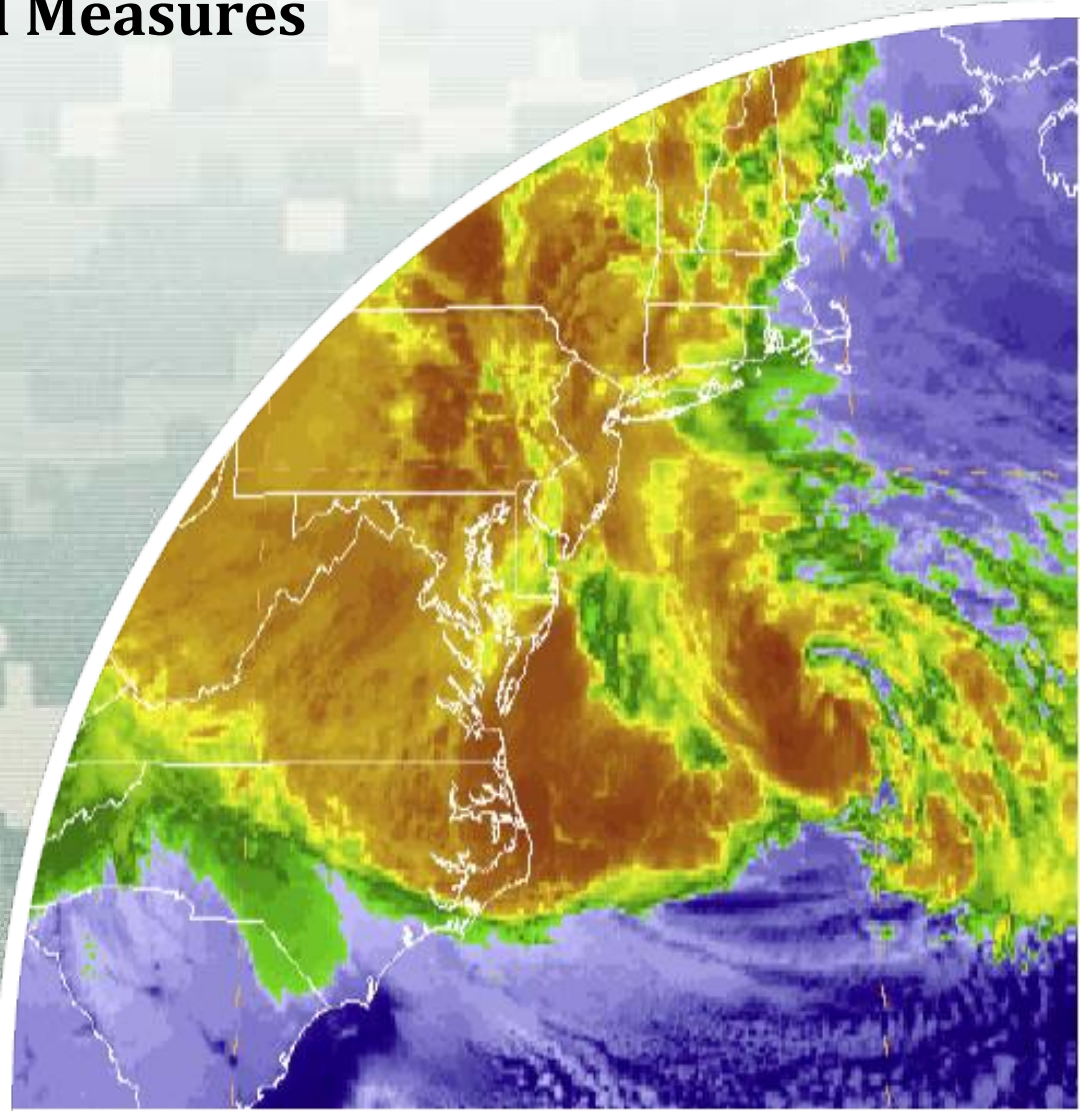


North Atlantic Coast Comprehensive Study

Draft Analyses Webinar: Coastal Flood Risk Management Strategies and Measures

U.S. Army Corps of Engineers
National Planning Center for Coastal
Storm Risk Management

3 April 2014



Speakers

- Dave Robbins
Project Manager, NACCS
- J.B. Smith
Plan Formulation Lead, NACCS
- Matthew Schrader
Engineering Team, NACCS
- Kelly Burks-Copes, Ph.D.
Research Ecologist, U.S. Army Engineer Research
& Development Center (ERDC)
Natural and Nature-Based Features (NNBF)
Team, NACCS



NACCS Background

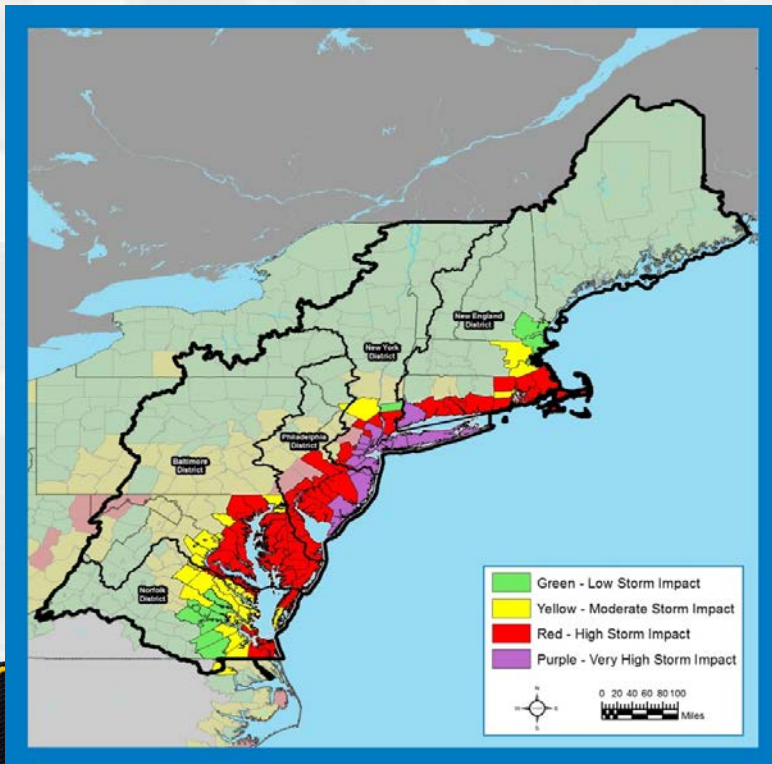
- ❑ Hurricane/Post-Tropical Cyclone Sandy moved to the U.S. Atlantic Ocean coastline 22-29 October 2012
- ❑ Affected entire U.S. east coast: 24 States from Florida to Maine; New Jersey to Michigan and Wisconsin
- ❑ Areas of extensive damage from coastal flooding: New Jersey, New York, Connecticut
- ❑ Public Law 113-2 enacted 29 January 2013



NACCS Background

“That using up to \$20,000,000* of the funds provided herein, the Secretary shall conduct a **comprehensive study** to address the flood risks of **vulnerable coastal populations** in areas that were affected by Hurricane Sandy within the boundaries of the North Atlantic Division of the Corps...”
(*\$19M after sequestration)

▪ Complete by January 2015



Goals

- Provide a **Risk Reduction Framework**, consistent with USACE-NOAA Rebuilding Principles
- Support **Resilient Coastal Communities** and robust, sustainable coastal landscape systems, considering future sea level rise and climate change scenarios, to reduce risk to vulnerable population, property, ecosystems, and infrastructure



Technical Teams

- ❑ USACE Enterprise
- ❑ Agency Subject Matter Experts
 - Engineering
 - Economics
 - Environmental, Cultural, and Social
 - Sea Level and Climate Change
 - Plan Formulation
 - Coastal GIS Analysis



U.S. ARMY®

Products

- ❑ Coastal Framework
 - Regional scale
 - Collaborative
 - Opportunities by region/state
 - Identify **range of potential solutions** and parametric costs by region/state
 - Identify activities warranting additional analysis and social/institutional barriers
- ❑ Not a Decision Document
 - No NEPA
 - No Recommendations



Coastal Flood Risk Management Strategies

- **Active Risk Management**
 - ▶ Structural, including Natural and Nature-Based Features (NNBF)
- **Acclimation**
 - ▶ NNBF and Non-structural
 - ▶ Policy/Programmatic
- **Retreat**
 - ▶ Buyout
 - ▶ Policy/Programmatic



Flood Risk Management Measures

■ Structural

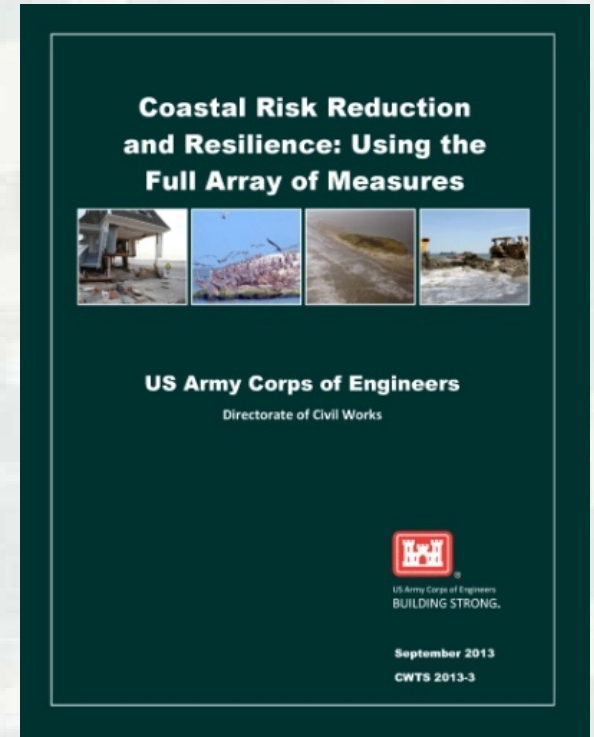
- Storm surge barriers, levees/floodwall, breakwaters, beach fill/dunes
 - NNBF
(e.g., living shorelines, wetlands, oyster reefs, sub-aquatic vegetation restoration)

■ Non-Structural

- Floodproofing, elevation, acquisition
- Evacuation, flood warning systems

■ Policy/Programmatic

- Floodplain management, land use planning
- State/Local Coastal Zone Policies, Flood Insurance Programs
- Natural resources/surface water management



[USACE Coastal Risk Reduction and Resilience: Using the Full Array of Measures](#)



Structural Measures

Table IV-4. Structural Measures Matrix

Aggregated Measure Category	Specific Measures	Typical Flood Risk Reduction Performance (Annual Probability of Design not Being Exceeded)	
		Storm Tide	Waves
Storm Surge Barriers		0.2%	0.2%
Beach Restoration¹	Beach fill, dunes, barrier island restoration	1%	1%
Breakwaters and Beach Restoration¹		1%	1%
Groins and Beach Restoration		1%	1%
Shoreline Stabilization/Protection	Seawall, Revetment, Bulkhead	1%-10%	1%
Deployable Floodwall		1%-10%	NA
Floodwall/Levee	Levee, Dike, Floodwall	1%	NA
Drainage Improvements	Pump station, culvert/drain/inlet, water storage/retention features	1%-20%	NA

¹ Beaches and dunes are also considered Natural and Nature-Based Features.



Structural Design Criteria

Table I-7. Criteria for Conceptual Design of NACCS Risk Reduction Measures

Measure Type	Criteria
Structural (not barriers) ¹	1 percent flood elevation + 3-foot sea level rise allowance
Storm Surge Barriers	0.2 percent flood elevation + 3-foot sea level rise allowance

1 Beaches and dunes are also considered Natural and Nature-Based Features.



Structural Measure Examples

Storm Surge Barriers



Figure II-1. Fox Point Storm Surge Barrier, Providence RI (Source: Providence Journal)

Beach Restoration with Breakwaters



Figure II-8. Breakwater Field at Ocean View



BUILDING STRONG®

Structural Measure Examples

Deployable Floodwalls



Figure II-13. Rapid Deployment Floodwall
(Courtesy: Plainschase.com)

Floodwalls



Figure II-14. Typical Floodwall Construction



BUILDING STRONG®

Non-Structural and Policy/Programmatic Options

Table IV-6. Nonstructural Measures Matrix

Aggregated Measure Category	Specific Measures	Typical Flood Risk Reduction Performance (Annual Probability of Design not Being Exceeded)	
		Storm Tide	Waves
Building Retrofit	Floodproofing ¹ , elevating structures, relocating structures, ringwalls	1%-20%	1%-100%
Acquisition and Evacuation	Acquisition, evacuation	1%-20%	1%-20%
Enhanced Flood Warning & Evacuation Planning	Early warning systems, emergency response systems, elevating roads, modify/remove structures for better channel function (ex. bridges), floatable development, floodable development	NA	NA

For the purposes of this report, all floodproofing measures are considered nonstructural.

Table IV-7. Policy/Programmatic Measures Matrix

Aggregated Measure Category	Specific Measures
Floodplain Management	Strategic acquisition, rolling easements, relocation/managed retreat
Land Use Planning	Land use zoning, subdivision regulations, design and location of services and utilities
State/Municipal Policy	Building codes, housing codes, tax adjustments
Natural Resources	Wetland migration, coastal zone management, beneficial use of dredged material, regional sediment management, ecosystem protection
Surface Water Management	Low impact development, stormwater best management practices
Increase Awareness in Vulnerable Coastal Populations	Education, special assistance programs



Natural and Nature-Based Features

Natural and Nature-Based Infrastructure at a Glance

GENERAL COASTAL RISK REDUCTION PERFORMANCE FACTORS:
STORM INTENSITY, TRACK, AND FORWARD SPEED, AND SURROUNDING LOCAL BATHYMETRY AND TOPOGRAPHY



Dunes and Beaches

Benefits/Processes

Break offshore waves
Attenuate wave energy
Slow inland water transfer

Performance Factors

Berm height and width
Beach Slope
Sediment grain size and supply
Dune height, crest, width
Presence of vegetation



Vegetated Features: Salt Marshes, Wetlands, Submerged Aquatic Vegetation (SAV)

Benefits/Processes

Break offshore waves
Attenuate wave energy
Slow inland water transfer
Increase infiltration

Performance Factors

Marsh, wetland, or SAV elevation and continuity
Vegetation type and density



Oyster and Coral Reefs

Benefits/Processes

Break offshore waves
Attenuate wave energy
Slow inland water transfer

Performance Factors

Reef width, elevation and roughness



Barrier Islands

Benefits/Processes

Wave attenuation and/or dissipation
Sediment stabilization

Performance Factors

Island elevation, length, and width
Land cover
Breach susceptibility
Proximity to mainland shore



Maritime Forests/Shrub Communities

Benefits/Processes

Wave attenuation and/or dissipation
Shoreline erosion stabilization
Soil retention

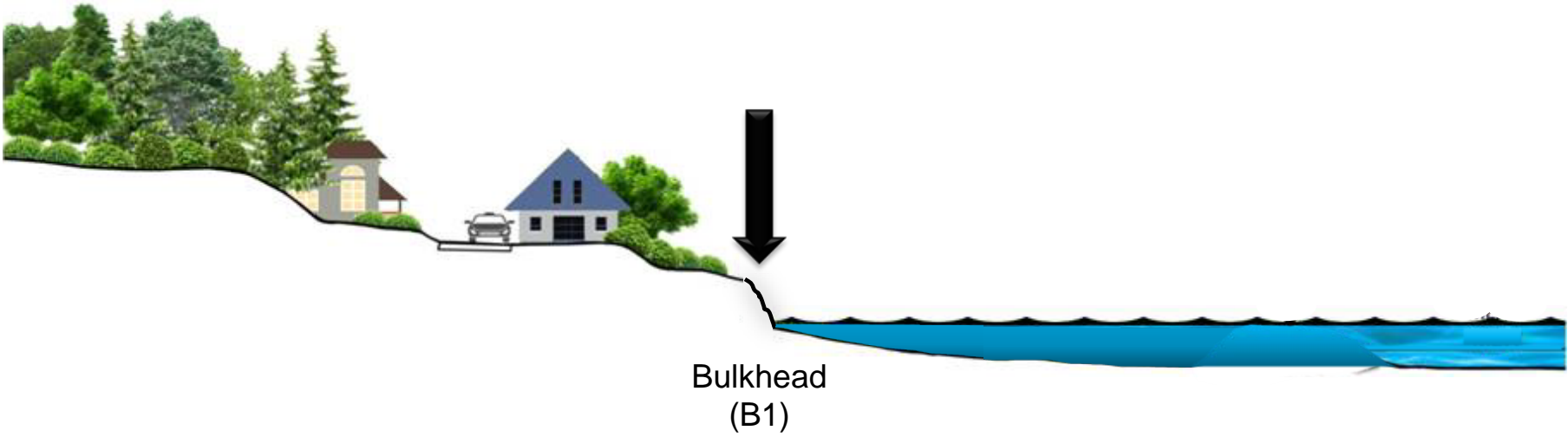
Performance Factors

Vegetation height and density
Forest dimension
Sediment composition
Platform elevation



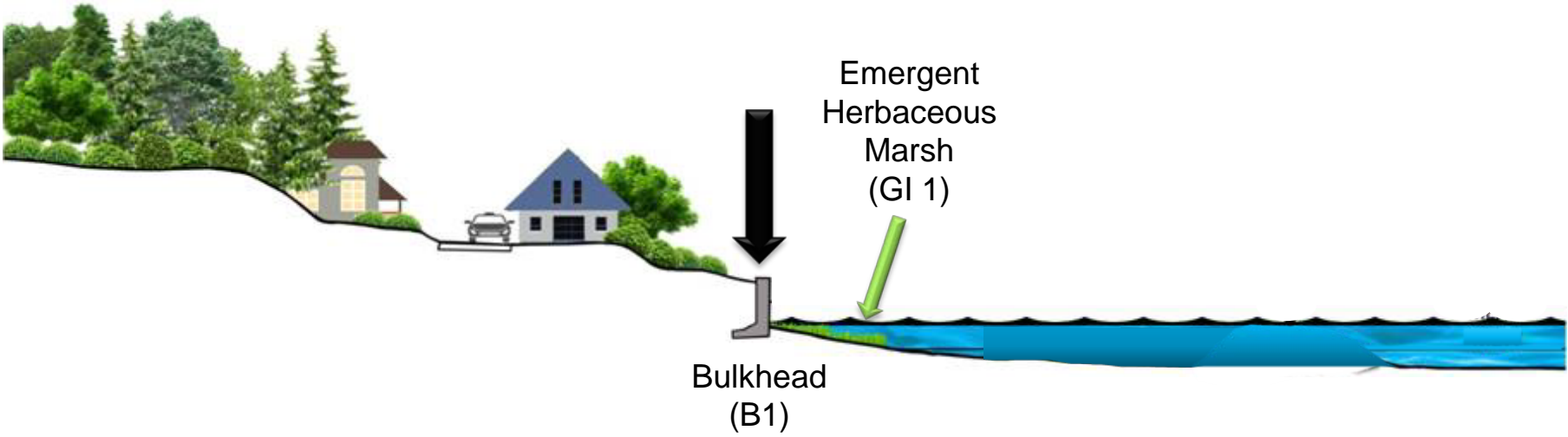
Blended Solutions

	SB1	NBI 1	NBI 2	NBI 3	ALL
S1	✓				
S2	✓				
S3					
S4					
S5					
S6					



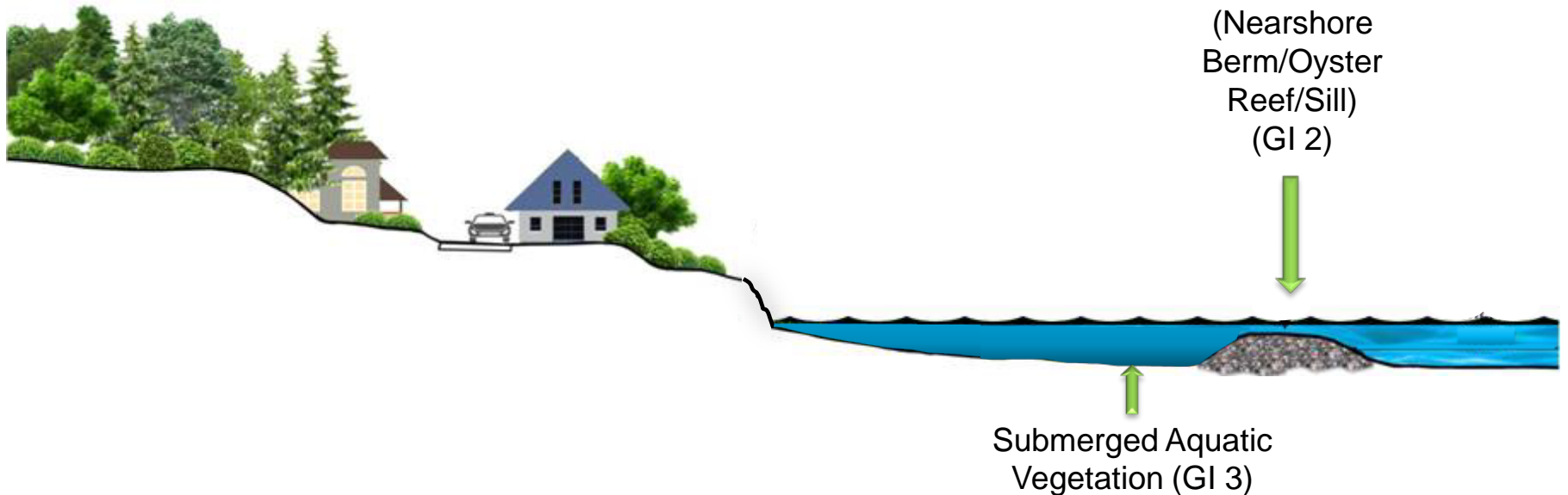
Blended Solutions

	SB1	NBI 1	NBI 2	NBI 3	ALL
S1	✓				
S2	✓				
S3					
S4					
S5		✓			
S6		✓			



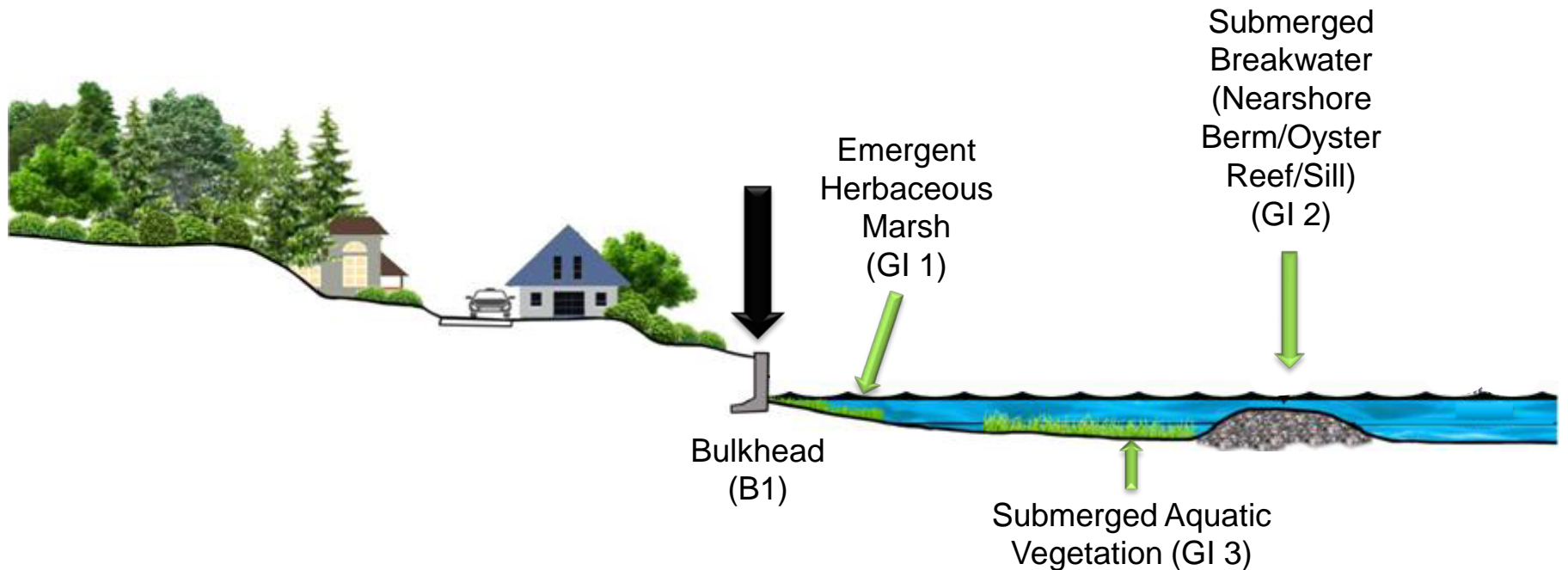
Blended Solutions

	SB1	NBI 1	NBI 2	NBI 3	ALL
S1	✓		✓		
S2	✓		✓	✓	
S3			✓		
S4				✓	
S5		✓	✓		
S6		✓		✓	



Blended Solutions

	SB1	NBI 1	NBI 2	NBI 3	ALL
S1	✓		✓		✓
S2	✓		✓	✓	✓
S3			✓		✓
S4				✓	✓
S5		✓	✓		✓
S6		✓		✓	✓



Shoreline Applicability

Table IV-8. Structural and NNBF Measure Applicability by NOAA-ESI Shoreline Type

Measures	Rocky shores (Exposed)	Rocky shores (Sheltered)	Beaches (Exposed)	Man-made structures (Exposed)	Man-made structures (Sheltered)	Scarps (Exposed)	Scarps (Sheltered)	Vegetated low banks (Sheltered)	Wetlands/Marshes/Swamps (Sheltered)
Structural									
Storm Surge Barrier ¹									
Beach Restoration ²			X						
Breakwaters and Beach Restoration ²			X						
Groins and Beach Restoration			X						
Shoreline Stabilization/Protection						X	X	X	
Deployable Floodwall					X				
Floodwall/Levee		X			X			X	
Drainage Improvements	X	X	X	X	X	X	X	X	X
Natural and Nature-Based Features									
Living Shoreline						X	X	X	X
Wetlands							X		X
Reefs	X	X				X			X
SAV Restoration³									X
Overwash Fan⁴									
Drainage Improvements	X	X	X	X	X	X	X	X	X

¹ Barriers are applicable to all types of shorelines.

² Beaches and dunes are also considered Natural and Nature-Based Features.

³ SAV restoration is not associated with any particular shoreline type. Initially assumed to apply to wetland shorelines.

⁴ Overwash fans may apply to the back side of barrier islands, which are not explicitly identified in the NOAA Environmental Sensitivity Index Shoreline Classification dataset.



What Happens Next?

- The NACCS team will receive comments for integration into the NACCS report
 - ▶ Mid-April 2014
- Integration
 - ▶ Mid-April/May 2014
- Draft Final Report production
 - ▶ June 2014
- Final USACE vertical team review
 - ▶ July - December 2014
- Submit to Congress
 - ▶ **January 2015**



Review Information

- Review documents are DRAFT and NOT FOR DISTRIBUTION
- Download the documents via AMRDEC
 - ▶ See email from No-Reply@amrdec.army.mil
- Review the draft analyses documentation
- Follow the link to the feedback form
 - ▶ Keep the feedback questions in mind during your review
 - ▶ Complete the online feedback form
- Tune into subject-specific webinars
- All feedback forms due by **April 14, 2014**



What Happens Next?

- ▶ Technical Challenges with accessing document and comment forms?
- ▶ General issues or for further coordination?
- ▶ Contact via email:

Dave Robbins

Baltimore District, USACE

Email: David.W.Robbins@usace.army.mil



BUILDING STRONG®

Questions



BUILDING STRONG®