MMRP Technology Update

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DoD's Environmental Technology Programs

Science and Technology

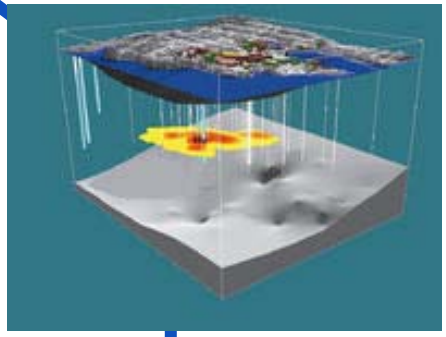
Demonstration/ Validation

Program Area Management Structure

Weapons Systems & Platforms

Energy & Water

Environmental Restoration



Resource Conservation & Climate Change

Munitions Response

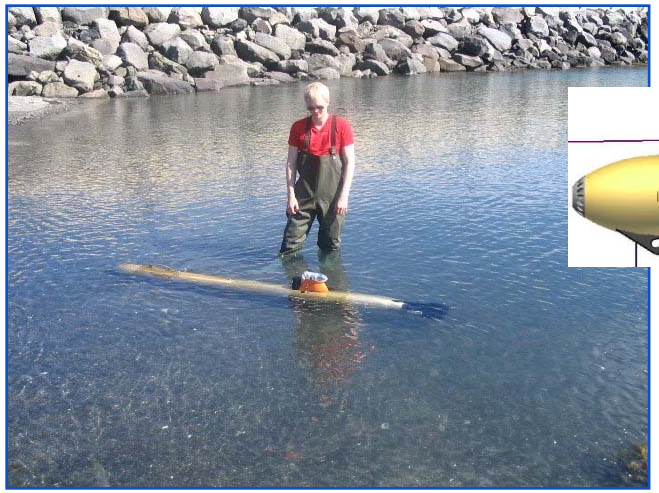
Today's Topics

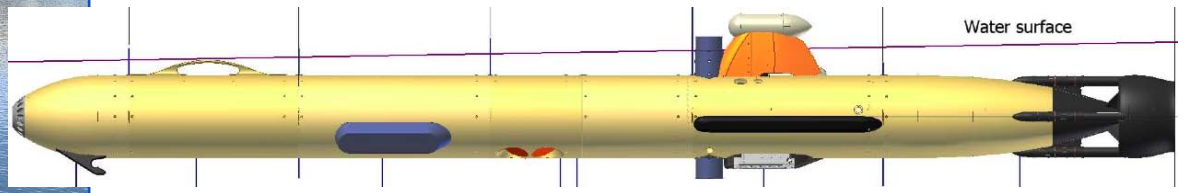
- Munitions Underwater
- Classification Applied to Munitions Response

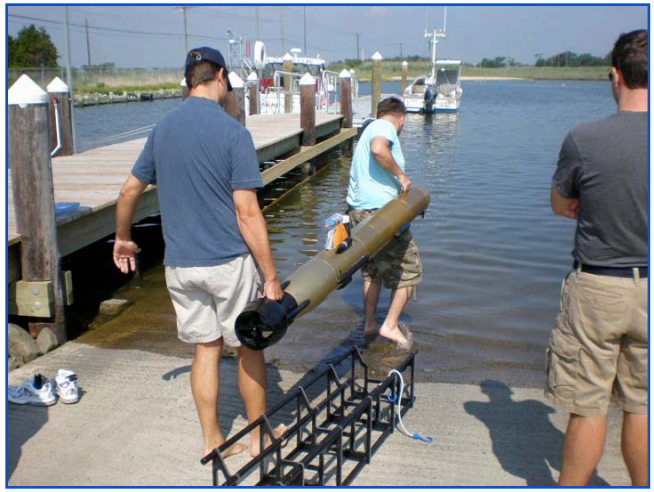
Three Areas of Focus Underwater

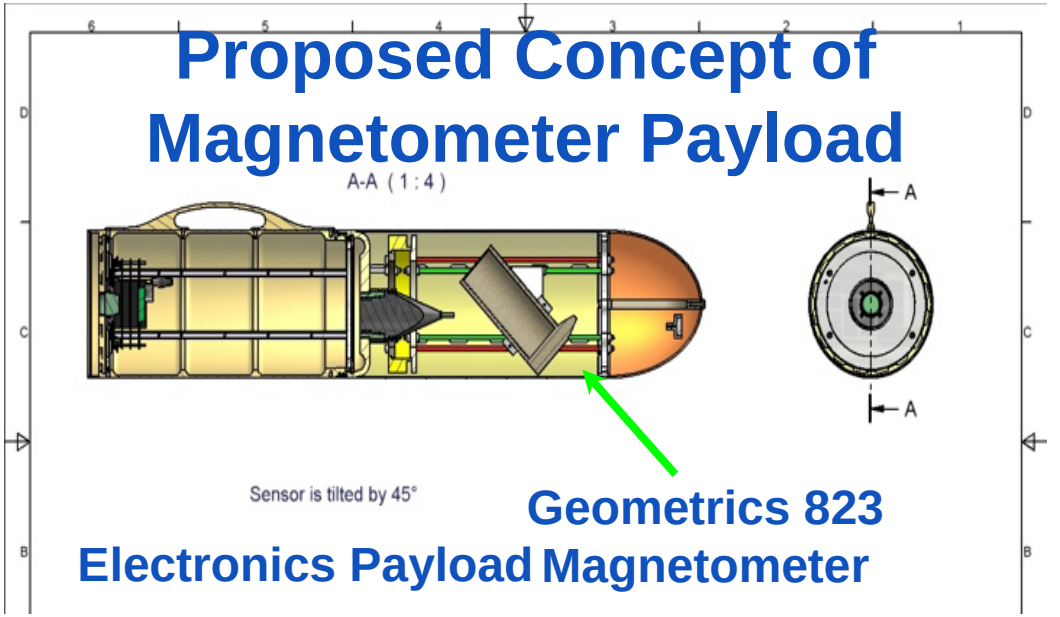
- Wide Area Assessment
  - locate areas of concentrated munitions
  - requires high coverage rates and reasonable probability of detection
- Detailed surveys
  - locate individual munitions for removal or monitoring
  - requires high probability of detection and good geolocation
- Enabling technologies
  - geolocation technologies
  - mobility models
  - remediation technologies

Wide Area Assessment
Geophysical Sensor on Statistical Transects

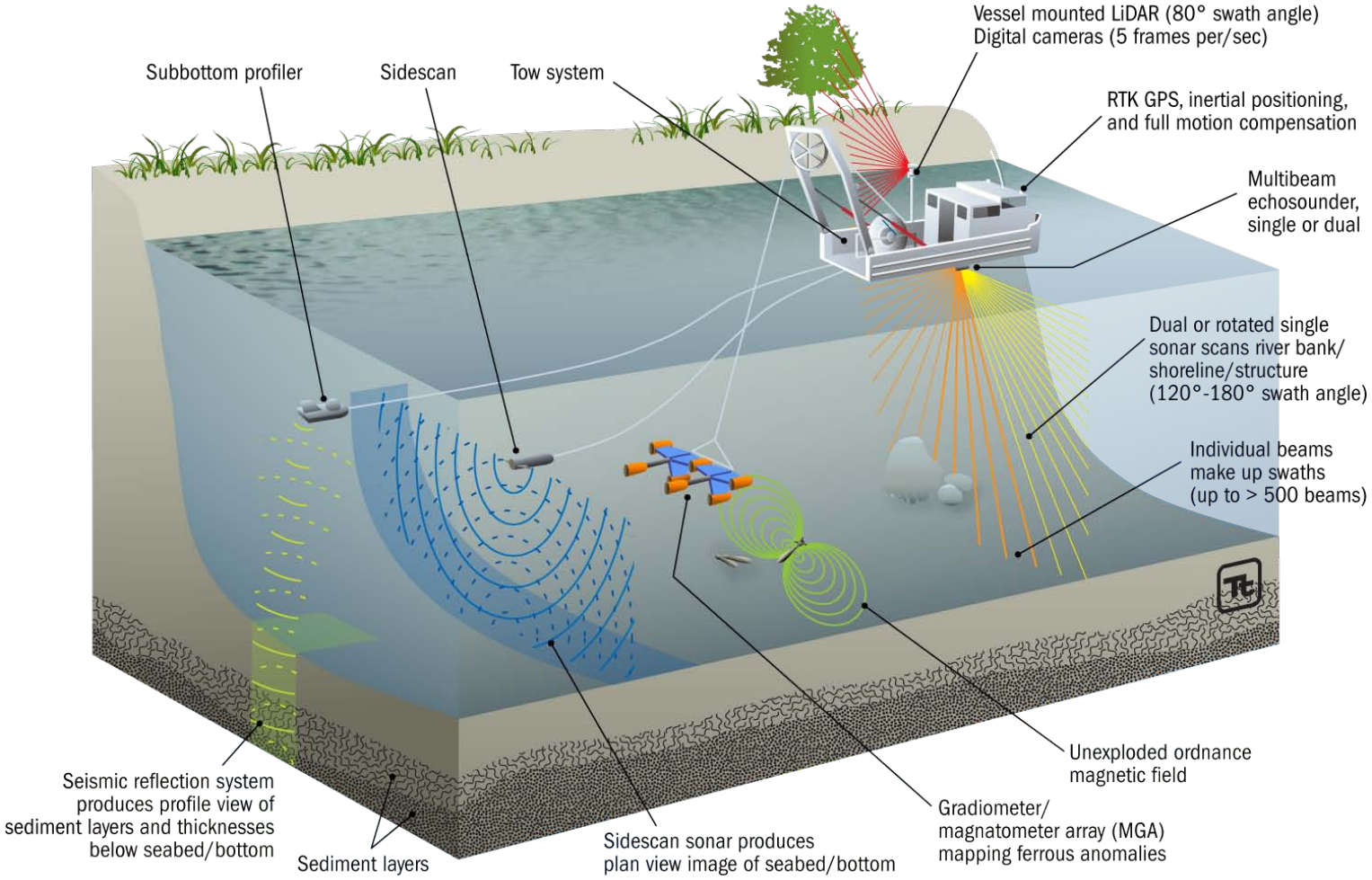








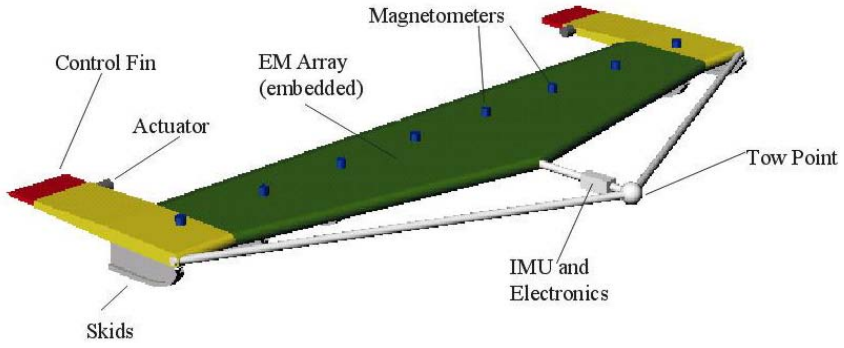
TetraTech Hybrid System



Marine Towed Array

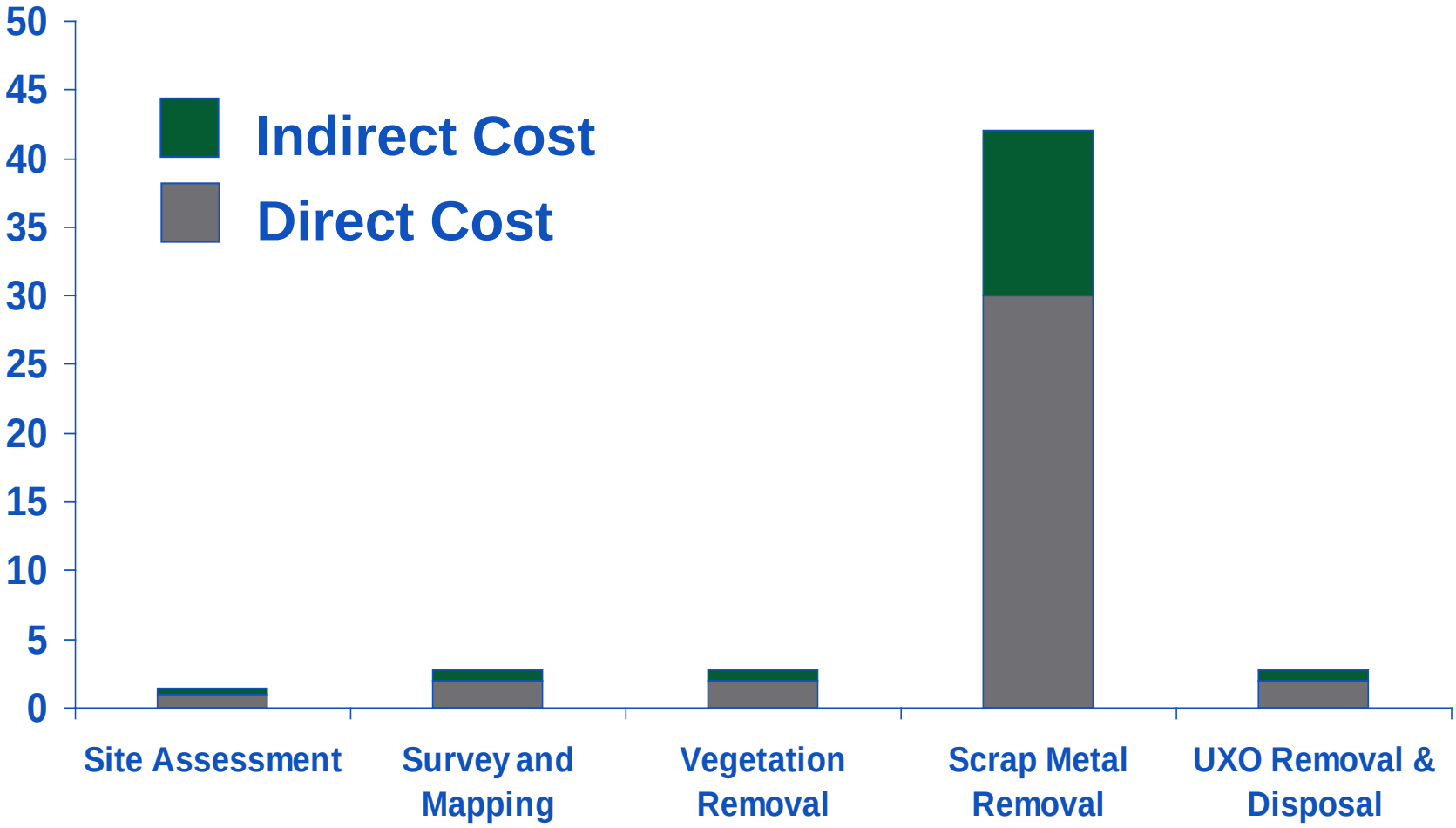
- Demonstrated and Validated System
  - Duck Naval Bombing Range, NC
  - Former Naval Ammunition Depot, Puget Sound
  - Lake Erie
  - Puerto Rico
  - Blossom Point

- 8 Total Field Magnetometers



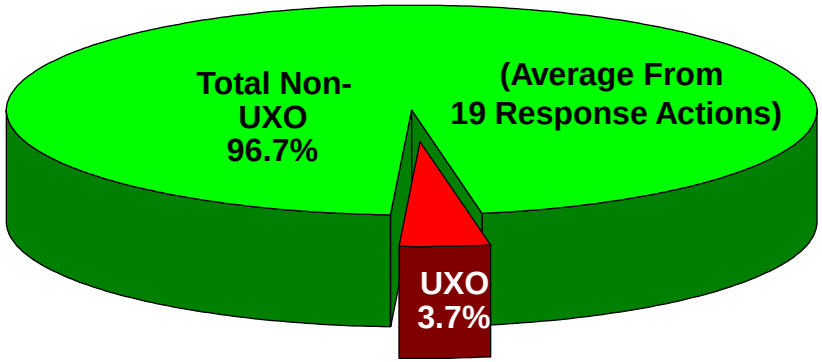
Classification Applied to Munitions Response

Defense Science Board
UXO Clean-up Cost Break Out



Why Discriminate?

- Excavation of suspected UXO drives cost and time
- Less than 4% of excavations are UXO
  - Usually <1%
  - Ex. Camp Butner
    - 7 items out of > 100,000 digs



- Most items are harmless scrap
- Technology can now discriminate UXO from scrap
  - Result of a decade of R&D
  - Proof of concept demonstrated at three real live sites (FUDS)

Evolution to Live Site Demonstrations

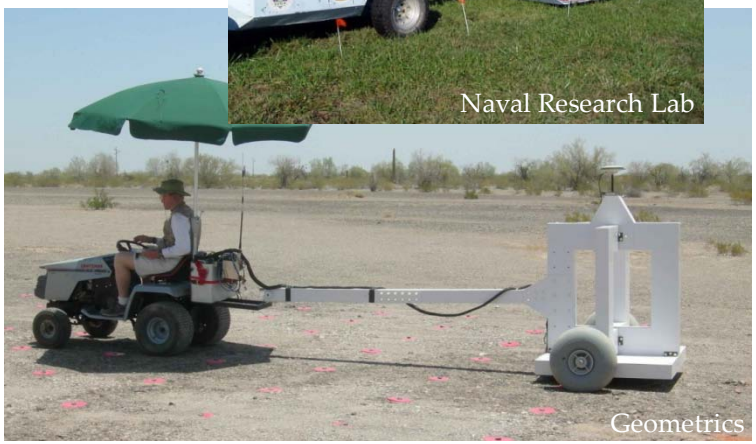
- More meaningful results when we validate capabilities of currently available and emerging technologies on real sites
- Supports dialog with regulators and program managers
- Keep standardized test sites as intermediate step between system shakedown tests and live site demonstrations

New EM Technology

- New **UXO-specific** EM technologies have been developed and tested under SERDP & ESTCP

- All digital electronics, measuring complete eddy current decay cycle

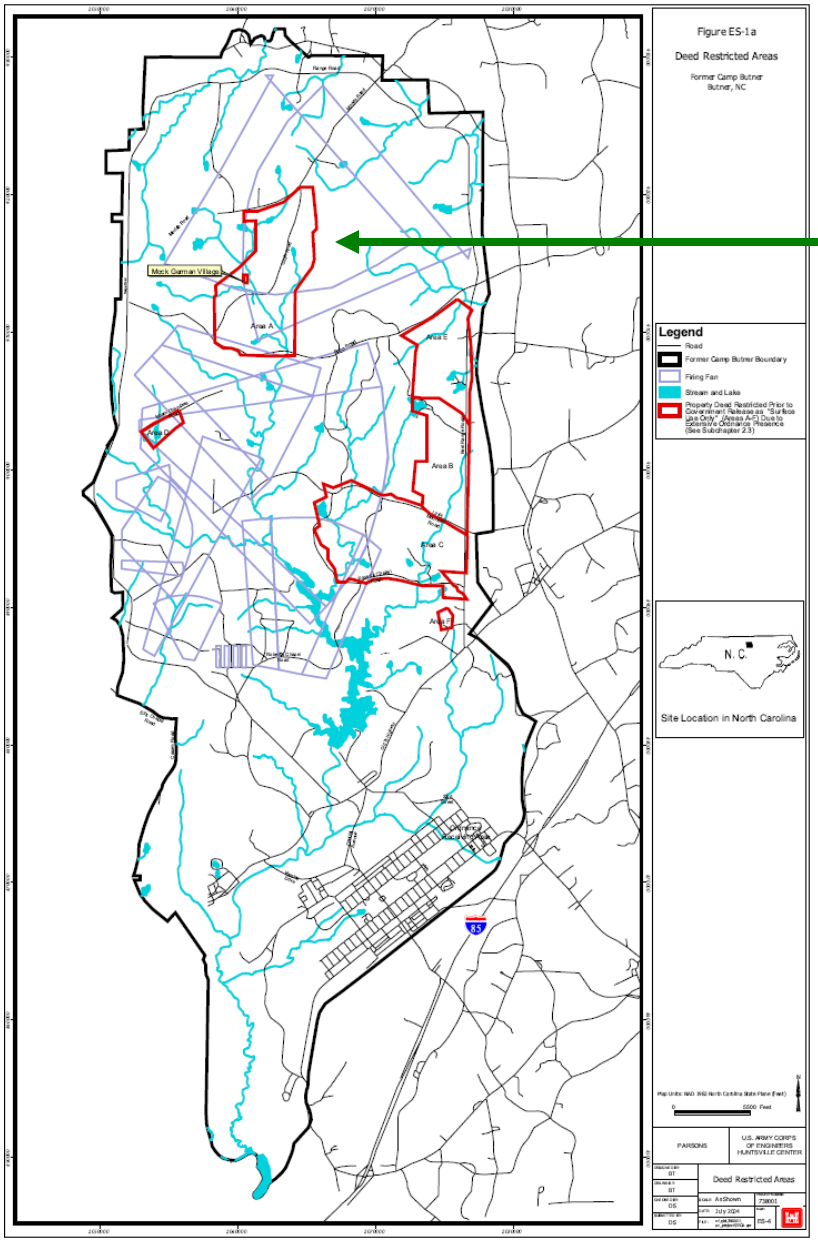
- Collect more complete data on the target.



Demonstrations to Date

- Completed
  - Former Camp Sibert, AL – simple site, single munitions type
  - Former Camp San Luis Obispo, CA – more difficult, mix of munitions
  - Former Camp Butner, NC – small munitions (37 mm)
- Ongoing
  - Mare Island Naval Shipyard, CA – industrial site
  - Pole Mountain, WY – case study in implementation
  - Former Camp Beale, CA – trees, restricted access
  - Site TBD
- Planned – additional demonstrations in FY12

Camp Butner



Area A- Artillery Impact Area

Survey Sensor Systems

- Survey Sensors
  - EM61 Cart
  - MetalMapper

MetalMapper

EM61 Cart

Cued Sensor Systems

- Cued Sensors
  - MetalMapper
  - Naval Research Lab Cued EMI array (TEMTADs)

MetalMapper

TEMTADS

Cued Area with Grid R21 Detail

~4.5 acres

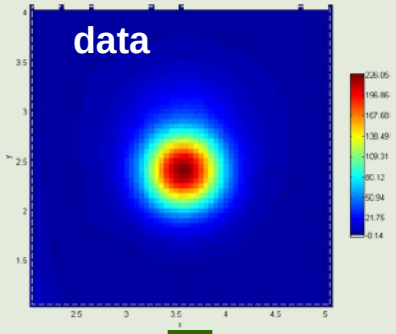
2300 targets

Standard Processing Stream

- The standard processing stream for detection and classification of munitions using geophysical data

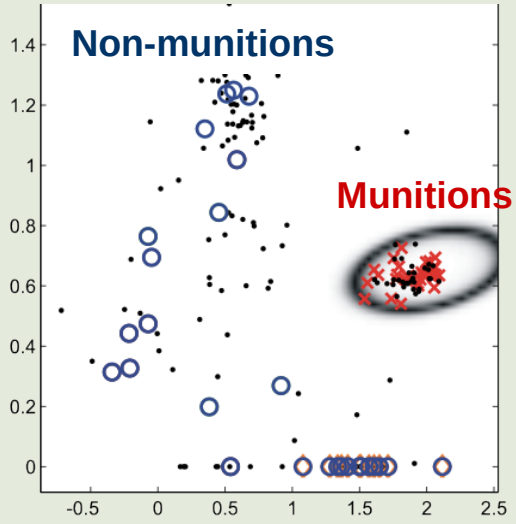
1. Data Collection

2. Parameter Estimation (Target Attributes)



Parameters

3. Classification



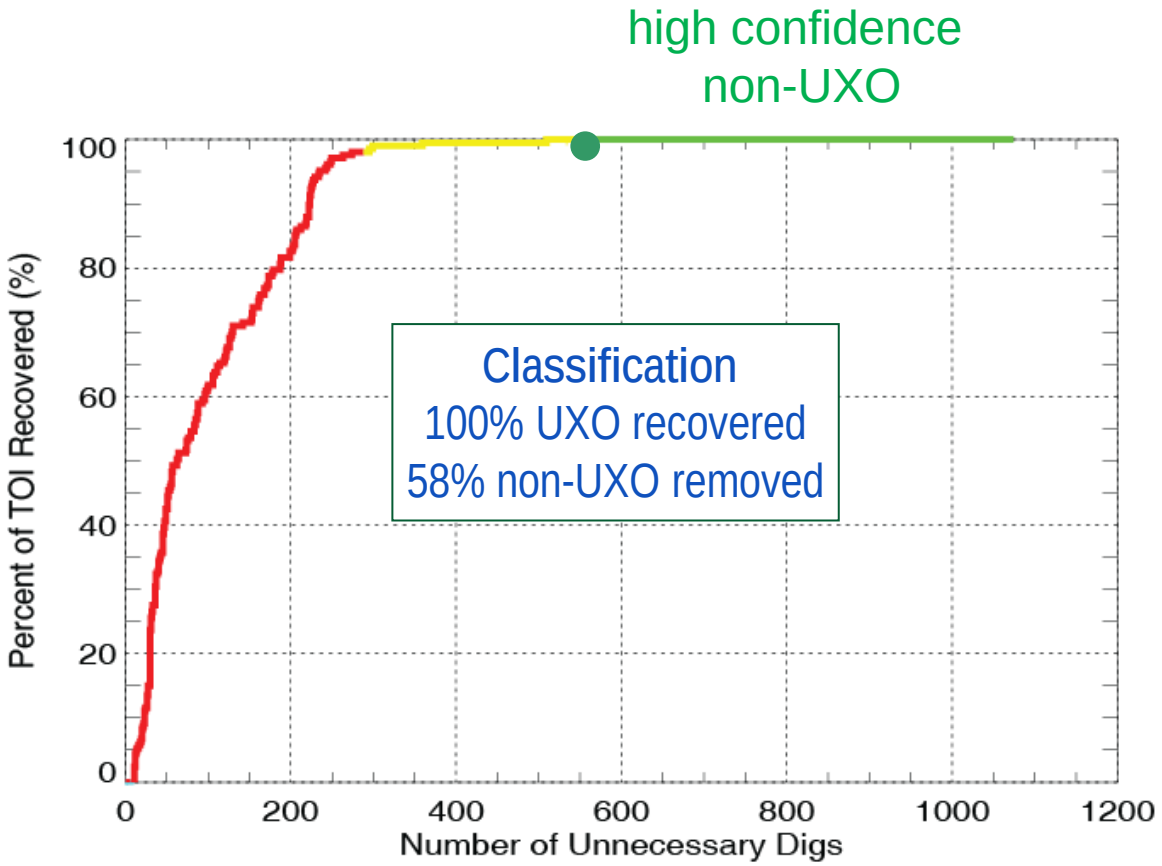
Dig List Example

Rank	Comment
N/A	Can't extract reliable parameters
1	
2	High confidence munition
3	
…	
…	Can't make a decision
…	
…	
…	High confidence non-munition
…	
…	
…	
N	

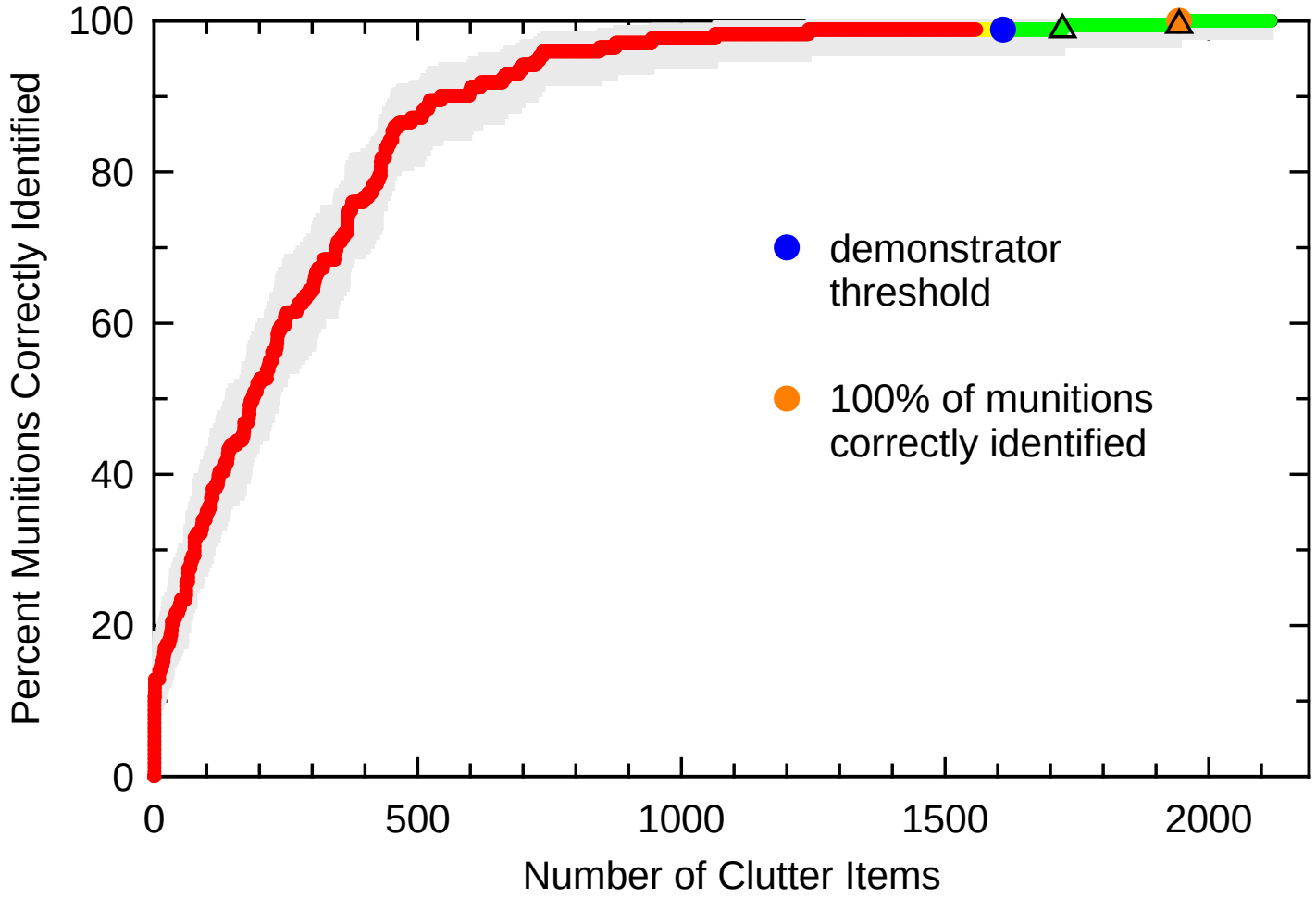
Threshold

Performance Evaluation

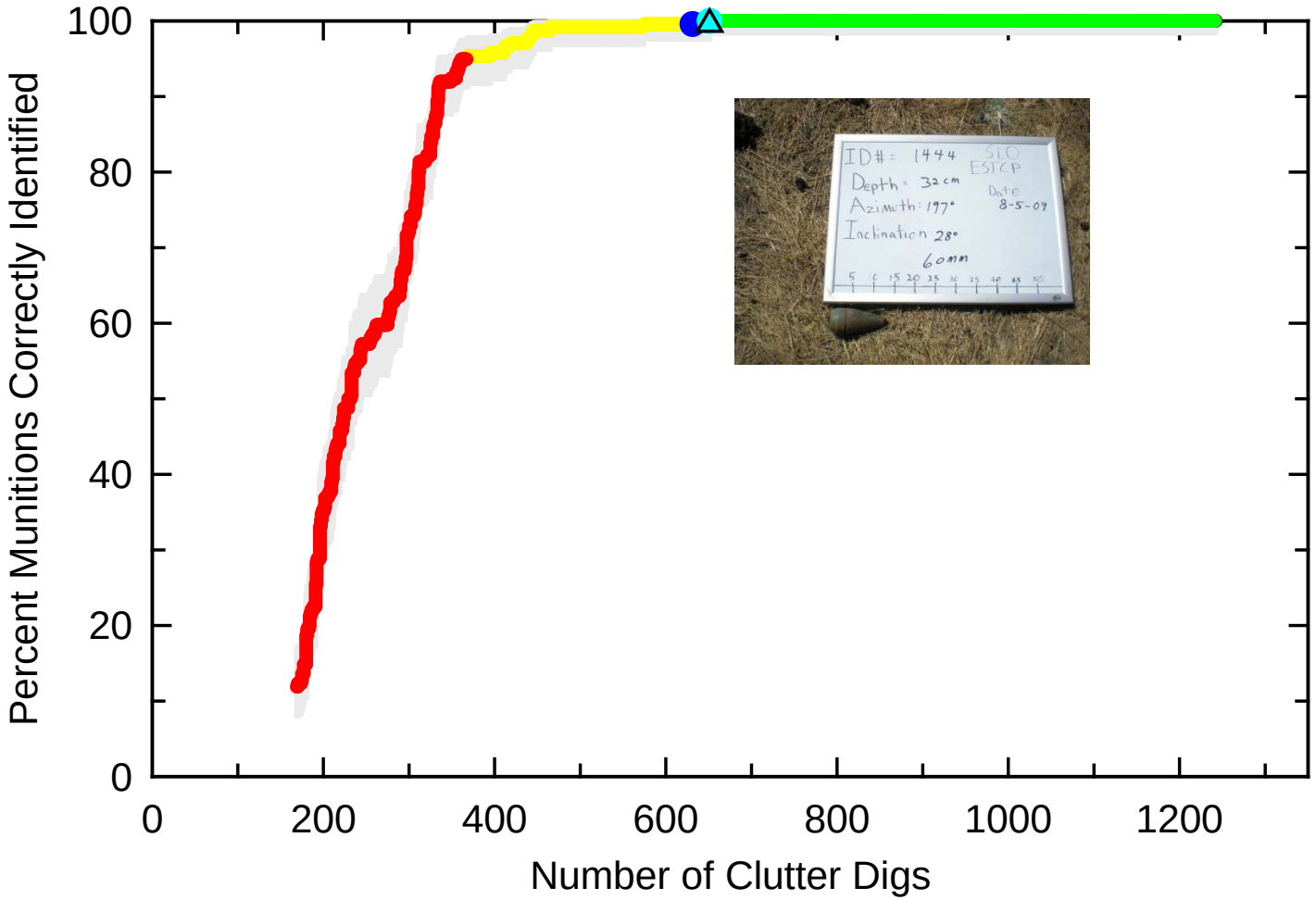
Receiver Operating Characteristic (ROC) Curve



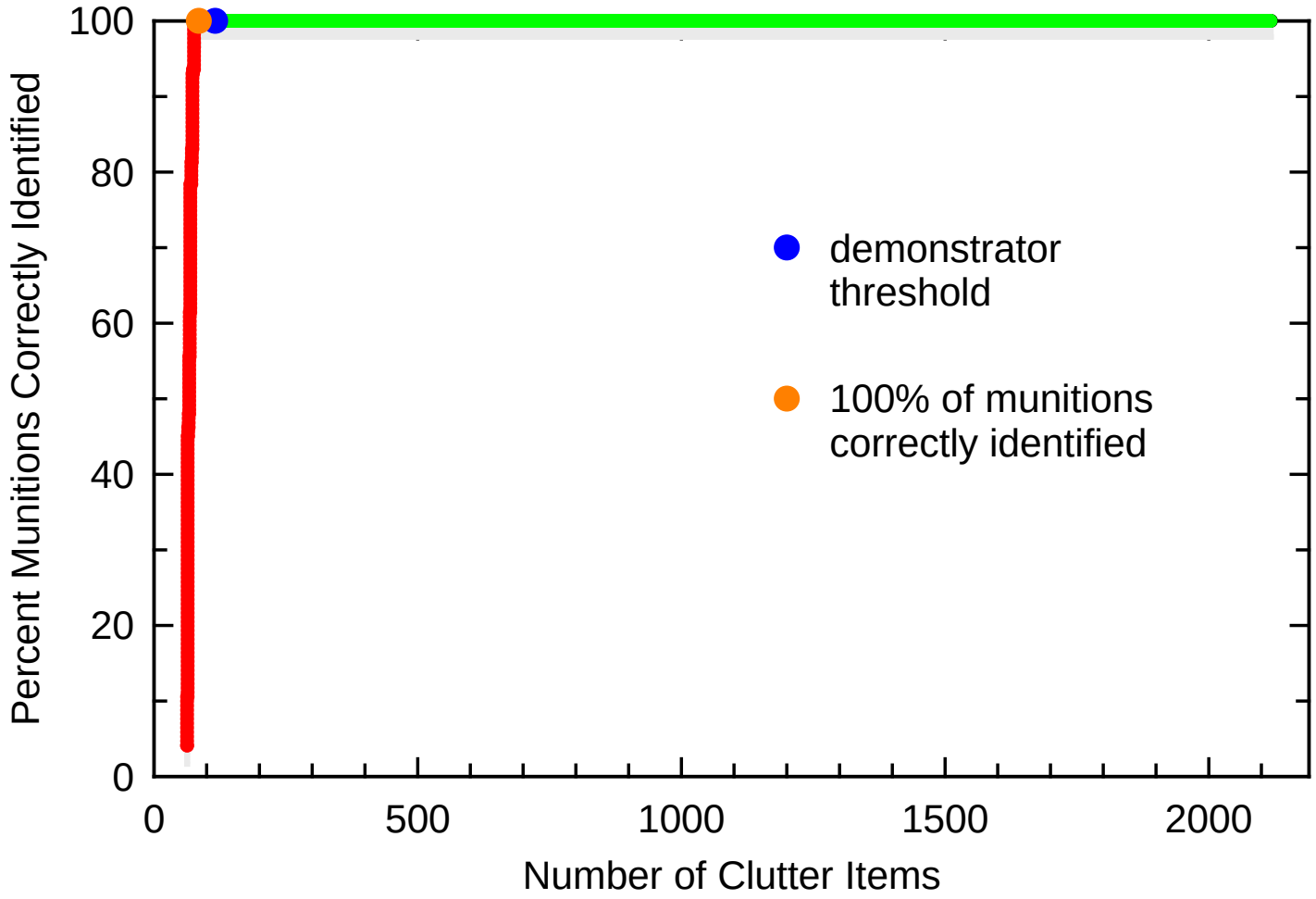
Camp Bunter: EM61-MK2 Cart



San Luis Obispo: EM61-MK2 Cart



TEMTADS Cued Data



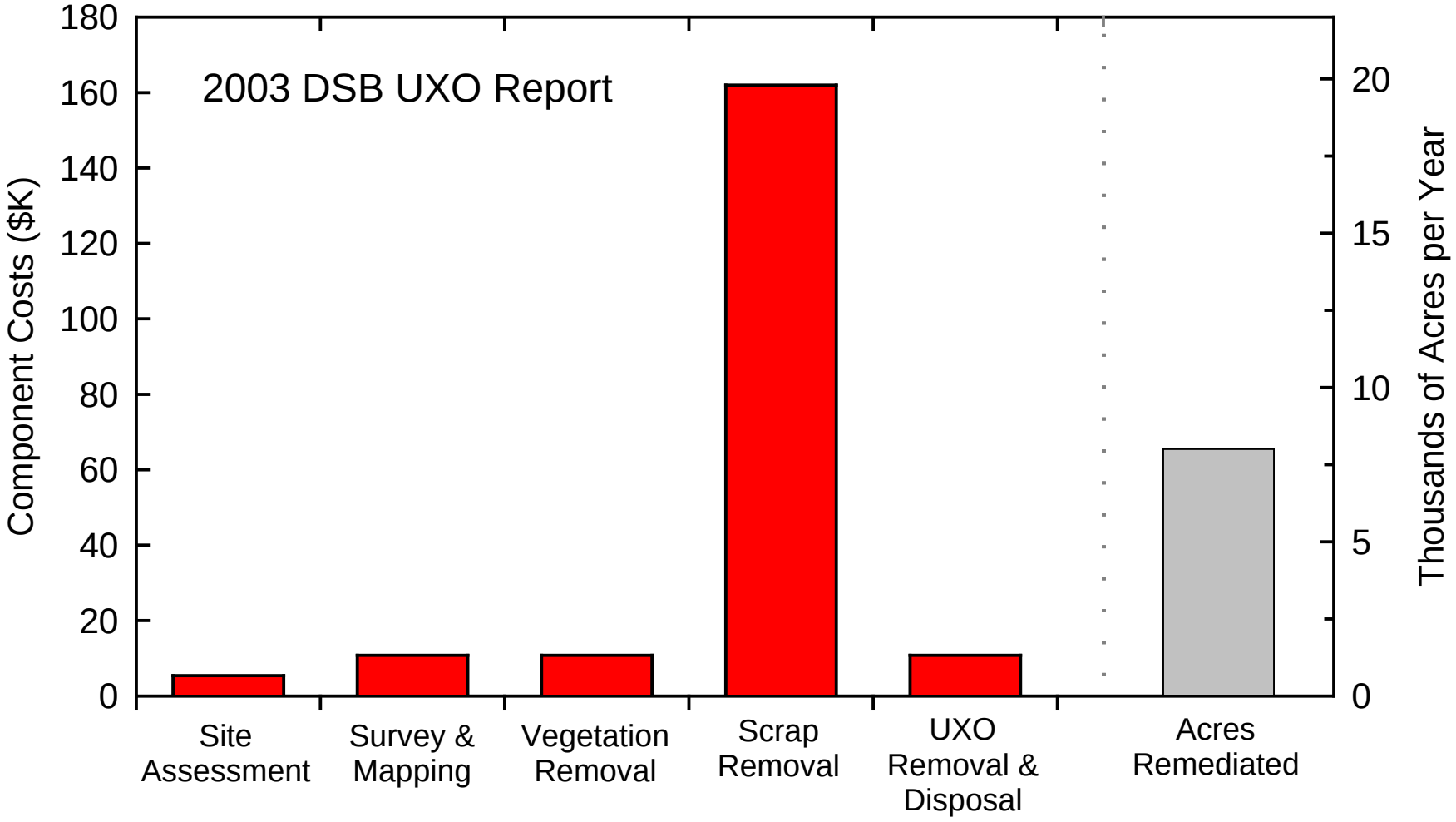
Implementation Approaches

- Hazard-based dig decision
  - High confidence non-hazardous anomalies remain in the ground
  - Remaining anomalies are dug

- Hazard-based dig protocol
  - High confidence non-hazardous anomalies dug with one UXO tech supervising a team of lower-cost diggers
  - Remaining anomalies are dug with usual procedures (UXO personnel and safety equipment)

Approach would be site dependent and determined by the site team

Breakdown of Nominal $200M FUDS MMRP



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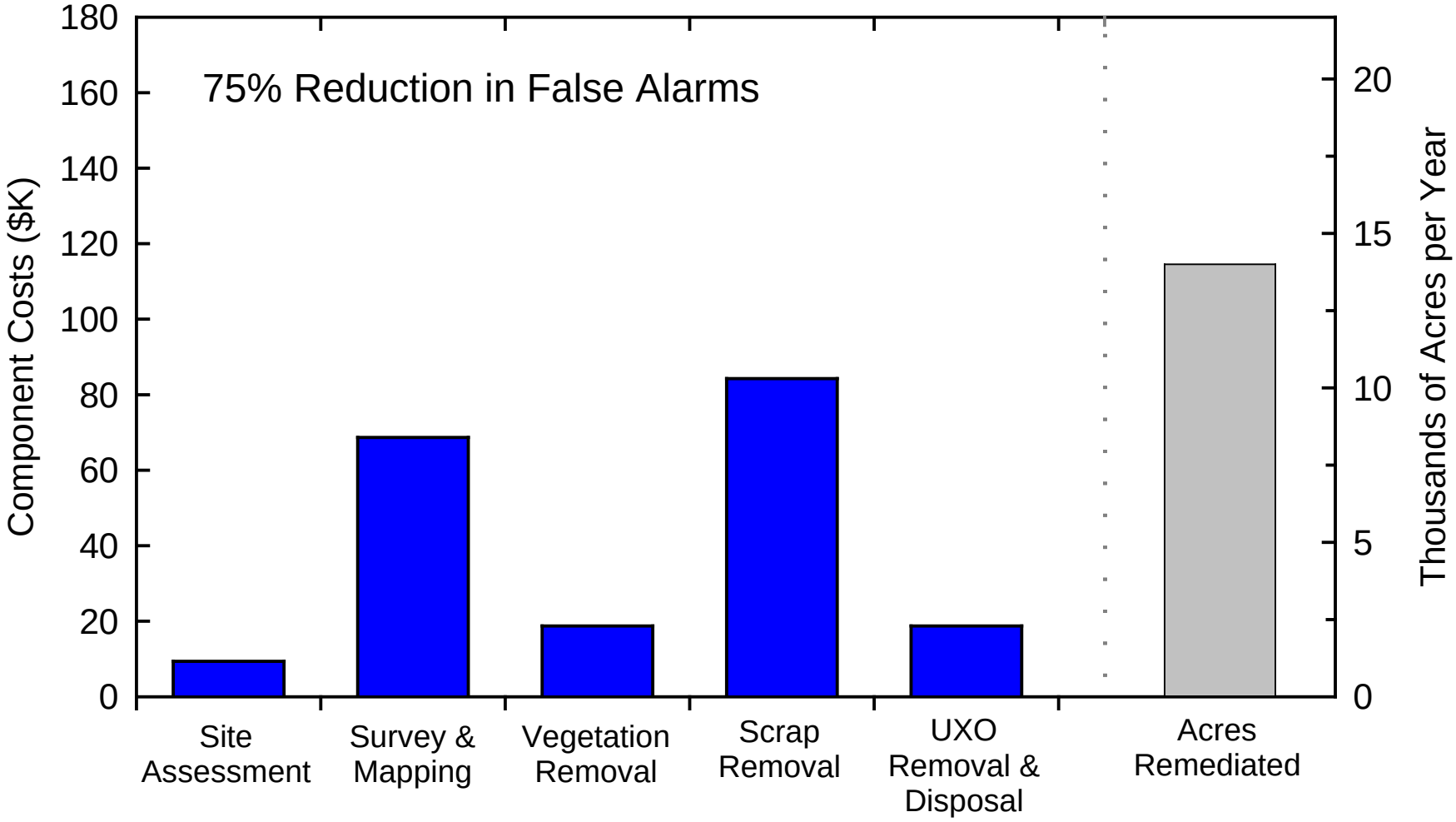

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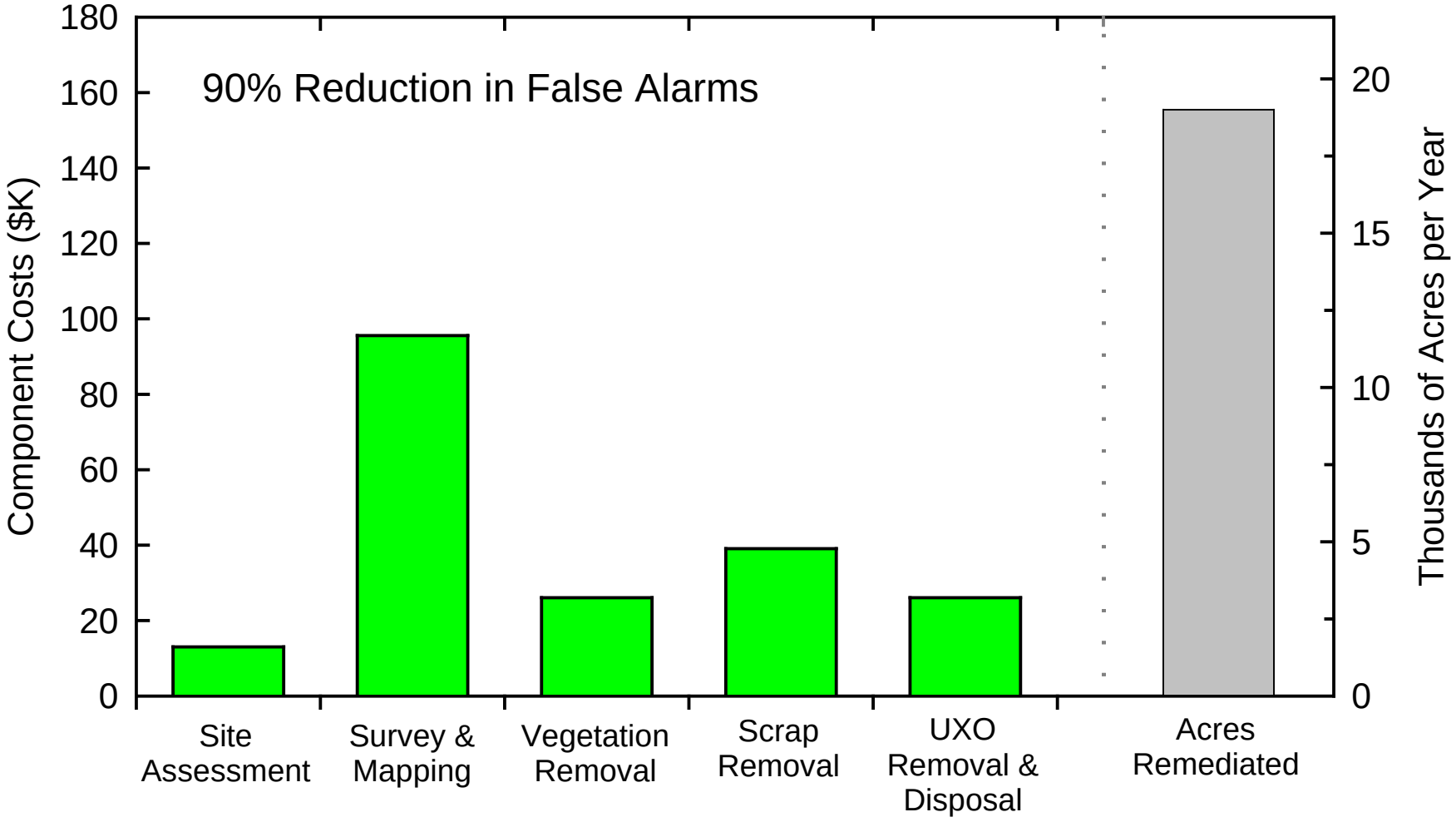

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November 29 – December 1, 2011
Washington, D.C.