DEMING PRECISION BOMBING RANGE (PBR) NO. 24
REMEDIAL INVESTIGATION (RI) / FEASIBILITY STUDY (FS)
SIERRA COUNTY, NEW MEXICO
FORMERLY USED DEFENSE SITES (FUDS)
PROJECT # K06NM041001

CASE STUDY – USING ALL THE EVIDENCE

John M. Jackson
Geophysicist
Environmental and Munitions Center of Expertise

July 20, 2017

"The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."

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ABBREVIATED PROJECT TEAM

USACE

- FUDS Project Manager (PM) – Jesse Laurie
- Ordnance and Explosives Safety Specialist – Jim Hug
- Geophysicist – John Jackson

Primary Stakeholders

- New Mexico Environment Department (NMED)
- U.S. Bureau of Land Management (BLM)
- Grazing Lease Holder
- Mining Claim Holders

Bristol Environmental Remediation Services - Prime

- Bristol PM – Andy Biaggi
- InDepth Corporation – Subcontractor
- Neptune and Company, Inc. – Subcontractor

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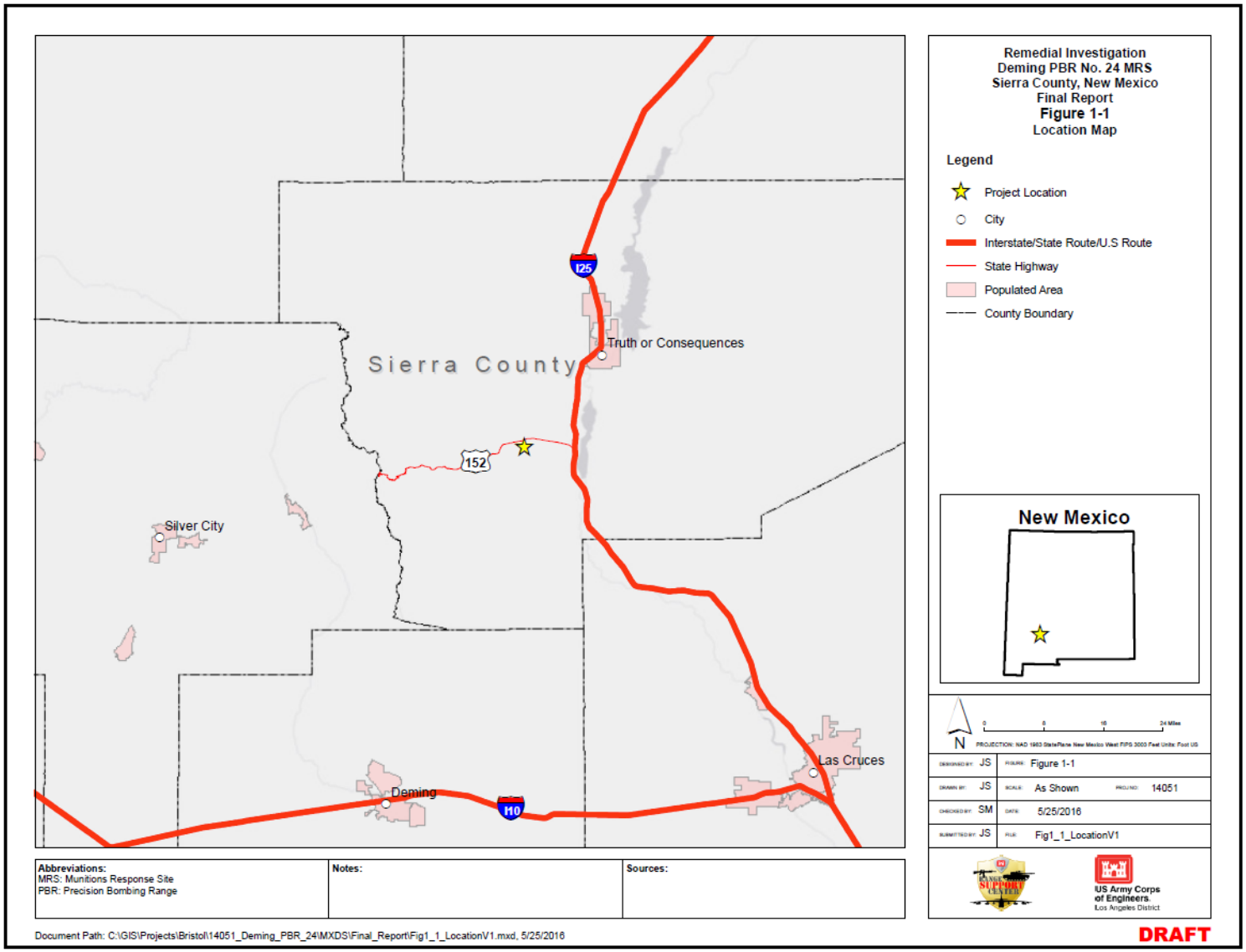
MUNITIONS RESPONSE SITE (MRS) LOCATION



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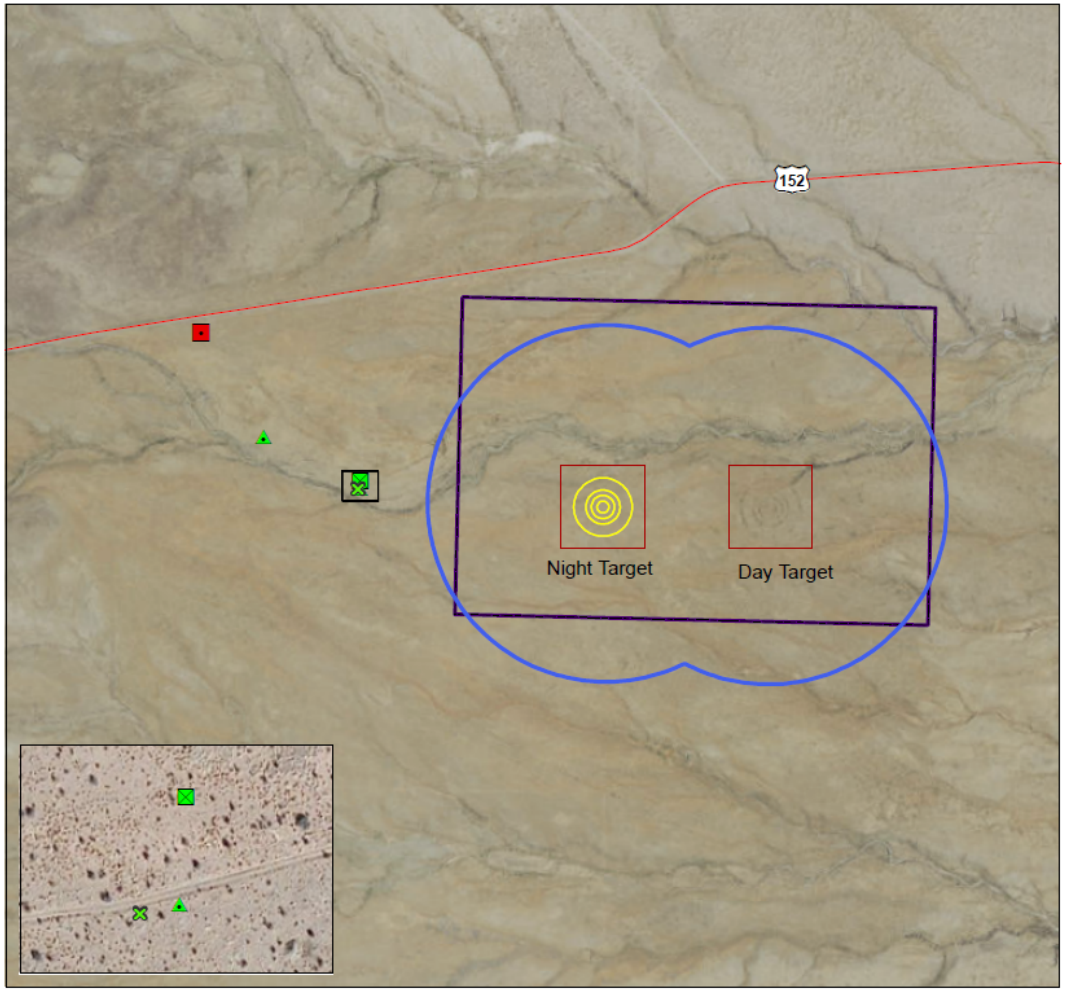
MRS SITE LAYOUT



Remedial Investigation
Deming PBR No. 24 MRS
Sierra County, New Mexico
Final Report
Figure 1-2
Site Layout

Legend

- Laydown Area
- GPS Check In Point
- IVS Location
- Survey Control
- State Highway
- Target Location
- Approximate Target Ring[1]
- MRS Boundary (1,012 Ac)
- FUDS Property Boundary

N

0 1,000 2,000 3,000 Feet

PROJECTION: NAD 1983 UTM Zone 13N Units: Meter

DESIGNED BY:	JK	FIGURE:	Figure 1-2
DRAWN BY:	JK	SCALE:	As Shown
CHECKED BY:	SM	DATE:	5/25/2016
SUBMITTED BY:	HC	FILE:	Fig1_2_LocationV1

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Abbreviations:
MRS: Munitions Response Site
PBR: Precision Bombing Range
FUDS: Formerly Used Defense Site
IVS: Instrument Verification Strip
GPS: Global Positioning System

Notes:
1) Ring location back calculated from provided MRS Boundary.

Sources:
MRS (USACE); Background Data (ESRI), Survey Control / IVS Location (InDepth), Laydown Area (Bristol)

Document Path: C:\GIS\Projects\Bristol\14051_Deming_PBR_24\MXDS\Final_Report\Fig1_2_LocationV1.mxd, 5/25/2016

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DEMING PBR NO. 24 DESCRIPTION

- Located in Sierra County, New Mexico approximately 50 miles northeast of Deming and 25 miles southwest of Truth or Consequences
- Comprised of 1,012 acres
- Deming PBR No. 24 MRS was under military control from 1942 to 1946 and was used as a precision bombing target by pilots and bombardiers stationed at the Deming Army Airfield between 1942 and 1944
- The target consisted of a bulls-eye with four concentric circles at 100, 200, 300, and 500 feet from the target center
- Located on land managed by BLM

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PREVIOUS INVESTIGATIONS

1991 Inventory Project Report

- Assigned the FUDS project # K06NM041001

1995 Archives Search Report (ASR)

- No evidence of High Explosive (HE) bombs or unexploded spotting charges

2004 ASR Supplement

- Indicated M38A2 100-pound (lb) practice bombs fitted with M1A1 spotting charges as potential Munitions and Explosives of Concern (MEC) that may be found at the MRS

2007 Site Inspection

- MEC/Munitions Debris (MD) Results
  - Based on the observation of MEC and MD, MEC exposure pathway was considered potentially complete and the MRS was recommended to proceed to the RI/FS phase
- Munitions Constituent (MC) Results
  - No evidence of MC contamination was identified

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SUMMARY OF POTENTIAL MUNITIONS

- Based on the historical documentation, previous investigations, and RI investigation, the following is a summary of munitions used at Deming PBR No.24 MRS
  - Bomb, 100-lb, M38A2, Practice
  - Bomb, 100-lb, M30A1, Tritonal and Trinitrotoluene (TNT) Filled
  - Most common fuzes associated with the 100-lb bomb include the M103 series nose fuze, and the M100 series tail fuze
  - Bomb, Spotting Charges, M1A1, M5 and M3
- One MEC item was identified (an unexpended M1A1 spotting charge) during the SI field activities
- No MEC items identified during RI fieldwork

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CHALLENGES AND SOLUTIONS

- New Mexico State Land Department refused Right of Entry without usage fee payments. USACE Project Delivery Team determined that a statistically defensible decision could be made with just the BLM property.
- Multiple grazing and mining claims located on site. USACE PM and contractor team met grazing leasee and mining claim holders on site to discuss operations and exchange contact information for any questions or concerns.
- NMED PM retired and new person was assigned after field work was completed. USACE coordinated with new PM to open clear lines of communication.

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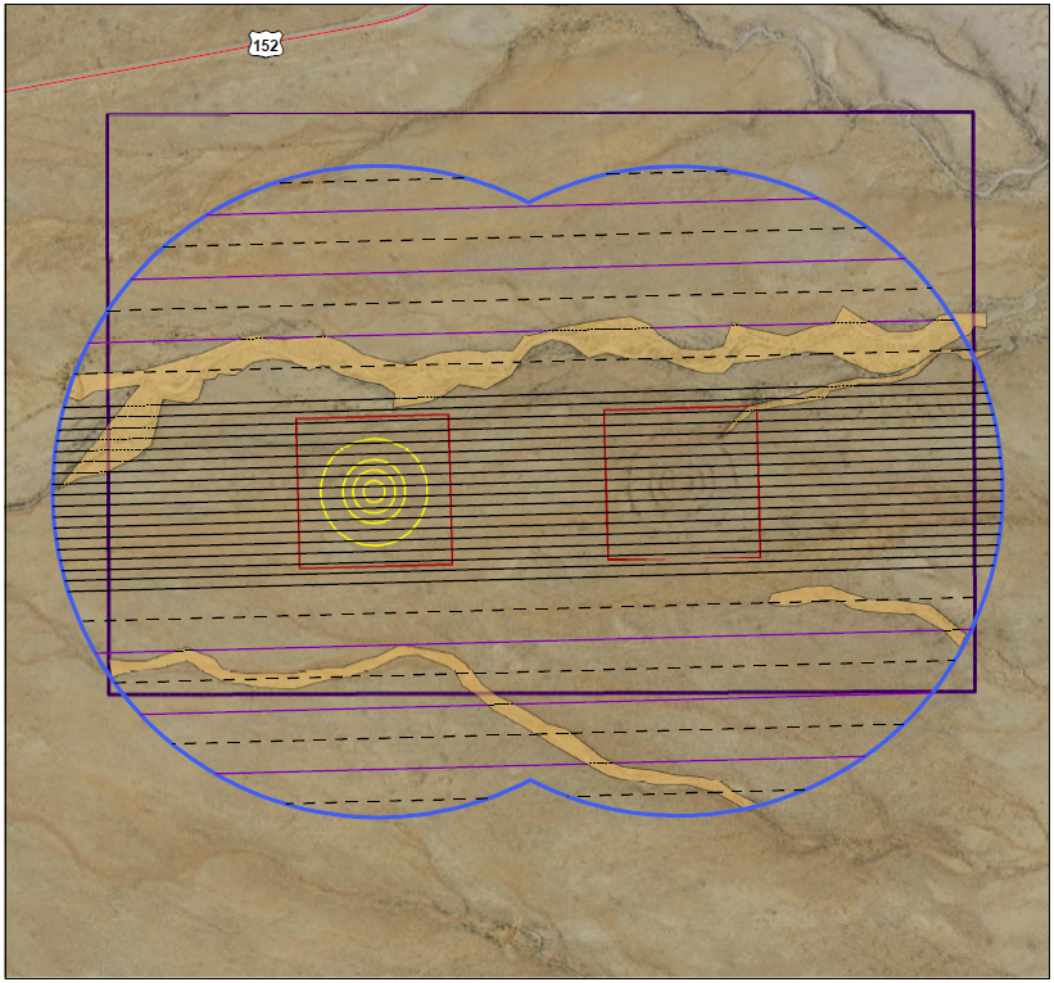
RI FIELDWORK OVERVIEW



Remedial Investigation / Feasibility Study
Deming PBR No. 24 MRS
Sierra County, New Mexico
Figure 11
Proposed Geophysical Transects

Legend

Proposed Transects

- DGM Transects - 575 ft spacing (7.4 miles)
- DGM Transects - 100 ft spacing (28.5 miles)
- Approximate Analog Geophysical Survey Transects (1.5 miles)[2]
- Analog Geophysical Survey (9.8 miles)
- State Highway
- Difficult Terrain (Dry Wash)
- Target Location
- Approximate Target Ring[1]
- FUDS Boundary

N

0 500 1,000 1,500 Feet

PROJECTION: NAD 1983 StatePlane New Mexico West FIPS 3003 Feet Units: Foot US

DESIGNED BY:	JS	FIGURE:	Figure 11
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SUBMITTED BY:	JS	FILE:	Fig11_ProposedTransects

PROJ NO: 14051

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Abbreviations:
MRS: Munitions Response Site
PBR: Precision Bombing Range
MD: Munitions Debris
DGM: Digital Geophysical Mapping
FUDS: FormerlyUsed Defense Site

Notes:
1) Ring location back calculated from provided MRS Boundary. There is supporting evidence that a night target was present at the MRS; however, the presence and location of the target will need to be verified during the RI field activities.
2) DGM will be collected preferentially along transects, where terrain precluded DGM collection Real-Time collection will occur. These areas displayed are a estimate of where DGM can not be collected.

Sources:
Find Locations (Parsons), Reconnaissance Track(Parsons), MRS (USACE); Background Data (ESRI)

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SUMMARY OF RI FIELDWORK

Geophysical Survey Summary for the Deming PBR No. 24 MRS

Item	Deming PBR No. 24 MRS
MRS Area (acres)	1,012
Digital Geophysical Mapping (DGM) Line Miles	
DGM (line miles)	34.76
Analog Line Miles	
Analog (line miles)	8.64

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SUMMARY OF RI FIELDWORK

Geophysical Survey Anomaly Summary for the Deming PBR No. 24 MRS

Category	Number	Percentage of Anomalies identified during Geophysical Surveys
UXO	N/A	N/A
MD	279	18.4
NMRD	57	3.8
No Contact	49	3.2
Other	1,132	74.5
Duplicate Anomaly	2	<1.0
Total Number of Anomalies Identified	**1,519**	**100**

Notes:

No Contact - Recovered no item during intrusive investigation.

Other - Recovered items determined to be blind seeds, range-related debris (e.g., items used during training, but no munitions hazard from debris), or hot rock.

Duplicate Anomaly - Geophysical anomaly investigated determined to be related to adjacent anomaly and not a separate item.

N/A = Not Applicable

NMRD = Non-munitions-related debris

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SUMMARY OF RI FIELDWORK

Summary of Recovered MD for the Deming PBR No. 24 MRS

Investigation Location	MD Items
Deming PBR No. 24 MRS	(136) 100-lb Bomb, Practice
	(135) HE fragments (potentially from 100-lb HE Bomb)
	(7) Bomb Spotting Charge
	(1) Fuze, Expended
Total	**279**

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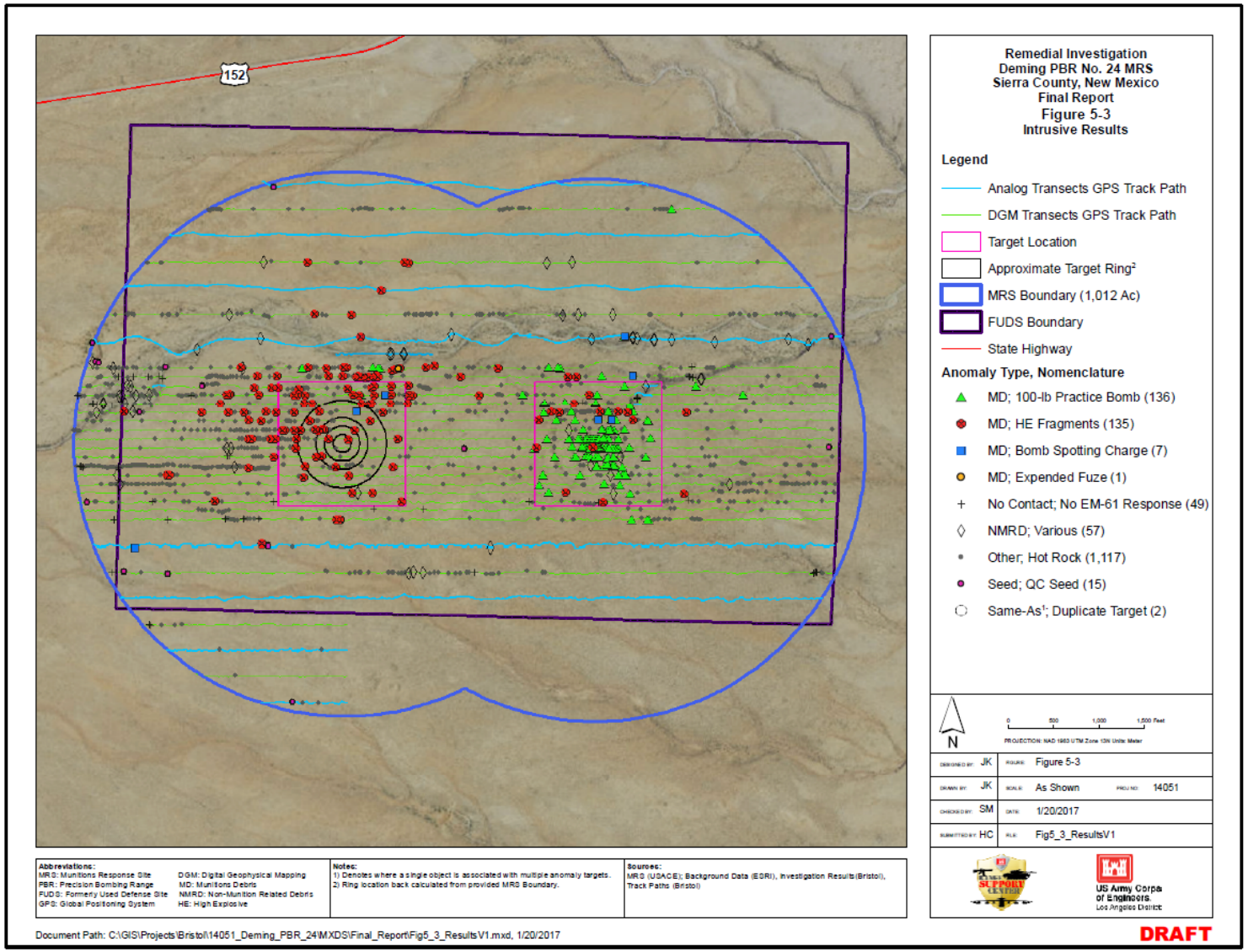
SUMMARY OF RI FIELDWORK



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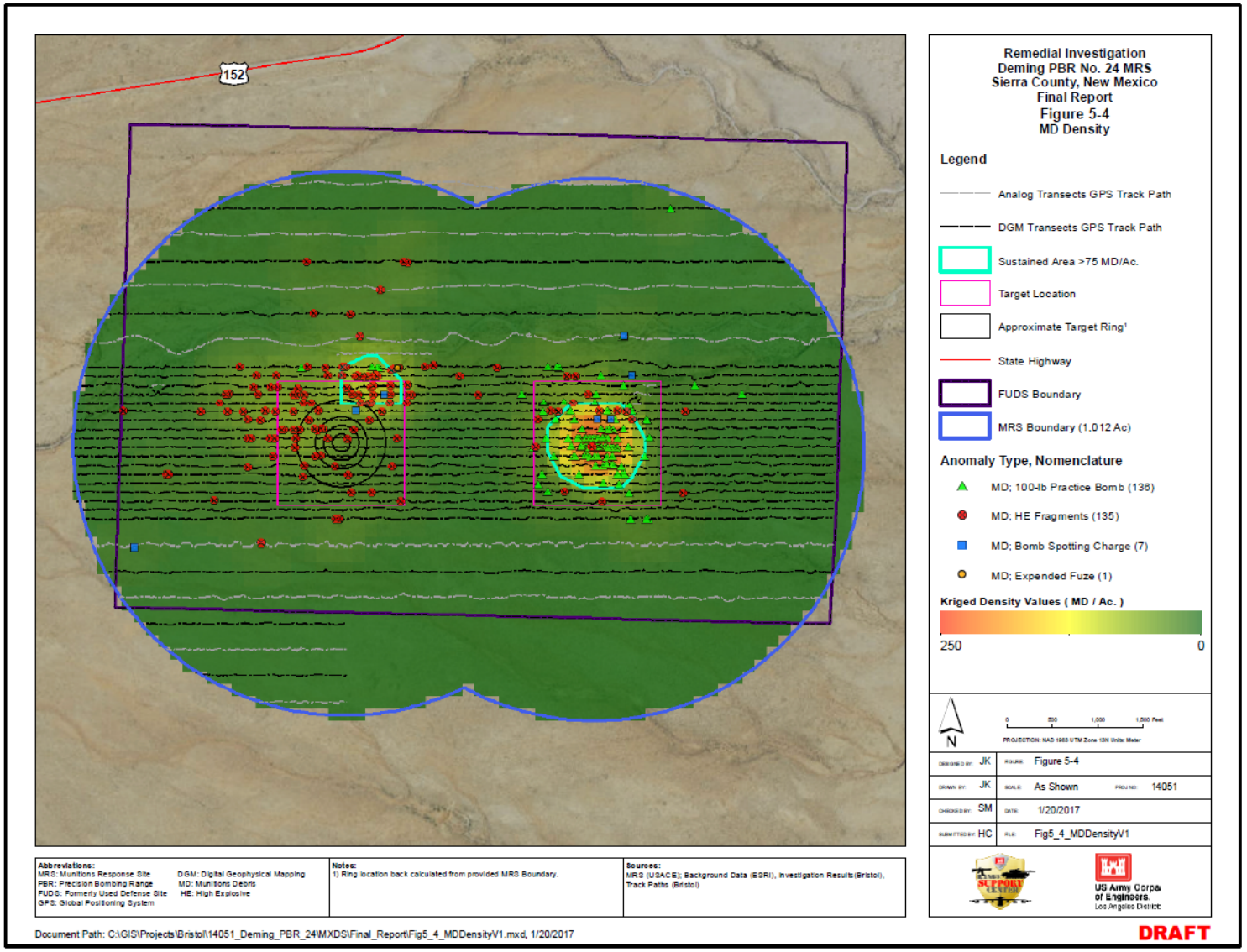
SUMMARY OF RI FIELDWORK



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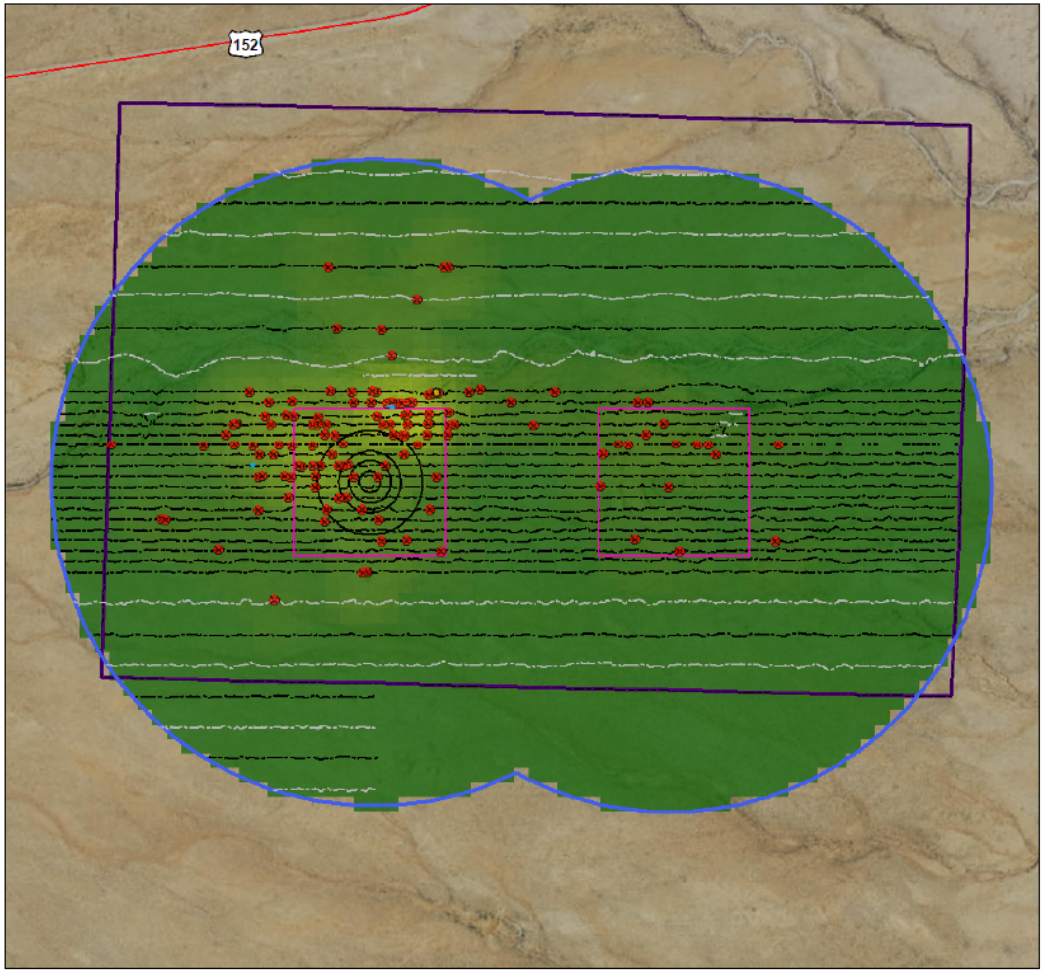
SUMMARY OF RI FIELDWORK



Remedial Investigation
Deming PBR No. 24 MRS
Sierra County, New Mexico
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Figure 5-5
HE Related MD Density

Legend

- Analog Transects GPS Track Path
- DGM Transects GPS Track Path
- Target Location
- Approximate Target Ring[1]
- State Highway
- FUDS Boundary
- MRS Boundary (1,012 Ac)

Anomaly Type, Nomenclature

- MD; HE Fragments (135)
- MD; Expended Fuze (1)

Kriged Density Values (MD / Ac.)

250 — 0

N

0 500 1,000 1,500 Feet

PROJECTION: NAD 1983 UTM Zone 13N Units Meter

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Abbreviations:
MRS: Munitions Response Site
PBR: Precision Bombing Range
FUDS: Formerly Used Defense Site
GPS: Global Positioning System
DGM: Digital Geophysical Mapping
MD: Munitions Debris
HE: High Explosive

Notes:
1) Ring location back calculated from provided MRS Boundary.

Sources:
MRS (USACE); Background Data (ESRI), Investigation Results (Bristol), Track Paths (Bristol)

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SUMMARY OF RI FIELDWORK

Example of Intrusive Investigation and MD (100-lb Practice Bomb)

Example of MD (100-lb Practice Bomb)

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SUMMARY OF RI FIELDWORK

Example of Intrusive Investigation and MD (100-lb Practice Bomb) and Example of Clearing Intrusive Investigation with DGM

Example of MD (HE fragment)

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DATA ANALYSIS SUMMARY

- Visual Sampling Plan (VSP) analysis (kriging) of the density and distribution of MD results associated with HE bombs only (fragments and HE fuze) recovered during the RI, estimated that 4,434 potential HE fragments may remain at the site
- Analysis was performed with intent to give context to the number of fragments estimated by VSP
- Mott Fragment Mass Distribution function was used to calculate the number of detectable fragments per bomb based on weapon data for the AN-M30A1 bomb from Ordnance Publication 1664, US Explosive Ordnance, 1947
- Fragment size for detectable fragment set at size of smallest fragment found with EM61
- Result was 1,279 detectable fragments per bomb
- Approximately 83% of HE related MD finds are within the fragmentation arcs for a 100-lb bomb (1,817 ft) using the two craters as the center – so this initial estimate does not account for all fragments

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DATA ANALYSIS SUMMARY

- Further estimates were conducted using a fragment distribution model to find an upper bound on number of munitions used on the site that also accounts for the number of fragments found and the spatial distribution
- The model that performed best for counts and spatial distribution was a four bomb scenario; with the following detonation locations
  - Two at the identified craters
  - One at the day target
  - One additional location placed so that it captured the remaining spatial extent of HE fragments

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DATA ANALYSIS SUMMARY

- A random simulation method was used to test the placement of the potential detonation points against actual transects (Diagram 1) to see if similar number of items and a similar spatial distribution would emerge, Diagram 2
- In the buffer areas 1,279 simulated fragments were randomly placed per each of the four potential detonation locations, the random placement was weighted in zones bases on weapon fragment distribution recorded in Terminal Ballistic Data, 1944 for the AN-M30A1 ground burst when dropped from aircraft, Diagram 3
- The actual transect pattern performed was intersected with the simulated random fragment to count the number of fragments that would be expected to be found given that fragment distribution, Diagram 4
- Assumptions for this data analysis summary are included in detail in the RI Report and a few are as follows
  - No significant amount of HE MD was removed from site
  - HE ordnance used was 100-lb M30A1 bomb
  - Estimated detectable fragments per HE bomb

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DATA ANALYSIS SUMMARY

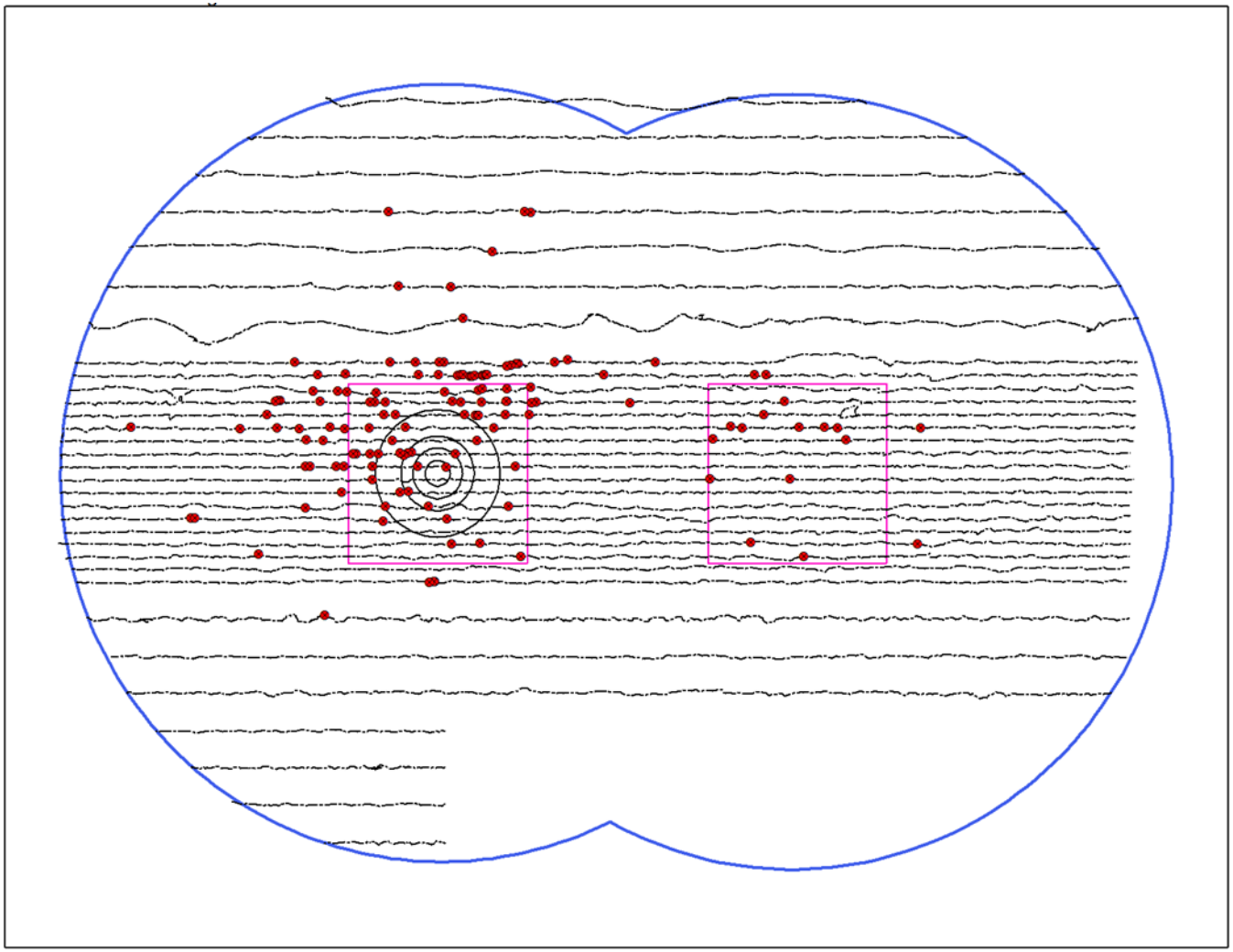

Diagram 1: Actual RI Fieldwork HE Fragment Distribution

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DATA ANALYSIS SUMMARY

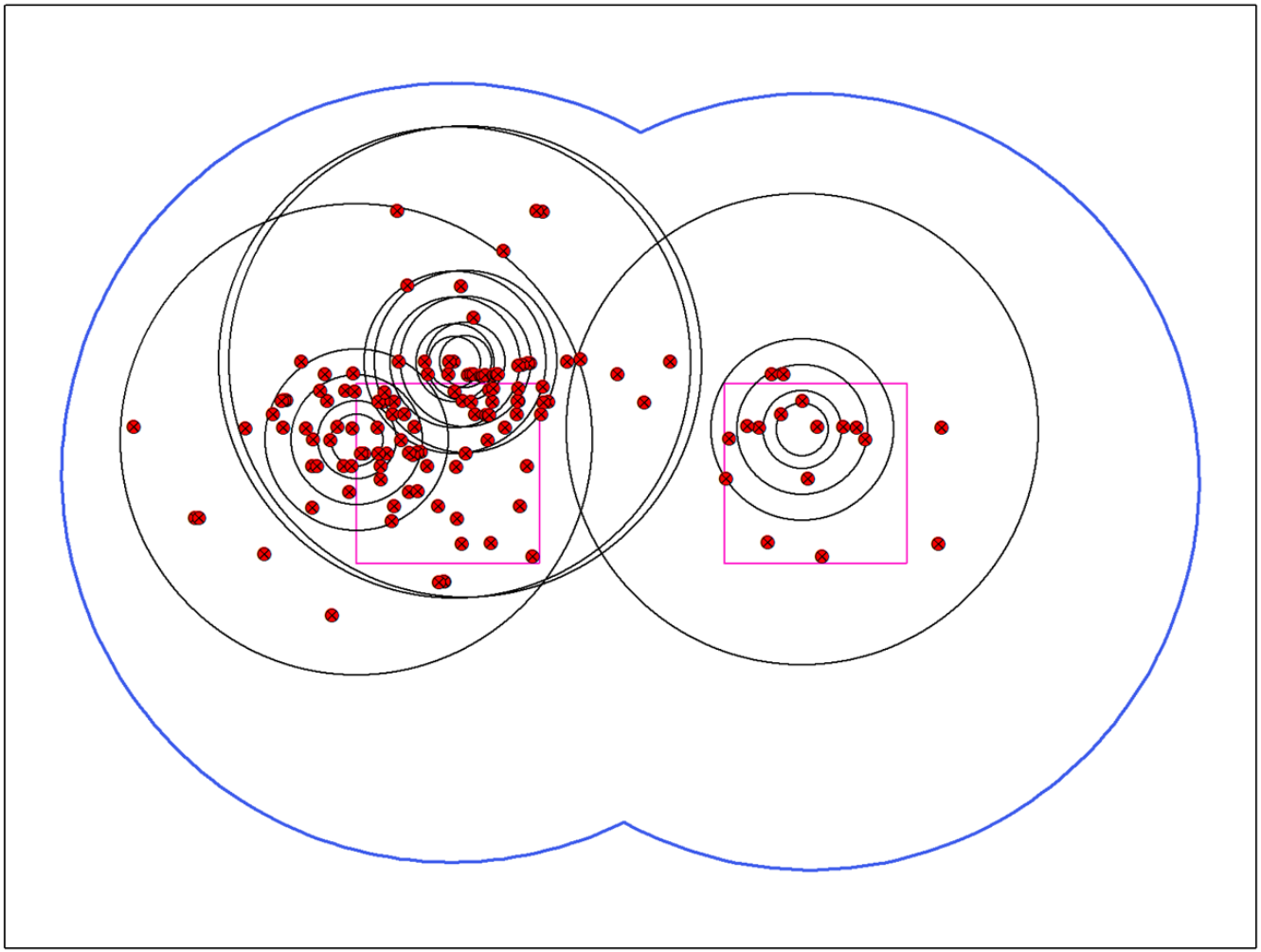

Diagram 2: Fragment Radius Buffer Circles Based on RI Field Work HE Fragment Distribution (2 centered on craters, 1 on day target, 1 back calculated based on fragment distribution)

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DATA ANALYSIS SUMMARY

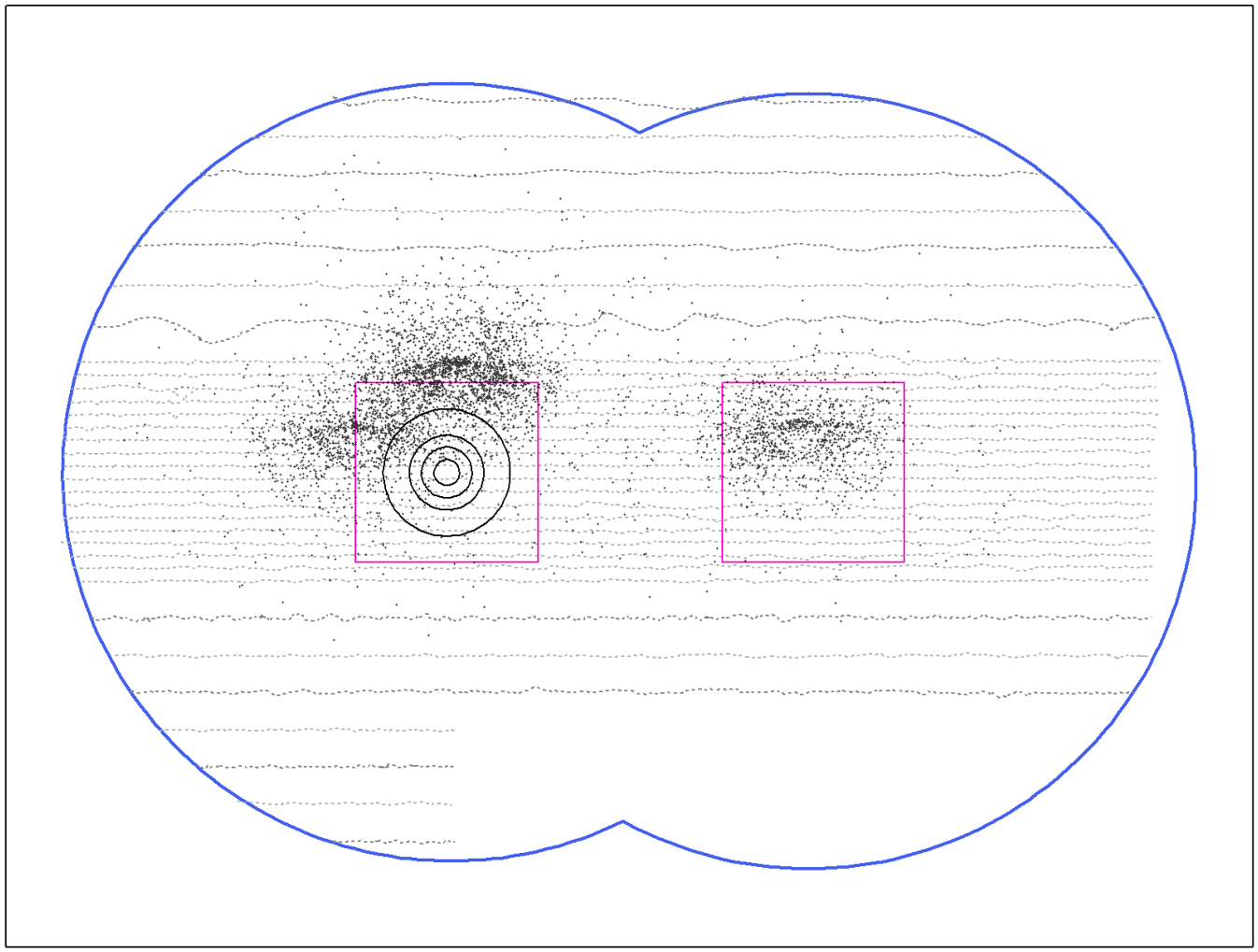

Diagram 3: Simulated Fragments - Theoretical Fragments from Four HE Bombs (1,279 randomly generated points per buffer circle [Diagram 2])

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DATA ANALYSIS SUMMARY

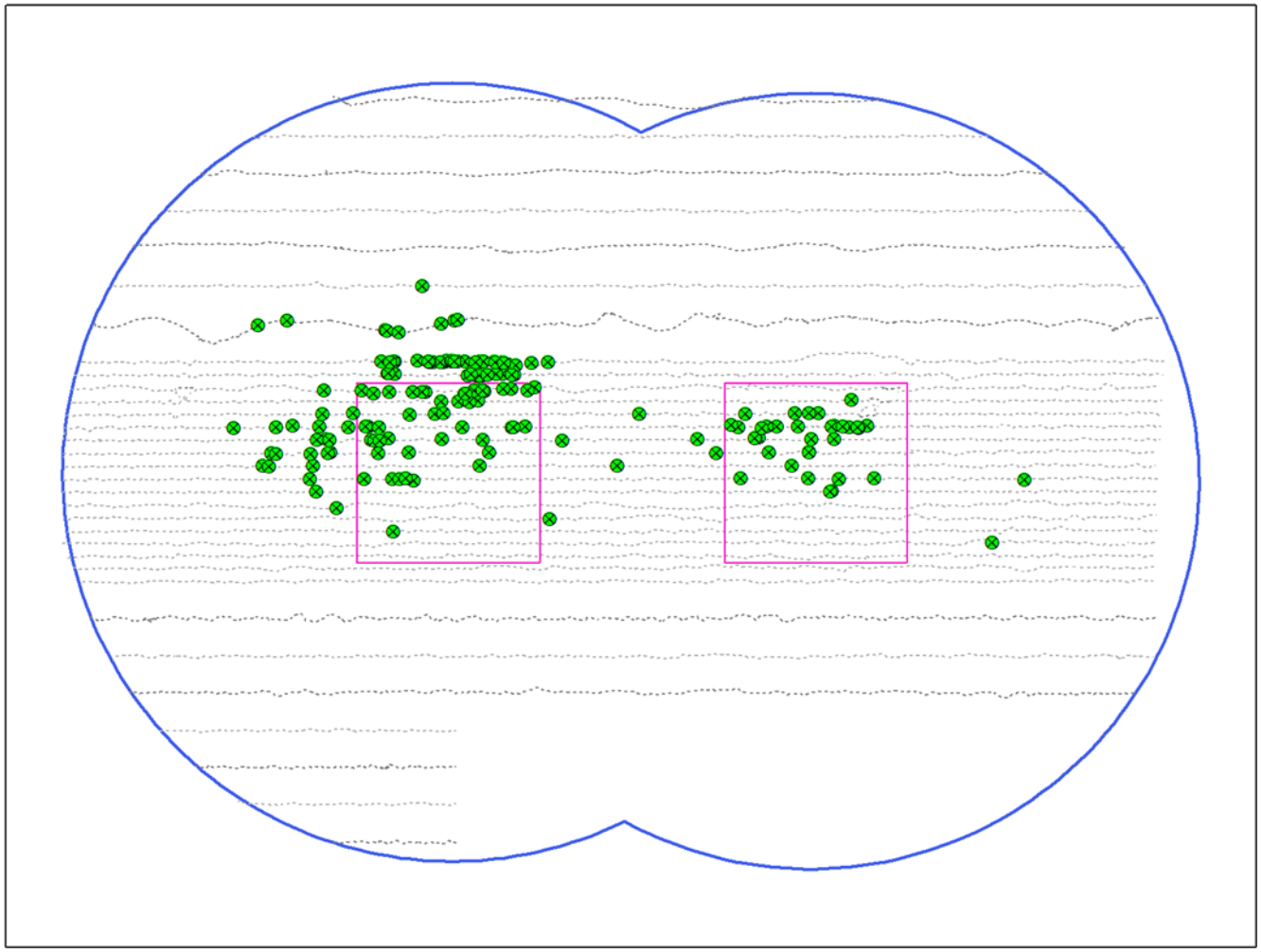

Diagram 4: Simulated Fragments: Using the RI Field Work Transect Pattern (resulted in an average of 155 theoretical detections)

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DATA ANALYSIS SUMMARY

Simulation Results

Number of Simulated Detonation Points	Average Intersection Counts
2	80
3	118
4	155
5	181
6	246
7	292
8	342

- The actual count of HE fragments from the RI was 135
- 135 HE MD finds correlates best with the four bomb simulated scenario of 155, as shown in table above and Diagram 4
- Spatial distribution matches well with four bomb scenario
- Conclusion is that HE usage on the site was limited

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CONCLUSIONS AND RECOMMDATIONS

- No unexpected munitions types were found during the investigation
- Lack of widespread cratering
- Based on the RI Report results and data analysis the whole site was classified as Non-Concentrated Munitions Use Area (NCMUA)
- Historical information, previous investigations, and the results of the RI, as well as the following four lines of evidence presented in the RI Report were evaluated
    1. Limited use of HE bombs
    2. Expected dud rate of HE bombs used
    3. Expected condition of practice munitions items (low likelihood of item not functioning properly and disarticulating, casing and spotting charge component material prone to deterioration from weathering)
    4. UXO estimations based on transect sampling
- Based on this evaluation, no current or future MEC hazards or MC risks are expected for current or anticipated future receptors
- The MRS was not recommended for further evaluation in a FS and a No Action Decision is recommended

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QUESTIONS?

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SAFETY REMINDER

Remember the 3Rs of Military Munitions Safety:

Recognize:
you may have encountered a munitions item.

Retreat:
from munitions item. Do not touch or disturb it; instead move away carefully, walking out the same way you entered the area. Do not use two-way radios or cell phones within 100 feet of the item.

Report:
what you saw and where you saw it by calling 911.

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