



Agenda Item Summary Sheet

Item No. 7
Meeting Date: 7/17/06

Item Title: UPDATE ON THE RE-USE OF THE BUXTON COAST GUARD BASE

Item Summary:

The USCG Group Cape Hatteras Base has been closed down and that facility and its associated housing have been under consideration for transfer to Dare County for some time. The decision to accept or refuse the facility is linked to the long-term sustainability of the wastewater treatment plant for the facility, which is located near the oceanfront and is threatened by erosion. The entire facility, including the wastewater treatment plant could have considerable re-use potential if a system of three shoreline stabilization groins located seaward of the facility can be repaired. The protective groins were installed by U.S. Navy in the 1970's prior to the base having been transferred to the USCG and have fallen into disrepair due primarily to a lack of maintenance.

(Use additional Paper if necessary)

Number of Attachments: _____

Will your presentation require audiovisual equipment? Yes No

Note: All audiovisual materials must be submitted in digital format to the Clerk of the Dare County Board of Commissioners with this sheet. Acceptable formats include: VHS, DVD, audio CD, Word document, Adobe Acrobat PDF files, PowerPoint files and jpeg files.

Specific Action Requested:

Consideration of alternatives and guidance to staff on selected alternative.

Submitted By: Ray Sturza, Planning Director  Date: 7/5/06

Dept. Head

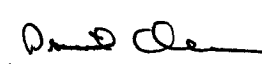
Comments:

Signature

Date:

Finance

Comments:

Signature 

Date: 7/10/06

County Attorney


Comments:

Signature

Date:

County Manager

Approval:

Signature 

Date: 7/11/06

Commission Action:

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Update on the reuse of the Buxton
Coast Guard Base
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In an effort to evaluate the plausibility of repairing the groins, the County contracted with the engineering firm Moffat and Nichols. A copy of their report on the groins is attached. Since federal funds to continue to maintain the USCG facility in Buxton will either expire or be re-programmed in the near future, the County must soon decide if it wishes to assume responsibility for the former USCG facility, including an obligation to return the facility to a natural state once it is no longer in use by the County at which time it reverts to the National Park Service.

Staff has prepared a number of alternatives for the Board's consideration at the July 17th meeting and guidance from the Board will be necessary if we are to proceed since the two federal agencies (USCG and NPS) are both nearing the point where they will run out of time and be forced to return the facility to a natural state. The protective groins were installed by U.S. Navy in the 1970's prior to the base having been transferred to the USCG and have fallen into disrepair due primarily to a lack of maintenance.

**BUXON COAST GUARD BASE
RE-USE ALTERNATIVES**

ALTERNATIVE 1: NO ACTION. If a majority of the Board feels Dare County should **not** accept the facility or any portion of the facility, guidance to the staff would be to disengage in negotiations and allow the federal agencies to proceed to dismantle the facility and return the former base and housing site to a natural state.

ALTERNATIVE 2: GROIN REPAIR. If a majority of the Board feels Dare County should investigate repair permits for the existing groins, guidance to the staff would be to seek permit authorization to repair the groins, to include appealing for action by the N.C. Coastal Resources Commission should the staff at the Division of Coastal Management determine a repair permit is inconsistent with the Coastal Area Management Act. Guidance by the Board to proceed with ALTERNATIVE 2 would include the assumption that the Board seeks to **accept** the facility, designated portions of the facility, and the housing as County owned or leased property **only if groin repair permits can be secured.**

ALTERNATIVE 3: WASTEWATER PLANT RELOCATION OR NEW CONSTRUCTION: Another alternative for the Board to consider is the relocation of the existing wastewater treatment plant to a less vulnerable location on the grounds of the facility or the construction of a new wastewater treatment facility capable of serving the portions of the facility identified for re-use by Dare County, including the housing. This alternative will address the wastewater issue, but will not reduce the vulnerability of the facility and its access road to the erosion problem if the groins are not repaired. Should a majority of Board favor this alternative, guidance to the staff would be to secure a cost estimate and permit analysis for the relocation of the existing wastewater plant or the demolition of the existing plant and the construction of a new plant. ALTERNATIVE 3 would include the assumption that the Board seeks to **accept** the facility, designated portions of the facility, and the housing as County owned or leased property **only if wastewater plant relocation or reconstruction permits can be obtained.**

EXECUTIVE SUMMARY

This report is provided as authorized on November 29, 2005 by the County of Dare, North Carolina. The services associated with the performance of this project included an underwater and above water investigation of the three groins, drawing research and review of the groin construction history, a wave loading analysis of the groins, structural analyses of a precast sheet pile alternative and a steel sheet pile alternative, an opinion of probable costs on the recommended alternative, and the research of permitting issues with NC Division of Coastal Management (CAMA).

Due to the beach erosion near the original location of the Cape Hatteras Light House, three groins were constructed in 1969. The 1969 construction of the three precast sheet pile groins are shown in plan on Figure 2.1. Figure 2.2 shows the original conceptual construction. Groin 1 is the northern most groin, and it was approximately 530 feet long. Groin 2 was the middle groin and it was approximately 530 feet long. Groin 3 was the southern most groin, and the closet to the original light house location. Groin 3 was 610 feet long. Storms between 1969 and 1975 destroyed portions of these original groins.

In 1975 steel sheet piles were installed. The sheet piles appeared to be PZ-27 piles based on the field dimensions that were taken during this inspection. Groin 1 had approximately 250 feet of sheet piles replaced and Groin 3 had 140 feet replaced. Groin 2 did not have any repairs performed in 1975. Figures 2.3 and 2.4 show conceptually the construction that was performed in 1975.

In 1980 and 1981, Groin 3 had approximately 300 feet installed mostly near the inboard end of the original construction. These sheets ran approximately at a 30 degree angle to the south of the existing bulkhead line. The sheets were PZ-27 sheet piles and appeared to have sacrificial anodes installed near the top of each sheet. Figure 2.5 and 2.6 show conceptually the construction of this improvement.

In 1994, additional improvements were made at Groin 3. Approximately 180 feet of PZ-40 sheet piles were installed. Figures 2.7 and 2.8 show conceptually the construction that was performed for this improvement. There appeared to be sacrificial anodes installed toward the top of each sheet.

In 1999 the Cape Hatteras Lighthouse was relocated approximately 2,900 feet to its current location. No additional groin improvements were considered. Appendix G provides a more detailed history of the lighthouse and the groins.

M&N performed a top side and an underwater inspection of Groin 1, 2, and 3 on February 21, 2006. Groin 1 was in very poor condition with the only usable portion of the groin being buried inland. We estimate the buried portion of the groin that extends towards the shore to be approximately 150 feet. The original precast sheet piles are leaning significantly to the north. There are only small portions of the steel sheet piles remaining. The remaining 18 steel sheets total have approximately 75 to 100% loss of section due to corrosion.

Groin 2 was found to have twenty five; 4 feet wide precast sheet piles still remaining and are in fair condition that can be observed near the shore line. Additionally, we estimate there is 150 linear feet in plan that are buried that extend inland. Except for the 25 sheets mentioned above, the remaining concrete and the steel sheets have failed or have corroded to the point that they are no longer capable of resisting storm wave forces.

Groin 3 was found to have most of the 1969 precast concrete sheet to be in very poor conditions and not able to resist the storm wave forces. The improvements performed in 1980 and 1981 are still present. The sacrificial anode cathodic protection appears to be past its useful life. These PZ-27 sheets have sustained approximately 16% loss of section, and still have enough section to perform their function.

The Groin 3, PZ-40 steel sheet piles improvements in performed in 1994 appear to have lost approximately 16 feet of the original 180 feet due to storm damage. The remaining 164 feet has sustained approximately 18% loss of section due to corrosion. The sacrificial anode

cathodic protection system appears to be past its useful life. Due to the more shallow depth, the existing sheets can still function with some normal overstresses in storm conditions.

Upon consulting with CAMA staff, it became apparent that the most likely way to be able to be permitted to strengthen the groins was to repair them in kind. The two kinds of existing construction were precast concrete sheet piles and steel sheet piles. Therefore these were the two alternatives that M&N considered. In order to perform a preliminary design, M&N performed a wave study for thee area and also performed structural analyses of two alternatives to resist the wave loads from the study.

The first alternative we evaluated precast sheet piles similar to the original construction in 1969. We found that in order to resist the wave forces, the precast sheets would need to be over 24 inches in thickness which is extremely expensive and not feasible from a practical construction aspect.

The other alternative was steel sheet piles groin similar in kind to the 1994 improvements at Groin 3. We found that for Groins 1 & 2 a PZ-27 A690 grade would be able to resist the wave loads. We found that for Groin 3 a PZ-40 A690 sheet would be sufficient to resist the wave loads. Since it is extremely difficult to maintain coatings or a sacrificial anode cathodic protection system, we recommend a more durable A690 grade which provides a better corrosion resistive composition than carbon steel. This alternative was used to obtain our opinions of probable costs for each groin.

In discussions with NC Division of CAMA staff, the existing groins are classified as hardened structures, and therefore are considered "non-conforming" structures along the oceanfront. In determining whether work on a structure is repair of the structure or replacement of the structure, the current physical value of the structure is used as the baseline for the 50% repair/replacement rule. The repair/replacement issue for non-conforming structures in the ocean hazard Area of Environmental Concern (AEC) is critical because replacement of non-conforming structures is inconsistent with current rules. The estimated

cost to repair the entire structure “in-kind” (similar conditions to what it was when first constructed but up to current codes) and within the same footprint must be computed and then compared to the current existing value. If the estimated repair cost is more than 50% of the current existing value, the project will be considered replacement and a permit will be required. If the estimated repair cost is less than 50% of the current existing value, the structure may be repaired with no permit required. These repairs may be phased over time, but again, it is important to note that the repair cost must be computed for the entire structure.

It should also be noted that the Coastal Resources Commission (CRC) is considering revisions to the above rule. The draft revision also provides a separate method for determining if water-dependent structures like piers, bulkheads and groins need repair/replacement determinations. Under this latest proposal, work would be considered replacement if it exceeds more than 50 percent of the linear footage of the structure, as determined by Department of Coastal Management (DCM) staff.

M&N estimates that at Groin 1, approximately 146 linear feet of the original 530 linear feet, is usable. The 146 feet consist of the buried portion of the original concrete sheet pile bulkhead. M&N could not confirm this length since it was buried. The remaining 384 feet of the original 530 feet of groin was almost completely gone or deemed unusable to resist the design wave forces. The estimated cost of the 146 ft of usable groin is approximately \$130,200. The estimated cost to repair in kind with a PZ-27 A690 repair of the remaining 384 ft of groin would be approximately \$345,200. Since the cost of repairs of \$345,200 is greater than 50% of \$130,200, the project would be considered a replacement and a permit from CAMA would be required. Figure 2.9 illustrates the length of usable groins and the amount of groin that would require replacement for Groin 1, 2 and 3.

M&N estimates that at Groin 2, approximately 246 linear feet of the original 530 linear feet, is usable. The 146 feet consist of the buried portion of the original concrete sheet pile bulkhead. M&N could not confirm this length since it was buried. The additional 100 feet of bulkhead has such a shallow depth that it should be able to resist reasonable wave forces. The remaining 284 feet of the original 530 feet of groin was almost completely gone or

deemed unusable to resist the design wave forces. The estimated cost of the 246 ft of usable groin is approximately \$219,400. The estimated cost to repair in kind with a PZ-27 A690 repair of the remaining 284 ft of groin would be approximately \$255,400. Since the cost of repairs of \$255,400 is greater than 50% of \$219,400, the project would be considered a replacement and a permit from CAMA would be required.

M&N estimates that at Groin 3, approximately 466 linear feet of the 910 linear feet of groin, is usable. The inland PZ-27 sheets and the newer PZ-40 sheets installed in 1994 still have adequate section to resist the storm wave forces. The remaining 444 feet of the original 910 feet of groin was almost completely gone or deemed unusable to resist the design wave forces. The estimated cost of the 466 ft of usable groin is approximately \$949,000. The estimated cost to repair in kind with a PZ-40 A690 sheet pile repair of the remaining 444 ft of groin would be approximately \$1,120,700. Since the cost of repairs of \$1,120,700 is greater than 50% of \$949,000, the project would be considered a replacement and a permit from CAMA would be required.

Each one of the groins would be considered a replacement and as such a permit will be required and historically found difficult to obtain. The fact that this structure is “non-conforming” to existing CAMA rules and hardened structures are not currently allowed in NC, a permit for replacement, even in-kind, is not likely. Our recommendation for the next step is to present this information to the CAMA staff and verify the work completed to date, that a permit for replacement is not likely to be granted, and to determine what other types of shoreline protection alternatives may be allowed.

Another option to consider is to rebuild the groins so that the value of the repairs is not over 50% of the present value of the existing usable groins remaining. M&N cannot determine at this time if this strategy will help the beach erosion at this area. However, it appears, if this strategy is employed, that permits would not be required.

1.0 INTRODUCTION

This report is provided as authorized on November 29, 2005 by the County of Dare, North Carolina. The services associated with the performance of this project included an underwater and above water investigation of the three groins, a drawing research and review of the groin construction history, a wave loading analysis of the groins, structural analyses of a precast sheet pile alternative and a steel sheet pile alternative, an opinion of probable costs on the recommended alternative, and research permitting issues with NC Division of Coastal Management (CAMA). This study is to be used as a feasibility study to aide the County of Dare to determine if they want to pursue additional beach erosion preventative measures in the future for this area. We understand the property is currently owned by the U.S. Government where a U.S. Coast Guard Station was once active. We understand that the U.S. Coast Guard no longer has a need for the property and the County of Dare is considering purchasing or leasing the property. This study does not address the actual coastal engineering solutions for beach erosion prevention around this vicinity.

2.0 BRIEF HISTORY OF THE BUXTON GROINS

The main reason for constructing the three groins was to stop or slow down beach erosion near the original location of Cape Hatteras Light House. The 1969 construction of the three precast sheet pile groins are shown in plan on Figure 2.1. Figure 2.2 shows the original conceptual construction. Groin 1 is the northern most groin, and it was approximately 530 feet long. Groin 2 was the middle groin and it was approximately 530 feet long. Groin 3 was the southern most groin, and the closet to the original light house location. Groin 3 was 610 feet long. Storms between 1969 and 1975 destroyed portions of these original groins.

In 1975 steel sheet piles, which appeared to be PZ-27 based on the field dimensions that were taken during this inspection. Groin 1 had approximately 250 feet of steel sheet piles replaced and Groin 3 had 140 feet replaced. Groin 2 did not have any repairs performed in 1975. Figures 2.3 and 2.4 show conceptually the construction that was performed in 1975.

In 1980 and 1981, Groin 3 had approximately 300 feet installed mostly near the inboard end of the original construction. These sheets ran approximately at a 30 degree angle to the south of the existing bulkhead line. The steel sheets were PZ-27 sheet piles and appeared to have sacrificial anodes installed near the top of each sheet. Figure 2.5 and 2.6 show conceptually the construction of this improvement.

In 1994, additional improvements were made at Groin 3. Approximately 140 feet of PZ-40 steel sheet piles were installed. Figures 2.7 and 2.8 show conceptually the construction that was performed for this improvement. There appeared to be sacrificial anodes installed toward the top of each sheet.

In 1999 the Cape Hatteras Lighthouse was relocated approximately 2,900 feet to its current location. No additional groin improvements were considered. Appendix G provides a more detailed history of the lighthouse and the groins.

3.0 PRESENT CONDITION OF THE BUXTON GROINS

M&N performed a top side and an underwater inspection of Groin 1, 2, and 3 on February 21, 2006. Groin 1 was in very poor condition with the only usable portion of the groin being buried inland. We estimate the buried portion of the groin that extends towards the shore to be approximately 150 feet. The original precast sheet piles are leaning significantly to the north. There are only small portions of the steel sheet piles remaining. The remaining 18 steel sheets total have approximately 75 to 100% loss of section due to corrosion.

Photographs 1 through 3 show the conditions of Groin 1. Photographs are found in Appendix B.

Groin 2 was found to have twenty five; 4 feet wide precast sheet piles still remaining and are in fair condition that can be observed near the shore line. Additionally, we estimate there is 150 linear feet in plan that are buried that extend inland. Except for the 25 sheets mentioned above, the remaining concrete and the steel sheets have failed or have corroded to the point

that they are no longer capable of resisting storm wave forces. Photographs 4 through 6 show the conditions of Groin 2.

Groin 3 was found to have most of the 1969 precast concrete sheet to be in very poor conditions and not able to resist the storm wave forces. The improvements performed in 1980 and 1981 are still present. The sacrificial anode cathodic protection appears to be past its useful life. These PZ-27 sheets have sustained approximately 16% loss of section, and still have enough section to perform their function. Photographs 7 through 13 show the conditions of Groin 3.

The Groin 3, PZ-40 steel sheet piles improvements in performed in 1994 appear to have lost approximately 16 feet of the original 180 feet due to storm damage. The remaining 164 feet has sustained approximately 18% loss of section due to corrosion. The sacrificial anode cathodic protection system appears to be past its useful life. Due to the more shallow depth, the existing sheets can still function with some normal overstresses in storm conditions.

4.0 GROIN REHABILITATION ALTERNATIVES

Upon consulting, CAMA staff it became apparent that the most likely way to be able to be permitted to strengthen the groins were to repair them in kind. The two kinds of existing construction were precast concrete sheet piles and steel sheet piles. Therefore these were the two alternatives that M&N considered.

In order to review the feasibility of these two alternatives, M&N performed a wave study for this area. The wave loads study provided pressures so that a structural analyses could be performed of two alternatives. For the more shallow groins nearer to land the wave loads produced lateral pressures on the order of 420 pounds per square foot (psf). The deeper groins further away from shore produced lateral pressures ranging from 590 psf to 710 psf.

4.1 Precast Concrete Sheet Pile Alternative:

The first alternative we evaluated were precast sheet piles similar to the original construction in 1969. We found that in order to resist the wave forces, the precast sheets would need to be over 24 inches in thickness which is extremely expensive and not feasible from a practical construction aspect.

4.2 Steel Sheet Pile Alternative:

The other alternative was steel sheet piles groin similar in kind to the 1994 improvements at Groin 3. We found that for Groins 1 & 2 a 29 foot long PZ-27 A690 grade would be able to resist the wave loads. We found that for Groin 3, a 38 foot, PZ-40 A690 sheet would be sufficient to resist the wave loads. Since it is extremely difficult to maintain coatings or a sacrificial anode cathodic protection system, we recommend a more durable A690 grade which provides a better corrosion resistive composition than carbon steel. This alternative was used to obtain our opinions of probable costs for each groin. The wave load and sheet pile calculations are found in Appendix D.

5.0 OPINION OF PROBABLE COSTS AND PERMITTING ISSUES

In discussions with the State of North Carolina Division of CAMA staff, the existing groins are classified as hardened structures, and therefore are considered “non-conforming” structures along the oceanfront. In determining whether work on a structure is repair of the structure or replacement of the structure, the current physical value of the structure is used as the baseline for the 50% repair and, or replacement rule. The repair and, or replacement issue for non-conforming structures in the ocean hazard Area of Environmental Concern (AEC) is critical because replacement of non-conforming structures is inconsistent with current rules. The estimated cost to repair the entire structure “in-kind” (similar conditions to what it was when first constructed but up to current codes) and within the same footprint must be computed and then compared to the current existing value. If the estimated repair cost is more than 50% of the current existing value, the project will be considered

replacement and a permit will be required. If the estimated repair cost is less than 50% of the current existing value, the structure may be repaired with no permit required. These repairs may be phased over time, but again, it is important to note that the repair cost must be computed for the entire structure.

It should also be noted that the Coastal Resources Commission (CRC) is considering revisions to the above rule. The draft revision also provides a separate method for determining if water-dependent structures like piers, bulkheads and groins need repair/replacement determinations. Under this latest proposal, work would be considered replacement if it exceeds more than 50 percent of the linear footage of the structure, as determined by Division of Coastal Management (DCM) staff. We have provided a copy of the CAMA Handbook for Development in Coastal Carolina in Appendix F.

M&N estimates that at Groin 1, approximately 146 linear feet of the original 530 linear feet, is usable. The 146 feet consist of the buried portion of the original concrete sheet pile bulkhead. M&N could not confirm this length since it was buried. The remaining 384 feet of the original 530 feet of groin was almost completely gone or deemed unusable to resist the design wave forces. The estimated cost of the 146 ft of usable groin is approximately \$130,200. The estimated cost to repair in kind with a PZ-27 A690 repair of the remaining 384 ft of groin would be approximately \$345,200. Since the cost of repairs of \$345,200 is greater than 50% of \$130,200, the project would be considered a replacement and a permit from CAMA would be required. Figure 2.9 illustrates the length of usable groin and the amount of groin that would require replacement for Groins 1, 2, and 3. All opinions of probable costs are found in Appendix C.

M&N estimates that at Groin 2, approximately 246 linear feet of the original 530 linear feet, is usable. The 146 feet consist of the buried portion of the original concrete sheet pile bulkhead. M&N could not confirm this length since it was buried. The additional 100 feet of bulkhead has such a shallow depth that it should be able to resist reasonable wave forces. The remaining 284 feet of the original 530 feet of groin was almost completely gone or deemed unusable to resist the design wave forces. The estimated cost of the 246 ft of usable

groin is approximately \$219,400. The estimated cost to repair in kind with a PZ-27 A690 repair of the remaining 284 ft of groin would be approximately \$255,400. Since the cost of repairs of \$255,400 is greater than 50% of \$219,400, the project would be considered a replacement and a permit from CAMA would be required.

M&N estimates that at Groin 3, approximately 466 linear feet of the 910 linear feet of groin, is usable. The inland PZ-27 sheets and the newer PZ-40 sheets installed in 1994 still have adequate section to resist the storm wave forces. The remaining 444 feet of the original 910 feet of groin was almost completely gone or deemed unusable to resist the design wave forces. The estimated cost of the 466 ft of usable groin is approximately \$949,000. The estimated cost to repair in kind with a PZ-40 A690 sheet pile repair of the remaining 444 ft of groin would be approximately \$1,120,700. Since the cost of repairs of \$1,120,700 is greater than 50% of \$949,000, the project would be considered a replacement and a permit from CAMA would be required.

Each one of the groins would be considered a replacement and as such a permit will be required and historically found difficult to obtain. The fact that this structure is "non-conforming" to existing CAMA rules and hardened structures are not currently allowed in NC, a permit for replacement, even in-kind, is not likely.

6.0 RECOMMENDATIONS

Our recommendation for the next step is to present this information to the CAMA staff and verify the work completed to date, that a permit for replacement is not likely to be granted, and to determine what other types of shoreline protection alternatives may be allowed.

Another option to consider is to rebuild the groins so that the value of the repairs is not over 50% of the present value of the existing usable groins remaining. M&N cannot determine at this time if this strategy will help the beach erosion at this area. However, it appears if this strategy is employed, that permits would not be required.