M2S2 Web Seminar

Unique Challenges of Performing a Remedial Investigation in a Dynamic Environment: A Case Study of the Remedial Investigation at Three Formerly Used Defense Sites on Martha's Vineyard, Massachusetts

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The Project Team

- CENAE – Overall Project Manager and Sponsor
  - Ms. Carol Ann Charette, PMP - Project Manager
  - Mr. John Winkelman – Dive Coordinator
  - Mr. Robert Davis and Mr. Mike Penko, Environmental Resource Specialists
  - Mr. Marcos Paiva, Cultural Resource Specialist
  - Ms. Cynthia Colquitt, Risk Assessor
  - Mr. Mark Koenig, Chemist
- USAESCH – Technical Lead/Contract Administration
  - Mr. Ralph Campbell, Project Manager
  - Mr. Robert Selfridge, Geophysicist
  - Ms. Kim Meacham, Environmental Manager
  - Mr. Michael Slovak, OE Safety Specialist

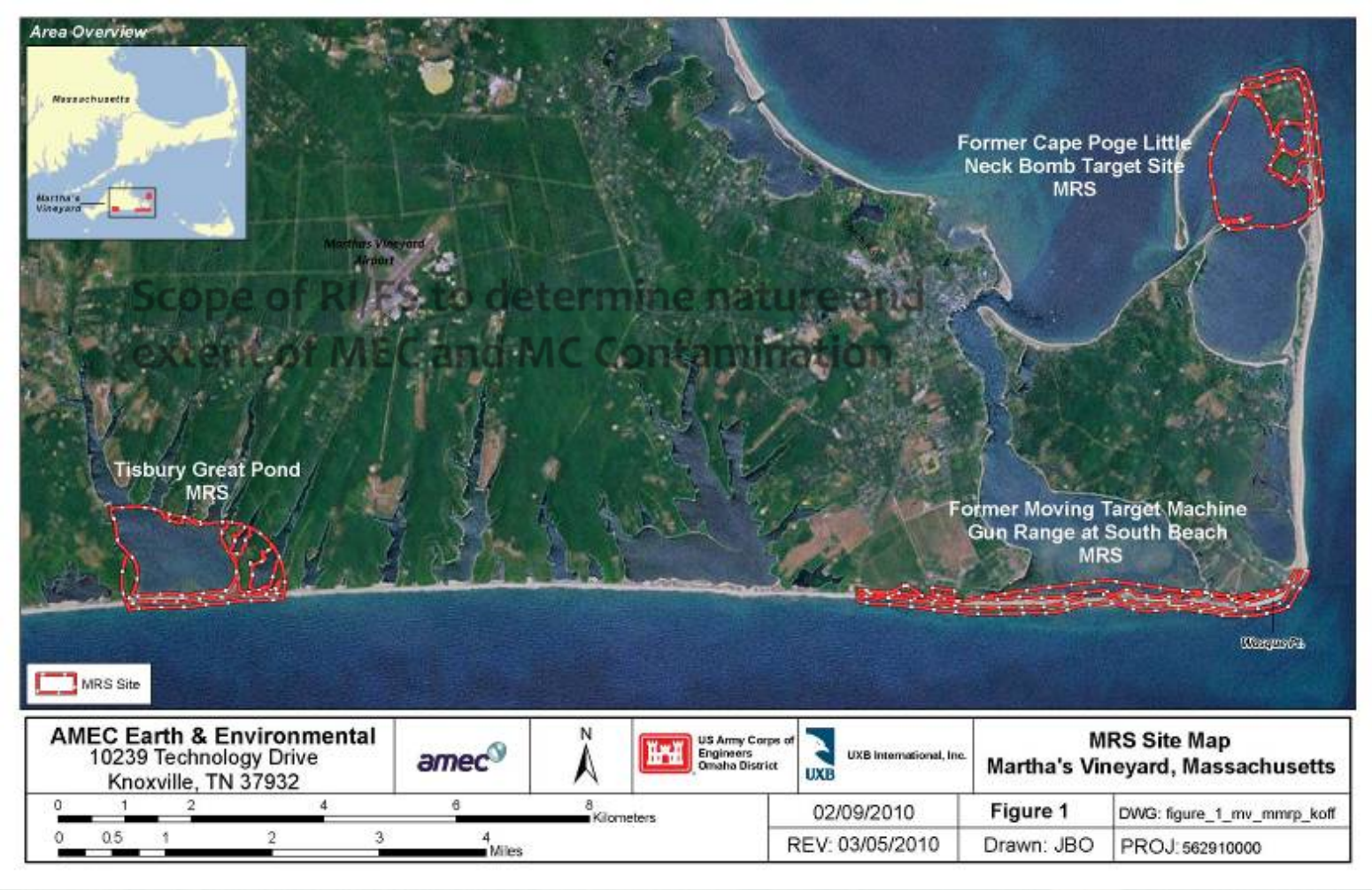
The Project Team (Continued)

- UXB International – Prime Contractor
  - Mr. Michael Warminsky, PE – Project Manager
  - Mr. Pat Fogleson, Senior UXO Supervisor (SUXOS)
  - Mr. Chris Mazur, Site Manager
  - Ms. Shirley Rieven, PhD, Sr. Geophysicist
  - Mr. David Tyrer, Geo-Data Manager
- Specialty Subcontractors Supporting the Project
  - AMEC International – Environmental Consulting
  - Aqua Survey Incorporated – Underwater EM Survey
  - Battelle Institute – Airborne Magnetometry Survey
  - NAEVA – Land-Based EM Survey
  - VRHabilis – Ocean Magnetometer Survey, Diver and Intrusive Underwater MEC Operations

Background

- 3 formerly Used Defense Sites (FUDS) on Martha's Vineyard (~2046 acres total)
  - Former WW II-era Navy Training Ranges:
    - Cape Poge Little Neck Bomb Target Site (~800 acres)
    - MTMG Range at South Beach (~478 acres)
    - Bombing Range at Tisbury Great Pond (~768 acres)
- Each Site included
  - Beach Areas (public and private) (~328 acres total)
  - Upland areas including wetlands, grasslands, and woodland areas (~369 acres total)
  - Inland water areas, including fresh, brackish, and saltwater (~964 acres total)
  - Ocean surf zone (~385 acres total)

Martha's Vineyard RI/FS



Project Challenges

- Varying Terrain and very dynamic surf zone/beach environment
- Ferrous and non-ferrous munitions of concern
- Mineral content of rocks/ magnetite in the beach sand
- Threatened/endangered species
- Area of investigation extends beyond FUDS boundary
- Rights of Entry (ROE) acquisition
- Very Involved Stakeholders

Project Challenges

- Dynamic Environment
  - Ocean surf-zone conditions change constantly
  - Tisbury Great Pond water levels change unexpectedly and barrier beach is breached several times a year
  - Summer Tourism Season

Project Challenges

- Beach Erosion
  - Beach width/location of Katama Inlet changed constantly
  - Over 600 feet of beach lost at Wasque Point over duration of project

Project Approach

- Technology Demonstration/Studies
  - WAA Technology Demonstration
  - Transport Study and Hydrodynamic Modeling
- RI Field Activities to Delineate Nature/Extent
  - Land/Beach geophysical survey/intrusive investigation
  - Inland Water geophysical survey/intrusive investigation
  - Ocean analog mag/dig transects
- Multiple technologies deployed
  - Land-based sensors – EM and Analog Sensors
  - Underwater EM Sensors
  - Underwater Analog Sensors
  - Airborne Magnetometry – all areas

WAA Technology Overview

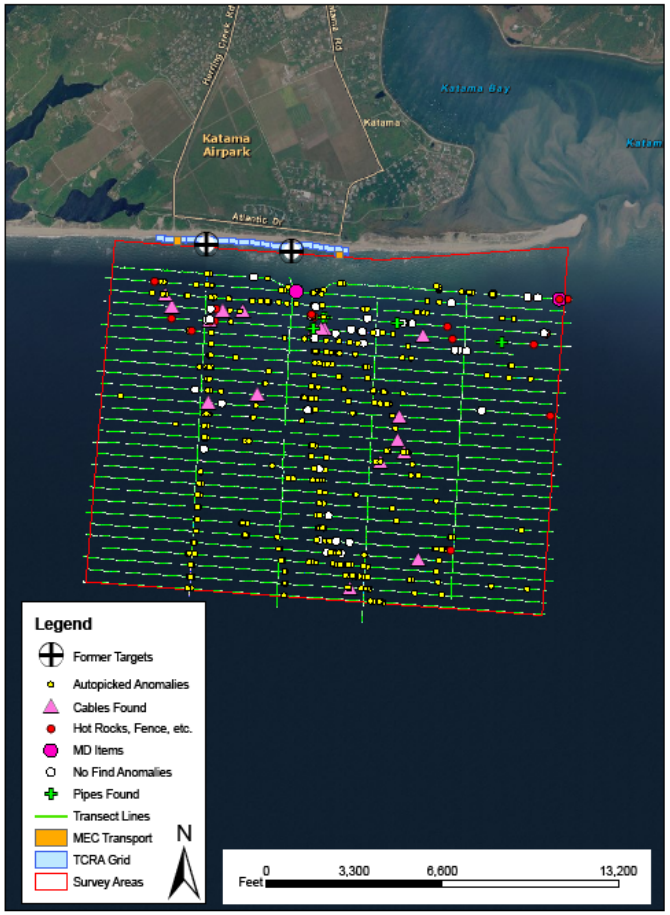
- Marine Gradiometer Array (MGA)

WAA Technology Demonstration

- WAA performed off-shore of South Beach

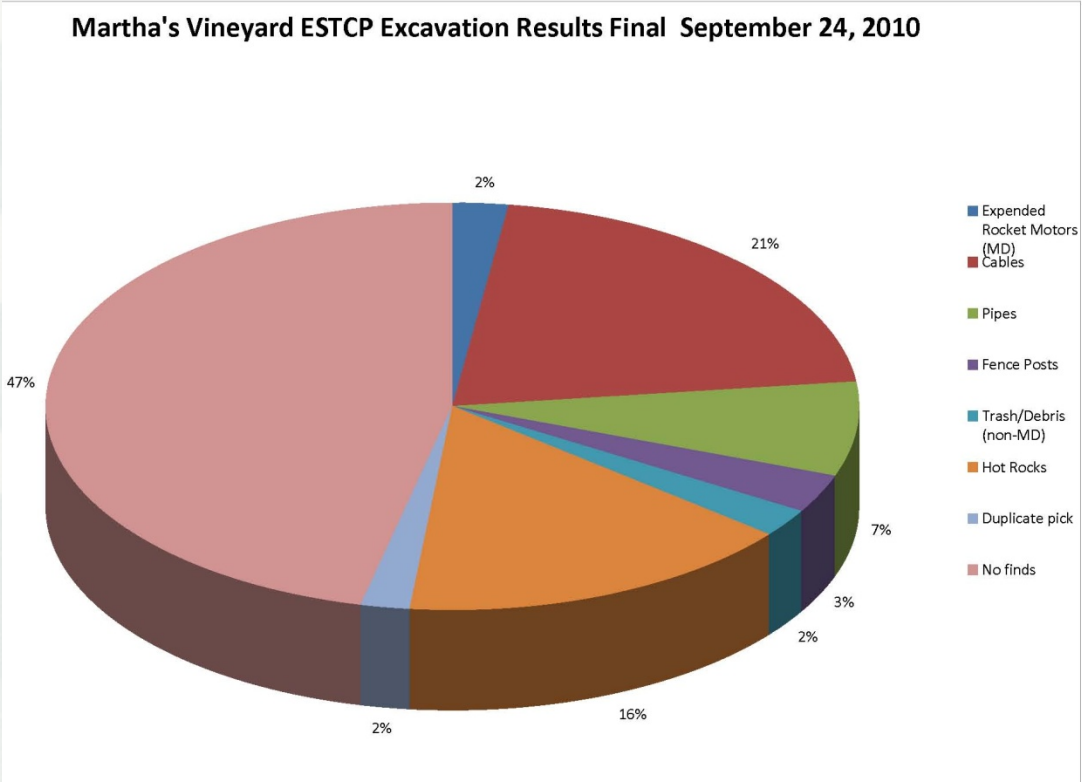
WAA Demonstration Survey Results

ESTCP Survey - Anomaly Status



WAA Intrusive Results

- 95 of 540 anomalies (18%) investigated
- Final September 24, 2010



Description	Quantity
Expended Rocket Motors (MD)	2
Cables	20
Pipes	7
Fence Posts	3
Trash/Debris (non-MD)	2
Hot Rocks	15
Duplicate pick	2
No finds	44
	95

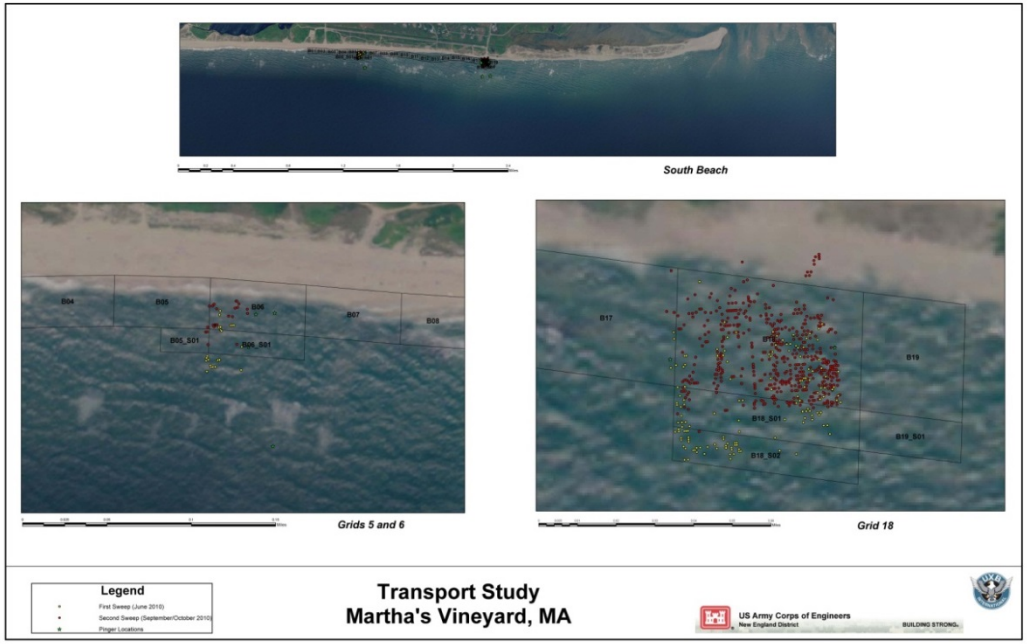
WAA Technology Demonstration Summary

- What Does the Data Tell Us?
  - Only two munitions-related items – Munitions Debris (MD) were found
  - MD items found on transects closest to the beach
  - No munitions-related items found in deeper water
  - Large number of no-finds
- Implications to RI Field Work
  - MD items found could justify extending transects beyond the planned 300 foot length
  - Very dynamic environment – ocean transects/grids planned - changed to mag/dig to eliminate need for reacquisition
  - Sufficient data to suggest the negative/no additional deeper water investigation planned

Transport Study

- Baseline and subsequent investigations in previously cleared TCRA grids at South Beach

Dive 1	Dive 2
June 2010	October 2010
Grid 5/6 24 anomalies None visible	Grid 5/6 22 anomalies None visible
Grid 18/19 155 anomalies None visible	Grid 18/19 385 anomalies Several visible

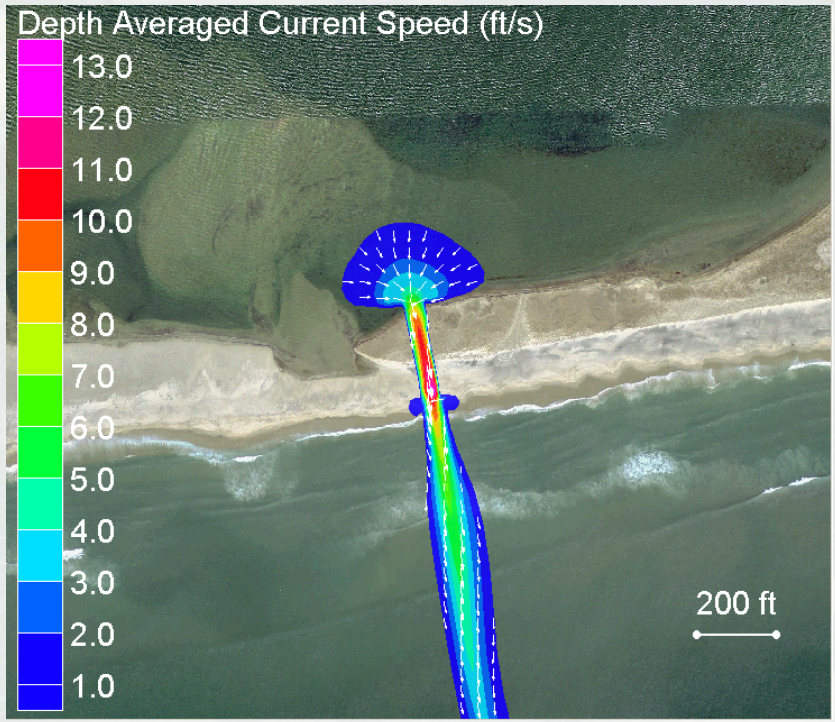


Hydrodynamic Study

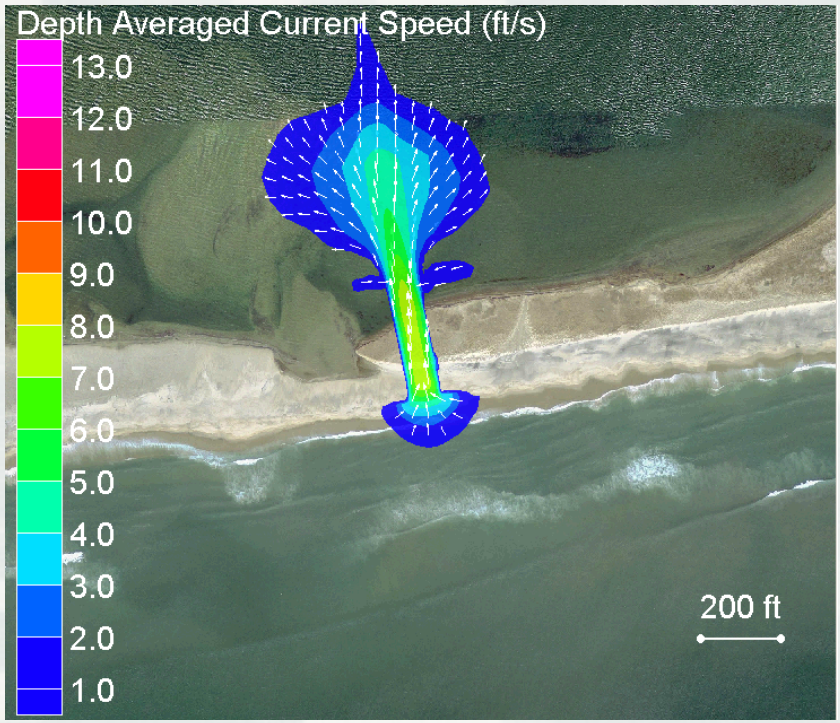
- Performed at Tisbury Great Pond (TGP) - “cuts” made in barrier beach connecting ocean to pond to maintain salinity and water levels
- Dune/barrier beach part of former bomb target and MEC/MD found when past “cuts” were made
- Flow measurements conducted during one of the planned “cuts” in barrier Beach at Tisbury Great Pond over several tide cycles
  - Goal was to determine if potential MEC/MD migration from cut was bounded by field investigation

Hydrodynamic Study

- Field work conducted on 11 November 2011



Maximum depth-averaged current velocity during ebb tide.



Maximum depth-averaged current velocity during flood tide.

Transport/Hydrodynamic Study Summary

- What Does the Data Tell Us?
  - Anomalies detected in previously cleared TCRA grids
  - *Very dynamic environment*
    - No items on surface on baseline dive, numerous item(s) on the surface post-storm dive; beach erosion/redeposition
  - Surface/subsurface MD confirmed munitions-related items post storm dive
- Implications to RI Field Work
  - Extend ocean transects to 600 feet
  - MD items found may indicate continuing source
  - Any ocean transects/grids planned to be mag/dig to eliminate need for reacquisition
  - Hydrodynamic study confirms potential transport from TGP “cut” bounded by investigation area

RI Field Work

- Determine Nature and Extent of MEC
  - Perform Geophysical investigation to identify anomalies
    - MEC Recon Transects (analog and EM)
    - Geophysical Grids (EM)
  - Perform intrusive investigation on anomalies in grids above threshold value to characterize the area
  - Continue Transport Study in ocean areas to understand movement of items on ocean floor
  - Use WAA and Transport Study data to further focus RI/FS efforts (extend ocean transects to WAA) transect; mag/dig ocean transects)

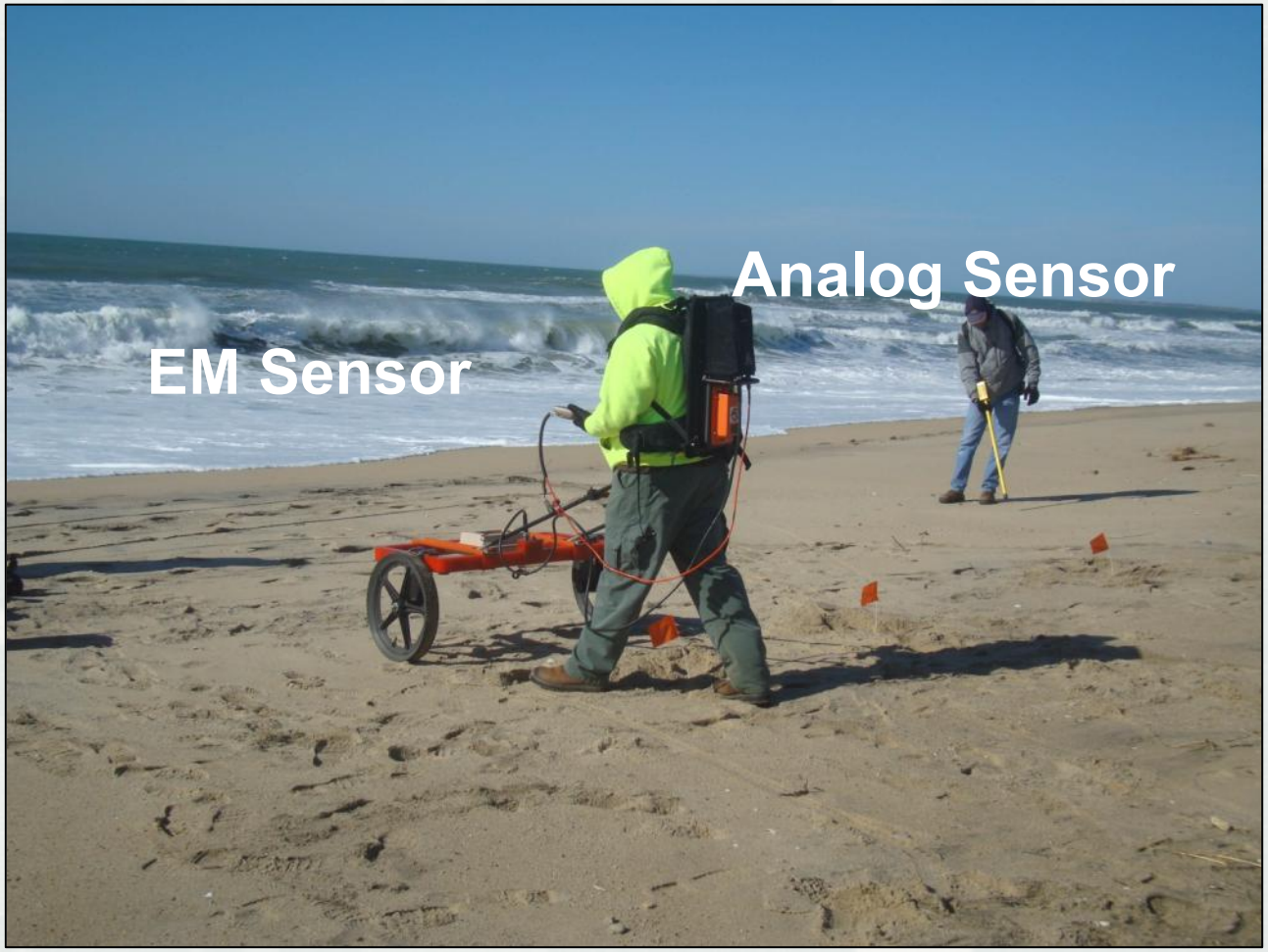
RI Field Work

- MC Characterization
  - Soil and sediment samples collected in grids with highest MEC/MD densities including a combination of:
    - Incremental soil samples
    - Discrete surface soil samples
    - Discrete subsurface soil samples
    - Discrete sediment samples
  - Groundwater samples collected to characterize groundwater within AOI
    - Samples not collected at Little Neck due to lack of freshwater aquifer
  - Samples analyzed for select metals (Method 6020A) and explosives (Method 8321B)

Multiple Technologies Used

- Areas for Investigation
  - Upland and Beach Areas
    - Recon Transects (all-metals analog and EM)
    - Geophysical Grids (EM)
  - Inland Underwater
    - Recon Transects (EM)
    - Geophysical Grids (EM)
  - Ocean
    - Field change to mag/dig transects (analog)
  - Use Airborne Magnetometry to supplement data in all areas

Land-Based Sensors



Inland Underwater EM Sensor

Underwater Analog Sensor

Airborne Magnetometer

Environmental Compliance

- Objective
  - Avoid, minimize, and/or mitigate impacts to natural resources, and sensitive populations and habitats as well as archaeological/cultural resources
- Dependent on Species, Season and Environment
- Approach includes technology considerations and monitors/specialists in the field

Environmental Compliance

- Monitors/Specialists
  - Project Marine Archeologist, Cultural Resources Specialist, and Botanist on project staff
  - Local entomologist and avian specialist on retainer to support as needed
- Environmental Protection Plan
  - Included in work plan
  - Specialized recognition training for all site workers
  - Field Manual prepared summarizing threatened and endangered species

Technology Considerations

- RI Field Investigation Approach:
  - Underwater EM using specialized wheeled cart to avoid damage to shellfish beds
  - Airborne Magnetometry to fill in data gaps due to missing ROE permissions, and inaccessible areas
  - Analog recon transects on land to minimize vegetation clearing
  - Mag/Dig ocean transects due to dynamic environment
  - Schedule sequencing to minimize impacts during nesting seasons
  - Perform work in tourist off-season

Summary

- Lessons Learned
  - Involve all Stakeholders early and often
    - Technical Project Planning (TPP) process works
  - Never underestimate the ROE effort
    - Combination of public meetings, public notices in local paper, direct mailings/phone calls and “door hangers” for keeping public informed
  - Ocean/surf zone is unforgiving
    - Dynamic environment and dangerous working conditions
  - Project Management is also dynamic
    - Weekly project calls with client, project team, and regulators
    - Work plan is a “living” document to address field changes based on changing conditions

Summary

- Lessons Learned (continued)
  - Diving is difficult at best, UXO diving much tougher
    - Surf zone is unforgiving
    - All work with surface supplied air, tethers, and umbilical's that carried com, video, air, and hot water as needed
    - Site logistics can take up to half the crew field time
    - Dive work VERY weather dependent
  - The only thing predictable with weather is it's inherent unpredictability
    - Can and does change often
    - Perform dive/underwater geophysics on a day-rate basis
    - Weather delay/downtime widely varied between 3 sites because of exposure/prevailing winds and currents: ~65% at Tisbury Great Pond, ~30% at South Beach, and ~10% at Cape Poge

Summary

- Lessons Learned (continued)
  - Sensor selection based on terrain, geology, munitions of concern
    - All metals detectors use for recon transects due to zinc MK 5's
    - Analog/hand held sensors for transects in upland areas minimized amount of clearing required in sensitive habitat
    - DGM used on beach where there was no vegetation
  - Natural minerals impact geophysical surveys
    - Layer of magnetite below root layer of dune grass showed up in Air-Mag data on dunes
    - Ground-truthing/test pits in magnetite areas allowed geophysicists to discriminate natural minerals from suspect anomalies

In Memory of Bob Davis

Bob's tireless dedication and passion for his work were instrumental to this project and he will be missed by all...

1951-2012

Questions/Discussion

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