

NC COASTAL RESOURCES COMMISSION

May 5, 2011

NOAA/NCNERR Administration Building

Beaufort, NC

The State Government Ethics Act mandates that at the beginning of any meeting the Chair remind all the members of their duty to avoid conflicts of interest and inquire as to whether any member knows of any conflict of interest or potential conflict with respect to matters to come before the Commission. If any member knows of a conflict of interest or potential conflict, please state so at this time.

Thursday, May 5th

- 9:00 EXECUTIVE COMMITTEE MEETING (Auditorium)** Bob Emory, Chair
- 10:00 COMMISSION CALL TO ORDER (Auditorium)** Bob Emory, Chair
- Roll Call
 - Approval of February 23-24, 2011 Meeting Minutes
 - Executive Secretary's Report
 - Chairman's Comments
- PRESENTATIONS**
- Marsh Sill Study Results (*CRC-11-08*)
 - Amendments to 15A NCAC 7H .0312 Sediment Criteria (*CRC-11-10*)
 - Sandbag Enforcement Update
 - Sandbag Stakeholder Meetings Summary Report (*CRC-11-09*)
 - National Flood Insurance Program – Community Rating System
- Dr. John Fear
Jim Gregson
Ted Tyndall
Mike Lopazanski
Berry Williams,
Williams & Associates
- 12:00 LUNCH**
- 1:00 PUBLIC INPUT AND COMMENT**
- 1:15 PRESENTATIONS**
- 2011 Draft Erosion Rates 15A NCAC 7H .0304(1)(a) (*CRC-11-11*)
 - Implementation of Beach and Inlet Management Plan
 - Progress on Sea-Level Rise Policy Development
 - Determining the Socio-Economic and Environmental Impacts of Sea-Level Rise to Bogue Banks, NC
 - Sea-Level Rise and Marsh Migration – High Marsh
 - NC Coastal Reserve Education Efforts (*CRC-11-12*)
 - Sea-Level Rise Education and Outreach for Coastal NC (*CRC-11-12*)
- Ken Richardson
Steve Underwood
Tancred Miller
- Jeff Allenby, Duke U.
Nicholas School of the
Environment
- Dr. Bob Christian, ECU
Scott Kucera
- Casey Dziuba, Duke U.
Nicholas School of the
Environment
- ACTION ITEMS**
- Land Use Plan Certifications and Amendments** John Thayer
- Town of Shallotte LUP Amendment (*CRC-11-14*)
- OLD/NEW BUSINESS** Bob Emory, Chair
- Standing Committee Assignments
 - Future Meetings and Agenda Items
- 5:00 ADJOURN**

Executive Order 34 mandates that in transacting Commission business, each person appointed by the governor shall act always in the best interest of the public without regard for his or her financial interests. To this end, each appointee must recuse himself or herself from voting on any matter on which the appointee has a financial interest. Commissioners having a question about a conflict of interest or potential conflict should consult with the Chairman or legal counsel.



N.C. Division of Coastal Management

www.nccoastalmanagement.net

Next Meeting:

July 13-14, 2011

NOAA/NCNERR Administration Building

Beaufort, NC

NC COASTAL RESOURCES COMMISSION (CRC)
February 23-24, 2011
NOAA/NCNERR Auditorium
Beaufort, NC

Present CRC Members

Bob Emory, Chairman
Joan Weld, Vice-Chair

Chuck Bisette	Ed Mitchell
Renee Cahoon	Lee Wynns
Charles Elam	Benjamin Simmons
David Webster	Pat Joyce
Jerry Old	James Leutze (present at 3:30 p.m. 2/23)
Bill Peele	
Melvin Shepard (absent 2/24)	

Present CRAC Members

Ray Sturza, Chair	J. Michael Moore
Bob Shupe	Harry Simmons
Charles Jones	Bert Banks
Tim Tabak	Debbie Smith
Dave Weaver	Judy Hills
Missy Baskerville (for Chris Mele)	Bryant Buck
Bill Morrison	Tracy Skrabal
Wayne Howell	Spencer Rogers
Dara Royal	Joe Lassiter
Webb Fuller	Lee Padrick
Anne Deaton	Cyndi Karoly
Phil Harris	

Present Attorney General's Office Members

Jennie Hauser
Ward Zimmerman
Christine Goebel
Mary Lucasse

CALL TO ORDER/ROLL CALL

Chairman Emory called the meeting to order and reminded Commissioners of the need to state any conflicts due to Executive Order Number One and also the State Government Ethics Act. Chairman Emory stated the State Government Ethics Act mandates that at the beginning of each meeting he remind all members of their duty to avoid conflicts of interest and inquire as to whether any member knows of any conflict of interest or potential conflict with respect to matters to come before the Commission. If any member knows of a conflict of interest or a potential conflict of interest, please state so when the roll is called.

Angela Willis called the roll. Veronica Carter was absent. Renee Cahoon stated she would recuse herself from discussion and voting on the Town of Nags Head Land Use Plan. Based upon this roll call, Chairman Emory declared a quorum.

VARIANCES

Walton O'Neal (CRC-VR 11-01) Emerald Isle, Static Line Exception
Ward Zimmerman

Ward Zimmerman of the Attorney General's Office represented Staff. Mr. Zimmerman stated the O'Neals own a vacant oceanfront lot in Emerald Isle. Mr. O'Neal is present and will speak on behalf of the Petitioners. The Petitioners propose to construct a new single-family residence and the proposed development does not meet the oceanfront erosion setback requirements set forth in 15A NCAC 07H .0306(a)(8). The Town of Emerald Isle has received an exception to the static line, however the O'Neal's proposed development is seven feet past the neighbors to the west. Mr. Zimmerman reviewed the stipulated facts of this variance request. Staff and Petitioners agree on all four statutory criteria which must be met in order to grant the variance request.

Walton O'Neal spoke on behalf of himself and his wife, Helene. Mr. O'Neal reviewed the stipulated facts which he contends support the granting of this variance request. Mr. O'Neal stated this request is to allow building 7.3 feet oceanward of where they could currently build.

Renee Cahoon made a motion that strict application of the applicable development rules, standards, or orders issued by the Commission cause the Petitioner unnecessary hardship. Chuck Bisette seconded the motion. The motion passed unanimously (Joyce, Mitchell, Webster, Simmons, Peele, Wynns, Weld, Shepard, Bisette, Cahoon, Elam, Old).

Renee Cahoon made a motion that hardships result from conditions peculiar to the Petitioner's property. Jerry Old seconded the motion. The motion passed unanimously (Joyce, Mitchell, Webster, Simmons, Wynns, Peele, Weld, Shepard, Bisette, Cahoon, Elam, Old).

Renee Cahoon made a motion that hardships do not result from actions taken by the Petitioner. Jerry Old seconded the motion. The motion passed unanimously (Joyce, Mitchell, Webster, Simmons, Wynns, Peele, Weld, Shepard, Bisette, Cahoon, Elam, Old).

Renee Cahoon made a motion that the variance request is consistent with the spirit, purpose and intent of the rules, standards or orders issued by the Commission; will secure the public safety and welfare; and will preserve substantial justice. Jerry Old seconded the motion. The motion passed unanimously (Joyce, Mitchell, Webster, Simmons, Wynns, Peele, Weld, Shepard, Bisette, Cahoon, Elam, Old).

This variance was granted.

Wayland (CRC VR 11-02) Oak Island, Oceanfront Setback
Ward Zimmerman

Ward Zimmerman of the Attorney General's Office represented Staff. Mack Paul of K&L Gates represented Petitioners. Mr. Zimmerman stated the Petitioners own a single family residence on an oceanfront lot in Oak Island, Brunswick County. Petitioners propose to replace the residence's current 29 square foot deck with a 300 square foot deck. The Petitioner's proposed development does not meet the ocean hazard setback requirement in 15A NCAC 07H .0306(a)(2) and 07H .0309(a). Mr. Zimmerman reviewed the stipulated facts for this variance request and stated that Staff and Petitioners do not agree on any of the four statutory criteria which must be met in order to grant the variance request. Mr. Zimmerman stated the Petitioners rely on the Williams Case from the Court of Appeals which says that to show unnecessary hardship a petitioner must show that he has been denied the ability to make any reasonable and significant use of his property. Financial loss standing alone does not constitute an unnecessary hardship in itself. The Petitioners have made reasonable use of their property. This property has been rented out for the past six years so Staff contends that this hardship has not been met. Petitioners bought this piece of property with the existing deck after the static line had been established. Staff believes this is an instance where an enlargement of a deck oceanward of the static vegetation line is in conflict to the spirit, purpose and intent of the static line exception.

Mack Paul, of K&L Gates, stated the biggest issue before the CRC today is the hardship issue. Mr. Paul discussed the four statutory criteria. Mr. Paul stated that there is case law that talks about the variance criteria. We don't have to show that there is no use of the property; we have to show that there is no reasonable use. This property has gone up four times in value in tax assessments, meanwhile it is more difficult to rent because there is no deck available. This request does not run afoul of the rule because of the vegetation line but because of the static line. There are a couple of peculiar conditions here. Oak Island has a project that occurred 10 years ago yet the Town has not been able to get an exception because it has taken a number of years to go through the federal process. Other communities along the coast have been able to get their exceptions. The property owner did not see fit to build a deck like all the other properties and this is a unique circumstance to not have a deck.

Melvin Shepard made a motion that strict application of the development rules, standards or orders issued by the Commission do not cause the Petitioner unnecessary hardships. Jim Leutze seconded the motion. The motion passed unanimously (Leutze, Joyce, Mitchell, Webster, Simmons, Wynns, Peele, Weld, Shepard, Bissette, Cahoon, Elam, Old).

Joan Weld made a motion that hardships do not result from conditions peculiar to the Petitioner's property. Jerry Old seconded the motion. The motion passed unanimously (Leutze, Joyce, Mitchell, Webster, Simmons, Wynns, Peele, Weld, Shepard, Bissette, Cahoon, Elam, Old).

Melvin Shepard made a motion that the hardships result from actions taken by the Petitioner. Jerry Old seconded the motion. The motion passed unanimously (Leutze, Joyce, Mitchell, Webster, Simmons, Wynns, Peele, Weld, Shepard, Bissette, Cahoon, Elam, Old).

Jim Leutze made a motion that the variance request will not be consistent with the spirit, purpose and intent of the rules, standards or orders issued by the Commission; will not secure the public safety; and will not preserve substantial justice. Bill Peele seconded the motion. The motion passed unanimously (Leutze, Joyce, Mitchell, Webster, Simmons, Wynns, Peele, Weld, Shepard, Bissette, Cahoon, Elam, Old).

This variance was denied.

PRESENTATIONS

Sandbag Stakeholders Meeting Summary

Mike Lopazanski

Mike Lopazanski stated we held a fourth sandbag stakeholder meeting today. Chairman Emory indicated that he would like to have the group wrap up their work and develop some recommendations that the Commission could consider. These recommendations will be before the Commission during the next meeting for discussion.

The discussion today was about the status of enforcement. With the end of the moratorium the CRC directed staff to continue with enforcement action. Staff reassessed the top twenty that were originally identified for removal. Thirteen are still on the list. The others have been removed in some manner along the way. We have sent out thirty day removal notices this week. We had further discussion along the same themes as the other stakeholder meetings. We talked about the condemnation of structures, FEMA National Flood Insurance Program involvement, and the continuing existence of these structures out along the beach. We talked about a more comprehensive approach to removing structures similar to what is done in Texas and to provide funding for the relocation of structures. We talked about possible funding connected to the Beach and Inlet Management Plan. We discussed the current condition of sandbags on the beaches, most notably in South Nags Head. We had some discussion related to tax payer support as a remedy versus personal/private responsibility for these structures. We discussed again the covering of sandbags during beach nourishment projects. We also considered additional criteria that might be utilized in assessing the removal such as the time the structure has been condemned. Chairman Emory suggested that we look at the issues we have been talking about in two categories. The first is structures that are out on the beach and the second being the continuing issue of the sandbag policy and what to do about bags with expired permits.

For the structures that remain on the beach we discussed the state funding source for beach management to include the removal of structures. There was a proposal to institute a tax credit whereby the agreement to remove the structure should it become threatened by the ocean then you could receive certain credits along the way. There was an idea for cash payments to remove the structure before it falls in since it is cheaper to remove it while it is still whole. We talked about the Hazard Mitigation Program as an option for a solution. We discussed a mechanism for private entities to salvage derelict structures.

For the sandbag policy we talked about a community sandbag management plan as a way to handle the permitting and subsequent removal of sandbags. We talked about regulating size and

not worrying so much about the time limit. We discussed bonding requirements to ensure removal and some of the pitfalls involved with that. We also discussed the possibility of using escrow accounts to ensure removal of structures.

Hazard Mitigation Grant Program
Chris Crew, NCDEM

Chris Crew, Branch Chief for Hazard Mitigation with the Division of Emergency Management, stated he also serves as the State Hazard Mitigation Officer. Mitigation means to make less severe or painful. FEMA guidance says that mitigation is any sustained action to reduce or eliminate long-term risk to human life and property from natural hazards. The risk is the bottom line when it comes to what we will mitigate. We look at risk as a function of both the probability of an impact and then what is in the way of the hazard that is going to be impacted. Our mission statement says that our mission is to assist North Carolinians, communities, state agencies, local governments and businesses to become less vulnerable to the impacts of natural hazards. We strive to achieve this through the effective administrative of hazard mitigation grant programs, hazard risk assessments, wise floodplain management, and a coordinated approach to mitigation policy through state, regional and local planning activities. We mitigate to try to reduce loss of life and property, to reduce response and recovery costs, and to minimize future losses. Projects that we seek funding for are projects to prevent something from happening in the future. The line gets blurred following major disasters because there is an appearance that large property acquisitions are because of flooding or other disasters. The real reason we do it is because the same properties could receive the same damages again. We have a couple of different mitigation actions that are identified in various FEMA planning documents. We look at prevention actions and these are the highest ordered of mitigation. Prevention includes zoning and land use planning and things that local governments can undertake to keep property from getting in the wrong place to begin with. We look at property protection actions and these would be acquisitions, demolitions, retrofittings and elevations. We also do public education and awareness. We take actions to inform and remind the public about hazards in the State and that there are actions they can take to avoid losses. Mapping and outreach efforts are examples of this. We look occasionally at natural resource protection actions such as erosion, sediment control, wetland protection, or environmental restoration designed to reduce the intensity of hazard effects. Emergency services protection actions are provisions for protection of warning systems or infrastructure. There are also structural actions which are large-scale actions such as channel modification, dams, levees, flood and storm water control facilities, and sea walls that directly protect people and property at risk. The Division and the Mitigation program do not have a lot to do with large-scale structural actions because our granting sources have prohibitions on duplication of benefits. These types of activities are typically provided by the Corps of Engineers. There are project eligibility requirements for all of the funding sources we use. The applicant community must have a hazard mitigation plan. The project must have a beneficial impact. The project must conform with environmental laws (NEPA) and must be cost effective. Local hazard mitigation planning identifies community specific hazards, risks and possible impacts as well as mitigation goals and actions supported by the community that is designed to reduce risk. The plan adoption process requires the offering of public participation. The projects must have a beneficial impact. It has to independently solve problems that are repetitive or pose a significant risk to public health and safety if it is left unresolved. The plans must meet the

requirements of the NEPA. It also must conform with floodplain management and environmental considerations and not have an adverse impact on the human or natural environment. Plans must not cost more than the anticipated value of the reduction in both direct damages and subsequent negative impacts on the area if future disasters occur. For every dollar spent the result must be at least one dollar in savings over the lifetime of the project. There are five federally funded grant programs that we work with. The hazard mitigation grant program is a disaster based program and there must be a presidential declaration to secure funds. Currently the state has to experience 10.2 million dollars in uninsured losses before we are eligible. Based on the current census we believe that the disaster threshold will go up. Over the last 12 years the average disaster has cost about 12 million dollars for the HMGP. The Pre Disaster Mitigation Program is an annually funded program designed to try to get ahead of these disasters and reduce the future costs of them. This is typically funded between 60-200 million per year. The average is about 160 million per year. The Flood Mitigation Assistance Program, the Repetitive Loss Program and the Severe Repetitive Loss Programs are aimed specifically at reducing claims on the National Flood Insurance Program. The only eligible properties for these three programs are flood insured properties that have had two or more losses in the previous rolling ten year periods. The Repetitive Flood Loss Program is an attempt to identify the worst of the worst repeat offenders in the NFIP. There are approximately 60 structures on that list in North Carolina. The other use of this program is if we can identify a local government that does not have the capacity to manage one of these projects on their own and they have the eligible properties within their jurisdiction then we can apply for funds. The Severe Repetitive Loss Program is aimed specifically at repetitive loss NFIP structures. These are properties that have four or more claims in the previous ten year period or where the amount of the claim is approaching the value of the property. Traditionally the State of North Carolina has picked up the entire non-federal match. When we do an acquisition project the local government has to agree to take title to the underlying property. The structure is removed and then the local government records a deed restriction holding the property as public open space in perpetuity. All these programs are voluntary on the part of the local government and the individual participants. We do not use powers of condemnation to compel anyone to sell or elevate their property. In coastal North Carolina we do not want to encourage development in high hazard areas. Our view of high hazard areas are floodplains, coastal V-zones, and the landslide hazard areas. We do not want to duplicate other programs with benefits. We would not consider it a good investment of mitigation dollars to purchase a property that was on a lot that is unbuildable because when that property becomes substantially damaged it will be removed and not be replaced. Our vision is the vision of the local government and the citizens. The planning process at the local level determines which mitigation measures will be pursued. Our authority stems from the Stafford Act and various parts of the 44 Code of the Federal Regulations, and NCGS 1166-A. Our policies are laid out in the State Hazard Mitigation Plan and it is available on the website. Our state has a hazard mitigation plan and it is the basis for all grant activity. Just like the local plans we have to describe the process; we have to have a risk assessment, the goals and measures, maintenance process, and adoption of the plan. The single goal that the State has identified is to reduce the State's vulnerability and increase resilience to natural hazards in order to protect people, property and natural resources. There are five objectives to support this goal. The first is to support the capacity of the State to implement mitigation policies, practices and programs. The second is to boost the commitment to mitigation. Another objective is to improve communication, collaboration and integration among stakeholders. We also want to increase public awareness

and understanding of hazards and their risks as well as mitigation opportunities. The last objective is to identify and pursue mitigation activities appropriate to identified hazards. There are five strategies that are applied to each of the five objectives in the State Hazard Mitigation Plan. The first is training. This will increase awareness and knowledge of hazard mitigation principles and practice among local public officials, local planners, emergency management practitioners and North Carolina Emergency Management staff. The second strategy is staffing. This will provide direct technical assistance to local government officials. The third strategy is data to cooperate and coordinate with partners in industry, academia and at all government levels in collection and interpretation of appropriate data. Technology will coordinate with all levels of government and industry to incorporate and maximize use of technology. The last strategy is funding. This strategy is to identify and secure funding to implement mitigation planning and projects. Our standard operating guide governs how mitigation projects are administered and addresses the procurement of services, financial and grants management, application of the Uniform Relocation Act, property acquisition, property demolition, and structural elevation. North Carolina Emergency Management retains the authority to establish funding properties. Participation is voluntary for both government and property owners. Owner-occupied structures receive top priority for funding. North Carolina Emergency Management establishes the basis for market value. North Carolina Emergency Management will not generally participate in an acquisition project if the rules or policies of another agency render the property unbuildable. North Carolina Emergency Management will not participate in relocation or elevation projects in high hazard areas including floodways and coastal V-zones. Relocated structures must be sited outside of the special flood hazard area. Owners of elevated properties must record a deed restriction calling for maintenance of NFIP flood insurance in perpetuity.

MINUTES

Charles Elam made a motion to approve the November 17-18, 2010 CRC meeting minutes. Bill Peele seconded the motion. The motion passed unanimously (Weld, Leutze, Bissette, Cahoon, Elam, Old, Peele, Simmons, Wynns, Joyce) (Mitchell absent for vote) (Webster abstained).

EXECUTIVE SECRETARY'S REPORT

DCM Director Jim Gregson gave the following report.

Budget

Governor Perdue recently announced that the state's \$3.7 billion budget deficit for the next fiscal year shrunk by more than \$1 billion, to \$2.4 billion, thanks to some better-than-expected revenues and lower-than-expected costs in the current year's budget. In her budget proposal released last week, the governor highlighted her plan to combine 14 state agencies into eight Cabinet-level departments. Her budget offers an early retirement package that could potentially eliminate 1,000 positions, continues the state's current hiring freeze and salary freeze, eliminates, reduces or reorganizes 176 state programs which will eliminate more than 5,000 state positions. Combined with targeted agency cuts, state government will eliminate an estimated 10,000 positions. For DCM, the budget includes fund shifting three positions in the permitting and enforcement programs to permit receipts. In addition, one position in the Strategic Planning Program and one position in the Planning and Access Program would be shifted to grant support. This will result in the elimination of five appropriated positions within DCM. The budget proposed for DENR recommends a department-wide reduction of 224.5 appropriated positions, plus an additional 68 positions, 50% of which must be permitting positions in those divisions

where regulatory activity has declined due to the economy. The remaining reductions should focus on middle management positions. DCM was asked to eliminate one permitting position.

Rules Reform

Governor Perdue released a list of 900 rules that she and her staff had identified as “outdated, unnecessary, or vague,” and has turned the list over to the General Assembly to take action in repealing the rules. Many of these rules relate to programs or procedures that are no longer in use. No CRC rules were included on this list. DENR did submit a list of further potential rules that could also be eliminated, including 7J. 0303, Contested Case Hearing Procedures. This rule duplicates language in the Administrative Procedures Act and is no longer necessary.

Clean Marina

DCM will partner with the Division of Water Quality to hold two Clean Marina workshops for marina owners next month, in Beaufort on March 1 and in Wilmington on March 7. This workshop will provide marina owners/operators with up-to-date information about CAMA permits, DWQ permit requirements, No Discharge Zone designations, and pumpout system information.

Staff News

Dr. Bo Dame, manager of our Northern coastal reserve sites, left DCM in December for a position at Chowan College. Due in part to the hiring freeze, Claudia Jones, who has been a field representative in the Elizabeth City office, will be serving as the temporary Northern Sites Manager through June 30. Dr. Jeff Warren, DCM’s coastal hazards specialist, recently left DCM for a position as Director of Environmental and Regulatory Affairs in Senator Phil Berger’s office. Public Information Officer Michele Walker’s position has moved to the Department’s Office of Environmental Education and Public Affairs. Michele will continue to serve as DCM’s public information officer, and will also be working on department website initiatives. Morehead City compliance representative Ryan Davenport and his wife Sarah welcomed daughter Isla James on February 11.

DENR ASSISTANT SECRETARY REMARKS

Chairman Emory welcomed Robin Smith, Assistant Secretary for Environment.

Robin Smith stated we talked at the last meeting about Executive Order #70. This is the Governor’s Executive Order concerning rulemaking. This Executive Order had several different pieces to it. One of the initial pieces asked agencies to look at rules that are underway to be sure that the rules were necessary and to be sure that the rules are not unduly burdensome. There was also a piece of the Executive Order that was intended to look at existing rules. The Governor asked the Executive Branches to look at existing rules and identify any rules that we believe are unnecessary or unduly burdensome. We did identify a handful of rules that our agency felt were ready for repeal. In another part, the Governor established a website through OSBM inviting citizens to identify rules that they believe are unnecessary or unduly burdensome. That process has been ongoing. As a result of this process, the Governor has identified about 900 rules that she has recommended for repeal. DENR had about 200 of these 900 and most of them had to do with programs that no longer exist. There is an ongoing review through OSBM of much more substantive rules that have been identified by citizens. We are providing feedback to OSBM on these rules. The most recent piece of implementation information has to do with new

rulemaking. OSBM has requested that agencies provide notice to that office prior to publishing notice of the proposed rule and prior to adoption. This is new guidance for us. OSBM has asked for a monthly notice. OSBM is seeing most of our rules anyway because of the fiscal review process. If a rule triggers the need for a fiscal analysis then it is reviewed by OSBM anyway prior to publication of the notice in the NC Register.

Senate Bill 22 has passed the Senate and been sent to the House. This Bill essentially says that an agency may not adopt a rule that results in additional costs to the person subject to the rule unless the rule falls into one of several categories. The categories are that it would either address a serious and unforeseen threat to public health, safety or welfare. This is the language used to justify emergency rules and most of our Commission's rules do not fall into this category. The second alternative is that an act of the General Assembly or the United States Congress expressly requires the agency to adopt the rule. The third is a change in federal or state budgetary policy so the rule responds to the change. The next alternative is that the rule responds to a federal regulation or a court order. We have talked to members about some of the possible implications of a Bill this broad. The House does not seem to be in a great hurry to take this Bill up and there seems to be a different point of view on the House side about how broad to go with a Bill like this.

The other legislative piece is a Senate Joint Resolution (SJR17). This would create a new joint legislative regulatory reform committee. It would consist of nine members from the Senate and nine members of the House. The idea would be to have this study committee do something similar to what the Executive Order process is doing which is to go out and hold meetings across the state to get input from citizens on both the rulemaking process and rules that may be presenting a particular impediment to economic development or rules that are unduly burdensome. There is a sense of fairly strong support in both bodies for creating the legislative joint study committee.

The Governor's budget was released last week. Under the Governor's proposed budget, the Department would see a reduction of about 13%. My understanding is that across State government there were additional reductions for the next biennium ranging from 7-15%. DENR was toward the higher end of the range. The Joint Appropriations Subcommittee that deals with the Department's budget has been meeting three mornings per week for the past two weeks and it looks like they will continue on that track until one House produces its budget. The leadership of the General Assembly has put out their budget targets for each of the appropriations subcommittees. This year, more than in the past, we are getting a lot of questions along the lines of which programs in the Department are federally mandated programs versus programs that are not federally mandated. We are being asked which rules are more stringent than corresponding federal rules. There seems to be a lot of interest in the question of whether we need to do things that are beyond what is necessary to meet federal environmental mandates.

Bill Peele asked Ms. Smith about the Bill that is in the Senate that talks about terminal groins. Ms. Smith stated it was either filed late yesterday or today and it looks a lot like the CRC's recommendations in that it includes a lot of the requirements to justify terminal groin approval. There is no bonding requirement, which was a recommendation of the Commission. There seems to be a little more play in terms of the number of structures that could be authorized.

There is language in the Bill that would allow a terminal groin on each shoreline of an inlet, except that there could be one additional groin in an area located near a federal navigation channel. The groin Bill is likely to be up for its first committee hearing next week in the Senate Agriculture and Environment Committee. Ms. Smith told Commissioners that if they had comments on the draft Bill language then the comments should be sent to Jim Gregson.

CHAIRMAN'S COMMENTS

Chairman Emory stated at the CHPP Steering Committee meeting we discussed estuarine shoreline management, especially shoreline stabilization techniques. This has been an area of interest to the Commission for awhile, but while we are doing some field trials and some studies we have put it on the back burner. Dr. Fear is making progress on this and the Commission should see data by mid-year and even more by the end of the year that will allow us to take this topic up again. We heard that there has been a groin bill introduced in the Legislature. We will know the fate of this bill by the next time we meet. We will likely be discussing next steps resulting from this bill. The Commission had developed a draft sea level rise policy at our last meeting and asked Staff to begin discussing this policy with local governments. It has become obvious that we unintentionally and unnecessarily alarmed some local governments. We are going to talk about it some more today have a chance to make some changes to the draft policy in response to some of the concerns we have heard from local governments.

CRAC UPDATE

Ray Sturza, Chair of the CRAC, stated I represent Dare County on the CRAC. The CRAC discussed an area wide picture of what is going on along the coast of North Carolina as a region and how it is effecting our local governments and how the CRAC may serve as an adjunct to the Commission in terms of providing information and feedback. We also had a presentation from Cyndi Karoly. One of the issues raised at the last meeting concerned issues that have been arising in our urgency to establish a way to retain stormwater on site. We have gravitated toward the construction of on-site retention ponds. One of the ramifications that we did not recognize is that the maintenance of these ponds has become an issue. We find that they need to be maintained and folks that moved into the developments feel that it is someone else's responsibility. We are not sure what the answer is, but local governments should be prepared in advance for it. The other alternative would be the development of stormwater collection systems. The CRAC also heard from Mike Lopazanski concerning our new committee structure. We provided each member an opportunity to request an assignment to one of the two new committees that will be established.

PRESENTATIONS

CRC Offshore Energy Exploration Recommendations (CRC 11-01)

Mike Lopazanski

Mike Lopazanski stated a Bill had been introduced in the General Assembly in response to the BP Spill in the Gulf of Mexico. Senate Bill 836 addressed the liability for damages caused by the discharge of oil into state and coastal waters. The Bill added information requirements for state consistency review. It also directed the CRC to review laws and regulations related to offshore energy permitting and development. It directed the Department of Crime Control and Public Safety to review the oil spill contingency plan and directed DENR to review the

limitations on recovery of damages to public resources from oil or other hazardous substances. This was a reaction to the BP disaster. The Division of Coastal Management reviews projects associated with federal activities such as beach nourishment, dredging, as well as oil and gas activities in the Outer Continental Shelf area. It is through the federal consistency provisions of the Coastal Zone Management Act that the state gets to comment on either a federal activity or an action that requires a federal permit even when it may be outside the state's jurisdictional boundaries. The amendments to CAMA specifically spoke to the consistency review of offshore projects. The General Assembly incorporated many of the provisions that are in the CRC's 7M .0400 Coastal Energy Policies into the law. Elements from the federal requirements were also incorporated. Since the CRC met in November, there has been additional activity at the federal level. New regulations that focus on workplace safety and oversight of environmental safeguards were given a lot of attention. The federal government has also begun the process of developing a programmatic EIS for geological and geophysical studies for the Mid Atlantic and South Atlantic planning regions. The Bureau of Ocean Energy Management is continuing moving forward with the seismic studies and are seen as being critical to future development of oil and gas, wind energy, and non-energy mineral resource issues. The Mid Atlantic and South Atlantic will not be included in the 2012-2017 lease program. The BOEM's intention is to focus on areas that currently have active leases. The public comment period on the next five year lease plan ends on March 31. Other activities that have occurred since November include the further division in the Bureau of Ocean Energy Management. The Department of Interior has continued to undergo reorganization for the Bureau. The Bureau of Ocean Energy Management is going to be responsible for leasing, plan administration, environmental studies, NEPA analysis, resource evaluation, as well as the renewable energy program. The new Bureau of Safety and Environmental Enforcement will administer the safety and environmental regulation functions. The CRC has done a lot of work with regard to offshore energy. The Commission had its own ocean policy study that resulted in rule changes that addressed the wind facilities as well as the broadening of the CRC's coastal energy policies to be more inclusive of all ocean-based energy development. The Legislative Research Commission Advisory Subcommittee on offshore energy exploration recommended further study and analysis and also recommended that their work be rolled into the Governor's Advisory Panel. The Governor's Scientific Advisory Panel has planned a number of public meetings to gather public comments and input on energy development off the coast of North Carolina. The weather caused them to cancel two of them but they did hold one meeting. The big focus from the public's point of view was to seek ways of enhancing our abilities to develop alternative energy sources, primarily wind energy resources off of the coast as opposed to pushing for oil and gas development. The Governor's Advisory Panel is still in the process of drafting their report. Another offshore energy group has been formed, the N.C. Wind Energy Task Force, and is coordinated by the Minerals Management Service in order to help the state with development of offshore wind projects. We are likely to see additional changes at the federal level. These changes will have bearing on how offshore projects are permitted. Since North Carolina is no longer included in the 2012-2017 five-year lease program, Staff recommends that the CRC's recommendation to the Legislature be to allow the Governor's Scientific Advisory Committee to complete its work.

Jim Leutze made a motion that the Coastal Resources Commission recommend to the General Assembly to allow the Governor's Scientific Advisory Committee to complete its

work. Charles Elam seconded the motion. The motion passed unanimously (Leutze, Joyce, Mitchell, Webster, Simmons, Wynns, Peele, Weld, Bisette, Cahoon, Elam, Old).

Marine Spatial Planning and Efforts to Streamline OCS Wind Energy Development (CRC 11-08)
Scott Geis

Scott Geis stated this is an overview of Coastal and Marine Spatial Planning and federal activities to expedite the permitting of offshore wind facilities. Marine spatial planning is defined by the interagency ocean policy task force. The definition is a comprehensive, adaptive, integrated, ecosystem-based and transparent spatial planning process, based on sound science for analyzing current and anticipated uses of ocean, coastal and Great Lakes areas. It is a process for areas most suitable for various types or classes of activities in order to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystem services to meet economic, environmental, security, and social objectives. CMSP is an attempt to move away from traditional, single-sector management approaches to enhance resource protection and development. Federal and state government agencies are developing Coastal and Marine Spatial Planning capabilities to help make better resource management decisions, particularly as demand for ocean space and resources continue to grow. This growth can be attributed to the emergence of new human uses converging with traditional human development and harvesting of ocean and coastal resources. Comprehensive planning enabled NOAA, the U.S. Coast Guard and several other government agencies and stakeholders to examine shipping needs, proposed permitting of deepwater natural gas port locations, and endangered whale distributions. This was an effort to successfully reconfigure the Boston Traffic Separation Scheme (TSS) to reduce the risk of whale mortality due to collisions with ships in Stellwagen Bank National Marine Sanctuary. The reconfigured TSS reduced the risk of collision by an estimated 81% for all baleen whales and 58% for endangered right whales. Industry transit times increased by only 9-22 minutes depending on speed and conflict with deepwater ports was eliminated. In addition, the new route decreased the overlap between ships using the TSS, commercial fishing vessels, and whale watch vessels, thereby increasing maritime safety. CMSP has the significant potential of applying this integrated, multi-objective, multi-sector approach on a broader, sustained scale. In this scenario we have essentially a narrow focus. There is a cause and effect situation that is likely occurring or a reactive process. For North Carolina we need to think what is the driver and how do we incorporate this driver into a larger plan for a state-level approach to CMSP. At this moment, the driver appears to be wind energy and how these facilities are going to go in and impact existing uses of our marine resources and state and federal waters. On June 12, 2009, there was a memorandum sent out to the heads of executive departments and federal agencies establishing an Interagency Ocean Policy Task Force. This task force was charged with developing recommendations to enhance national stewardship of the ocean, coasts, and Great Lakes to promote the long-term conservation and use of these resources. The task force was led by the U.S. Center for Environmental Quality and included 24 senior level policy officials from across the Federal Government. In September 2009, the task force released its interim report. In December 2009, the task force released its interim framework for effective CMSP. In July 2010, the final task force recommendations were released and President Obama signed an Executive Order establishing a national policy for the stewardship of the oceans, coasts, and Great Lakes. This National Oceans Council represented the first ever national ocean policy. They looked at how to strengthen the government structure to provide

high level coordinated efforts and attention to the resources and attention to demands on the resources. There were nine national priority objectives which included ecosystem –based management, coastal and marine spatial planning, regional ecosystem protection and restoration, and ocean, coastal and Great Lakes observations, mapping and infrastructure. One of the priorities that was established for the National Oceans Council was the development of a national information management system (NIMS). This is data acquisition and the identification of the resources. Draft plans for NIMS implementation is due in August 2011. Final NIMS implementation plan is due November 2012. There has already been significant work done on this database in the form of the Multipurpose Marine Cadastre. This is an effort by NOAA to create an integrated marine information system that provides legal, physical, ecological, and cultural information in a common geographic information system framework. This is particularly beneficial to those involved in CMSP efforts that involve finding the best location for renewable energy projects. It provides direct access to authoritative data on marine boundaries, jurisdictions, habitat and biodiversity, geology and bathymetry from federal and state sources. In November 2010, the Smart from the Start Initiative was launched. The key players are Secretary Salazar of the Department of Interior, the Bureau of Ocean Energy Management, and NOAA. It is a plan to expedite appropriate commercial-scale wind energy development in America’s waters. A lot of the momentum of this initiative has come from the Cape Wind lease. It has gone through significant environmental review. The national goal is for generation of 80% of the nation’s energy from renewable sources by 2035. The goals of the initiative are to identify priority wind energy areas for potential development and designate federal lease blocks, improve coordination with local, state and federal partners, and to accelerate the leasing process. Mid-Atlantic regional environmental assessments for wind energy areas are being developed using CMSP principles. Transmission lines should be addressed simultaneously. In February 2011, the Departments of Energy and Interior released a coordinated strategic plan for offshore wind energy. The plan focuses on overcoming three key challenges; the relatively high cost of offshore wind energy, technical challenges surrounding installations, operations, and grid interconnections, and the lack of site data and experience with the project permitting process. There is money that is investing into these specific activities including technological development, removing market barriers, and the next generation of turbines. Based on stakeholder and public participation, BOEM will prepare regional environmental assessments for wind energy area to evaluate the effects of leasing and site assessment activities on leased areas. If no significant impacts are identified, BOEM could offer leases in these mid-Atlantic areas as early as the end of 2011 or early 2012. Then a comprehensive, site-specific NEPA review process will need to be conducted for the construction of any individual wind power facility. BOEM will work directly with the project managers to ensure that these reviews take place on an aggressive schedule. The National Offshore Wind Strategy is pursuing a scenario that includes deployment of 10 gigawatts of offshore wind generating capacity by 2020 and 54 gigawatts by 2030. WEA’s have been defined for the mid-Atlantic and will receive early environmental reviews that will help to lessen the time required for review, leasing and approval of offshore wind turbine facilities. In March 2011, the Department of Interior expects to identify WEA’s off of the North Atlantic states including Massachusetts and Rhode Island and launch additional NEPA environmental reviews for these areas. A similar process is expected to occur for the South Atlantic region, namely North Carolina, in spring 2011. In the Ocean Policy Steering Committee Report that was published in 2009, coastal and marine spatial planning was a significant component. The NOAA 309 enhancement grant strategy has plans for beginning the

discussion of how North Carolina would go down the path of creating coastal and marine spatial planning and the groups that would need to come together to facilitate the discussion. The UNC wind study is also a good example of how one of these analyses could go forward.

UNC Coastal Studies Institute
Dr. Andy Keeler

Dr. Keeler stated the Coastal Studies Institute and the public policy programs are part of a network of research and outreach that supports decision making at the state and federal levels. We are also a part of the University network that has research expertise in coastal issues. We are a focal point for northeastern North Carolina's issues because of our location. Our goals are to include public policy on the North Carolina coast by producing usable research within and across disciplines. We want better use of and accessibility to research results. One of our goals is fostering participatory decision making in the context of the research. We also want to help fulfill the role of honest broker in helping people evaluate competing claims about science and policy. CSI can provide a broad view of issues and options facing coastal North Carolina in front of the CRC. We can put individual issues in the context of fundamental socioeconomic and environmental driving forces. We can incorporate experiences from other locations and from similar issues. CSI can provide a long-term perspective on policy issues. We can also help the CRC put social science and scientific research in context for decision making. Some of the key issues that we plan to look at are adaptation to changes on the coast, energy on the coast, shoreline protection, biodiversity protection, and marine protected areas. Coastal public policy is always about adaptation because its conditions are always changing. Some of the particular focuses on public investment include infrastructure and public goods. We also need to understand market responses to changing conditions. Regulations to manage the commons in changing conditions in all kinds of biodiversity are central to adaptation. Adaptation includes prioritizing and carrying out research and development. Adaptation also includes public education about and participation in policy formation and implementation. Ocean energy research is a CSI priority. Understanding both energy system and environmental policy that affects power generated using coastal resources in the context of meeting energy needs on the coast is a focus of our program. The costs of alternative shoreline protection management strategies and expectations for the future will be looked at. There are co-benefits and costs of alternative strategies. Particular attention will be paid to financing alternatives. We will focus on real estate market feedback. We have a strong focus on long-run costs and the timing of policy and strategy changes. We have our own mess on the Outer Banks that deals with biodiversity protections. We are hoping to use this to look at the difficult decisions of management issues in both science and policy research. CSI will work with Maritime Heritage and Educations programs at CSI to examine public policy and economic value of marine protected areas. CSI is committed to building a program in public policy that compliments its other programs in Coastal Processes and Engineering, Estuarine Ecology and Human Health and Maritime Heritage. We believe that our program should be useful for supporting decision-making and for increasing systematic understanding of human-environment interactions on the coast. We place a high priority on working with the CRC and DCM.

Progress on Sea Level Rise Policy Development (CRC 11-03)

Tancred Miller

Chairman Emory stated he has had contact by some people that are concerned with the path the CRC is on. We have a draft policy on sea level rise that we are reviewing with local governments. This policy includes the Science Panel recommendation of one meter of sea level rise by 2100. Some of the things that local governments would have to consider are addressing sea level rise in land use plans and taking sea level rise into account where development is located and development standards or in locating infrastructure. While all of these are reasonable and logical subjects for local governments to consider, as we stated them in the draft policy it has caused some alarm. Additionally, I have heard concern over the projected one meter of sea level rise by the year 2100. I have not heard one single person say that they don't believe sea level rise is occurring. The use of the Duck tide gauge as the primary indicator of historic sea level rise has been questioned. The application of one rate of sea level rise along the entire coast has also been questioned. Today we will look at a revised version of the sea level rise policy. DCM has been out meeting with local governments and we will ask staff to make some revisions that are responsive to the concerns that we have heard from local governments. Without intending to, the CRC has incorporated some things in the original policy that are premature of where we are on this issue. The CRC's one meter rate came from the Science Panel, but NC-20 has an alternate view. When we asked the Panel to give us an estimate of sea level rise for the state we did not give them much time or opportunity to develop different estimates for different parts of the state. It would be helpful for the CRC to ask the Panel to take some time to see how sea level rise will affect different parts of the state. I would also like the Panel to help us understand the alternative view from NC-20. The bottom line is we need to be careful as we address sea level rise. We need local government to be our partners as we talk about how sea level rise is going to affect the coast. We need to be open to making changes in our policy and be sensitive to local government's concerns.

Tancred Miller stated Chairman Emory has reviewed the feedback very accurately. We have heard from Carteret County and other counties and it has reminded us that we have overstepped what the intent of the policy is and crossed the line between policy and regulation. It is a group effort. We have met with Carteret County, the Nags Head Planning Board, and Pender County. We have also received written comments from BASE in Brunswick County. The comments have been fairly consistent. The major concerns are the use of the Duck tide gauge data that the Panel thought we should use as a conservative estimate of what we should look at statewide. Another concern was that one single rate should not apply to the entire coast. The one meter rise rate was also a concern. There is a lot of discomfort about the one meter rate and there is probably no need to talk about a one meter rate. The CRC has no desire for a direct result to be the immediate action of the local government. The land use planning provisions also were a concern because it causes local governments to immediately apply a one meter benchmark to their land use plans, but that is not the intent and it is something that we should amend. We have made some changes to the draft policy approach. There is no rush so we abandoned a timeline. We want to focus on education and awareness at the local level. The CRC should reconsider using a benchmark. We should take it out completely. We should ask local governments to familiarize themselves with what impacts could be. NOAA has been in conversation with me and we could take another look at the tide gauge data. We also want to clarify the land use

planning guidelines. There isn't anything in this draft policy that should give a local government the concern that this will directly influence what they put into their land use planning guidelines. In the draft policy revisions, we propose that any notion that a rule update will follow this policy should be stricken. This policy should stand on its own. We would leave a note in the draft policy that says that land use planning comes through the 7B guidelines and not through the sea level rise policy. The specific things about land use planning in this draft policy are probably not necessary. Whether or not sea level rise is accelerating is probably not as important to the conversation as the agreement that sea level rise is occurring and will continue to occur. In the comments from BASE, they were concerned about low impact development and say that it is not a conservation measure. We have stricken the language from the draft policy. We have also removed the planning benchmark. There is one section that is drafted to include a reference to local land use plans. This section says that the CRC encourages coastal communities to consider regional rates using their local tide gauges as well as projected rates in planning.

Charles Elam made a motion to accept the revisions to the draft sea level rise policy and directed staff to take the new draft policy out to local governments to continue receiving feedback. Ed Mitchell seconded the motion. The motion passed unanimously (Joyce, Mitchell, Webster, Simmons, Wynns, Peele, Weld, Bisette, Cahoon, Elam) (Leutze, Old absent for vote).

PUBLIC INPUT AND COMMENT

Bill Price stated he is from Morehead City. I have heard a couple of comments here today about whether or not sea level is rising. I generally agree that sea level has been rising since the last ice age. The general question is whether or not it is accelerating. We all need to know about it. We need to know what to do about it. However, some folks are very concerned about the report. Some of the information seems to be not quite all there. There is a full tide gauge record that started in 1850. There were three gauges on the coast of North Carolina. I have a copy of the letter of transmittal of the report of 1855. It was done annually. There is an indication of tide gauge benchmarks. I would hope that at a very minimum this group would find the tide gauge data for the past 160 years and use that as a beginning point to consider sea level rise issues. In 1850 there was a series of charts and maps of the entire coastline of America. If Duck is projecting to have had 15 inches of sea level rise up until now for the past 100 years, then it would be 24 inches in 150 years. One would think that 24 inches would have had a dramatic effect on the coastline of North Carolina. I am just wondering if anyone has gone back and looked at the charts from the 1850's and compared them with charts of today to see how much difference there has been. There have been hundreds of millions of cubic yards of material that has been dredged out of the inlets and dumped offshore. It has stopped pretty much all of the downdrift material that erodes and naturally builds up the coastal plain. In any event, when I look at the chart it looks close to what I see today. Please look at the NOAA temperature record for North Carolina. There is a picture that shows NOAA weather stations and infrared heat sources. NOAA acknowledges that there is a problem with their data and they do a computer adjustment. Before making any policies you should evaluate the data that is available.

George Birchard stated he is a body surfer, geochemist, PhD, and worked in a regulatory agency with the US Regulatory Commission. I applaud you for having the courage to go forward and show leadership with sea level rise. You are the first to do this. Stick to the science. If you try

to get involved in a situation where you back off from what the science is telling you based on politics, and you have to consider politics in how you say things and how you do your basic involvement with the State, but you still have to stick to what the science is telling you. Or you are not going to have anything to base what you are doing on. You are going to be adrift. I have been looking over the last year or two at a lot of reports and scientific literature and the problems are getting worse in Greenland and Antarctica and a lot worse than the IPCC projections. I have a lot of stuff on my computer and I can't show you, but you are right to get ahead of this. You are going to get a lot of feedback and people saying that it isn't true, but go to the data and go to the science and listen to your people and don't just base it on North Carolina. You are going to have to look at global data and look at the information in peer reviewed literature and base your decisions on solid science. I go out to the Outer Banks and it is getting harder and harder to get to Cape Hatteras. It gets very complicated and we get into disagreements about dredging. Go back to the science. When I go to Hatteras they tell me just how far the sand has come in at Rodanthe. I see houses disappearing as I am body surfing. I see change. Go back to the science and stick with your guns. Listen to the local people and ask how can we help you. Don't try to force things down their throats. Try to help them solve their problems.

Sharon Spencer stated I am the Hyde County Commission Chairman. It was interesting to hear Mr. Simmons' comments and I hope I don't have to tell everybody to go get a house boat or a boat to travel around in for Hyde County. We are concerned about sea level rise. But we are also concerned about policy. We know when you make policy that means regulations. When you make regulations that means restrictions. We are desperate for economic growth. We are trying so hard to create a good infrastructure so we can do it. Everybody is struggling and we just hope that you use the good solid scientific data and remember that there are people in this equation that will be greatly impacted by what you decide.

Larry Baldwin stated I am one of the representatives of NC-20. I have had the opportunity to talk with a couple of your staff and I appreciate the time they gave us to air concerns and questions we had. Much of what I have already heard this morning took a lot of the fire out of what I had to say. I think this is the right considerations for this. Let's get the public educated that there is sea level rise. There are not too many people that deny that there is sea level rise. The rate has a lot of controversy. I think to try to counterbalance that it is always good to keep around your friends, but keep the opposition closer. If the intent is to try to get the idea out on sea level rise then let's keep it at that. It is hard to get around specifics. Even for any other rules and policies, rough policies can become de facto rule making. This sea level rise policy has done damage already. It is already in the paper. When you start airing this in public it gets into the paper that there is a 39 inch sea level rise projection. The banks and insurance have already looked at this. The County tax base could be impacted by it. Maybe not directly, but just by the demand and supply of land. There has been damage done. Insurance and costs to do D.O.T. roads with a 39 inch sea level rise is billions and billions of dollars. I would caution you before you start trying to educate the public that we try to keep the specifics out of it and then get into specifics later. The only way we are going to do this is to have a two party, pro-con committee before we get to the specifics of a policy. That way you can air a lot of public concerns before we start to get into rulemaking.

Harry Simmons stated I want to offer the opportunity to answer questions about the terminal groin legislation that has been proposed and see if there is anything I can tell you based on my knowledge. There was a lot of information provided to folks in Raleigh and some of it is in this Bill and some of it is not. I was as surprised as you were to see some of the elements in it when it came out yesterday. It does seem to be at least something that we can work with. It puts the process in the hands of the Division of Coastal Management through the Major Permit process. It adds some things that are not included in every other Major Permit. There is a whole list of things that must be met. It is acceptable to me and my group of folks. It is one of those things that you will have to wait and see how the process works.

Chris Voss stated I am here as a North Carolina tax payer but I am also a coastal ecologist. I want to say thank you for being proactive. The North Carolina coast is one of the three areas in the country that is most greatly impacted by sea level rise. I also applaud you for trying to keep the political process, which is very short-term oriented, different from sea level rise which is long term oriented. I would think you might want to consider relative sea level rise because it is a relationship of the land with the sea that is causing the effects that we see. I see that all the terms in your policy just deal with sea level rise. There is a preponderance of information that suggests that sea level rise is accelerating. I, as a scientist, think that you are missing the boat if you don't try to capture the acceleration. What you do with it as far as policy down the road is something to be decided later, but sea level rise is accelerating. As far as looking at sea level rise rates, there are various cycles and water level patterns that run on about a 20-year cycle. If you look at very short term periods then you might get information that actually conflicts with the longer term patterns. I also want to say that the goal of the Commission is to protect the tax payer. Let's be proactive. It is more cost effective in the long term if you are prepared for what is coming down the road. Fortunately, sea level rise is a very slow process and we have some time. Please let's be proactive and don't back down from the science. It is truly what is guiding us.

PRESENTATIONS

Climate Change Ecosystem Assessment

Laura Gadd

Laura Gadd stated I am here from the North Carolina Natural Heritage Program to talk to you a little bit about what our program has done to address climate change and the effects on ecosystems. The Natural Heritage Program is a program within DENR and was founded in 1976. We are part of an international network. Our staff are funded through the Natural Heritage Trust Fund grant. We have a partnership focus. We are a non-regulatory program who works with other conservation partners focusing on conservation efforts and our motto is Science Guiding Conservation. We take inventory of where the species occur and where the high quality natural communities are located in the state. Our focus for conservation is significant natural areas. We track wildlife habitats and share this information with other conservation agencies. We work very closely with DCM, WRC, State Parks and other conservation agencies in the state on state, federal and local levels to support conservation. In late 2009, DENR started working on climate change and started to develop a strategic plan. The goal of the plan was to address litigation and adaptation and the strategies that will increase resilience to natural resources to the expected changes of climate change. DENR's climate change initiative addresses both

mitigation strategies as well as adaptation strategies. The Natural Heritage Program is addressing climate-sensitive ecosystems. We started this process about a year ago in early 2010. We were charged with coming up with an assessment of how ecosystems will be effected by climate change. We developed a detailed ecosystem risk assessment. Then we needed to identify what species and ecosystems are going to be most at risk from the expected climate change factors. We then identified adaptation strategies or management practices to enhance resiliency. Priority conservation areas and corridors had to be identified as well as avoiding adverse effects on biodiversity from human responses to climate change. We took a hierarchical approach. It started with our panel of biologists and the initial structure was worked out internally. It was then reviewed and we received input from our partners. When we started this process we knew there was uncertainty. We have to generalize from the limited detailed data on particular effects. When we started this process we were taking our information from Climate Wizard (www.climatewizard.org). This is a program put together by the Nature Conservancy where they have assimilated different kinds of climate models. Our methodology included compiling a list of physical and biological changes that we expect to happen based on a list of impacts from climate change. Then determine if the impacts are good or bad. Then we rank climate change threats in comparison to other threats. Then we recommended adaptation strategies. We are still in the process of identifying conservation priorities. We have identified 42 ecosystem groups. These include terrestrial, aquatic, and successional communities. Of the 42 ecosystem groups, estuarine communities is one of them. For these estuaries the climate impacts that we have identified are sea level rise salt intrusion, sea level rise inundation, drought, flooding, and storm surge from increased storms. At the ecosystem level the response could be inland migration, change in species composition, elevation change as it shifts inward, and change in acreage. At the community level we have identified four different communities. The communities are salt marsh, brackish marsh, salt flat, and salt shrub. At the species level we know there are rare, disjunct or endemic species there that are already extinction prone. Any kind of major disruption could be bad news for these species. We also know that a lot of these species are already well adapted to a naturally dynamic environment. In the estuarine communities climate change is probably the biggest threat followed by development and pollution. The adaptation strategies for this ecosystem are to protect future sites which would allow for migration of the ecosystem, control erosion, maintain hydrology, allow barrier islands to naturally migrate, preserve riparian buffers, and stormwater controls. Another example along the coast is the dry longleaf pine community. The effects we think will most likely be caused by climate change are wind damage, milder winters and wildfires. We know these systems are adapted to wildfires and they are actually a good thing if it is not catastrophic. With warmer temperatures we could see an increase in invasive species. There could also be a change in structure if we have different species migrating up from the south and coming into these ecosystems. The longleaf pine communities can also increase in range. The communities in these systems include xeric sandhill scrub, mesic pine flatwoods, as well as many rare plants and animals. Some are already very rare and could be prone to extinction. Invasive species such as fire ants and armadillos moving north would threaten eggs, immature snakes and other ground nesting vertebrates. The combined threats to the longleaf pine community are development, conversion to agriculture, fire suppression, and lastly climate change. Adaptation strategies for these systems include protecting what we have, controlling invasive species, conducting prescribed fires, and restoring the landscape connections. Of the 42 ecosystems that we looked at, we looked at the ecosystem groups that were most threatened by climate change. The coastal

plain nonalluvial mineral wetlands, estuaries, freshwater tidal wetlands, maritime grasslands, maritime upland forests, and maritime wetland forests had sea level rise as the most threatening. The assessment identifies not just vulnerable habitats, but also those with resilience. We should not abandon highly threatened ecosystems, habitats, or species. Recommended interventions are things that we should be doing anyway. Climate change is not the only threat. There are still a lot of other threats that we have been working on for a long time and we don't want to abandon those. All of these reports are found on our website at www.climatechange.nc.gov.

Sea Level Rise and Marsh Migration – Spartina Marshes Dr. Carolyn Currin

Carolyn Currin stated this will address how marshes will respond to sea level rise. The marshes we have today developed during a period of increasing sea level rise. Marshes are well adapted towards keeping up with sea level rise and thriving during periods of sea level rise. There are rises and falls in the mean of sea level rise. It is not a straight line. We plan for the mean but it is just an average. There is a tremendous amount of variability in sea level rise both annually and over the long term. Over the past 100 years we have had about a 20 centimeter rise in sea level around the world and is about 2 millimeters per year. The current rate in North Carolina is projected to be three to four millimeters per year. We do anticipate acceleration. The marsh's response to sea level rise could be erosion due to wave energy, sink/drown, accrete in place, prograde seaward, or transgress inland. Salt marshes in many areas have demonstrated the ability to increase their elevation at a rate equal to recent relative sea level rise. As the tide comes in it carries sediments in with it and it builds up the marsh platform. The marshes also respond to tidal flooding by producing more biomass. There are a lot of people around the state who are tracking this process. We establish benchmarks and look at millimeter changes in surface elevation by comparing changes. The other thing we do to look at how much sediment is coming in on top is to put down horizon markers and measure millimeter changes. We can also use the benchmarks to use GPS systems to make digital elevation models and track centimeter level changes. We have had a four year project here in Carteret County where we focused on fringing salt marshes. We have learned that the edges of these marshes are losing elevation. However, on the upper edge they are building elevation. That can't keep on for too long or you will end up with a very steeply sloped marsh. We also have some evidence that if there is an oyster reef or toe at the edge of the marsh that it slows the elevation loss. We have another project down in Onslow County where for the past two years we have looked at marsh net elevation change. We have found that spartina marshes are accreting at a rate of 2-9 millimeters per year. We have done some fertilization and found that if you fertilize the marshes the elevation increases significantly. We have also looked at juncus marshes a little bit. The marsh equilibrium model suggests long-term sustainability is a problem with accelerated sea level rise. There are a number of research groups in the state that are doing this kind of work. Another way marshes can react is transgression, the horizontal movement of the marsh. One really important factor in marsh transgression is the slope of the land. If there is a lot of sediment supply and a fairly gentle slope then you will be able to build your marsh at the sediment supply and the marsh will be able to transgress inland. As you decrease your sediment supply with the same slope then you are not able to maintain the lower marsh and it will be eroding inland but you will still have transgression upland. The problem is if you have a steep slope. If the slope gets steep enough then the marsh isn't going to be able to transgress inland. Marshes occupy a narrow

band between high tide and mean sea level. *Spartina* marsh is mostly under water at high tide. The species distribution follows small changes in tidal elevations. In North Carolina the estuarine tidal range varies between 20 cm and 120 cm increasing from north to south. You can see the transgression into uplands marked by dead trees. The trees have likely died because of salt water intrusion. Shorelines are very dynamic. If you are in the more southern parts of the state where there are high banks you could have had a fringing marsh, but once it erodes then there isn't any place for it to go. Slope is going to be a major determining factor on whether the marshes will be able to transgress. Another issue is whether or not there is a hardened shoreline. If you have a heavy clay soil it will be harder for the marsh to get in and penetrate the heavy clay soil. Shoreline development limits marsh transgression even in areas with low elevation change. There are also groups in the state using a variety of modeling approaches to forecast exactly how marshes are going to respond to sea level rise. In Carteret County some parts of the county will probably get transgression. In other areas, like the backside of barrier islands, it is more likely to overwash. Other areas, like along the backside of Bogue Sound, are going to suffer from erosion. If there is not adequate sediment supply then some marshes, like Middle Marsh, will just sink. They either have keep up with sea level rise or they will sink. Shoreline slope, sediment supply, and coastal development will largely determine the ability of the marshes to vertically accrete and/or horizontally transgress. We don't know what the rate of sea level rise is going to be and storm events are game changers.

Swan Quarter Dike Project
Rob Williams, USDA-NRCS

Rob Williams stated I am an engineer on the NRCS staff in Raleigh. Five hurricanes between 1954 to 1960 led to development and approval of the Watershed Workplan that falls under the Watershed Protection and Flood Prevention Act. The original Swan Quarter Work plan was signed on February 2, 1965 by the chairman and secretary of the Pamlico Soil and Water Conservation District. This District is now broken up into the Beaufort, Hyde, Washington, Tyrrell, and Dare Districts. The original work plan encompassed quite a bit of area including 17.7 miles of earthen dike, 3 pumping plants, 16 tide gate structures, 19.1 miles of channel improvements, and 11, 440 acres. There were four primary objectives. The first was the acceleration of planning and installation of on-farm conservation land treatment measures. The second was to improve outlets for on-farm and small group drainage ditches. The third was the elimination of flooding caused by high water and wind tides. The last was the reduction of flood damage from excess direct precipitation. Nothing was done on this project at this time. There were concerns about long-term pumping costs and concerns about the fact that the land treatment measures had been installed and were progressing well with other funding sources. There was a request from the local sponsors to modify this plan. That was done in 1984 and was called the West, Quarter, Double, and Bay Supplement. It deleted the entire original work plan except for reduction of flood damages caused by high wind tides. It also added the Hyde County Board of Commissioners as a project sponsor. The project decided to use the 25-year high wind tide as the control elevation for this project. The source of that decision was a 1955 Corps of Engineers report on Hurricanes Affecting the North Carolina Coastal Areas, Appendix B. The revised plan was significantly cut back to 6.1 miles of earthen dike, no pumping plants, 29 tide gates, 34 water control structures, 2.9 miles of channel improvements, and 7,040 acres. The Corps' permit was obtained in February 1986 and work began in 1987. There were a series of seven contracts

and the extent of each contract was determined by funds availability. The first phase was the installation of an earthen dike on the east side of the project. The second phase was the installation of one of the tide gate structures. The gates are modular so you can put as many gates in as you want based on the size of the channel. Phase three of the project was a continuation of the gate installations. The fourth phase was also a continuation of the gate installation. The fifth phase was the installation of the earthen dike. The sixth phase was the final phase of the earthen dike at that time. Phase seven was a maintenance phase that addressed the few washout areas that had occurred and installed one more tide gate. The work was completed on these seven phases by 1995. Following several hurricane events in the 1990's the local sponsors came back to us and requested that the project be extended west through the Town of Swan Quarter out to the junction of NC45 and US264. An environmental assessment was developed in August 2002, the CAMA permit was issued in December 2002, and the Corps permit was issued in January 2003. The work was carried out in six contracts determined by funds availability. The funding for these later phases was from Congressional earmarks and the American Recovery and Reinvestment Act. In 2003 we had Hurricane Isabel and had quite a bit of damage. The dike received a lot of deposits that had to be cleaned off. The eighth phase of the project picked up where phase seven left off. It was the installation of an earthen dike. Phase nine consisted of a continuation of the earthen dike where phase eight left off. Phase nine also included a couple of wetlands mitigation sites. Phase ten of the project was the last phase of the earthen dike. Phase eleven was a vinyl and composite post wall. Phase twelve was a continuation of the wall. Phase thirteen is the phase that is currently under construction. It extends the vinyl wall and goes into an earthen dike. We are currently under construction and are on schedule. The scheduled completion date is May 16, 2011.

Draft Subcommittee Description/Structure/Assignments (CRC 11-02)

Mike Lopazanski

Mike Lopazanski stated we have been talking for some time about revisiting our meeting format. The CRC set up a subcommittee to look at our meeting format and come up with some recommendations. The subcommittee recommended returning to a standing committee structure but with some differences from how it was run before. We are going to have two committees. The first will focus on estuarine and ocean systems. The second will focus on ocean hazards. The estuarine and ocean systems committee will deal primarily with the AECs, coastal wetlands, estuarine waters, public trust areas, and coastal shorelines. The ocean hazard committee would deal with the ocean erodible area, high hazard flood area, inlet hazard areas, and unvegetated beach areas. The committees would not necessarily meet every CRC meeting. The committee would only meet if they had an assignment. The assignments would be made by the CRC Chair. The committee meetings would be held on Wednesday morning or early afternoon before the CRC meeting begins. The committees would not meet concurrently. CRC and CRAC have been given the opportunity to sign up for the committee that they are most interest in. The Executive Committee will make the final committee member assignments. Any actions in committee will be brought before the full Commission for a vote. If committee meetings are scheduled prior to a CRC meeting, it is unlikely that there will be a CRAC meeting.

ACTION ITEMS

Land Use Plan Certifications and Amendments

John Thayer

John Thayer stated there are four Land Use Plans up for certification. These are Dare County, Hertford County, Town of Nags Head, and the joint plan between New Bern, Trent Woods, and River Bend. Staff has reviewed these documents and recommends that they have met the substantive requirements of the 2002 7B guidelines and also recommend certification. There are no outstanding issues with any of these documents.

Charles Elam made a motion to certify the Dare County Land Use Plan. Renee Cahoon seconded the motion. The motion passed unanimously (Joyce, Mitchell, Webster, Simmons, Wynns, Peele, Weld, Bissette, Cahoon, Elam) (Leutze, old absent for vote).

David Webster made a motion to certify the Hertford County Land Use Plan. Renee Cahoon seconded the motion. The motion passed unanimously (Joyce, Mitchell, Webster, Simmons, Wynns, Peele, Weld, Bissette, Cahoon, Elam) (Leutze, Old absent for vote).

Chuck Bissette made a motion to certify the Town of Nags Head Land Use Plan. Bill Peele seconded the motion. The motion passed unanimously (Joyce, Mitchell, Webster, Simmons, Wynns, Peele, Weld, Bissette, Elam) (Cahoon abstained) (Leutze, Old absent for vote).

David Webster made a motion to certify the New Bern, Trent Woods, River Bend Joint Land Use Plan. Renee Cahoon seconded the motion. The motion passed unanimously (Joyce, Mitchell, Webster, Simmons, Wynns, Peele, Weld, Bissette, Cahoon, Elam) (Leutze, Old absent for vote).

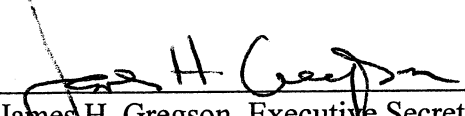
John Thayer stated the Carteret County Land Use Plan has met the conditions of the conditional certification and has been certified by DCM Director Jim Gregson.

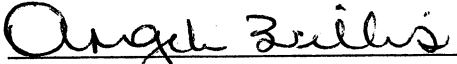
OLD/NEW Business

Chairman Emory stated the revised draft sea level rise policy will be sent out to boards/commissions, local governments, and interested parties and will be accompanied by a letter from him. The revised policy will also be taken back to the local governments that have already seen the old draft policy. Renee Cahoon stated it is not necessary to revisit the Nags Head Planning Board. Bill Peele asked that staff notify the CRC members when/where the Science Panel meets.

With no further business, the CRC adjourned.

Respectfully submitted,


James H. Gregson, Executive Secretary


Angela Willis, Recording Secretary

N.C. Division of Coastal Management
Assessment of 27 Marsh Sills in North Carolina
Final Report



Prepared by: John Fear, Ph.D. and Bonnie Bendell

April 2011

Acknowledgments

The N.C. Division of Coastal Management received assistance from many individuals in completing this assessment. Without this assistance, the project would not have been possible. We wish to sincerely thank those listed here for their enthusiastic support in completing the field visits and their tireless commitment to the coastal resources of our great state. We would also like to thank all the property owners for allowing us access to their properties, as well as all of the survey respondents.

A. Deaton
S. Winslow
K. Hart
R. Sechler
R. Scheller
E. Fleckenstein
T. Skrabal
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C. Currin
T. Wheeler
D. Timpy
J. Steenhuis
M. Dunn
M. Ellwood
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J. Baker
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R. Carpenter
S. McKenna
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List of Abbreviations

CAMA	Coastal Area Management Act
CRC	Coastal Resources Commission
NCCF	North Carolina Coastal Federation
NOAA	National Oceanic and Atmospheric Administration
DCM	North Carolina Division of Coastal Management
DMF	North Carolina Division of Marine Fisheries
DWQ	North Carolina Division of Water Quality
WRC	North Carolina Wildlife Resources Commission
NOAA	National Oceanic and Atmospheric Administration
UNC-IMS	University of North Carolina at Chapel Hill – Institute of Marine Sciences
USACE	United States Army Corps of Engineers

1.0 Project Introduction

1.1 Introduction

North Carolina has more than 9,000 miles of estuarine shoreline (DCM 2010). Most of these shorelines are eroding (Riggs and Ames 2003). The coastal region where these estuarine shorelines are located has also experienced rapid population growth over the past decade. The 20 coastal counties subject to the Coastal Area Management Act have seen on average a 13 percent increase in population from 2000 – 2009 (NCOSBM 2010). These two trends have combined to make estuarine shoreline stabilization an important coastal management issue.

The type of stabilization structure used and how many such structures are present have the potential to impact North Carolina's estuarine shorelines and the ecological benefits they provide. Natural shorelines capture nutrients and sediment from stormwater before it enters our estuarine systems. They also provide feeding and nursery habitat for a multitude of species and dampen wave energy along the shoreline. These ecosystem services are what help maintain the health of our estuaries. Shoreline stabilization often leads to a change in these ecosystem services. While a small change in these ecosystem services on a parcel by parcel basis may not seem significant, when you scale the effect to the watershed level, the collective impact due to all shoreline stabilization activity can be extremely significant.

Presently, bulkheads are the primary way in which estuarine shorelines are stabilized in N.C (DCM 2010). As understanding of ecosystem function has increased, new alternatives to bulkheads have emerged. These alternatives are designed to provide similar levels of shoreline stabilization while minimizing the reduction in ecosystem services compared to a bulkhead. The rock sill with marsh plantings, commonly referred to as a marsh sill (Figure 1), is one alternative that has been of particular interest to the N.C. Division of Coastal Management (DCM), the Coastal Resources Commission (CRC), and the N.C. General Assembly.

1.2 Marsh Sills Background

Marsh sills, for the purpose of this project, are shore parallel structures made up of two critical elements: 1) an offshore low relief mound made of rock or oyster shell called a sill; and 2) an intertidal area between the offshore sill and the upland containing emergent marsh vegetation. Fill is sometimes used landward of the rocks/oysters to properly grade the area to the elevation required for marsh plant establishment and survival. The sill is typically designed with overlaps, gaps, or dropdowns to allow water, fish, and other nekton access to the marsh area. The overlap design provides an opening by splitting the offshore sill into two sections. In the area where the two sections meet, they overlap for a few feet in a parallel offset manner. The gap design provides an opening by splitting the offshore sill into two sections. In this design the two ends do not fully meet, leaving a gap in the offshore sill. The dropdown design provides access by periodically lowering the height of the offshore sill. Figure 1 shows pictures of three marsh sills with these design elements labeled.

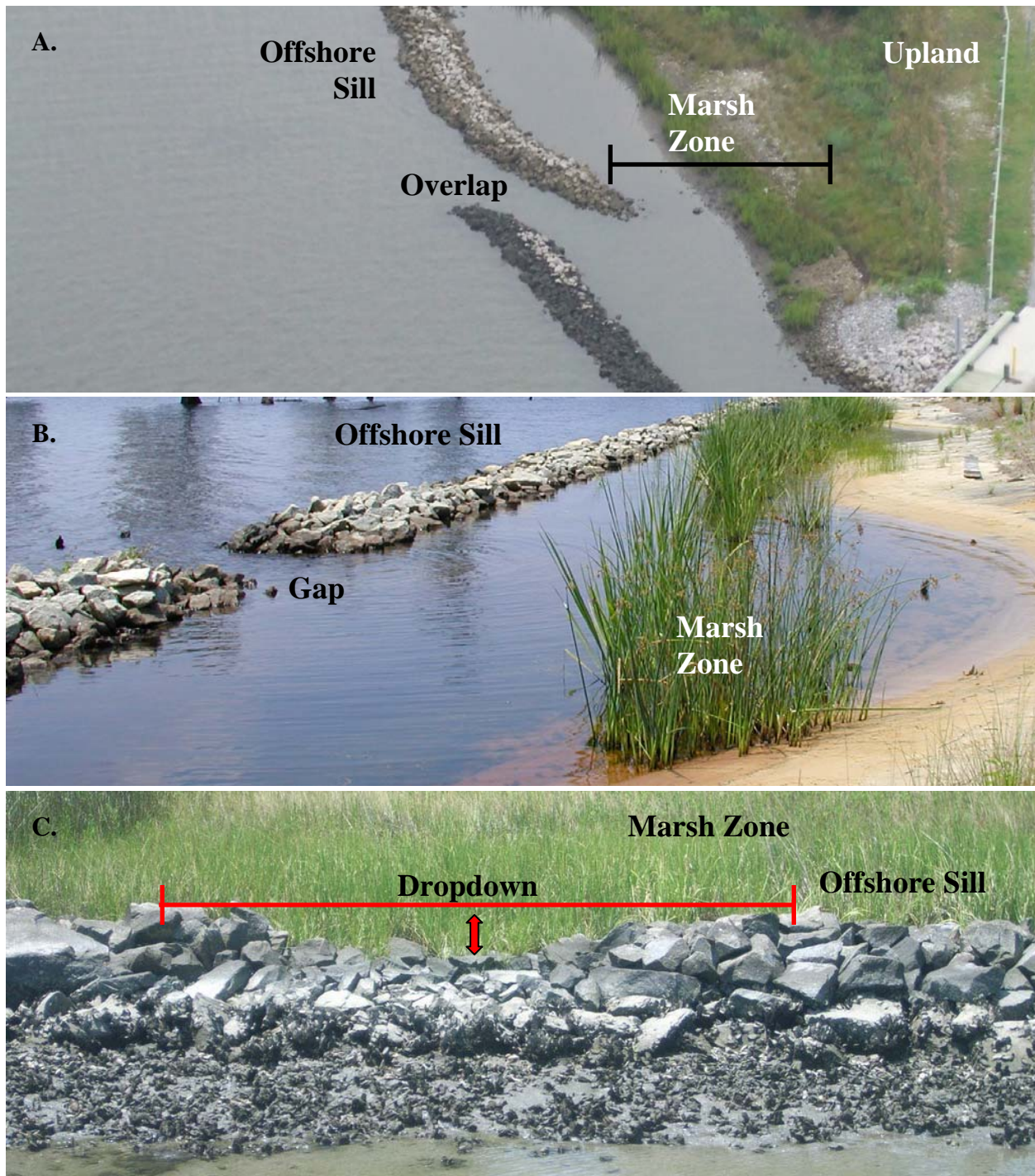


Figure 1: Labeled marsh sill design elements. Panel A depicts the overlap design, panel B the gap design, and panel C the dropdown design. The red lines and arrows in panel C show the vertical relief of the dropdown area.

Marsh sills are considered living shorelines. “Living shorelines” are defined as shoreline stabilization methods that employ as many natural habitat elements as appropriate for site conditions to protect shorelines from erosion (Erdle, et al. 2006). Because marsh sills include

natural shoreline features in their construction and maintain some of the natural shoreline habitats, they are considered by many as a better alternative to more traditional shoreline stabilization methods such as bulkheads. Marsh sills minimize shoreline erosion because the sill protects the marsh or allows marsh establishment. Once established, marsh absorbs wave energy, preventing it from reaching the upland (Rogers and Skrabal 2001).

Despite the benefits of marsh sills listed above, there are also a few concerns associated with them. During marsh sill construction, shallow subtidal and intertidal flats are converted into other habitat types, potentially reducing fish feeding habitat and submerged aquatic vegetation habitat. There is also concern that marsh sills may lead to the creation of new uplands, converting what was originally public trust areas into private land. Finally marsh sills, specifically the rock portions, have long lifetimes (50+ years). This has caused some to worry that if marsh sills do not perform as expected, it may be difficult to remove them.

Research efforts by many groups in many states are ongoing to assess the performance of marsh sills. In the interim, more than 30 marsh sill structures have been constructed in the state. Given the potential impact these structures may have (positive and negative), their long lifetime (50+ years), and their current use in N.C, the CRC requested that DCM assess how the existing marsh sills are performing.

1.3 Marsh Sill Permitting

The construction of a marsh sill requires permit authorization under the Coastal Area Management Act (CAMA). The type of permit required for a marsh sill is determined by the design of the proposed structure, the proposed location of the structure, and the potential for impacts to coastal resources that would result from the construction of the sill. If the design of the proposed sill structure entails minimal potential for adverse impacts, and if the design of the sill does not exceed certain specific use standards, a General Permit (Section 15A NCAC 07H.2700) may be issued for the proposed project. Most General Permits, which are an expedited form of a CAMA Major Permit, can be issued within a few days and require minimal agency coordination. However, due to complexities associated with sill projects, the sill General Permit involves several additional coordination steps, requires that the applicant coordinate directly with the DWQ and the USACE to ensure compliance with those regulatory programs, and thus likely will take longer to process than other general permits.

If a proposed sill project does not qualify for a CAMA General Permit, a CAMA Major Permit will be required. The CAMA Major Permit application, which requires that the applicant prepare a more formal permit application package, is coordinated with as many as 14 State and Federal review agencies. If no significant concerns are raised during this review, or if concerns are raised that can be addressed through design modifications, a CAMA Major Permit can be issued for the sill. The CAMA Major Permit review process typically takes an average of 75 to 90 days to complete.

1.4 Project Objectives

To meet the CRC mandate, DCM initiated a qualitative technical assessment of existing marsh sills. Sills were evaluated on two criteria: 1) Are the marsh sills performing their function as expected? and 2) What are the landowner and adjacent property owners' (where marsh sills are located) perceptions of the marsh sill shoreline stabilization option? Criterion one addressed the following questions:

- Has the marsh sill stabilized the shoreline of the property where it is installed?
- Has the marsh sill caused any unexpected erosion or other unanticipated problems or benefits?
- Based on the performance of the existing marsh sills, are the specific conditions outlined in 15A NCAC 7H .2705 of the marsh sill general permit appropriate?

Criterion two addressed the following questions:

- What are the feelings and perceptions of the landowner regarding the marsh sill stabilization technique where the marsh sills are currently installed?
- What are the feelings and perceptions of the property owners regarding the marsh sill stabilization technique adjacent to where the marsh sills currently are installed?

It should be noted that concurrent with this effort, many additional research efforts are currently being conducted to understand estuarine processes. Researchers from the University of North Carolina at Chapel Hill – Institute of Marine Science (UNC-IMS) are conducting an examination of the existing and planned marsh sills to quantify the biological and ecological impact of these structures through a study funded by the North Carolina Marine Resources Fund. Researchers from the North Carolina Coastal Reserve and National Estuarine Research Reserve, the National Oceanic and Atmospheric Administration (NOAA), Center for Coastal Fisheries and Habitat Research, UNC-IMS, and the University of North Carolina Wilmington are investigating the impacts of bulkheads on coastal fringing saltmarsh. DCM is working on a project to map all estuarine shorelines in terms of margin type (natural, bulkhead, marsh sill, riprap revetment, etc.). All these efforts together will provide qualitative and quantitative information regarding how marsh sills are performing in North Carolina and how they relate to the larger estuarine systems in general.

2.0 Methods

2.1 Field Visits

Questions associated with criterion one were assessed by visiting 27 marsh sills that have been installed in North Carolina through the CAMA major permit or marsh sill general permit process (Figure 2). These sites were identified by a review of the DCM permit database (Bendell 2010). A full description and photograph of each site is included in Appendix 8.1. Table 1 includes general characterizations for each visited marsh sill site.



Figure 2: Locations of marsh sills visited during the study. Marsh sill locations are marked by red dots. Note that some points represent more than one marsh sill.

At each marsh sill visited, representatives from the agencies and organizations listed in Table 2 visually evaluated the condition of the marsh sill structure, the property where the sill is located, and the adjacent properties. Qualitative evaluations were conducted through the use of a field data sheet containing a list of questions designed to assess marsh sills in four areas: navigation, rock and fill; erosion control and impacts; wetlands habitats and tidal flow; and other (Appendix 8.1). The site visits were conducted during June, July and August 2010. The site visits typically occurred at low tide so that more of the structure could be observed; however a few sites were also visited at high tide to ensure no major discrepancies in observer responses occurred due to differences in the tide state. Permission was obtained from all property owners to access the marsh sills.

Table 1: Characteristics of Visited Marsh Sills.

Site	Permit #	Permit Type	County	Waterbody	Year Permitted	Mound Material	Length (ft)
1	42-00-03	Major	Carteret	Core Sound	6-2000	Rock	90
2	39-01	Major	Carteret	Gallant's Channel	4-2001	Rock	315
3	13-02	Major	Carteret	Gallant's Channel	1-2002	Rock	300
4	42-00-05	Major	Carteret	Bogue Sound	2-2002	Rock	400
5	42-00-06	Major	Carteret	Bogue Sound	5-2002	Rock	450
6	42-00-08	Major	Carteret	Straights	3-2004	Rock	410
7	42-00-10	Major	Carteret	North River	7-2004	Rock	456
8	20-05	Major	Carteret	Oyster Creek	2-2005	Rock	258
9	45794C	General	Carteret	Straights	7-2006	Rock	95
10	142-06	Major	Carteret	Newport River	8-2006	Rock	230
11* and 12*	48144C 48145C 50129C 50168C 50130C	General	Carteret	Back Sound	3-2007 3-2007 2-2008 2-2008 2-2009	Rock	105 99 52 12 106
13	131-07	Major	Carteret	North River	8-2007	Rock	282
14	49808C	General	Carteret	Back Sound	2-2008	Rock	180
15	15-08	Major	Carteret	North River	2-2008	Rock	~1000
16	42-00-09	Major	Chowan	Chowan River	5-2004	Rock	450
17	42-00-04	Major	Craven	Neuse River	8-2000	Rock	176
18	36-09	Major	Dare	Roanoke Sound	3-2009	Oyster Bags	425
19	46565B	General	Hyde	Pamlico Sound	10-2006	Rock	225
20	42-00-02	Major	Onslow	White Oak River	6-2000	Rock	285
21	28-05 Rock	Major	Onslow	Stump Sound	2-2005	Rock	550
22	28-05 Oyster	Major	Onslow	Stump Sound	2-2005	Oyster Bag	150
23	47575D	General	Onslow	Chadwick Bay	5-2007	Broken Cement	100
24	47-09	Major	Onslow	White Oak River	4-2009	Oyster Bags	400
25	50-03	Major	Pamlico	Neuse River	4-2003	Rock	653
26	42-00-11	Major	Onslow	Stump Sound	10-2005	Rock	62
27	42-00-07	Major	Tyrrell	Albemarle Sound	1-2003	Rock	424

* these were all permitted separately, but were constructed as indicated into two structures.

Table 2: Participating organizations.

U.S. Army Corps of Engineers	N.C. Division of Coastal Management
N.C. Division of Marine Fisheries	N.C. Division of Water Quality
N.C. Coastal Federation	N.C. Wildlife Resources Commission
University of North Carolina at Chapel Hill	NOAA-National Marine Fisheries Service
N.C. Sea Grant	NOAA-National Ocean Service

Information from each organization's field datasheets were compiled by DCM staff into one summary sheet for each marsh sill project that contains the comments of all the representatives that visited that site. These summary sheets are included as Appendix 8.1 of this report. The results of the closed-ended questions from the summary sheets were tabulated into an excel spreadsheet. Closed-ended questions are defined as ones with specific yes or no answers. Open-ended questions are defined as those which did not have a specific yes or no answer. These

questions provided an open space in which respondents could write in whatever response they thought suitable.

The participating representatives from the U.S. Army Corps of Engineers (USACE) were not able to provide DCM with their field datasheets due to internal agency considerations. However, USACE personnel did visit the marsh sills with the rest of the assessment team and provided DCM with a summary letter of the USACE comments and concerns. In addition to their field datasheets, the following agencies/organizations provided DCM with summary letters: the N.C. Division of Marine Fisheries (DMF); the N.C. Division of Water Quality (DWQ); the N.C. Wildlife Resources Commission (WRC); and the N.C. Coastal Federation. These letters are included in this report as Appendix 8.2.

2.2 Property Owner Surveys:

Questions associated with criterion two were assessed through the use of property owner and adjacent property owner surveys. Surveys were provided to all owners of the properties visited as part of this project. Surveys were also provided to the property owners immediately adjacent to the visited properties. The surveys were designed to assess the feelings and perceptions of both the property and adjacent property owners regarding the use of marsh sills. Surveys were administered through several methods including, in person, via email, via U.S. mail, and via the online survey provider surveymonkey.com. Returned surveys were compiled and analyzed for common themes. The returned surveys, with identifiable information removed, are included as Appendix 8.3.

3.0 Results:

The tabulated results from the field assessment team's responses to closed-ended questions are provided in Table 3. The numbers presented are the percentage for each response after pooling the data from the 27 visited marsh sills. These numbers do not represent the percentage of sill sites visited as there were multiple answers for each question at each site. The answers to the open-ended questions of the field datasheet (questions 3, 5, 7, 8, 10, 12, 18, 20, 22, 23, 33, 35, 36, 40, 41, 42, 45, and 48) were too lengthy to include in the text of this section. These data are located in Appendix 8.1 within the summary datasheets for each visited project. Responses from both the open and closed-ended questions were used to develop the project findings.

DCM had a 90 percent response rate for the homeowner surveys, and a 47 percent response rate for the adjacent property owner surveys. Tables 4 and 5 provide the responses to these two surveys respectively. The "provided responses to other" column for both Tables 4 and 5 represent all responses received for each question. Additional open-ended written comments were also provided by most survey respondents. These responses were too lengthy to include in this section. These data are located in Appendix 8.3 under question 9 for the property owner survey, and question 10 for the adjacent property owner survey.

Table 3: Tabulated field team responses for all visited marsh sills.

	Question	Yes	No	Unsure	N/A
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	1%	93%	5%	
2	Do you think the overall benefit of the marsh created outweighs the initial impacts/changes due to the placement of rock on shallow water habitats?	64%	5%	31%	
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	34%	4%	29%	34%
6	Is the grade behind the sill still gently sloping?	78%	9%	13%	
9	Is there evidence of erosion on this property?	26%	61%	13%	
11	Is erosion occurring on the adjacent properties?	31%	46%	23%	
13	Is there a distinct shoreline offset between this property and the adjacent properties?	37%	50%	13%	
14	Has the sill created new uplands behind it?	16%	64%	20%	
15	Was the placement of the sill appropriate?	61%	15%	24%	
		Too far	Too close	Other	
16	If you answered "No", please check the appropriate box.	12%	81%	7%	
		Yes	No	Unsure	
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	38%	24%	38%	
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	2%	48%	50%	
21	Is the structure damaged in any way?	3%	89%	8%	
24	Are both high and low marsh plant species present?	80%	14%	7%	
		Dense	Patchy	Other	
25	Does the marsh behind the sill appear continuous and dense, or patchy?	73%	19%	8%	
		Yes	No	Unsure	
26	Has there been any noticeable sediment accumulation landward of the sill?	41%	26%	32%	
27	Are upland species colonizing the area behind the sill?	37%	44%	19%	
28	Is there evidence that the upper marsh area is mowed?	6%	91%	3%	
29	Has the marsh grown waterward completely against the sill?	63%	33%	3%	
		Landward	Waterward	Neither	Unsure
30	Is SAV present landward or waterward of the sill?	1%	40%	29%	30%
		Yes	No	Unsure	
31	Are oysters present on or around the sill?	75%	19%	6%	
32	Is macroalgae present on or around the sill?	57%	25%	18%	
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	66%	22%	12%	
37	Is there a noticeable wrack line landward of the sill?	58%	34%	8%	
38	Is there noticeable trash in and around the sill area?	22%	76%	2%	
39	Are there any noticeable issues with the water quality?	6%	77%	17%	
43	Do you think this sill is functioning as intended?	83%	2%	15%	
44	Do you think a different structure would have performed/functioned better in this location?	17%	45%	38%	
46	Overall, do you think the wetland creation portion of the project has been successful?	75%	5%	20%	
47	Do you think this structure will continue to function into the future given expected sea level rise?	51%	10%	40%	

Table 4: Tabulated property owner survey responses.

Question		Response	Provided Responses to Other
1	Did you install the marsh sill or was it present when you bought your property?	<ul style="list-style-type: none"> • 89%, Yes, I installed sill. • 11%, No, it was already present. 	
2	What two factors most influenced your decision to install a marsh sill?	<ul style="list-style-type: none"> • 5%, Cost • 29%, Maintain the environmental integrity of my property. • 43%, Protect my property from future erosion. • 0%, Having a structure like my neighbor's. • 10%, Wanted something besides a bulkhead. • 7%, Aesthetics. • 7%, Other. 	<ul style="list-style-type: none"> • Put marsh sill in because neighbor put one in and felt I had to follow suite as a defense to protect my property from erosion. • Hopefully enhancing water quality. • Marsh sill put in because was a requirement placed on our CAMA major permit application by National Marine Fisheries.
3	Did the presence of the marsh sill impact your decision to buy this property?	<ul style="list-style-type: none"> • 5%, Increased my desire (to buy). • 5%, Decreased my desire (to buy). • 90% N/A, I installed the sill. 	
4	Are you happy with the performance of the marsh sill?	<ul style="list-style-type: none"> • 95%, Yes. • 5%, No. 	
5	Has your marsh sill had any impacts to your property?	<ul style="list-style-type: none"> • 84%, Increased my marsh. • 0%, Decreased my marsh. • 11%, Had no impacts. • 5%, Caused erosion. • 16%, Caused accretion. • 11%, Degraded my viewscape. • 32%, Enhanced my viewscape. • 26%, Other. <p>Overall:</p> <ul style="list-style-type: none"> • 86%, positive responses • 14%, negative responses 	<ul style="list-style-type: none"> • Trash collection (behind sill). • Hopefully will cause accretion. • Caused some erosion by beach, marsh area essentially unchanged since installation. • Provided additional habitat for wildlife. • Halted erosion.
6	Has your marsh sill ever had to be repaired? If so, how?	<ul style="list-style-type: none"> • 11%, Yes. • 89%, No. 	<ul style="list-style-type: none"> • 50% of marsh had to be replanted in second year. • Lost vegetation in Veteran's Day storm of 2010.
7	Do you think your marsh sill has had any impacts (good and bad) on your neighbor's property? If yes, what were they?	<ul style="list-style-type: none"> • 58%, Good impact. • 0%, Bad impact. • 42%, No impact. 	<ul style="list-style-type: none"> • Increased their marsh grass. • Made their bulkhead look awful. • Increase of neighbor's marsh and visual aesthetics. • Enabled neighbor's added fill to remain in place and not wash away. Helped protect their shoreline. • Fisheries enhancement. • Maintained neighbor's beach area...added some sand. • Reduced neighbor's erosion. • Slowed neighbor's erosion. • Helped to slow neighbor's erosion. • Convinced neighbor to install sill.

Table 5: Tabulated adjacent property owner survey responses.

	Question	Response	Provided Responses to Other
1	Was your neighbor's marsh sill present when you bought your property?	<ul style="list-style-type: none"> • 27%, Yes. • 73%, No. 	
2	Did the presence of your neighbor's marsh sill impact your decision to buy your property?	<ul style="list-style-type: none"> • 0%, Increased my desire (to buy). • 7%, Decreased my desire (to buy). • 20%, Had no impact on my decision. • 73% N/A, it was installed after I purchased my property. 	
3	Has your neighbor's marsh sill had any impacts to your property?	<ul style="list-style-type: none"> • 20%, Increased my marsh. • 13%, Decreased my marsh. • 13%, Had no impacts. • 33%, Caused erosion. • 20%, Caused accretion. • 27%, Degraded my viewscape. • 20%, Enhanced my viewscape. • 47%, Other. <p>• Overall 45% positive responses. 55% negative responses.</p>	<ul style="list-style-type: none"> • Preserved bulkhead as good buffer, I have a bulkhead too. • Nice to look at from water. • No access to beachfront to the west of my property. • Washed sand out. Marsh use to be real tall but now is short. • Caused boat ramp on my property to collapse. Clogged drainage pipe from road. Decreased water access by causing beach area to erode. • Added sand. • A bulkhead would be more attractive. • Dramatically changed my shoreline. • Increased my marsh.
4	In your opinion, has your neighbor's marsh sill done its job? If no, Why?	<ul style="list-style-type: none"> • 73%, Yes. • 27%, No. 	<ul style="list-style-type: none"> • Project was a failure. • Yes, for them. Caused more impact (erosion) on my beach. • Dramatically changed my shoreline.
5 and 6	Do you currently have a shoreline protection structure on your property? If yes, which kind	<ul style="list-style-type: none"> • 53%, Yes. • 47%, No. 	<ul style="list-style-type: none"> • 3 responses of riprap revetment. • 1 response of marsh sill. • 2 responses of groin. • 5 responses of bulkhead.
7	Would you consider installing a marsh sill in the future on your property?	<ul style="list-style-type: none"> • 53%, Yes. • 47%, No. 	<ul style="list-style-type: none"> • Caused horrible consequences for my property. • <i>Expletive</i> no.
8	What two factors most influenced your answer to question 7?	<ul style="list-style-type: none"> • 47%, Maintain the environmental integrity of my property. • 47%, Protect my property from future erosion. • 13%, Ease of permitting. • 13%, Cost of installation. • 13%, Having a structure like my neighbors. • 40%, Aesthetics. • 47%, Other. 	<ul style="list-style-type: none"> • Success of other neighbor's sills. • Hurricane damage. • I want the property and water left as is. • Ruined sea grasses/clam beds, clogged wetlands. Permit system is very poor and allows failures to be installed. • Having natural beach areas. • Having a nice sand beach to walk on. These things are awfully ugly and create walking hazards and severely limit access to water. • Prohibits usage of natural shoreline.

4.0 Findings

- **4.1 Marsh sills were not found by the field team to present a hazard to navigation.**

This finding is based on answers to question 1 of the field data sheet (Table 3) and the agency letter from DMF. Ninety-three percent of the respondents said that navigation was not impacted by the sills that were visited as part of this project. Out of 214 total responses, only three times did a field team member consider the marsh sill to have an impact to navigation. One field team member thought that project 142-06 impacted navigation. Another thought that project 15-08 impacted navigation. Finally, one thought project 42-00-05 impacted navigation, but noted in a comment that this was only in regard to getting kayaks in and out of the water. The agency letter from DMF states: “DMF did not observe any of the sills causing any problems related to navigation...” (Appendix 8.2).

- **4.2 Marsh sills were observed to provide erosion protection to the property upon which they were installed.**

This finding is based on the responses of the field team to questions 9, 21, and 43 of the field datasheet (Table 3), the agency letter from DMF, and the responses of the property owners to property owner survey questions 4, 5, and 6 (Table 4). The field team noted 61 percent of the time that erosion was not occurring on the properties protected by marsh sills. Of the remaining responses, 13 percent of the time the field team was unsure and 25 percent of the time evidence of erosion was observable (Table 3, question 9). However, this does not imply that erosion was actively occurring at seven (25% of 27) of the visited marsh sills. One limitation of this study was that it did not account for the temporal difference between when the marsh sills were installed. Some of the visited marsh sills were more than ten years old, while others were recently constructed. The field team was only afforded a one-time snapshot view of the marsh sills. As such, it was not possible for the field team to assess when the observed erosion evidence actually occurred. There was only one site where the field team unanimously agreed that evidence of erosion existed, at project 47-09, the Jones Island marsh sill site in Onslow County. This marsh sill is newly constructed and sits in front of a pre-existing high bank bluff (Figure 3). It was the presence and condition of this bluff that the field team noted as evidence of erosion (Appendix 8.1, page 120, question 10).

The team observed that 89 percent of the time the marsh sills that were visited were not damaged (Table 3, question 21). This suggests that erosion was not actively occurring on most of the visited marsh sills. If erosion was actively occurring, it seems likely the marsh sill would show some damage, especially in the marsh area (*e.g.*, scoured marsh). The field team response to question 43 also supports the finding that marsh sills were preventing erosion. The field team found that the marsh sills were functioning as designed 83 percent of the time. If active erosion was occurring at the visited properties this result would most likely be lower. The agency letter from DMF supports this finding as well. In their letter, DMF states that “at all sites, the sills appeared to be preventing erosion of the upland property...” and “Overall, the sills appeared to be functioning well in controlling erosion...” (Appendix 8.2).



Figure 3: Eroding high bank bluff with marsh plantings in front at Jones Island, Onslow County.

The property owners' survey data corroborate the field team findings. Ninety-five percent of the property owners were happy with the performance of their marsh sills (Table 4, question 4). Question 2 of the property owners' survey demonstrated that protection from erosion was the most important issue for property owners in deciding to utilize a marsh sill. Thus, one may conclude that if erosion was actively occurring, the property owners would not be happy with the performance of their marsh sills. Of the property owners surveyed, only one reported erosion that he attributed to his marsh sill (Table 4, questions 4 and 5). This individual went on to say in his open-ended comments that he was happy with the marsh sill and thought it was doing its job appropriately (Appendix 8.3). The property owners' survey data show that no repair was required to date at 89 percent of the visited marsh sills (Table 4, question 6). Eighty-four percent of the property owners reported an increase in their marsh coverage (Table 4, question 5). If erosion was actively occurring, it is not likely that marsh coverage would increase, or that the marsh sills would not have needed repairs. The viewpoints of the property owners relative to this issue are extremely valuable because the current property owners installed the marsh sill at 89 percent of the sites visited (Table 4, question 1). Thus, the property owners have observed the entire history of the sill from pre-construction conditions through post-construction performance, and are able to comment on erosion issues associated with the sill.

- **4.3 Marsh sills were often built in combination with other structures.**

This finding is based on visual observation from the field visits. Of the 27 visited marsh sills, 12 of them (44 percent) were built in front of or attached to another type of shoreline stabilization. Most commonly observed were marsh sills built in front of bulkheads, or in combination with groins. Figure 4 shows examples of several marsh sills built in combination with other stabilization structures. The interaction of several shoreline stabilization structures operating synergistically is a much more complex situation compared to a marsh sill by itself. The design process and potentially the permitting for marsh sills must account for the potential interaction between two or more shoreline stabilization methods utilized at the same place and time.

- **4.4 Marsh sills that utilized the gap or overlap design were observed to provide better water, fish, and other nekton access to the area behind the sill compared to ones utilizing the dropdown design.**

This finding is supported by the responses provided by the field team to question 34 (Table 3), and the open-ended questions 35 and 36 (Appendix 8.1). The agency letters from DMF and DWQ also document this finding. In general the field team responses indicated 66 percent of the time that water and fish ingress/egress was occurring at the visited marsh sills (Table 3, question 34). This finding is a little misleading as in several instances the field team commented that while water and fish ingress/egress was occurring, it needed to be improved (see Appendix 8.1, pages 67, 105, and 128, question 35 and 36 for examples). The dropdowns at many of the visited marsh sills were often found filled in with rocks that toppled down from the adjacent higher areas of the sill, partially blocked with oysters and/or retained sediment (Appendix 8.1). The agency letters from DMF and DWQ also address this finding. The DMF letter noted that “Dropdowns are more likely to trap fish, as well as sediment, behind the sill when the water level lowers. In addition, we observed oysters growing on the dropdowns which further obstructs water flow”. The DWQ letter also noted that, “In instances where the step-down (dropdown) was at or close to the elevation of the surrounding bottom, oysters would grow and fill the void and would come close to closing off the gap and impede the water flow.” The sills that utilized a gap or overlap design did not have this problem. At these locations, the field team often reported very good water and fish access (see Appendix 8.1, pages 42 and 122, question 35). The agency letters from DMF and DWQ support this finding as well. In their letter, DMF stated that, “DMF believes that a break in the sill will usually provide more fish access than dropdowns...”. In their letter, DWQ stated that, “During the site visits, this Office noted that the sill structures that had overlaps instead of drop downs functioned better.” (Appendix 8.2)

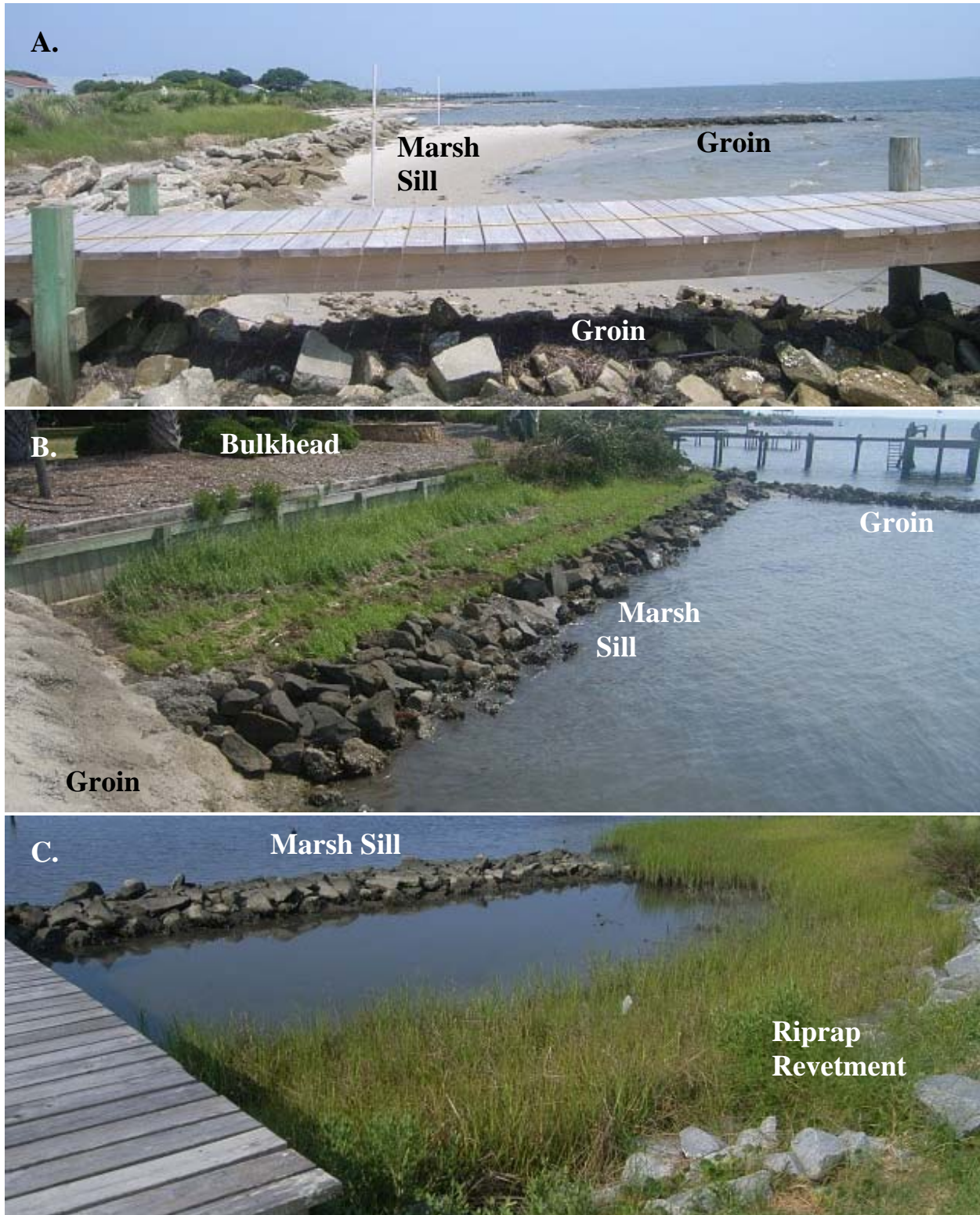


Figure 4: Marsh sills built in combination with other stabilization structures. Panel A: marsh sill and groins; Panel B: marsh sill and groins in front of a bulkhead; Panel C: marsh sill built in front of a riprap revetment.

- **4.5 It was unclear whether marsh sills cause erosional impacts on adjacent property.**

This finding is supported by responses provided by the field team to question 11 (Table 3); the open-ended question 12 of the field datasheet (Appendix 8.1); the agency letter from DMF (Appendix 8.2); the responses of the property owners to survey question 7 (Table 4); and the responses of the adjacent property owners to survey question 3 (Table 5). Question 11 from Table 3 explicitly asked the field team to assess whether erosion was occurring on adjacent properties. There was no agreement among the responses. The field team reported “yes” 31 percent of the time, reported “no” 46 percent of the time, and was “unsure” for the remaining 23 percent. As noted above, the field team was only afforded a one-time snapshot view of the condition of the adjacent properties. As such, it was not possible for the field team to assess when the observed erosion evidence actually occurred. Consequently, the field team was not able to defensibly conclude that the erosion was caused by the installation of the marsh sill. In fact there was not a single site where all field team members unanimously concluded that evidence of erosion was present on a neighboring property. DMF concluded in their agency letter that, “No sill-associated erosion problems were observed at adjacent properties.” (Appendix 8.2)

There were two site visits (permit 42-00-07 and permit 46565B) where all but one team member noted evidence of erosion on the adjacent property. In both cases, the field team member that did not agree with the others marked “unsure” on their questionnaire (Appendix 8.1 Page 137 and 93, Question 11). For the case of permit 42-00-07, the adjacent property contained a natural swamp forest with remnants of dead trees on the edge (Figure 5).



Figure 5: Adjacent property to marsh sill project 42-00-07.

It was the presence of these dead trees that most of the team members cited as the evidence of erosion (Appendix 8.1, page 137, question 12). This type of shoreline margin is a natural feature of the Albemarle Sound and was not caused due to the installation of the marsh sill.

Several different areas of erosion on the adjacent properties were noted by the field team at site 46565B (Appendix 8.1, page 93, question 12). However, the field team was unsure if the erosion was being caused by the marsh sill or the two groins present at the site, as most of the erosion seemed to be occurring near where the marsh sill joined with the groins (Figure 6).

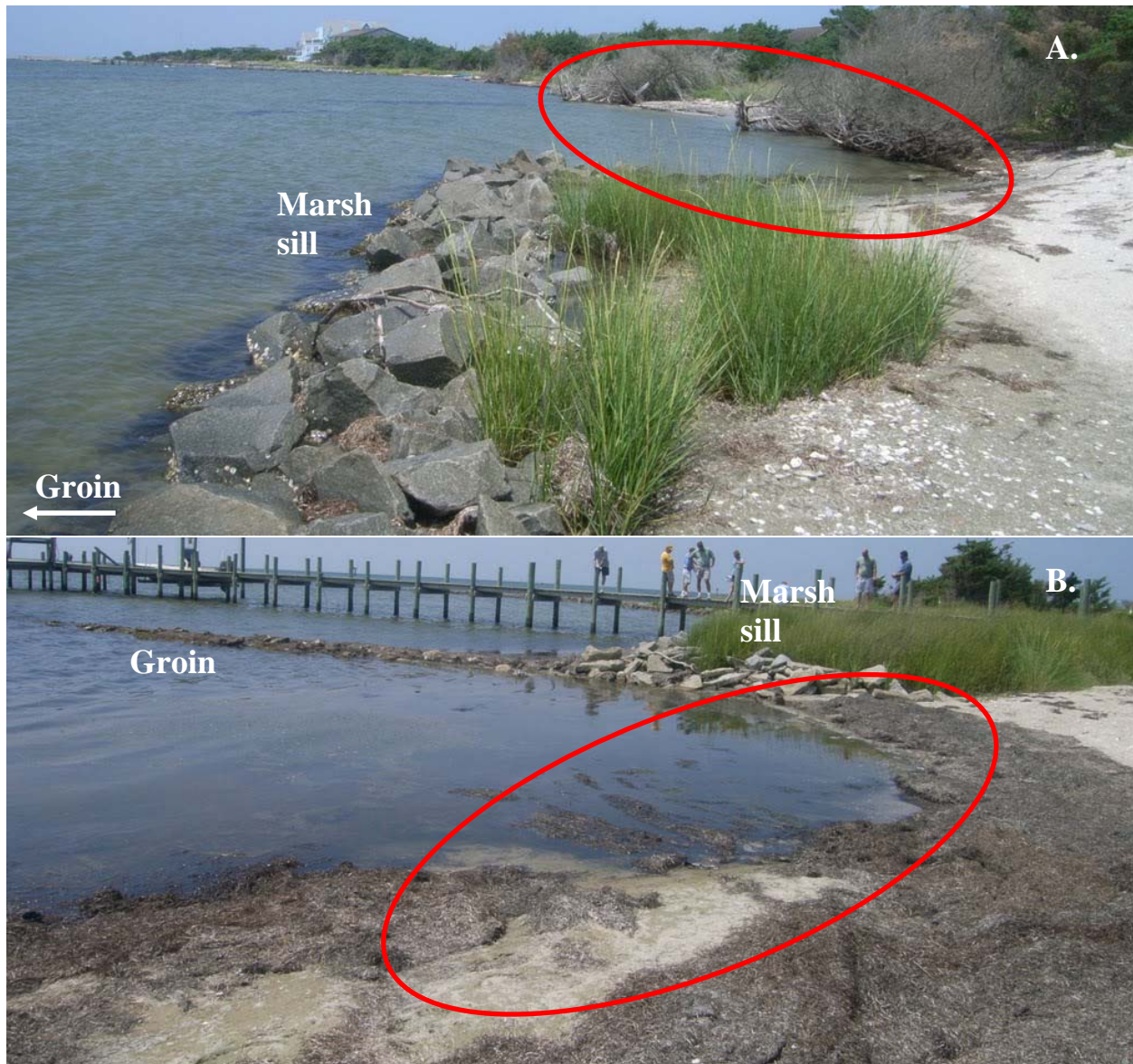


Figure 6: Erosion on adjacent properties of project 46565B. Panel A shows a picture of the adjacent property to the north taken from the junction of the marsh sill and one of the two groins. The groin extends off picture to the left as indicated by the arrow. Panel B is taken from the adjoining property to the south and shows where the other groin joins the marsh sill. The red circles on both panels show the areas of erosion.

The property owners unanimously reported in their survey that they did not consider their marsh sill was causing any detrimental impacts (including erosion) to their neighbors' properties (Table 4, question 7). In fact the property owners either thought their marsh sill had no impact to their neighbors' property (42%) or had beneficial impacts (58%) (Table 4, question 7).

The response of the adjacent property owners was not as easy to interpret. In question 3 of Table 5, which asked respondents to describe the impact their neighbor's marsh sill has had on their property, 45 percent of the responses were positive and 55 percent were negative. Of the negative responses, 34 percent directly cited erosional impacts. It is clear that some of the adjacent property owners sampled as part of this study believe that their property is experiencing erosion due to the presence of their neighbor's marsh sill. Seventy-three percent of the adjacent property owners that responded stated they owned their property before their neighbor's marsh sill was installed (Table 5, question 1). As such, they have been able to observe how their property has changed or not changed after their neighbor's marsh sill was installed. However, this historical perspective should be viewed with caution as direct cause and effect can not be solely based on observational evidence.

- **4.6 After completion of the field aspects of this project, the resource agencies still prefer to review and comment on marsh sill permits on a case-by-case basis.**

This finding is supported by the agency letters from USACE, WRC, DWQ, and DMF. The overriding theme of the letters is that marsh sills are site specific structures that require case-by-case review by the resource agencies. To fully appreciate this theme, it is necessary to read the agency letters in their entirety (Appendix 8.2). The following excerpts from the agency letters validate this finding.

The USACE letter states:

“In our 2004 letter (enclosed), we identified 13 issues that require extensive review and which preclude the Corps from developing a more expedited permit process to authorize these projects. Those concerns have not been alleviated. The Corps continues to be concerned that it would not be in the best interest of the public to expedite the processing of a Department of the Army permit for activities that may individually and cumulatively result in significant impacts to the human environment.”

WRC states in their letter:

“Although the NCWRC believes the use of marsh sills to stabilize shorelines can protect or even enhance habitat opportunities, we also strongly believe the success of these structures is very site specific.”; “The coast of North Carolina is vastly variable. A design in one location may not serve well in another.”; and, “Marsh sills and their success are very site specific and require adequate review by resource agencies to evaluate the design, the impacts, and the area where the sill is proposed.”

DWQ states in their letter:

“This Office feels that each tidal regime and coastline needs to be evaluated as a case-by case situation.”; “The sill evaluation project allowed this Office to

recognize that sills should be very site specific and still needs to be evaluated on a case-by-case basis by the agencies.”; and, “It was noted during the sill evaluation project that successful sill construction is site/shoreline specific.”

DMF states in their letter:

“From our observations the, amount of erosive energy and substrate type at a site had a large effect on the success of marsh sills in providing habitat.”, “Decisions about trade-offs should be made on a case-by-case basis and based on the location, resources in the areas, and habitat threats in that location.”, and, “The DMF requests that the DCM continues to utilize the input of resource agency personnel to site and design shoreline stabilization structures.”

- **4.7 The mound material used in the marsh sills is often colonized with oysters.**

This finding is supported by the field team responses to question 31 (Table 3), and the agency letter from the DMF (Appendix 8.2). Oysters were observed on the sill by the field team 75 percent of the time (Table 3, question 31). DMF notes in their agency letter that: “Sills may be promoting oyster growth by providing substrate. Oysters were found growing on 20 of the 25 sills observed and those without oysters were located in low salinities (two sills) or located with minimal exposure to water(three sills).”

- **4.8 The marsh sills visited supported marsh grass and do not appear to be creating new uplands.**

This finding is supported by the field team responses to questions 14, 24, 25, and 46 (Table 3) and the agency letter from DMF. The field team noted 73 percent of the time that the marsh appeared dense and healthy (Table 3, question 25). Furthermore 80 percent of the field team responses documented both high and low marsh species were present behind the sill (Table 3, question 24). Both of these findings indicate that the elevations behind the sills are appropriate and supportive of marsh growth. Seventy-five percent of the field team responses indicated that the created wetland portions of the visited marsh sills were successful (Table 3, question 46). The older a marsh sill, the longer period of time it has had to trap sediment and potentially gain elevation. Looking at two of the oldest marsh sills visited - project 42-00-03 (~10 years old), and 42-00-02 (~10 years old) - both were found to still support high and low marsh species (Appendix 8.1, pages 5 and 99, question 24). Even at these oldest marsh sills, the majority of the field team noted no evidence of upland creation (Appendix 8.1, pages 4 and 98, question 14). Question 14 of the field datasheet specifically asked if the marsh sill had created new uplands. The field team reported 61 percent of the time that the marsh sills had not created new uplands (Table 3). In their agency letter DMF also concluded that, “Looking at 25 sills constructed over a nine year period, the intertidal zone behind the sills did not increase in elevation to a point that supported upland vegetation and did not scour to a point that did not allow marsh vegetation to grow.” (Appendix 8.2)

- **4.9 Marsh sills were observed to be free from damage.**

The marsh sills visited by the field team were generally found to be free from damage. The field team noted no marsh sill damage in 89 percent of their responses (Table 3, question 21). The most common observed damages were drop downs that had started to fill in (see Section 4.4) and portions of the rocks that had settled and/or lost height due to shifting. The marsh sill owners also reported very few problems with the structures. Two reported some rock settling and two reported the need for replanting of marsh plants. Outside of these isolated incidents, 89 percent of the property owners reported that their marsh sill has never had to be repaired (including replanting) (Table 4, question 6). Marsh sills that are the oldest have more potential to show signs of damage. Looking at two of the oldest marsh sills visited - project 42-00-02 and 42-00-03 (both ~10 years old) - neither was found to be damaged during the field visits (Appendix 8.1, pages 4 and 98, question 21).

- **4.10 No marsh sill related impacts to water quality were observed.**

This finding is supported by the field team responses to question 39 (Table 3) and the open-ended responses to question 40 (Appendix 8.1). The field team noted no issues with water quality 77 percent of the time. Only six percent of the time did the field team note an issue with water quality. In all of these cases, the issue noted was related to stormwater runoff potential from the adjacent upland or via a pre-existing stormwater ditch or pipe (see Appendix 8.1, pages 17, 33, 57, 63, 78, 83, 100, and 122, question 40). These potentials would be the same regardless of what type of shoreline stabilization was installed on the property. The oyster growth noted in section 4.7 and the marsh noted in section 4.8 may eventually lead to increased water quality around marsh sills due to the increased filtering capacity provided by these elements. It should be noted that none of the marsh sills visited as part of this project were in the construction phase. During construction the potential for water quality impacts is much greater because of the disturbance associated with the marsh sill installation.

5.0 Specific conditions of the marsh sill general permit

The final aspect of this project was to examine the specific conditions of the marsh sill general permit. A list of the specific conditions is included in this report as Appendix 8.4. The specific conditions of the marsh sill general permit were classified into two categories: those that are common with other CAMA general permits; and those that are unique to the marsh sill general permit. Specific conditions (b), (e), (g), (h), (m), (n), (p), (q), (r), (s), (t), (u), (v), (y), and (z) are common conditions that exist in other CAMA general permits, and so will not be examined as part of this study. The remaining specific conditions (a), (c), (d), (f), (i), (j), (k), (l), (o), (w), (x), (aa), (bb), and (cc) are unique to the marsh sill general permit. These can be further classified into those that detail design criteria [(a), (c), (d), (f), (i), (j), (k), (l), (o), (w)] and those that address other agency coordination [(i), (aa), (bb), and (cc)]. Note that one specific condition (i) appears in both the design criteria list and the other agency coordination list as it details specific design criteria but also states that deviations from the design criteria are allowable following coordination with DMF. The findings of this technical assessment provided no conclusive evidence that the marsh sill general permit unique specific conditions are unnecessary. However, the findings do provide some guidance on potential modifications to some of the specific conditions.

Specific condition (a) outlines the usable materials for the construction of the sill structure. Currently, it lists riprap or stone as the only allowable materials. Given the finding that oysters are colonizing the sills in most areas, and the fact that a few of the visited marsh sills successfully used oyster shell as the mound material, the list of usable materials should be evaluated to consider the addition of oyster shell.

Specific condition (i) describes the specifications for the use of dropdowns and openings. This assessment observed that the marsh sills that utilized the gap or overlap design were functioning better than the ones that utilized the dropdown design (see 4.4). Thus, it seems this specific condition could be modified to suggest or require gaps or overlaps be used instead of dropdowns.

The specific conditions that deal with other agency coordination, (i), (aa), (bb), and (cc), are the ones that make the marsh sill general permit more like a CAMA major permit as compared to the other CAMA general permits. These are also the specific conditions that make installing a marsh sill require more cost and processing time compared to the other shoreline stabilization options (bulkheads, riprap revetments, etc.) as often the coordination with the other agencies leads to additional state and federal permits. This study did not evaluate the need for specific condition (bb) which requires that DCM consult with the Department of Administration's State Property Office to determine whether or not an easement for the proposed marsh sill is required. The necessity of specific condition (i) and (aa) (coordination with DMF) and specific condition (cc) (coordination with DWQ, and USACE) were validated by the agency letters received as part of this project (Appendix 8.2). In each case, USACE, DMF, DWQ, and even though there is not a specific condition that requires it, the WRC, all state that they want to continue to review marsh sill permits on a case-by-case basis (see 4.6). Given this finding, specific conditions (i), (aa), and (cc) are still necessary.

6.0 Summarized List of Findings

- Marsh sills were not found by the field team to present a hazard to navigation.
- Marsh sills were observed to provide erosion protection to the property upon which they were installed.
- Marsh sills were often built in combination with other structures.
- Marsh sills that utilized the gap or overlap design were observed to provide better water, fish, and other nekton access to the area behind the sill compared to ones utilizing the dropdown design.
- It was unclear whether marsh sills cause erosional impacts on adjacent property.
- After completion of the field aspects of this project, the resource agencies still prefer to review and comment on marsh sill permits on a case by case basis.
- The mound material used in the marsh sills are often colonized with oysters.
- The marsh sills visited supported marsh grass and do not appear to be creating new uplands.
- Marsh sills were observed to be free from damage.
- No marsh sill related impacts to water quality were observed.

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* These were all permitted separately, but were constructed as indicated into two structures.

The pages that follow contain a picture, general description, and the compiled field datasheet for each site visited. Field team comments and responses to open-ended questions are noted by bullets. Each new bullet is a comment from a separate field team member. Empty boxes indicate that no comments were received for that particular question at that particular site.



Major Permit No: 42-00-03

Issue Date: June 15, 2000

Marshallberg, NC 28553

Waterbody: Core Sound

Carteret County

- 2 part project.
- The first part consists of a 90 foot long stone sill with a 3 foot wide base.
- The sill is 18 feet waterward of normal high water (bulkhead) and has a total height of 2 feet.
- Fill placed landward of the sill, graded, and planted with *Spartina alterniflora* and *Spartina patens*.
- The second part consists of rock revetment 110 feet along the normal high water line.

Compiled Field Team Responses						
Date of Visit: 6-23-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	10	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	4	0	6		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> - Would like to have seen the structure farther out in the water. - Although sill provided protection establishment for small healthy zone of marsh, the marsh zone is too narrow of combination of bulkhead and sill is overkill for the site for the site of disallows migration of marsh no riparian zone etc. - Too close to bulkhead, no fish access, small area. - Need? if bulkhead failure ok-minimizes scour - would not like at adjacent property with new bulkhead - should have installed marsh sill only. - Sill area is in front of bulkhead. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	2	1	7	0	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	<ul style="list-style-type: none"> - The site is only sustaining a small, confined, Spartina marsh. No fish access, its more landscaped marsh than true habitat. - Remove bulkheads and have a gentle slope and sill seaward of that. - Further away from shore no bulkhead. 				
6	Is the grade behind the sill still gently sloping?	5	5	0		
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> - Rock fill shallow intertidal. - Seems failing steep by design. - No slope, bulkhead behind sill new concrete added to left of sill. - Adequate see above. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	<ul style="list-style-type: none"> - Bulkhead on site, no impact on navigation riprap fill and fill for tidal marsh plus or minus 20ft. - The sill should have been placed seaward with gaps or overlaps. Less fill should have been used. 				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	1	9	0		
10	If yes, describe the evidence, extent, and location?	- High elevation of property. - No; stabilized.				
11	Is erosion occurring on the adjacent properties?	1	8	1		- No, hardened.
12	If yes, describe the extent and location.	- Not sure - I would expect moderate energy forces except during seasonal storms and hurricanes.				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	4	5	1		- But not natural - all hardened.
14	Has the sill created new uplands (land above the high water mark) behind it?	2	6	2		
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	0	6	4		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	7	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	5	1	4		
18	If yes, please describe them.	- Marsh plantings. - Oysters. - Creation of marsh in area where it couldn't survive before. - Oysters, small marsh area. - Some oyster recruitment Codium on rocks (invasive).				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	3	7		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	9	1		
22	If yes, please describe the damage.	- At the time site visit sill did not appear to be damages.				
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	- Although sill provided protection establishment for small healthy zone of marsh, the marsh zone is too narrow of combination of bulkhead and sill is overkill for the site for the site of disallows migration of marsh no riparian zone etc. - Sill protecting about 10feet of shoreline. - Perched tidal marsh fish ingress and egress unlikely. - Groin between sills and on both sides.				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	6	4	0		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	10	0	0	0	- It was planted.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	1	2	7		- Filled behind sill. - Out of fill if placed hard to tell without history.
27	Are upland species colonizing the area behind the sill?	2	6	2		- Present at open section but not at the appropriate elevation. - No room for them.
28	Is there evidence that the upper marsh area is mowed?	0	8	2		- N/a bulkhead.
29	Has the marsh grown waterward completely against the sill?	10	0	0		- Didn't have far to grow.
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	1	9	0	0	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	10	0	0		
32	Is macroalgae present on or around the sill?	6	2	2		
33	If yes, is this problematic or concerning? Please explain.	Yes codium.				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	4	5	1		
35	If yes, how can you tell?	<ul style="list-style-type: none"> - 2 wrack lines. - Elevation of marsh sp relative to tide ranges. - Low sill. - Marsh behind the sill. - No breaks/water standing at mid tide. - No open areas, tried to bulkhead no access. - Marsh is too high for utilization of fish only a little use? 				
36	If no, why not and is it a concern?	<ul style="list-style-type: none"> - But sill is low enough it should be trapped by high tide. - Yes, this is not a true sill to me. - No water for aquatic passage. 				

	Wetlands, Habitats, and Tidal Flow Continued.	# yes	# no	# not sure	# N/A	Field Team Comments
37	Is there a noticeable wrack line landward of the sill?	10	0	0		
38	Is there noticeable trash in and around the sill area?	3	7	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	8	2		
40	If so, what are they?	<ul style="list-style-type: none"> - No/ limited fish access to marsh landward of the sill (sill waterward of bulkhead). - Small wetland fringe is very healthy but isolated between sill and bulkhead. No ability to migrate landward and very little habitat - no riparian connection. - Marsh is well established good oyster habitat. 				
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					- No COE permit issued on this site.
43	Do you think this sill is functioning as intended?	6	0	4		<ul style="list-style-type: none"> - Not sure; It's helping the bulkhead from being undermined. - Not sure, didn't know applicants intentions. - Yes; if the intention was to protect bulkhead. - Yes; at current time.
44	Do you think a different structure would have performed/functioned better in this location?	3	2	5		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and why?					<ul style="list-style-type: none"> - A sill further off shore or just marsh planting. - Didn't need B Head and sill combo- could have gone with grading of sill/plants - elevation of sill crest (and sill size) very good for erosion energy. - Breakwater or larger sill prospect. - Marsh sill further seaward. - Maybe farther offshore or just doing bulkhead toe protection. - Oyster bad sill instead of marl. - No bulkhead behind sill - ok in areas of old failing bulkheads - not new ones; must choose.
46	Overall, do you think the wetland creation portion of the project has been successful?	4	2	4		<ul style="list-style-type: none"> - Not sure; not really wetlands as one thinks of sills. - Not sure; limited direct access for fish.
47	Do you think this structure will continue to function into the future given expected sea level rise?	0	5	5		<ul style="list-style-type: none"> - Not sure; not for long. - No; bulkhead will not allow marsh migrate. - No; bulkhead. - No; bulkhead behind.
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> - Distance of sill from bulkhead provides zero space for marsh to retreat. I like the height of the sill ... just needs to be a little farther offshore. - Sill appears to have excess fill behind it. - Because they already have a bulkhead just planting and putting cultch down my have been sufficient.



Major Permit No: 39-01

Issue Date: April 5, 2001

Reissued: January 13, 2005

Beaufort, NC 28516

Waterbody: Gallant's Channel

Carteret County

- The project site is 31.5 acre tract with numerous existing and proposed shoreline stabilization projects consisting of two sites for ease of discussion. The project consisted of a 315 foot rock sill.
- Site 1 has natural shoreline, new and failing bulkheaded shoreline, and a pier. There are three proposed projects at Site 1. (SP1) Remove 80 feet of failing wall to normal high water (+2.5') elevation and construct a stone sill waterward of the cut bulkhead. The rock sill is 195 feet long with a 15 foot base width, using 180 cubic yards of granite. The sill was placed (waterward edge) between 50 and 65 feet waterward of normal high water, with a top width of 4 feet and extend 0.5 feet below the normal high water elevation.
- (S1P2) Along the waterward side of the failing bulkhead, a riprap revetment 100 feet long with a base width of 17 to 27 feet, and top width of 4 feet was constructed. The waterward side will be located approximately 60 feet from the NHW line. (S1P3) The last stabilization proposed at Site 1 is to the restoration of a previously stabilized area.
- Site 2 has an existing deteriorating bulkhead. The project removed 110 feet of that bulkhead and installed 2 sills and new wetland plantings.

Compiled Field Team Responses						
Date of Visit: 6-8-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	7	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	2	1	4		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> - There is large amount of bottom covered and significant loss of marsh on either side. Reduce or eliminate sills. - Site was designed to provide erosion control at minimal cost by stabilizing embayment at headlands which existed as a result of rubble groins. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	0	0	0	7	- No fill; only bulkhead rubble debris removed, grade cleaned up and planted with marsh as needed.
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?					
6	Is the grade behind the sill still gently sloping?	4	0	3		
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> - No. - Significant erosion adjacent to sill. Rock covers large amount of bottom. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.					

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	1	3	3		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> – It appears to be scalloping between the sills. It was stated that at low tide the beach appears to be eroding and not accreting. – On either side of sills observations and 6 years of survey data show loss of salt marsh. – Embayment headlands have been stabilized by added sills, but not sure about actual shoreline changes. 				
11	Is erosion occurring on the adjacent properties?	1	5	1		
12	If yes, describe the extent and location.	– Erosion rate is same as prior to project (since it is unstabilized) which I think was ~ 1-3 feet per year.				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	2	5	0		
14	Has the sill created new uplands (land above the high water mark) behind it?	0	6	1		
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	2	0	5		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	0	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	4	1	2		
18	If yes, please describe them.	<ul style="list-style-type: none"> – Some oysters on rock. – Yes and No - oyster recruitment and loss of shallow bottom habitat. – Lots of wrack and trash. – Accretion of marsh immediately behind sill. – Phrag present. – Site has been cleaned up as a result of removal of debris, etc. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	2	5		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	6	1		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	– This design creates classic tombolo effects but may result in loss of marsh between sills. Wave energy exacerbated by boat wakes.				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	6	0	1		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	7	0	0	0	
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	3	2	2		
27	Are upland species colonizing the area behind the sill?	1	2	4		– Presence of phragmites along shoreline for years.
28	Is there evidence that the upper marsh area is mowed?	0	6	1		
29	Has the marsh grown waterward completely against the sill?	4	3	0		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	0	4	3	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	6	0	1		
32	Is macroalgae present on or around the sill?	2	1	4		
33	If yes, is this problematic or concerning? Please explain.	– No-ephemeral.				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	6	0	1		
35	If yes, how can you tell?	<ul style="list-style-type: none"> – Water behind it, ends open. – The riprap is in arc that is just a short simple line parallel to shore. – Water behind the sill. – Sill relatively short and open on either end. – Water is behind the sill. – Not true sill – more of headland T structure to stabilize embayment without installing sill along entire shoreline. Very effective where it is possible. 				
36	If no, why not and is it a concern?					
37	Is there a noticeable wrack line landward of the sill?	6	0	1		
38	Is there noticeable trash in and around the sill area?	2	5	0		

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	4	3		
40	If so, what are they?					
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					<ul style="list-style-type: none"> - Short sills. - Phragmites invasion on one side of the sill. - Sediment accumulation and upland species crept waterward behind the sill – only know this because of long term data collections – not obvious through one time site visit.

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	3	1	3		
44	Do you think a different structure would have performed/functioned better in this location?	3	1	3		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					<ul style="list-style-type: none"> - If longer, could have expanded marsh growth. - Marsh toe protection riprap would prevent scalloping that is occurring. - Plantings with oysters. - Vegetation planting because vegetation present in un-silled areas. - Not sure if better, but might have been able to use sheetpile sill but may have created more flanking effect. Too much energy for oyster bag sill.
46	Overall, do you think the wetland creation portion of the project has been successful?	2	0	5		
47	Do you think this structure will continue to function into the future given expected sea level rise?	1	0	6		<ul style="list-style-type: none"> - Migrate landward. - Yes and no - In short term, yes, but at some point erosion will continue in embayment's and entire shoreline will move landward. Structure may allow marsh to keep pace for longer time and lack of other bulkhead/riprap will allow marsh migration.
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> - There was little information about the site before the riprap was put in place. The tide was coming in so some of the erosion that was mentioned could not be observed. - Oysters at base of marsh may have been an improved alternative at this site.



Major Permit No: 13-02

Issue Date: February 1, 2002

Beaufort, NC 28516-9721

Pivers Island

Waterbody: Gallant's Channel

Carteret County

- Goal of project is to complete shoreline stabilization along 676 feet of shoreline along the western edge of Pivers Island.
- Rock sill, approximately 300 feet long with a bottom width of 12.5 feet.
- At its most waterward extent, the structure will be 70 feet offshore.
- The sill will have a 2' top width and be 3.5 feet high (0.5' above NHW). At 100 foot intervals 2 drop downs are proposed. The top portion of the existing bulkhead will be removed. Fill be used to grade from the sill to NHW (existing bulkhead location) for low marsh. Landward of the existing bulkhead location (NHW) the land will be graded for high marsh and upland vegetation.
- Class 2 granite will be used for stability in the sill and revetment.
- A riprap revetment will be constructed along the south 426 feet of the site and will extend 10 feet waterward of the existing bulkhead.
- In June 2004 a new revetment was considered maintenance under CAMA permit 13-02. The new revetment included rock placed in an eroded area at the intersection of the sill and the bulkhead to the north. The work included a rock face and two loads of clean fill.

Compiled Field Team Responses						
Date of Visit: 6-8-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	6	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	4	0	2		<ul style="list-style-type: none"> - Yes because was bulkhead adj to road and impervious surface. - Yes - Site contained deepening profile prior to construction of "drowning" oysters which were relocated during the project. Fringing marsh has been lost along entire lab shoreline due to long term construction of bulkheads and revetments over the years. Very little marsh remained of what was once excellent low and high marsh habitat.
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> - Use oyster instead of rock. - Height shortened, base narrowed, not clear granite sill needed at this site. - Yes - Profile too deep to re-establish marsh. Fill profile could have been lowered adjacent to sill to allow shallow subtidal area to be sustained as part of the project. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	3	0	4	0	- Yes not SAV or PNA.
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?					
6	Is the grade behind the sill still gently sloping?	4	0	2		<ul style="list-style-type: none"> - Yes at little to steep right behind sill - leads to a lot of high marsh. - Not sure - the grade is dictated by sediment movement, has changed. - Yes, but could have maintained more "edge" of low marsh if profile was initially lower. Fill has either moved down the profile during initial stabilization (making low marsh area grade extend all the way to the sill) or sill has trapped sediment adjacent to the sill.
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> - Seems wider width than permitted but appears to be working, lots of oysters on and seaward of rock (1-4 feet out). - Not native. - Probably too much for this site. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.					

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	2	3	1		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> - Not now, but was - added rock at end. Some erosion from road/land. At the upper edge of the site where the marsh is narrow, behind the granite revetment. - Erosion has been a problem where sill project joins existing bulkhead on NOAA property. - Difficult to prevent "flanking" effects of bulkheads when storms bring energy in. - Erosion at end of bulkhead. 				
11	Is erosion occurring on the adjacent properties?	1	5	0		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> - Bulkhead on both ends. - Upland areas behind the sill, next to the road. - Hardened shoreline on both sides. - All bulkheaded and/or stabilized by riprap. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	3	3	0		
14	Has the sill created new uplands (land above the high water mark) behind it?	2	3	1		
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	4	0	2		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	4	1	1		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	4	1	1		
18	If yes, please describe them.	- Trash.				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	1	5	0		- Lots of wrack deposition, oyster recruitment on the sill.
20	If yes, please describe them.	- Historic intertidal sloping shoreline and marsh fringe/riparian buffer have been lost due to construction of bulkheads and revetments.				
21	Is the structure damaged in any way?	0	6	0		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> - Lots of debris and trash washed up into the wetlands. - The upper erosion is problematic and suggests lower limits of how narrow sill structures can be. - Sill appears stable, good vegetation cover. 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	6	0	0		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	6	0	0	0	
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	5	1	0		– Yes - or movement of fill from higher portions of the filled site during stabilization or combination of both.
27	Are upland species colonizing the area behind the sill?	3	1	2		– Sea oats, Ox-eye daisy. – Dune/upland buffer species were planted and have volunteered in subaerial portions of the project - part of the design.
28	Is there evidence that the upper marsh area is mowed?	0	6	0		
29	Has the marsh grown waterward completely against the sill?	6	0	0		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	0	4	2	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	6	0	0		
32	Is macroalgae present on or around the sill?	5	0	1		
33	If yes, is this problematic or concerning? Please explain.	– maybe O2 sag once algal dies.				

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	6	0	0		– Yes for water passage, but not sure for fish passage.
35	If yes, how can you tell?	<ul style="list-style-type: none"> – Gap, wrack line. – High water mark is in the marsh. – Dropdowns. – Collected and published data showing fish utilization, observation of fish behind sill. – Have watched it for years. – Water staining on the rocks and marsh vegetation. 				
36	If no, why not and is it a concern?					
37	Is there a noticeable wrack line landward of the sill?	6	0	0		
38	Is there noticeable trash in and around the sill area?	6	0	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	1	4	1		
40	If so, what are they?	<ul style="list-style-type: none"> – Scoured out near road. – Project greatly improved water quality by trapping stormwater infiltrating runoff into the swale area. 				
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.	<ul style="list-style-type: none"> – Fiddler crabs, hermit crabs. Verify this is from this sheet. – There are several bare patches that could be of concern for erosion, especially in the uplands. – SET and GPS RTK data show significant sediment accretion behind sill, with lower accretion rates at higher elevations landward of sill. Vegetation has pushed into sill. – Having seen the Radio Island site, it seems that we could improve fish ingress and egress through these sites by altering drop down design. Where possible, could narrow opening to 1-1.5 foot on base, keeping rock gap to grade level (trench) and place slopes on 1.5:1 to narrow top opening. Would maintain greater fish passage at all tide ranges while still minimizing velocities of flow coming through the gaps. Could also angle the gaps with a trench like gap to grade diagonally cut (in the direction opposite of the dominant wave action) through the sill for better protection against the wave/current energy. 				

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	6	0	0		
44	Do you think a different structure would have performed/functioned better in this location?	1	3	2		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					<ul style="list-style-type: none"> - This has almost become a marsh toe revetment. - Lower sill and or oyster.
46	Overall, do you think the wetland creation portion of the project has been successful?	6	0	0		
47	Do you think this structure will continue to function into the future given expected sea level rise?	5	0	1		
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> - Fish passage drop down could be better - use overlap with drop down to reduce scour. - There could be a change to an upland marsh or loss of an upland marsh if sea level rises considerably. I also have concerns about the maintenance of the sill gaps to allow nekton access. - This site is a trash and dead bird collector - needs more frequent maintenance. - Hopefully, marsh evolution and migration will keep pace with expected sea level rise scenarios. Will eventually impact upland berm areas and in longer term, ___?___ if allowed continued migration. Sill will be overtopped more after but should continue to provide adequate dissipation for many decades, or at least another 2 feet of rise in sea level , low marsh will be replaced by shallow subtidal, high marsh by low marsh, etc.



Major Permit No: 42-00-05

Issue Date: February 8, 2002
Pine Knoll Shores, NC 28512
Waterbody: Bogue Sound
Carteret County

- Stone sill 400 feet in length with a 10 foot average base width at the North Carolina Aquarium in Pine Knoll Shores.
- The sill will extend 6 inches above normal high water and be located varying distances offshore.
- The sill will be located a maximum distance offshore of 90 feet and an average distance of approximately 50 feet.
- The sill's landward toe is proposing to mimic the original marsh edge, but some sections will be close to 30 feet from the marsh edge.
- These areas will be backfilled and planted with *Spartina alterniflora*.
- There are 3 drop down areas.

Compiled Field Team Responses						
Date of Visit: 6-23-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	1	9	0		– No; only for canoe launch but added canoe ramp.
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	7	0	3		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	– Tie in ends better.				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	3	0	3	4	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	– More water access.				
6	Is the grade behind the sill still gently sloping?	9	0	1		– Yes, but slopes downward from the sill back.
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> – No. – Sill is higher than needed, BB - dropdowns don't go lower than low tide. – Rock looks a bit high. A lot of sediment building up directly behind the rocks. – No. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	<ul style="list-style-type: none"> – General recommendation to reduce structure/size of sills. – Have seen sedimentation/accretion here so treat if re-designed, would have lowered planting grade sufficiently to allow shallow subtidal immediately adjacent to sill and/or accretion to occur but not excessively (also lower elevation of sills) except perhaps nearest to piers where protection of infrastructure is critical. 				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	5	5	0		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> - At the end of the sill, wetland erosion 100 ft of shoreline. - Washed oat area - maybe not sill related? - End of sill area is highly eroded on west side. - Marsh end next to sill eroding away. 				
11	Is erosion occurring on the adjacent properties?	6	2	2		- No; natural marsh.
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> - Marsh is severely eroded on either side of the sill. - Marsh scarp present. - Marsh scarping. - Erosion evident where no structure exists - average rate here is approximately 1 foot per year - maybe more in storms and hurricanes. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	5	3	2		<ul style="list-style-type: none"> - No, but some on one side. - Yes - erosion continues.
14	Has the sill created new uplands (land above the high water mark) behind it?	2	7	1		
15	Was the placement of the sill (relative to the existing shoreline) appropriate?	7	0	3		- Large area, told erosion set sill mark.
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.		1	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	3	3	4		
18	If yes, please describe them.	<ul style="list-style-type: none"> - Oysters. - Oyster recruitment, marsh expansion. - Oyster habitat on rocks. - Oysters. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	5	5		
20	If yes, please describe them.	- Erosion				
21	Is the structure damaged?	0	9	1		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> - Sill seems to be functioning well. It's unclear whether blow out area was related to sill. - Excellent erosion control. - Project has successfully stabilized shoreline around pier where erosion was most critical due to infrastructure concerns. If redesigned I would lower the size of the sill and planting grades away from pier to minimize impacts. - Might be a site for oyster bags but not around pier itself. 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	10	0	0		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	10	0	0	0	
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	6	1	3		
27	Are upland species colonizing the area behind the sill?	6	3	1		
28	Is there evidence that the upper marsh area is mowed?	0	10	0		
29	Has the marsh grown waterward completely against the sill?	10	0	0		- In most places
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	8	0	2	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	10	0	0		
32	Is macroalgae present on or around the sill?	8	0	2		
33	If yes, is this problematic or concerning? Please explain.	<ul style="list-style-type: none"> - No. - No. - No. - No - a good thing. 				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	6	2	2		- Not sure - limited opening for this.
35	If yes, how can you tell?	<ul style="list-style-type: none"> - Sill may be covered by water but no open water areas for fish to utilize. - Too high, but not inappropriate. - Waterline and wet mud behind the sill. - Vegetation. Elevation. - Dropdowns. - Dropdowns - but not at low tide. - Marsh is getting enough water. - Structure is sufficiently inundated at higher tides. 				
36	If no, why not and is it a concern?	- No fish egress.				
37	Is there a noticeable wrack line landward of the sill?	3	5	2		

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
38	Is there noticeable trash in and around the sill area?	0	10	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	7	3		
40	If so, what are they?	– Eroding shore of wetlands adjacent to sill.				
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.	<ul style="list-style-type: none"> – Sill appears to be somewhat over built. Steep drop-off along waterward edge of sill. – Dropdowns could go lower to allow water in during low tide. – Great habitat and healthy marsh. – Wetlands are very healthy, site heavily used as habitat both around sill and in marshes. 				

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	8	0	2		<ul style="list-style-type: none"> – Yes, wanted intake protection. – Not sure, elevation behind sill seemed to be high.
44	Do you think a different structure would have performed/functioned better in this location?	0	5	5		– No but could have used oyster bags.
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?	<ul style="list-style-type: none"> – This type of structure positioned in a way that doesn't end so abruptly mid-shoreline. – Not bulkhead, but a toe protection riprap revetment. – Maybe an oyster bag sill. – Might have lowered elevation/size of sill and planting grade. 				
46	Overall, do you think the wetland creation portion of the project has been successful?	10	0	0		
47	Do you think this structure will continue to function into the future given expected sea level rise?	5	1	4		<ul style="list-style-type: none"> – Not sure - depends on timeline. – Not sure - structure may be less effective in providing the designed effect.
48	Please provide any additional concerns and/or comments in regards to this site location.	<ul style="list-style-type: none"> – Evaluated this location at high tide. – This sill is well established. I do have concerns about the low marsh being converted to upland marsh due to the high rate of sediment accumulation. 				



Major Permit No: 42-00-06

Issue Date: May 3, 2009

Pine Knoll Shores, NC 28512

Waterbody: Bogue Sound

Carteret County

- 450 foot long stone sill with a maximum bottom width of 11 feet. The sill will be 3.2 feet high and approximate the elevation of normal high water.
- The maximum distance offshore will be 80 feet and average approximately 40ish feet.
- Three dropdowns are proposed with each 5 feet wide. No fill will be used, but marsh plants will be planted within a 1650 square foot area along the unvegetated shoreline.

Compiled Field Team Responses						
Date of Visit: 6-23-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	9	1		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	8	0	2		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	– Less rock, lower elevations more/larger/deeper openings best part is at the open end.				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	4	0	2	4	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	– Same effect maybe achieved with out as high a sill and no fill behind sill.				
6	Is the grade behind the sill still gently sloping?	10	0	0		
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> – The sill is probably bigger than it needs to be. – Sill could have been outward with oyster shells. – No-oysters growing all over the rocks (rip/rap). – Yes - small rock in wetland. – Sill to high/wide for this site. Max 80ft offshore 3.2ft high, avg 40ft. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	– Excellent demonstration site. Best functional site thus far. The greater the distance offshore that the sill is constructed (based on existing marsh /tidal range) the more functional (erosion control, marsh establishment/habitat).				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	0	9	1		
10	If yes, describe the evidence, extent, and location?	– Stabilized by sill of marsh plantings.				
11	Is erosion occurring on the adjacent properties?	1	8	1		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> – Not same rate - average rate for this area is ~1'/yr more if hurricanes. – Adjacent property appears to be stable. Oysters have established at the edge pf marsh. – Bulkhead on one side. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	4	6	0		
14	Has the sill created new uplands (land above the high water mark) behind it?	2	8	0		
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	7	1	2		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	1	0	0		<ul style="list-style-type: none"> – Could have been farther offshore. – Perfect placement.
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	3	2	5		
18	If yes, please describe them.	<ul style="list-style-type: none"> – Oyster recruitment marsh expansion. – Oysters, habitat. – Oysters, fishes, marsh, crabs. – Many oysters on the rocks. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	1	5	4		
20	If yes, please describe them.	<ul style="list-style-type: none"> – Oysters. – Seems like a lot of sand accumulated right behind the sill. 				
21	Is the structure damaged in any way?	0	10	0		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> – Drop downs could be lower _?_ sediment elevations should have been taken to determine if bottom erosion on waterward side of sill is occurring. – Lots of sediment deposition. – Great erosion control; excellent! 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	10	0	0		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	9	0	0	0	– Healthy. – Dense but some patches.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	6	2	2		
27	Are upland species colonizing the area behind the sill?	4	5	1		
28	Is there evidence that the upper marsh area is mowed?	1	9	0		
29	Has the marsh grown waterward completely against the sill?	9	0	1		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	1	9	0	0	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	9	1	0		
32	Is macroalgae present on or around the sill?	7	2	1		
33	If yes, is this problematic or concerning? Please explain.	– No it's a good thing.				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	9	0	1		
35	If yes, how can you tell?	<ul style="list-style-type: none"> – Drop downs and open on west end. – Drop downs. – Ends and gaps. – Water behind the sill but only on one side of the sill. – Sill heavily used by fish species both on sill and in wetland areas. – Yes; could be more. – Yes; at least one drop down. – Tidal pool. – Open ends and dropdowns. 				
36	If no, why not and is it a concern?					
37	Is there a noticeable wrack line landward of the sill?	6	3	1		
38	Is there noticeable trash in and around the sill area?	2	8	0		

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
39	Are there any noticeable issues with the water quality?	0	8	2		
40	If so, what are they?					
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					<ul style="list-style-type: none"> - Tidal creek present in back area of marsh. - Oysters, crabs, good tidal flow. - Sill project has stabilized site allowed restoration of relatively extensive wetland areas which had eroded away - area _?_ tidal Flow at mod/high tides. - Marsh heavily used for habitat. - Fish/crabs around sill when we were there.

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	9	0	1		
44	Do you think a different structure would have performed/functioned better in this location?	1	4	5		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					<ul style="list-style-type: none"> - Oyster reef breakwater like natural shoreline on left side. - Oyster bags would have worked too. - Maybe bags of oyster instead of rock and not as high. - Sill could/should be smaller/lower. - Sill concept is appropriate - may have been adequately protected by oyster bags sill or sheet pile sill except fill cannot be easily used with sheetpile sill advice needed at this site especially for 2 properties adjacent to bulkhead.
46	Overall, do you think the wetland creation portion of the project has been successful?	9	0	1		
47	Do you think this structure will continue to function into the future given expected sea level rise?	7	0	3		
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> - Erosion at this site created by construction of bulkhead of incident erosion forces, design effective but if I were to redesign - would decrease overall size of sill and decrease fill elevations overall and encourage open water landward of sill. Property owners might not agree with this especially during storms, which still brings water over marsh/sill and into yard. - Seems like a large structure and eventually may fill in with sediment that would change the wetland species to more higher ground species (patens etc) Would like to see drop downs lower. - Wall too high for site conditions. - This sill has had a lot of sediment accretion. More drop downs would provide better fish habitat.



Major Permit No: 42-00-08

Issue Date: March 2, 2004

Harker's Island, NC 28531

Waterbody: Straights

Carteret County

- 410 foot long rock sill with a bottom width of 10 feet and height of 6 inches above normal high water (2.5 feet above substrate).
- The project will start at the bulkhead to the west and have 2 drop downs 5 feet wide.
- A small pile of rock will be placed landward of the dropdowns to help dissipate wave energy in that area.
- The waterward toe will be located 25-40 feet waterward of the NHW line.
- Fill (300 cubic yards) will be placed landward of the sill, graded, and planted with marsh vegetation.

Compiled Field Team Responses						
Date of Visit: 6-22-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	7	1		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	5	0	3		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> - Good possibility due to potential scour of hardened adjacent shoreline, previous sandy beach - maybe stable. What need for shoreline stabilization, look like enhancement. - I think this will become high marsh. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	3	0	5	0	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	<ul style="list-style-type: none"> - The fill associated with this house is a bigger issue than the marsh fill. It has impacted adjacent Juncus marsh and increases elevation of marsh near house. - But should used less fill, lower elevation of sill would provide more fish habitat. 				
6	Is the grade behind the sill still gently sloping?	5	0	3		<ul style="list-style-type: none"> - Gentle until upland boundary. - Fill from upland construction. - No original data so can't judge. - Has both gentle and steep grades.
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> - No drop down, has filled in with oysters. - Need more dropdowns and lower elevation, we like narrow footprint. - Small rock in spaces, may be movable in storms. - High shoreline energy?? - Very large differences in rock size, very large to really small. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	<ul style="list-style-type: none"> - Marsh has established very nicely. - More dropdowns would result in more scour/pools providing fish habitat. May also prevent complete fill behind sill of plants. - Would be nice to have cross section data. 				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	0	7	1		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> - Erosion of upland fill into created marsh. - Only from upland activity. 				
11	Is erosion occurring on the adjacent properties?	5	2	1		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> - Perhaps some on marsh on eastern edge. - Lots of scarping. - Not sure if due to sill. - Scarp on end of bulkhead. - Eroding marsh past the end of the sill and the dock. - Bulkheading on one side. - Marsh scarp and failing bulkhead. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	1	7	0		
14	Has the sill created new uplands (land above the high water mark) behind it?	4	2	2		<ul style="list-style-type: none"> - Filling from uplands. - Could have been done by marsh being filled. - Juncus marsh has been filled in.
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	7	0	1		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	0	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	4	1	3		
18	If yes, please describe them.	<ul style="list-style-type: none"> - Fill for house has reduced impacted marsh, not directly due to sill installing. - More marsh area and oysters. - Oyster shell on sill, however also present on nearby shores without sill. - Oyster recruitment, marsh advancement. - Oysters on rock. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	4	4		
20	If yes, please describe them.	<ul style="list-style-type: none"> - Erosion at eastern end. 				
21	Is the structure damaged in any way?	0	7	1		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> - May have additional openings to allow more water. 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	6	0	2		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	8	0	0	0	– Some places are patchy.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	6	0	2		– Upland runoff. – Can't tell what is from sill and what is from accumulation.
27	Are upland species colonizing the area behind the sill?	4	2	2		– Moved out toward the sill, but not all the way to the sill. – <i>Spartina patens</i> .
28	Is there evidence that the upper marsh area is mowed?	0	8	0		
29	Has the marsh grown waterward completely against the sill?	8	0	0		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	8	0	0	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	8	0	0		
32	Is macroalgae present on or around the sill?	6	1	1		
33	If yes, is this problematic or concerning? Please explain.	<ul style="list-style-type: none"> – No, very little. – No. – No. – No. – No. 				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	6	0	2		
35	If yes, how can you tell?	<ul style="list-style-type: none"> – Elevation of drop downs appears appropriate. – Obvious wrack line. – Not enough water flow, no water here. – Wet area behind east area near end of sill, muddy silt near vegetation, wet but maybe isn't inundated. – Evidence of wrack and water line behind sill. – Channel Runnels. 				
36	If no, why not and is it a concern?					

Wetlands, Habitats, and Tidal Flow Continued		# yes	# no	# not sure	# N/A	Field Team Comments
37	Is there a noticeable wrack line landward of the sill?	8	0	0	[REDACTED]	
38	Is there noticeable trash in and around the sill area?	2	6	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	1	5	2		
40	If so, what are they?	– Upland runoff from homesite.				
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.	– Flow is good, good habitat. – Could have more openings to increase flow.				

Other		# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	7	0	1	[REDACTED]	
44	Do you think a different structure would have performed/functioned better in this location?	0	4	4		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?	– Need for parallel structure?, something to absorb energy from adjacent bulkhead. – Segmented breakwaters.				
46	Overall, do you think the wetland creation portion of the project has been successful?	6	0	2	[REDACTED]	
47	Do you think this structure will continue to function into the future given expected sea level rise?	5	0	3		– For a while.
48	Please provide any additional concerns and/or comments in regards to this site location.	– Good demonstration site of functioning sill and habitat. – The sill and marsh seem to be functioning as intended. However the fill from the house has encroached on the marsh. – With vegetation growing to rock, I doubt there will be much of ingress/egress (fish), probably only at high tide. – East end of sill, appears to be erosional pocket forming on adjacent property.				



Major Permit No: 42-00-10

Issue Date: July 21, 2004
Harkers Island, NC 28531
Waterbody: North River
Carteret County

- The project will restore shoreline damaged by Hurricane Isabel.
- 456 linear feet of stone sill for shoreline stabilization and restoration of coastal marsh grass in place of an existing remnant bulkhead damaged by Hurricane Isabel.
- Placement of 800 cubic yards of clean sand to grade and plant with *Spartina alterniflora* and *Spartina patens*.
- 110 foot long stone sill that ties into an existing breakwater, the removal of the remnant bulkhead and associated tie backs, and deadmen, relocating the remaining stone to form the base of the remaining 340 foot stone sill.
- One opening and one overlap area would allow fish and other marine organisms to move in and out.
- A small riprap pile placed behind the dropdown for dispersion of wave energy.

Compiled Field Team Responses						
Date of Visit: 6-22-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	7	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	5	0	2		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?					
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	4	0	2	1	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?					
6	Is the grade behind the sill still gently sloping?	6	0	1		– In same places, not in others.
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> – No. – Some places the sill is well into the upland marsh. – No. – No, maybe more dropdowns. – There is a lot of it, large structure. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	– The height difference between the subtidal and marsh behind the sill is very large.				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	0	7	0		
10	If yes, describe the evidence, extent, and location?					
11	Is erosion occurring on the adjacent properties?	0	6	1		
12	If yes, describe the extent and location.					
13	Is there a distinct shoreline offset between this property and the adjacent properties?	1	4	2		
14	Has the sill created new uplands (land above the high water mark) behind it?	1	5	1		
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	4	2	1		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	2	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	4	1	2		
18	If yes, please describe them.	<ul style="list-style-type: none"> – Oyster habitat. – Oysters, wetlands. – Codium (invasive) negative, oyster recruitment and marsh expansion positive. – Need more gaps (dropdowns). – Marsh creation. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	3	4		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	6	1		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	– High energy site, sill is probably needed, but poorly placed/designed.				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	7	0	0		
		# Dense	# Patchy	# Other	# No marsh behind sill	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	5	1	1		<ul style="list-style-type: none"> - Dense with patches. - Dense and sparse patches.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	5	1	1		<ul style="list-style-type: none"> - On one end.
27	Are upland species colonizing the area behind the sill?	3	4	0		
28	Is there evidence that the upper marsh area is mowed?	0	6	1		
29	Has the marsh grown waterward completely against the sill?	7	0	0		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	7	0	0	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	7	0	0		
32	Is macroalgae present on or around the sill?	4	2	1		
33	If yes, is this problematic or concerning? Please explain.	<ul style="list-style-type: none"> - No. - Yes, codium. - Codium, can't tell if it's the native or invasive species. 				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	5	1	1		<ul style="list-style-type: none"> - Yes in southern area, no in northern area.
35	If yes, how can you tell?	<ul style="list-style-type: none"> - Wrackline. - Structure needs more passes. - Only on one side, no access on the other. - Overtops at high tide, some dropdowns/overlaps. - Small pond behind sill, channel behind sill. 				
36	If no, why not and is it a concern?	<ul style="list-style-type: none"> - No water passage does not maintain scour area for fish habitat. - Well, obvious that water is getting thru the rocks and area is filled and veg goes all the way to the sill. 				
37	Is there a noticeable wrack line landward of the sill?	7	0	0		
38	Is there noticeable trash in and around the sill area?	3	4	0		

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	5	2		
40	If so, what are they?					
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					– Healthy upper marsh established, <i>Spartina</i> growth stunted.

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	6	0	1		
44	Do you think a different structure would have performed/functioned better in this location?	1	4	2		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					
46	Overall, do you think the wetland creation portion of the project has been successful?	6	0	1		– Too dry.
47	Do you think this structure will continue to function into the future given expected sea level rise?	5	0	2		
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> – This sill could have been smaller with drop downs at more locations. It also could have been pushed seaward. – Some aspects are like a marsh sill others are higher almost like a revetment. The area especially near inlet is extremely high land relative to the water level. Mostly upland species and/or higher elevation species. – Dead bird present behind sill, big project, old bulkhead left in place at corner is serving as a small breakwater. In places high marsh has colonized entire area up to sill suggesting elevation is not correct.



Major Permit No: 20-05

Issue Date: February 7, 2005

Davis, NC 28524

Waterbody: Oyster Creek

Carteret County

- Public boat launching facility with 2 ramps, 3 access docks, 3 breakwaters, and shoreline stabilization in the form of a vinyl sheet pile bulkhead, riprap revetment, and riprap marsh sill.
- Along the south shoreline, a 258 long rock sill was constructed with a 6.5 foot base width to a height of 1.5 feet above mean low water.
- Average of 15 feet offshore with the waterward edge along the MLW contour.
- Culverts are designed in lieu of drop downs or gaps to allow water and fish passage with enhancing the problem of scour.

Compiled Field Team Responses						
Date of Visit: 6-23-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	10	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	6	0	4		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?					
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	6	0	3	1	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	– Fill appears necessary to provide planting grades for low/high marsh.				
6	Is the grade behind the sill still gently sloping?	9	1	0		
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> – No. – Codium is growing on it. – No. – Openings too big, appears that fill has washed out from landward side of sill. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	– Extent of fill not clear, overlap is better than dropdown in most cases.				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	0	10	0		– Yes before stabilization, no after stabilized.
10	If yes, describe the evidence, extent, and location?	– Erosion caused by presence of boat ramp structure and incident erosion forces. Sill stabilized this shoreline.				
11	Is erosion occurring on the adjacent properties?	4	5	1		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> – Eroded marsh to the west of the sill. – Marsh scarped. – Tough to say. – Probably average extent 1-2 feet per year. – Scarping on adjacent marsh. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	1	8	1		
14	Has the sill created new uplands (land above the high water mark) behind it?	1	5	4		– There are uplands, may not have been created by sill.
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	8	0	2		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	0	0		– Perfect.
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	4	2	4		– Debris adjacent.
18	If yes, please describe them.	<ul style="list-style-type: none"> – Oysters, protected fish habitat. – Marsh protection, fish occupying water behind the sill, oyster recruitment. – Sill seems to enhance marsh survival. – Oyster habitat on riprap. – Oysters. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	6	2		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	10	0		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> – Overlapping gap seems large. – Effective erosion control approach for this site and purpose. Much better approach (ecosystem wise) than bulkhead on other side of ramp and equally effective. – Good function. 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	9	0	1		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	3	4	2	0	<ul style="list-style-type: none"> – Linear moderate growth. – Very narrow and clumpy. – Dense on part of sill.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	1	6	3		
27	Are upland species colonizing the area behind the sill?	3	5	2		– Species exist but cannot tell from when/where/how colonized.
28	Is there evidence that the upper marsh area is mowed?	1	9	0		
29	Has the marsh grown waterward completely against the sill?	0	10	0		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	5	0	5	– From aerial, SAV was present when constructed.
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	10	0	0		
32	Is macroalgae present on or around the sill?	3	3	4		
33	If yes, is this problematic or concerning? Please explain.	– Depends on species of codium present.				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	9	0	1		
35	If yes, how can you tell?	<ul style="list-style-type: none"> – Large overlap, open. – Sill in two sections and open at both ends. – Water is behind the sill and fish visible behind the sill. – Nice overlap area with water on both sides of the sill. – Large gap/overlap. – Lots of fish even at low tide, many crabs, some shrimp visible around structure. – Openings large enough for fish passage. – Fish present, sill is offset. 				
36	If no, why not and is it a concern?					

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
37	Is there a noticeable wrack line landward of the sill?	6	3	1		
38	Is there noticeable trash in and around the sill area?	3	7	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	8	2		
40	If so, what are they?					
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					<ul style="list-style-type: none"> - Good design for fish passage, structure heavily used as habitat at this site, good relationship of wetlands to structure. - Tidal flow = great, habitat = great.

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					<ul style="list-style-type: none"> - Agency was concerned about original design with culvert pipes; project was redesigned without pipe. We also suggested reducing height and adding gaps which also appears to have happened.
43	Do you think this sill is functioning as intended?	8	0	2		
44	Do you think a different structure would have performed/functioned better in this location?	1	6	3		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					<ul style="list-style-type: none"> - Just as well as. - Oyster rock breakwaters. - Half of one sill is unnecessary since it fronts a revetment and deeper water.
46	Overall, do you think the wetland creation portion of the project has been successful?	8	0	2		
47	Do you think this structure will continue to function into the future given expected sea level rise?	4	0	6		
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> - I really like this one. Has fish access while still providing protection. - Evaluated this site at mid tide. - This sill seems appropriate for the site. It seems to be well constructed and is providing accessible habitat. The gap between the two sills is larger than I have seen, but does not seem to be resulting in erosion. - Lots of pebble rock in marsh and behind the sill. - Overall sill height looks good. The overlap seems large. I think it will perform as designed. I like this project. - Good design concept and implementation. Good crest height. - Sill provides great protection of restored marsh.



General Permit No: 45794C

Issue Date: July 20, 2006

Beaufort, NC 28516

Waterbody: Straights

Carteret County

- Offshore Sill and Riprap
- Riprap Length – 95’
- RR Average distance offshore – 2’
- RR Max distance offshore – 5’
- Riprap Sill 95’x15’
- Max distance offshore – 30’
- Shoreline Length – 110’

Notes or Conditions added to the Permit:

- All portions of sill must be 15’ from neighbors to west (riparian corridor).
- Riprap to be landward of all marsh
- Rock sill no higher than 6 inches above NHW or adjacent wetland substrate

Compiled Field Team Responses						
Date of Visit: 6-22-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	7	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	2	1	4		<ul style="list-style-type: none"> - Good natural marsh on both sides of sill. - Can't tell if any is created.
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> - Very narrow fringe of marsh, barely same area as rock fill. Nearby fringing marsh appear healthy and stable without any rock sill. - May have been placed on/near SAV habitat, has not created large area of marsh, created SAV habitat behind sill, oyster habitat, smaller structure and not as far from shore and not as close to SAV habitat. - Veg planting seems like it would have worked without rocks. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	0	1	1	5	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	<ul style="list-style-type: none"> - Rock appears unnecessary. - Marsh planting probably sufficient but may have needed fill. 				
6	Is the grade behind the sill still gently sloping?	5	1	1		- Up to riprap shoreline.
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> - Seems unnecessary. - Structure necessary to begin with? - Rock retaining wall between property and marsh, Are rocks really necessary? 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	- No fill, no SAV issues.				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	0	6	1		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> – Lack of high marsh adjacent to lawn and narrowness of existing marsh suggest past erosion. – Marsh finger comparable to vicinity. 				
11	Is erosion occurring on the adjacent properties?	0	6	1		
12	If yes, describe the extent and location.					
13	Is there a distinct shoreline offset between this property and the adjacent properties?	4	1	2		<ul style="list-style-type: none"> – Depends on definition. – Offset is stairstepped.
14	Has the sill created new uplands (land above the high water mark) behind it?	1	6	0		– Because of riprap.
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	4	2	1		– Too close to SAV.
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	1	0	0		– And probably unnecessary.
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	3	2	2		
18	If yes, please describe them.	<ul style="list-style-type: none"> – Oysters on sill. – Oyster recruitment. – Oysters growing on rocks. – Maybe new marsh created upstream. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	4	3		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	7	0		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> – Not much erosion evident. – I don't think this property really needed erosion protection. There is adjacent non-eroded natural marsh. 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	1	5	0		<ul style="list-style-type: none"> - Only high. - Low marsh only.
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	2	2	3	0	<ul style="list-style-type: none"> - Very narrow. - Not growing immed behind sill, maybe too deep at low tide. - In nearshore area, then absent. - Continuous and thick. - Dense but very narrow.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	1	5	1		
27	Are upland species colonizing the area behind the sill?	0	7	0		<ul style="list-style-type: none"> - A few.
28	Is there evidence that the upper marsh area is mowed?	1	6	0		<ul style="list-style-type: none"> - Because of rip rap.
29	Has the marsh grown waterward completely against the sill?	0	7	0		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	6	0	1	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	7	0	0		
32	Is macroalgae present on or around the sill?	6	1	0		
33	If yes, is this problematic or concerning? Please explain.	<ul style="list-style-type: none"> - No, although macroalgal do appear to be covering the SAV. - No, its offshore of the sill. - No, it's a good thing. 				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	6	1	0		<ul style="list-style-type: none"> - Water not passing through sill. Only getting behind it by going around the ends.
35	If yes, how can you tell?	<ul style="list-style-type: none"> - Sill is open on both ends. - Fish present and using area behind sill. - We see them. - Water flow present behind sill. - Mostly around edges, but it is low tide so not sure about fish going through. - See them. 				
36	If no, why not and is it a concern?					

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
37	Is there a noticeable wrack line landward of the sill?	1	5	1		
38	Is there noticeable trash in and around the sill area?	3	4	0		<ul style="list-style-type: none"> - 1 bag of chips. - A little. - 1 bag.
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	7	0		
40	If so, what are they?					
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					- Lots of habitat, good oyster recruitment.

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	5	1	1		
44	Do you think a different structure would have performed/functioned better in this location?	4	0	3		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					<ul style="list-style-type: none"> - Marsh plantings, oyster toe. - Just plantings would have been sufficient. - Maybe a smaller sill. - Was sill really needed? Allow natural process, use oyster shells instead of rocks. - No structure because the marsh could have been planted and would have likely persisted. - Veg plantings.
46	Overall, do you think the wetland creation portion of the project has been successful?	2	1	4		<ul style="list-style-type: none"> - Not planted? - Not a lot of marsh created. - Already believe marsh was present.
47	Do you think this structure will continue to function into the future given expected sea level rise?	3	0	4		<ul style="list-style-type: none"> - In the immediate future, but not long-term as wetland cannot migrate due to upland riprap. - Depends on SLR rate.
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> - Sill may not have been necessary; no apparent erosion issues, oyster bag sill would have worked too, or just planting the shoreline. - No gaps in structure, ends open, but does it fit permitted design? Could not compare to GP drawing, not available, marsh already seemed present in construction photos. - This should not have been a general permit b/c additional review may have shown that less structure is needed to protect this shoreline.



Major Permit 142-06

Issue Date: August 21, 2006

Morehead City, NC

Waterbody: Newport River

Carteret County

- The applicant proposed converting an existing marina into a subdivision with a community marina. Involving the construction of 20 townhomes including the entire infrastructure, the reconfiguration of docks, and excavation around the docks.
- The slip count would be increased from 23 to 28. The shoreline would be straightened and stabilized with a bulkhead and riprap.
- A 230 foot long riprap sill was placed 5 feet waterward of the marsh area. The riprap sill was 16 feet wide at the base and has a 5 foot gap every 100 feet.

Compiled Field Team Responses						
Date of Visit: 6-8-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	1	5	0		–Markers are necessary.
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	3	0	3		– Marsh was not created, was already here. – Protected not created.
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	– There appear to be no significant impacts. – Area appeared impacted by land uses and being actively eroded prior to project. Marsh peat eroded, but vegetation has been restored and sustained.				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	1	0	2	3	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?					
6	Is the grade behind the sill still gently sloping?	4	0	2		
7	Are there any issues associated with the rock that you can observe today that concern you?	– No. – Very large rock used for large footprint. – No. – Distance from shore.				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	– This sill is in much deeper water than other sills, therefore more rock was needed to build up the sill. The opening in the sill seems appropriate for fish access. – This site used the sill to protect, not create marsh. There is a relatively steep slope and deep water adjacent to the sill. No fill was used. – Can't remember if site was marked by pilings/markers.				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	1	3	2		– Not sure about this one, see Duke?
10	If yes, describe the evidence, extent, and location?	– Maybe some right behind the dropdown but probably good or designed that way. – Site has been stabilized.				
11	Is erosion occurring on the adjacent properties?	0	6	0		– They are hardened. – Bulkheaded around here, around here shoreline erosion continues where not stabilized. – Adjacent properties have bulkheads. – N/A, bulkheaded both sides.
12	If yes, describe the extent and location.					
13	Is there a distinct shoreline offset between this property and the adjacent properties?	5	1	0		–Marsh area extends beyond adjacent bulkheaded site.
14	Has the sill created new uplands (land above the high water mark) behind it?	1	1	4		
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	5	0	1		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	1	0	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	3	3	0		
18	If yes, please describe them.	– Fish access behind the sill and marsh establishment. – No - fish and microalgae. – Protection of the marsh and the maturation of the marsh. – Restored habitat for fish, shellfish, etc. Water quality benefits, riparian buffers.				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	6	0		
20	If yes, please describe them.	– None observed.				
21	Is the structure damaged in any way?	0	6	0		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.					

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	6	0	0		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	5	1	0	0	
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	1	3	2		
27	Are upland species colonizing the area behind the sill?	0	4	2		
28	Is there evidence that the upper marsh area is mowed?	0	6	0		
29	Has the marsh grown waterward completely against the sill?	0	6	0		- Marsh was existing.
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	0	4	2	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	2	3	1		- Not many.
32	Is macroalgae present on or around the sill?	5	1	0		
33	If yes, is this problematic or concerning? Please explain.	<ul style="list-style-type: none"> - No. - No. - No. - No. 				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	6	0	0		
35	If yes, how can you tell?	<ul style="list-style-type: none"> - Fish behind the sill and moving in and out of the sill opening. - Observations narrow but deep openings. - Fish and water present. - There are 5 ft dropdowns every 100 ft per permit requirements. - Excellent design with narrower openings at the base act to create and open to grade level. Does not meet current gap requirements. - I see fish behind the sill. 				
36	If no, why not and is it a concern?					
37	Is there a noticeable wrack line landward of the sill?	4	2	0		
38	Is there noticeable trash in and around the sill area?	4	2	0		

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	5	1		
40	If so, what are they?	– No efforts to divert/mitigate stormwater runoff but does not seem to erode shoreline.				
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	6	0	0		
44	Do you think a different structure would have performed/functioned better in this location?	1	3	2		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and WHY?	– Nothing or marsh toe protection would have been enough. – Presents of bulkhead behind the sill limits the ability of marsh to migrate landward and is unnecessary with sill/marsh. Sill might have been able to be constructed here with sheetpile or oyster bags but not sure of wave energy.				
46	Overall, do you think the wetland creation portion of the project has been successful?	4	0	2		– Marsh was not created, was already present here. – Protection/enhancement...not creation.
47	Do you think this structure will continue to function into the future given expected sea level rise?	1	1	4		
48	Please provide any additional concerns and/or comments in regards to this site location.	– I think this sill is functioning as intended and creates viable fish habitat. The opening is deep and wall designed for tidal passage. – From aerial photo, it appears that marsh has changed configuration. Would be useful to compare before/after photos to see if total marsh acreage has changed. – This sill appears to be protecting the marsh. – Sill continues to function even with elevated sea level rise, but shoreline will not be able to migrate landward past bulkhead. Sill will dissipate energy with additional 1- 2 feet but low marsh will move up profile and more shallow subtidal will exist between sill and low marsh.				



General Permits 48144C, 48145C, 50129C, 50168C, 50130C

Issue Date: 48144C and 48145C issued March 9, 2007

50129C and 50130C issued February 15, 2008 and 50168C issued on February 22, 2008.

Harkers Island, NC

Waterbody: Back Sound

Carteret County

- Project consists of two rock sills approximating 354 feet in length divided between five homeowners (each owning and permitting their own portion of the sill).

Compiled Field Team Responses						
Date of Visit: 6-22-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	6	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	5	0	1		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?					
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	1	0	2	3	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?					
6	Is the grade behind the sill still gently sloping?	6	0	0		
7	Are there any issues associated with the rock that you can observe today that concern you?	– Too high on the land, should have been placed more seaward.				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.					

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	2	4	0		
10	If yes, describe the evidence, extent, and location?	– Beach is eroding some.				
11	Is erosion occurring on the adjacent properties?	4	1	1		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> – Loss of beach. – Due to groin on east end. – Beaches are eroding. – Lots of groin fields around. – Groin field. – Erosion on adjacent property behind sill. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	1	4	1		
14	Has the sill created new uplands (land above the high water mark) behind it?	1	5	0		
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	1	4	1		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	4	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	2	2	2		
18	If yes, please describe them.	<ul style="list-style-type: none"> – Reflector unnecessary and ugly, wetlands created. – Marsh expansion. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	4	2		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	6	0		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.					

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	4	1	1		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	4	0	2	0	– Dense on one side, patchy on the other.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	2	1	3		
27	Are upland species colonizing the area behind the sill?	2	4	0		– Not quite at the sill.
28	Is there evidence that the upper marsh area is mowed?	2	4	0		
29	Has the marsh grown waterward completely against the sill?	5	0	1		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill?	0	4	0	2	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present?	0	5	1		
32	Is macroalgae present?	2	3	1		
33	If yes, is this problematic or concerning? Please explain.	– No. – No. – No.				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	2	3	1		
35	If yes, how can you tell?	– Wrack line. – No water or fish present. – Around sides at high tide.				
36	If no, why not and is it a concern?	– Not supporting fish habitat but it was a beach here before. – Yes, no fish utilization. – There are species of wetland plants. – Sill too high.				
37	Is there a noticeable wrack line landward of the sill?	5	1	0		
38	Is there noticeable trash in and around the sill area?	1	5	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	2	4	0		
40	If so, what are they?	– Drainage ditch running right into the sill. – Drainage ditch between properties empties behind sill.				
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.	– Beach has built up.				

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	4	2	0		– Not high enough. – More like a toe revetment.
44	Do you think a different structure would have performed/functioned better in this location?	2	2	1		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					– A sill further from shore. – Groins repaired.
46	Overall, do you think the wetland creation portion of the project has been successful?	5	0	1		– Somewhat.
47	Do you think this structure will continue to function into the future given expected sea level rise?	3	1	2		
48	Please provide any additional concerns and/or comments in regards to this site location.					– Drainage ditch between properties empties right adjacent to sill.



Major Permit No: 131-07

Issue Date: August 24, 2007

Beaufort, NC

Waterbody: North River

Carteret County

- Restore 400 feet of shoreline adjacent to property along the North River as well as constructing a 4 slip boat docking facility at the property line of the two properties.
- 282 feet long rock sill consisting of two parts: 188 feet and 95 feet long with a 30 foot gap between them and a revetment along shoreline.
- The sill base width is 16 feet with a maximum distance offshore of 60 feet and average distance offshore of 46 feet.
- The crest elevation would extend 1 foot above normal high water with a crest width of 2 feet. Project consists of 537 cubic yards of material.
- The revetment would be along the southern portion of the property along a dilapidated bulkhead.

Compiled Field Team Responses						
Date of Visit: 6-8-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	6	1		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	5	1	1		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> - Structure is correct design/alignment for this high energy site-followed existing shoreline. - Increased marsh no existing halo. To impact - no PNA, SAV. - There was no PNA, shellfish or SAV impacts. Created more low marsh and potentially avoided the installation of bulkhead benefits of the creation of this sill more a result of the applicant appropriately addressing WRC concerns about height of sill. - Sill could be smaller and lower. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	5	0	2		
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	<ul style="list-style-type: none"> - Erosion had progressed so that elevations could not support low or high marsh. - 537 yds3 excessive fill. 				
6	Is the grade behind the sill still gently sloping?	4	0	3		
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> - Water standing behind sill healthy marsh, rock sill on N end doesn't seem necessary. - Sill height appears greater than needed. Sill may be overbuilt on North side of dock. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	<ul style="list-style-type: none"> - Not having a dropdown on the Dunn side prevents fish utilization of the marsh. However, it is a high energy site. 				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	1	5	1		
10	If yes, describe the evidence, extent, and location?	– Upland, and at the dock. – Site is stable.				
11	Is erosion occurring on the adjacent properties?	2	3	2		
12	If yes, describe the extent and location.	– Bulkheaded adjacent property to west. – On revetment to right of property evidence of storm water run off through revetment and on left marsh is present. – Healthy marsh adjacent. – But at a marsh lower rate done to different shoreline reach and orientation.				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	2	5	0		– Sill followed alignment of previous remnant bulkhead.
14	Has the sill created new uplands (land above the high water mark) behind it?	0	7	0		– There is continued concern that future accretion and the change of low marsh to high marsh, subsequently followed by mowing can change uplands.
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	5	1	1		– Sill followed alignment of previous remnant bulkhead.
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	0	1		– Needs to be tapered more to boat ramp.
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	3	2	2		
18	If yes, please describe them.	– Marsh development, but lots of wrack deposition in some places in the adjacent marsh. – Some macroalgae, some oysters on rock. – Marsh had been able to grow in area from which it had eroded. – Enhanced marsh rip/rap area buffer habitat. Water quality buffer.				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	6	1		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	7	0		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	– Project appears to tie into adj. marsh in elevation and orientation.				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	6	0	1		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	6	0	1		– Healthy in places, straggly in others.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	1	3	3		
27	Are upland species colonizing the area behind the sill?	0	4	3		– Dune/subaerial species exists where appropriate.
28	Is there evidence that the upper marsh area is mowed?	1	6	0		
29	Has the marsh grown waterward completely against the sill?	0	7	0		– Yes in a few small areas but mostly no.
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill?	0	0	3	4	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present?	7	0	0		
32	Is macroalgae present?	2	2	3		
33	If yes, is this problematic or concerning? Explain.					
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	6	0	1		
35	If yes, how can you tell?	<ul style="list-style-type: none"> – Flooding behind the sill. – 1 sill open both end- lots water other sill 1 opening and drop down. – Drop downs get fish behind sill. – There is standing water on the landward side of the sill. – Water and fish. – End of sill adj. to revetment/bulkhead has less egress/ingress - sediment build up at open end makes fish passage reduced at lowest tides - ok from mean tide to MHW I think. – Limited sill opening on S side - sill open on both ends in N side. 				
36	If no, why not and is it a concern?					

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
37	Is there a noticeable wrack line landward of the sill?	6	0	1		
38	Is there noticeable trash in and around the sill area?	2	5	0		– No but there seems to be no real source of trash.
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	1	4	2		
40	If so, what are they?	– Storm water runoff evident on adj. property for the right. – Boat ramp between sill.				
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.	– Fiddler crabs, blue crabs, fish- mullet, mummuchog. – Same comments as on Duke - might have improved egress/ingress with modified design and sill protected against too much energy though the drop down.				

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.	– The applicant lowered the height of the sill and included drop downs.				
43	Do you think this sill is functioning as intended?	7	0	0		
44	Do you think a different structure would have performed/functioned better in this location?	1	4	2		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and WHY?					
46	Overall, do you think the wetland creation portion of the project has been successful?	6	0	1		
47	Do you think this structure will continue to function into the future given expected sea level rise?	2	0	5		– Kind of low.
48	Please provide any additional concerns and/or comments in regards to this site location.	– Sill should allow energy dissipation even at higher water levels, low marsh will ->shallow subtidal->high marsh will not equal low marsh etc. Element profile will allow migration landward but location of house is already done to shoreline - at some point, increased water levels and anticipated increase in storm energy will compromise house regardless. How many yrs? Not certain - sill can function even with 1'-1.5' (?) increase in SLR – The project had excessive fill large amt. of bottom impacts due to structure; ends of sill should have been tapered around boat ramp; overall, though sill is doing what it was intended to do.				



General Permit No: 49808C

Issue Date: February 07, 2008

Harkers Island, NC 28531

Waterbody: Back Sound

Carteret County

- Rock Sill 180'x15'
- Construct a rock sill shoreline stabilization structure approximately 30' seaward of NHW that will be 195'Lx15'W to a height not to exceed 6" above NHW as shown on the drawings.
- Shoreline Length – 192'

Compiled Field Team Responses						
Date of Visit: 6-22-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	8	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	4	1	3		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> – More breaks or lower openings to allow sediment to escape, smaller opening at east end. – Not sure but there seems to be minimal or hardly any vegetation. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	3	2	3	0	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?					
6	Is the grade behind the sill still gently sloping?	6	1	1		– East end sand accumulating behind sill.
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> – Build up of sand on back side of sill. – Too high, more of a marsh toe revetment than a sill. – Dropdown does not go very low. – Drop downs are not low enough to allow for fish to go in and out. – Tie in with old groins is concerning. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	– Constructed without gaps, dropdowns used instead.				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	5	2	1		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> – East end. – Slight, likely constructed due to scour from adjacent rip rap. – On north end of sill. – Some in front of the sill, sandy beach slightly eroded. – By pier runoff channel is present through marsh. 				
11	Is erosion occurring on the adjacent properties?	3	3	2		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> – Up to uplands and bulkhead, added riprap. – Hardened. – North end of sill adjacent to property eroding. – Beach erosion. – Possibly accreting. – Some erosion but many small groins flank the project. – Does appear to be erosional evidence on east end of sill. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	4	4	0		– On one side.
14	Has the sill created new uplands (land above the high water mark) behind it?	3	3	2		
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	3	2	3		– Equal to adjacent revetment.
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.		2	1		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	4	2	2		
18	If yes, please describe them.	<ul style="list-style-type: none"> – Oysters, marsh habitat. – Oysters. – Oyster recruitment, codium (invasive). – Oysters growing on sill. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	5	3		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	7	1		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> – Functioning well – Interplay between sill and groins is concerning. 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	6	1	1		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	2	5	1	0	– Both dense and sparse areas.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	7	1	0		
27	Are upland species colonizing the area behind the sill?	3	4	1		
28	Is there evidence that the upper marsh area is mowed?	3	5	0		– About 20ft of high marsh is mowed and now grass compared to neighboring properties.
29	Has the marsh grown waterward completely against the sill?	5	1	2		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	6	1	1	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	8	0	0		
32	Is macroalgae present on or around the sill?	5	0	3		– Codium is present.
33	If yes, is this problematic or concerning? Please explain.	– Codium is invasive – No is a good thing.				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	3	3	2		
35	If yes, how can you tell?	– Wrackline. – Very limited to fish. – Need more dropdowns. – Dropdown and sides. – Some because of one drop down. – Can't tell water gets in.				
36	If no, why not and is it a concern?	– No fish habitat, holds accumulated sand. – The dropdown is too high. – Drop down not cut down deep enough.				
37	Is there a noticeable wrack line landward of the sill?	6	2	0		

Wetlands, Habitats, and Tidal Flow Continued		# yes	# no	# not sure	# N/A	Field Team Comments
38	Is there noticeable trash in and around the sill area?	3	5	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	5	3		
40	If so, what are they?					
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.	– Good marsh habitat.				

Other		# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	6	0	2		– Applicant intentions.
44	Do you think a different structure would have performed/functioned better in this location?	1	4	3		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					
46	Overall, do you think the wetland creation portion of the project has been successful?	5	0	3		– Prevented in area of deposition.
47	Do you think this structure will continue to function into the future given expected sea level rise?	3	0	5		
48	Please provide any additional concerns and/or comments in regards to this site location.	– A smaller sill further seaward with more dropdowns may provide better fish habitat. – Reflectors are all broken.				



Major Permit No: 15-08

Issue Date: February 14, 2008

Harkers Island, NC 28531

Waterbody: North River

Carteret County

- A rock sill, 107 feet in length and a width of 16.5 feet. The next sill to the north is to begin approximately 45' north of the previous sill, and the farthest distance offshore is 64' to the waterward edge.
- This 99' long sill will have 14.5' bottom width and 2' top width, with the crest again positioned at +2.6' or +1' above the NHW level.
- The next shore-parallel sill is approximately 151 feet in length and averages 15 feet bottom width, and at its farthest is 105 feet from the NHW contour to the waterward edge of the sill.
- Continuing north, the sill will be approximately 121' in length, with an average bottom width of 19' and a 2' crest width.
- The last proposal is for a spur or rock sill with a 105 degree turn. The 122 foot long structure will begin 8 feet from the neighboring riparian corridor.

Compiled Field Team Responses						
Date of Visit: 6-22-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	1	6	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	5	0	2		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> - More outflows. - Wetlands better than sandy beach, rocks may have been placed on/near SAV. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	3	0	4	0	- Should be less structure, less elevation, and more dropdowns, more flushing.
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?					
6	Is the grade behind the sill still gently sloping?	4	2	1		- Almost too flat in western portion, more dropdowns and wider drops...too tall.
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> - More dropdowns, wider drops, structure too tall. - Structure is too large; tie ins with existing groins is troubling. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.					

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	3	3	1		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> – Scarped edges downed trees. – Upland scarp, large eroded cliffs landward of sill. – Upland scarp, can't tell if it is pre or post sill. 				
11	Is erosion occurring on the adjacent properties?	3	3	1		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> – Eroding on one side of project. – Marsh and beach is eroding next to sill end. – Erosional pocket at end of sill adjacent to groin. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	0	3	4		
14	Has the sill created new uplands (land above the high water mark) behind it?	2	3	2		– Has created land but not sure I would call it uplands.
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	6	0	1		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.					
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	2	1	4		
18	If yes, please describe them.	<ul style="list-style-type: none"> – More wetlands and oysters, there may be too much deposition. – Maybe (something) of rock sill. – Positive oyster recruitment, marsh growth, negative, codium accumulation. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	2	5		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	7	0		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	– Site functioning properly.				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	5	2	0		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	6	1	0	0	– Dense in eastern section, patchy in western section.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	6	0	1		– Too much.
27	Are upland species colonizing the area behind the sill?	3	2	2		– Not quite to the sill.
28	Is there evidence that the upper marsh area is mowed?	0	7	0		
29	Has the marsh grown waterward completely against the sill?	7	0	0		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	7	0	0	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present?	7	0	0		
32	Is macroalgae present?	5	0	2		
33	If yes, is this problematic or concerning? Please explain.	<ul style="list-style-type: none"> – No. – Codium invasive covering the lower sill. – Codium is present, can't tell if it is native or invasive sp. 				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	4	2	1		
35	If yes, how can you tell?	<ul style="list-style-type: none"> – Gaps are present, no evidence of fish, fairly dry. – No water. – High water mark behind sill. – Drop downs for this purpose are present. – Drop downs for this purpose are present. 				
36	If no, why not and is it a concern?	<ul style="list-style-type: none"> – Perhaps b/c wave energy too high, not required in permit? – Yes, it is a big concern. 				
37	Is there a noticeable wrack line landward of the sill?	6	1	0		
38	Is there noticeable trash in and around the sill area?	2	5	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	4	3		
40	If so, what are they?					
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.	– Fiddler crab heaven, lots of them, healthy marsh.				

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					– Yes, design was changed.
43	Do you think this sill is functioning as intended?	7	0	0		
44	Do you think a different structure would have performed/functioned better in this location?	0	4	3		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and WHY?					
46	Overall, do you think the wetland creation portion of the project has been successful?	7	0	0		
47	Do you think this structure will continue to function into the future given expected sea level rise?	5	0	2		
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> – Marsh is healthy and has established since it was planted, despite everyone else's comments saying its dying. I can send you all pre-planting pics taken in 2008. – High energy shoreline. – This is a huge sill. I think having more breaks with rock behind the drop downs would promote more fish utilization of the marsh. It is also too tall in some places. – Groins built into sill at end may be problematic, this is a big sill...may be too tall.



Major Permit No: 42-00-09

Issue Date: May 24, 2004

Edenton, NC 27932

Chowan River

Chowan County

- A 450 feet long rock sill was constructed with a bottom width of 15 feet and height of 1 foot above normal water level (4.5 feet total height).
- The sill extends 27 feet waterward of normal water level with 4 dropdowns, 5 feet wide located approximately every 100 feet.
- 460 cubic yards of fill used for grading and planting landward of the structure. An additional 13 feet landward of normal water level along the entire 450 foot long project will be graded and planted with high marsh species.
- An existing bulkhead along the shoreline will be removed.
- In May 2005, a modification was submitted to place rock breakwater type structures landward of the dropdown areas due to the severe scouring of the shoreline.

Compiled Field Team Responses						
Date of Visit: 7-20-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	9	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	7	0	2		– Was a bulkhead previously.
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> – Most likely yes - previous condition was eroding shoreline with no marsh. Water behind sill allows aquatic use. – Adjacent margin is woody debris and cypress flooded forest. Is marsh better than what's here naturally? 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	0	0	0	9	– Likely since high energy site with low SAV potential.
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?					
6	Is the grade behind the sill still gently sloping?	6	2	1		
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> – Maybe move breakwater waterward. – No. – Stair stepped. First stair is at edge of parking lot. Second stair at edge of silt fence. – No. – None. – Sill may need to be extended to tie into the boat ramp dock. – Shift? 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	– Secondary structures seem to be functioning well at maintaining the shallow bottom habitat and minimizing scour effects.				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	2	6	1		– No - not any more.
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> – Scouring at tramp looks like sill shifted or fell down during ramp construction. – Mostly stabilized with hardened structures (sill). Looks like scour area at upstream end maybe due to recent construction activity of the ramp. 				
11	Is erosion occurring on the adjacent properties?	2	6	1		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> – Separated by canal - stable wetland shoreline. – Cypress trees in water. – Adjacent shorelines are hardened. – Other side of sill, the shoreline appears to be receding within swamp forest. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	5	3	1		– But not from structure.
14	Has the sill created new uplands (land above the high water mark) behind it?	2	6	1		
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	6	1	2		– Would like to see a wider sill.
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	1	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	2	4	3		
18	If yes, please describe them.	<ul style="list-style-type: none"> – Trash in marsh. – Creation of estuarine habitat, use of native vegetation/species diversity screening. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	5	4		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	1	6	2		– Yes but not severe. – Shift?
22	If yes, please describe the damage.	<ul style="list-style-type: none"> – Maybe at the upstream end near the breakwater. – Yes some settling of the sill - uneven height. – Near boat ramp some rock ahs moved a bit, but can be easily remounded to repair. 				
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	– I like the baffled drop downs.				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	7	1	1		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	9	0	0	0	
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	0	4	5		
27	Are upland species colonizing the area behind the sill?	4	2	3		
28	Is there evidence that the upper marsh area is mowed?	0	9	0		
29	Has the marsh grown waterward completely against the sill?	7	2			<ul style="list-style-type: none"> - No; little gap. - Yes; almost to sill but sill shallow water habitat. - Yes; except in gaps.
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)			1	8	- Too high tide to tell.
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	0	7	2		- Too high tide to tell.
32	Is macroalgae present on or around the sill?	2	5	2		
33	If yes, is this problematic or concerning? Please explain.	<ul style="list-style-type: none"> - No, but some green filamentous alga on rocks near boat ramp. - No, it's a good thing. 				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	8	0	1		
35	If yes, how can you tell?	<ul style="list-style-type: none"> - Can see it. - Gap with water behind sill. - Gaps in sill ensure water passage around sill. - Drop downs present and water behind the sill. - Good gaps with rock behind gaps to keep from silting in. - Openings all the way across the structure. - Several openings. - Water present behind sill, observed juvenile fish moving in and out of restored area. 				
36	If no, why not and is it a concern?					
37	Is there a noticeable wrack line landward of the sill?	5	3	1		- Yes - some weedy wrack.

Wetlands, Habitats, and Tidal Flow Continued		# yes	# no	# not sure	# N/A	Field Team Comments
38	Is there noticeable trash in and around the sill area?	1	8	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	2	7	0		
40	If so, what are they?	<ul style="list-style-type: none"> – Drainage from parking lot – Parking lot behind sill. 				
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					

Other		# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	9	0	0		
44	Do you think a different structure would have performed/functioned better in this location?	0	7	2		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?	<ul style="list-style-type: none"> – Not sure - depends on goal. – But maybe slightly different orientation. 				
46	Overall, do you think the wetland creation portion of the project has been successful?	9	0	0		
47	Do you think this structure will continue to function into the future given expected sea level rise?	5	1	3		<ul style="list-style-type: none"> – Not sure; depends on goal and timeline – No; because no room for marsh to retreat. – Not sure; are SLR continues the adjacent parking lot may inhibit migration of the marsh.
48	Please provide any additional concerns and/or comments in regards to this site location.	<ul style="list-style-type: none"> – Overall impression: Design needs to be done by someone with some engineering experience. Built from foot of old bridge landing, north. Living Cypress trees in front of sill. Parking lot gives little room for marsh retreat. – Like this project - with the gaps. Would like to have the structure further offshore. 				



Major Permit No: 42-00-04

Issue Date: August 25, 2000

Waterbody: Neuse River

Craven County

- A rock sill 176 feet long with an average base width of 8 feet.
- Two groins exist on the property and will intersect the sill in those locations.
- Fill will be used landward of the structure and graded and planted with marsh vegetation.
- A riprap revetment is also located on the property approximately 40 feet inland of the normal high water line.
- One drop down will be constructed for the purposes of allowing for water circulation.
- Impacts include 1408 square feet to rock placed on the shallow bottom habitat, 250 square feet of shallow bottom habitat filled for marsh plantings, and another 4400 square feet of filled and planted upland area.

Compiled Field Team Responses						
Date of Visit: 6-30-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	9	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	5	1	3		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> - A lot of high marsh. - Not typical marsh area #2 states marsh ok for stabilization more like revetment. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	5	0	4	0	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	<ul style="list-style-type: none"> - Limited fish habitat behind sill; might be too high. - Why are grains present? 				
6	Is the grade behind the sill still gently sloping?	4	2	3		<ul style="list-style-type: none"> - Never was though. - Property has a step slope.
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> - No ingress of fish into wetland areas. No drop downs openings/access to cypress roots and methanols. - No. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	<ul style="list-style-type: none"> - Project designed to include fill sufficient to protect/prevent loss of cypress trees - initial shoreline had eroded to point where water had significantly exposed cypress roots and was eroding into upland/scarping. Fill was used to backfill sill and restore tree growing grounds - only high marsh spp. planted but some lower spp. have volunteered in limited areas. 				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	1	7	1		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> – Uplands well above the sill. – Armored shoreline. – Site stabilized on water of upland (stormwater) sites. 				
11	Is erosion occurring on the adjacent properties?	4	2	3		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> – Caused next door by stormwater runoff not marsh. – Roots exposed on trees. – Immediately adjacent site has eroding banks which are supplying sandy beach natural but properties in area show evidence of erosion similar to owners previously. – Referral shoreline of adjacent property to right. – No; to left of bulkhead. – Sight on beach; hardened. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	2	6	1		
14	Has the sill created new uplands (land above the high water mark) behind it?	2	6	1		
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	4	2	3		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	3	0		– Perhaps being further offshore would allow greater fish access.
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	2	3	4		
18	If yes, please describe them.	<ul style="list-style-type: none"> – More marsh area; no access to cypress roots. – Marsh/vegetation expansion, survival of bald cypress. – Sedimentation reduced to Neuse as a result of stabilization. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	4	5		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	8	1		
22	If yes, please describe the damage.	– Marl behind sill may be a result of too small stone used along shore.				
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> – Project has stabilized eroding shoreline. – Old tree stumps in front at sill shore past erosion did occur. – Bald cypress trees saved by project. 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	5	3	1		<ul style="list-style-type: none"> - Just high marsh a few sprigs of Spartina but not alt. - High only on one side, low on the other.
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	7	2	0	0	
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	1	3	5		
27	Are upland species colonizing the area behind the sill?	8	1	0		
28	Is there evidence that the upper marsh area is mowed?	0	9	0		
29	Has the marsh grown waterward completely against the sill?	8	0	1		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	1	5	3	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	1	8	0		
32	Is macroalgae present on or around the sill?	3	6	0		
33	If yes, is this problematic or concerning? Please explain.					
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	1	4	4		
35	If yes, how can you tell?	<ul style="list-style-type: none"> - Upland storm water BMP is draining through sill. - Good water passage but not good ingress /egress do to height of fill to restore tree growth of back of suitable dropdowns. 				
36	If no, why not and is it a concern?	<ul style="list-style-type: none"> - Design could be improved to allow more fish passage. - Not necessarily a concern, but not much habitat for fish. - No dropdowns/gaps/overlaps - High marsh directly behind the sill - on fill material. - Not for fish but still allows wetland hydrology. 				

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
37	Is there a noticeable wrack line landward of the sill?	3	3	3		
38	Is there noticeable trash in and around the sill area?	2	6	1		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	3	4	2		– Storm water runoff bc of elevation of land.
40	If so, what are they?	<ul style="list-style-type: none"> – Maybe lots of possible stormwater runoff from the upland. – Maybe stormwater pipe drainage to adjacent property. – Maybe stormwater pipe drainage to adjacent property. 				
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.	<ul style="list-style-type: none"> – More tidal flow would allow more utilization of habitat by fish. – Marsh areas are sustainable and diverse - plenty of tidal flushing - not great for fish passage due to lack of openings but good habitat on sill and in marsh landward. superior to bulkheads on adjacent shoreline 				

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	9	0	0		
44	Do you think a different structure would have performed/functioned better in this location?	1	6	2		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?	<ul style="list-style-type: none"> – Sill should have went further water word. – Could have lowered sill height if bulkhead area could be stabilized quickly. – Sheet pile sill maybe? – Adjacent natural shoreline looks just fine. – Lower height of sill provide opening for fish access dropdowns at high water. 				
46	Overall, do you think the wetland creation portion of the project has been successful?	6	0	3		<ul style="list-style-type: none"> – Saving the cypress. – Not really wetlands as one world think for marsh sills.
47	Do you think this structure will continue to function into the future given expected sea level rise?	6	1	2		

Other Continued		
48	Please provide any additional concerns and/or comments in regards to this site location.	<ul style="list-style-type: none"> - This is a fresh water site so the habitat considerations might be slightly different than the salt water sites. Perhaps a gentler slope and a sill further out would provide better fish habitat, but this may have put the existing bald cypress at risk from erosion, stagnant inundation. - Could have been placed further offshore? But functioning well. - Don't see this as a real marsh sill type of project. I think the habitat diversity is preferred verses adjacent sand beaches. Looks like a perched beach kind of set up. - Structure superior to revetments, bulkheads etc. at same location - but would modify design to allow better fish passage and reduce amt of stone. Project will accommodate shoreline migration with SLR projections for a while.



Major Permit No: 36-09
 Issue Date: March 26, 2009
 Nags Head, NC, 27959
 Waterbody: Roanoke Sound
 Dare County

- Oyster bag sill, 425 feet long, 6 feet wide and 1.5 feet tall.
- Constructed of bagged oyster shells and biologs and will be placed in the shallow waters of the Roanoke Sound a maximum of 30 feet beyond Normal Water Level. Constructed of four 100 foot sections of bagged shells separated by 5-10 foot wide gaps to ensure water circulation.
- Coconut Fiber Bio-Logs placed 5-10 feet landward of each gap in the sill structure to absorb wave energy seeping through the openings. The five 20 foot long bio-logs will be approximately 1 foot in diameter and will be held in place by wooden stakes.
- The shallow waters landward of the proposed sill will be planted with various Coastal Wetland species while sand fencing will be installed along a portion of the Estuarine Shoreline and planted with salt-tolerant grasses and shrubs. Approximately 19600 square feet will be planted with wetland vegetation. An additional 17400 square feet of upland will be planted. The sill will cover a total of 2400 square feet of shallow bottom.
- The site is located on the northwestern corner of Jockey's Ridge State Park.

Compiled Field Team Responses						
Date of Visit: 7-20-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	8	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	7	0	1		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	– Maybe a little higher, with water level here today area behind sill is just as rough as adjacent areas besides it.				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	0	0	0	8	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?					
6	Is the grade behind the sill still gently sloping?	8	0	0		
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> – Not high enough. Would need 1+ layer. – Sill is not tall enough. – Elevation may be too low. – No, other than would like to see the oyster bags stacked higher. – No. – Sill appears to have settled, permit modification has already been applied for and received to add additional shell bag layer. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	– No fill here.				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	6	2	0		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> - Pre sill construction. - Personal observation of eroding wetlands. - Erosion pocket exists at end of south end of oyster sill. Told it was present before sill. - Sparse vegetation along shoreline. - Shoreline would be eroding without the structure. - Other areas of the shore show a typical scalloped shoreline with marsh being lost. 				
11	Is erosion occurring on the adjacent properties?	0	3	5		
12	If yes, describe the extent and location.					
13	Is there a distinct shoreline offset between this property and the adjacent properties?	5	3	0		<ul style="list-style-type: none"> - Scalloped behind sill. - Yes, but not associated with this project.
14	Has the sill created new uplands (land above the high water mark) behind it?	0	7	1		<ul style="list-style-type: none"> - Not sure, dune migration? - At sediment fence.
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	6	1	1		<ul style="list-style-type: none"> - Sill needs to be higher.
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.		1			
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	4	1	3		
18	If yes, please describe them.	<ul style="list-style-type: none"> - Increase in colonization of local vegetation. - Creation of marsh. - Protects state park and jockey's ridge dune system - less erosion. Colonization of riparian areas by native vegetation. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	2	6		
20	If yes, please describe them.					
21	Is the structure damaged?	0	6	2		<ul style="list-style-type: none"> - Sill is underwater, hard to tell.
22	If yes, please describe the damage.	<ul style="list-style-type: none"> - But most likely will due to low height. - The water is high, due to wind tides. - Structure has settled in 2 years since construction. 				
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> - Addition of sill has helped to prevent/decrease continued scalloping of shoreline. - This sill and marsh grass plantings have created valuable habitat in a state park dependant on the health of its natural resources. Have helped to stabilize the shoreline to minimize future and land loss. 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	8	0	0		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?		7	1		<ul style="list-style-type: none"> - Patchy - sill in planting phase and newly planted vegetation is establishing itself. - Patchy - only in for 2 years. - Dense in some areas and Patchy in others. - Healthy - 50% established 1 year after planting.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	2	3	3		<ul style="list-style-type: none"> - Yes, sand behind where marsh has established. - No based on aerials.
27	Are upland species colonizing the area behind the sill?	4	2	2		
28	Is there evidence that the upper marsh area is mowed?	0	8	0		
29	Has the marsh grown waterward completely against the sill?	1	7	0		<ul style="list-style-type: none"> - Not yet. - Yes in some areas.
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	4	3	1	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	4	2	2		<ul style="list-style-type: none"> - See shells but can't tell if spat on bags. - Told that spat did settle. - Nothing visible yet.
32	Is macroalgae present on or around the sill?	5	1	2		
33	If yes, is this problematic or concerning? Please explain.	<ul style="list-style-type: none"> - No. - No. - No - it's a good thing. - No, minor amounts of algae present. 				

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	8	0	0		
35	If yes, how can you tell?					<ul style="list-style-type: none"> - See water movement over sill. - 10 foot gaps were left along the sill. Personal observation of small fish behind sill. - Waves are lapping on shore behind sill. - Gaps every 100 feet, during a west wind - overtopped and high water. Water over top of the whole sill. - 3 openings or drop downs. - Openings in sill, fish present, water present.
36	If no, why not and is it a concern?					
37	Is there a noticeable wrack line landward of the sill?	8	0	0		
38	Is there noticeable trash in and around the sill area?	0	8	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	8	0		
40	If so, what are they?					
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					- Increase height on sill for wetland protection.

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	7	0	1		<ul style="list-style-type: none"> - Yes but can be improved with taller sill. - Yes - kind of.
44	Do you think a different structure would have performed/functioned better in this location?	2	4	2		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					
46	Overall, do you think the wetland creation portion of the project has been successful?	6	1	1		- Nor'easter washed out plantings in Nov 2010.

	Other Continued	# yes	# no	# not sure	# N/A	Field Team Comments
47	Do you think this structure will continue to function into the future given expected sea level rise?	2	3	3		<ul style="list-style-type: none"> - No - height modifications needed. - Only if the marsh establishes itself well. - Yes with maintenance will allow marsh to migrate with SLR.
48	Please provide any additional concerns and/or comments in regards to this site location.	<ul style="list-style-type: none"> - The sill could be higher to account for an average wind driven tide day. Today is an average wind day (minor wind) and the water level is 6 inches above normal water level. They constructed the site to 6 inches above normal water level and it was completely underwater today. - Need to increase the width and height of the sill. Large fetch to overcome. - Concern that no thought given to the fact that lots of sand is being moved from dune ridges toward sound. With bags present much of this sand might be caught making elevation behind sill too high (everything might get buried). 				



General Permit No: 46565B

Issue Date: October 4, 2006

Ocracoke, NC 27960

Waterbody: Pamlico Sound

Hyde County

- Stone sill and plant marsh landward for shoreline stabilization.
- Riprap length – 225’
- Avg distance offshore – 20’
- Max distance offshore – 20’
- Shoreline length – 225’

Notes or Conditions added to the Permit:

- Riprap sill base to be +/- 6 feet
- Height not to exceed 6’ above NHL

Compiled Field Team Responses						
Date of Visit: 8-4-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	6	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	4	2	0		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> - Change the U shape structure. - Rocks seem to be on top of SAV. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	1	0	1	4	- No fill used.
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?					
6	Is the grade behind the sill still gently sloping?	5	1	0		- Gently sloping to almost flat.
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> - Rock on top of SAV. - Lack of openings to the back marsh. - Rocks seem to be on top of SAV. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	- Presence of groins on each end of sill in my mind makes this a very suspect project.				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	0	5	1		
10	If yes, describe the evidence, extent, and location?					
11	Is erosion occurring on the adjacent properties?	5	0	1		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> - Occurring on bulkhead on adj property, slope of beach increases closer to bulkhead of adjacent property. Also Spartina growing behind rock, just sand on adj. property. - Rock groins on side - erosion around those. - Fairly severe, chronic. - Erosion on downdrift shoreline. Could be influenced by existing groin. - Upland scarp ~1ft in hgt., sandy bank scalloped behind groin. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	6	0	1		
14	Has the sill created new uplands (land above the high water mark) behind it?	1	2	3		<ul style="list-style-type: none"> - Plantings? - Although there is accumulation behind sill.
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	3	0	3		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.					
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	2	1	3		
18	If yes, please describe them.	<ul style="list-style-type: none"> - Spartina growing behind sill, sill placed on SAV. - Elevation of property behind sill is higher than adjacent areas. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	2	4		<ul style="list-style-type: none"> - Not sure if conditions can be attributed to the sill or the groins.
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	6	0		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> - Seemed to have held up well (rocks). 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	6	0	0		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	6	0	0	0	– Some blocked by sediment.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	6	0	1		– Seasonal?
27	Are upland species colonizing the area behind the sill?	2	2	2		– Not yet.
28	Is there evidence that the upper marsh area is mowed?	0	6	0		
29	Has the marsh grown waterward completely against the sill?	6	0	0		– In most places.
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	6	0	0	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present?	6	0	1		
32	Is macroalgae present?	3	1	2		
33	If yes, is this problematic or concerning? Please explain.	– No a good thing. – Not a problem.				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	1	5	1		– Not any more.
35	If yes, how can you tell?					
36	If no, why not and is it a concern?	– Too much sand filled, and seems high above the back of the sill. – Probably floods occasionally, but never stays that long. – 2 designed openings, but are filled in with sediment and they are closed with grasses. – Settled in irregularly flooded though. – No drop downs and height behind rocks too high. No water present behind sill.				
37	Is there a noticeable wrack line landward of the sill?	6	0	0		– Wrack line is on rocks.
38	Is there noticeable trash in and around the sill area?	2	4	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	6	0		
40	If so, what are they?					
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	4	0	2		
44	Do you think a different structure would have performed/functioned better in this location?	0	3	3		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					
46	Overall, do you think the wetland creation portion of the project has been successful?	6	0	0		
47	Do you think this structure will continue to function into the future given expected sea level rise?	4	1	1		
48	Please provide any additional concerns and/or comments in regards to this site location.					– Height of sand behind sill, location of rock relative to SAV, pier crosses sill.



Major Permit No: 42-00-02

Issue Date: June 16, 2000

Swansboro, NC 28584

Waterbody: White Oak River

Onslow County

- 2 rock sills one to the east (Area #1) of the boat ramp and one to the west (Area #2).
- Area #1 includes a 170 foot long stone sill approximately 20 feet waterward of the existing bulkhead.
- The existing bulkhead (160 feet) is to be removed, regraded, and planted with appropriate marsh vegetation.
- Fill will be used landward of the sill.
- The sill will have a base width of 13 feet and be 3.5 feet tall.
- Area #2 includes a 115 foot long sill with 15 foot maximum base with an elevation of normal high water.
- The sill will be located along the existing bulkhead and the 79 feet of the bulkhead will be removed, area regraded, and planted with appropriate marsh vegetation.

Compiled Field Team Responses						
Date of Visit: 7-7-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	7	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	6	0	1		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> - Seems to have created habitat, it follows old bulkhead, might be a little too high though for adequate fish passage. - Need fish passage dropdowns or overlaps. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	6	0	1		
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?					
6	Is the grade behind the sill still gently sloping?	6	0	1		
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> - No drop downs or ways for fish ingress/egress at low tide. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	<ul style="list-style-type: none"> - Height of rocks seems appropriate. 				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	0	6	1		
10	If yes, describe the evidence, extent, and location?	– Bulkheads on north side of the structure.				
11	Is erosion occurring on the adjacent properties?	0	3	4		
12	If yes, describe the extent and location.	– Left side has offset but marsh is creeping over. – A neighbor voiced possible concern but none seen.				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	1	6	0		–Left side has offset but marsh is creeping over.
14	Has the sill created new uplands (land above the high water mark) behind it?	0	5	2		
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	7	0	0		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	0	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	2	1	4		
18	If yes, please describe them.	– Marsh areas and oysters. – Rough water channels through marsh seem out of place. – Marsh creation, water quality improvement. – Oysters, riparian buffer.				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	2	5		
20	If yes, please describe them.	– Adjacent property owner did not like it at installation but does now.				
21	Is the structure damaged in any way?	0	7	0		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	– May not need to be so tall even for erosion control. – Limited access because no drop downs.				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	6	0	1		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	7	0	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	4	0	3		– Maybe some around rocks.
27	Are upland species colonizing the area behind the sill?	3	4	1		– Yes, but further upland - not associated with the marsh creation project - maybe a runoff issue. – Not sure very limited.
28	Is there evidence that the upper marsh area is mowed?	0	7	0		
29	Has the marsh grown waterward completely against the sill?	7	0	0		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	2	4	1	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	7	0	0		– Yes but limited.
32	Is macroalgae present on or around the sill?	5	1	1		
33	If yes, is this problematic or concerning? Please explain.	– No. – No. – No. – Codium.				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	1	5	1		
35	If yes, how can you tell?	– Water channel behind sill but no drop downs are present.				
36	If no, why not and is it a concern?	– No fish utilization of marsh or rock at low tide. – There is one opening on the left side, but no water behind the sill at low tide. – No or limited access by fish. – No drop downs or openings. – No fish passage, trapping potential.				
37	Is there a noticeable wrack line landward of the sill?	2	5	0		

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
38	Is there noticeable trash in and around the sill area?	0	7	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	1	6	0		
40	If so, what are they?					<ul style="list-style-type: none"> • Storm drain empties into boat basin between sills. Fresh water is draining through marsh because cattails are present. • Project helped to reduce stormwater runoff into intercoastal.
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					<ul style="list-style-type: none"> • If sill was placed further waterward, rocks could be utilized during all tides.

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	7	0	0		
44	Do you think a different structure would have performed/functioned better in this location?	1	4	2		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					
46	Overall, do you think the wetland creation portion of the project has been successful?	7	0	0		<ul style="list-style-type: none"> • Yes - helped with storm water and water quality, created marsh.
47	Do you think this structure will continue to function into the future given expected sea level rise?	7	0	0		<ul style="list-style-type: none"> • Yes - but can only migrate back a certain distance because of development behind it.
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> • Needs drop downs or openings. • Lots of oyster shell but little live oyster colonization. • Need greater access for fish. • This is a really nice structure/site regarding function and aestheticism. Combined with stormwater management at site, makes this a very desirable area for shoreline stabilization purposes and habitat creation and maintenance. • Great demonstration site, great habitat, reduces stormwater flow.



Major Permit No: 28-05

Issue Date: February 28, 2005

Holly Ridge, NC

Waterbody: Stump Sound

Onslow County

- The property is located at the end of Morris Landing Rd. and consists of 2 sills (one made of rock and one made of oyster bags).
- Project consist of the construction of a public pier, oyster shell storage and loading pier for NC DMF shell recycling and oyster reef restoration programs, and a rock sill.
- The sill consists of Class II granite and located approximately 30 feet waterward of NHW.
- The rock sill is 550 feet long and 18 inches in height with a base width of 6 feet and a top width of 18 inches. The sill would be constructed on a geotextile mat and include two drop downs within alignment to promote water circulation.
- The area behind the sill would be planted with marsh species.
- Along the western shoreline, an oyster bag sill/marsh restoration project approximately 150 linear feet was added along with an additional 50 linear feet of shoreline re-grading and marsh restoration. This sill is 150 feet long, 8 feet wide and 1.5 feet high, and located a maximum of 30 feet waterward of normal high water.

Compiled Field Team Responses (Rock)						
Date of Visit: 7-8-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	9	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	7	0	2		<ul style="list-style-type: none"> • Is it shallow water?
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> • Project narrative did not discuss nor did the aerials show the rate of erosion that was occurring. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	0	0	0	9	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	<ul style="list-style-type: none"> • No fill was used. 				
6	Is the grade behind the sill still gently sloping?	8	1	0		<ul style="list-style-type: none"> • More flat than gently sloping.
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> • There appears to be no breaks but the sill is low enough that it appears to allow inundation at high tide. • No. • Algae presence on most drop downs. • None. • No. • Lower elevation sill has allowed more energy landward of sill but wetlands adequate to mitigate energy. Distance offshore is greater than many residential sill sites which allows for greater widths of marsh (low and high marsh). • On beach now, filled in and created bigger beach. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	<ul style="list-style-type: none"> • Sill height seems appropriate. • I like the sill height, but needs more drop downs. 				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	1	6	2		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> • Beach behind sill in some places instead of marsh. • Erosion forces still exist in boat washes and storm energy. 				
11	Is erosion occurring on the adjacent properties?	3	3	3		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> • Loss of low marsh. • Beach behind sill in some places instead of marsh. • Erosion forces still exist in boat washes and storm energy. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	1	4	4		
14	Has the sill created new uplands (land above the high water mark) behind it?	0	6	3		<ul style="list-style-type: none"> • Has allowed protection of scrub/shrub zone.
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	8	0	1		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	1	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	3	2	4		
18	If yes, please describe them.	<ul style="list-style-type: none"> • Oysters, marsh area. Oyster recruitment, fish utilization. • Habitat benefits, water quality benefits. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	4	5		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	9	0		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> • The drop down is pretty high although tides here seem to allow plenty of inundation behind sill. • Foot path present in upper marsh - source of erosion maybe. • Seems to be helping with erosion control. 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	8	0	1		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	2	4	3	0	<ul style="list-style-type: none"> • Both dense and patchy. • Patchy - not sure if the elevation or human problems are creating the patchiness. • Both dense at parts, patchy elsewhere. • Dense with gap right behind sill.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	5	2	2		<ul style="list-style-type: none"> • Some at ends • Yes - fill material. • Yes - in central part of sill. At each end of sill - loss of sediment.
27	Are upland species colonizing the area behind the sill?	2	6	1		<ul style="list-style-type: none"> • Yes - already there. • Yes - only in scrub/shrub zone as designed.
28	Is there evidence that the upper marsh area is mowed?	0	9	0		
29	Has the marsh grown waterward completely against the sill?	0	9	0		<ul style="list-style-type: none"> • Marsh has reached sill in some places but not all.
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	0	4	5	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	8	0	1		
32	Is macroalgae present on or around the sill?	7	0	2		
33	If yes, is this problematic or concerning? Please explain.	<ul style="list-style-type: none"> • No. • No. • It is covering the oysters pretty good. Also algae in mid flat area behind sill. • No, a good thing. • No. • No. • Not problematic, but lots of it. 				

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	6	3	0		
35	If yes, how can you tell?					<ul style="list-style-type: none"> • There is standing water at low tide. • Water and fish behind the sill. • Dropdowns, fish behind sill. • Water puddled on back-side.
36	If no, why not and is it a concern?					<ul style="list-style-type: none"> • There should be breaks. May help with marsh growth and accretion behind sill. Provide flushing, deposit sand, etc. • There do not appear to be drop downs. • The sill is low (below water at high tide) but the drop downs are nearly non-existent. • No/minimal - would like to see more drop downs.
37	Is there a noticeable wrack line landward of the sill?	1	8	0		
38	Is there noticeable trash in and around the sill area?	3	6	0		<ul style="list-style-type: none"> • Yes but from heavy public use. • Yes - area heavily used by public who leave lots of trash...not due to sill.
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	8	1		
40	If so, what are they?					
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					<ul style="list-style-type: none"> • No real erosion on property before the sill was installed, just some loss of low marsh. • Good mix of habitat - sill, to lower sand/mud flats to <i>S. alterniflora</i>, etc. • Area has benefited from restoration of high, low marsh and protection of riparian buffer.

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					<ul style="list-style-type: none"> Agency recommend pier be 4 feet above wetland and it is.
43	Do you think this sill is functioning as intended?	8	0	1		
44	Do you think a different structure would have performed/functioned better in this location?	0	5	4		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					<ul style="list-style-type: none"> I think this structure is probably okay for site. Fairly significant energy along shoreline. Possible option of sheetpile sill here and possible use of oyster bag sill over marl bags might be successful here. Still acting more like riprap revetment.
46	Overall, do you think the wetland creation portion of the project has been successful?	8	0	1		
47	Do you think this structure will continue to function into the future given expected sea level rise?	6	0	3		<ul style="list-style-type: none"> Yes - More so if the marsh is able to extend and/or become more dense. Yes - designed as such to allow/accommodate SLR.
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> There is significant erosion and marsh loss behind the sill. This is a high energy site. <i>Spartina alterniflora</i> had to be planted many times.

Compiled Field Team Responses (Oyster)						
Date of Visit: 7-8-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	8	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	5	0	3		<ul style="list-style-type: none"> • There was limited plantings, so little marsh was created. • Not yet.
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> • There was limited plantings so little marsh was created. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	3	1	4	0	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	<ul style="list-style-type: none"> • The fill that was used washed away. • The marsh has not yet established and until it does, the impacts won't be mitigated. • Oysters are covered in silt and algae. May not be the best place for an oyster sill. 				
6	Is the grade behind the sill still gently sloping?	8	0	0		
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> • The oyster bag is slipping and covered with algae. • Oyster bag sill slightly damaged on right side if looking at water. • Low elevation and lack of drop downs. • Oyster bags places over base of marl layer (~3 inches). Has been more problematic than sites where oyster bags are placed over marl bags (marl bags are more stable). Stone is working better than the oyster bags. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	<ul style="list-style-type: none"> • This is a high energy site and the oyster bags may not last. The marsh also may not establish. 				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	5	2	1		
10	If yes, describe the evidence, extent, and location?					<ul style="list-style-type: none"> • Maybe at end. • Loss of low marsh. • Eroded marsh behind the sill. • At left side of sill, shoreline is eating away and scalloping in. • Offset's on either side of the project and inability for vegetation to become established. • No/not sure.
11	Is erosion occurring on the adjacent properties?	4	2	2		
12	If yes, describe the extent and location.					<ul style="list-style-type: none"> • Adjacent as in area beyond the sill. • Eroded Marsh. • Left side of project - scalloped out shoreline.
13	Is there a distinct shoreline offset between this property and the adjacent properties?	6	1	1		<ul style="list-style-type: none"> • Yes, slight. • Yes; to the left, but not between properties, just after the sill. • Not sure; there is an embayment.
14	Has the sill created new uplands (land above the high water mark) behind it?	0	7	1		
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	6	0	2		<ul style="list-style-type: none"> • Yes, but should have extended to right further toward and under pier.
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	1	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	2	4	2		
18	If yes, please describe them.					<ul style="list-style-type: none"> • Some marsh and oysters. • Area used fill. • Habitat and Water quality benefits.
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	5	3		
20	If yes, please describe them.					<ul style="list-style-type: none"> • Property to left is much more landward, but don't think it's due to the sill.

	Erosion Control and Impacts Continued	# yes	# no	# not sure	# N/A	Field Team Comments
21	Is the structure damaged in any way?	4	4	0		
22	If yes, please describe the damage.	<ul style="list-style-type: none"> • Bags blown out, slid off marl. • Oyster bags have been sliding off the loose stone that comprised the base. Slipping bags, broken bags. • On right side, oyster bags are sliding off the marl base. 				
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> • Successfully mitigated erosion landward of sill but level of energy and relative low elevation of sill requires 2-3 years of planting of marsh for stability. Shoreline adjacent to sill as filled, planted with marsh grass and loose cultch dumped offshore but has not mitigated erosion and all fill has been lost. 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	6	0	2		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	0	8	0	0	<ul style="list-style-type: none"> • Almost completely eroded. • Filled but not accreted to date.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	2	5	1		
27	Are upland species colonizing the area behind the sill?	1	6	1		
28	Is there evidence that the upper marsh area is mowed?	0	8	0		
29	Has the marsh grown waterward completely against the sill?	0	8	0		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	0	4	4	<ul style="list-style-type: none"> • May be some at different time of year.
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	6	1	1		<ul style="list-style-type: none"> • Not a lot. • Spat dies. • Some recruitment.
32	Is macroalgae present on or around the sill?	6	1	1		
33	If yes, is this problematic or concerning? Please explain.	<ul style="list-style-type: none"> • It is covering the bags, may make oyster recruitment fail. • Covering the oyster bags. • Good thing - structure is oyster bags. • Doesn't seem problematic. 				

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	7	0	1		• Lateral flow.
35	If yes, how can you tell?					<ul style="list-style-type: none"> • Ends are open. • Standing water on landward side of the sill. • Fish behind the sill. • Water is behind the sill. • Open on both ends and low sill but no gaps/openings. • But on either end only. • Observed fish (minimal) behind sill.
36	If no, why not and is it a concern?					• Maybe from water/waves from ICW.
37	Is there a noticeable wrack line landward of the sill?	4	4	0		
38	Is there noticeable trash in and around the sill area?	0	8	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	7	1		
40	If so, what are they?					• Turbidity possible after storm events from fill material washing away.
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					• Wetlands establishment has been slow due to high energy of area and relative low elevation of sill. Should be stabilized in 2-3 years.

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	4	1	3		<ul style="list-style-type: none"> • Yes kind of needs more grass. • Yes, but could use some help.
44	Do you think a different structure would have performed/functioned better in this location?	4	3	1		<ul style="list-style-type: none"> • But its not really doing much.
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					
46	Overall, do you think the wetland creation portion of the project has been successful?	1	2	5		<ul style="list-style-type: none"> • Not sure maybe in a few years. • Somewhat, maybe eventually. • Not yet.
47	Do you think this structure will continue to function into the future given expected sea level rise?	3	1	4		
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> • Either too open/exposed or poor sediment source. Has resulted in no accretion and washing away of plantings. Very silty area. • A new modification to extend the sill northwards is currently in the works. Extending the sill should further buffer the high wake energy of the area. • This site may not be appropriate for an oyster bag sill. • <i>Spartina alterniflora</i> had to be replanted many times. • Very low and short structure. Would like to see it extended and more oyster bags stacked on top.



General Permit No: 47575D

Issue Date: May 02, 2007

Sneads Ferry, NC 28460

Waterbody: Chadwick Bay

Onslow County

- Install of Riprap Sill of broken cement
- Sill – 100'x5'x2'
- Maximum distance offshore – 10 feet
- Shoreline Length – 150+'

Notes or Conditions added to the Permit:

- Max 5' from NHW
- 5' Wide x100' Long

Compiled Field Team Responses						
Date of Visit: 7-8-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	8	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	3	1	4		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> • Move it off the beach a bit. • It does not appear that any marsh was created. Appears to be a rip rap revetment. Does not appear complete. Aerial photos do not clearly show pre construction site conditions. • Not 100' long nor 5' wide, not much marsh created. Concrete pieces placed on "beach". • Rock appears to on the NHW line. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	2	1	2	3	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	<ul style="list-style-type: none"> • This looks more like a revetment- only high marsh behind the concrete. Does not appear to be wetland created. Pre construction site conditions and abundance of marsh is unknown. 				
6	Is the grade behind the sill still gently sloping?	7	1	0		<ul style="list-style-type: none"> • I didn't think it was originally. • Placed offshore of an escarpment.
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> • Gap actually is concerning. • Project not completed. • Starting to resemble a wall/landscape feature. It's too close to upland but not too tall or too wide. • Reused concrete slabs (not really a concern). 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	<ul style="list-style-type: none"> • This is a very small marsh toe revetment. The concrete blocks are placed right up against remnant high marsh. • This site may not be applicable. • Bad example of a marsh sill project. 				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	2	4	2		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> • Marsh is eroded back to high marsh. • Live oak at waters edge, no low marsh. • Nothing specific beachy shoreline with no low marsh. • Very minor if at all. 				
11	Is erosion occurring on the adjacent properties?	1	3	4		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> • Marsh is eroded back to high marsh. • Natural? Not sure of pre construction conditions. • Maybe-very beachy and a few downed trees and brush. • Not absent, neighbor has a rock wall installed. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	0	7	1		
14	Has the sill created new uplands (land above the high water mark) behind it?	0	6	2		
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	0	5	3		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	7	1		<ul style="list-style-type: none"> • Sill on beach. • Marsh toe revetment, not a sill. • Need area for S. alt.
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	1	2	5		
18	If yes, please describe them.	<ul style="list-style-type: none"> • There is high marsh above sill (patens). 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	4	4		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	1	4	3		
22	If yes, please describe the damage.	<ul style="list-style-type: none"> • Unfinished. • Appears to not be complete. • Only 50' present with a large gap bw areas. • Not complete? • Large concrete blocks placed on shoreline - big gap (or missing pieces) to tree- (~30' of structure remains). 				
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> • Just pieces on concrete placed at the edge of the s. patens. • Confusing to assess. Not sure if the project was complete and do not have a clear idea about what pre construction site conditions were like. 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	0	8	0		<ul style="list-style-type: none"> • Not within the "sill" area some S.alt on other side only high marsh present at sill. • 6 people all commented that it was high marsh present. • Low present on right of sill
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	8	0	0	0	
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	0	5	3		
27	Are upland species colonizing the area behind the sill?	5	1	2		<ul style="list-style-type: none"> • Yes; some live oaks have been present for a long time, nothing new though. • Not sure; they are present but were so before sill went in. • Some 404 but could have been pre existing.
28	Is there evidence that the upper marsh area is mowed?	1	6	1		
29	Has the marsh grown waterward completely against the sill?	7	0	1		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	0	5	3	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	4	4	0		<ul style="list-style-type: none"> • Yes but not many attached, most are in the surf area.
32	Is macroalgae present on or around the sill?	0	8	0		
33	If yes, is this problematic or concerning? Please explain.					

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	2	5	1		
35	If yes, how can you tell?					<ul style="list-style-type: none"> • Very short sill (30' long) is just at the high tide line. • Height of sill. • Stain marks. • It's too high and dry. The sill could have been effective and created a larger and more diverse marsh if it were placed 25+ offshore.
36	If no, why not and is it a concern?					<ul style="list-style-type: none"> • Seems to be rip rap revetment. • Not needed an patens behind rock. • Seems that land behind sill is too high for fish access - structure not for enough in water. • Too high up on shore, not available as fish habitat.
37	Is there a noticeable wrack line landward of the sill?	0	8	0		
38	Is there noticeable trash in and around the sill area?	1	6	1		<ul style="list-style-type: none"> • No, but is a wrack line next to it. • There is one in the "incompleted area". • There is no noticeable wrack line.
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	8	0		
40	If so, what are they?					<ul style="list-style-type: none"> • The homeowner mentioned that during storm events the adjacent wetlands channel some sediment out.
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					<ul style="list-style-type: none"> • There is a concern of the wetlands being mowed and the conversion to lawn grasses. Project appears to be more of a rip rap revetment.

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	4	0	4		<ul style="list-style-type: none"> • Yes; protecting marsh grass (patens) from erosion.
44	Do you think a different structure would have performed/functioned better in this location?	1	2	5		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheeppile sill, or no structure at all) and Why?					<ul style="list-style-type: none"> • Sill further off shore or just marsh plantings. • Different structure! More closely resembles rip rap revetment. • I do not think a structure is needed here. • This seems here like a marsh toe rip rap structure.
46	Overall, do you think the wetland creation portion of the project has been successful?	4	3	1		<ul style="list-style-type: none"> • Yes, success in high marsh restoration. • No; none observed.
47	Do you think this structure will continue to function into the future given expected sea level rise?	4	1	3		
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> • This should not have been permitted as a sill. • Does not appear to have had wetland created. Question the pre construction site conditions in relation to what species grew here and the amount of erosion. Appears to be a rip rap revetment, not a sill. • Bad example of a project used for one GP. • Wall needs to be finished to fully protect property.



Major Permit No: 47-09

Issue Date: April 15, 2009

Swansboro, NC

Waterbody: White Oak River

Onslow County

- The site is on the North and Northwest portion of Jones Island.
- 2 oyster bag sills and a T Head Pier/Dock.
- The sills are to be constructed of marl and 2 layers of recycled oyster shell bags with *Spartina alterniflora* plantings landward of the sill.
- The Northeast sill is to be 150 feet long with a base width of 6 feet and be placed 80 feet waterward of the NHW line. The Northwest sill will be 250 feet long with a 6 foot base width and be placed 30 feet offshore.
- 2 gaps in the Northwest sill and 1 gap in the Northeast sill.
- A 5'x85' pier with a 5'x20' T-Head dock was also constructed.

Compiled Field Team Responses						
Date of Visit: 7-7-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	7	7		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	5	0	2		<ul style="list-style-type: none"> • Yes and No. • Yes - just planted so if it fills in will be great. • Yes - marsh is young due to recent plantings.
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> • The distance from the shoreline could be an issue if this wasn't for a natural area. It appears to be accreting that there is the potential for high ground to form. If it was a private piece of property there could be issues. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	0	0	0	7	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	<ul style="list-style-type: none"> • There was no fill other than the placement of the rock/oyster shell. There is accretion adjacent to significant erosion. 				
6	Is the grade behind the sill still gently sloping?	7	0			<ul style="list-style-type: none"> • Yes on north Side, No on south side. • Yes to the high bank. • Yes very flat.
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> • We like the oysters. • The oyster shell appears to be well inhabited. • I like the restored offshore natural oyster reefs as opposed to the sill design. • No. • None. • No. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	<ul style="list-style-type: none"> • Like the height of the sill. Seems best as compared to others we have seen. Will allow a large vegetative buffer because of distance offshore. 				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	7	0	0		<ul style="list-style-type: none"> • Yes, but maybe its not new erosion since the sill is new.
10	If yes, describe the evidence, extent, and location?					<ul style="list-style-type: none"> • On cliff behind the sill. • There is approximately 8-10 foot escarpment on the south side and approximately 1 foot on the north side. • Behind the sill marsh is being undercut and upland is scarped. • Bluff shoreline behind the sill. • South side - escarpment in back ~ 15 feet high, DWQ - 8-10 foot escarpment.
11	Is erosion occurring on the adjacent properties?	3	1	3		
12	If yes, describe the extent and location.					<ul style="list-style-type: none"> • Adjacent to sills. • There are no adjacent properties, this is an island. • Behind the sill, marsh is being undercut and upland is scarped. • Undercut marsh escarpments. • Seems to be a setback on.
13	Is there a distinct shoreline offset between this property and the adjacent properties?	3	2	2		<ul style="list-style-type: none"> • Yes and no - slight on property from end of sill particularly on the north side. There is a slight one on the south side. Eventually it can take on that marsh form.
14	Has the sill created new uplands (land above the high water mark) behind it?	0	5	2		<ul style="list-style-type: none"> • Not sure - sediment being deposited from failing bluff.
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	6	0	1		<ul style="list-style-type: none"> • Yes - seems a bit far, but works with the tides.
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	0	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	3	1	3		
18	If yes, please describe them.					<ul style="list-style-type: none"> • Oysters, fisheries habitat, trapping sediment (similar to a breakwater). • Silting in behind the south sill. • Sill provides habitat and attenuation.
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	2	2	3		
20	If yes, please describe them.					<ul style="list-style-type: none"> • Oysters, fisheries habitat, trapping sediment (similar to a breakwater). • Oyster habitat.
21	Is the structure damaged?	0	7	0		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts.					<ul style="list-style-type: none"> • Dead trees left in gaps on south side. Potential sediment trap and fish blocker. • At least giving the high bank some additional stabilization.

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	5	2			<ul style="list-style-type: none"> • Yes only at north side. • No - only <i>Spartina</i> species that have been recently planted. • Yes on north side, No on south side. • No - low marsh only. • Yes. • Yes on north, No on south. • Yes - some on south side.
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	0	4	3	0	<ul style="list-style-type: none"> • Sparse and Patchy. • Dense and Patchy - older plantings seem denser. Mostly sparse newer plantings though. • Patchy. • Patchy and sparse - it was just planted. • Patchy - new project. • Recently planted. • Patchy and sparse.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	5	1	1		<ul style="list-style-type: none"> • Yes mostly on south side, created tombolo. • Yes particularly on the south side. • Yes minor.
27	Are upland species colonizing the area behind the sill?	0	6	1		<ul style="list-style-type: none"> • No - still a new project.
28	Is there evidence that the upper marsh area is mowed?	0	7	0		
29	Has the marsh grown waterward completely against the sill?	0	7	0		<ul style="list-style-type: none"> • In some places.
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	0	6	1	<ul style="list-style-type: none"> • Waterward on north side, neither on south side.
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	7	0	0		<ul style="list-style-type: none"> • Yes - sill made of bags of oyster that is collecting spat. • Minor.

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
32	Is macroalgae present on or around the sill?	3	3	1		
33	If yes, is this problematic or concerning? Please explain.	<ul style="list-style-type: none"> • No. • No- a real good thing. • Not sure. 				
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	7	0	0		<ul style="list-style-type: none"> • Yes at high tide.
35	If yes, how can you tell?	<ul style="list-style-type: none"> • I can see it. • There are breaks in the sill. Sill is low enough that the marsh area is regularly inundated at high tide as well. • Evidence of tidal scarp behind sill. • Gaps and open on ends. • Drop downs periodically in the structure. • Openings. • Tide marks, wrack and debris lines. 				
36	If no, why not and is it a concern?					
37	Is there a noticeable wrack line landward of the sill?	5	2	0		
38	Is there noticeable trash in and around the sill area?	0	7	0		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	1	5	1		
40	If so, what are they?	<ul style="list-style-type: none"> • Boat traffic? There is a large escarpment that may still erode to create more fill. There was some turbidity on the south side, but could from boat traffic. • Upland runoff over bluff on south side. 				
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.	<ul style="list-style-type: none"> • The sills are very low to provide shoreline protection while trying to create oyster habitat. The elevation is great for fish movement along with the breaks. • Good diversity of habitat. 				

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	6	0	1		<ul style="list-style-type: none"> • Yes/not sure - time will tell but it seems to be creating marsh. • Yes a little early to tell but appears to be off to a good start. • Yes – localized.
44	Do you think a different structure would have performed/functioned better in this location?	1	1	5		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					
46	Overall, do you think the wetland creation portion of the project has been successful?	3	1	3		<ul style="list-style-type: none"> • Not sure -too soon. • Yes/not sure - some plantings are taking. Again, time will tell. • Yes still early but think it will work. • Maybe eventually - localized protection.
47	Do you think this structure will continue to function into the future given expected sea level rise?	4	0	3		<ul style="list-style-type: none"> • No/not sure - the low elevation may need to be altered. Especially with the significant escarpment on the south side. • Yes on North side, No on South side. • Not sure - hard to say due to elevation of the structure.
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> • Think sediment from bluff on south side will cover marsh. Also think gaps are too wide and will allow erosion behind sill to continue. • I like the gaps at the downed trees and that they remained in place. The sill is not great protection for the high bank, but it will create a buffer eventually to help with some of the wave energy.



Major Permit No: 50-03

Issue Date: April 11, 2003

Oriental, NC 28571

Waterbody: Neuse River

Pamlico County

- 653 feet of offshore rock sill, 313 feet of rock riprap and to place riprap waterward of 93 feet of existing marsh.
- The sill consists of 2 sections – one 240 foot long section adjacent to the coastal wetlands on the eastern side of the property and one 413 foot long section adjacent to the marsh on the western side of the lot.
- The eastern sill would have one opening to allow tidal flow.
- 200 feet of shoreline are already stabilized by riprap in the middle of the property. The property to the east is protected by extensive riprap and to the west is undeveloped. The shoreline is natural clay bank with evidence of severe erosion.

Compiled Field Team Responses						
Date of Visit: 6-30-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	8	1		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	7	0	1		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> Use less rock. Revetment is huge. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	6	0	2	1	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	<ul style="list-style-type: none"> Could have more drop downs. 				
6	Is the grade behind the sill still gently sloping?	7	0	2		
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> None-good habitat for fish, some oyster colonization. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	<ul style="list-style-type: none"> No navigation issues; fill was adequate to establish marsh (low, high) and graded into riparian zone. Some erosion of marsh fill has occurred landward of sill/marsh revetment but not significant and not affecting marsh function. More breaks should have been placed on sill sections. Good functioning site. Site was highly eroded prior to construction. Marsh and fill planting was most likely appropriate. 				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	5	3	1		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> • Some eroded marsh at opening beside riprap shoreline. • A bit-except inland, behind previously existing riprap. Along the natural marsh area between the sills. under cutting of marsh substrate. • Marsh is under at behind sill and on end of right sill. • Under marsh hummocks. 				
11	Is erosion occurring on the adjacent properties?	2	3	4		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> • Natural shoreline on right side is eroding and has woody debris but this is natural. • All riprap revetment adjacent to sill on both sides. • Covered in rip rap. • To left-no-riprap unknown the right. • Entire shoreline with debris and sharp incline on completely armored. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	2	4	3		
14	Has the sill created new uplands (land above the high water mark) behind it?	1	6	2		<ul style="list-style-type: none"> • But Phragmites. • Might accumulate seed.
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	8	0	1		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	0	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	4	1	4		
18	If yes, please describe them.	<ul style="list-style-type: none"> • Phrag present. • Oysters- some marsh area increased phragmites! • Oyster recruitment on the sill, marsh expansion. • Oyster. • Sedimentation reduced for stabilization of shore. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	1	8		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	8	1		
22	If yes, please describe the damage.	<ul style="list-style-type: none"> • Does not appear damaged. 				
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> • Revetment sill and marsh toe revetment all effective for upland erosion control; only sill/marsh for revetment are effective in allowing continuation of marsh/riparian buffer and connecting zones. 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	9	0	0		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	9				<ul style="list-style-type: none"> • Dense on one side, patchy on the other.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	3	1	5		
27	Are upland species colonizing the area behind the sill?	3	4	1		<ul style="list-style-type: none"> • As designed in riparian zone upland sp. Have not colonized former marsh areas. • Not yet.
28	Is there evidence that the upper marsh area is mowed?	0	9	0		
29	Has the marsh grown waterward completely against the sill?	6	2	1		<ul style="list-style-type: none"> • As planted as such-have lost 5-10' since initial stabilization.
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	0	2	7	<ul style="list-style-type: none"> • Not likely; high energy.
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	8	0	1		
32	Is macroalgae present on or around the sill?	9	0	0		
33	If yes, is this problematic or concerning? Please explain.	<ul style="list-style-type: none"> • No. • No. • No. • No. • No. • Not a lot of oysters. 				

	Wetlands, Habitats, and Tidal Flow Continued	# yes	# no	# not sure	# N/A	Field Team Comments
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	8	0	1		
35	If yes, how can you tell?	<ul style="list-style-type: none"> • Around edges a opening dropdown on one of the sills. • Open water. • Water behind sill. • Fishes present. • Open on one end at sill 1- not good at sill 2 except at higher tides and at one end. • Drop downs water behind sill. • Drop downs but could be more of them. Break and ends. 				
36	If no, why not and is it a concern?	<ul style="list-style-type: none"> • Could be modified in design to create openings (offsets) for better fish passage and still have shoreline stabilized. 				
37	Is there a noticeable wrack line landward of the sill?	2	4	3		
38	Is there noticeable trash in and around the sill area?	0	8	1		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	7	2		
40	If so, what are they?					
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.	<ul style="list-style-type: none"> • Great habitat and flow Spartina is tall and healthy. • One sill has active water flow behind the sill, the second sill does not look like it has active water flow. • Wetlands areas are very diverse and new species have volunteered in low marsh graded into high marsh/shrub zone/upland as designed-tidal flow adequate to sustain very healthy marsh. 				

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	9	0	0		
44	Do you think a different structure would have performed/functioned better in this location?	0	7	2		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?	<ul style="list-style-type: none"> • High energy site-significant storm impacts to site would not alter the design, except for drop down could be improved for better fish passage bulkhead/revetment would not/does not allow sustenance of marsh shoreline nor provide diversity of habitat. • Maybe revetment however this allowed marsh propagation. 				

	Other Continued	# yes	# no	# not sure	# N/A	Field Team Comments
46	Overall, do you think the wetland creation portion of the project has been successful?	9	0	0		
47	Do you think this structure will continue to function into the future given expected sea level rise?	5	0	4		<ul style="list-style-type: none"> • Depends on how much land sinks.
48	Please provide any additional concerns and/or comments in regards to this site location.	<ul style="list-style-type: none"> • Project will accommodate shoreline protection and migration with sea level rise projectors but will not provide protection for much increase in SLR for house for very long given low elevation of marsh landward of sill. • Nice site but our concerned about sediment deposits directly behind the sill almost will be a barrier to having more sand distribute itself behind the sill area. • Good demonstration site for comparison bw sill, revetment, rip rap. No marsh behind rip rap. • The fetch and elevation of the site seem to require shoreline protection. The sill seems appropriate. 				



Major Permit No: 42-00-11

Issue Date: October 25, 2005

North Topsail Beach, NC

Waterbody: Stump Sound

Onslow County

- A stone sill 80 feet long already exists on the west side of the property.
- A rock sill 62 feet long was constructed east of the existing sill with a bottom width of 8 feet.
- At the east end, the sill tapers to a bottom width of 6.5 feet and lower crest elevation. This is to allow for space between the existing marsh island/spit and sill. The taper will prevent restrictions of navigation.
- Extend 12 feet, on average from normal high water and a maximum of 20 feet waterward of normal high water.
- The area landward of the sill will be filled, graded, and planted with appropriate marsh vegetation, utilizing 130 cubic yards of sand within 618 square feet.

Compiled Field Team Responses						
Date of Visit: 7-8-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	9	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	6	0	3		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?					<ul style="list-style-type: none"> • Would like to see sill father offshore. • Protect marsh island left in front at rocks on N. end. • No impact on shallow water habitat.
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	5	0	4	0	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?					
6	Is the grade behind the sill still gently sloping?	6	1	2		<ul style="list-style-type: none"> • Very narrow wetlands zone landward of this sill.
7	Are there any issues associated with the rock that you can observe today that concern you?					<ul style="list-style-type: none"> • Sill elevation adequate for flushing/circulation /erosion control. • Because a bulkhead exists behind sill, so grades are incidental. • Bulkhead and riprap behind sill with 10' to 30' of marsh between.
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.					

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	1	6	2		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> • Area behind gap is eroding. • If any just a little under or on other side of pier. • Not currently. • There is a rip rap revetment head that were put in after the construction of the sill. Why? • Site has been stabilized. 				
11	Is erosion occurring on the adjacent properties?	1	7	1		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> • Erosion forces still present. • Marsh is scarped but erosion doesn't seem to be too big an issue. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	2	7	0		
14	Has the sill created new uplands (land above the high water mark) behind it?	1	6	1		<ul style="list-style-type: none"> • He has done a lot of work on his own.
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	4	4	1		<ul style="list-style-type: none"> • Yes, appropriate but if further out in the water there would be more low marsh. • Yes; I think so. Maybe could have been placed landward by ~5'. • Narrow zone at correct location.
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	4	0		<ul style="list-style-type: none"> • Move sill waterward and remove bulkhead.
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	3	4	2		
18	If yes, please describe them.	<ul style="list-style-type: none"> • Oysters marsh area. • Habitats/WQ benefits. • Oyster recruitment,, fish utilization. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	5	4		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	9	0		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.	<ul style="list-style-type: none"> • Why was marsh island left on outside of sill? Presence of bulkhead is problematic. 				

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	8	1	0		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	9	0	0	0	<ul style="list-style-type: none"> Dense but could be from un-permitted fill.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	1	2	6		
27	Are upland species colonizing the area behind the sill?	5	2	2		<ul style="list-style-type: none"> Not sure; seemed to be planted by homeowner.
28	Is there evidence that the upper marsh area is mowed?	1	7	1		<ul style="list-style-type: none"> No there is a bulkhead.
29	Has the marsh grown waterward completely against the sill?	9	0	0		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	1	6	2	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present?	8	0	1		
32	Is macroalgae present?	6	3	0		
33	If yes, is this problematic or concerning? Please explain.					
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	9	0	0		
35	If yes, how can you tell?	<ul style="list-style-type: none"> See them behind sill. There is a break between the two "phrases" of sill creation. One drop down. Opening in / near middle of structure. Gaps. Opening could have been more and further out. Water flowing behind the sill. There is an opening in the sill. 				
36	If no, why not and is it a concern?					
37	Is there a noticeable wrack line?	1	7	1		
38	Is there noticeable trash?	0	8	1		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	8	1		
40	If so, what are they?					
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.					

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	9	0	0		
44	Do you think a different structure would have performed/functioned better in this location?	4	1	4		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					<ul style="list-style-type: none"> • Construction of sill and bulkhead ~15' landward isolation wetlands zone and disallows landward migration of wetlands/intertidal zone over time duplicated - should have disallowed bulkhead into this location. • Natural veg plantings with oyster reefs. • Just plantings. • Would like them placed further offshore.
46	Overall, do you think the wetland creation portion of the project has been successful?	9	0	0		
47	Do you think this structure will continue to function into the future given expected sea level rise?	4	4	1		
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> • The rip rap revetment and the bulkhead seem to be unnecessary. • But not much marsh buffer between bulkhead and sill. • Could have been placed waterward a bit. Really lift sill height/size. • Existence of bulkhead behind sill leaves marsh as where to retreat to . Given performance of adjacent natural properties, I don't see why rocks were needed. • Bulkhead constructed in vicinity of MHW or slightly higher in elevation. Not needed for environmental control. • This sill has fairly high species diversity and active fish utilization. It seems appropriately constructed, but due to lack of erosion of surrounding properties, I don't think the sill was necessary.



Major Permit No: 42-00-07

Issue Date: January 22, 2003

Columbia, NC 27925

Waterbody: Albermarle Sound

Tyrrell County

- 424 stone sill an average of 14 feet waterward of the normal water level and base width of 12.6 feet. The sill will be 3.57 feet high and extend 1 foot above normal high water level.
- Approximately 250 cubic yards of clean fill placed behind the sill, graded, and planted with suitable marsh species to stabilize the shoreline and reduce/prevent erosion.
- A 10 foot wide opening at the western end and a 5 foot long opening at the eastern end (where the sill overlaps 20 feet of existing riprap revetment) will allow water to flow through the created coastal wetland.

Compiled Field Team Responses						
Date of Visit: 7-20-10						
	Navigation, Rock, and Fill	# yes	# no	# not sure	# N/A	Field Team Comments
1	Based upon the placement of the structure and your observations, has navigation of the adjacent waterbody been impacted by this structure?	0	8	0		
2	Do you think the overall benefit of the marsh created, outweigh the initial impacts/changes due to the placement of rock on shallow water habitats?	4	2	2		
3	If no, how could the project have been modified to alleviate the concerns or issues surrounding the rock's initial impacts/changes?	<ul style="list-style-type: none"> • Should be dropdowns/breaks to allow water movement, cut off unless storm. • No fill was needed. • Are they really needed. 				
4	Does the overall benefit of the marsh created outweigh the initial impacts/changes from the fill used to create proper grade and depths?	3	2	2	1	
5	If no, how could the project have been modified to alleviate the concerns or issues surrounding the fill's initial impacts/changes?	<ul style="list-style-type: none"> • Storms would have filled in. How many storms? • No fill was needed. • Further offshore? • Natural marsh is present on adjacent properties...so not gone. 				
6	Is the grade behind the sill still gently sloping?	7	1	0		
7	Are there any issues associated with the rock that you can observe today that concern you?	<ul style="list-style-type: none"> • No openings. • Area is adjacent to uplands. • No gaps. • Presence. • Gaps should have been installed in sill. • No dropdowns/offsets. 				
8	Please provide any additional comments or concerns regarding Navigation or Fill on this site.	<ul style="list-style-type: none"> • No gaps or fish passages. 				

	Erosion Control and Impacts	# yes	# no	# not sure	# N/A	Field Team Comments
9	Is there evidence of erosion on this property?	3	3	2		
10	If yes, describe the evidence, extent, and location?	<ul style="list-style-type: none"> • Erosion occurring on shoreline opposite structure (other side of dock). • Aggressive upstream along wooded shoreline. • Old tree stumps in sound. 				
11	Is erosion occurring on the adjacent properties?	7	0	1		
12	If yes, describe the extent and location.	<ul style="list-style-type: none"> • Erosion occurring on shoreline opposite structure (other side of dock). • Aggressive upstream along wooded shoreline. • Old tree stumps in sound. • To left (if facing water) dead cypress in water. • At end of sill probably natural events. • Lots of stumps, dead trees. • On adjacent areas of the sill. 				
13	Is there a distinct shoreline offset between this property and the adjacent properties?	6	1	1		
14	Has the sill created new uplands (land above the high water mark) behind it?	4	1	3		<ul style="list-style-type: none"> • Done because of fill. • According to homeowner it has. • No, will with time.
15	Was the placement of the sill (relative to the existing shoreline margin) appropriate?	4	0	4		
		# too far	# too close	# other		
16	If you answered "No", please check the appropriate box.	0	0	0		
		# yes	# no	# not sure	# N/A	Field Team Comments
17	Are other non-erosional impacts (positive and negative) observable on this property due to the installation of the sill?	3	1	4		
18	If yes, please describe them.	<ul style="list-style-type: none"> • Accreted land behind sill. • Presence of phrag; very dense marsh compared to adjacent natural. • Thriving dense wetland area has been created. 				
19	Are other non-erosional impacts (positive and negative) observable on the adjacent properties due to the installation of the sill?	0	3	5		
20	If yes, please describe them.					
21	Is the structure damaged in any way?	0	7	1		
22	If yes, please describe the damage.					
23	Please provide any additional comments or concerns regarding Erosion Control and Impacts on this site.					

	Wetlands, Habitats, and Tidal Flow	# yes	# no	# not sure	# N/A	Field Team Comments
24	Are both high and low marsh plant species present?	7	0	1		
		# Dense	# Patchy	# Other	# No marsh	Field Team Comments
25	Does the marsh behind the sill appear continuous and dense, or sparse and patchy?	8	0	0	0	• Phrag.
		# yes	# no	# not sure	# N/A	Field Team Comments
26	Has there been any noticeable sediment accumulation landward of the sill?	6	0	2		
27	Are upland species colonizing the area behind the sill?	6	1	1		
28	Is there evidence that the upper marsh area is mowed?	2	6	0		
29	Has the marsh grown waterward completely against the sill?	8	0	0		
		# Landward	# Waterward	# Neither	# Not Sure	Field Team Comments
30	Is SAV present landward or waterward of the sill? (Circle all that apply)	0	0	3	5	
		# yes	# no	# not sure	# N/A	Field Team Comments
31	Are oysters present on or around the sill?	0	7	1		
32	Is macroalgae present on or around the sill?	3	4	1		
33	If yes, is this problematic or concerning? Please explain.					
34	Is there evidence of water passage through the sill and the ability for fish ingress and egress?	2	5	1		
35	If yes, how can you tell?	<ul style="list-style-type: none"> • Water behind sill. • Personal observation (rip rap is not a watertight structure). • Water puddling. 				
36	If no, why not and is it a concern?	<ul style="list-style-type: none"> • Only openings at far ends but does overtop with waves. • Limited access. • Vegetation is thick to sill. 				
37	Is there a noticeable wrack line landward of the sill?	0	4	4		
38	Is there noticeable trash in and around the sill area?	0	7	1		
39	Are there any noticeable issues with the water quality (turbidity, erosion, stormwater runoff)?	0	6	2		
40	If so, what are they?	• "high turbidity" exists along this shoreline.				
41	Please provide any additional comments or concerns regarding Wetlands, Habitats, and Tidal Flow on this site.	• Installed sill should have gaps every 100' to ensure some shallow habitat behind sill is maintained/created.				

	Other	# yes	# no	# not sure	# N/A	Field Team Comments
42	For this question, please refer back to the original permit packet. Were the comments/concerns your agency made during the permit process substantiated during and/or after construction? Please explain and/or respond to each comment/concern that was made by your agency for this permit.					
43	Do you think this sill is functioning as intended?	6	0	2		<ul style="list-style-type: none"> • Too well though shoreline is stabilized but is starting to fill in and becomes higher ground.
44	Do you think a different structure would have performed/functioned better in this location?	2	2	4		
45	If so, which one (bulkhead, riprap revetment, marsh toe protection riprap, groin, planting only, sheetpile sill, or no structure at all) and Why?					<ul style="list-style-type: none"> • Maybe riprap revetment. • Natural plantings. • The installed sill should have gaps to ensure some shallow water habitat was created.
46	Overall, do you think the wetland creation portion of the project has been successful?	7	0	1		
47	Do you think this structure will continue to function into the future given expected sea level rise?	5	0	3		
48	Please provide any additional concerns and/or comments in regards to this site location.					<ul style="list-style-type: none"> • Phrag. • Rocks better than rip rap revetment on adjacent property but looks worse than the property on other adjacent. • Seems to be a good project- hate to see phragmites falling over - still elevation still a bit high in my opinion.



IN REPLY REFER TO

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS

Washington Regulatory Field Office
Post Office Box 1000
Washington, North Carolina 27889-1000

August 31, 2010

Regulatory Division

Mr. James H. Gregson, Director
North Carolina Division of Coastal Management
400 Commerce Avenue
Morehead City, North Carolina 28557

Dear Mr. Gregson,

This correspondence is in reference to the Marsh Sill Evaluation Project initiated by the Policy and Planning Section of your agency. The purpose of the project was to conduct onsite evaluations of existing sill projects that have been permitted in the state and to generate discussion among review and commenting agencies concerning the effectiveness of the structures and potential adverse impacts associated with their construction. The evaluation and comments may be used to develop regulations designed to facilitate use of these marsh enhancement breakwaters in North Carolina.

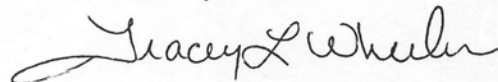
The U.S. Army Corps of Engineers Regulatory Division staff issued permits for activities on the sites that we visited during the evaluation project throughout coastal North Carolina. However, due to the potential for adverse impacts to a variety of resources under our jurisdiction, we typically reviewed these permit applications on an individual basis. The structures vary widely in type of structure, construction techniques and habitat type impacted. As stated in our March 17, 2004 correspondence to Congressman Walter B. Jones (attached) in response to previous inquiries concerning this subject, each project involved extensive site selection review, interagency pre-application consultation and resource agency review. During review of the project proposals, the Corps determined that the sites were appropriate for the proposed activity and that proposed work would not result in significant adverse impacts to the human environment. I am very concerned that future activities authorized under a less rigorous permit review process would not benefit from the same level of expertise, planning and commitment as the past projects.

For the past several months, I have attended interagency meetings in which the North Carolina Division of Coastal Management discussed the merits of the proposed State general permit for marsh sills. There were numerous State and Federal agency resource managers in attendance at these meetings and most agreed that these projects should continue to be reviewed on a case-by-case basis. In our 2004 letter (enclosed), we identified 13 issues that require extensive review and which preclude the Corps from developing a more expedited permit process to authorize these projects. Those concerns have not been alleviated. The Corps continues to be concerned that it would not be in the best interest of the public to expedite the

processing of a Department of the Army permit for activities that may individually and cumulatively result in significant impacts to the human environment.

Thank you for your efforts to facilitate discussion of this topic. We value our agency coordination and look forward to future interaction. If you have any questions, please contact me at telephone (910)251-4627.

Sincerely,



Tracey L. Wheeler
Regulatory Project Manager
Washington Regulatory Field Office

Copy Furnished with enclosure:

Steve Underwood, Assistant Director, Policy & Planning
North Carolina Division of Coastal Management
1638 Mail Service Center
Raleigh, NC 27699-1638

John Fear, Research Coordinator
North Carolina Coastal Reserve
101 Pivers Island Road
Beaufort, NC 28516

Bonnie Bendell, Coastal Engineer
North Carolina Division of Coastal Management
1638 Mail Service Center
Raleigh, NC 27699-1638



IN REPLY REFER TO

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS

Washington Regulatory Field Office
Post Office Box 1000
Washington, North Carolina 27889-1000

March 17, 2004

Honorable Walter B. Jones
House of Representatives
Washington, DC 20515

Dear Mr. Jones:

Thank you for your inquiry of March 2, 2004, regarding a request by the North Carolina Coastal Federation for the development of a U.S. Army Corps of Engineers, Wilmington District regional general permit to expedite permit applications for the construction of riprap sills within navigable waters of the United States in North Carolina. The purpose of this correspondence is to inform you of our interests in this matter.

Over the years, my Regulatory Division staff has issued permits for these types of activities throughout coastal North Carolina. However, due to the potential for adverse impacts to a variety of resources under our jurisdiction, we have typically reviewed these permit applications on an individual basis. It is important to note that the majority of the past projects were engineered and developed through the Coastal Federation and/or the North Carolina Sea Grant programs. The permitting of these activities occurred in a relatively short period of time, generally 60 to 90 days, and most projects were implemented under the direct supervision of Coastal Federation or Sea Grant staff. Each project involved extensive site selection review, interagency pre-application consultation and application review. I am very concerned that future activities authorized under a new regional general permit would not benefit from the same level of expertise, planning and commitment as the past projects.

On December 8, 2003, my Regulatory Division staff attended a stakeholders meeting to discuss the merits of the proposed State general permit that the North Carolina Division of Coastal Management had been directed to develop. There were numerous State and Federal agency resource managers in attendance at this meeting and most agreed that these types of projects should be reviewed on a case-by-case basis. Many major issues have been identified that preclude the development of a Wilmington District regional general permit, including but not limited to: 1) public safety; 2) navigation; 3) impacts to endangered species; 4) destruction of Essential Fish Habitat; 5) destruction of submerged aquatic vegetation; 6) impacts to near-shore cultural resources; 7) impacts to water quality; 8) conversion of productive, shallow-water habitat to another use; 9) the focusing of erosive forces onto neighboring properties; 10) commitment to long-term maintenance; 11) adequate monitoring; 12) adequate tracking of the success of these projects; 13) implementation of contingency measures should the projects fail; and 14) future regulatory enforcement concerns should additional fill material or structures be placed within the permit area.

-2-

Please be aware that many of the above issues are governed by other important Federal laws of which I am charged to consider. I am also concerned that each applicant will differ in motive, interest and ability to comply with the required permit conditions, and many will lack the commitment and resources to adequately maintain the projects. Rip rap sills are included as an activity that could be covered under State Programmatic General Permits in Virginia, Delaware, Pennsylvania, and Maryland. However, coordination with our sister districts revealed that most riprap sills are disqualified from general permit due to issues such as navigation and Essential Fish Habitat. For these reasons, the Wilmington District does not believe that the development of a regional general permit for riprap sills would satisfy our coordination responsibilities with other State and Federal agencies, nor would it be in the best interest of the public to expedite the processing of a Department of the Army permit for activities that may individually and cumulatively result in significant impacts to the human environment.

Thank you for your time and cooperation. As always, your interest in this matter, our regulatory program, and all Wilmington District matters is greatly appreciated.

Sincerely,

Charles R. Alexander, Jr.
Colonel, U.S. Army
District Engineer



North Carolina Department of Environment and Natural Resources
Division of Marine Fisheries

Beverly Eaves Perdue
Governor

Dr. Louis B. Daniel III
Director

Dee Freeman
Secretary

MEMORANDUM:

TO: Bonnie Bendell, DCM
John Fear, DCM NERRS

FROM: Jessi O'Neal
Kevin Hart
Anne Deaton
Division of Marine Fisheries

DATE: August 31, 2010

SUBJECT: DMF summary on the marsh sill survey

A sill is described in the DCM publication "Property Owner's Guide to Determining the Most Appropriate Stabilization Method" as a shore-parallel, wood or rock structure that is designed to protect, enhance, or restore existing or newly planted wetland vegetation, as well as landward upland property. The structures are typically constructed of rock or wood, but other materials such as oyster bags can be used. The structure is positioned waterward of MHW or NWL to allow for expansion of the wetland fringe. In contrast, a wetland toe revetment is a similar but lower elevation sloped structure placed at the base of existing wetland vegetation for plant protection. Bulkheads are a vertical structure, usually placed landward of existing wetland vegetation to prevent erosion of uplands. According to the evaluation information provided, sills are "thought to provide shoreline protection similar to, or better than, vertical bulkheads while also retaining ecosystem services associated with a natural shoreline margin".

The 2010 CHPP describes studies documenting how bulkheads directly or indirectly eliminate or degrade wetlands and shallow water habitats, prevent wildlife access to and from the estuary, and prevent landward migration of wetlands over time. The CHPP recommends revising shoreline stabilization rules to promote incentives for use of non-vertical shoreline stabilization alternatives where shoreline stabilization is necessary for erosion control. A sill may be permitted through a general or major permit process, depending on the structure specifications. Review agencies initially had concerns with sills due to less familiarity with the structures, uncertainty about erosion control effectiveness, and associated effect or change to shorelines and shallow water habitats. The CHPP Steering Committee asked DENR agencies to develop strategies that will result in reduced vertical hardening of shorelines, including incentives to alternative shoreline stabilization devices. Prior to initiating any potential rule changes, the committee decided that a follow-up evaluation of existing permitted and

constructed sills was needed to determine their effectiveness and any rule changes. During the months of June through August 2010, DMF staff visited 25 marsh sills as a part of a multiagency marsh sill evaluation organized by DCM. The purpose of these efforts was to evaluate the status of the post-construction sill sites. DMF staff evaluations focused on the biological benefits or impacts of the structures and whether this structure would be preferred from an ecological perspective over a bulkhead, knowing that an applicant in most situations can easily get a permit for a bulkhead. For the survey, DCM staff asked the agencies to evaluate existing sills for stabilization effectiveness, impacts to navigation, habitat trade-offs, fish access, erosion caused by the sill, filling and grading, planting success, impacts to existing resources, trash, water quality, and sea-level rise.

Some of the issues evaluated did not appear to be problematic. At all sites, the sills appeared to be preventing erosion of the upland property, supporting marsh vegetation landward of the sill, and had not filled in naturally or unnaturally above MHW/NWL. No sill-associated erosion problems were observed at adjacent properties. DMF did not observe any of the sills causing any problems related to navigation, or causing visibly elevated turbidity. While some trash was observed in a few sills, none was excessive. Filling of submerged lands to support marsh plantings was originally a concern of agencies, however no fill-related problems were observed. In all cases, we were unable to determine how sea level rise would affect sills from a one-time visit, but under rising sea level, marsh landward of the sill would be allowed to migrate and if waterward of a bulkhead, migration may be inhibited. At a few sites localized scour near structure ends or gaps was observed, apparently due to design flaws. A sill that is oriented parallel to the predominant wave energy or in any other way that directs wave energy toward a shoreline would likely cause erosion. Overall, the sills appeared to be functioning well in controlling erosion while providing beneficial ecological services.

Prior to the survey, topics of concern to the Division included habitat tradeoffs associated with siting and location, fish access behind sills, and impacts to existing fisheries habitat resources. Because of the width needed for a sill, it is generally positioned in shallow water. Construction of a sill to control erosion and maintain wetland fringe could result in covering of soft bottom, SAV or oysters. Primary nursery areas generally consist of shallow, muddy, unstructured substrate. DMF would be concerned with how the shift from a muddy unstructured substrate to rocks and wetlands would affect the nursery function of the area. However, the benefits of controlling erosion with a sill may outweigh immediate habitat loss or change. Ecological benefits include reducing sediment runoff and turbidity, greater trapping and filtering of pollutants by the wetland fringe, providing shallow protected refuge for juvenile fish, providing structure for oyster recruitment, and sustaining riparian wetlands that can migrate landward over time as sea level rises. From the perspective of protecting fisheries, a successful marsh sill would be one that stabilizes an eroding shoreline while maintaining valuable fish habitat and functions that may have been lost to erosion. Important fish habitats that are most vulnerable to erosion are wetland fringe and SAV.

One original concern of DMF is that the sills should be designed to allow fish access behind the sill since they are partially constructed over submerged land. This has been accomplished by using either “drop-downs” or breaks in the sill wall. A drop-down is a portion of the sill that is

lower in height than the rest of the sill. A break in a sill is created by leaving a gap with no sill material and can be positioned in a line or by constructing offset sills where the ends overlap. DMF believes that a break in the sill will usually provide more fish access than dropdowns because it allows more water through the sill and the scouring process that will occur around these breaks will maintain a depth accessible by fish. Dropdowns are more likely to trap fish, as well as sediment, behind the sill when the water level lowers. In addition, we observed oysters growing on the dropdowns which further obstructs water flow. Of the 25 sills evaluated by DMF, only half were considered to have fish ingress and egress behind the sill. We noted that others would have benefited from more access. Often the sill was not constructed as permitted (ie. Maxwell, Sneads Ferry) or too few openings were included in the design (ie. PKS Aquarium, Hammocks Beach, Marshallberg).

Fish access behind the sills did not appear to increase as the permit issue date became more recent. We observed 13 sills whose permit was issued after the general permit for marsh sills was created, with nine general permits and four major permits during this time period included in our observations. Considering DMF had been commenting about fish passage for years previous to 2005 and it is included as a condition of the general permit, it was surprising that seven of the 13 sills provided no fish passage. Of those seven, six were permitted with the general permit. Of the six general permits none had requirements for fish passage in their permit conditions. Three sills permitted under a GP did have fish passage.

Design elevation affected the amount of standing water behind a sill. All of the sills maintained intertidal ^{marsh spp} ~~Spartina~~ habitat behind them. Where elevations were slightly lower in portions of the sill, by design or scour, small tidal pools remained at low tide. In other sills, the entire area behind the sill was vegetated with *Spartina* and no open areas of water occurred. However, small fish and invertebrates were observed even in these “higher” wetlands, indicating they were still providing fish access. From observing the sills, it appears that the rocks and landward substrate could be designed to slightly lower elevation to allow some tidal pooling and unvegetated areas behind the structures at low tides to enhance fish refuge, while still adequately protecting the shoreline. Because surveys were conducted at low tide, some staff revisited a subset of sites at high tide. The sills were full of water during those times.

From our observations, the amount of erosive energy and substrate type at a site had a large effect on the success of marsh sills in providing habitat. In sites with high erosive energy (from wind or boat wake-generated waves), there appears to be a much higher likelihood that significant sedimentation occurs behind the sill, raising elevation, reducing fish access (if any existed by design), and allowing the marsh vegetation to grow up to the sill itself (ie: Harker’s Island five, Marshallberg, west end of Jones Island). In areas of mostly low energy, accretion was far less. In these areas, fish access was maintained but it was unclear if the frequency of high energy was such that sills were necessary in these locations (ie. Sullivan, Oyster Creek boat ramp). Substrate type also appeared to effect sedimentation and marsh growth. In areas that were sand-limited, it appears that there was higher erosion and lower success of marsh vegetation because there was very low accretion behind the sills (ie: Morris Landing oyster bag, north end of Jones Island). This may be an example where fill is necessary. Sills in medium to high energy systems that were designed to provide sufficient water passage and fish access,

appeared to be the most ecologically functioning marsh sills (PKS Oakleaf drive, North Topsail, Oriental, Gauldan).

Another initial concern of DMF due to siting of the structures over submerged lands was impacts to existing SAV, oysters, or Primary Nursery Areas. Of those 25 sills observed, 15 were adjacent to submerged aquatic vegetation (SAV), with 11 of those stating in the permit that there was no SAV at the site. Although since 2000 there has been an increase in SAV coverage throughout the state, it seems unlikely that only two of the total 25 sills evaluated had some SAV in the area. The sills did not appear to be causing problems to adjacent SAV since vegetation was found growing right up to the rocks at some locations. Sills may be promoting oyster growth by providing substrate. Oysters were found growing on 20 of the 25 sills observed and those without oysters were located in low salinities (two sills) or located with minimal exposure to water (three sills). Oysters present before construction can be relocated to prevent loss of shellfish. Where sills are located in PNAs, drop downs or openings for fish access are critical to the design. Of the three sills in PNA, all had openings or were under the length requirement for openings. When designing a structure, a site visit to identify potential resources is needed so that decisions can be made about the habitat trade-off at that site or the design modified to avoid impacts to SAV, oysters, or Primary Nursery Areas. Where a significant impact to SAV, oysters, or other habitat is unavoidable, alternative methods may need to be considered.

Two of the sills observed, Jones Island and Jockeys Ridge, were constructed of oyster bags rather than rocks. This has an additional ecological benefit in providing oyster reef habitat that can enlarge over time and is a true living shoreline. New oyster spat was observed on the shells and there was wetland vegetation landward of the sills. However, because there were only a few constructed with oyster bags and this is a relatively new method, more time is needed to observe how these lower profile sills perform in stabilizing the shoreline and maintaining wetland vegetation landward of the sill. If successful, this would be the most ecologically beneficial and natural-material shoreline stabilization technique to use. On other rock sills, oyster shell was added among the rocks to accelerate oyster recruitment. Live oysters were observed on sill rocks, regardless of whether oyster shell had been added. Algae, crabs, and other mollusks were also observed on and around the rock sills.

After completing the surveys, it was evident that sills are more dynamic than bulkheads. Like a natural shoreline, shoreline elevation, slope, and vegetation will vary over time, and sediment will aggrade and degrade dependent on storms, tides and wave energy. Looking at 25 sills constructed over a nine year period, the intertidal zone behind the sills did not increase in elevation to a point that supported upland vegetation, and did not scour to a point that did not allow marsh vegetation to grow.

To conclude, DMF continues to support sills as alternatives to bulkheads for shoreline stabilization, as stated in the CHPP. All sills appeared to be stabilizing the shoreline and providing ecological benefits. While a bulkhead can be constructed at or above the MHW line, avoiding immediate impacts to submerged habitats, it does not provide any of the ecological benefits of a sill; long-term maintenance of a wetland fringe, water quality enhancement,

structure and protection for juvenile fish, oyster habitat, and resiliency to sea level rise. Based on our field evaluations of constructed marsh sills throughout the state, the overall ecological benefits of the sill outweighed the habitat tradeoff and would be preferred over a bulkhead in all cases at those locations. In many instances, marsh area increased, shallow soft bottom was protected, adjacent SAV was not impacted, and there was an increase in oysters at the site. However, because there are habitat trade-offs, a natural shoreline is preferred to any stabilization structure. Sills and other structures should be used only where a documented erosion problem is occurring and associated habitat trade-offs should be considered carefully. Potentially covering SAV, shellfish, or other important habitats, may not be a positive trade-off. Decisions about trade-offs should be made on a case-by-case basis and based on the location, resources in the areas, and habitat threats in that location. Although design compliance is a concern of DMF, no ecological problems were observed when small deviations from the conditions did occur. Follow-up compliance is essential for all permitted activities. In addition, the ongoing CICEET and CRFL research should provide additional information on structural and ecological effectiveness of marsh sills. The DMF requests that DCM continues to utilize the input of resource agency personnel to site and design shoreline stabilization structures.

Cc: L. Daniel
J. Johnson
D. Knight



North Carolina Department of Environment and Natural Resources

Division of Water Quality

Beverly Eaves Perdue
GovernorColeen H. Sullins
DirectorDee Freeman
Secretary

MEMO

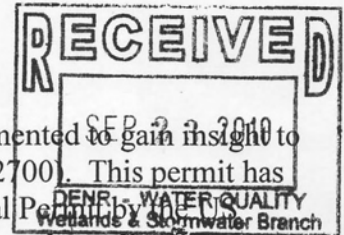
To: Cyndi Karoly, Wetlands/Stormwater Branch Supervisor

Through: Rick Shiver, Wilmington Regional Office Supervisor *RS*

From: Joanne Steenhuis, Senior Environmental Specialist and *JAS*
Chad Coburn, Senior Environmental Specialist *CCC*

Subject: Comments on the Division of Coastal Management Marsh Sills Evaluation Project

Date: September 21, 2010



The Division of Coastal Managements Marsh Sill Evaluation Project was implemented to gain insight to the potential support of their General Permit (GP) 2700 (under 15A NCAC 7H .2700). This permit has been effective since April 1, 2005 but does not have a corresponding 404 General Permit by the U.S. Army Corps of Engineers or a Division of Water Quality 401 General Certification, hence it cannot be issued by DCM as a GP and therefore the applicants are required to apply through the DCM major permitting process.

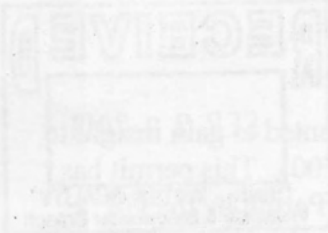
After visiting a majority of the sill project sites, this Office has the following concerns:

- This Office observed that along the shorelines there are various tidal regimes and wind tides. The proposed GP would try to incorporate an average type of sill to try to be consistent along the coastlines whether they are riverine in nature or those of the sounds and bays. This Office feels that each tidal regime and coastline needs to be evaluated as a case-by-case situation. The site visits confirmed that some of the sills had been overbuilt for the area and may do as well or better with smaller structures.
- This Office also observed that the "step-downs", that were included in the sills designs to allow water behind the sill for habitat and to allow water to flow out as the tide went out, often were built too high on the sill. In instances where the step-down was at or close to the elevation of the surrounding bottom, oysters would grow and fill the void and would come close to closing off the gap and impede the water flow.
- This Office also has a concern for the use of sediment (fill) landward of the sills. The sites we saw that did have sediment fill were graded appropriately for the project site and there was no noticeable difference from adjoining properties. This Office believes the use of sediment can be minimized even more, thereby allowing water in the area landward of the sills. This feature would allow for more habitats for aquatic species. In addition, the reduction of fill would allow for accumulation of sediment landward of the sill and the potential of sediment accretion causing the area to accrete out of our jurisdiction (create high ground) would be greatly reduced.

Wilmington Regional Office
127 Cardinal Drive Extension Wilmington, NC 28405
Phone: 910-796-7215 / FAX: 910-350-2004
Internet: www.ncwaterquality.org

One
North Carolina
Naturally

- During the site visits, this Office noted that the sill structures that had overlaps instead of the drop downs functioned better. These sills were built with open areas with smaller sills in front or overlapping sills. Water could freely move with the tides behind these sills. There were no “washout” areas like those behind some of the sills with step-downs. These gaps allowed a better ingress and egress of organisms behind the sill, the planted vegetation also flourished due to natural flushing thereby maintaining the low marsh component landward of the sill.
- At sites where SAVs were present, it could not be determined if any SAVs had been impacted during the construction of the sill.
- The sill evaluation project allowed this Office to recognize that sills should be very site specific and still needs to be evaluated on a case-by-case basis by the agencies. There is insufficient data for us to be “comfortable” with a GP this early in the process.
- If DCM issues a sill project through this GP process, therefore taking the project out of the Major CAMA application process, the applicant then has to apply for a General Permit (GP) or Nationwide (NW) permit through the regular 404/401 application process. If the sill project does not fit an existing NW or GP the applicant will be required to apply for an IP/IC.
- During the sill evaluation field trips most of the resource agencies agreed that the sills should still be evaluated on a case-by-case basis.



The Office observed that along the shoreline there are various tidal regimes and wind that...
proposed sill would be to incorporate an average type of sill to try to be consistent along the coastline...
which they are reviewing in terms of range or range of the sounds and tides. The Office feels that each sill...
regime and creation needs to be evaluated as a case-by-case situation. The site visits confirmed that...
some of the sills had been overlapped for the area and may do as well or better with smaller structures...
This Office also observed that the “step-downs” that were included in the sill designs to show water...
behind the sill for habitat and to allow water to flow out as the tide went out, often were built too high...
on the sill. In instances where the step-down was at or close to the elevation of the surrounding bottom...
systems would grow and fill the void and would also close off the gap and impede the water...
flow.

The Office also has a concern for the use of sediment (fill) landward of the sill. The sites we saw that...
did have sediment fill were graded appropriately for the project site and there was no noticeable...
disturbance from sedimenting practices. This Office believes the use of sediment can be minimized even...
and thereby allowing water in the area landward of the sill. This feature would allow for more...
padding for greater species. In addition, the reduction of fill would allow for accumulation of sediment...
landward of the sill and the potential of sediment accretion causing the area to accrete out of an...
jurisdiction (create high ground) would be greatly reduced.



Washington Regional Office
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North Carolina Department of Environment and Natural Resources
Division of Water Quality

Beverly Eaves Perdue
Governor

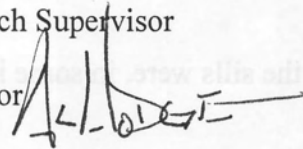
Coleen H. Sullins
Director



Dee Freeman
Secretary

September 21, 2010

MEMO

To: Cyndi Karoly, Wetlands/Stormwater Branch Supervisor

Through: Al Hodge, Washington Regional Supervisor 

From: Roberto L. Scheller, Senior Environmental Specialist
Chris Pullinger, Environmental Specialist  

Subject: Comments on Marsh Sill Evaluation Project

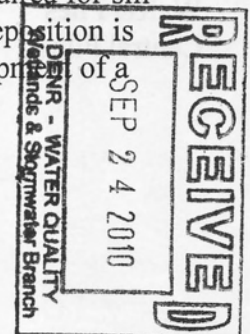
The Marsh Sill Evaluation Project was established by the Division of Coastal Management (DCM) in order to evaluate the possibility of expanding the General Permitting portion of their regulations. The project began on June 8, 2010 with the last sill evaluation conducted by this Office on August 4, 2010. Mr. Chris Pullinger and Mr. Roberto Scheller of the Washington Regional Office reviewed sills previously permitted by DCM. These projects were permitted in one of two ways: through the CAMA Major Permit process; or under a CAMA General Permit for sill structures (15A NCAC 7H .2700). After reviewing these permitted sill projects in various stages of completion, we have included the following general concerns, along with comments and recommendations for improvement..

Concern: Earthen Fill

The amount of earthen fill behind the sill, as well as the amount of rip-rap for the construction of the sill, appeared to be excessive on certain sites.

Recommendations

It is our recommendation that the amount of fill used behind a sill be limited to a set number of cubic yards per sill per project. The distance of the sill from the normal water line should also be set. These parameters, along with the water depth in which the sill is to be placed, will influence the amount of riprap required for sill construction. On sites where nearshore bedload movement is high or accretion of alluvial deposition is probable, no fill, or minimum fill should be used behind the sill. We believe that the development of a permitting guidance document could incorporate these issues.



Concern: Presence of SAV

It was noted that all sites reviewed on June 22, 2010 had Submerged Aquatic Vegetation (SAV) present waterward of the sill. DCM staff could not determine if SAV's were impacted from construction of sills.

Recommendations

We would recommend that SAV surveys be conducted on site before construction begins. Impacts to SAV beds should be avoided and or minimized to the greatest extent possible. The evaluation of impact is very difficult. The marsh sill in itself is a desirable shoreline stabilization device as an alternative to a hardened structure; however, if existing aquatic resources are impacted during the installation of this positive shoreline stabilization device, how is the net gain to be calculated? We believe that the development of a permitting guidance document could incorporate these issues.

Concern: Step-down gaps

It appeared that step-down gaps in the sills were, in some instances, impeding flow and aquatic passage.

Recommendations

We would recommend that step downs be set at or as nearly as possible to existing grade to allow adequate exchange of flow in low water conditions and to allow for adequate passage of aquatic organisms.

Concern: Site specificity of projects

It was noted during the sill evaluation project that successful sill construction is site/shoreline specific.

Recommendations

Because sill success is affected by site location/orientation, particularly in relation to wave energy and alluvial deposition movement, it is our suggestion that a guide be developed as a reference for sill placement, with minimum design requirements, allowable types of fill, as well as amounts of fill. The guide could be used by the DCM Permitting staff and approved by the resource agencies.

In summary, this Office would support the use of the General Permit process for the construction of rock marsh sills for shoreline protection as a preferred alternative to bulkheads and/or other hardened structures. On-site review of sills in their various stages of completeness has demonstrated some of the benefits sills can have on the aquatic environment, along with their benefits in marsh protection and restoration. We believe that the development of a permitting guidance document is crucial for "buy in" from State resource agencies. We hope our comments and recommendations are useful in development of an acceptable sill permit.

cc: WaRO Files
Central Files





☒ North Carolina Wildlife Resources Commission ☒

Gordon S. Myers, Executive Director

September 1, 2010

John Fear, Ph.D.
Research Coordinator
North Carolina National Estuarine Research Reserve
North Carolina Division of Coastal Management
101 Pivers Island Rd
Beaufort, NC 28516

Dear Dr. Fear,

The North Carolina Wildlife Resources Commission (NCWRC) appreciates the opportunity provided by the North Carolina Division of Coastal Management (NCDCM) to participate in the recent Marsh Sills Evaluation Team. We believe the coordination of the state and federal agencies along with the all the information collected on each site visited provided an invaluable tool in this state's effort to evaluate appropriate shoreline stabilization measures.

In general, the NCWRC believes marsh sills may provide important habitat opportunities while allowing shoreline stabilization on certain properties. Vertical structures such as bulkheads may encourage scour at the base of the structure, thereby removing the opportunity for submerged aquatic vegetation (SAV) and the development of regularly inundated marshes. Quiescent waters behind the sill that allow for aquatic passage and coastal marsh generation can provide a rearing habitat for juvenile species that need shallow waters. Coastal marshes that establish behind sills also filter stormwater runoff, removing nutrients and pollutants before entering surface waters. This marsh area also provides an important source for organic input. Fish assemblages also benefit from the structure of the sills and can be found foraging in the vicinity. The sills also provide habitat for a variety of shellfish to congregate to further improve water quality while providing additional habitat.

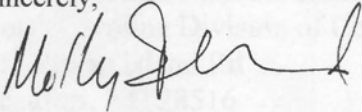
Permit requests for shoreline stabilization structures continue to increase as the use of the coastal areas increases. Sea level rise, increased use of public waterways, and continued residential and commercial development result in the need to evaluate appropriate erosion control structures that will minimize the cumulative loss of environmentally important areas. Appropriately designed sills are able to find the balance between erosion control while minimizing the loss of shallow bottom habitat and marsh areas.

Although the NCWRC believes the use of marsh sills to stabilize shorelines can protect or even enhance habitat opportunities, we also strongly believe the success of these structures is very site specific. Wave energy, water depths, existing aquatic habitats, adjacent property circumstances, navigation, land owner intentions, marsh sill design, and construction all play a vital role in deciding whether or not a marsh sill

is successful in providing and not replacing wetland / shallow water habitats with upland opportunities. The coast of North Carolina is vastly variable. A design in one location may not serve well in another. Examples of design differences include drop downs, baffled openings, heights above normal water / normal high water, amount of fill landward the structure, and presence or absence of a tidal creek feature. Maintenance of the structures and post-construction compliance would go a long way to insure the structure met the intentions of the applicant and the review agencies. Marsh sills and their success are very site specific and require adequate review by resource agencies to evaluate the design, the impacts, and the area where the sill is proposed. If properly sited and designed, they can be a boon to marine and estuarine habitats.

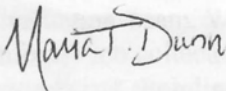
Once again the NCWRC would like to express our appreciation for the opportunity to provide comment during this NCDWM marsh sill evaluation project. Please contact either Molly Ellwood (910) 796-7240 or Maria Dunn (252) 948-3916 if the NCWRC can be of further assistance or if you have additional questions.

Sincerely,



Molly M. Ellwood
Southeast Permit Coordinator

And



Maria T. Dunn
Northeast Permit Coordinator

Subject: Final thoughts on Living Shoreline assessment

From: Tracy Skrabal <tracys@nccoast.org>

Date: Thu, 23 Sep 2010 14:18:04 -0400

To: "Fear, John" <john.fear@ncdenr.gov>, "Bendell, Bonnie" <bonnie.bendell@ncdenr.gov>, "Underwood, Steve" <steve.underwood@ncdenr.gov>

CC: 'Erin Fleckenstein' <erinf@nccoast.org>, 'Lexia' <lexiaw@nccoast.org>, 'Todd Miller' <toddm@nccoast.org>, "Gregson, Jim" <jim.gregson@ncdenr.gov>

John, Bonnie and Steve- First, thank you for allowing me to participate in this site by site assessment of a number of the sill projects, including some we were not involved in. It is always helpful to revisit sites and to visit other practitioner's sites, especially since the implementation of living shoreline projects is constantly evolving, along with the science and methodology. You should have all the sheets I completed for the sites I visited, but I wanted to take an opportunity to provide some final thoughts, as a practitioner and advocate for these projects:

1) For the sites I visited, I would characterize all of the projects as successful- they were mitigating erosion, which is important to the property owners, and they were meeting most of our conservation objectives for all the sites. In addition to stabilization, our conservation objectives included 1) preservation, enhancement or restoration of a vegetated coastal marsh (both low and high marsh); 2) where possible, preservation, enhancement or restoration of dune or native upland riparian buffer, and 3) where possible, offering treatment of polluted stormwater runoff to protect adjacent waters.

Although I would characterize the various sites as successful in balancing property owners' rights with achieving conservation objectives, there are design changes I might make to the sites if constructing them today, which is the benefit of evaluating a projects performance over time. Specifically, I would downsize the sills at some of the sites, recognizing that some of our smaller sills performed quite well in moderate-higher energy environments. Having said that, this is tricky thing to regulate, since incident energy conditions and site conditions vary significantly. The best design information that is available (COE, State of MD) will generally lead practitioners to larger structures, and it is risky for consultants and contractors to under-design projects for clients, no matter which structure you choose.

The other area we should consider modifying is the drop-down requirements. I think we all agree that we need better fish passage for these structures, and the current permit conditions can seriously impede passage, and at the same time may allow too much current/wave energy through the structures. The best design I saw for this was at Radio Island. The drop down was very steep and very narrow (~2' gap at base) but stone was about at grade (trenched in) on the bottom of the dropdown. Not having the prism so large (5' wide opening on base, which can mean 10-15' opening at the crest) can prevent erosion of the marsh and property landward of the sill, and it can also allow you to reduce the base of the dropdown to grade level, which helps with fish passage for a fuller tide range.

2) Many field comments that our staff heard were about footprint, size of structure and trade-off of habitats. As stated above, evaluating performance of sills after years installed is a great tool in making design changes for future projects, and practitioners should always be open to better design. However, these conversations avoid that giant elephant in the room. The bottom line is that we cannot evaluate these projects in a vacuum, without applying the

same set of criteria for bulkheads and revetments. We have to keep in mind what science already tells us about adverse impacts associated with traditional hardened structures, particularly in light of recent sea level rise estimates, and compare the direct and long term implications of hardening by bulkheads/revetments vs. those of sill/marsh projects.

There can be no argument that our estuarine ecosystem would be much better off if NC adopted a no hardening policy/ regulatory program (which science supports). Barring that option, recommendations of the National Academy of Science, the Biological and Physical Processes Workgroup, as well as a number of other states' programs, and the CHPP plan clearly support the implementation of alternatives to vertical walls and revetments (such as sills/marsh plantings) for the vast majority of shoreline types.

3) The other issue debated is whether or not agencies could ever feel comfortable with a GP approval for sill projects, given the site considerations and resource concerns that may exist at each site. I would agree with this, but again challenge us to stop ignoring the obvious contradiction within our current program. NC's state and federal agencies should be comfortable and concerned that sill projects are designed appropriately and with the minimal adverse impact to the ecosystem, and whatever permit review process that is adopted should assure this. Why are we not completely uncomfortable (or outraged) with our current rubber-stamp approvals of bulkheads and revetments? There is no scientific justification to bypassing a full field review for each and every bulkhead and revetment project, and seeking the same level of assurance that we minimize or avoid their impacts to our ecosystem.

Can any scientific argument justify the current permit process which has allowed hundreds of miles of hardening since 2000 with virtually no consideration of alternative design or method? Aside from the potential direct, secondary and cumulative physical and biological impacts associated with these traditional measures, nearly every bulkhead and/or revetment eliminates a minimum of 2'-10' from the natural intertidal ecosystem (including the alignment channelward of mhw, footprint and backfill) , and usually an equal or greater area of natural riparian buffer. I would argue that the worst of the sills are more environmentally sustainable than 90% of bulkhead and revetments in NC.

4) Over the years, a common concern is the potential to (over time) see conversion of the landward portion of a sill projects from low marsh to high marsh or upland "real estate". Taking the bad actors out of the picture, who will always seek to game any system, compare the sill projects to bulkhead projects. As designed, sills may trap sediment landward of the structure, which can over time move the line from low marsh to high marsh, or adjust the entire profile upward. There is an upward limit to this conversion, however, as is seen when you look at projects that have been in place for decades in Virginian, Maryland, Delaware and our older sites in NC. If one even considers a modest increase in sea level rise, it is possible that this rate of accretion may have important implications for marshes keeping pace with sea level rise. More importantly, if one calculates the acreage of intertidal vegetated and/or unvegetated public trust bottoms that have been permanently eliminated by the current delineation and backfilling of bulkheads and revetments, the potential loss of low to high marsh or high marsh to riparian uplands pales in comparison. Marshes that are created or restored as part of sill projects are jurisdictional wetlands, just like any other marsh. Elimination of that marsh is a violation, and restoration can be enforced under the current program. Backfilling of every 100 miles of bulkhead placed 5' channelward of MHW represents a permanent loss of 60 acres of low tide marsh, and a much greater acreage of

potential high marsh and riparian vegetation.

I thank you again for your including Lexia, Erin and me in this important process, and I look forward to the next steps in this process. Best regards, Tracy

Tracy E. Skrabal
Coastal Scientist
Southeast Regional Manager
We've moved! Please note our new contact information:
North Carolina Coastal Federation
The Landing
530 Causeway Drive Suite F1
Wrightsville Beach, NC 28480
Ph: (910) 509-2838 Ext. 201 Fax: (910) 509-2840
Website: www.nccoast.org

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Property owner survey responses.

	Question	Response	Provided Responses to Other
1	Did you install the marsh sill or was it present when you bought your property?	<ul style="list-style-type: none"> • 89%, Yes, I installed sill. • 11%, No, it was already present. 	
2	What two factors most influenced your decision to install a marsh sill?	<ul style="list-style-type: none"> • 5%, Cost • 29%, Maintain the environmental integrity of my property. • 43%, Protect my property from future erosion. • 0%, Having a structure like my neighbor's. • 10%, Wanted something besides a bulkhead. • 7%, Aesthetics. • 7%, Other. 	<ul style="list-style-type: none"> • Put marsh sill in because neighbor put one in and felt I had to follow suite as a defense to protect my property from erosion. • Hopefully enhancing water quality. • Marsh sill put in because was a requirement placed on our CAMA major permit application by National Marine Fisheries.
3	Did the presence of the marsh sill impact your decision to buy this property?	<ul style="list-style-type: none"> • 5%, Increased my desire (to buy). • 5%, Decreased my desire (to buy). • 90% N/A, I installed the sill. 	
4	Are you happy with the performance of the marsh sill?	<ul style="list-style-type: none"> • 95%, Yes. • 5%, No. 	
5	Has your marsh sill had any impacts to your property?	<ul style="list-style-type: none"> • 84%, Increased my marsh. • 0%, Decreased my marsh. • 11%, Had no impacts. • 5%, Caused erosion. • 16%, Caused accretion. • 11%, Degraded my viewscape. • 32%, Enhanced my viewscape. • 26%, Other. <p>Overall:</p> <ul style="list-style-type: none"> • 86%, positive responses • 14%, negative responses 	<ul style="list-style-type: none"> • Trash collection (behind sill). • Hopefully will cause accretion. • Caused some erosion by beach, marsh area essentially unchanged since installation. • Provided additional habitat for wildlife. • Halted erosion.
6	Has your marsh sill ever had to be repaired? If so, how?	<ul style="list-style-type: none"> • 11%, Yes. • 89%, No. 	<ul style="list-style-type: none"> • 50% of marsh had to be replanted in second year. • Lost vegetation in veteran's day storm of 2010.
7	Do you think your marsh sill has had any impacts (good and bad) on your neighbor's property? If yes, what were they?	<ul style="list-style-type: none"> • 58%, Good impact. • 0%, Bad impact. • 42%, No impact. 	<ul style="list-style-type: none"> • Increased their marsh grass. • Made their bulkhead look awful. • Increase of neighbor's marsh and visual aesthetics. • Enabled neighbor's added fill to remain in place and not wash away. Helped protect their shoreline. • Fisheries enhancement. • Maintained neighbor's beach area...added some sand. • Reduced neighbor's erosion. • Slowed neighbor's erosion. • Helped to slow neighbor's erosion. • Convinced neighbor to install sill.

8	<table border="1"> <thead> <tr> <th>In general, rate the following in terms of the important to you.</th> <th>not important</th> <th>somewhat important</th> <th>important</th> <th>very important</th> </tr> </thead> <tbody> <tr> <td>Water Quality</td> <td>0%</td> <td>7%</td> <td>13%</td> <td>100%</td> </tr> <tr> <td>Aesthetics</td> <td>0%</td> <td>25%</td> <td>325%</td> <td>100%</td> </tr> <tr> <td>Preserving ecosystem function</td> <td>0%</td> <td>0%</td> <td>27%</td> <td>100%</td> </tr> <tr> <td>Preserving wildlife habitat</td> <td>0%</td> <td>0%</td> <td>82%</td> <td>100%</td> </tr> <tr> <td>Erosion control/protection from sea level rise</td> <td>7%</td> <td>0%</td> <td>29%</td> <td>100%</td> </tr> <tr> <td>Leaving system as natural as possible</td> <td>0%</td> <td>9%</td> <td>64%</td> <td>100%</td> </tr> <tr> <td>Having shore access for boating/fishing/recreation</td> <td>100%</td> <td>100%</td> <td>150%</td> <td>100%</td> </tr> </tbody> </table>	In general, rate the following in terms of the important to you.	not important	somewhat important	important	very important	Water Quality	0%	7%	13%	100%	Aesthetics	0%	25%	325%	100%	Preserving ecosystem function	0%	0%	27%	100%	Preserving wildlife habitat	0%	0%	82%	100%	Erosion control/protection from sea level rise	7%	0%	29%	100%	Leaving system as natural as possible	0%	9%	64%	100%	Having shore access for boating/fishing/recreation	100%	100%	150%	100%
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Having shore access for boating/fishing/recreation	100%	100%	150%	100%																																					
9	<p>Are there any other comments you would like to make regarding your marsh sill?</p> <ul style="list-style-type: none"> • Owner wants to save live oak trees at waters edge behind sill. • Love it - its fine but oysters are everywhere. • Everyone living on the sound should have a marsh sill. • Our project proved to be much more difficult to obtain permits for than we anticipated, and was also somewhat more costly. However we still feel that it was well worth it as it is far superior to the alternative of hardened structures. We hope the state of NC will find ways to encourage the marsh sill solution to others needing erosion protection in the future. • The reason Hammock's Beach SP constructed two marsh sill projects was to help protect the outstanding resource waters located behind Bear Is, to increase water quality, to provide additional wildlife habitat, and to decrease shoreline erosion. In addition one of the projects decreased the cost of maintaining a hardened bulkhead at the park's maintenance area. Overall we feel that both these projects have been successful. • The sill has performed exceptionally: the system was challenged by Hurr Isabel within 2m after installation and marsh planting was undamaged by the storm surge and waves (unlike the stone revetment in other areas of our shoreline, which required repair). The living shoreline has failed, however, near one end due to the mandated presence of a wide gap that allows (and likely increases) scouring effects. The shoreline is again eroding behind the gap, with impending uprooting of shoreline trees. we believe this gap ("dropdown"), intended for wildlife passage was quite unnecessary given the broad area of access available in pre-existing marsh adjacent to the sill project. The specific design and orientation of the wildlife passage gap that we were obligated to install was certain to fail from an erosion control engineering perspective. It is ironic that we were forced to incorporate in an otherwise wildlife enhancing system a feature that would defeat its erosion control function at least focally, whereas we could have installed a much less environmentally friendly treated-wood bulkhead with no such restriction and an immensely simpler permitting system.. • The sill has performed well and has protected and preserved the shoreline. We have experienced high water from Nor'Easters and hurricanes and the sill has remained stable and has effectively broken the dynamic force of the storm water action. • Very effective at stabilizing beach erosion. • I think (know) it has helped growth. Eventually I'll need another level or rocks as they have sunk quite a bit. I would contact you guys first. • Not being able to do anything in the easement area has allowed the proliferation of Phragmites, to the exclusion of other native flora. The 30' setback defining the easement area seems arbitrary when applied in areas where flora is already well established or where a drainage ditch runs perpendicular to the waters edge. • The sill seems to be preventing erosion and damage to bulkhead but serves as a catch basin for bottles/cans and debris. In general, much better solution for erosion than bulkhead, but application process to bulky, detailed and expensive. In future would consider allowing slightly higher walls since rocks tend to subside and increase distance from 18' to 24ft. Lowering administrative hassles would facilitate implementation of the project. • USACE was hard to work with. We had designed a system that had worked well in Chesapeake Bay area. They would not consider, afraid to try something new and innovative. Therefore we ended up with low sill. Two yrs later USACE came back and suggested we add height and enclose outlets by about 40%. What we ask for after tomboloas were denied. USACE also imposed overly cautious and restrictive requirements for monitoring. • Installed and functioning without a hitch. 																																								

- We are very pleased with the performance of the marsh sill. The growth of the marsh grass behind the sill has been rapid. It is certainly a better/superior option than the traditional bulkhead. We hope that we are one of the twenty eight sills selected for personal inspection by DCM. We are willing to participate in any future evaluation program that DCM might deem useful.

Adjacent property owner survey responses.

Question		Response	Provided Responses to Other
1	Was your neighbor's marsh sill present when you bought your property?	<ul style="list-style-type: none"> • 27%, Yes. • 73%, No. 	
2	Did the presence of your neighbor's marsh sill impact your decision to buy your property?	<ul style="list-style-type: none"> • 0%, Increased my desire (to buy). • 7%, Decreased my desire (to buy). • 20%, Had no impact on my decision. • 73% N/A, it was installed after I purchased my property. 	
3	Has your neighbor's marsh sill had any impacts to your property?	<ul style="list-style-type: none"> • 20%, Increased my marsh. • 13%, Decreased my marsh. • 13%, Had no impacts. • 33%, Caused erosion. • 20%, Caused accretion. • 27%, Degraded my viewscape. • 20%, Enhanced my viewscape. • 47%, Other. • Overall 45% positive responses. 55% negative responses. 	<ul style="list-style-type: none"> • Preserved bulkhead as good buffer, I have a bulkhead too. • Nice to look at from water. • No access to beachfront to the west of my property. • Washed sand out. Marsh use to be real tall but now is short. • Caused boat ramp on my property to collapse. Clogged drainage pipe from road. Decreased water access by causing beach area to erode. • Added sand. • A bulkhead would be more attractive. • Dramatically changed my shoreline. • Increased my marsh.
4	In your opinion, has your neighbor's marsh sill done its job? If no, Why?	<ul style="list-style-type: none"> • 73%, Yes. • 27%, No. 	<ul style="list-style-type: none"> • Project was a failure. • Yes, for them. Caused more impact (erosion) on my beach. • Dramatically changed my shoreline.
5 and 6	Do you currently have a shoreline protection structure on your property? If yes, which kind	<ul style="list-style-type: none"> • 53%, Yes. • 47%, No. 	<ul style="list-style-type: none"> • 3 responses of riprap revetment. • 1 response of marsh sill. • 2 responses of groin. • 5 responses of bulkhead.
7	Would you consider installing a marsh sill in the future on your property?	<ul style="list-style-type: none"> • 53%, Yes. • 47%, No. 	<ul style="list-style-type: none"> • Caused horrible consequences for my property. • <i>Expletive</i> no.

Question	Response	Provided Responses to Other																																											
8	<p>What two factors most influenced your answer to question 7?</p>	<ul style="list-style-type: none"> • 47%, Maintain the environmental integrity of my property. • 47%, Protect my property from future erosion. • 13%, Ease of permitting. • 13%, Cost of installation. • 13%, Having a structure like my neighbors. • 40%, Aesthetics. • 47%, Other. 	<ul style="list-style-type: none"> • Success of other neighbor's sills. • Hurricane damage. • I want the property and water left as is. • Ruined sea grasses/clam beds, clogged wetlands. Permit system is very poor and allows failures to be installed. • Having natural beach areas. • Having a nice sand beach to walk on. These things are awfully ugly and create walking hazards and severely limit access to water. • Prohibits usage of natural shoreline. 																																										
9	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">In general, rate the following in terms of the important to you.</th> <th style="text-align: center;">not important</th> <th style="text-align: center;">somewhat important</th> <th style="text-align: center;">important</th> <th style="text-align: center;">very important</th> </tr> </thead> <tbody> <tr> <td>Water Quality</td> <td style="text-align: center;">7%</td> <td style="text-align: center;">0%</td> <td style="text-align: center;">33%</td> <td style="text-align: center;">60%</td> </tr> <tr> <td>Aesthetics</td> <td style="text-align: center;">0%</td> <td style="text-align: center;">13%</td> <td style="text-align: center;">20%</td> <td style="text-align: center;">67%</td> </tr> <tr> <td>Preserving ecosystem function</td> <td style="text-align: center;">7%</td> <td style="text-align: center;">13%</td> <td style="text-align: center;">27%</td> <td style="text-align: center;">53%</td> </tr> <tr> <td>Preserving wildlife habitat</td> <td style="text-align: center;">7%</td> <td style="text-align: center;">27%</td> <td style="text-align: center;">13%</td> <td style="text-align: center;">53%</td> </tr> <tr> <td>Erosion control/protection from sea level rise</td> <td style="text-align: center;">27%</td> <td style="text-align: center;">0%</td> <td style="text-align: center;">27%</td> <td style="text-align: center;">47%</td> </tr> <tr> <td>Leaving system as natural as possible</td> <td style="text-align: center;">0%</td> <td style="text-align: center;">20%</td> <td style="text-align: center;">27%</td> <td style="text-align: center;">53%</td> </tr> <tr> <td>Having shore access for boating/fishing/recreation</td> <td style="text-align: center;">0%</td> <td style="text-align: center;">7%</td> <td style="text-align: center;">33%</td> <td style="text-align: center;">60%</td> </tr> </tbody> </table>					In general, rate the following in terms of the important to you.	not important	somewhat important	important	very important	Water Quality	7%	0%	33%	60%	Aesthetics	0%	13%	20%	67%	Preserving ecosystem function	7%	13%	27%	53%	Preserving wildlife habitat	7%	27%	13%	53%	Erosion control/protection from sea level rise	27%	0%	27%	47%	Leaving system as natural as possible	0%	20%	27%	53%	Having shore access for boating/fishing/recreation	0%	7%	33%	60%
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10	<p>Are there any other comments you would like to make regarding your neighbor's marsh sill?</p>																																												
<ul style="list-style-type: none"> • Rip-rap seems to be effective way of decreasing wave action against a bulkhead and decreasing erosion and preserving the shoreline. • It worked out very well. We would like to see all of the shoreline in Mashallburg done the same way. The whole sound for that matter. Permitting and expense are the major limiting factors. Please keep us informed as to your progress. • Made value of my property go down. Put sand in front of property and decreased marsh grass. It affected his property and ones on each side of it. Empty lot next door sand built up over there too. When it comes to SE rocks in wrong direction. Makes a funnel of sand blowing out around property. I lived here 30 yrs and watched the bank. I should know. Trying to sell house for a year and no one wants it. Neighbors house to blame? Take them (sills) out. CAMA should take them rocks out. • It has caused extensive damage and erosion to my property. Lost beach and collapsed boat ramp. Hard pan exposed. Neighbor's marsh sill is not fluid. • As a retired biology teacher, I've always preached against shoreline hardening of any type. They are all temporary and doomed to failure. You must know this as a scientist too. The impact of these things (sills) on non-participating neighbors should be very clear. Just walk down the beach where you still can from Springer's Point to the harbor entrance and you will see the obvious. Greed is what keeps this foolish process going. • Remove it! 																																													

15A NCAC 7H .2705 SPECIFIC CONDITIONS of the marsh sill general permit.

- (a) A general permit issued pursuant to this Section shall be applicable only for the construction of riprap or stone sill structures built in conjunction with existing, created or restored wetlands.
- (b) This general permit shall not apply within the Ocean Hazard System Areas of Environmental Concern (AEC) or waters adjacent to these AECs with the exception of those portions of shoreline within the Inlet Hazard Area AEC that feature characteristics of Estuarine Shorelines. Such features include the presence of wetland vegetation, lower wave energy, and lower erosion rates than in the adjoining Ocean Erodible Area.
- (c) On shorelines where no fill is proposed, the landward edge of the sill shall be positioned no more than 5 feet waterward of the waterward depth contour of locally growing wetlands or to mid-tide depth contour, whichever is greater. Where no wetlands exist, in no case shall the landward edge of the sill be positioned greater than 30 feet waterward of the mean high water or normal high water line.
- (d) On shorelines where fill is proposed, the landward edge of the sill shall be positioned no more than 30 feet waterward of the existing mean high water or normal high water line.
- (e) The permittee shall maintain the authorized sill and existing or planted wetlands in conformance with the terms and conditions of this permit, or the remaining sill structures shall be removed within 90 days of notification from the Division of Coastal Management.
- (f) The height of sills shall not exceed six inches above mean high water, normal water level, or the height of the adjacent wetland substrate, whichever is greater.
- (g) Sill construction authorized by this permit shall be limited to a maximum length of 500 feet.
- (h) Sills shall be porous to allow water circulation through the structure.
- (i) The sills shall have at least one five-foot drop-down or opening every 100 feet and may be staggered or overlapped or left open as long as the five-foot drop-down or separation between sections is maintained. Overlapping sections shall not overlap more than 10 feet. Deviation from these drop-down requirements shall be allowable following coordination with the N.C. Division of Marine Fisheries and the National Marine Fisheries Service.
- (j) The riprap structure shall not exceed a slope of a one foot rise over a two foot horizontal distance and a minimum slope of a one and a half foot rise over a one foot horizontal distance. The width of the structure on the bottom shall be no wider than 15 feet.
- (k) For the purpose of protection of public trust rights, fill waterward of the existing mean high water line shall not be placed higher than the mean high water elevation.
- (l) The permittee shall not claim title to any lands raised above the mean high or normal water levels as a result of filling or accretion.

- (m) For water bodies more narrow than 150 feet, the structures shall not be positioned offshore more than one sixth (1/6) the width of the waterbody.
- (n) The sill shall not be within a navigation channel marked or maintained by a state or federal agency.
- (o) The sill shall not interfere with leases or franchises for shellfish culture.
- (p) All structures shall have a minimum setback distance of 15 feet between any parts of the structure and the adjacent property owner's riparian access corridor, unless either a signed waiver statement is obtained from the adjacent property owner or the portion of the structure within 15 feet of the adjacent riparian access corridor is located no more than 25 feet from the mean high or normal water level. The riparian access corridor line is determined by drawing a line parallel to the channel, then drawing a line perpendicular to the channel line that intersects with the shore at the point where the upland property line meets the water's edge.
- (q) The sill shall not interfere with the exercise of riparian rights by adjacent property owners, including access to navigation channels from piers, or other means of access.
- (r) Sills shall be marked at 50-foot intervals with yellow reflectors extending at least three feet above mean high water level.
- (s) If the crossing of wetlands with mechanized construction equipment is necessary, temporary construction mats shall be utilized for the areas to be crossed. The temporary mats shall be removed immediately upon completion of the construction of the riprap structure.
- (t) Sedimentation and erosion control measures shall be implemented to ensure that eroded materials do not enter adjacent wetlands or waters.
- (u) No excavation or filling of any native submerged aquatic vegetation is authorized by this general permit.
- (v) No excavation of the shallow water bottom or any wetland is authorized by this general permit.
- (w) No more than 100 square feet of wetlands may be filled as a result of the authorized activity.
- (x) Backfilling of sill structures may ~~only~~ be utilized only for the purpose of creating a suitable substrate for the establishment or reestablishment of wetlands. Only clean sand fill material may be utilized.
- (y) The riprap material shall consist of clean rock or masonry materials such as granite or broken concrete. Riprap material shall be free of loose sediment or any pollutant. The structures shall be of sufficient size and slope to prevent its movement from the site by wave or current action.

(z) If one or more contiguous acre of property is to be graded, excavated or filled, an erosion and sedimentation control plan shall be filed with the Division of Land Resources, Land Quality Section, or appropriate government having jurisdiction. The plan must be approved prior to commencing the land-disturbing activity.

(aa) In order to ensure that no adverse impacts occur to important fisheries resources, the Division of Marine Fisheries shall review and concur with the location and design of the proposed project prior to the issuance of this general permit.

(bb) Prior to the issuance of this general permit, Division staff shall coordinate with the Department of Administration's State Property Office to determine whether or not an easement ~~will~~ shall be required for the proposed activity.

(cc) Following issuance of this general permit, the permittee shall contact the N.C. Division of Water Quality and the U.S. Army Corps of Engineers to determine any additional permit requirements. Any such required permits, or a certification from the appropriate agency(s) that no additional permits are required, shall be obtained and copies provided to the Division of Coastal Management prior to the initiation of any development activities authorized by this permit.

History Note: Authority G.S. 113A-107; 113A-118.1;
Temporary Eff. June 15, 2004;
Eff. April 1, 2005.



North Carolina Department of Environment and Natural Resources
Division of Coastal Management

Beverly Eaves Perdue
Governor

James H. Gregson
Director

Dee Freeman
Secretary

April 20, 2011

MEMORANDUM

CRC-11-10

TO: Coastal Resources Commission

FROM: Jim Gregson

SUBJECT: Draft Amendments to **15A NCAC 07H .0312 TECHNICAL STANDARDS FOR BEACH FILL PROJECTS** (Sediment Criteria)

The Sediment Criteria for beach fill projects (15A NCAC 07H .0312) became effective on February 1, 2007. The rule was amended effective April 1, 2008 to change the requirements for seafloor surveys and geophysical imaging of the seafloor in areas with water depths of less than 10 feet due to the technical challenges and physical limitations at these shallow depths.

Based on recent meetings with representatives from Carteret County and the Wilmington / New Hanover Ports, Waterway and Beach Commission, staff is recommending additional amendments to this rule. These amendments would affect the characterization of borrow areas that are located within navigation channels or sediment basins located within the active nearshore or inlet shoal complex, as well as borrow areas that are located within offshore dredged material disposal sites. A brief summary of the proposed changes are as follows:

- For offshore dredged material disposal sites, only one set of imagery without elevation would be required. Line spacing for geophysical imaging would be reduced from 1,000 feet to 2,000 feet. Grid spacing for sediment sampling would be reduced from 1,000 feet to 2,000 feet. Characterization of material deposited after the initial characterization would not be required if the new material was removed from a maintained navigation channels or sediment deposition basin within the active nearshore, beach or inlet shoal system and if the original two sampling sets are found to be compatible with Section 3(a) of the rule, i.e., less than 10% fine grained material.
- Reduced sampling protocol for federal or state maintained navigation channels would be expanded to include all maintained navigation channels and sediment deposition basins that are located within the active nearshore, beach or inlet shoal system. In these areas only five (5) evenly spaced vertical samples or sample spacing of no more than 5,000 linear feet, per channel or sediment basin, whichever is greater, would be required. Swath sonar imaging of the seafloor without elevation or geophysical imaging of the subsurface would not be required. Characterization of the recipient beach would not be required. Carbonate analysis would not be required.
- For subsequent nourishment events, two consecutive sets of sampling (with at least one dredging event in-between) from navigation channels or sediment basins could be used for characterization of material if the original two sampling sets are found to be compatible with Section 3(a) of the rule, i.e., less than 10% fine grained material.

The proposed amendments are intended to reduce sampling costs in situations where past sampling and/or project history has shown that material from these areas has consistently been beach compatible material. Staff is recommending that the draft rule language be approved for public hearing. I look forward to discussing the proposed amendments at the May meeting.

15A NCAC 07H .0312 TECHNICAL STANDARDS FOR BEACH FILL PROJECTS

Emplacement of sediment along the oceanfront shoreline shall be referred to in this Rule as beach fill. Beach fill projects including beach nourishment, dredged material disposal, habitat restoration, storm protection, and erosion control may be permitted under the following conditions:

- (1) The applicant shall characterize the recipient beach according to the following methodology:
 - (a) Characterization of the recipient beach shall not be required for the placement of sediment directly from and completely confined to a ~~federally or state~~ maintained navigation channel or associated sediment basins within the active nearshore, beach or inlet shoal system;
 - (b) Sediment sampling and analysis shall be used to capture the three-dimensional spatial variability of the sediment characteristics including grain size, sorting and mineralogy within the natural system;
 - (c) Shore-perpendicular topographic and bathymetric surveying of the recipient beach shall be conducted to determine the beach profile. Topographic and bathymetric surveying shall occur along a minimum of five (5) shore-perpendicular transects evenly spaced throughout the entire project area. Each transect shall extend from the frontal dune crest seaward to a depth of 20 feet (6.1 meters) or to the shore-perpendicular distance 2,400 feet (732 meters) seaward of mean low water, whichever is in a more landward position. Transect spacing shall not exceed 5,000 feet (1,524 meters) in the shore-parallel direction. Elevation data for all transects shall be referenced to the North American Vertical Datum on 1988 (NAVD 88) and the North American Datum of 1983 (NAD 83);
 - (d) No less than 13 sediment samples shall be taken along each beach profile transect. At least one (1) sample shall be taken from each of the following morphodynamic zones where present: frontal dune, frontal dune toe, mid berm, mean high water (MHW), mid tide (MT), mean low water (MLW), trough, bar crest and at even depth increments from 6 feet (1.8 meters) to 20 feet (6.1 meters) or to a shore-perpendicular distance 2,400 feet (732 meters) seaward of mean low water, whichever is in a more landward position. The total number of samples taken landward of MLW shall equal the total number of samples taken seaward of MLW;
 - (e) For the purpose of this Rule, sediment grain size categories shall be defined as “fine” (less than 0.0625 millimeters), “sand” (greater than or equal to 0.0625 millimeters and less than 2 millimeters), “granular” (greater than or equal to 2 millimeters and less than 4.76 millimeters) and “gravel” (greater than or equal to 4.76 millimeters and less than 76 millimeters). Each sediment sample shall report percentage by weight of each of these four (4) grain size categories;
 - (f) A composite of the simple arithmetic mean for each of the four (4) grain size categories defined in Sub-Item (1)(e) of this Rule shall be calculated for each transect. A grand mean shall be established for each of the four (4) grain size categories by summing the mean for each transect and dividing by the total number of transects. The value that characterizes grain size values for the recipient beach shall be a grand mean of percentage by weight for each grain size category defined in Sub-Item (1)(e) of this Rule;
 - (g) Percentage by weight calcium carbonate shall be calculated from a composite of all sediment samples along each transect defined in Sub-Item (1)(d) of this Rule. The value that characterizes the carbonate content of the recipient beach shall be a grand mean calculated by summing the percentage by weight calcium carbonate for each transect and dividing by the total number of transects. For beaches on which fill activities have taken place prior to the effective date of this Rule, the Division of Coastal Management shall consider visual estimates of shell content as a proxy for carbonate weight percent;
 - (h) The total number of sediments and shell material greater than three (3) inches (76 millimeters) in diameter, observable on the surface of the beach between mean low water (MLW) and the frontal dune toe, shall be calculated for an area of 50,000 square feet (4,645 square meters) within the beach fill project boundaries. This area shall be considered a representative sample of the entire project area and referred to as the “background” value;
 - (i) Beaches that have received sediment prior to the effective date of this Rule shall be characterized in a way that is consistent with Sub-Items (1)(a) through (1)(h) of this Rule and shall use data collected from the recipient beach prior to the addition of beach fill. If such data were not collected or are unavailable, a dataset best reflecting the sediment

- characteristics of the recipient beach prior to beach fill shall be developed in coordination with the Division of Coastal Management and;
- (j) All data used to characterize the recipient beach shall be provided in digital and hardcopy format to the Division of Coastal Management upon request.
- (2) The applicant shall characterize the sediment to be placed on the recipient beach according to the following methodology:
- (a) The characterization of borrow areas including submarine sites, upland sites, and dredged material disposal area shall be designed to capture the three-dimensional spatial variability of the sediment characteristics including grain size, sorting and mineralogy within the natural system or dredged material disposal area;
- (b) The characterization of borrow sites shall include sediment characterization data provided by the Division of Coastal Management;
- (c) Seafloor surveys shall measure elevation and provide acoustic imagery of the seafloor. Measurement of seafloor elevation at each submarine borrow site shall provide 100 percent coverage and use survey-grade swath sonar in accordance with current US Army Corps of Engineers standards for navigation and dredging. Seafloor imaging without an elevation component shall also provide 100 percent US Army Corps of Engineers standards for navigation and dredging. Because shallow submarine areas can provide technical challenges and physical limitations for acoustic measurements, alternative elevation surveying methods for water depths less than 10 feet (3 meters) may be evaluated on a case-by-case basis by the Division of Coastal Management and seafloor imaging without an elevation component may not be required for water depths less than 10 feet (3 meters). Elevation data shall be tide- and motion-corrected and referenced to the North American Vertical Datum of 1988 (NAVD 88) and the North American Datum of 1983 (NAD 83). Seafloor imaging data without an elevation component shall be referenced to the NAD 83. All final seafloor survey data shall conform to standards for accuracy, quality control and quality assurance as set forth either by the US Army Corps of Engineers, the National Oceanic and Atmospheric Administration, or the International Hydrographic Organization. For offshore dredged material disposal sites, only one set of imagery without elevation shall be required. Sonar imaging of the seafloor without elevation shall not be required for borrow sites completely confined to maintained navigation channels, sediment deposition basins within the active nearshore, beach, or inlet shoal system;
- (d) Geophysical imaging of the seafloor subsurface shall be used to characterize each borrow site and shall use survey grids with a line spacing not to exceed 1,000 feet (305 meters). Offshore dredged material disposal sites shall use a survey grid not to exceed 2,000 feet (610 meters) and only one set of geophysical imaging of the seafloor subsurface shall be required. Survey grids shall incorporate at least one (1) tie point per survey line. Because shallow submarine areas can pose technical challenges and physical limitations for geophysical techniques, subsurface data may not be required in water depths less than 10 feet (3 meters). Subsurface geophysical imaging shall not be required for borrow sites completely confined to federally or state maintained navigation channels, sediment deposition basins within the active nearshore, beach, or inlet shoal system, or upland sites. All final subsurface geophysical data shall use accurate sediment velocity models for time-depth conversions and be referenced to the North American Datum of 1983 (NAD 83);
- (e) Sediment sampling of all borrow sites shall use a vertical sampling device no less than 3 inches (76 millimeters) in diameter. Characterization of each borrow site shall use no less than 10 evenly spaced cores or one (1) core per 23 acres (grid spacing of 1,000 feet or 305 meters), whichever is greater. Characterization of borrow sites completely confined to ~~federally or state~~ maintained navigation channels or sediment deposition basins within the active nearshore, beach or inlet shoal system shall use no less than five (5) evenly spaced vertical samples per channel or sediment basin, or sample spacing of no more than 5,000 linear feet (1,524 meters), whichever is greater. Two sets of sampling data (with at least one dredging event in-between) from maintained navigation channels or sediment deposition basins within the active nearshore, beach or inlet shoal system can be used to characterize material for subsequent nourishment events from those areas if the sampling results are found to be compatible with Section 3(a) of this rule. In

submarine borrow sites other than ~~federally or state~~ maintained navigation channels or associated sediment deposition basins within the active nearshore, beach or inlet shoal system where water depths are no greater than 10 feet (3 meters) geophysical data of and below the seafloor are not acquired, sediment sample spacing shall be no less than one (1) core per six (6) acres (grid spacing of 500 feet or 152 meters). Vertical sampling shall penetrate to a depth equal to or greater than permitted dredge or excavation depth or expected dredge or excavation depths for pending permit applications. All sediment samples shall be integrated with geophysical data to constrain the surficial, horizontal and vertical extent of lithologic units and determine excavation volumes of compatible sediment as defined in Item (3) of this Rule;

- (f) ~~For offshore dredged material disposal sites, the grid spacing shall not exceed 2,000 feet (610 meters). Characterization of material deposited at offshore dredged material disposal sites after the initial characterization will not be required if all of the material deposited complies with Section 3(a) of this rule as demonstrated by at least two sets of sampling data with at least one dredging event in-between.~~
 - (f)(g) Grain size distributions shall be reported for all sub-samples taken within each vertical sample for each of the four (4) grain size categories defined in Sub-Item (1)(e) of this Rule. Weighted averages for each core shall be calculated based on the total number of samples and the thickness of each sampled interval. A simple arithmetic mean of the weighted averages for each grain size category shall be calculated to represent the average grain size values for each borrow site. Vertical samples shall be geo-referenced and digitally imaged using scaled, color-calibrated photography; and
 - (g)(h) Percentage by weight of calcium carbonate shall be calculated from a composite sample of each core. A weighted average of calcium carbonate percentage by weight shall be calculated for each borrow site based on the composite sample thickness of each core. Carbonate analysis shall not be required for sediment confined to ~~federally or state~~ maintained navigation channels or associated sediment deposition basins within the active nearshore, beach or inlet shoal system ; and
 - (h)(i) All data used to characterize the borrow site shall be provided in digital and hardcopy format to the Division of Coastal Management upon request.
- (3) The Division of Coastal Management shall determine sediment compatibility according to the following criteria:
- (a) Sediment completely confined to the permitted dredge depth of a ~~federally or state~~ maintained navigation channel or associated sediment deposition basins within the active nearshore, beach or inlet shoal system shall be considered compatible if the average percentage by weight of fine-grained (less than 0.0625 millimeters) sediment is less than 10 percent;
 - (b) Sediment used solely to establish or strengthen dunes shall not be considered a beach fill project under this Rule;
 - (c) Sediment used solely to re-establish state-maintained transportation corridors across a barrier island breach in a disaster area as declared by the Governor shall not be considered a beach fill project under this Rule;
 - (d) The average percentage by weight of fine-grained sediment (less than 0.0625 millimeters) in each borrow site shall not exceed the average percentage by weight of fine-grained sediment of the recipient beach characterization plus five (5) percent;
 - (e) The average percentage by weight of granular sediment (greater than or equal to 2 millimeters and <less than 4.76 millimeters) in a borrow site shall not exceed the average percentage by weight of coarse-sand sediment of the recipient beach characterization plus five (5) percent;
 - (f) The average percentage by weight of gravel (greater than or equal to 4.76 millimeters) in a borrow site shall not exceed the average percentage by weight of gravel-sized sediment for the recipient beach characterization plus five (5) percent;
 - (g) The average percentage by weight of calcium carbonate in a borrow site shall not exceed the average percentage by weight of calcium carbonate of the recipient beach characterization plus 15 percent; and
 - (h) Techniques that take incompatible sediment within a borrow site or combination of sites and make it compatible with that of the recipient beach characterization shall be evaluated on a case-by-case basis by the Division of Coastal Management.

- (4) Excavation and placement of sediment shall conform to the following criteria:
- (a) Sediment excavation depth from a ~~federally or state~~ maintained navigation channel shall not exceed the permitted dredge depth of the channel;
 - (b) Sediment excavation depths for all borrow sites shall not exceed the maximum depth of recovered core at each coring location;
 - (c) In order to protect threatened and endangered species, and to minimize impacts to fish, shellfish and wildlife resources, no excavation or placement of sediment shall occur within the project area during times designated by the Division of Coastal Management in consultation with other State and Federal agencies, and;
 - (d) Sediment and shell material with a diameter greater than three (3) inches (76 millimeters) shall be considered incompatible if it has been placed on the beach during the beach fill project, is observed between mean low water (MLW) and the frontal dune toe, and is in excess of twice the background value of material of the same size along any 50,000-square-foot (4,645 square meter) section of beach.

*History Note: Authority G.S. 113 229; 113A-102(b)(1); 113-229; 113A-103(5)(a); 113A-107(a); 113A-113(b)(5) and (6); 113A-118; 113A-124;
Eff. February 1, 2007;
Amended Eff. April 1, 2008.*



North Carolina Department of Environment and Natural Resources
Division of Coastal Management

Beverly Eaves Perdue, Governor

James H. Gregson, Director

Dee Freeman, Secretary

April 18, 2011

MEMORANDUM

TO: Coastal Resources Commission

FROM: Mike Lopazanski

SUBJECT: Sandbag Stakeholder Meetings Report

At the July 2010 Commission meeting, the CRC directed the Division to engage stakeholders in an effort to discuss how sandbag structures were being managed, nuances of the temporary erosion control structure rules and to facilitate possible changes in the implementation of the Commission's sandbag policy. A total of four meetings were held (September 15, 2010; October 4, 2010; January 17, 2011 and February 23, 2011) which included representatives of the Commission, Advisory Council, local government, property owner representatives, and DCM staff.

Staff was asked to summarize these meetings as well as some of the suggestions for management of sandbags structures now in the future. Attached is a report for consideration by the Commission at the May 2011 meeting in Beaufort. I look forward to discussing the results of these meeting at our upcoming meeting.

**COASTAL RESOURCES COMMISSION
SANDBAG STAKEHOLDER MEETINGS
SUMMARY REPORT
APRIL 2011**

Background

Beginning in 2007, the Coastal Resources Commission and the Division of Coastal Management began to prepare for the approaching May 2008 deadline for when a large number of temporary erosion control structures (sandbags) that had been subject to numerous extensions would be required to be removed. While the Division moved forward with enforcement of the Commission rules on the use of temporary erosion control structures, Session Law 2009-479 established a moratorium on enforcement actions related to the time limits placed on sandbag structures until September of 2010. With the expiration of the moratorium, the Commission once again directed the Division at the Commission's July 2010 meeting to enforce the provisions of the sandbag rules.

Division staff was also requested to engage stakeholders in an effort to discuss how sandbag structures were being managed, nuances of the temporary erosion control structure rules and to facilitate possible changes in the implementation of the Commission's sandbag policy. A total of four meetings were held (September 15, 2010; October 4, 2010; January 17, 2011 and February 23, 2011) which included representatives of the Commission, Advisory Council, local government, property owner representatives, and DCM staff.

Over the course of these meetings, the evolution of the temporary erosion control structure rules was discussed as well as a focus on some of the specific issues related to the management of sandbag structures used as a temporary erosion control measure. These issues included the requirement for removal of sandbags prior to nourishment projects, the covered and vegetated requirements and the possible use of other criteria in the permitting and removal of sandbags such as beach elevation and shoreline recession.

Refinement of the issues led to discussions of FEMA and how insurance payouts related to the National Flood Insurance Program (NFIP) as well as building standards (piling depths) may be contributing to the problem. There was general agreement that while the focus has been on the sandbag structures protecting houses, it is the houses on the public beach that continues to be the core issue. Since the NFIP does not pay the insurance claim until there is a loss, there is no incentive for the property owner to remove the structure prior to that event. Adding to the problem is the fact many of the structures are held by out of state owners or are owned by LLCs. In most cases it is the local government's responsibility to pursue removal of structures once they are condemned and there is considerable difficulty in locating owners, or the structures are simply abandoned. There has been little financial help for local governments as the state is under no obligation to assist the local government with removal of the structures from the public beach.

The Town of Nags Head was cited in many examples of the issues facing local government. Mayor Oakes provide additional details on how condemnations were being handled in Nags

Head and how the Town would exchange civil penalty collection for the ability to take the house down, which is often less expensive than court costs associated with forcing a property owner to remove the structure.

Various methods of dealing with structures that are condemned frequently were considered such as piling depths, the use of sister pilings, permit conditions for removal and a repetitive loss trigger. The Town of Nags Head has adopted a new ordinance for condemned structures in which they are declared a nuisance once they encroach on the public trust beach. In this way, re-establishment of septic and utilities does not necessarily lift the designation and the need to remove the structure remains. However, the ordinance has not been fully tested in the courts.

Possible Solutions

Over the course of the stakeholder meetings, several suggestions were made as to how sandbags could be better managed and the issue of chronic erosion addressed. In addition to the more technical and specific aspects of sandbags structures (configuration and installation/removal criteria), there was discussion of local government management of sandbags. While local governments previously had authority to permit sandbags prior to 1996 under the local permitting program, the idea discussed involved allowing communities to be responsible for management of sandbags as a part of a locally implemented shoreline management plan. Specifically, sandbags would only be allowed if the community was pursuing a beach nourishment project and the authority would be under an “umbrella” permit to the local government similar to what done for beach bulldozing. The blanket authority would be extended to the local government once the shoreline management plan was approved by the CRC. The overall approach would be similar to the static line exception provisions connected with a long-term beach fill project. There would be no time limits associated with sandbag structures as they would be tied to an approved shoreline management plan. Once a beach fill project is approved, the sandbag structures would no longer be necessary and could be removed. Much of the discussion of this option centered on whether or not the same pitfalls that currently exist for the state regarding the removal of structures could be avoided by local governments.

Another suggestion utilizes an innovative strategy involving a conservation tax credit in exchange for advance agreement on the removal of a structure. The focus of this strategy is to plan ahead for the eventual removal of a structure once it is threatened by erosion, giving property owners an incentive to get out of harm’s way. In exchange for a tax credit toward the value of the property, the property owner would obtain insurance or a bond to assure the state that structure would be removed once it was threatened. Discussion of this option centered on how much of the value of the property would be allowed as a credit and the limitations of individuals capable of taking advantage of such a tax credit. Questions were also raised with regard implementing bond requirements and that the use of escrow accounts may be easier from an administrative standpoint.

There were also suggestions for dealing with existing sandbag structures. Under one scenario, sandbag structures would be allowed in limited circumstances where time is needed to remove a threatened structure or a where a permitted beach fill or inlet relocation project will

protect a threatened structure. Provisions were also suggested for limiting the size and number of bags to prevent the creation of “seawalls”, including authorization for removal of sandbags and restoration of the oceanfront lot, as well as daily financial penalties for leaving sandbags beyond their permitted time.

Other suggestions for management of existing sandbags structures included tying the continued use of sandbags to the viability of the structure being protected such as maintaining an occupancy permit; financial responsibility for sandbag structures incorporated into the deed; reconsideration of the dimensional requirements after installation (timeframe to address exceedance of permitted dimensions); requiring that property owners keep sandbags covered with sand; and allow sandbag installation contractors the ability to experiment with a variety of sandbag dimensions, methods of placement, and anchoring to secure alignments within permitted dimensions.

Finally, there was discussion of financial assistance that may be available to assist property owners and local governments with removal of structures. Initiatives such as the Upton-Jones Amendment to the Federal Flood Insurance Program were seen as an effective measure to remove structures from the beach before they are destroyed. The Texas Open Beaches Act was also mentioned as a successful program where there is a cash payment to the property owner for removal of structures from the beach. There were also questions raised about the possibility of using the Hazard Mitigation Program to assisting local government with the removal of structures. A presentation on the program at the February 2011 CRC provided additional information.

There are three possible programs that could address structures on the public beach associated with the Hazard Mitigation Program. These are the Flood Mitigation Assistance Program, the Repetitive Loss Program and the Severe Repetitive Loss Programs which are aimed specifically at reducing claims on the NFIP. The only eligible properties for these three programs are flood insured properties that have had two or more losses in previous rolling ten year periods. The Repetitive Flood Loss Program is an attempt to identify the worst of the worst repeat offenders in the NFIP. The other use of this program depends on identifying a local government that does not have the capacity to manage one of these projects on their own and have eligible properties within their jurisdiction. The Severe Repetitive Loss Program is aimed specifically at repetitive loss NFIP structures. These are properties that have had four or more claims in the previous ten year period or where the amount of the claim is approaching the value of the property. Traditionally the State of North Carolina has picked up the entire non-federal match in these projects. In an acquisition project, the local government has to agree to take title to the underlying property. The structure is removed and then the local government records a deed restriction holding the property as public open space in perpetuity. All these programs are voluntary on the part of the local government and the individual participants. During the presentation, the representative of the program indicated a willingness to work with local governments interested in submitting an application to FEMA for the removal of condemned structures.

Conclusions

While many of the issues were more thoroughly considered during the stakeholder meetings, no specific recommendations were being directed to the Commission. Possible solutions for the management of sandbags and the implementation of the temporary erosion control measure policy focused on funding, tax credits cash payments, private entities interested in salvaging condemned structures and possible help from the FEMA Hazard Mitigation Program. There was general agreement that the issue ultimately falls to the local government as has been seen in the Town of Nags Head. Interest was expressed by some in drafting rule language that would address the community management idea however; there was concern of a potential conflict with taking steps to change the rule while there were ongoing enforcement actions to remove sandbags. Since many of the properties subject to ongoing enforcement were unlikely to benefit from a potential rule change (due to their being on the beach), this may not be that much of a problem. The recommendation from the final stakeholder meeting was to summarize the discussion as well as the potential actions for further research and discussion by the CRC.



North Carolina Department of Environment and Natural Resources
Division of Coastal Management

Beverly Eaves Perdue, Governor

James H. Gregson, Director

Dee Freeman, Secretary

April 18, 2011

MEMORANDUM

TO: Coastal Resources Commission

FROM: Ken Richardson

SUBJECT: 2011 Draft Erosion Rates and Amendments to 15A NCAC 7H .0304(1)(a)

The Division of Coastal Management has completed the 2011 update of the long-term average annual erosion rates used in determining the ocean hazard setback factors initially established by the CRC under the Coastal Area Management Act (CAMA) in 1979. The long-term average annual erosion rates have been updated periodically since 1980, with the last update report completed in 2003. Setback factors are used to site oceanfront development and determine the extent of the Ocean Erodible Area of Environmental Concern (OEA), or the area where there is a substantial possibility of excessive shoreline erosion.

This update was completed using the end-point methodology. This technique of calculating shoreline change rates is consistent with earlier studies, and provides results that can be generally compared to those from previous studies. The end-point method uses the earliest and most current shoreline data points where they intersect at any given shore-perpendicular transect. The distance between the two shorelines (shore-transect intersect) is then divided by the time, or number of years, between the two shorelines. This information is then "smoothed and blocked" to determine the ocean hazard setback factor.

Attached is a copy of the "Methods Report" as well as a summary of the changes to erosion rates along the various barrier islands. The methodology was presented to the CRC's Science Panel on Coastal Hazards at their April 4th meeting in Raleigh. The Science Panel had questions regarding smoothing and blocking procedures, particularly in regard to which was the last transect used adjacent to inlets, as well as in the vicinity of "peaks" in the rates. There were also general suggestions for graphing areas where there are not two shorelines (closed inlet areas). The Science Panel questions and suggestions have been incorporated into the report to be considered at the May 5th meeting in Beaufort.

In order to facilitate CRC review of the draft rates, barrier island summaries are attached showing how the rates have changed since the last update as well as a characterization of trends associated with each island. Also attached is draft rule language containing the

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updated report reference for public hearing should the Commission approve the report and associated erosion rates. Staff is recommending that the proposed amendment be sent to public hearing. Erosion rate maps will be available for review at the upcoming meeting and I look forward to reviewing the methodology at our upcoming meeting.

DRAFT AMENDMENTS TO 15A NCAC 07H .0304 AECS WITHIN OCEAN HAZARD AREAS

15A NCAC 07H .0304 AECS WITHIN OCEAN HAZARD AREAS

The ocean hazard system of AECs contains all of the following areas:

- (1) Ocean Erodible Area. This is the area in which there exists a substantial possibility of excessive erosion and significant shoreline fluctuation. The seaward boundary of this area is the mean low water line. The landward extent of this area is determined as follows:
 - (a) a distance landward from the first line of stable natural vegetation to the recession line that would be established by multiplying the long-term annual erosion rate times 60, provided that, where there has been no long-term erosion or the rate is less than two feet per year, this distance shall be set at 120 feet landward from the first line of stable natural vegetation. For the purposes of this Rule, the erosion rates are the long-term average based on available historical data. The current long-term average erosion rate data for each segment of the North Carolina coast is depicted on maps entitled "Long Term Annual Shoreline Change Rates updated through 1998" "2011 Long-Term Average Annual Erosion Rate Update" and approved by the Coastal Resources Commission on January 29, 2004 May 5, 2011 (except as such rates may be varied in individual contested cases, declaratory or interpretive rulings). The maps are available without cost from any local permit officer or the Division of Coastal Management; and
 - (b) a distance landward from the recession line established in Sub-Item (1)(a) of this Rule to the recession line that would be generated by a storm having a one percent chance of being equaled or exceeded in any given year.
- (2) The High Hazard Flood Area. This is the area subject to high velocity waters (including hurricane wave wash) in a storm having a one percent chance of being equaled or exceeded in any given year, as identified as zone V1-30 on the flood insurance rate maps of the Federal Insurance Administration, U.S. Department of Housing and Urban Development.
- (3) Inlet Hazard Area. The inlet hazard areas are natural-hazard areas that are especially vulnerable to erosion, flooding and other adverse effects of sand, wind, and water because of their proximity to dynamic ocean inlets. This area shall extend landward from the normal low water line a distance sufficient to encompass that area within which the inlet shall, based on statistical analysis, migrate, and shall consider such factors as previous inlet territory, structurally weak areas near the inlet and external influences such as jetties and channelization. The areas identified as suggested Inlet Hazard Areas included in the report entitled INLET HAZARD AREAS, The Final Report and Recommendations to the Coastal Resources Commission, 1978, as amended in 1981, by Loie J. Priddy and Rick Carraway are incorporated by reference without future changes and are hereby designated as Inlet Hazard Areas except that the Cape Fear Inlet Hazard Area as shown on said map shall not extend northeast of the Baldhead Island marina entrance channel. These areas shall be extensions of the adjacent ocean erodible areas and the width of the inlet hazard area shall not be less than the width of the adjacent ocean erodible area. This report is available for inspection at the Department of Environment and Natural Resources, Division of Coastal Management, 400 Commerce Avenue, Morehead City, North Carolina. Photo copies are available at no charge.
- (4) Unvegetated Beach Area. Beach areas within the Ocean Hazard Area where no stable natural vegetation is present may be designated as an unvegetated beach area on either a permanent or temporary basis:
 - (a) An area appropriate for permanent designation as an unvegetated beach area is a dynamic area that is subject to rapid unpredictable landform change from wind and wave action. The areas in this category shall be designated following studies by the Coastal Resources Commission. These areas shall be designated on maps approved by the Commission and available without cost from any local permit officer or the Division of Coastal Management.
 - (b) An area that is suddenly unvegetated as a result of a hurricane or other major storm event may be designated as an unvegetated beach area for a specific period of time. At the expiration of the time specified by the Commission, the area shall return to its pre-storm designation. Areas appropriate for such designation are those in which vegetation has been lost over such a large land area that extrapolation of the vegetation line under the procedure set out in Rule .0305(a) of this Section is inappropriate.

The Commission designates as temporary unvegetated beach areas those oceanfront areas on Hatteras Island west of the new inlet breach in Dare County in which the vegetation line as shown on Dare County orthophotographs dated 4 February 2002 through 10 February 2002 was destroyed as a result of Hurricane Isabel on September 18, 2003 and the remnants of which were subsequently buried by the construction of

an emergency berm. This designation shall continue until such time as stable, natural vegetation has reestablished or until the area is permanently designated as an unvegetated beach area pursuant to Sub-Item 4(a) of this Rule.

History Note: Authority G.S. 113A-107; 113A-113; 113A-124;
Eff. September 9, 1977;
Amended Eff. December 1, 1993; November 1, 1988; September 1, 1986; December 1, 1985;
Temporary Amendment Eff. October 10, 1996;
Amended Eff. April 1, 1997;
Temporary Amendment Eff. October 10, 1996 Expired on July 29, 1997;
Temporary Amendment Eff. October 22, 1997;
Amended Eff. January 1, 2010, February 1, 2006; October 1, 2004; Amended Eff. April 1, 2004; August 1, 1998.



North Carolina Department of Environment and Natural Resources
Division of Coastal Management

Beverly Eaves Perdue, Governor

James H. Gregson, Director

Dee Freeman, Secretary

April 21, 2011

MEMORANDUM

TO: Coastal Resources Commission

FROM: Scott Kucera (DCM) and Casey Dziuba (Duke University)

SUBJECT: Education and Outreach Activities

Environmental education and outreach are vital for preparing North Carolina to cope with impending sea-level rise and the large number of risks it presents to the state's coastal communities. The Education Section of the NC Coastal Reserve will incorporate estuarine shoreline and sea-level rise content into existing programs and in the development of new activities. These interpretive programs will reach multiple target audiences: K-12 teachers and students, coastal decision-makers, and the general public.

In order to help with the goal of public education and outreach for coastal North Carolina, Duke University Master's student Casey Dziuba created educational materials for use by the Division of Coastal Management and other agencies. These materials consist of a sea-level rise education section of the Division of Coastal Management's website and an educational module on sea-level rise. These materials can be used to target different audiences for sea-level rise education. The website will serve as a good educational tool because it can reach a large number of people, displays a great deal of information, allows for the use of graphics and images that may aid in viewer comprehension and understanding, and can provide links that direct the reader to additional information on the subject from other sources. The module that was created provides more in-depth information on the science behind sea-level rise and includes hands-on activities to allow students to better grasp less tangible concepts about this long term, difficult to visualize process.



North Carolina Department of Environment and Natural Resources
Division of Coastal Management

Beverly Eaves Perdue, Governor

James H. Gregson, Director

Dee Freeman, Secretary

MEMORANDUM

CRC-11-14

To: The Coastal Resources Commission

From: Michael Christenbury, Wilmington District Planner

Date: April 20, 2011

Subject: Requested Certification of Amendment #1 of the 2007 Shallotte Core Land Use Plan

Staff Recommendation: Certification of the Shallotte Core LUP Amendment based on the determination that the amendment has met the substantive requirements outlined within the 2002 7B Land Use Plan Guidelines and that there are no conflicts evident with either state or federal law or the State's Coastal Management Program.

Overview:

The Town of Shallotte is located along US 17 in southwestern Brunswick County. This is the first (1st) amendment to the 2007 Shallotte Core Land Use Plan (LUP), certified by the Coastal Resources Commission (CRC) on September 28, 2007. The purpose of these changes is to ensure that the land use plan better reflects, and is more applicable to the changing and underlying conditions within the Town since the plan was adopted in August of 2007. Changes in the municipal limits, real estate market, and planning goals of the Town have prompted the Town to re-evaluate certain elements of the plan.

Specifically, the amendment involves two (2) components: (1) text amendments, which detail changes within the description of each Future Land Use Map Classification and supporting documentation; and (2) changes to the Future Land Use Map, which includes newly annexed areas within the Town and a greatly expanded planning boundary.

Component 1:

In July 2008, the Town of Shallotte adopted a Vision Plan for the Town. Within this Vision Plan, it is noted that the 2007 CAMA Land Use Plan did a poor job differentiating between various development characteristics and intensities, particularly with respect to commercial development. For this reason, the Vision Plan recommended changes to the descriptions of the Future Land Use Map Classifications. The Vision Plan also calls for a mixed-use pedestrian-friendly downtown district (noted as Vision Plan Overlay) that is not referenced within the Future Land Use Map Classifications nor illustrated on the Future Land Use Map. This amendment includes the Vision

Overlay (downtown district) within the Future Land Use Map Classification descriptions and illustrates this classification on the Future Land Use Map.

The Vision Plan also recommended changes to the town Zoning Ordinance, Zoning Map and Development Standards. The Town recognized that these changes should not occur until the Land Use Plan is amended first to reflect and drive the zoning and development standard changes. The Town placed a high priority that the zoning and development standard changes shall be based on a sound and up-to-date Land Use Plan and, therefore, should not begin until the 2007 Land Use Plan and Future Land Use Map are amended. *(See 'Exhibit A' for Text Amendments)*. Included in the text amendments are changes to Tables 44 and 45. All of the text amendments are in support of the map amendments discussed in Component 2 below.

Component 2:

Updating the Future Land Use Map was deemed a high priority by the Planning Board and Board of Aldermen at the start of 2010. Specifically, the Future Land Use Map amendment is an attempt to correct a few issues: (1) the Town's satellite annexations extended beyond the "Expanded Planning Boundary" of the 2007 Future Land Use Map and the Town desires to plan for the entire area that may be expected to be within the Town's limits over the next 25 years; (2) the 2007 Future Land Use Map was created from the zoning map, rather than vice versa, and was a better reflection of current conditions rather than a plan for the future; and (3) illustrating the Vision Plan's downtown district (noted as Vision Plan Overlay), which calls for a mixed-use pedestrian-friendly downtown area. Further, the map amendment illustrates all of Shallotte's newly annexed areas, as well as a greatly expanded planning boundary. *(See 'Exhibit A' for the newly amended Future Land Use Map, and see 'Exhibit B' for the original 2007 Future Land Use Map)*.

These amendments (text and map) help further the Town's vision and desire to plan for future development, and shall allow the Land Use Plan to help shape changes to the Town's zoning and development standards, which help implement the plan. These amendments shall also help the plan serve as the basis and guide for subsequent changes to the Town's development regulations, furthering the likelihood of the Town achieving its vision.

The Shallotte Board of Aldermen unanimously adopted the amendments by resolution following a public hearing that was held on January 11, 2011.

The Town of Shallotte reviewed the amendments and determined they are not in conflict with other policies or sections of the 2007 Shallotte Land Use Plan.

The public had the opportunity to provide written comments up to fifteen (15) business days (excluding holidays) prior to the CRC meeting. No comments have been received, written or otherwise as of the date of this memorandum.

To view the full 2007 Shallotte Core Land Use Plan, go to the following link and scroll down to Shallotte LUP:

http://www.nccoastalmanagement.net/Planning/under_review.htm

Exhibit A: Text Amendments and newly amended Future Land Use Map

Exhibit B: Original 2007 Future Land Use Map

E. FUTURE LAND USE

1. Introduction

The Future Land Use map (Map 19) depicts application of the policies for growth and development and the desired future patterns of land use and land development. Some areas are classified as low suitability areas. The intent is not to prohibit development in these areas but to indicate areas where careful review of proposed development should be undertaken. The future land use map must include the following:

- (1) Areas and locations planned for conservation or open space and a description of compatible land uses and activities.
- (2) Areas and locations planned for future growth and development with descriptions of the following characteristics:
 - » Predominant and supporting land uses that are encouraged in each area;
 - » Overall density and development intensity planned for each area; and
 - » Infrastructure required to support planned development in each area.
- (3) Land use which reflects existing and planned infrastructure.
- (4) The information depicted on the Environmental Composite Map (Map 9) and the Land Suitability Analysis (Map 17). On the Future Land Use Map there are some areas that are considered least suitable for development which have been assigned a Future Land Use category other than Conservation or Low Density Residential. In most of those cases, they are considered least suitable because of their locations in floodplain or wetland areas, or significant natural heritage areas. For those undeveloped parcels with wetlands coverage, the Town will make every effort to ensure that any development that occurs will be located outside of the wetland areas or that the negative impact to the environment is minimal, if any. For those undeveloped parcels with all or portions located within a floodplain, the Town will encourage the location of development on the portions of the property outside of the floodplain.

Map 19 - Future Land Use

2. Smart Development

The Town of Shallotte must continuously work at accomplishing plan implementation and maintaining an effective planning program. This may require a change in Shallotte's management of growth. In contemporary planning, the most discussed concept is "smart development." In reality, this concept is not a new idea. It is simply the blending of many existing ideas. Randall Arendt, considered an authority on smart development, believes that smart development adheres to six basic principles which are described as follows:

Principle 1 - Efficient Use of Land Resources: Smart development supports the preservation of land and natural resources. This is accomplished through compact building forms, in-fill development, and moderation in street and parking standards.

Principle 2 - Full Use of Urban Services: The same frugality of land development supports efficient use of public and private infrastructure. Smart development means creating neighborhoods where more people will use existing services like water lines and sewers, roads, emergency services, and schools.

Principle 3 - Mix of Uses: Smart development supports locating stores, offices, residences, schools, and recreation spaces within walking distance of each other in compact neighborhoods with pedestrian-oriented streets. This promotes:

- » Independence of movement, especially for the young and the elderly who can conveniently walk, cycle, or ride public transit;
- » Safety in commercial areas, through around-the-clock presence of people;
- » Reduction in auto use, especially for shorter trips;
- » Support for those who work at home, through nearby services and parks; and

- » A variety of housing choices, so that the young and old, singles and families, and those of varying economic ability may find places to live.

Principle 4 - Transportation Options: Transportation must be safe, convenient, and interesting. These performance factors affect sidewalk and street design, placement of parking, and location of building fronts, doors, and windows.

Principle 5 - Detailed, Human-Scale Design: Community acceptance of compact, mixed-use development requires compatibility between buildings to ensure privacy, safety, and visual coherency. Similar massing of buildings, orientation of buildings to the street, the presence of windows, doors, porches, and other architectural elements, and effective use of landscaping all contribute to successful compatibility between diverse building types. Human-scale design is also critical to the success of streets and paths as preferred routes for pedestrians, cyclists, and motorists alike. In general, smart street design considers the role of pedestrians along with that of vehicular traffic, emphasizing the quality of the walking environment.

Principle 6 - Implementation: The Town’s ability to adopt smart development principles will depend on the ability and willingness of developers to apply the principles. Frustrating, costly, and time-consuming delays due, in part, to inflexible standards, regulations, and processes will discourage innovative approaches to development and design. Providing for flexibility and certainty in the application of standards can help promote creative development that complies with the principles.

3. Future Land Use Acreages

Table 44 summarizes the Town’s future land use acreages. The future land use plan map depicts areas for development which are consistent with the land suitability analysis (Map 17, page 81). All future land use acreages are based on suitability of land for development and not forecast market demand for future acreages. It should be noted that the Town established an expanded planning boundary on the Future Land Use Map. The expanded planning boundary extends ~~approximately one half mile outside of~~ beyond the Town’s ETJ to include areas the Town may expect to annex over the long-range planning period. This area is to be used for future planning purposes only and is, therefore, not shown on the existing land use map or other maps throughout this plan. Carrying capacity forecasts are also not included for this area. The policies/implementing actions included in this plan should apply to the expanded planning boundary. The Town established the boundary to serve as a planning guide when considering contiguous or satellite annexations and any ETJ boundary extensions. Development within the expanded area may result in the need for revisions to the policies and implementing actions included in this plan and/or local regulatory documents.

Table 44. Town of Shallotte
Future Land Use Acreages

	Corporate Limits		Extraterritorial Jurisdiction		Total		Expanded Planning Boundary	
	Acres	%	Acres	%	Acres	%	Acres	%
Low-Density Residential	912.3	17.3%	270.0	8.2%	1,182.3	13.8%	9,959.2	52.3%
Medium-Density Residential	1,629.7	30.9%	1,745.7	53.3%	3,375.4	39.5%	3,737.2	19.6%
High-Density Residential	212.4	4.0%	48.0	1.5%	260.4	3.0%	260.4	1.4%
Light Commercial	102.1	1.9%	10.6	0.3%	112.7	1.3%	157.0	0.8%
Mixed Use	453.7	8.6%	336.3	10.3%	790.0	9.2%	820.8	4.3%
General Commercial	1,073.7	20.4%	434.6	13.3%	1,508.3	17.7%	1,990.7	10.5%
Industrial	749.2	14.2%	63.2	1.9%	812.4	9.5%	1,080.0	5.7%
Conservation	133.3	2.5%	366.6	11.2%	499.8	5.9%	1,026.6	5.4%
TOTAL	5,266.3	100.0%	3,275.0	100.0%	8,541.3	100.0%	19,031.8	100.0%

	Corporate Limits		Extraterritorial Jurisdiction		Total		Expanded Planning Boundary	
	Acres	%	Acres	%	Acres	%	Acres	%
Commercial	1,438.1	37.3%	830.8	21.5%	2,268.9	29.5%	321.8	5.5%
Conservation	56.4	1.5%	277.9	7.2%	334.3	4.3%	0	0.0%
Industrial	762.5	19.8%	63.2	1.6%	825.7	10.7%	126.8	2.1%
High-Density Residential	92.4	2.4%	3.1	0.1%	95.5	1.2%	88.6	1.5%
Medium-Density Residential	852.8	22.1%	830.8	21.5%	1,683.6	21.8%	4,540.6	77.0%
Low-Density Residential	473.4	12.3%	1,785.0	46.2%	2,258.4	29.2%	819.7	13.9%
Mixed-Use	116.0	3.0%	35.5	0.9%	151.5	2.0%	0	0.0%
O&I	64.2	1.7%	39.7	1.0%	103.9	1.3%	0	0.0%
TOTAL	3,855.8	100.0%	3,866.0	100.0%	7,721.8	100.0%	5,897.5	100.0%

*The acreages in this table assume total build-out of the attached future land use map.
Source: Holland Consulting Planners, Inc., Town of Shallotte

All future land use acreages are based on suitability of land for development and not forecast market demand for future acreages. The land uses in each of these areas have been coordinated with the Town's UDO zoning classifications. The zoning classifications specify allowable uses for each land use category. Refer to the UDO's Table of Permitted Uses for a specific listing of allowable uses in each district. A complete list of the land use categories utilized on the future land use map, the zoning classifications that should be included in each category, and the assumed development patterns that are to occur in Shallotte are provided in Section VI.E.4. These categories are intrinsically tied to the policy section of the plan.

4. Locational Aspects of Land Use

The purpose of this section is to describe the reasoning behind the location of land uses as shown on the future land use map. It should be noted that the land use plan depicts a desired or optimum pattern of land uses. For land areas that are already developed, the desired land use may not be consistent with the existing land use. In cases where the planning process resulted in a recommended land use that deviated from the existing land use, preferred land use is indicated. The following provides an example of a case in which an existing land use would not be indicated on the map: For example, an industrial property industry might that was located in an rural area that was considered "rural" ten years ago. As the years go by, development occurs, urban areas of the city expand, and eventually the industry but that now finds itself in an recently urbanized setting surrounded by residential development. This situation has resulted in a conflicting land use. In this case the existing land use of the industrial property is industrial but might be shown classified on the future land use map as Office/Institutional, a more suitable and compatible use for classification adjacent to a residential area.

Generally, the future land use map was drafted with consideration given to key land use issues (identified in Section 4A on page 6); development constraints, existing zoning patterns, and citizen input. It should be stressed that while the future land use map indicates a desired pattern for future land use, the zoning of a property ultimately regulates the permitted uses. However, zoning changes require a statement of land use plan consistency and, therefore, it is not being suggested that the land uses portrayed cannot be deviated from. However, it is recommended that as the need for changes in the land use map becomes apparent, it should that the map be revised and approved by the Board of Aldermen. A general description of land use by type follows. NOTE: There are no impervious surface maximum percentages. However, for all developments, stormwater runoff must be controlled so that there is no more than a 5% net increase in the peak discharge from the predevelopment conditions for the 10-year, 24-hour storm.

a. Conservation & Recreation

The Conservation & Recreation designation is primarily located as a buffer in areas where there is a potential for flooding and in areas where there is a potential land use conflict. The designation is intended to protect floodplain and estuarine areas as well as residential areas. This designation primarily occurs along the Shallotte River, but can be found in other environmentally sensitive areas and along the perimeters of industrial land uses. In addition, the designation is intended to identify recreational.

historical, and cultural open spaces targeted for permanent preservation. Appropriate uses include parks, cemeteries, and nature centers. Residential, commercial, and industrial development are not appropriate.

Corresponding zoning district: C

Appropriate uses: passive recreation areas

Inappropriate uses: residential, commercial, and industrial development

Allowable density: N/A – There are to be no permanent public or private structures

Maximum height: 40 feet

Minimum lot size: None

b. General Commercial

Commercial land uses in Shallotte's planning jurisdiction are currently concentrated along Main Street. Future commercial development is intended to be located along major thoroughfares such as Main Street, US Highway 17 Bypass, Whiteville Road, Smith Avenue, and areas along Holden Beach Road near its intersection with Main Street. Appropriate uses include a variety of high intensity commercial, office, and institutional establishments such as grocery stores, big box retail, pharmacies, movie theaters, car dealers, restaurants, shopping malls, lifestyle centers, office parks, builders supply stores, high schools, and large religious and civic assembly places. Lower intensity commercial uses such as small offices and boutiques are also appropriate, as are appropriately sited high-density residences in limited circumstances. Manufacturing operations, detached single-family residences, and residential subdivisions are not appropriate.

Corresponding zoning district: CB, HB, CW, B-2

Appropriate uses: a variety of high intensity retail and wholesale establishments such as grocery stores and builders supply as well as lower intensity commercial uses such as offices and boutiques

Inappropriate uses: manufacturing operations

Allowable densities: CB – 8 units/acre, HB – 4 units/acre, CW – 2 units/acre, B-2 – 2 units/acre

Maximum height: 40 feet

Minimum lot size: CB – 5,000 s.f., HB – 10,000 s.f., CW – 20,000 s.f., B-2 – 20,000 s.f.

c. Light Commercial/Office/Institutional

Future light commercial office and institutional land uses are located as a buffer between higher intensity general commercial uses and adjacent residential development behind the commercial land use designation, primarily on south Main Street and as buffers along Village and Bridger Roads and White Street. In addition, light commercial provides the opportunity for neighborhood-scale commercial and office uses at the intersection of several major secondary roads in primarily residential areas. Appropriate uses include neighborhood-scale retail and service establishments and professional and government offices, religious and educational institutions, and appropriately designed high-density residences. Large-scale or intense commercial establishments and industrial operations are not appropriate. Buildings are generally limited to 5,000 square feet in size or smaller.

Corresponding zoning district: O&I

Appropriate uses: single family dwellings and professional and government offices

Inappropriate uses: commercial establishments and industrial operations

Allowable density: 4 units/acre

Maximum height: 40 feet

Minimum lot size: 10,000 s.f.

d. Residential

Residential land uses are have been divided into three separate land use categories based on density: associated variable residential densities. These categories include high, medium, and low density

residential. ~~The location of r~~Residential land uses are generally located based on a density gradient, with higher density development focused toward the core of the municipal limits and adjacent to areas planned for higher intensity commercial uses and near primary roadways, and with lower density residential development occupying areas toward the fringe of the planning boundary in more rural settings. ~~by density was based on existing residential development patterns and constraints to development (i.e. floodplains and wetlands).~~

- (1) High Density Residential. High density residential land uses are generally located behind or adjacent to areas planned for commercial development in an effort to advance the smart growth goals articulated in this plan. Appropriate uses include multi-family residences such as apartments and condominiums, attached single-family residences such as townhouses, row houses, and duplexes, and small-lot single-family residences. Limited, small-scale retail and service uses that are well-integrated into the development pattern and designed to serve only the immediate community may be appropriate w properly designed. Target densities are between eight (8) and fourteen (14) dwelling units per acre. High density residential development is encouraged to adopt a pedestrian-friendly urban development pattern with buildings fronting interconnected public streets with sidewalks and with stormwater infrastructure and parking located behind buildings. Campus-style suburban development patterns, with buildings fronting parking lots, private driveways, and private common open space, are discouraged. In general, commercial, office, and industrial uses are inappropriate.

Corresponding zoning districts: R-7 and RM-10

Appropriate uses: single and multi-family residential uses

Inappropriate uses: commercial and industrial

Allowable densities: R-7 – 6 units/acre, RM-10 – 4 units/acre

Maximum height: 40 feet

Minimum lot size: R-7 – 7,000 s.f. for first dwelling; 3,000 for each additional dwelling unit RM-10 – 10,000 s.f. for first dwelling; 3,000 for each additional dwelling unit.

- (2) Medium Density Residential. Medium density residential land uses are generally located within the extraterritorial planning jurisdiction (ETJ) boundary and are, for the most part, existing residential subdivisions and nearby vacant properties not designated for commercial use. Appropriate uses include single-family residences and subdivisions, duplexes, community recreation and open space uses like golf courses and pools, and neighborhood-scale institutional uses such as religious and civic organizations. Planned communities may also include well-integrated multi-family and single-family attached residences and limited neighborhood-scale commercial and office uses. Industrial and manufacturing uses, as well as commercial and office uses not located within a planned community are inappropriate. Large institutional uses, such as high schools, community colleges, and mega-churches are also generally inappropriate. Target densities are between four (4) and six (6) dwelling units per acre.

Corresponding zoning districts: R-10, RAM-15, PUD, and PRD (Overlay)

Appropriate uses: single-family residences, manufactured homes, Planned Unit

Developments, and Planned Residential Developments – Please note that not every use listed above is permitted in all districts.

Inappropriate uses: commercial uses outside of a PUD or PRD, and industrial operations

Allowable densities: R-10 – 4 units/acre, RAM-15 – 2.9 to 4 units/acre, PUD – 6 units/acre, PRD – Cannot exceed the density of the underlying zoning district

Maximum height: 40 feet

Minimum lot size: R-10 – 10,000 s.f., RAM-15 – 15,000 without public water/sewer; 10,000 with public water/sewer, PUD – 25 acres, PRD – 10 acres

- (3) Low Density Residential. Low density residential land uses are located at the fringe of the planning boundary, generally beyond the existing Town ETJ and in areas without direct access to primary roads. These areas are typically rural in nature with an existing low density residential development pattern. Water and sewer services are often not available in these areas. Appropriate uses include single-family residences, manufactured homes, agriculture and forestry activities, and neighborhood-scale institutional facilities. Commercial and industrial uses are

generally inappropriate in these areas, as are large institutions and other significant traffic generators. Target densities are between zero (0) and three (3) dwelling units per acre.

Corresponding zoning district: R-15, RA-15, PUD, and PRD

Appropriate uses: single family residences and parks

Inappropriate uses: commercial uses outside of a PUD or PRD, and industrial operations

Allowable densities: R-15—2.9 units/acre, RA-15—2.9 to 4 units/acre, PUD—6 units/acre, PRD—

Cannot exceed the density of the underlying zoning district

Maximum height: 40 feet

Minimum lot size: R-15—15,000 s.f., RA-15—15,000 without public water/sewer; 10,000 with public water/sewer, PUD—25 acres, PRD—10 acres

e. Industrial

Existing industrial areas are located in the north and northwest portions of the Town. Future industrial development should occur along Whiteville Road in the ~~plus one mile area of the Future Land Use Map~~ expanded planning area. Future industrial land uses have been ~~located~~ designated in this area in an effort to concentrate new uses near existing industrial land uses. Industrial land uses that are adjacent to residential land uses ~~have been~~ should be significantly buffered with open space land uses. Buffering ~~should be provided~~ to help prevent land use conflicts between industrial development and neighboring land uses. The width of the buffer should be based on the type of industry and its potential to create compatibility problems. It is not the Town's intention to acquire land to be utilized as buffer areas, but rather to encourage industries to incorporate adequate buffers into their development plans. Appropriate uses include manufacturing, warehousing and wholesaling, transportation and distribution centers, water and wastewater treatment facilities, landfills, bulk storage of hazardous materials, large equipment storage and operation, and other uses that may be unpopular neighbors such as adult businesses and telecommunication towers. Residential development and general retail uses are typically not appropriate.

Corresponding zoning districts: HI and LI

Appropriate uses: a variety of commercial and industrial uses—Please note that not every use listed in one district is permitted in the other district.

Inappropriate uses: residential development

Allowable density: 1 unit/acre

Maximum height: 40 feet

Minimum lot size: HI—50,000 s.f., LI—1 acre

f. Mixed Use

The Town of Shallotte recognizes the positive impact that Smart Development practices could have in an area. One of the implementing actions in the policy section (Land Use Compatibility - Residential) is to revise the UDO to include definitions and regulations for a Mixed Use zoning district. Therefore, the Town added a Mixed Use land use designation to the Future Land Use Map to designate areas where a mixture of integrated commercial, office, institutional, and residential uses are desired. The designation will provide the Town with guidance for locating the district when it is eventually created and for appropriate siting of suitable mixed use projects. The Mixed Use land use classification is not intended to be solely reserved for mixed use developments. Single use developments that contribute toward an integrated land use pattern of appropriate commercial, office, institutional, and medium and high density residential uses are encouraged. Developments located in areas designated as Mixed Use are intended to be designed to create a pedestrian-friendly environment, with an urban development pattern where buildings front interconnected public streets with sidewalks and with stormwater infrastructure and parking located behind buildings. Urban design is a primary consideration in Mixed Use areas and a wide variety of uses is appropriate as long as a development pattern is employed that fully incorporates the Smart Development principles identified earlier in this section.

g. Least Suitable Land Overlay

The Future Land Use Map (Map 19, page 134) includes a least suitable Land Overlay. These areas parallel the areas that are least suitable as identified during the land suitability analysis (Map 17, page 81). Development of any areas located within the overlay should be sensitive to protection of the

environmentally sensitive areas. Development proposals should be reviewed on a case by case basis for the needs of the particular area and development plans should be designed to cluster land-disturbing activities in such a way as to avoid the disturbance of sensitive areas.

h. Vision Plan Overlay

On September 2, 2008, the Town of Shallotte Board of Aldermen adopted the Shallotte Vision Plan, which is incorporated herein by reference. The character of development in the Vision Plan area is expected to adhere to the goals, policies, and principles identified in the plan and to further the community-supported vision of a pedestrian-friendly downtown environment.

h. Land Use Compatibility Matrix

Each of the land use categories is supported by zoning districts contained in the Town's existing Unified Development Ordinance. Table 45 provides a comparison of the land use categories and the Town's existing zoning districts. The reader is cautioned that this is an "overview" and detailed analysis must be based on careful review of the Town's Unified Development Ordinance.

Table 45. Future Land Use Plan Compatibility Matrix
 Consistency Review of Future Land Use Map Designations and Existing Zoning Districts

Zoning Districts	MF-14	MF-10	MF-6	R-7	R-10	RM-10	R-15	RA-15	RAM-15	PUD	CB	HB	CW	B-2	O&I	LI	HI	C	PRD
Min. Lot Size (SF)	Note 4 2 ac	Note 4 2 ac	Note 4 2 ac	Note 1	10,000	Note 2 10,000	15,000	Note 3 15,000	Note 3 15,000	25 ac.	5,000	10,000	20,000	20,000	10,000	1 ac.	50,000	None	10 ac.
Max. Bldg. Height (ft.)	40	40	40	40	40	40	40	40	40	40	40, 60	40	40	40	40	40	40	40	40
Designations/Average Density (du per acre)																			
General Commercial/4NA	X C	X	X	X	X	X	X	X	X	C	G	G	G	G	C	C	C X	X C	C
Light Commercial/O&I/4NA	X C	X C	X C	X	X	X	X	X	X	C	G	G	G	G	G	C	C X	X C	C
Industrial/1NA	X	X	X	X	X	X	X	X	X	X	X	X C	X	X	X	G	G	X C	X
Mixed Use/7	C	C	C	C	C X	C X	X	X	X	G	G	G	G	C	C	X	X	X C	G
High Density Residential/6.8	G	G	X C	C	C X	C	X	X	X	C	C	C	C	C	C	X	X	X C	C
Med. Density Residential/4	X	C X	C	X	G	X G	X C	X	C X	G	X	X	X	X	C	X	X	X C	G
Low Density Residential/3	X	X	X	X	X C	X C	G	G	X G	C	X	X	X	X	C	X	X	X C	C
Conservation/NA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	G	X

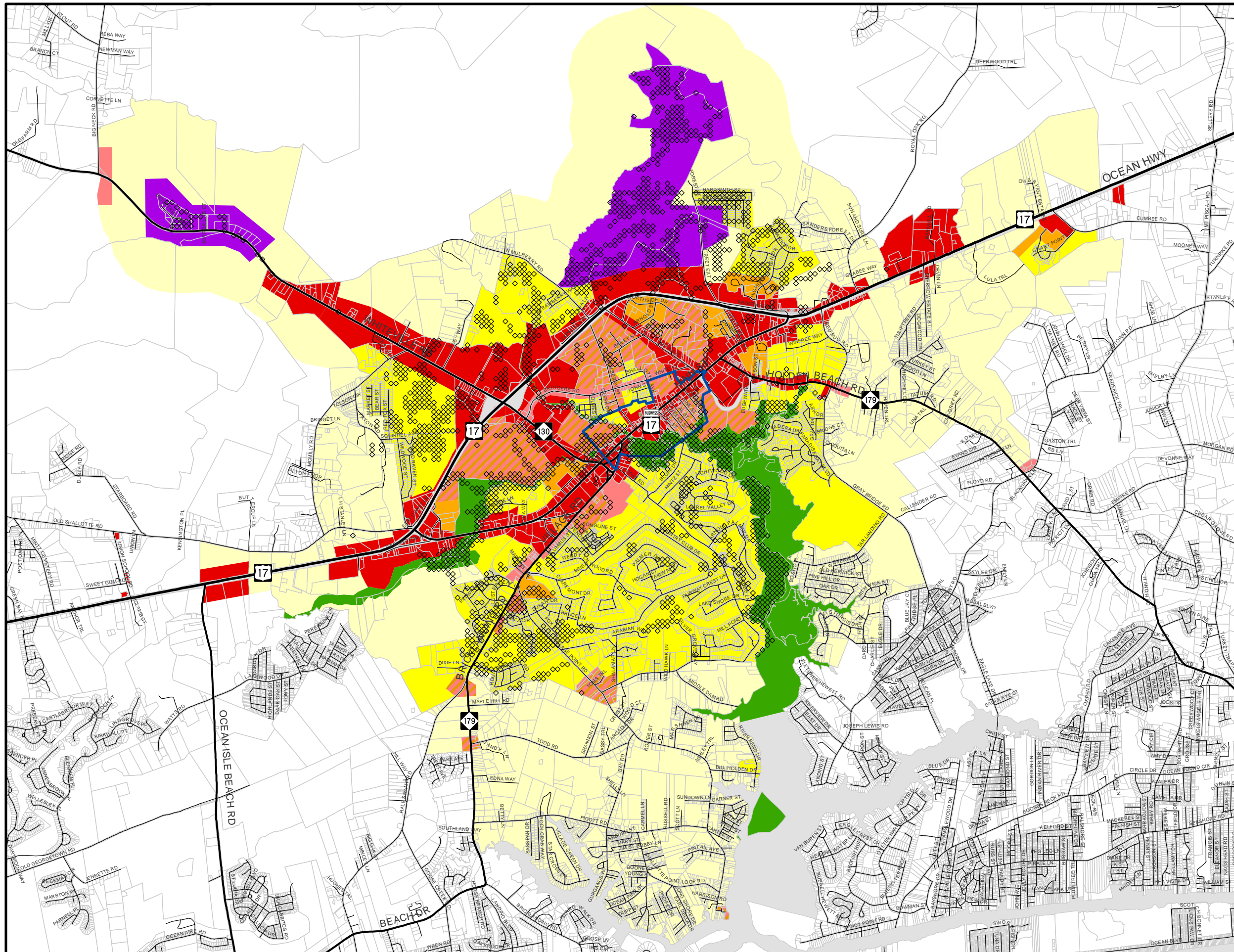
G = generally consistent; C = conditionally consistent; X = inconsistent

Note 1: 7,000 s.f. for first dwelling; 3,000 s.f. for each additional dwelling.

Note 2: 10,000 s.f. for first dwelling; 3,000 s.f. for each additional dwelling unit.

Note 3: 15,000 s.f. without public water/sewer, 10,000 s.f. with public water/sewer.

Note 4: 2.0 acres minimum/ duplex – 10,000 s.f. per individual unit.



Town of Shallotte North Carolina



Future Land Use Map

Legend

Future Land Use

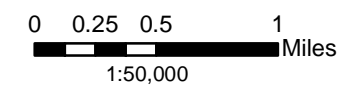
- Low-Density Residential
- Medium-Density Residential
- High-Density Residential
- Mixed Use
- General Commercial
- Light Commercial
- Industrial
- Conservation
- Vision Plan Overlay
- Least Suitable Land Overlay

DRAFT

Mayor's Signature _____ Date _____

Clerk's Signature _____ Date _____

TOWN SEAL








Data Sources: Brunswick County GIS, Town of Shallotte, Holland Consulting Planners. Created by Town of Shallotte Planning & Zoning Department, 11/4/2010.

Town of Shallotte Land Use Plan









Future Land Use

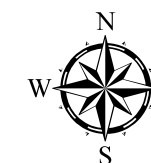
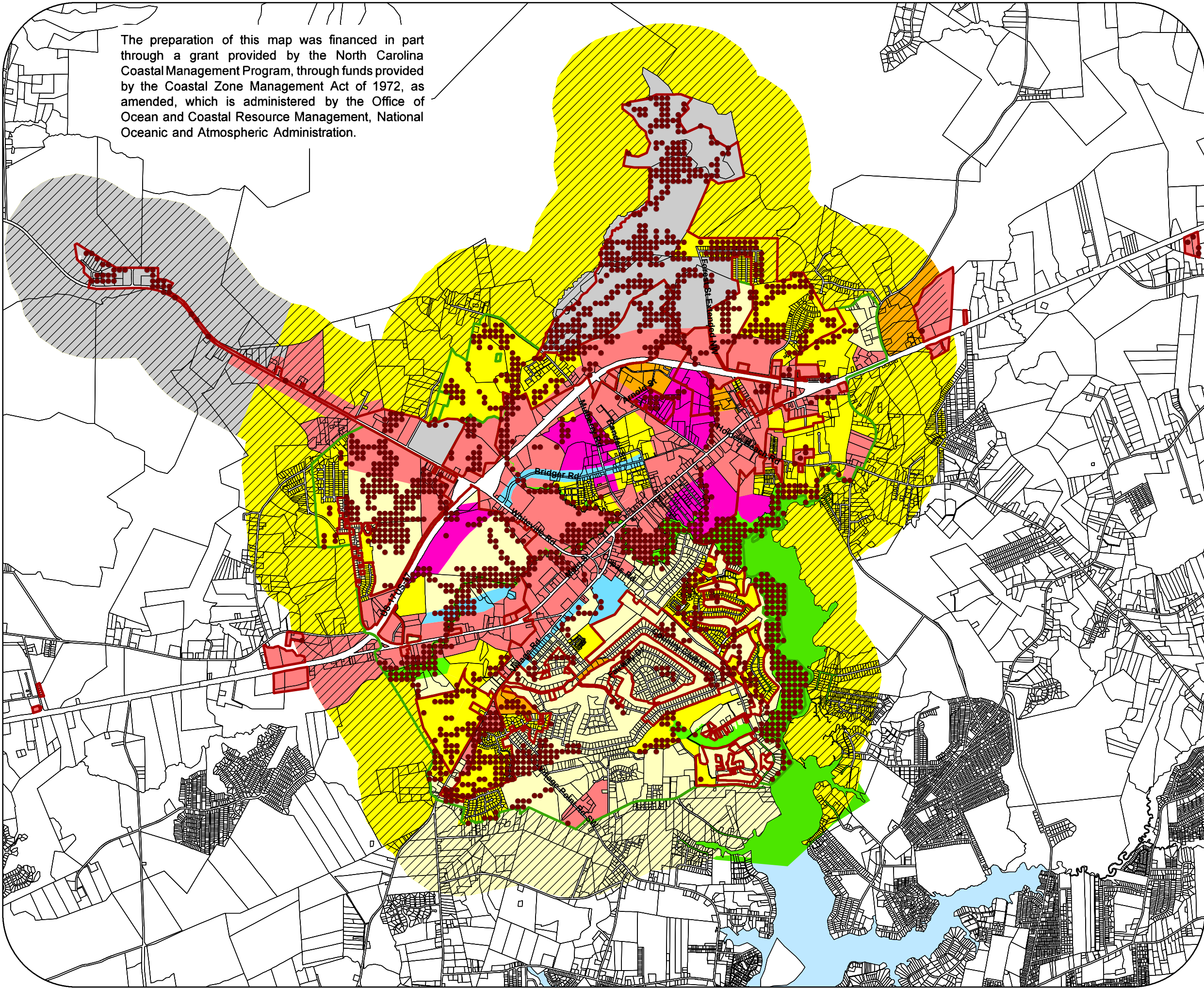
The preparation of this map was financed in part through a grant provided by the North Carolina Coastal Management Program, through funds provided by the Coastal Zone Management Act of 1972, as amended, which is administered by the Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration.

Legend

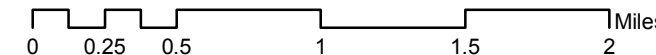
-  Corporate Limits
-  ETJ
-  Expanded Planning Boundary
-  Hydrology
-  Least Suitable Land

Future Land Use

-  Commercial
-  Conservation
-  HDR
-  Industrial
-  LDR
-  MDR
-  Mixed Use
-  O&I



HCP
Holland Consulting Planners, Inc.





North Carolina Department of Environment and Natural Resources
Division of Coastal Management

Beverly Eaves Perdue, Governor

James H. Gregson, Director

Dee Freeman, Secretary

April 21, 2011

MEMORANDUM

TO: CRC & Interested Parties
FROM: Tancred Miller
SUBJECT: Rulemaking Update

Along with this memo is a spreadsheet that contains all of the Commission's rules that are currently in the rulemaking process—from those being proposed for initial action to those reviewed by the N.C. Rules Review Commission (RRC) since the last CRC meeting. Listed below is a description and recent history of the CRC's action on each rule. Complete drafts of rules scheduled for public hearing at this meeting will be available on the DCM website.

RULE DESCRIPTIONS

1. 15A NCAC 7H.0304 AECs Within Ocean Hazard Areas
Status: Additional changes being requested for public hearing.
The original amendments will change the formula used to calculate the Ocean Erodible AEC to make it consistent with the CRC's new oceanfront setbacks, and remove the "unvegetated beach" designation for Hatteras Island that was adopted in 2004. Additional changes will be requested in May to update long-term annual erosion rates for the oceanfront.
2. 15A NCAC 7H.0310 Use Standards for Inlet Hazard Areas
Status: On hold.
The CRC directed staff to put further rule development on hold until after the oceanfront erosion rate update is complete.
3. 15A NCAC 7H.0312 Technical Standards for Beach Fill Projects
Status: Recommended for public hearing
Staff will recommend changes to certain sampling requirements be sent to public hearing.
4. 15A NCAC 7H.0214 Installation and Maintenance of Regulatory Signs Exempted
Status: Approved for public hearing.
The proposed amendment would exempt certain regulatory signs from permitting requirements.
5. 15A NCAC 7M.1300
Status: In discussion/development.
A draft policy on sea-level rise is under development and will be on the Commission's February 2011 agenda as a discussion item. Staff is continuing to present the draft to local governments and soliciting their feedback.

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COASTAL RESOURCES COMMISSION RULEMAKING STATUS - MAY 2011

Item #	Rule Citation	Rule Title	May '11 Status	May Action Required?	Next Steps
1	15A NCAC 7H.0304	AECs Within Ocean Hazard Areas	Going to public hearing	Yes	Public hearings being scheduled. Additional changes being requested in May for erosion
2	15A NCAC 7H.0310	Use Standards for Inlet Hazard Areas	On hold	No	On hold until oceanfront erosion rates update is completed.
3	15A NCAC 7H.0312	Technical Standards for Beach Fill Projects	Up for discussion	Yes	Staff will request that amendments to sampling requirements be sent to public hearing.
4	15A NCAC 7K.0214	Installation & Maintenance of Regulatory Signs Exempted	Approved for public hearing	No	Public hearing to be scheduled.
5	15A NCAC 7M.1300	Sea-Level Rise Policy	In discussion	Discussion item	Review local government input received to date, consider revisions, continue local government meetings.