MetalMapper Overview

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
MAY 2012		**00-00-2012 to 00-00-2012**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
MetalMapper Overview	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
Environmental Security Technology Certification Program (ESTCP),4800 Mark Center Drive, Suite 17D08,Alexandria,VA,22350-3605	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES
Presented at the NDIA Environment, Energy Security & Sustainability (E2S2) Symposium & Exhibition held 21-24 May 2012 in New Orleans, LA.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**19**	

Scope of the Program

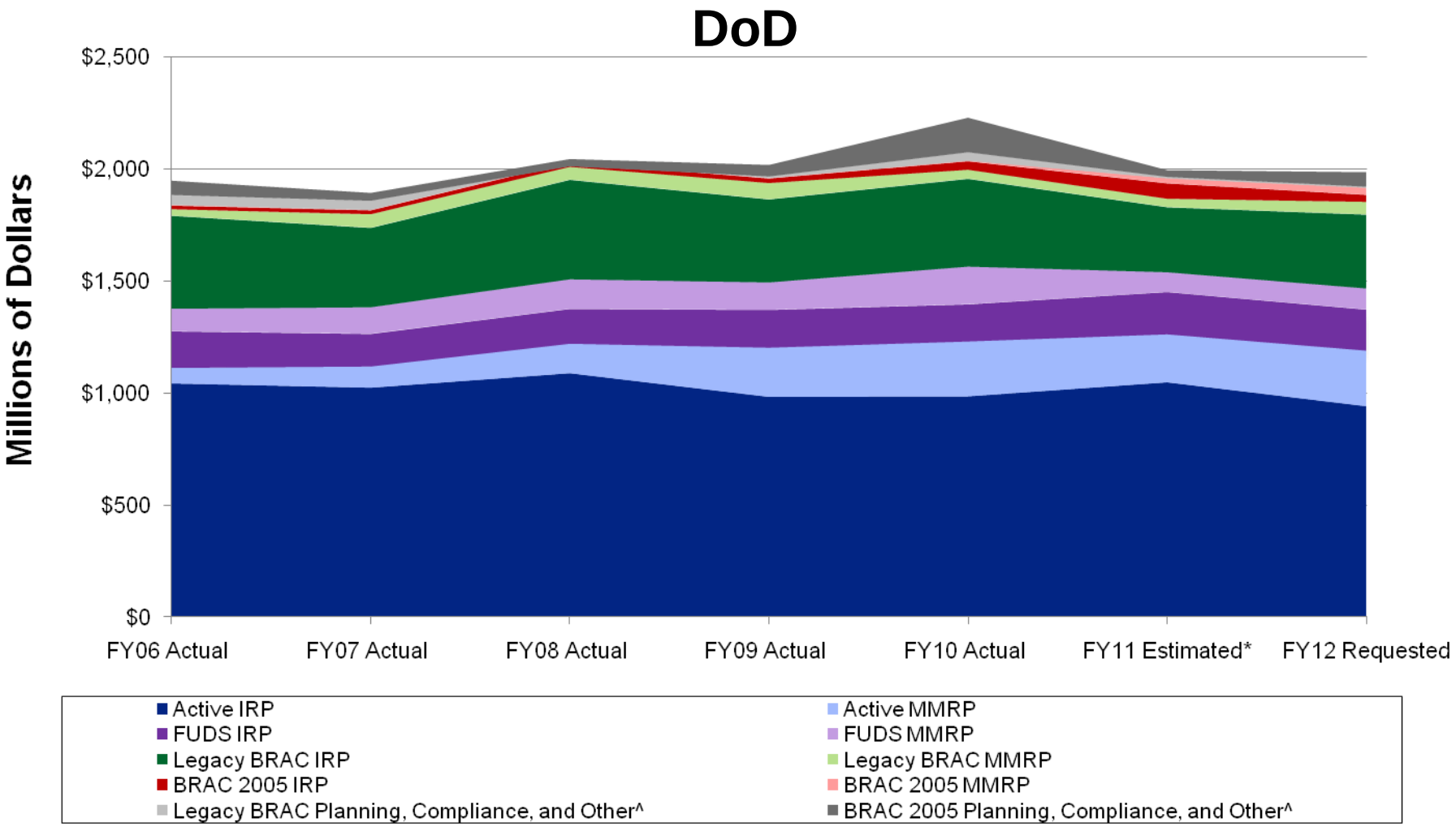
- Military Munitions Response Program (MMRP)
  - Manages environmental responses to unexploded ordnance (UXO), discarded military munitions (DMM), or munitions constituents (MC)
  - Does not include operational ranges, operating storage or manufacturing facilities, or permitted facilities for the treatment or disposal of military munitions

Scope of the Program (continued)

- 34,058 sites on 1,907 active and BRAC installations and 2,691 Formerly Used Defense Sites (FUDS) properties
- Active installations – 23,961 sites
  - 21,528 IRP sites
  - 2,433 MMRP sites
- FUDS properties – 4,624 sites
  - 2,921 IRP sites
  - 1,703 MMRP sites
- Legacy BRAC installations – 5,238 sites
  - 4,953 IRP sites
  - 285 MMRP sites
- BRAC 2005 installations – 235 sites
  - 174 IRP sites
  - 61 MMRP sites

Note: Data is based on draft FY2010 Annual Report to Congress

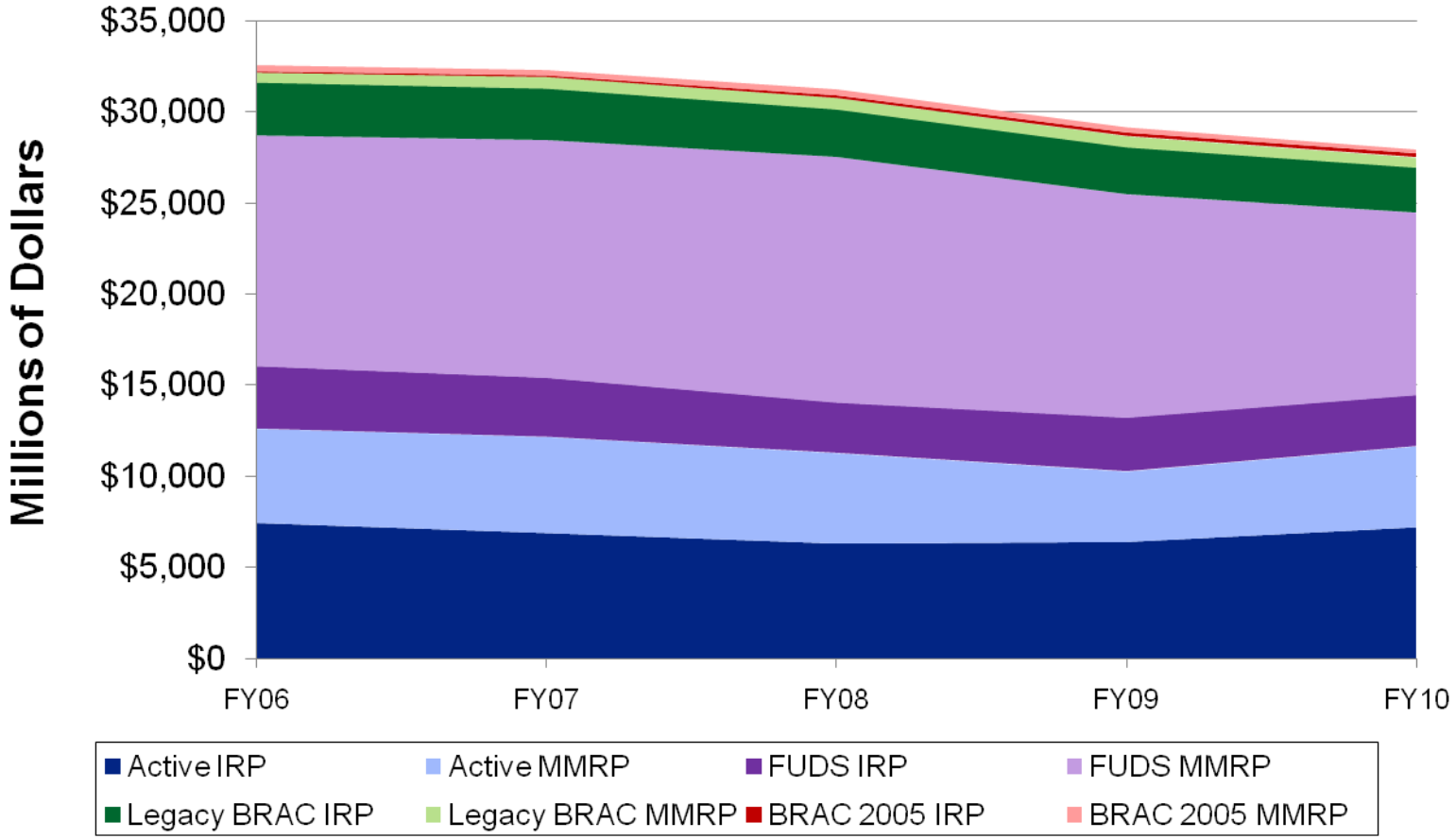
Program Funding



* Reflects an adjustment to match the Annualized Continuing Resolution funding level

^ Other may include revenue gained from land sales or execution of prior year funding

Funding: Cost-to-Complete*



* Includes installation project funding allocated to individual sites

UXO Live Site Demonstrations

- Known liability ~ $17B
- Excavation of suspected UXO drives cost and time – less than 4% of excavations are UXO, most are harmless scrap
- Technology has the potential to discriminate UXO from scrap, thereby potentially reducing costs and accelerating cleanup
- Demonstrations have been completed at six FUDS sites – Camp Sibert, AL, Camp San Luis Obisop, CA, and Camp Butner, NC, Mare Island Naval Shipyard, CA, Pole Mountain, WY, Camp Beale, CA
- Additional demonstrations are planned for FY2012 and beyond

UXO Live Site Discrimination Demonstrations (con't)

- Live-Site Demonstration Path Forward
  - Four-pronged approach
    - Demonstrate Successful Technology
      - Replicate success with the current contractor workforce with a variety of munitions, depths, and terrains
    - Work with Contracting Personnel
      - Identify and resolve contract disincentives to innovate technology
    - Regulator Involvement
      - Involve state and federal environmental regulators as site team members
    - Communicate Results to Decision Makers and the Public

Example Live Site Demonstrations

Camp Beale, CA

- 37mm projectiles, 60 and 81mm mortars, 105mm projectiles
- Unexpected fuzes found during intrusive investigation
- Some background noise from soil

Pole Mountain Target and Maneuver Area, WY

- 37mm to 3-inch projectiles, 60mm and Stokes mortars, small arms
- Relatively easy site for classification

Fort Sill, OK

- 20 and 40mm cartridges, 37 to 75mm projectiles (incl. many 40mm), 2.36- and 3.5-in rockets, LAW rockets, practice mines, MKII hand grenades, rifle grenades, various fuzes, possibly others
- Extremely high anomaly density areas

Mobilization

Relatively compact for transport
RTK-GPS for target stake-out

Multiple components to transport
RTK-GPS for survey
Tractor rental and transport

Staffing

1 – 2 person field crew
Dedicated analyst

1 – 2 person field crew
Dedicated analyst

Test Pit

Camp Beale

- 9 Items: 4 TOI expected at site based on prelim research, 2 seed items, 2 found on-site during surface sweeps, 1 typical frag
- Measurements collected at 2 depths and 4 orientations for most.

Fort Sill

- 24 Items: 22 separate TOI or versions of TOI (ex. 2.36” rockets w/ varying warheads), 2 horseshoes.
- Measurements collected at 1 depth and 3 orientations for most.

Systems Operations

Generally Easy

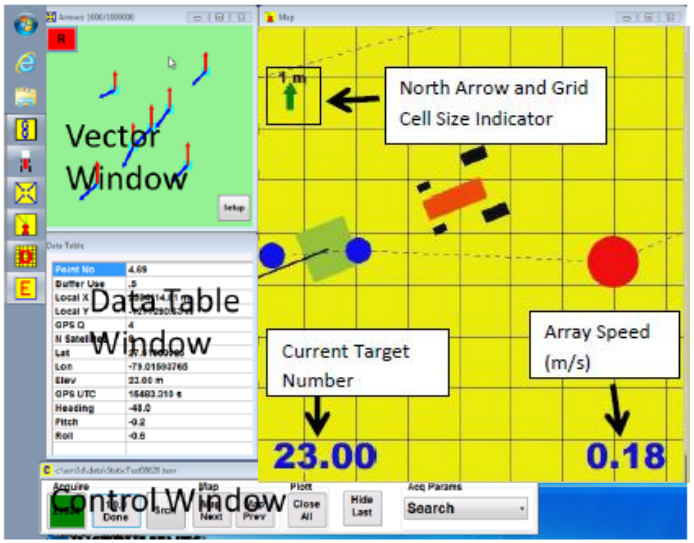
Pre-established background locations

Production rate less influenced by site conditions

More to "keep eye on"

Real-time background

Production rate more influenced by site conditions



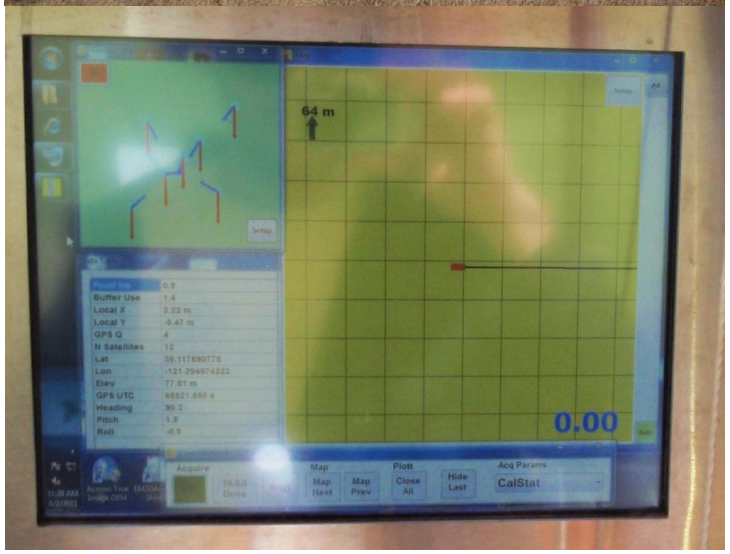
Cued Target Acquisition

Production

- 3 person team
- 115/day avg. at Beale, max of 239
- 117/day avg. at Sill, max of 244
- Dependent on density
- Includes re-shots (> 0.4m between collection location and modeled location)

Issues

- GPS + Windows 7 (+ EM3D Acquire? Touch Screen?) = crashes
- High percentage of re-shots at Beale first week
- Learning curve both locations



Quality Assurance / Quality Control

Instrument Verification Strip

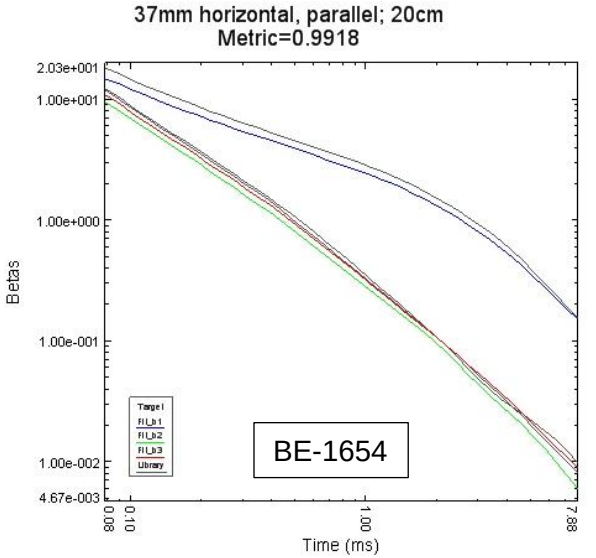
- 5 items at each site, tailored to site
  - Sphere, 37mm projectile, 60mm mortar, 105mm HEAT round, and small ISO at Beale
  - 37 and 40mm projectiles, MK2 hand grenade, anti-tank mine fuze (native), and 2.36-inch rocket at Sill
- Surveyed morning and afternoon. Identified TOI should match buried TOI using classification scheme planned for project, measured locations w/in 15cm X,Y and 10cm Z.

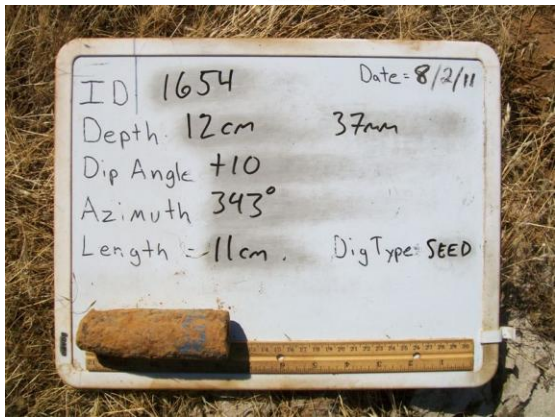
Seeds

- Mix of inert examples of TOI expected at the site and ISOs.
- 2 types of seeds: QC and statistical. Both blind to collection and initial analysis. QC misses available for revision of classifier, as necessary, following submittal of draft dig list. Statistical remain blind.

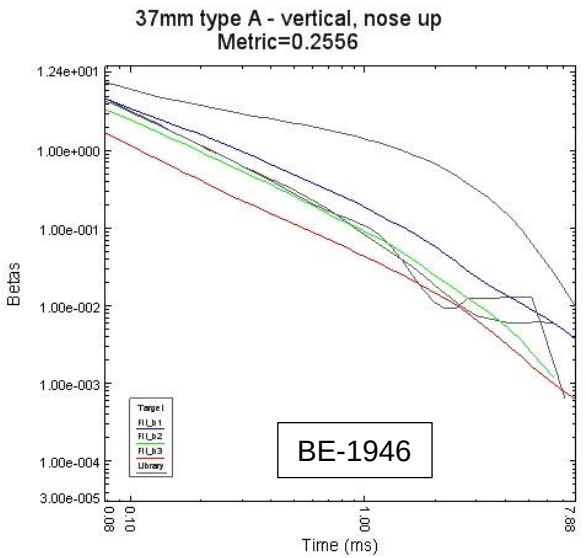
Polarization Curve Analysis
Usable 3-Curve Results

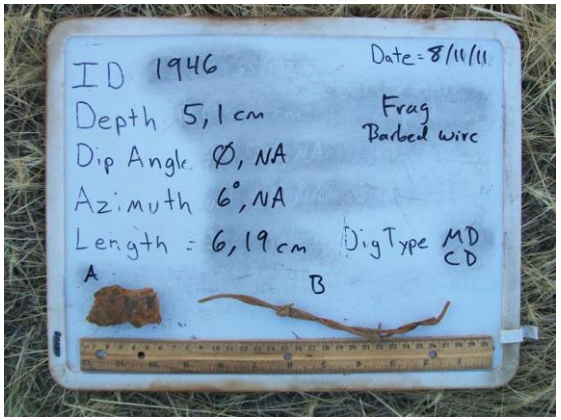
TOI



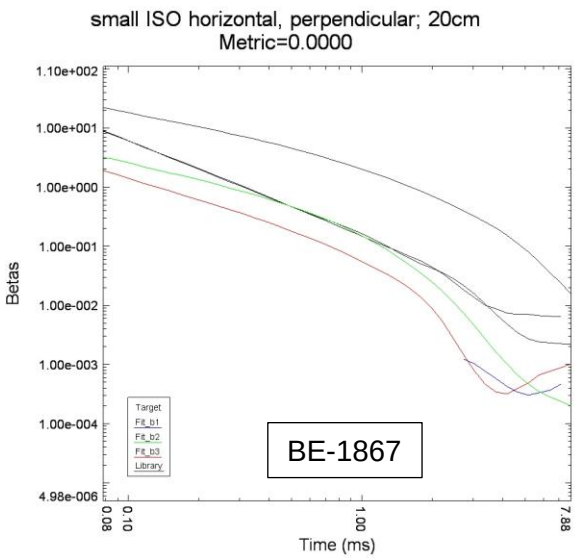


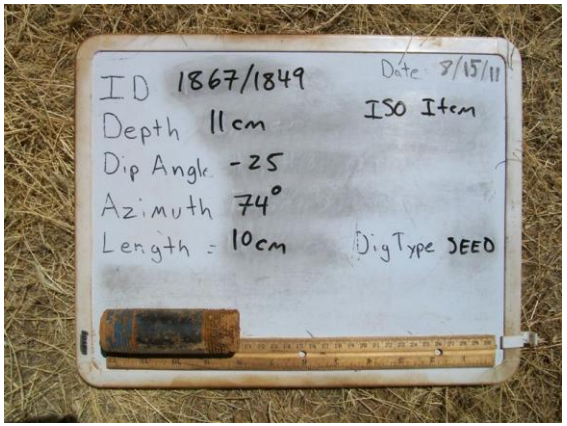
Non-TOI





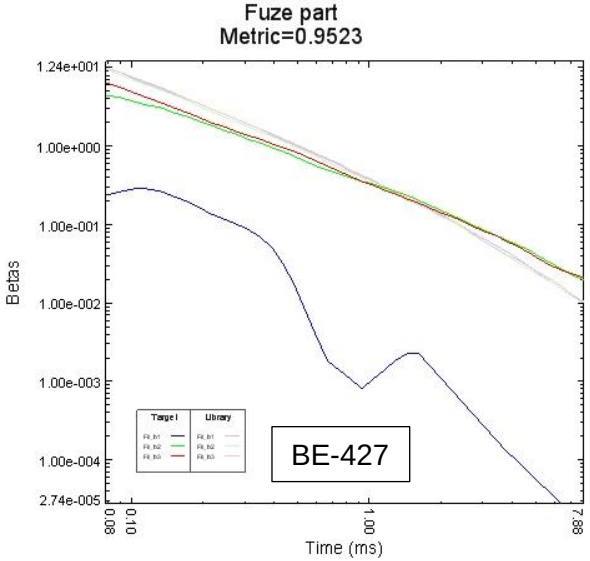
Can't Analyze



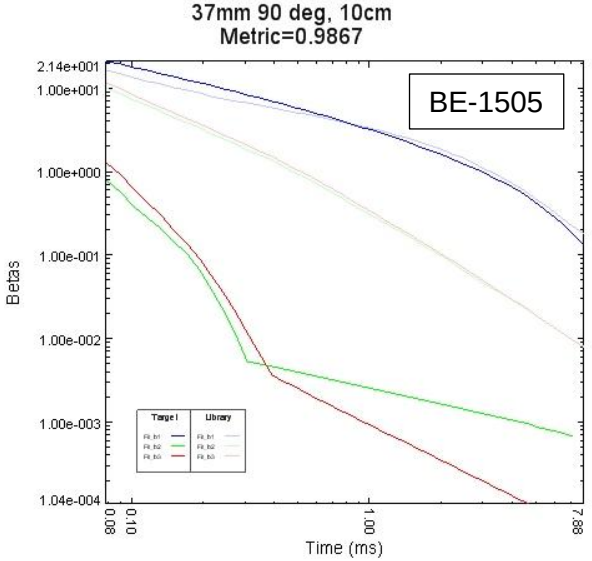


Polarization Curve Analysis
Unusable Curves

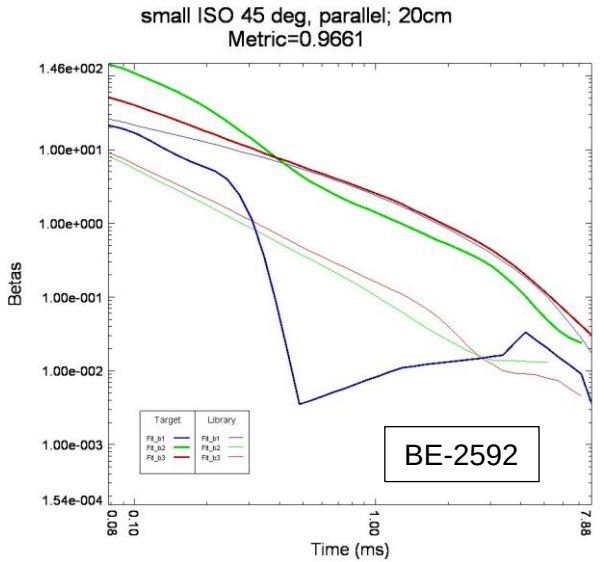
β1/β2 only

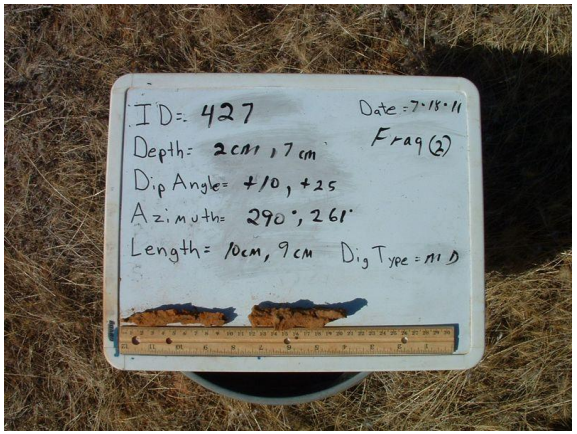


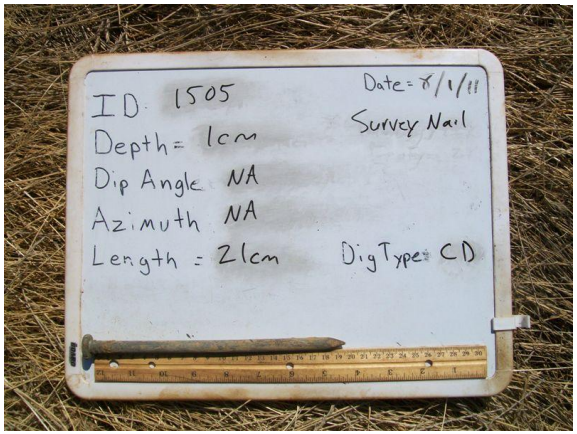
β1 only

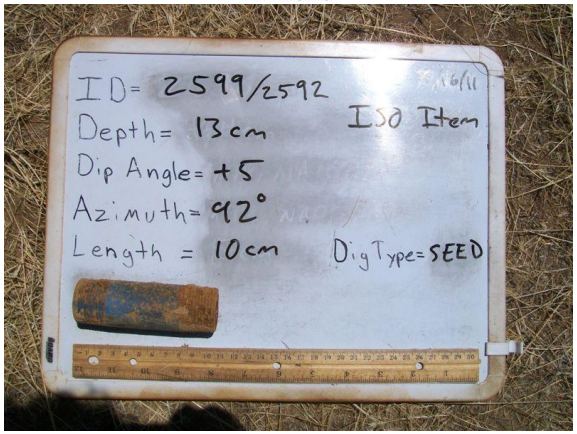


Single object result β1 only

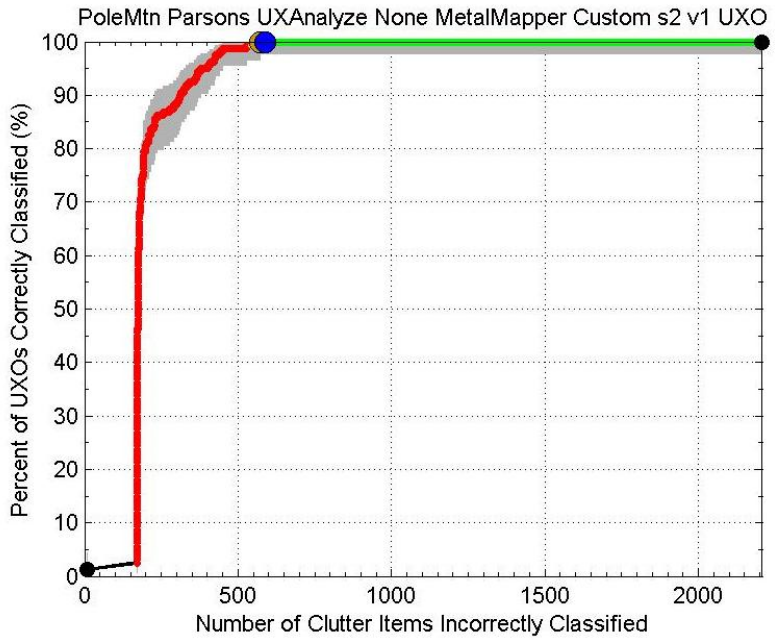






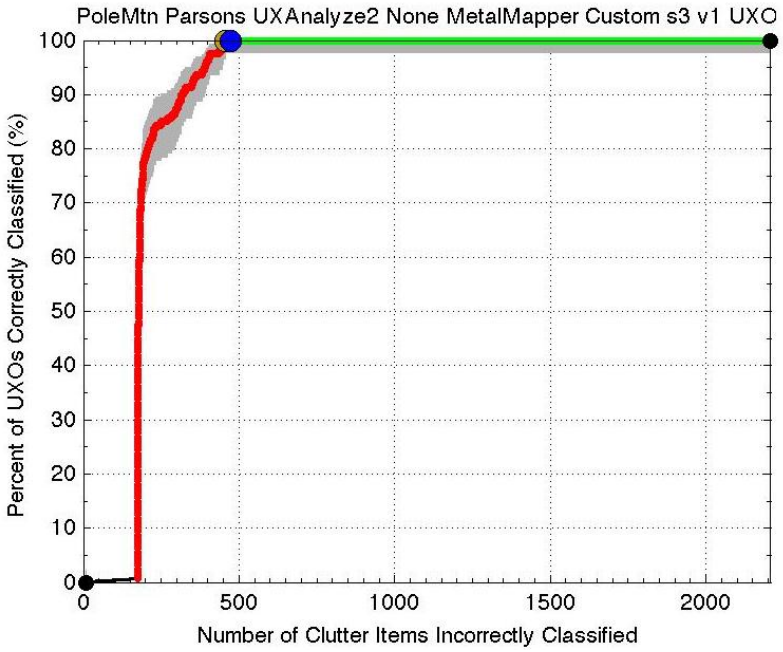


Pole Mountain Results



Dig list V1: Except for targets with 1 or more poor curves, used 3-curve metrics only

No Difficult UXOs



No Difficult UXOs

Dig list V2: Reduced false positives by limiting digs to targets with β1 metric > 0.7 (116 fewer digs). Could have been higher.

Example Results Summary

Camp Beale

- 1 missed item: 1 statistical seed item
- 462 of 1,441 digs required to excavate all TOI
- ~74% reduction in unnecessary digs

Pole Mountain

- No missed TOI
- 616 digs required to excavate all TOI
- Threshold at 633 digs of 2,368 possible digs
- ~79% reduction in unnecessary digs

Lessons Learned

- Understanding best ways to apply emerging technologies to current investigations
- Training and system refinements in progress
- Regulatory acceptance key component to process
- Use of appropriate contracting mechanisms vital to success
- Process is still evolving; not a silver bullet