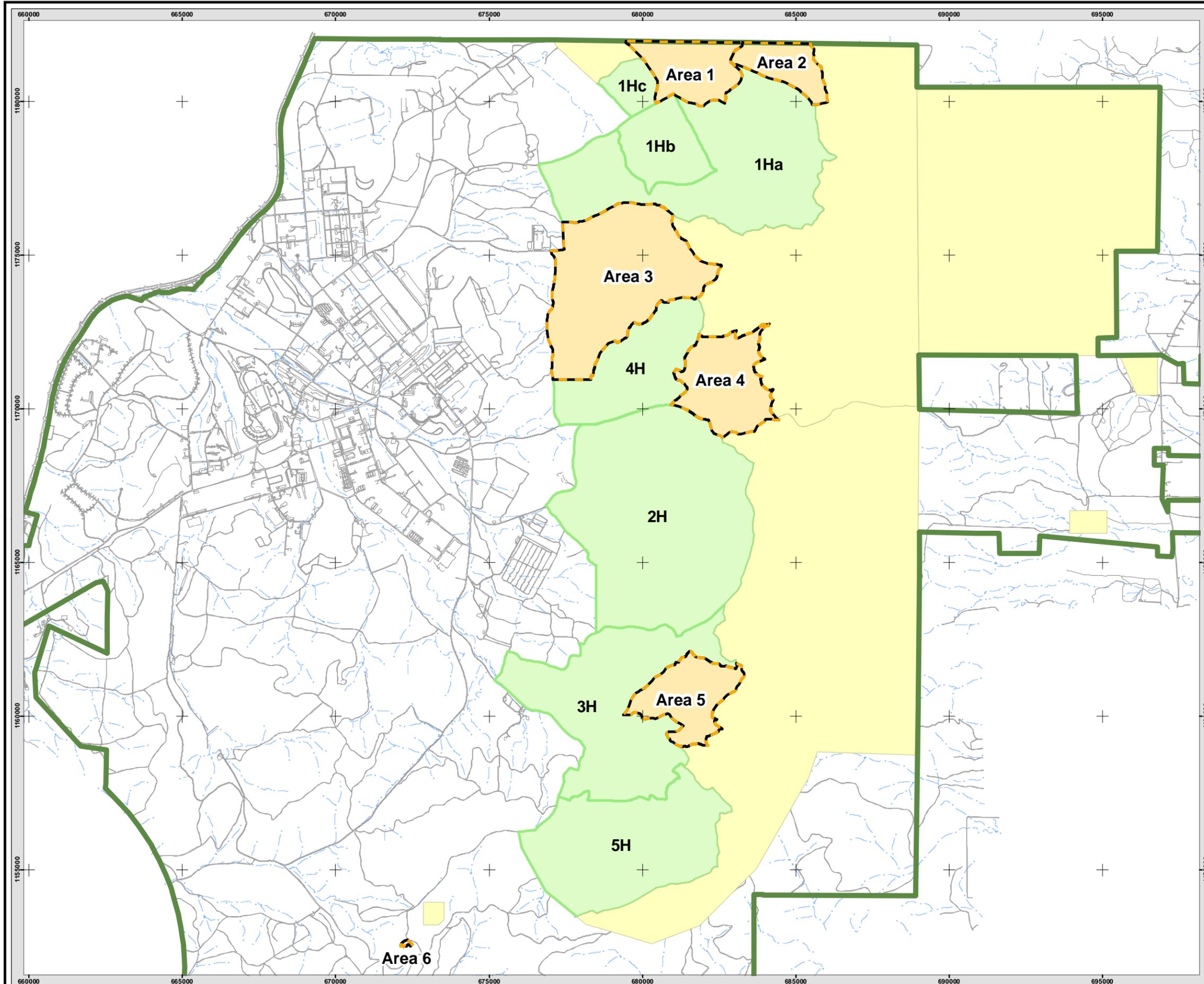
- a. If disposal activities are required, they will be performed by qualified EODT personnel within the Area. The MSDs for intentional detonations are shown in Table 7-1 and Q-D Arcs are shown on Figures 7-1 through 7-6.
- b. Sandbags (HNC-ED-CS-S-98-7) or water mitigation (HNC-ED-CS-S-00-3) may be used to reduce the intentional detonation MSD as shown in Table 7-1. Sandbag mitigation or water mitigation are approved for disposal of single munitions. Tamping (single or multiple items) may be used in accordance with DDESB Technical Paper 16 (Rev. 3) and the Buried Explosion Module. These reports will be available on site for all mitigation methods used.

- c. Two ATF Type II magazines have been sited for the existing approved ESS, Amendment 4, "Choccolocco Area U.S. Fish and Wildlife Transfer of Fort McClellan, Alabama " dated June 2009. These magazines will be utilized during the efforts being performed under this ESP, and all criteria approved in the existing ESS shall apply. A copy of the referenced ESS (in addition to this ESP) shall be available on-site during project activities.
- d. Consolidating multiple MEC may be used. If MEC is deemed acceptable to move by qualified personnel as specified in the approved Work Plan, it may be moved to a collection point within the area and items may be disposed of using a consolidated shot in accordance with US Army Engineering and Support Center, Huntsville (USAESCH) publication, *Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives (OE) Sites*, dated March 2000 (a copy of this report will be available on site). Items at a collection point will be positioned in accordance with this report and the maximum total net explosive weight (NEW) at a collection point will not exceed the total NEW for which the K40 overpressure distance is less than or equal to the unintentional detonation MSD for the area as shown in Table 7-1. The maximum total NEW for a consolidated shot will not exceed the total NEW for which the K328 overpressure distance is less than or equal to the Horizontal Distance of Maximum Weight Fragment (MFD-H) for the area as shown in Table 7-1.

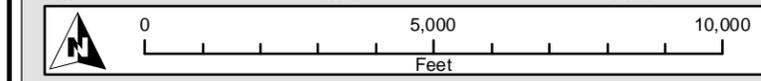
**APPENDIX A**  
**MAPS**

# Figure 6 - 1 Fort McClellan Anniston, Alabama

## Additional Sampling for Charlie Area EE/CA Location Map



- Road
  - Stream
  - Fort McClellan Boundary
  - Subarea Boundaries
  - Sampling Boundaries
- Charlie Area Clearance Status**
- Covered by Current ESS and Amendments
  - No Further Action



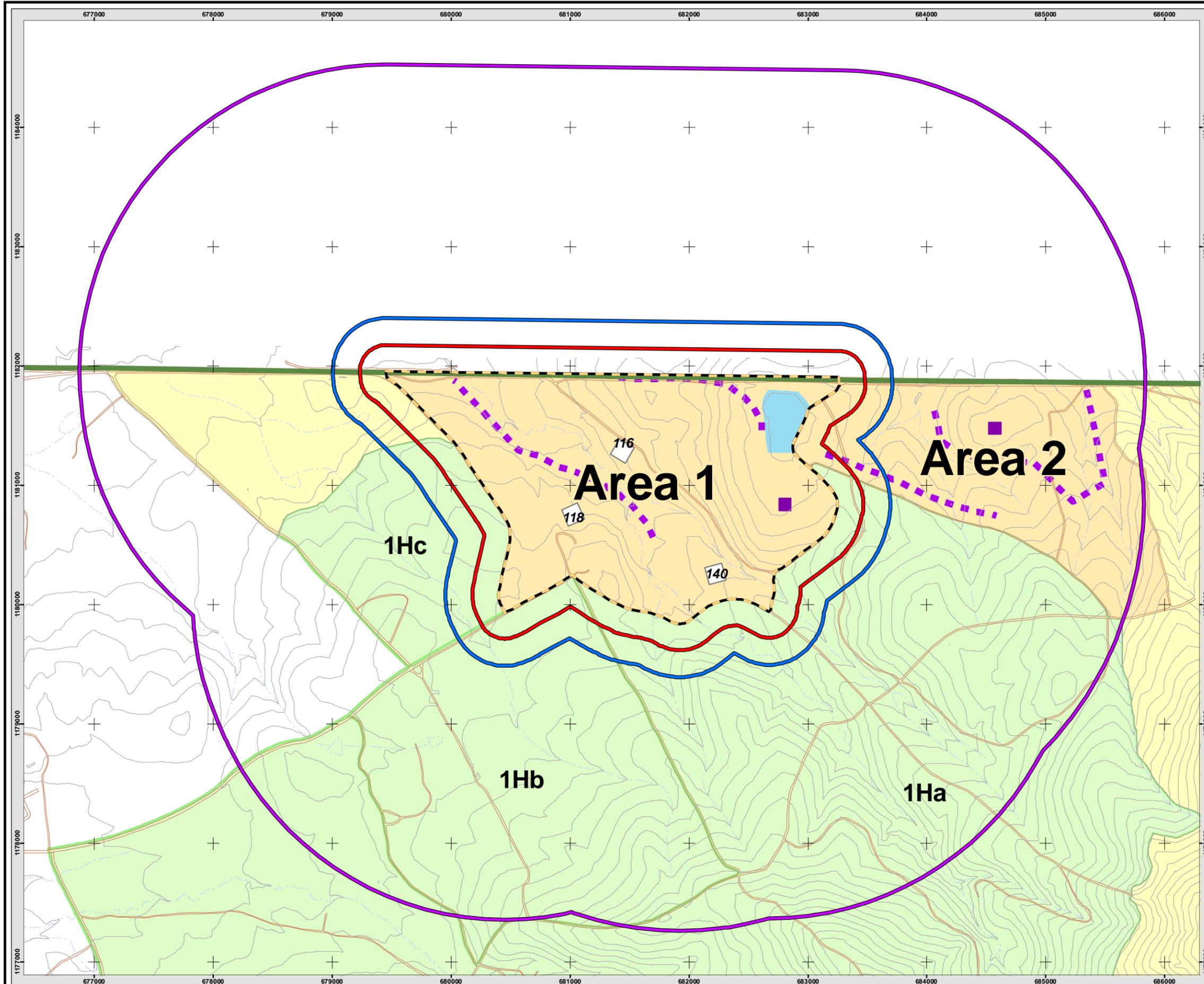
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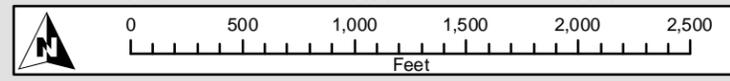


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**Figure 7 - 1**  
**Fort McClellan**  
**Anniston, Alabama**  
**Charlie Area EE/CA**  
**Area 1 Additional Sampling**  
**and Q - D Arcs**



-  Area 1
-  Sandbag Mitigation 220 ft
-  HFD 447 ft
-  Without Engineering Controls (MFD) 2577 ft
-  25 ft contour
-  Road
-  Stream
-  Fort McClellan Boundary
-  Sampling Boundaries
-  New Transects New Transects
-  New Grids
-  Reacquired Investigation Grid
-  USFWS Potential Facility and Activity Locations
- Charlie Area Clearance Status**
-  Covered by Current ESS and Amendments
-  No Further Action



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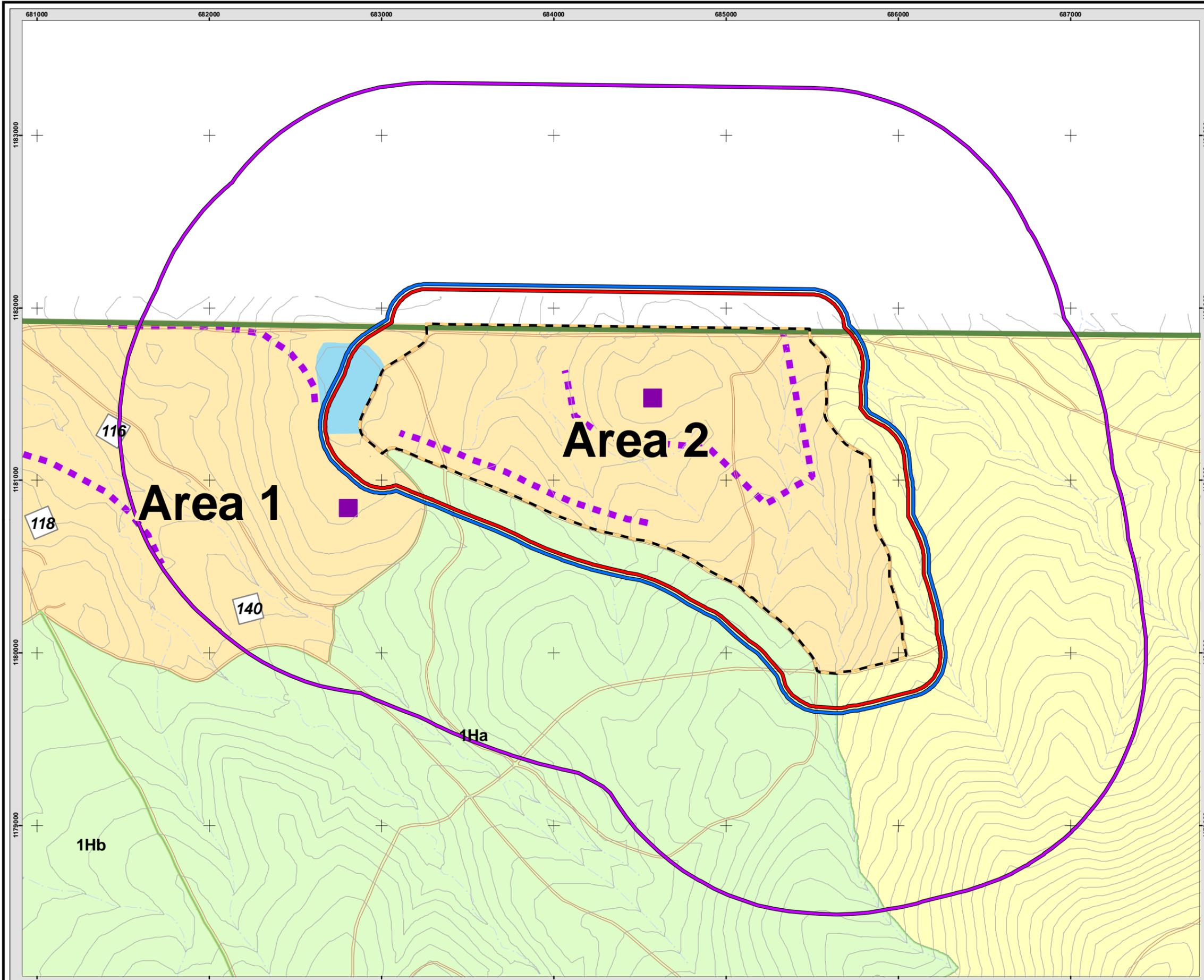


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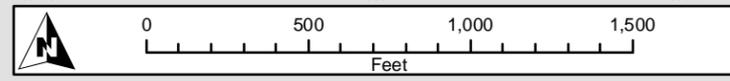


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**Figure 7 - 2**  
**Fort McClellan**  
**Anniston, Alabama**  
**Charlie Area EE/CA**  
**Area 2 Additional Sampling**  
**and Q - D Arcs**



-  Area 2
-  Sandbag Mitigation 200 ft
-  HFD 230 ft
-  Without Engineering Controls (MFD) 1395 ft
-  25 ft contour
-  Road
-  Stream
-  Fort McClellan Boundary
-  New Transects
-  Sampling Boundaries
-  New Grids
-  Reacquired Investigation Grid
-  USFWS Potential Facility and Activity Locations
- Charlie Area Clearance Status**
-  Covered by Current ESS and Amendments
-  No Further Action



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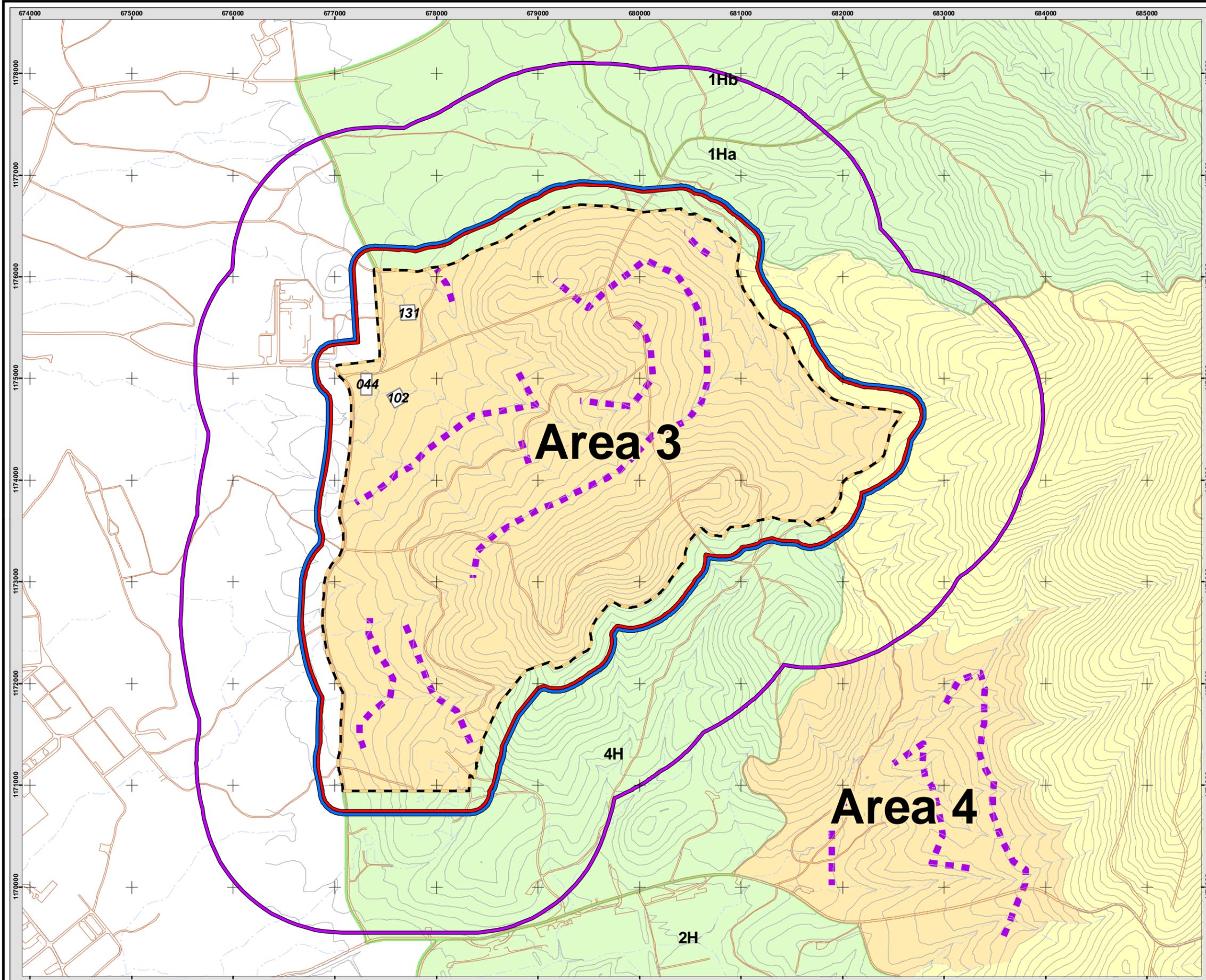
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**Figure 7 - 3**  
**Fort McClellan**  
**Anniston, Alabama**  
**Charlie Area EE/CA**  
**Area 3 Additional Sampling**  
**and Q - D Arcs**



-  Area 3
-  Sandbag Mitigation 200 ft
-  HFD 230 ft
-  Without Engineering Controls (MFD) 1395 ft
-  25 ft contour
-  Road
-  Stream
-  New Transects New Transects
-  Sampling Boundaries
-  Reacquired Investigation Grid
- Charlie Area Clearance Status**
-  Covered by Current ESS and Amendments
-  No Further Action



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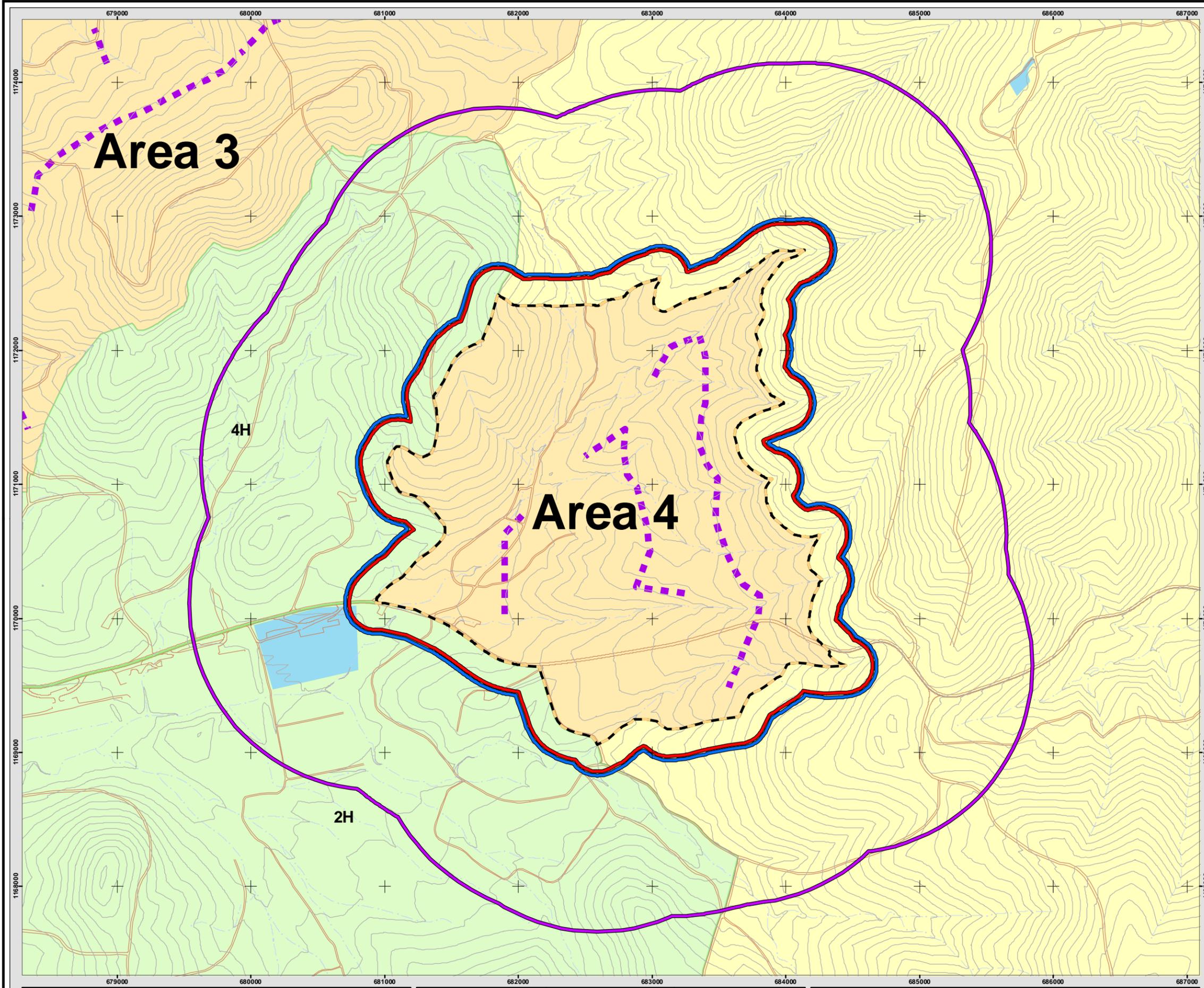
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**Figure 7 - 4**  
**Fort McClellan**  
**Anniston, Alabama**  
**Charlie Area EE/CA**  
**Area 4 Additional Sampling**  
**and Q - D Arcs**



-  Area 4
-  Sandbag Mitigation 200 ft
-  HFD 230 ft
-  Without Engineering Controls (MFD) 1395 ft
-  25 ft contour
-  Road
-  Stream
-  New Transects
-  Sampling Boundaries
-  USFWS Potential Facility and Activity Locations
- Charlie Area Clearance Status**
-  Covered by Current ESS and Amendments
-  No Further Action



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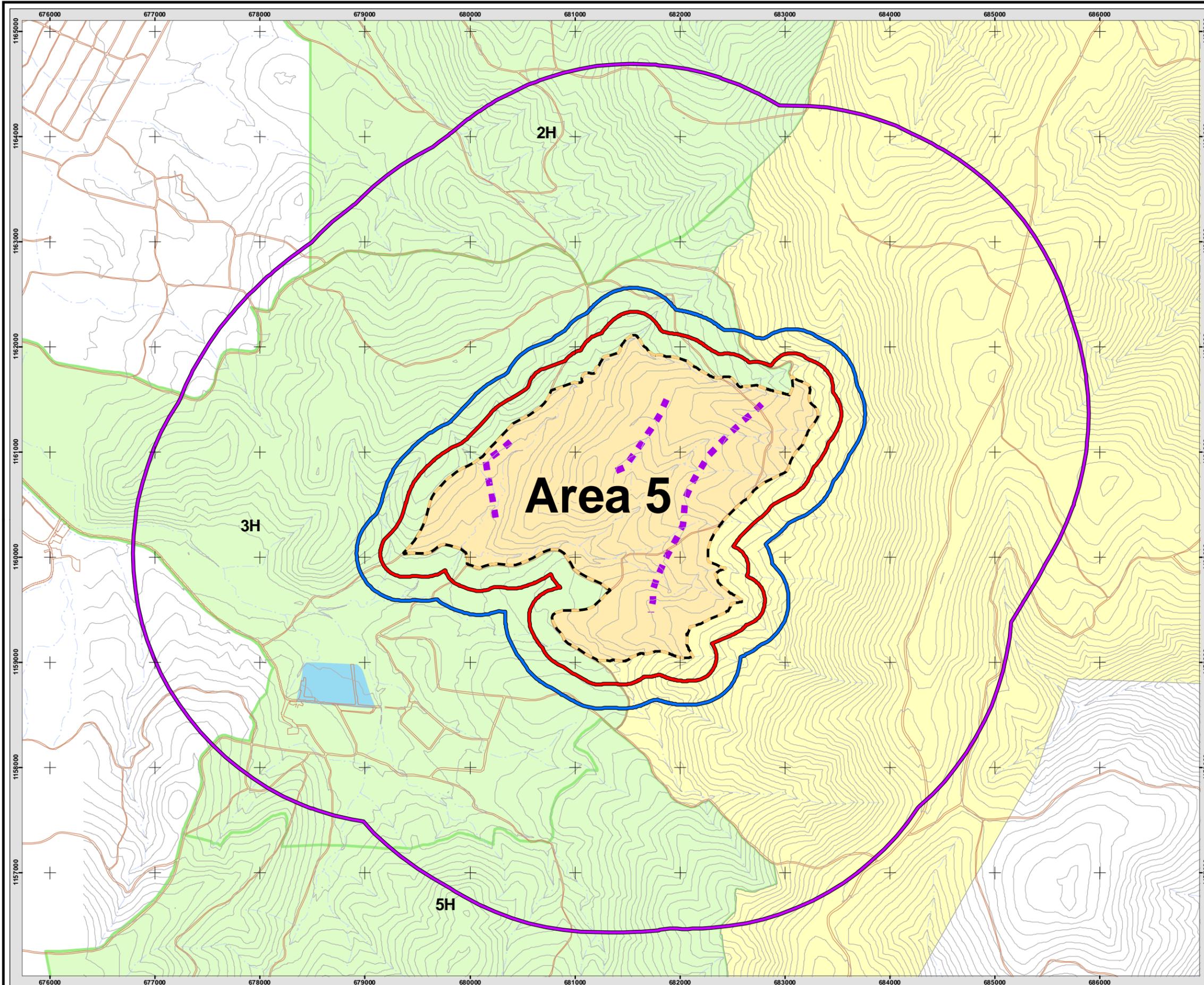
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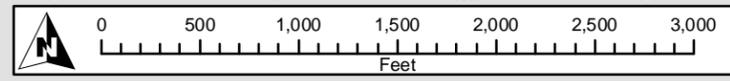
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**Figure 7 - 5**  
**Fort McClellan**  
**Anniston, Alabama**  
**Charlie Area EE/CA**  
**Area 5 Additional Sampling**  
**and Q - D Arcs**



-  Area 5
-  Sandbag Mitigation 220 ft
-  HFD 447 ft
-  Without Engineering Controls (MFD) 2577 ft
-  25 ft contour
-  Road
-  Stream
-  New Transects
-  Sampling Boundaries
-  USFWS Potential Facility and Activity Locations
- Charlie Area Clearance Status**
-  Covered by Current ESS and Amendments
-  No Further Action



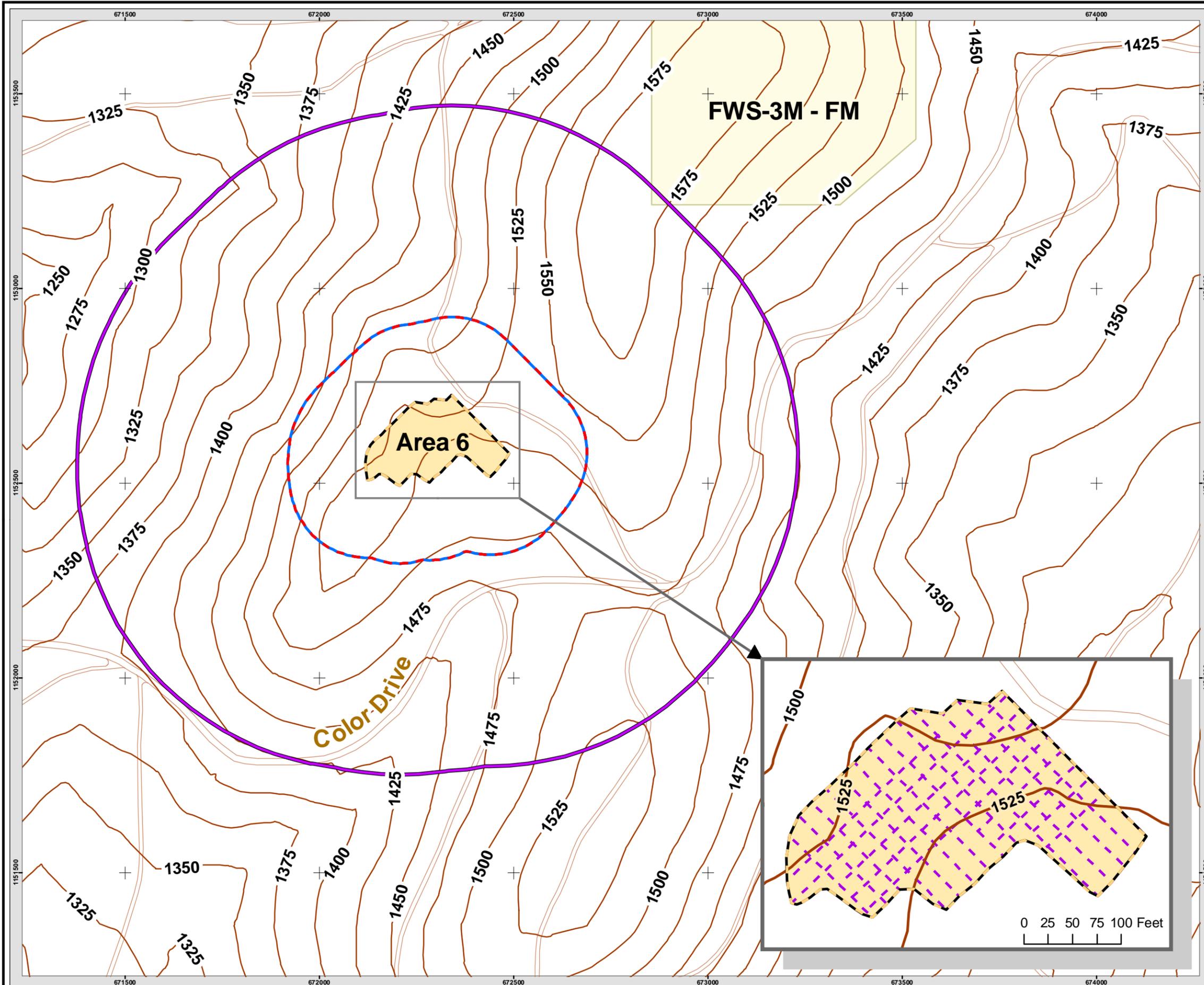
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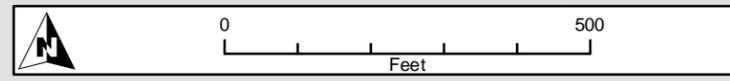
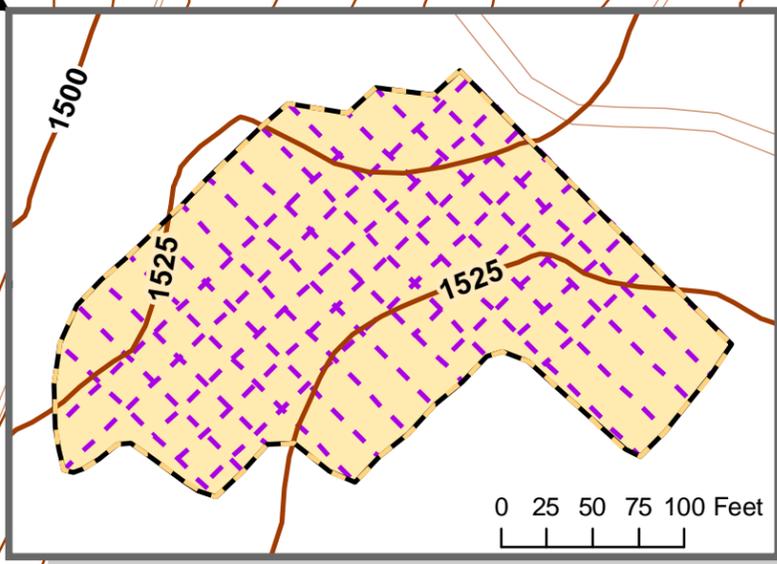


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**Figure 7 - 6**  
**Fort McClellan**  
**Anniston, Alabama**  
**Charlie Area EE/CA**  
**Area 6 Additional Sampling**  
**and Q - D Arcs**



- Area 6
- HFD & Sandbag Mitigation 200 ft
- Without Engineering Controls (MFD) 743 ft
- 25 ft contour
- Road
- Sampling Boundaries
- Charlie Area Clearance Status**
- No Further Action
- Inset**
- New Area 6 Transects



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**APPENDIX B  
CALCULATION SHEETS**

# FRAGMENTATION DATA REVIEW FORM

Database Revision Date 8/15/09

Category:	Black Powder Roun	DODIC:	
Munition:	75 mm Mk1 (Shrapnel)	Date Record Created:	7/30/2004
Primary Database Category:	projectile	Last Date Record Updated:	3/26/2008
Secondary Database Category:	75 mm	Individual Last Updated Record:	Crull
Munition Case Classification:	Robust	Date Record Retired:	

## Munition Information and Fragmentation Characteristics

Explosive Type:	Black Powder
Explosive Weight (lb):	0.19000
Diameter (in):	2.9528
Max Fragment Weight (lb):	0.026600
Critical Fragment Velocity (fps):	1200

## Theoretical Calculated Fragment Range

HFD [Distance to No More Than 1 Hazardous Fragment per 600 Square Feet] (ft):	200
MFD-V [Vertical Distance of Max Weight Fragment] (ft):	523
MFD-H [Horizontal Distance of Maximum Weight Fragment] (ft):	743

## Overpressure Distances

Inhabited Building Distance (12 psi), K40 Distance:	18
Inhabited Building Distance (09 psi), K50 Distance:	23
Intentional MSD (0065 psi), K328 Distance:	148

## Minimum Thickness to Prevent Perforation

4000 psi Concrete (Prevent Spall):	2.14
Mild Steel:	0.14
Hard Steel:	0.11
Aluminum:	0.28
LEXAN:	1.76
Plexi-glass:	0.96
Bullet Resist Glass:	0.76

## Required Sandbag Thickness

Max Fragment Weight (lb)SB:	0.026600
Critical Fragment Velocity (fps)SB:	1200
Kinetic Energy 106 (lb-ft <sup>2</sup> /s <sup>2</sup> )SB:	0.0192
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:	0.026600
Critical Fragment Velocity (fps)W:	1200
Kinetic Energy 106 (lb-ft <sup>2</sup> /s <sup>2</sup> )W:	0.0192
Water Containment System:	5 gal carboys/ inflatable pool
Minimum Separation Distance (ft)W:	200/200



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# FRAGMENTATION DATA REVIEW FORM

Database Revision Date 8/15/09

Category:	HE Rounds	DODIC:	C225
Munition:	81 mm M43	Date Record Created:	7/30/2004
Primary Database Category:	mortar	Last Date Record Updated:	3/26/2008
Secondary Database Category:	81 mm	Individual Last Updated Record:	Crull
Munition Case Classification:	Robust	Date Record Retired:	

## Munition Information and Fragmentation Characteristics

Explosive Type:	Comp B
Explosive Weight (lb):	1.29000
Diameter (in):	3.1890
Max Fragment Weight (lb):	0.057300
Critical Fragment Velocity (fps):	4933

## Theoretical Calculated Fragment Range

HFD [Distance to No More Than 1 Hazardous Fragment per 600 Square Feet] (ft):	230
MFD-V [Vertical Distance of Max Weight Fragment] (ft):	1097
MFD-H [Horizontal Distance of Maximum Weight Fragment] (ft):	1395

## Overpressure Distances

Inhabited Building Distance (12 psi), K40 Distance:	49
Inhabited Building Distance (09 psi), K50 Distance:	61
Intentional MSD (0065 psi), K328 Distance:	403

## Minimum Thickness to Prevent Perforation

4000 psi Concrete (Prevent Spall):	3.62
Mild Steel:	0.68
Hard Steel:	0.56
Aluminum:	1.43
LEXAN:	4.51
Plexi-glass:	3.00
Bullet Resist Glass:	2.40

## Required Sandbag Thickness

Max Fragment Weight (lb)SB:	0.057300
Critical Fragment Velocity (fps)SB:	4933
Kinetic Energy 106 (lb-ft <sup>2</sup> /s <sup>2</sup> )SB:	0.6972
Required Wall Roof Sandbag Thickness (in)SB:	24
Expected Maximum Sandbag Throw Distance (ft)SB:	125
Minimum Separation Distance (ft)SB:	200

## Water Containment System and Minimum Separation Distance:

Max Fragment Weight (lb)W:	0.057300
Critical Fragment Velocity (fps)W:	4933
Kinetic Energy 106 (lb-ft <sup>2</sup> /s <sup>2</sup> )W:	0.6972
Water Containment System:	5 gallon carboys/inflatable pool
Minimum Separation Distance (ft)W:	264/200



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# FRAGMENTATION DATA REVIEW FORM

Database Revision Date 8/15/09

Category:	HE Rounds	DODIC:	D571
Munition:	155 mm M107	Date Record Created:	7/30/2004
Primary Database Category:	projectile	Last Date Record Updated:	7/30/2004
Secondary Database Category:	155 mm	Individual Last Updated Record:	Crull
Munition Case Classification:	Robust	Date Record Retired:	

## Munition Information and Fragmentation Characteristics

Explosive Type:	Comp B
Explosive Weight (lb):	15.44800
Diameter (in):	6.1024
Max Fragment Weight (lb):	0.648213
Critical Fragment Velocity (fps):	3426

## Theoretical Calculated Fragment Range

HFD [Distance to No More Than 1 Hazardous Fragment per 600 Square Feet] (ft):	447
MFD-V [Vertical Distance of Max Weight Fragment] (ft):	1983
MFD-H [Horizontal Distance of Maximum Weight Fragment] (ft):	2577

## Overpressure Distances

Inhabited Building Distance (12 psi), K40 Distance:	112
Inhabited Building Distance (09 psi), K50 Distance:	141
Intentional MSD (0065 psi), K328 Distance:	922

## Minimum Thickness to Prevent Perforation

4000 psi Concrete (Prevent Spall):	6.82
Mild Steel:	1.27
Hard Steel:	0.64
Aluminum:	2.59
LEXAN:	6.76
Plexi-glass:	5.13
Bullet Resist Glass:	4.43

## Required Sandbag Thickness

Max Fragment Weight (lb)SB:	0.648213
Critical Fragment Velocity (fps)SB:	3426
Kinetic Energy 106 (lb-ft <sup>2</sup> /s <sup>2</sup> )SB:	3.8042
Required Wall Roof Sandbag Thickness (in)SB:	36
Expected Maximum Sandbag Throw Distance (ft)SB:	220
Minimum Separation Distance (ft)SB:	220

## Water Containment System and Minimum Separation Distance:

Max Fragment Weight (lb)W:	0.648213
Critical Fragment Velocity (fps)W:	3426
Kinetic Energy 106 (lb-ft <sup>2</sup> /s <sup>2</sup> )W:	3.8042
Water Containment System:	1100 gal tank
Minimum Separation Distance (ft)W:	275



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