Demonstration of Wide Area Assessment Technologies to Characterize Munitions Density

Closed Castner Firing Range
Fort Bliss, TX

Technical Project Planning Meeting
14 January 2010

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Agenda

- Introductions
- Meeting Goals
- Project Background
- What have we done?
- What have we found?
- What is left to do?
- Project Schedule
- Future TPP Meetings
- Questions

Meeting Goals

- Provide venue for exchange of information & stakeholder perspectives
- Discuss project objectives, progress, and data needs
- Achieve common understanding of technical approach
- Discuss next steps

Project Background

Project Purpose

Demonstrate non-traditional technology applications for detecting munitions on Army property

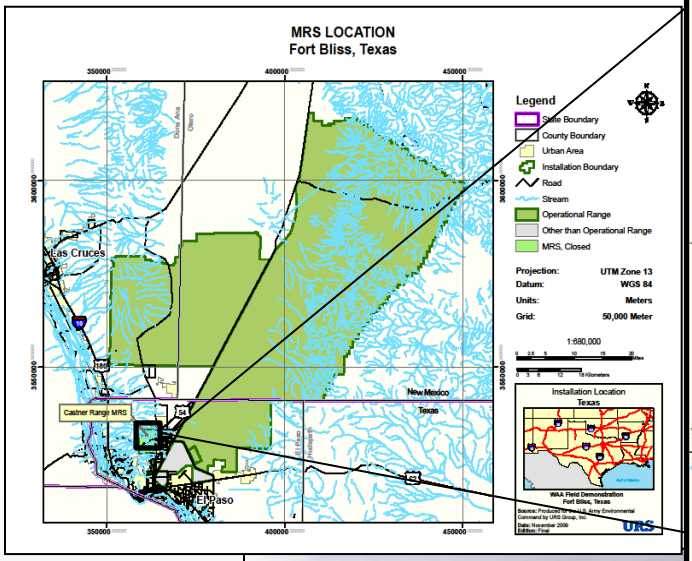
- Determine areas with evidence of past military munitions use
- Determine relative density of anomalies across these areas
- Determine areas with no evidence of past military munitions use

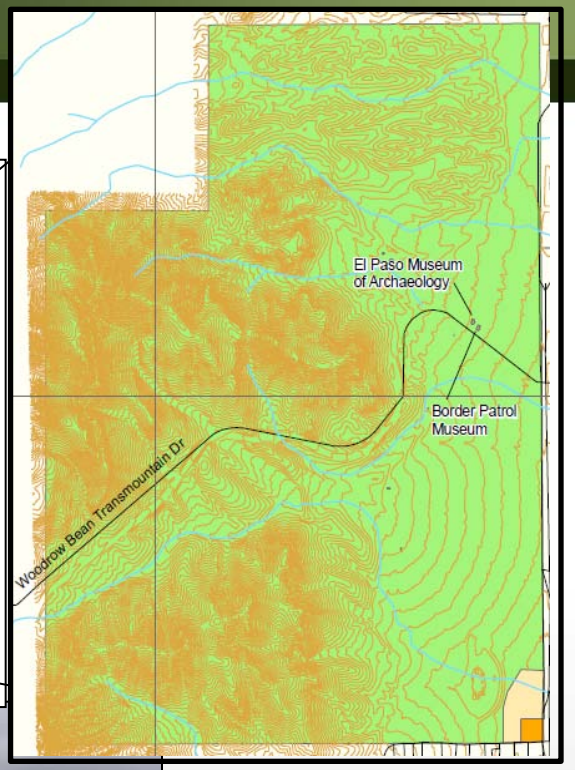
What is NOT included

- Remedial Investigation
- Decisions about future land use
- Decisions about transferring the property
- Decisions about developing the property
- Decisions regarding future munitions response actions (i.e. removal)

Site Overview

- Size
- Location
- Vegetation
- Terrain
- Historical uses
- Munitions types





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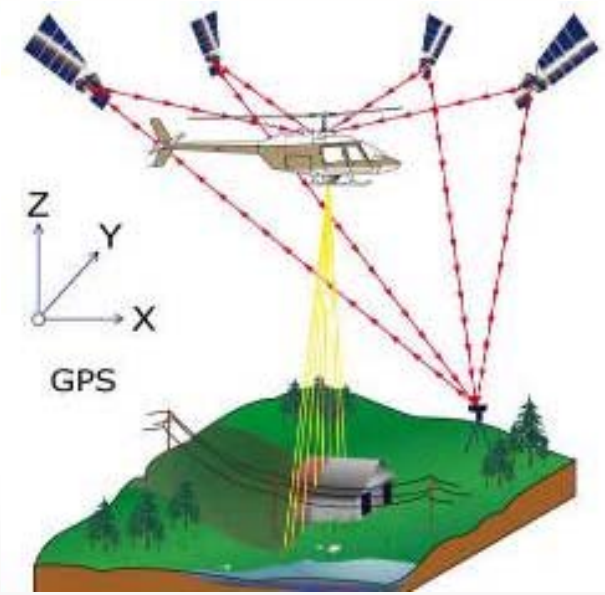
What have we done?

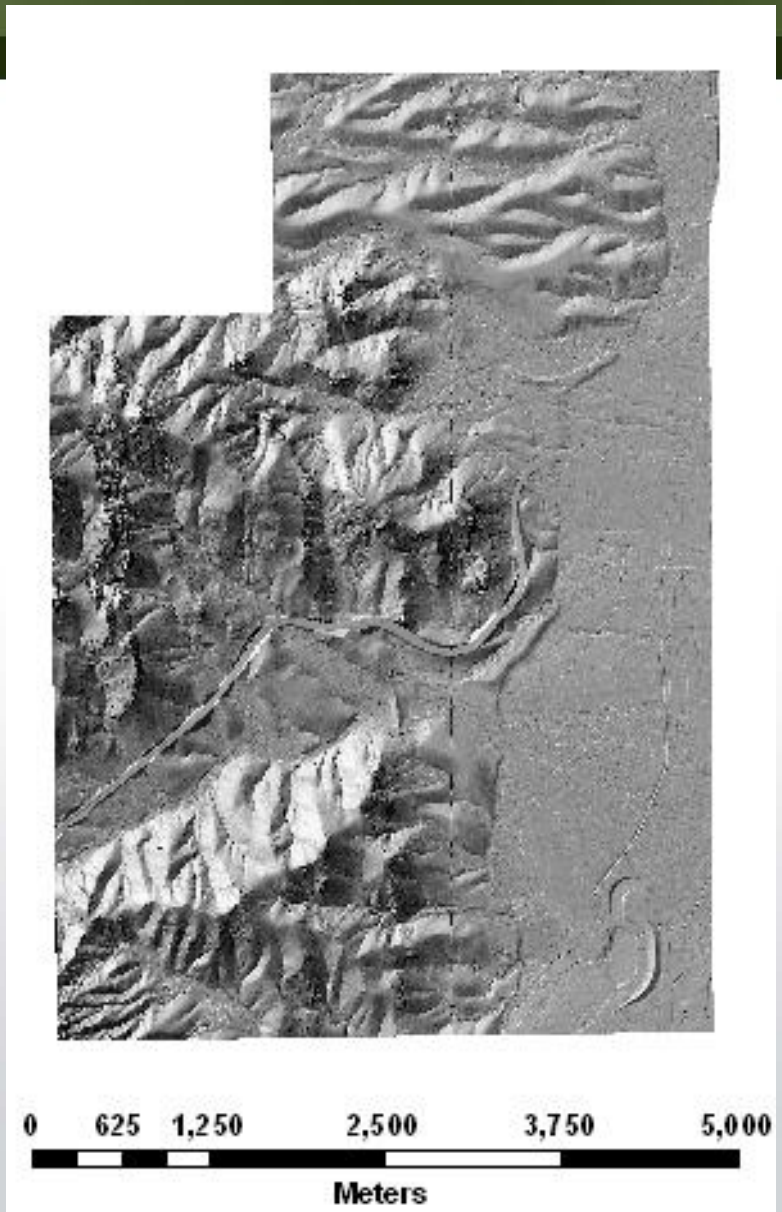
Lidar & Orthophotography

- Lidar at 20 points/m^2
- Analyzing two data sets
  - 20 points/m^2
  - 5 points/m^2
- Orthophotography at 10cm pixels
- Data acquired October 2009

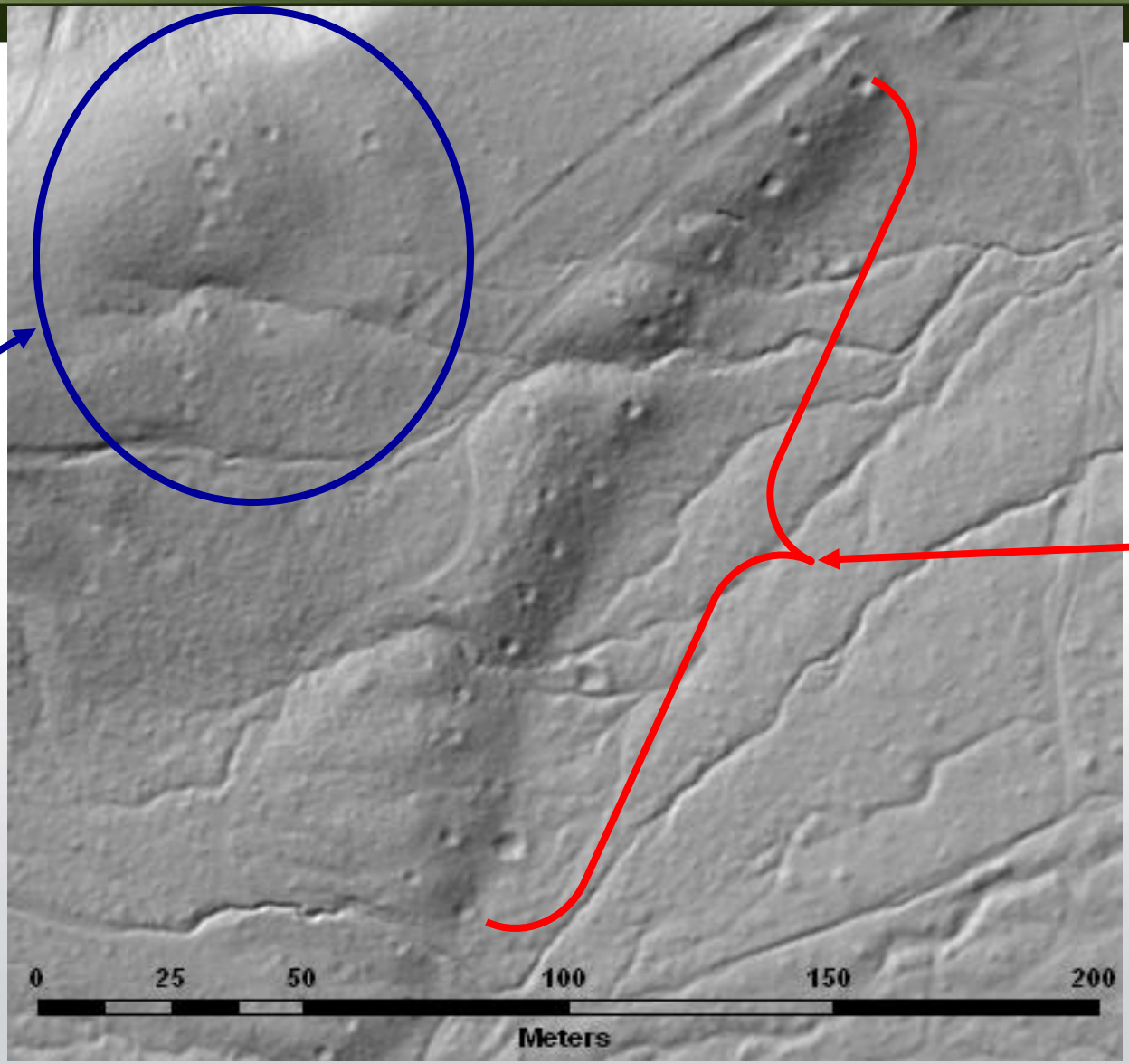


Crater and Fighting Positions

Lidar Surface Model of the Site



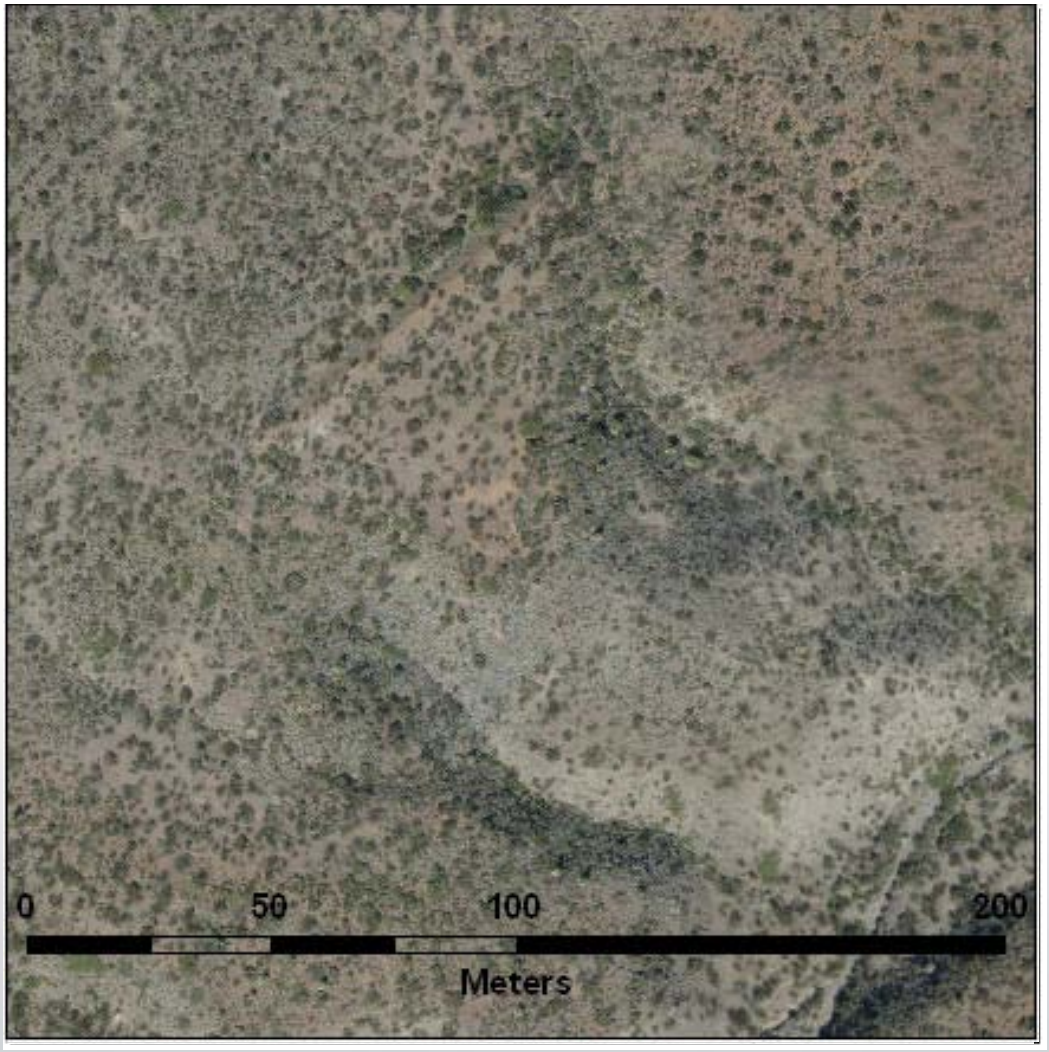
Lidar Surface Models



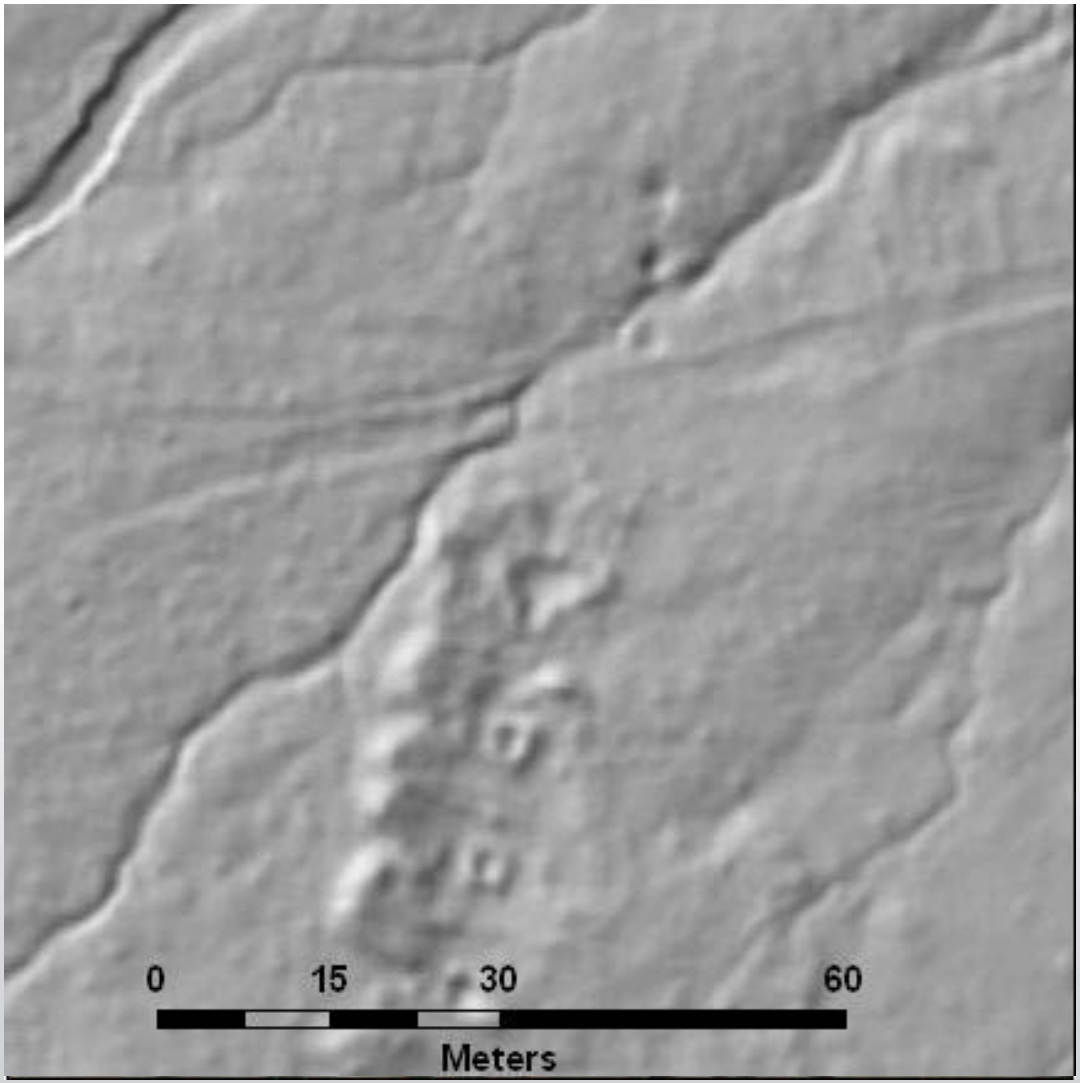
Crater Field

Fighting Positions

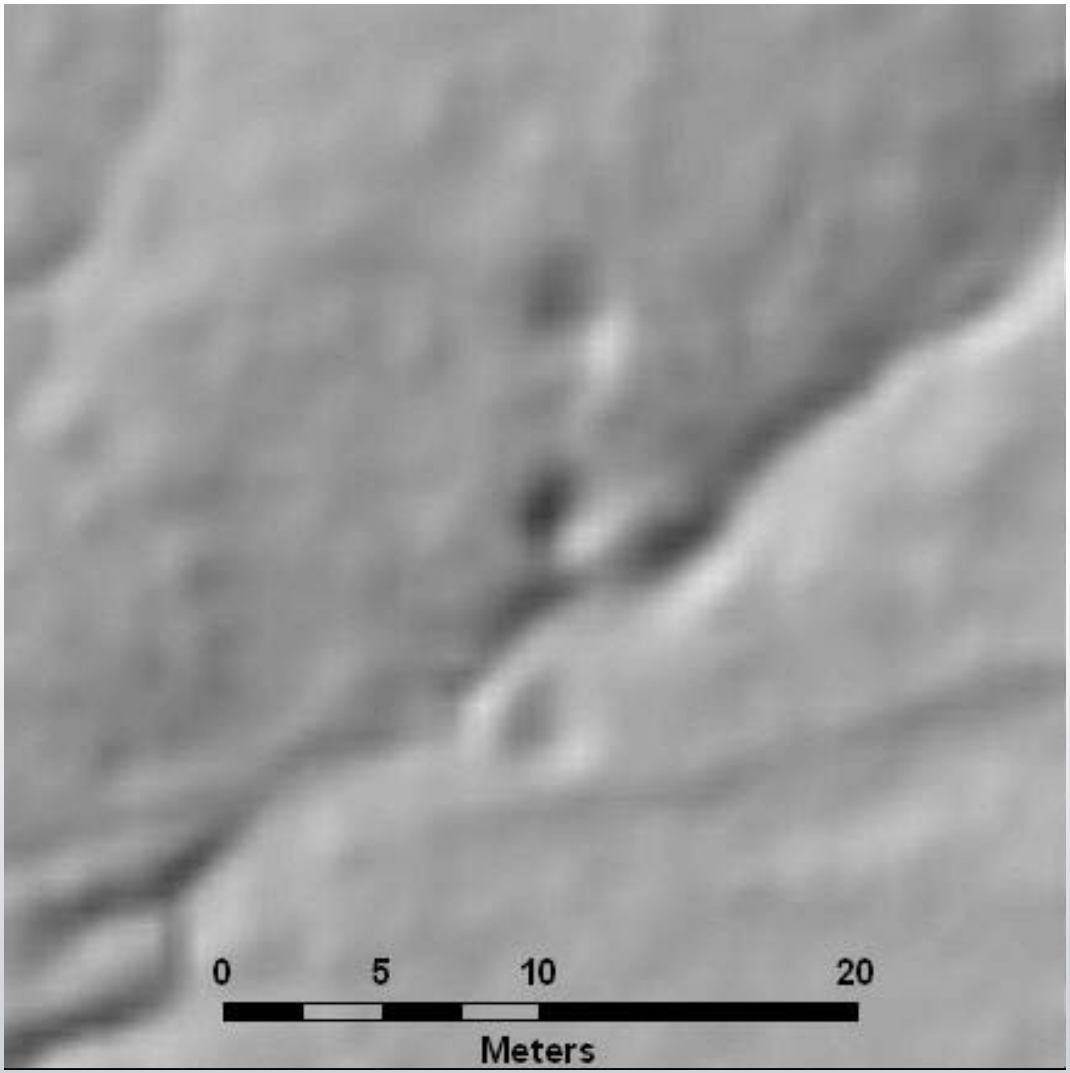
Berms and Trenches



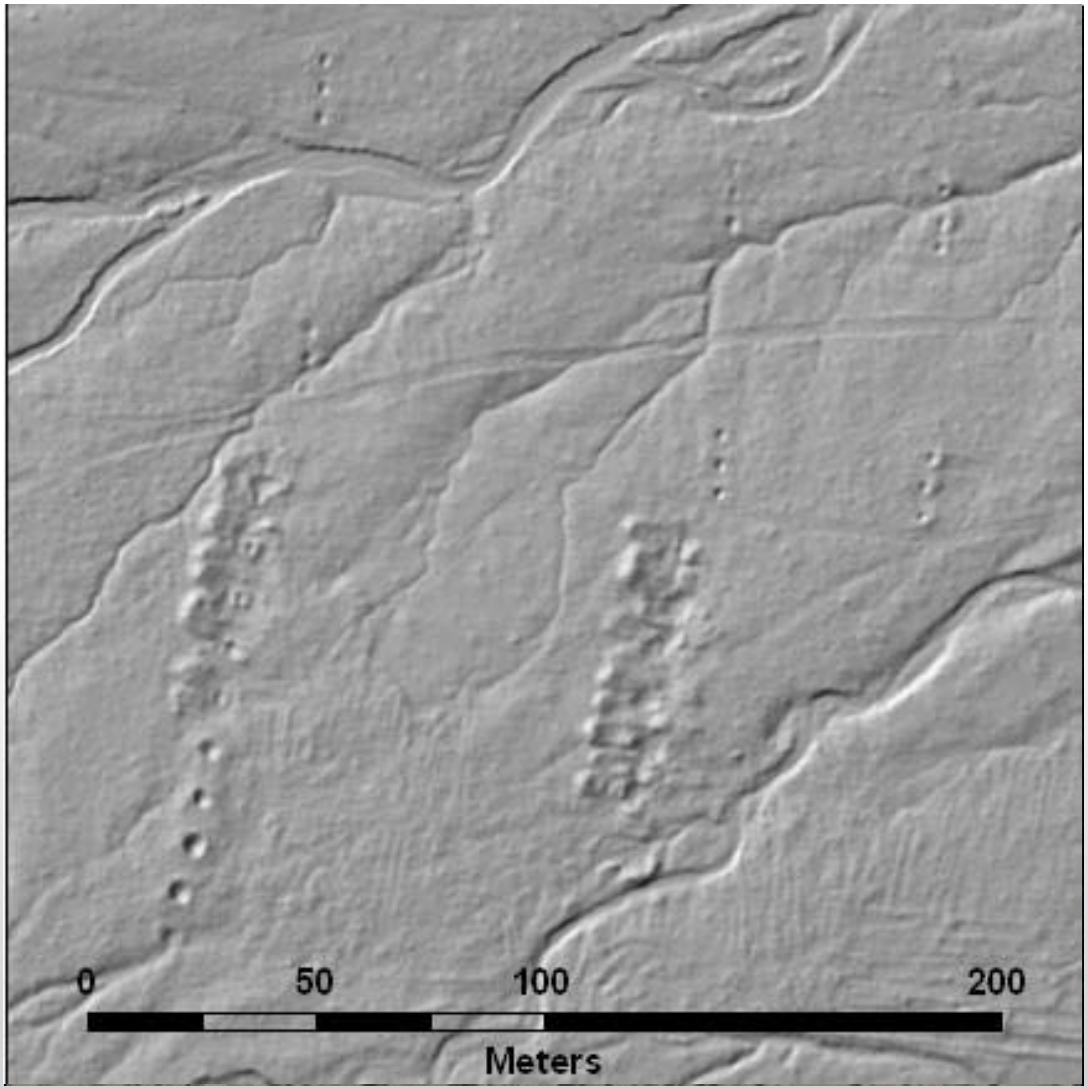
Hole Groups



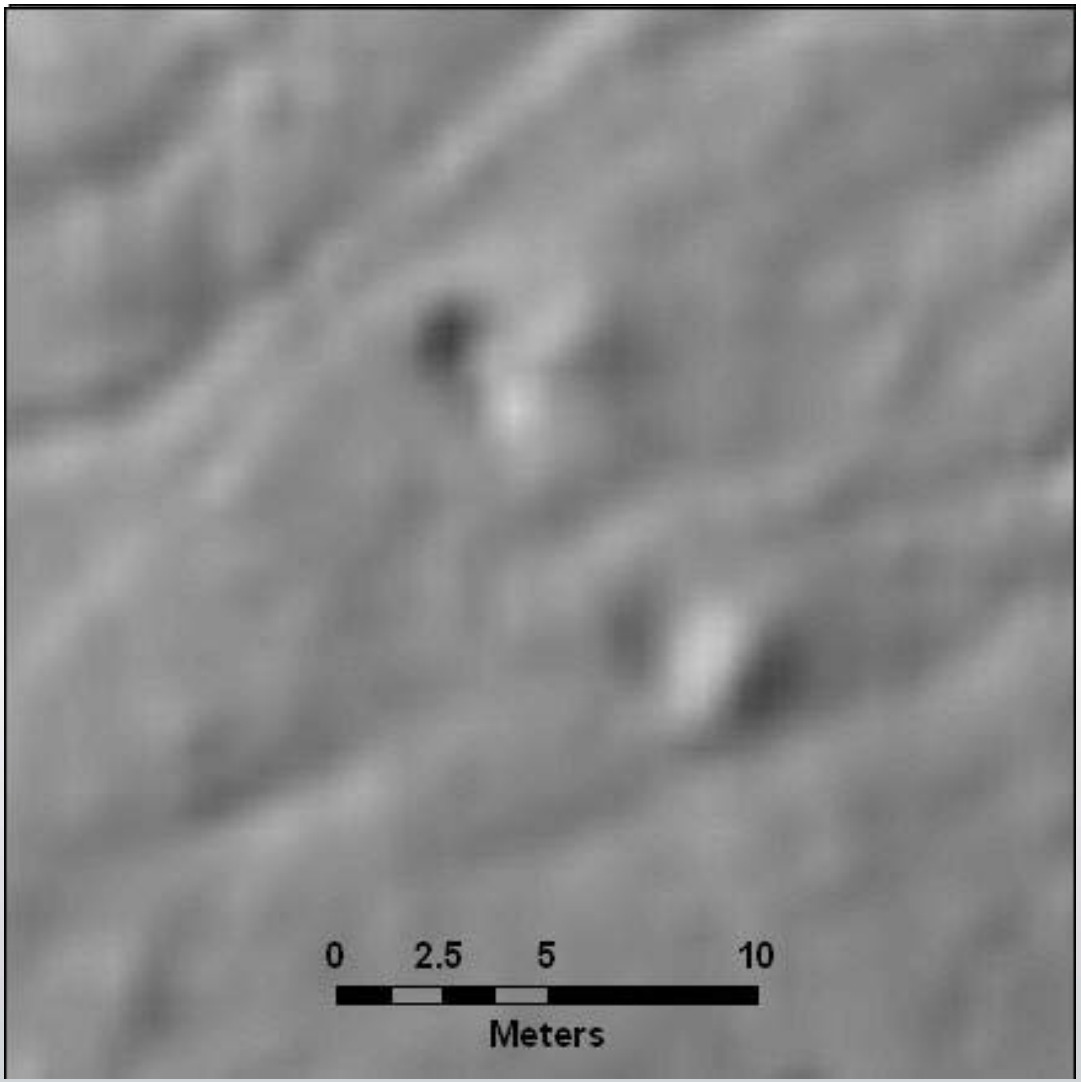
Hole Groups 2



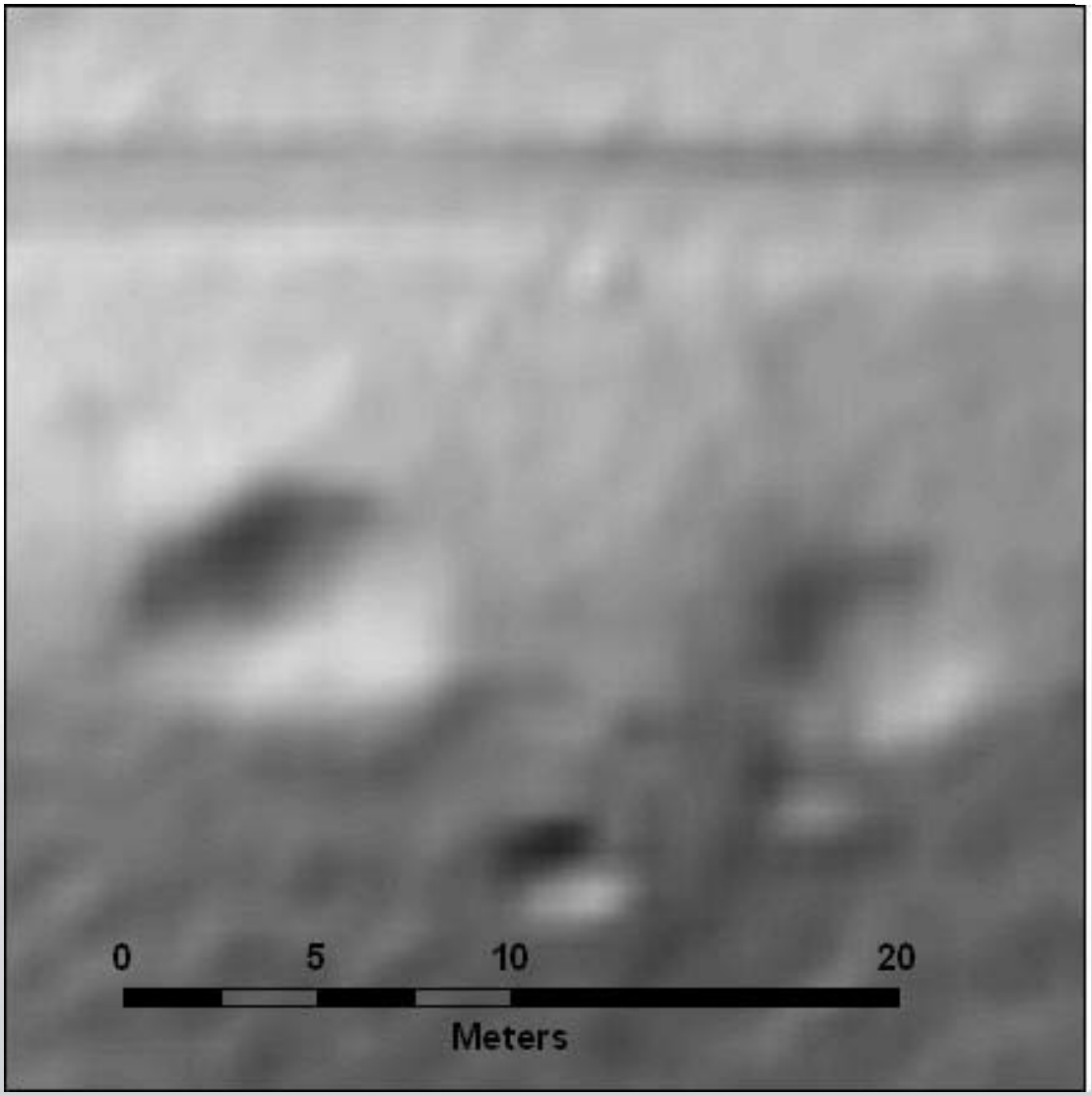
Hole Groups 3



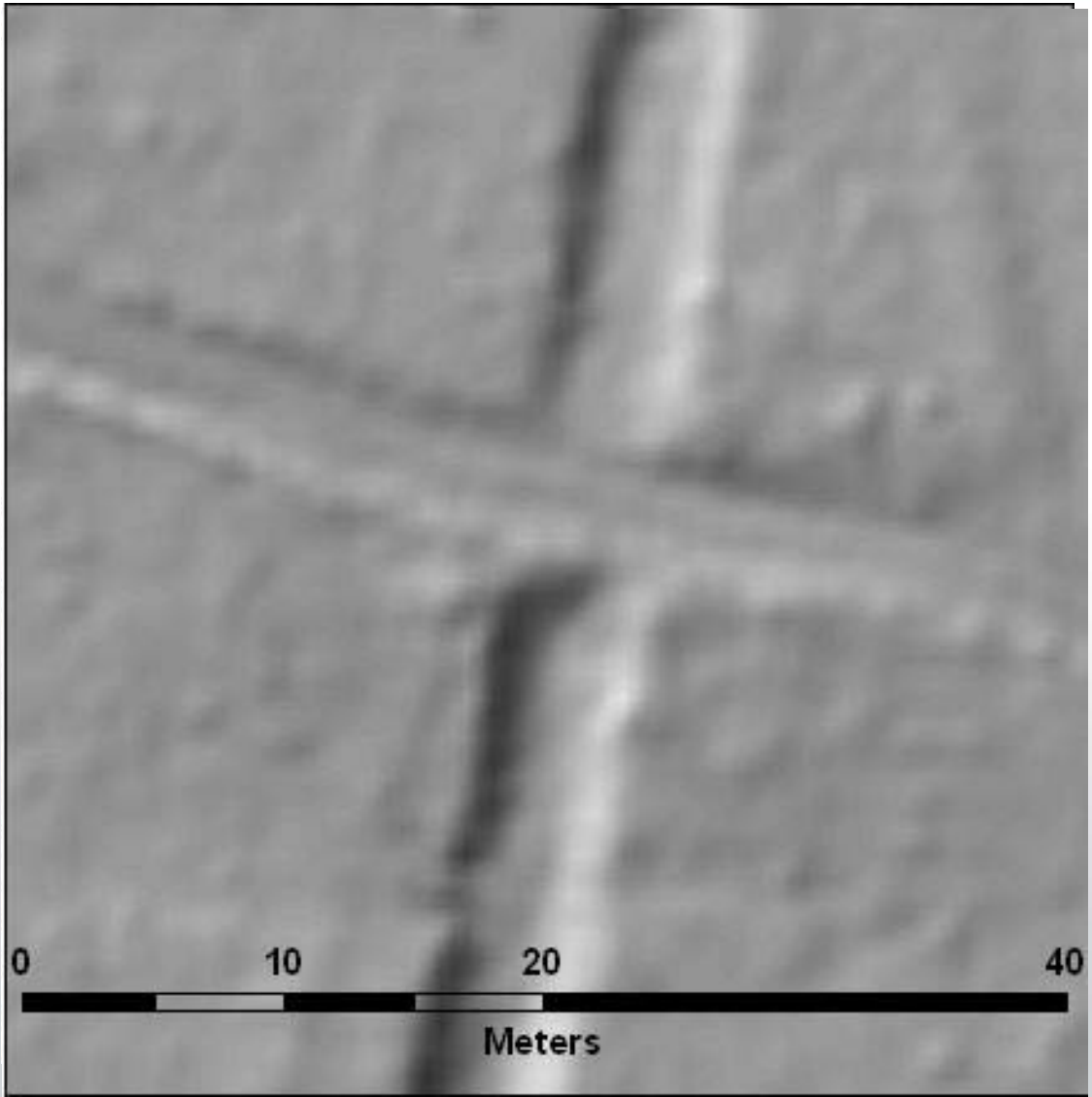
Hole Groups 4



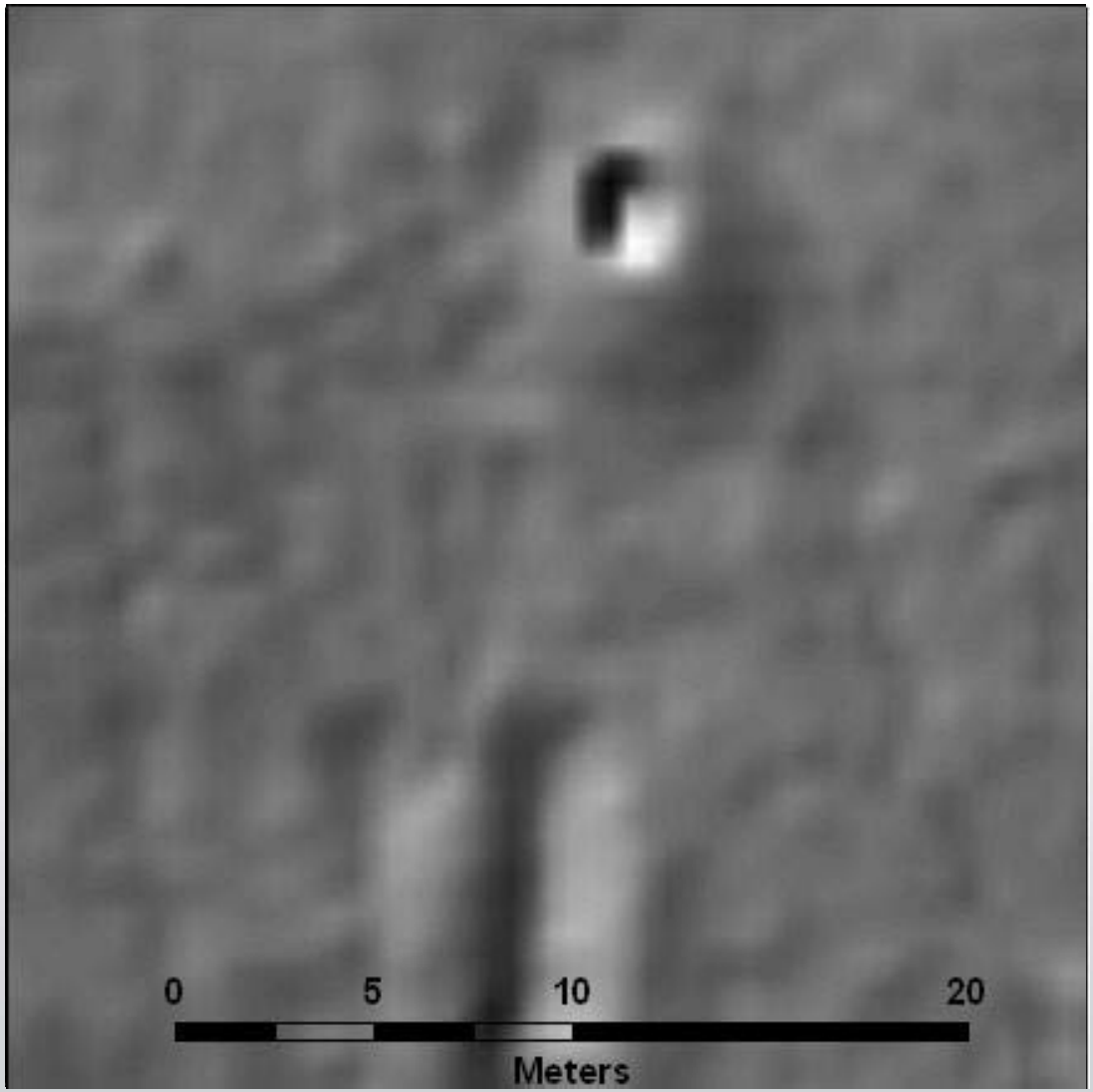
Hole Groups 5



Linear Features



Scoring

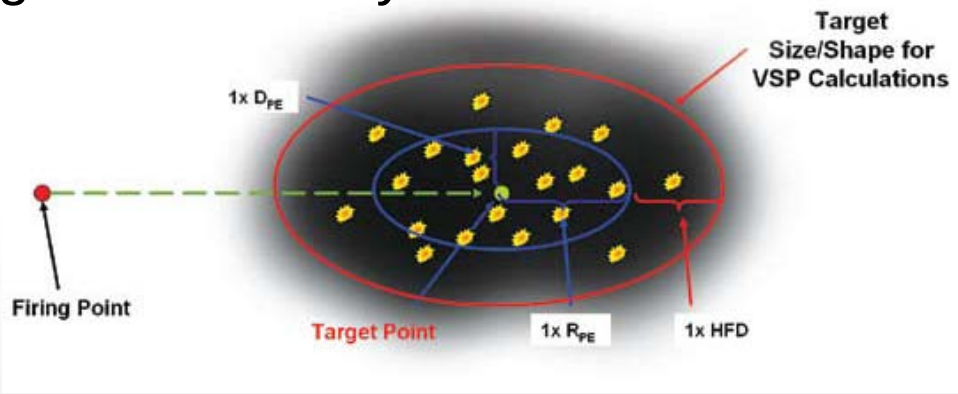


Lidar & Orthophotography Study Questions

- To what degree do lidar/ortho detect surface features indicative of munitions related activities?
  - Craters/Crater Fields
  - Target Features
  - Berms
  - Demolition Pits
  - Burial Pits
- Do lidar/ortho images provide sufficient evidence to:
  - Reliably identify areas of concentrated munitions use?
  - Reliably identify areas with no indication of munitions use?
  - Improve the understanding of relative densities and distributions of MEC across the MRS?
- How confident are stakeholders in these conclusions?
- To what degree do lidar/ortho data make subsequent characterization steps (e.g., helicopter-borne magnetometry) more cost effective?
- What are the total cost, cost per characterized acre, and cost per surveyed acre associated with lidar/orthophotography?

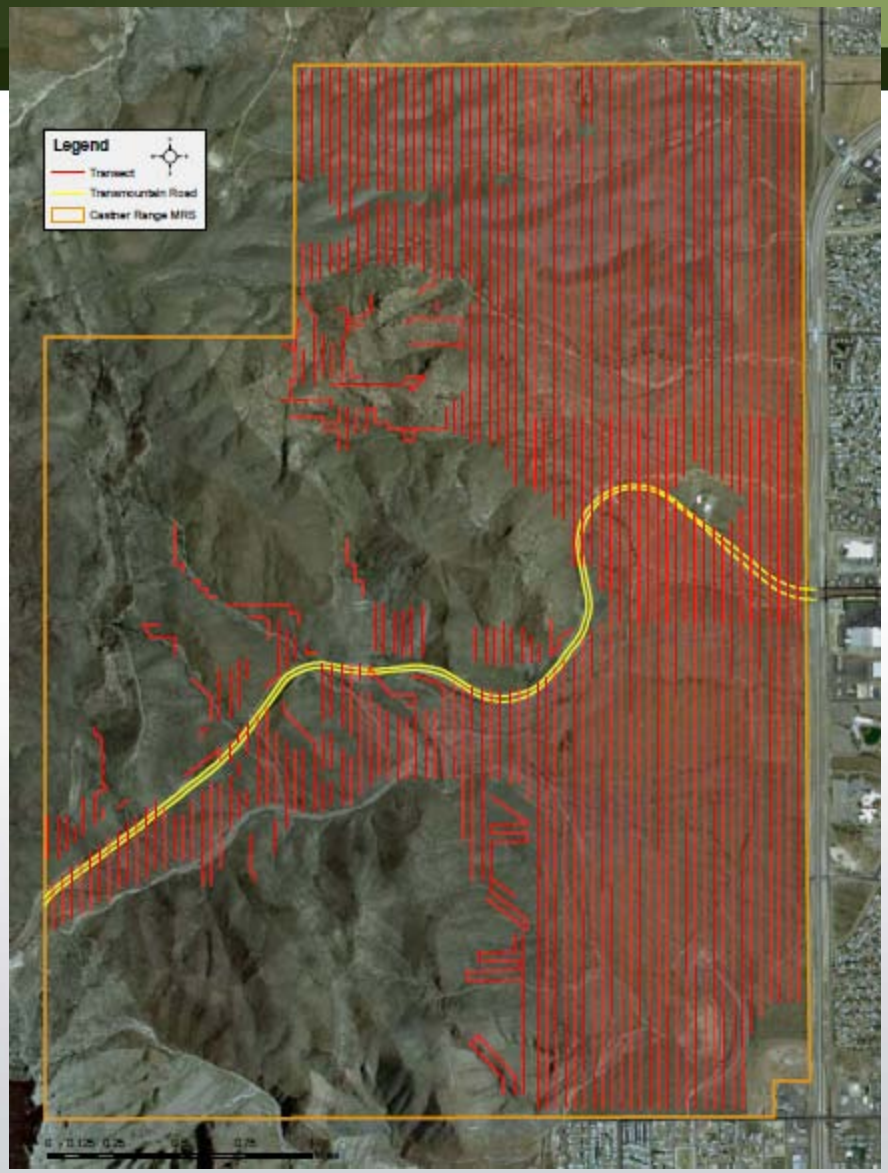
Visual Sampling Plan (VSP)

- "Transect Spacing to Ensure High Confidence (95%) of Traversal and Detection of Target Areas"
- Evaluated transect spacing for most likely munitions items:
  - 37mm projectiles
  - 60mm mortars
  - 75mm projectiles
  - 2.36-in rockets
- Used combination of:
  - Munitions firing table data (range and deflection probable errors) from Army field manuals
  - Hazardous fragmentation distances from DDESB fragmentation database
- 2.36 inch rocket is the munitions item with the smallest estimated transect spacing at 57m



Establish Transects

- Used VSP output (57m) transect spacing
- Plotted on areas of <18% slope (safety/accessibility)
- Marking nearly 1 million linear feet of transect for ground-based geophysics

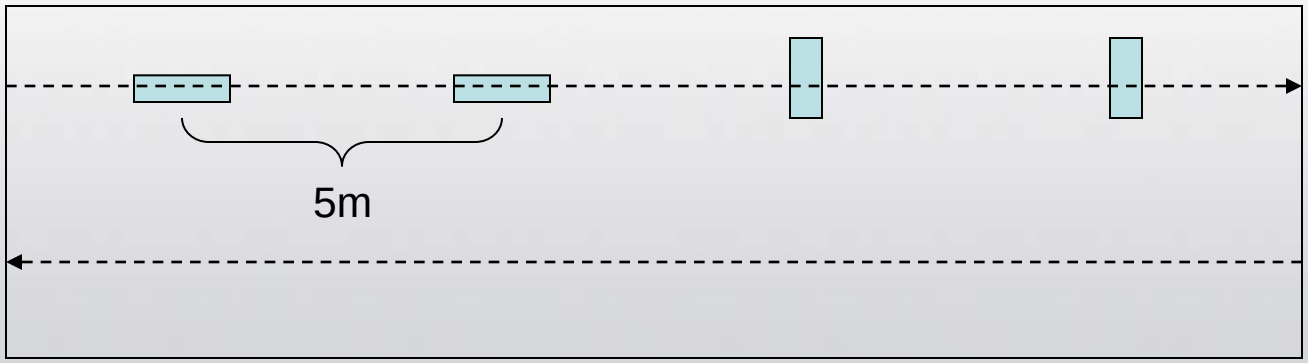


Geophysical System Verification

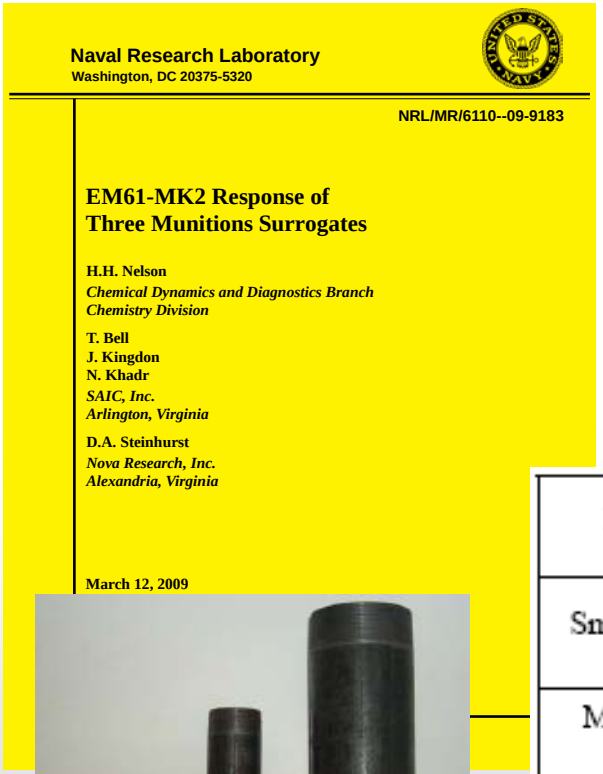
- Purpose
  - Demonstrate the geophysical system is meeting typical and acceptable detection performance
  - Evaluate the project team's data collection and data transfer methods
  - Establish site-specific signal-to-noise ratios for selection criteria
- For ground-based and helicopter-borne systems
- Using specifications contained in *"Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove Outs"* (ESTCP 2009)
- Includes:
  - Instrument verification strip (IVS)
  - Blind seed items in the production area

Instrument Verification Strip (IVS)

- A line of seed items of known size, shape, orientation, depth, and location
- Run geophysical equipment over the IVS before and after each data collection day to verify instrument performance
- Use “industry standard objects” (ISOs) with known signal responses for common instruments (e.g., EM61)



Industry Standard Objects (ISOs)



Naval Research Laboratory
Washington, DC 20375-5320

NRL/MR/6110--09-9183

EM61-MK2 Response of Three Munitions Surrogates

H.H. Nelson
Chemical Dynamics and Diagnostics Branch
Chemistry Division

T. Bell
J. Kingdon
N. Khadr
SAIC, Inc.
Arlington, Virginia

D.A. Steinhurst
Nova Research, Inc.
Alexandria, Virginia

March 12, 2009

- Readily available, similar in size and shape to common munitions items
- Documented response curves
- Repeatable, consistent EM signals for calibration and performance validation

Item	Nominal Pipe Size	Outside Diameter	Length	Part Number[1]	ASTM Specification
Small ISO	1"	1.315" (33 mm)	4" (102 mm)	44615K466	A53/A773
Medium ISO	2"	2.375" (60 mm)	8" (204 mm)	44615K529	A53/A773
Large ISO	4"	4.500" (115 mm)	12" (306 mm)	44615K137	A53/A773

1. Part number from the McMaster-Carr catalog.

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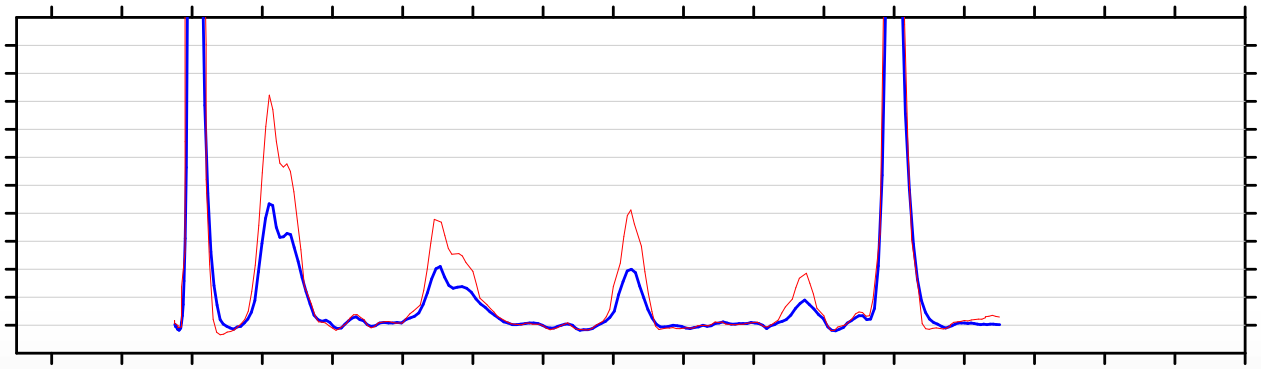
Ground-based IVS

EM61 Signal Response for Seed Items in IVS



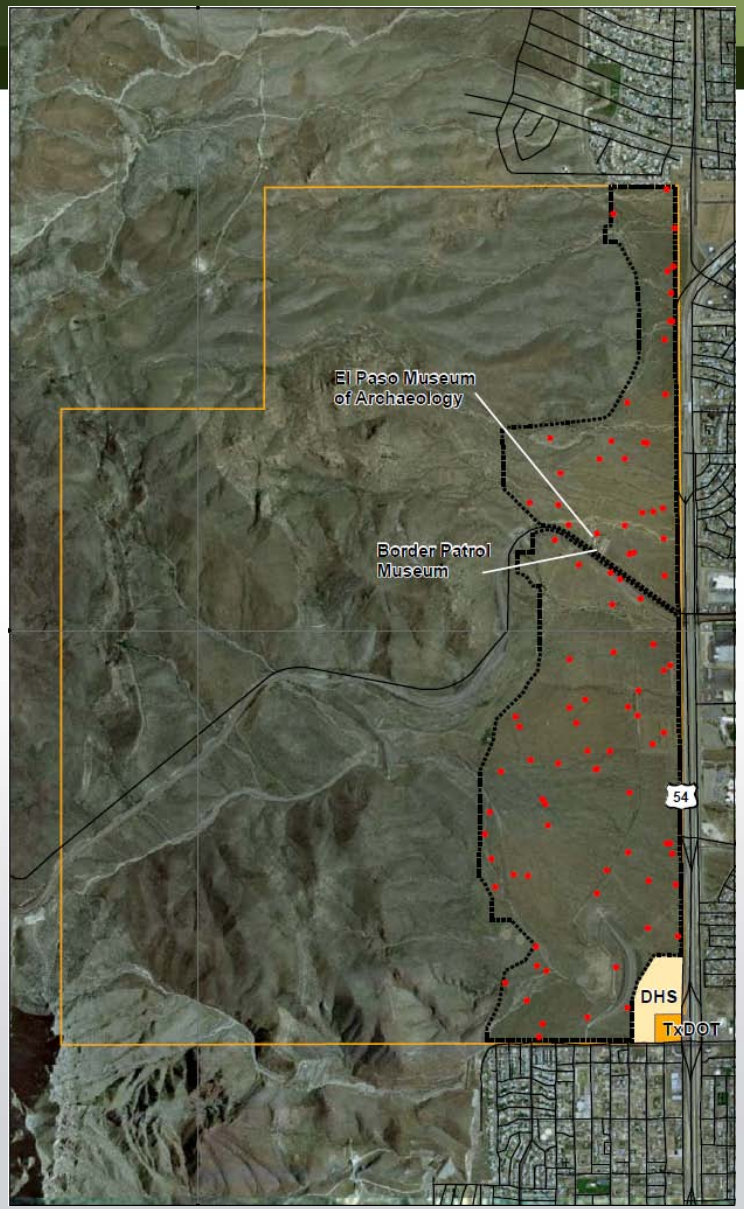
ISO Size	Position (m)	Depth (in.)	Orientation (relative to instrument path)
Small	2.5	3	Horizontal along path
Small	7.5	7	Horizontal along path
Small	12.5	3	Horizontal across path
Small	17.5	7	Horizontal across path

Airborne IVS

Item/ Size	Orientation (relative to instrument path)
2.75-in. rocket (inert)	Horizontal along path
155mm projectile (inert)	Horizontal along path
155mm projectile (inert)	Horizontal across path
100-lb. bomb (inert)	Horizontal across path
ISO Large	Horizontal along path
ISO Medium	Horizontal along path
ISO Small	Horizontal along path

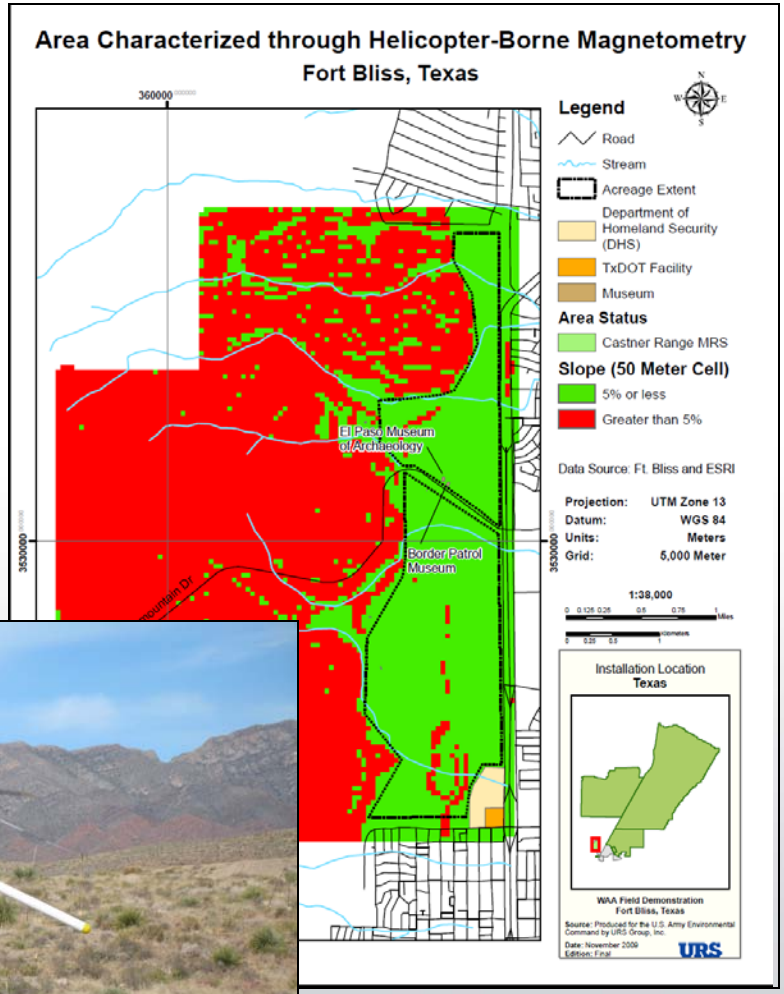
Blind Seeds

- Blind seeds evaluate adequacy of coverage, signal levels/instrument response, data processing, and positional accuracy
- 90 seed placements using 93 seed items:
  - 31 small ISO
  - 31 medium ISOs
  - 31 large ISOs
- 3 of the placements will contain two ISOs



Helicopter-Borne Magnetometry (ongoing)

- Objective: Map relative densities of ferrous metals
- Flown 1-3m above ground surface
- 7 sensors space 1.5m apart provide swath width of approx 9m
- Flight lines 7m apart provide for 2m overlap
- 100% coverage of survey area (approx 1,577 acres; < 5% slope)
- Approx 350-500 acres/day
- Performer – Sky Research
- 11 - 16 January 2010



What have we found?

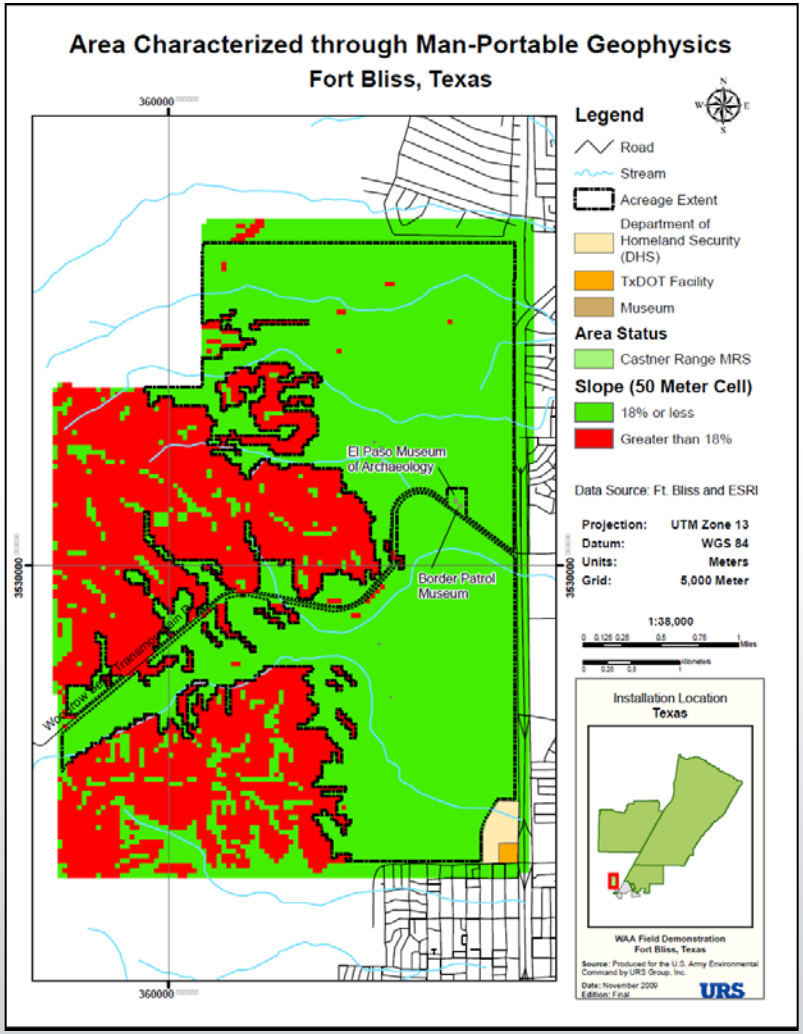
What have we found?

- Terrain is tougher than we thought (no towed-array; site survey very difficult)
- Lots of magnetic noise
- Lidar/orthophotos can see munitions related features
- Finding lots of munitions debris

What is left to do?

Ground-Based Geophysics

- Man-portable (litter) EMI array with transect-based coverage
- Estimated characterized acreage is 4,020
- Approximately 1 million linear feet of transects
- Performer: NAEVA Geophysics and Sky Research
- Work scheduled 25 January – April 2010

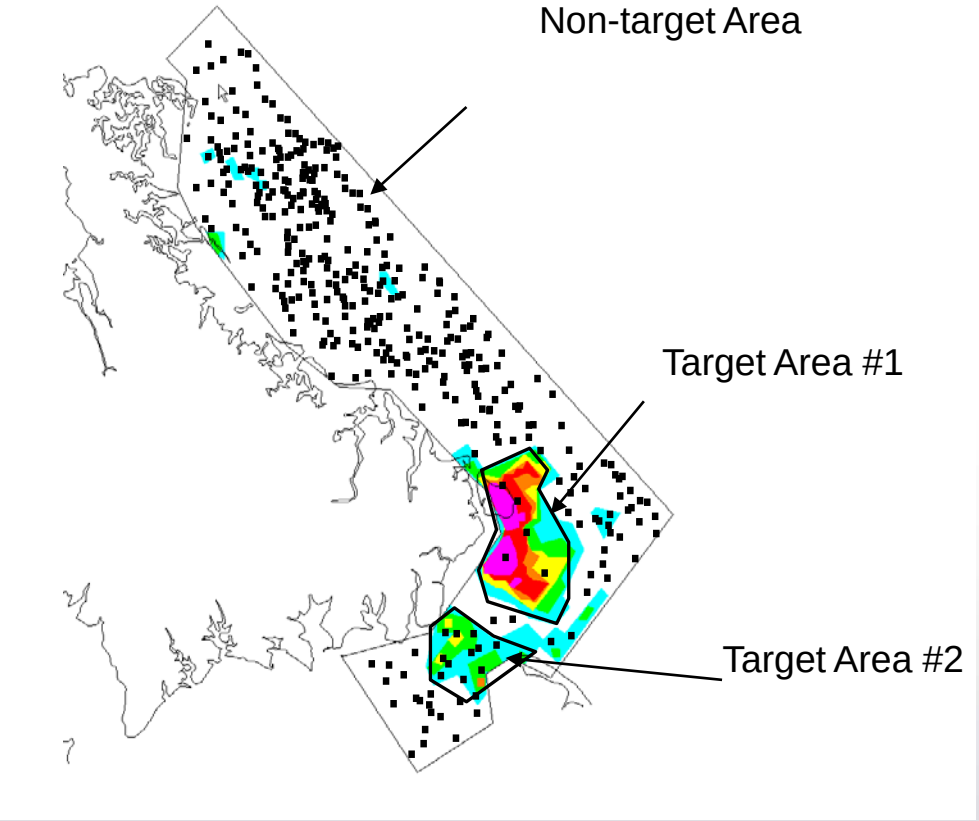


Anomaly Discrimination and Prioritization

- Develop target lists (i.e., “dig sheets”) for the reacquisition of anomalies using outputs from helicopter-borne magnetometry & ground-based geophysics
- Evaluated anomaly characteristics
- Prioritize for intrusive investigation

Delineate Target Areas and Non-Target Areas

- Delineate boundaries of target areas through analysis of anomaly densities using VSP (90% confidence level)
- Target areas:
  - Develop hypotheses of MD densities (e.g., at least 100 pieces of MD/acre)
  - Test hypotheses through intrusive investigation of 20'x20' grids to confirm munitions target areas (90% confidence level)
- Non-target areas:
  - Develop hypotheses of MEC densities (e.g., less than or equal to 0.25 MEC items per acre)
  - Test hypotheses through intrusive investigation of 20'x20' grids to confirm non-target areas (90% confidence level)



Investigate the Nature of MEC in Target Areas

- Once the target areas have been confidently identified and delineated, reacquire and dig individual anomalies
- Focus on anomalies of high priority/high likelihood of being MEC
- Record:
  - MEC, MD, range related debris, metal debris types
  - Size and type
  - Depth
  - Orientation

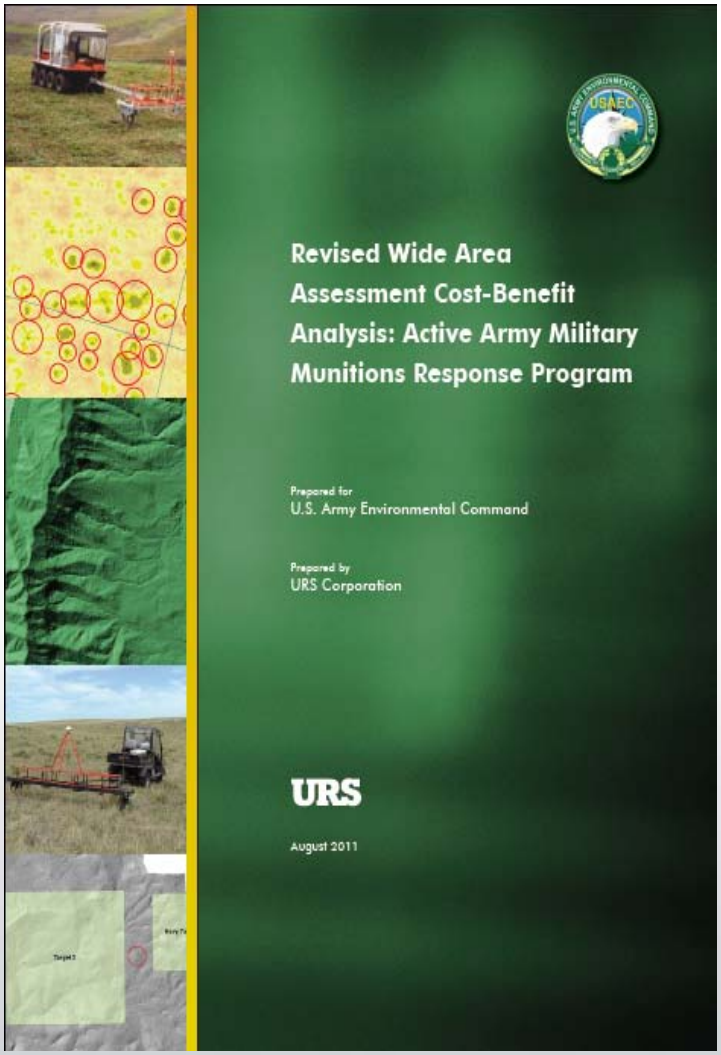
Intrusive Investigation (General)

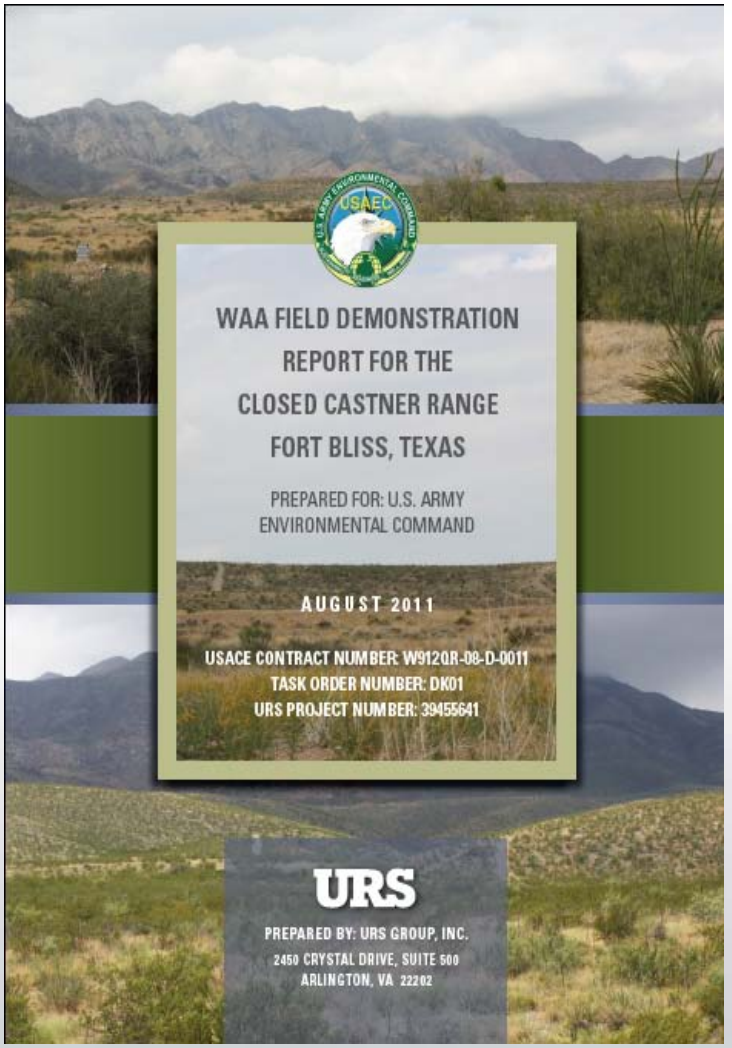
- Coordinate dig locations with Fort Bliss natural and cultural resources staff to minimize disturbance of sensitive areas
- Conduct Section 106 consultation through Fort Bliss programmatic agreement with continued consultation with the Tribes
- Excavate anomalies
- Work scheduled October – December 2010

Data Review & Analysis

- Review the ability of methods (i.e., lidar/ortho, helicopter-borne magnetometry, and ground-based geophysics) to answer study question
  - Did the method improve the understanding of relative densities and distributions of MEC across Castner Range?
  - Did the method reliably identify areas of past munitions use?
  - Did the method identify areas with no indication of munitions use?
  - How confident are stakeholders in the conclusions?
- Review the effectiveness of methods
  - Individually
  - In combinations (layered application)

Reports


Revised Wide Area
Assessment Cost-Benefit
Analysis: Active Army Military
Munitions Response Program
Prepared for
U.S. Army Environmental Command
Prepared by
URS Corporation
URS
August 2011


WAA FIELD DEMONSTRATION
REPORT FOR THE
CLOSED CASTNER RANGE
FORT BLISS, TEXAS
PREPARED FOR: U.S. ARMY
ENVIRONMENTAL COMMAND
AUGUST 2011
USACE CONTRACT NUMBER: W912QR-08-D-0011
TASK ORDER NUMBER: DK01
URS PROJECT NUMBER: 39455641
URS
PREPARED BY: URS GROUP, INC.
2450 CRYSTAL DRIVE, SUITE 500
ARLINGTON, VA 22202

Project Schedule

Project Schedule

- **11 – 16 January 2010:** Helicopter-borne magnetometry data collection
- **25 January – March 2010:** Ground-based geophysics
- **April – July 2010:** Data analysis
- **October – December 2010:** Anomaly identification and intrusive investigation
- **January – May 2011:** Report writing

Future TPP Meetings

Future TPP Meetings

- **June 2010:** Discuss information gathered from helicopter-borne magnetometry and ground-based geophysics
- **October 2010:** Discuss target delineation and approach for intrusive investigation
- **February 2011:** Discuss findings from intrusive investigation
- **June 2011:** Discuss project results, stakeholder confidence in results, and WAA costs/benefits

Questions?