

Balancing Coastal Engineering and Potential Impacts of Discarded Military Munitions on Beach Replenishment Projects

**23rd Annual National Conference on
Beach Preservation Technology**

February 4, 2010



**US Army Corps
of Engineers**



The Trusted Integrator for Sustainable Solutions





Agenda

- ∅ LBI beach replenishment project background
- ∅ Responses to munitions at Surf City
- ∅ Lessons learned
- ∅ Engineering controls to mitigate risks
- ∅ Cost considerations

Site Location / Background



- ∅ Water Resources Development Act of 2000, Public Law 106-541
- ∅ Coastal Storm Damage Reduction Program (CSDRP), to construct a multi-phased beach fill project consisting of an estimated 11,000,000 cubic yards (cy)
- ∅ Non-Federal sponsor NJDEP

Borrow Area Feasibility Study



- ∅ Due diligence investigations: magnetic, acoustic, bathymetric remote sensing, and hydrographic surveys
- ∅ HTRW, FUDS/OEW, historical/cultural resources, underground cables
- ∅ 'Young' sediment grab sampler (benthic), commercial clam dredge (surf clams), Vibratory cores (sediment)
- ∅ Multi-agency review of NEPA EIS
- ∅ Compliance with Sec. 401 CWA, Sec 307(c) CZMA, Sec 404(b) F&WCA, etc; Federal Consistency Determination by NJDEP

Beach Replenishment



Initial Placement

∅ 1st Phase of LBI:

- 1.6 miles: Surf City to Ship Bottom, NJ
- Dec-06 through Mar-07

∅ Approx. 886,000 cy

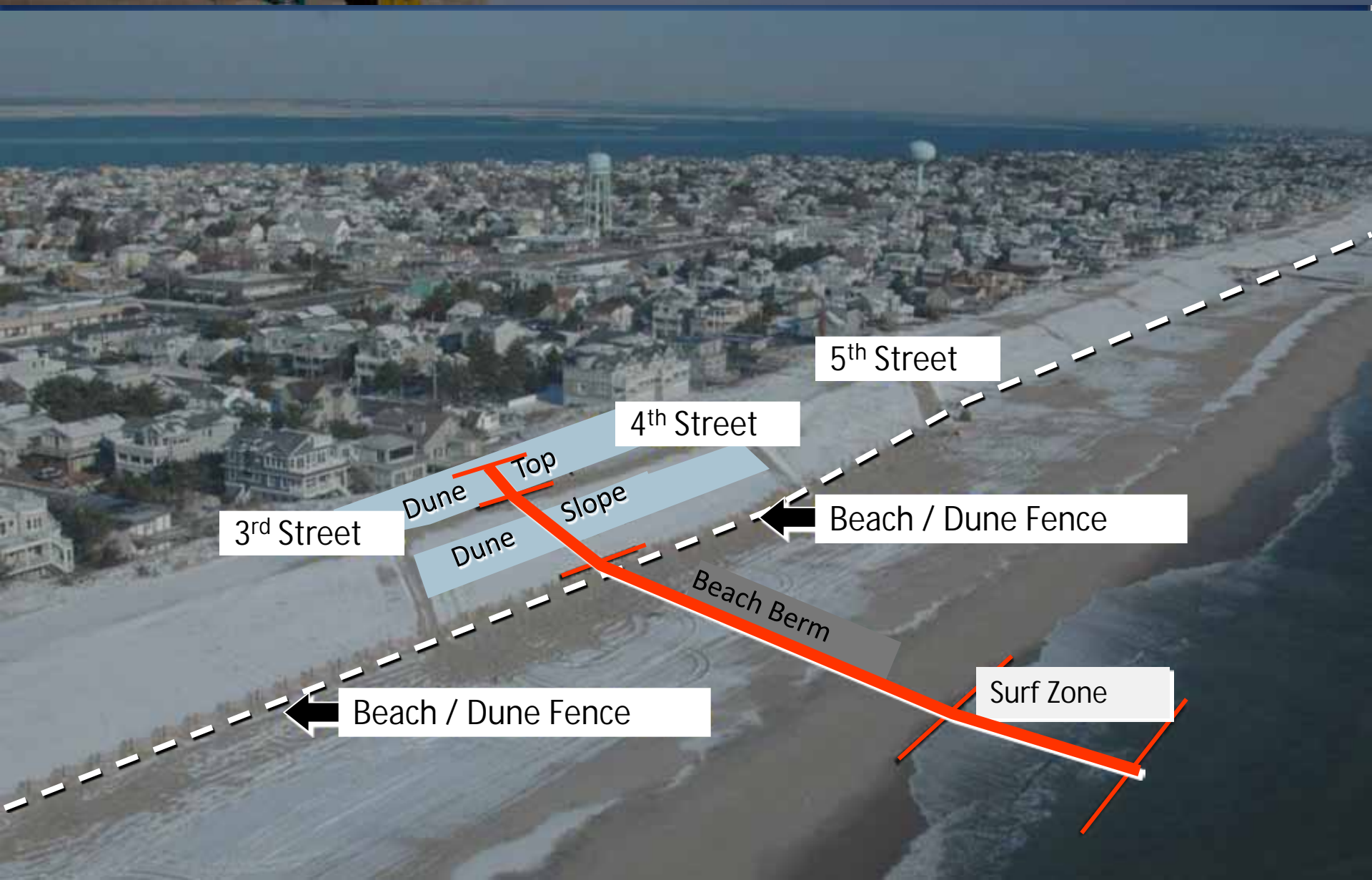
∅ Berm: 8 - 12 ft thick, 125 ft wide at Elev. +8 ft NAVD88

∅ Dune: 30-ft wide crest at Elev. +22 ft NAVD88

∅ Overall berm/dune profile approx. 400 – 500 ft wide



Beach / Dune System



Digital Geophysical Mapping (DGM)



4-Coil EM61-MK2 Towed-Array



RTK GPS Base Station



Mag and Dig (M&D) Dunes



M&D Surf Zone



Typical MEC Types Found



Base Detonating Fuze
Model 1906



MKI Fuze



37-mm Projectile



MKII PD Fuze w/ Booster



MKIII Booster

Phase I MEC TCRA Results



- ∅ Approx. 1,200 MEC items recovered
- ∅ Discarded Military Munitions (DMM)
- ∅ All items turned over to U.S. Army EOD for disposal

Phase 2 Monitoring

- ∅ Land Use Controls – Signage and Brochure
- ∅ CENAB OE-SS on-site and on-call 24/7
- ∅ MEC recognition and safety training for municipal employees
 - Police, fire, township, and lifeguards
- ∅ Early morning and evening visual scans of the beach
- ∅ Visual scan of surf zone at low tide





EE/CA Alternatives

- A. No further action
- B. Close beach
- c. Continue Land Use Controls (LUCs)
- D. Repeat surface / subsurface clearance
- E. Sieve berm / surf zone to depth of sand placement
- F. Sieve entire beach – berm, surf, and dune to depth of sand placement
- g. Alternative E with a subsequent storm event that erodes the dune

Consider the Risks





Phase 3 Goals

- ∅ Remove MEC from remaining new beach fill – dunes, berm, and, intertidal / surf zone
- ∅ Re-open beaches prior to 22 May 2009 season
- ∅ Ensure safe and secure site at all times
- ∅ Control sand losses
- ∅ Minimize beach closures to public
- ∅ Establish / maintain excellent coordination / communications among project stakeholders

Stakeholder Engagement

- ∅ U.S. Army Corps of Engineers
 - Philadelphia District
 - Baltimore District
- ∅ Boroughs of Surf City and Ship Bottom, NJ
- ∅ Local Public
- ∅ State of New Jersey (NJDEP)
- ∅ Environmental Protection Agency (Region II)
- ∅ Weston Solutions, Inc. Team
 - Severson Environmental Services
 - Seismic Surveys, Inc
 - Rettew Associates

WESTON SOLUTIONS

Severson Environmental Services, Inc.

PARTNERING CHARTER

**Surf City and Ship Bottom, NJ
Munitions Non-Time Critical Removal Action**

We, the Project Delivery Team, Commit to:

- Completing the Surf City and Ship Bottom munitions removal project before the opening of public beaches by May 22, 2009!
- Meeting all the interim project milestones safely and efficiently.
- Delivering a high-quality end state which allows the citizens of Surf City and Ship Bottom to confidently and safely access all of their beaches.
- Demonstrating the highest degree of open, honest communication and trust throughout the project.

At the end of the day, we will be judged on our ability to complete this project safely, on time, and on budget!

Handwritten signatures of team members:

- John H. Wilkins
- John P. Dunning
- John P. Yabl
- Paul C. Thomas
- Robert J. Avramik
- Gary Feltner
- John Wick
- Marty A. Hebert
- M. Samuels
- Seth Fritsinger
- Davis Lys
- Bill Long
- Michael D. Deo
- Max Zwick
- W. J. M.
- John Hall
- John L. Lee
- John J.
- Robert J. Avramik
- Gary Feltner
- John Wick
- Marty A. Hebert
- M. Samuels

RETTIEW
We answer to you.

SEISMIC SURVEYS, INC.

Stakeholder Engagement



Project Quality Pledge



Surf City and Ship Bottom, NJ Munitions Non-Time Critical Removal Action Project Quality Pledge

We commit to ensuring the complete opening of the public beaches at Surf City and Ship Bottom, New Jersey prior to May 22, 2009!

These are our Quality Goals:

- **Safety** - Everyone's number one priority!
- **Execution** - Complete the project with minimal impact to the surrounding communities.
- **Schedule** - Complete MEC removal and beach restoration on schedule.
- **Communication** - Ensure issues and challenges are addressed quickly and public information goes out in a timely manner.
- **Approach** - Locate and remove all MEC possible from remaining beachfill, reducing residual hazard, while minimizing sand losses.
- **Budget** - Sustain accurate and timely cost reporting to facilitate effective decision making. Cost is important!
- **Delivery** - Restore project area which allows the citizens of Surf City and Ship Bottom to confidently and safely access all of their beaches.



WESTON SOLUTIONS, INC.

Trust • Performance • People

Ø Safety

Ø Community

Ø Schedule

Ø Communications

Ø Technique

Ø Cost

Ø Quality end-product

Primary Work Elements

The background image shows a beach restoration site. In the foreground, there is a yellow excavator with 'Svensson' and 'PC 220 LC' written on its side. Behind it, several yellow bulldozers are parked on the sand. The ocean is visible in the distance under a clear sky.

∅ Planning and mobilization

∅ Surveys

∅ Screening to remove MEC from dune and berm

∅ MEC surf zone removal

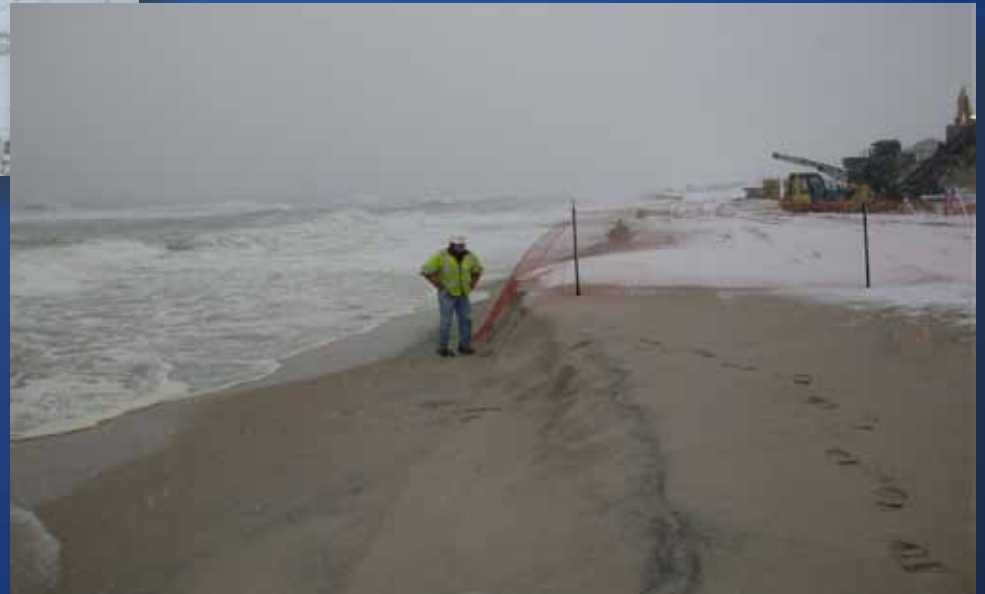
∅ MEC offsite disposal

∅ Dune reconstruction and restoration

Screening Operations



Wintry Conditions



Wintry Conditions



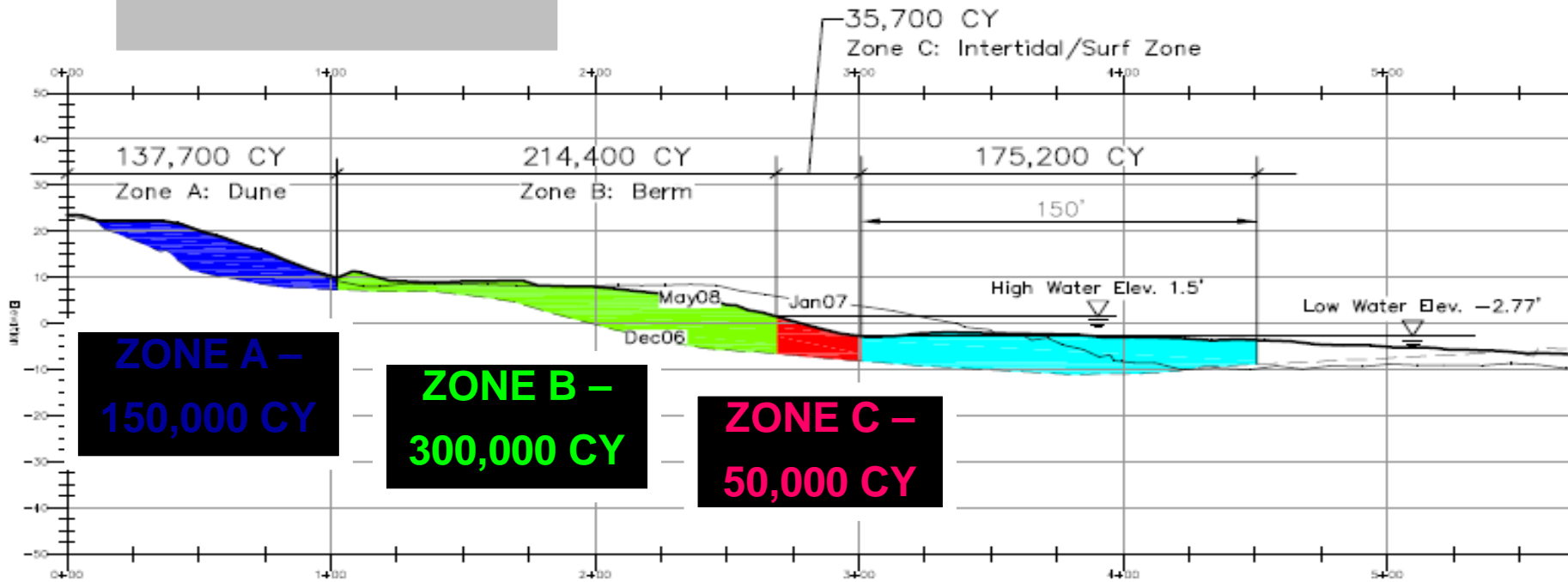
Aerial View of Operations



Typical Section

Based on
May-08 Survey

Volumes between December 2006 and May 2008:
 Above High Tide Volume = 352,100 CY
 Intertidal Volume = 35,700 CY
 Below Low Tide Volume = 175,200 CY
 Total Fill Volume = 563,000 CY



**ZONE A –
150,000 CY**

**ZONE B –
300,000 CY**

**ZONE C –
50,000 CY**

TYPICAL PROFILE

HORIZONTAL SCALE: 1"=60'-0"

VERTICAL SCALE: 1"=30'-0"

Clearing Excavations



Surf Zone Clearance



EOD Coordination





Total DMM Recovered

Phase 1 (TCRA) - 1,078

Phase 2 (monitoring) - 113

Phase 3 (Removal) - 1,914

Phase 4 (post monitor) - 2

Total to date = 3,107

Communications & Recognition





Surf City and Ship Bottom, NJ - Munitions Removal Weekly Project Update – 03/14/09 thru 03/20/09

Progress This Week:

- Beach Status (33 blocks total).....6 Blocks Open / 27 Blocks Closed (see attached site map)
- DMM Items Found (weekly / cumulative to date)..... 540 /1331 (see attached summary table)

Mechanical Screening Operations (CY volume screened):

- Operation 1 Volume (weekly / cumulative).....10,911 cy/ 50,512 cy
- Operation 2 Volume (weekly / cumulative).....14,167 cy / 65,478 cy
- Operation 3 Volume (weekly / cumulative).....16,598 cy / 86,515 cy
- Operation 4 Volume (weekly / cumulative).....16,041 cy / 71,067 cy
- Operation 5 volume (weekly/cumulative).....5,355 cy/8197 cy

Surf Zone Operations:

- Blocks Completed (36 blocks total).....19/36

Dune Reconstruction Status:

- Areas Final Graded (by street) N. 24th Street – N. 21st Street, N. 15th Street, N. 8th – N. 6th Street, N 2nd Street – N. 1st Street
- Vehicular Cross-overs Completed to Date (of 3 total).....N/A
- Pedestrian Cross-overs Completed to Date (of 25 total).....4/25
- Handicap Cross-overs Completed to Date (of 1 total).....N/A
- Sand Fencing Completed (of 8,100 linear feet).....1952 feet/8100 feet
- Dune Grass Replanted (by street)..... N. 6th Street, N. 7th Street, N. 8th Street, N. 20th Street, N. 21st Street

Noteworthy Events This Week:

- Project Team contracted for aerial photos of project on 3/17/09
- Dune Grass reinstallation started.

Anticipated Accomplishments Next Week:

- Ongoing dune, berm, and surfzone operations.

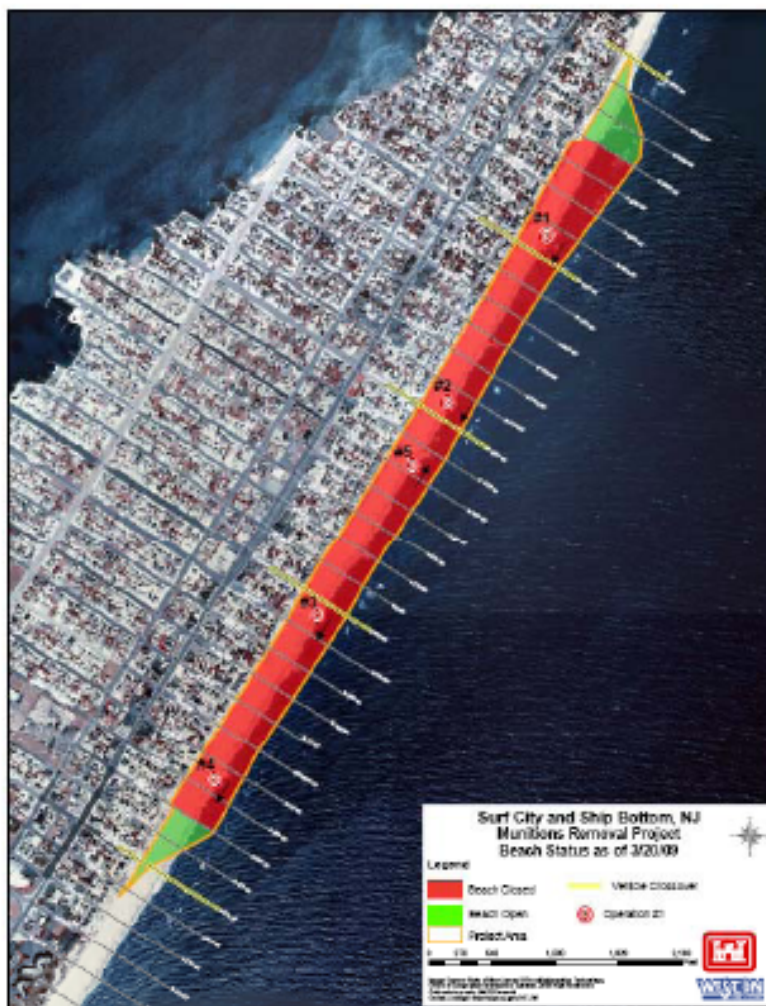
Project Milestones:

(√ Accomplished ∅ Missed)

- √ Completed Partnering Meeting and Pre-Con Meeting.....(1/14/2009)
- √ Complete site mobilization and initiate MEC removal from dunes and berm.....(2/12/2009)
- √ Initiate MEC removal from surf zone.....(2/28/2009)
- √ Initiate reconstruction of beach access points and dune fencing.....(3/6/2009)
- Complete MEC removal and open Surf City beach for public access from N. 18th Street vehicular cross over and areas north.....(4/10/2009)
- Complete MEC removal and open Surf City beach for public access from N. 12th Street vehicular cross over and areas north.....(4/10/2009)
- Complete MEC removal and open Surf City beach for public access from N. 5th Street vehicular cross-over and areas north.....(4/17/2009)
- Complete MEC removal and open Surf City and Ship Bottom beaches for public access from N. 5th Street and areas south.....(4/24/2009)
- Complete MEC removal from surf zone.(4/24/2009)
- Complete dune restoration and reconstruction of beach access points.....(5/15/2009)
- Complete site demobilization.....(5/22/2009)



Surf City and Ship Bottom, NJ - Munitions Removal Weekly Project Update – 03/14/09 thru 03/20/09



Site
Status
Map

Items to Date		
DMM Items	Quantity	
	Beach	Surf
MKIII Booster	956	1
MKII Booster	236	N/A
MKII Fuze	85	N/A
MKI Fuze	20	N/A
M1906 Base Fuze	10	N/A
V/B Rifle Grenade	3	N/A
37mm Projectile	19	N/A
MD Items		
2.25" SCAR Rocket	1	N/A
Total Items By Area:	1330	1
Total Items to Date:	1331	

Safety – Everyone's No. 1 Priority!

- 42,088 Hours worked without a lost time incident.
- Employee Safety Participation Program in force.





Surf City and Ship Bottom, NJ - Munitions Removal Weekly Project Update – 03/14/09 thru 03/20/09



1. Private Crossover Sand Fence installed and inspected at toe of dune.
2. Excavation and screening activities on 16 March 2009 captured in aerial photograph.
3. WESTON UXO Team sweeping base of excavation in dune system with MK26 instrumentation on 19 March 2009.

Dune / Berm Reconstruction

- ∅ Sand fencing
- ∅ Split rail fencing
- ∅ Pedestrian crossovers at each street
- ∅ 3 vehicular dune crossovers
- ∅ 1 handicap dune crossover
- ∅ Private dune crossovers





Project Metrics

- ∅ 400,000 cy of sand sifted in 65 days
- ∅ Over 3,000 DMM items safely removed
- ∅ Over 60,000 hours worked with no lost time
- ∅ Approx. 100 workers onsite each day
- ∅ Beaches open 3 weeks early

Lessons Learned – Underwater MEC





MEC Potential

- ∅ Underwater MEC sites may exist in ponds, lakes, marshes, streams, rivers, estuaries, harbors, canals, seas, and oceans.
- ∅ Some MEC sites have existed for decades and are well-known, while the presence of others is discovered during dredging operations when MEC unexpectedly appears in the dredging system or spoils.
- ∅ MEC (including CWM) have been recovered from dredging spoils, commercial fishing catches, at-sea clam harvesting, and beach replenishment operations.



MEC Potential

ALL OCEAN BORROW SITES ARE SUSPECT!

- ∅ Dredging projects along the Atlantic and Pacific Seaboard should take steps to prevent the introduction of MEC into the dredge system and subsequent spoils.
- ∅ Ocean dumping of military munitions (DMM) was a lawful disposal method for MEC and CWM until 1973.
- ∅ Many offshore dump sites can be found on maritime charts. *Not all sites are known.*

Ocean



Ocean



Harbors



Rivers





MEC Potential

- ∅ MEC items can show up in many places during a dredging project (i.e. drag heads, cutter heads, pump casings, pipes, turtle screens, placement sites...).
- ∅ MEC detonations have damaged dredge plants, and have been rumored as the cause for the sinking of at least one fishing vessel.

Clamshell (Bucket) Dredge (Mechanical)



Backhoe Dredge (Mechanical)



Cutter Head Dredge (Hydraulic)



“ILLINOIS” Cutter Head (Hydraulic)



Hopper Dredge (Hydraulic)





Planning

- ∅ Archive searches
- ∅ MEC detection and discrimination
- ∅ General considerations
 - Hazards analysis
 - Removal vs. avoidance
 - Production rates
 - *****Costs*****



Planning

1 Solution – Screen sediment intake and outfall and conduct periodic inspection of screens and spoils

- ∅ Utilize experienced MEC specialists in the planning and operational phases
- ∅ Essential that the correct verbiage is placed in the dredging specifications before contract award

Discharge to Beach





Surf City – Remediation Costs

- ∅ Team Recommended Remedy – Sift Berm
 - Estimated Cost - \$12.8M
- ∅ Public Recommendation – Sift Berm & Dune
 - Estimated Cost - \$19.88M
- ∅ Final Decision – Sift Berm and Dune
 - Completed April 09 (\$13.2M)



Costs

*****IT IS CHEAPER TO SCREEN
AND PREVENT
RATHER THAN CONDUCT
A POST-REPLENISHMENT
MEC REMOVAL ACTION*****



Success Story: Bethany Beach, DE

- ∅ 3.2 million cu yds of sand over 2.75 miles
- ∅ 1.25 inch screen on drag heads
- ∅ 1.25 inch screening basket at outflow
- ∅ 37mm projectile is smallest MEC item expected in borrow area

Bethany Beach, DE



Beach Screening Basket



Beach Screening Basket



40mm & 37mm Projectiles in Basket



Ongoing MEC Prevention

Harvey Cedars, Long Beach Island, NJ

- ∅ Screen material to 3/4 inch
- ∅ Screen dredge intake at the ocean bottom (borrow area) and the outfall point



- ∅ Intake screen may be larger than outfall screen to minimize impact on dredging plant
- ∅ MEC support being provided aboard dredge



Other Success Stories

Sandbridge, VA, Beach Replenishment via Hopper Dredge:
Borrow area in known USN firing range (large projectiles 5").
Screen on drag head – No MEC (completed 07').

Ocean City, MD, Beach Replenishment via Hopper Dredge:
Borrow area within range fan of (former) Ft Miles coastal shore batteries.
Screen on drag head – No MEC (completed 06').

Bethany Beach, DE, Beach Replenishment Via Hopper Dredge:
Borrow area within range fan of (former) Ft Miles coastal shore batteries. Drag head screen, outflow screen. 12 MEC captured in beach outflow basket (completed 08').

New York Harbor, NY, Ongoing harbor deepening project: 1.5" screen on intake (recently changed to 1.25").

Cape May, NJ, Beach Replenishment Via Hopper Dredge:
Borrow area within range fan of coastal shore batteries. Drag head screen, outflow screen. No MEC (completed 09').

Dewey Beach, DE, Beach Replenishment Via Hopper Dredge:
Borrow area within range fan of (former) Ft Miles coastal shore batteries. Drag head Screen, outflow screen - No MEC (completed 09').



Positive Steps

- ∅ NJDEP requiring MEC screens on intake and outfall for all dredging projects in NJ
- ∅ DDESB planning to insert language in 6055.09 STD requiring MEC screens during dredging
- ∅ USACE EM 385-1-1 inserting language in the safety manual requiring dredging districts to consult with MMDC to determine whether MEC screens are required on specific projects
- ∅ USACE guidance manual published in August 2008



Positive Steps

- ∅ NAD drafting requirement for all NAD districts to consider MEC screens during dredging
- ∅ NAP requires all dredging PDT's to consult with MMDC on applicability of MEC screens during specific dredging projects; NAP requires an OESS on-site during dredging that may encounter MEC

A photograph of a construction site with yellow excavators and a green conveyor belt.

So What's the Problem?

Culture

Attitudes

FUNDING

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