CECW 29 Apr 2024

MEMORANDUM FOR The Chief of Engineers

SUBJECT: Outcomes from the Executive Meeting of the Board on Coastal Engineering Research, 19-20 March 2024, Norfolk, VA

1. I chaired the Executive Session of the Board on Coastal Engineering Research's (BCER) Meeting in Norfolk, VA from 19-20 March 2024. The theme of the meeting was "Coastal Storm Risk Management R&D Challenges and Solutions in Urban Coastal Settings." The meeting was hosted by USACE's North Atlantic Division's Norfolk District (NAO) and included a technical tour of NAO's Coastal Storm Risk Management projects in the Norfolk area. Table 1 summarizes the BCER Action items. The remainder of the memo provides a narrative summary of the meeting and more details on each action item. Below is a synthesis of key discussion topics.

- **The 100th Meeting of the BCER** will be held 13-15 August 2024, in San Francisco, CA. The Board discussed focusing the meeting on BCER past successes and highlight the future trajectory of the Board framed through "Moonshots" to impact national coastal engineering and science research and development. The meeting will engage federal, state, local, non-federal, and academics to broaden the discussion and offer opportunities for emerging leader discussions.
- **Moonshots and Coastal Commander Decadal Challenges.** Future trajectory of the Board centered around identifying strategic long-term goals termed "Moonshots" that are directed towards major advancements to deliver advanced knowledge and capability to the nation. USACE Coastal Commanders identified Coastal Decadal Challenges which provide the foundational requirements to focus future Moonshots.
- **R&D Needs.** R&D priorities discussed by USACE, external federal agencies, and partners included focusing Sediment Transport R&D via Test Beds to validate and improve model capability for use-cases; utilizing Artificial Intelligence and Machine Learning to improve and speed modeling and decision-support; advancing Nature-Based Solutions to reduce coastal risk and provide community benefits; and integrating Coastal and Flood Risk Management processes and technologies to address compound flooding and social equity for urban applications and installations.
- **Communications and Partnering.** The Board was impressed by the USACE Norfolk District's comprehensive and effective partnerships. In addition to significant benefits in collaboratively planning and executing projects, partnerships enable broader communications and innovative tools to visualize USACE projects and provide near-real-time updates directly to the public.
- **Partnering to Train the Next Generation.** The Board continues to support opportunities to work more closely with academia to develop the nation's next-generation workforce. Knowledge, skills, and abilities identified included cross-disciplinary engineering and science including social science and computer science expertise.

Table 1. March 2024 Executive BCER Action Items

NUMBER	ACTION ITEMS
2024-Exec-1	Develop agenda for 100th BCER meeting to be held in San Francisco, CA, to include a summary of BCER past successes and recommended future priorities.
2024-Exec-2	Use the Coastal Commander Decadal Challenges (Appendix B) to create BCER Moonshot challenges in the form of short, authentic vision statements for review by the BCER at the 100th Meeting.
2024-Exec-3	Provide an update on ongoing Artificial Intelligence/ Machine Learning activities in ERDC-CHL.
2024-Exec-4	Develop a Sediment R&D Strategy and Roadmap including Test Bed opportunities centered around USACE project types.
2024-Exec-5	Share summary of Civil Works R&D Weekly Communications with BCER Civilian Board.

2. The first day of the BCER's Executive meeting focused on integrated Coastal Storm Risk Management projects in urban coastal settings, including a technical tour of Norfolk projects (Figures 1 and 2). The second day discussion centered on R&D needs of continued interest to the Board including sediment transport, compound storm impacts, and Moonshots, which are framed as long-term strategic goals to develop and deliver innovative solutions to coastal communities. The meeting agenda is provided in Appendix A.

a. The USACE NAO provided the BCER an overview of Norfolk's coastal projects with local invited speakers from the City of Norfolk, City of Hampton, and U.S. Air Force Joint Base Langley-Eustis. Challenges in this region include integrating across project study areas for holistic assessments; preserving connection to the water with socially-equitable solutions; integrating modeling frameworks to include physical processes, ecology, economics, and social aspects; quantifying short-and long-term performance and benefits of Nature-Based Solutions; quantifying compound flooding including coastal storms, relative sea level rise including subsidence, riverine flooding, precipitation, groundwater, and storm water drainage systems; and ways to monitor projects for performance and future adaptation.

b. On the second day, a panel session on Coastal Sediment Transport Research Needs discussed cohesive and non-cohesive sediment transport research and priorities and use of Artificial Intelligence applications to inform sediment transport solutions. Coastal Commander Decadal Challenges were summarized (Appendix B) to inform discussion of Moonshots.

3. The Board recommended the 100th meeting of the BCER scheduled for 13-15 August 2024 include a session to frame effectiveness and impact of the BCER via a **summary of BCER past successes and recommended future priorities** (2024-Exec-1). Discussion centered toward identifying three past problems, solutions, and costs; and three future Moonshot opportunities in a

similar structure. The **Coastal Commander Decadal Challenges will provide foundational requirements to inform the future Moonshots** (2024-Exec-2).

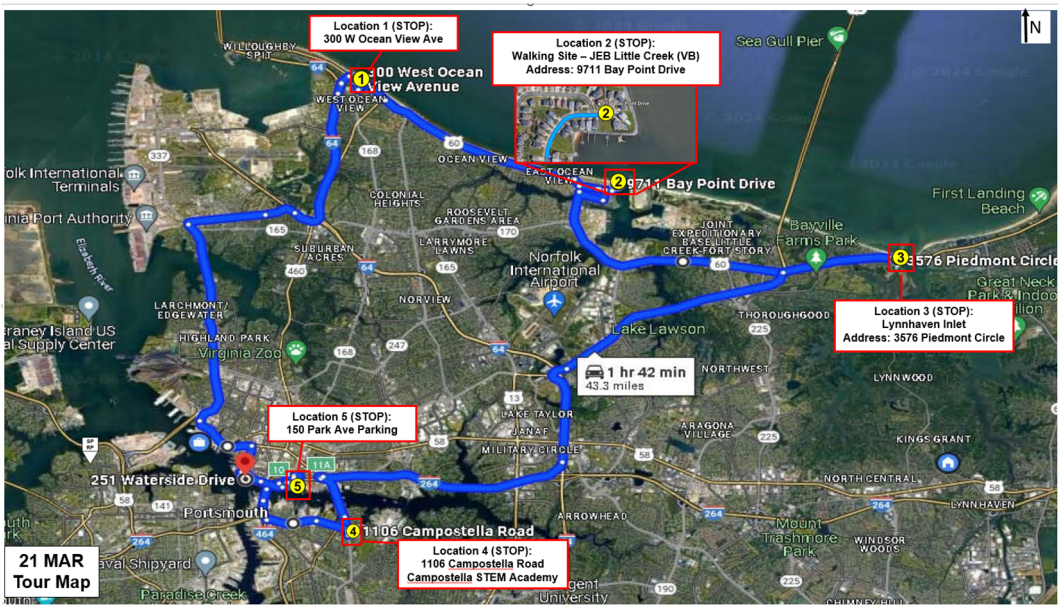

Figure 1. Overview of BCER Technical Tour Stops: (1) Willoughby Spit, (2) Joint Expeditionary Base Little Creek, (3) Lynnhaven Inlet, and parts of the Southside project at (4) Campostella Neighborhood and (5) Eastern Branch of the Elizabeth River near Berkley Bridge.

Figure 2. BCER Members in Norfolk, VA, at Lynnhaven Inlet, VA, March 2024 (from left to right: Dr. Jack Puleo, COL James Handura, Dr. Ed Lewis Link, MG William Graham Jr., BG Daniel Hibner, Dr. Tuba Özkan-Haller, and BG John P. Lloyd).

4. Improving sediment transport predictive capability continues to be a challenge and focus of the Board. A presentation on Artificial Intelligence and Machine Learning (AI/ML) for accelerating sediment transport estimations led to an Action Item from the Board to **Summarize Ongoing AI/ML Research in ERDC-CHL** (2024-Exec-3). The Sediment R&D panel session recommended using Test Beds centered around USACE project types to focus research and technology development. An action item is for ERDC to conduct an interagency and academic partnering workshop to **Develop a Sediment R&D Strategy and Roadmap including identifying Test Bed Opportunities** (2024-Exec-4).

5. Finally, many discussions during the meeting centered around improving communications with the public, partners, collaborators, within USACE, and with the Board. The Board recommended **Sharing the Civil Works R&D Weekly Communication with the Civilian Board members** (2024-Exec-5) (military members already receive this weekly summary).

6. The 100th Meeting of the BCER 13-15 August 2024 will be a celebration of past successes enabled through the Board's engagement with the USACE and targets future Moonshot advancements. The meeting will be structured to engage federal, state, local, non-federal and academics to improve communication and collaboration, and provide opportunities for emerging leader engagement with the Board.

7. For questions about topics discussed herein, please contact the Designated Federal Officer for the BCER, Dr. Julie Rosati, Julie.D.Rosati@usace.army.mil.

WILLIAM "BUTCH" GRAHAM
Major General, US Army
Chair, Board on Coastal Engineering Research

Attachment A: Agenda for the Board on Coastal Engineering Research's Executive Meeting

Theme: *Coastal Storm Risk Management R&D Challenges and Solutions in Urban Coastal Settings*

Meeting Room: Renaissance Hotel Grand IV Ballroom

Monday March 18, 2024

1800	2000	Registration – Renaissance Hotel Grand IV Ballroom	

Tuesday March 19, 2024
Meeting Attire: Military- Cammies/OCP; Civilian-Business Casual Meeting

0700	0800	Registration	Renaissance Hotel Grand IV Conference Room
0730	0800	Breakfast	
0800		Call to Order	Dr. Julie Rosati, ERDC/CHL
0800	0830	Welcome and Introductions	MG William H. "Butch" Graham, Jr. Deputy Commanding General for Civil and Emergency Operations, Headquarters (HQ), U.S. Army Corps of Engineers (USACE)
		Welcome to NAO	COL Brian Hallberg Commander Norfolk District, NAO
		Overview of Agenda and Introduction to Panel #1	Dr. Rosati, ERDC/CHL

Panel Session #1: Norfolk District Coastal Processes & Challenges
Moderator: Mr. Brandon Harris
Chief, Design Branch, Engineering and Construction Division, NAO

0830	0900	NAO Coastal Setting, Processes, Projects and R&D Needs	Michelle Hamor, Chief, Planning and Policy Branch, NAO
0900	0930	Natural Based Solutions: Challenges in Norfolk Study Leveraging Miami Dade Back Bay NBS Pilot	Zach Martin, Chief, Planning Resources Section, NAO Justine Woodward MDBB CSRM Environmental Team Lead, NAO
0930	0945	Break	
0945	1015	NAO Virginia Beach Study	Kristin Mazur,

			Project Manager, NAO
1015	1045	NAO City of Norfolk CSRM Project and R&D Needs	Kyle Spencer Chief Resilience Officer, City of Norfolk
1045	1115	From the Sea to the Stars, Resilience in Hampton	Scott Smith, Senior Civil Engineer, City of Hampton, Virginia
1115	1145	Sea Level Rise and Climate Resiliency at JBLE-Langley	Cecilia Boyd, Natural Resources Program Manager, USAF Langley
		Norfolk Site Visit	
1145	1215	Overview of Site Visit	Brandon Harris, NAO
1215	1245	Break; Board Busses	
1245	1700	Box Lunch; Site Visit	
1700	1730	Return to Hotel	

Wednesday, March 20, 2024

Meeting Attire: Military- Cammies/OCP; Civilian-Business Casual

0730	0800	Breakfast	
0800	0830	Welcome Board Comments on Day 1	BCER
		Panel Session #2: Coastal Sediment Transport Research Needs and Plans **Moderator: Dr. Jack Puleo** *Concept: 15 min per panel speaker interspersed with 45 min Q/A session*	
0830	0845	Introduction to Panel Session and Panelists	Dr. Jack Puleo, University of Delaware
0845	0900	Non-Cohesive Sediment Transport R&D Needs and Plans	Dr. Kate Brodie, ERDC/CHL
0915	0930	Advancing muddy (cohesive) sediment management through observation and prediction	Dr. Jarrell Smith, ERDC/CHL
0945	1000	Break	
1000	1015	AI applications to sediment transport	Dr. Tom Hsu, University of Delaware

1030	1045	National USACE Sediment Transport Needs in Coastal Planning, Engineering, and O&M	John Winkelman, USACE CWG
1100	1115	Sediment transport research at USACE: How to motivate and focus a program	Dr. Rob Holman, Oregon State University, BCER Emeritus
1130	1200	Discussion: Coastal Sediment R&D – Summary of Priorities	BCER
1200	1300	Working Lunch	

Planning for Next 100 BCER Meetings

1300	1330	WRDA 2022 Section 8106: Assessment of Integrated Compound Storm Impacts	Dr. Gaurav Savant, CHL
1330	1400	BCER Moon-Shots	Dr. Ed Link, BCER
1400	1430	100th BCER Meeting, San Francisco, CA (Action Item 2023-Full-4)	Ms. Heather Schlosser, USACE SPD and BCER Discussion
1430	1445	Break	
1445	1515	Synthesis of R&D Priorities	Dr. Jane Smith, Emeritus Senior Research Scientist, CHL

Closing and Next Steps

1515	1545	Public Comment	Written comments must be submitted to Dr. Julie Rosati, Julie.D.Rosati@usace.army.mil
1545	1615	BCER Member Discussion	BCER
1615	1645	Review Ongoing & New Action Items	Dr. Julie Rosati ERDC/CHL
1645	1700	Closing Comments	BCER
1700		Adjourn	MG Graham

Attachment B: USACE Coastal Commander Decadal Challenges

SUMMARY: Coastal Commanders' Decadal Challenges (Mar 2024)

	LRD	MVD	NAD	NWD	POD	SPD	SAD	SWD	Total
Assessment of **Value**/Impact of NNBF	3	1	5	1	1	0	5	0	16
All Things **Sediment** (influence of CC, Erosion, modeling, transport/tracking	2	0	5	1	1	2	3	0	14
More Holistic Assessment of Study Areas and Surround (**Watershed**/region)	3	0	4	1	2	1	3	0	14
Strategies for Addressing Decreasing Sustainability of Coastal **Infrastructure**	2	1	4	1	1	1	2	1	13
Compound **Flooding** Modeling and Assessment Capabilities	2	1	1	1	1	1	5	0	12
Incorporating **Adaptive** Strategies in Project Planning (methods & policy)	0	1	2	2	1	2	1	1	10
Workforce: Supporting a large & talented enough workforce to meet CSRM demand	1	0	2	0	2	2	3	0	10
Partnering with Non-Federal Sponsors (increased authority)	0	0	2	2	1	1	1	1	8
Benefits: Methods to Assess Other Social Effects and Environment	0	0	1	0	1	0	0	0	2
Districts responding per division	3	1	5	2	2	2	5	1	

KEY: # Districts in Division with Challenge
5
4
3
2
1
0

DETAILS: USACE Coastal Commanders Decadal Challenges (Mar 2024)

	LRD-LRB	LRD-LRC	LRD-LRE	MVD-MVN	NAD-NAB
Supporting a large & talented enough workforce to meet CSRM demand	X				X
All Things Sediment (influence of CC, Erosion, modeling, transport/tracking					
•Model support for RSM, BUDM, or sediment budgets	X		X		X
•Sediment availability (quantity or quality) or dredge-related concerns	X		X		X
•Funding concerns (RSM & BU)	X				X
•Gaps in transport modeling: mixed grained sediments	X				X
•Research into CSRM BU of fines					
•Gaps in transport modeling: other than mixed grained sediments					
•Research on BUDM on nearshore environmental resources					
Assessment of Value/Impact of N and NBF					
•Systemic site-specific CSRM planning in feasibility stage	X				X
•Research & standards of practice for NNBF & hybrid installs			X	X	
•Risk Informed Decision Making tool across multiple USACE business lines		X			
More Holistic Assessment of Study Areas and Surround (Watershed/region)					
•Limited ability of models to accurately simulate gamut of nearshore cond	X	X	X		X
•Gap in computational or survey resources needed			X		
•Need for "West of the Mississippi" or lacustrine based coastal models			X		
Compound Flooding Modeling and Assessment Capabilities					
•Consistent & robust observational nearshore hydrodynamic data to infor	X		X		
•Research in saltwater intrusion or bayside or compound flooding				X	
Methods to Assess Other Social Effects and Environment					
Incorporating Adaptive Strategies in Project Planning (methods & policy)					
•Growing need for adaptation pathways or data-driven solutions for best solution				X	
•Authorizing "adaptation flexibility" in CSRM					
•Community buy-in on different CSRM options (traditional vs. newer options)					
Partnering with Non-Federal Sponsors (increased authority)					
•Organizational or interagency cooperation or efficiency					
•Increased permitting issues					
Strategies for Addressing Decreasing Sustainability of Coastal Infrastructure					
•Complex quantification of benefits surrounding CSRM		X		X	
•Research, methods, or guidance of coastal infrastructure adaptation			X	X	X

DETAILS: USACE Coastal Commanders Decadal Challenges (Mar 2024)

	NAD-NAE	NAD-NAN	NAD-NAO	NAD-NAP	NWD-NWP
Supporting a large & talented enough workforce to meet CSRM demand			X		
All Things Sediment (influence of CC, Erosion, modeling, transport/tracking					
•Model support for RSM, BUDM, or sediment budgets	X	X	X		
•Sediment availability (quantity or quality) or dredge-related concerns		X		X	X
•Funding concerns (RSM & BU)			X	X	
•Gaps in transport modeling: mixed grained sediments			X		
•Research into CSRM BU of fines	X			X	
•Gaps in transport modeling: other than mixed grained sediments	X				
•Research on BUDM on nearshore environmental resources					
Assessment of Value/Impact of N and NBF					
•Systemic site-specific CSRM planning in feasibility stage	X		X	X	
•Research & standards of practice for NNBF & hybrid installs	X	X	X	X	
•Risk Informed Decision Making tool across multiple USACE business lines				X	
More Holistic Assessment of Study Areas and Surround (Watershed/region)					
•Limited ability of models to accurately simulate gamut of nearshore cond	X		X		
•Gap in computational or survey resources needed	X			X	
•Need for "West of the Mississippi" or lacustrine based coastal models					
Compound Flooding Modeling and Assessment Capabilities					
•Consistent & robust observational nearshore hydrodynamic data to infor			X		
•Research in saltwater intrusion or bayside or compound flooding					
Methods to Assess Other Social Effects and Environment	X				
Incorporating Adaptive Strategies in Project Planning (methods & policy)					
•Growing need for adaptation pathways or data-driven solutions for best s	X			X	X
•Authorizing "adaptation flexibility" in CSRM	X			X	X
•Community buy-in on different CSRM options (traditional vs. newer optio	X				
Partnering with Non-Federal Sponsors (increased authority)					
•Organizational or interagency cooperation or efficiency	X			X	
•Increased permitting issues	X			X	X
Strategies for Addressing Decreasing Sustainability of Coastal Infrastructure					
•Complex quantification of benefits surrounding CSRM	X	X	X		X
•Research, methods, or guidance of coastal infrastructure adaptation					X

DETAILS: USACE Coastal Commanders Decadal Challenges (Mar 2024)

	NWD-NWS	POD-POA	POD-POH	SPD-SPL	SPD-SPN
Supporting a large & talented enough workforce to meet CSRM demand		X	X	X	X
All Things Sediment (influence of CC, Erosion, modeling, transport/tracking					
•Model support for RSM, BUDM, or sediment budgets			X		X
•Sediment availability (quantity or quality) or dredge-related concerns			X	X	X
•Funding concerns (RSM & BU)			X	X	X
•Gaps in transport modeling: mixed grained sediments			X		
•Research into CSRM BU of fines			X		X
•Gaps in transport modeling: other than mixed grained sediments			X		X
•Research on BUDM on nearshore environmental resources			X		X
Assessment of Value/Impact of N and NBF					
•Systemic site-specific CSRM planning in feasibility stage	X		X		
•Research & standards of practice for NNBF & hybrid installs	X				
•Risk Informed Decision Making tool across multiple USACE business lines	X				
More Holistic Assessment of Study Areas and Surround (Watershed/region)					
•Limited ability of models to accurately simulate gamut of nearshore cond	X	X	X		X
•Gap in computational or survey resources needed		X			X
•Need for "West of the Mississippi" or lacustrine based coastal models	X	X	X		X
Compound Flooding Modeling and Assessment Capabilities					
•Consistent & robust observational nearshore hydrodynamic data to infor	X	X			
•Research in saltwater intrusion or bayside or compound flooding					X
Methods to Assess Other Social Effects and Environment			X		
Incorporating Adaptive Strategies in Project Planning (methods & policy)					
•Growing need for adaptation pathways or data-driven solutions for best s	X		X		
•Authorizing "adaptation flexibility" in CSRM				X	X
•Community buy-in on different CSRM options (traditional vs. newer optio	X				X
Partnering with Non-Federal Sponsors (increased authority)					
•Organizational or interagency cooperation or efficiency	X	X			
•Increased permitting issues				X	
Strategies for Addressing Decreasing Sustainability of Coastal Infrastructure					
•Complex quantification of benefits surrounding CSRM				X	
•Research, methods, or guidance of coastal infrastructure adaptation			X		

DETAILS: USACE Coastal Commanders Decadal Challenges (Mar 2024)

	SAD-SAC	SAD-SAJ	SAD-SAM	SAD-SAS	SAD-SAW
Supporting a large & talented enough workforce to meet CSRM demand	X		X		X
All Things Sediment (influence of CC, Erosion, modeling, transport/tracking					
•Model support for RSM, BUDM, or sediment budgets	X		X		X
•Sediment availability (quantity or quality) or dredge-related concerns					X
•Funding concerns (RSM & BU)	X		X		X
•Gaps in transport modeling: mixed grained sediments	X		X		X
•Research into CSRM BU of fines					
•Gaps in transport modeling: other than mixed grained sediments					
•Research on BUDM on nearshore environmental resources					
Assessment of Value/Impact of N and NBF					
•Systemic site-specific CSRM planning in feasibility stage	X		X		X
•Research & standards of practice for NNBF & hybrid installs		X		X	
•Risk Informed Decision Making tool across multiple USACE business lines				X	
More Holistic Assessment of Study Areas and Surround (Watershed/region)					
•Limited ability of models to accurately simulate gamut of nearshore cond	X		X		X
•Gap in computational or survey resources needed					
•Need for "West of the Mississippi" or lacustrine based coastal models					
Compound Flooding Modeling and Assessment Capabilities					
•Consistent & robust observational nearshore hydrodynamic data to infor	X		X		X
•Research in saltwater intrusion or bayside or compound flooding		X		X	
Methods to Assess Other Social Effects and Environment					
Incorporating Adaptive Strategies in Project Planning (methods & policy)					
•Growing need for adaptation pathways or data-driven solutions for best s				X	
•Authorizing "adaptation flexibility" in CSRM				X	
•Community buy-in on different CSRM options (traditional vs. newer optio					
Partnering with Non-Federal Sponsors (increased authority)					
•Organizational or interagency cooperation or efficiency				X	
•Increased permitting issues					
Strategies for Addressing Decreasing Sustainability of Coastal Infrastructure					
•Complex quantification of benefits surrounding CSRM		X			X
•Research, methods, or guidance of coastal infrastructure adaptation					

DETAILS: USACE Coastal Commanders Decadal Challenges (Mar 2024)

	SWD-SWG	TOTAL
Supporting a large & talented enough workforce to meet CSRM demand		10
All Things Sediment (influence of CC, Erosion, modeling, transport/tracking		
•Model support for RSM, BUDM, or sediment budgets		11
•Sediment availability (quantity or quality) or dredge-related concerns		10
•Funding concerns (RSM & BU)		10
•Gaps in transport modeling: mixed grained sediments		7
•Research into CSRM BU of fines		4
•Gaps in transport modeling: other than mixed grained sediments		3
•Research on BUDM on nearshore environmental resources		2
Assessment of Value/Impact of N and NBF		
•Systemic site-specific CSRM planning in feasibility stage		10
•Research & standards of practice for NNBF & hybrid installs		9
•Risk Informed Decision Making tool across multiple USACE business lines		4
More Holistic Assessment of Study Areas and Surround (Watershed/region)		
•Limited ability of models to accurately simulate gamut of nearshore cond		13
•Gap in computational or survey resources needed		5
•Need for "West of the Mississippi" or lacustrine based coastal models		5
Compound Flooding Modeling and Assessment Capabilities		0
•Consistent & robust observational nearshore hydrodynamic data to infor		8
•Research in saltwater intrusion or bayside or compound flooding	X	5
Methods to Assess Other Social Effects and Environment		2
Incorporating Adaptive Strategies in Project Planning (methods & policy)		
•Growing need for adaptation pathways or data-driven solutions for best s		7
•Authorizing "adaptation flexibility" in CSRM		6
•Community buy-in on different CSRM options (traditional vs. newer optio	X	4
Partnering with Non-Federal Sponsors (increased authority)		
•Organizational or interagency cooperation or efficiency	X	6
•Increased permitting issues		4
Strategies for Addressing Decreasing Sustainability of Coastal Infrastructure		
•Complex quantification of benefits surrounding CSRM		9
•Research, methods, or guidance of coastal infrastructure adaptation	X	6