VILLAGE OF BALD HEAD ISLAND
SHORELINE PROTECTION PROJECT

FINAL ENVIRONMENTAL IMPACT STATEMENT

Prepared By:

U.S. Army Corps of Engineers
Wilmington District

and

Land Management Group, Inc.
(Third-Party Contractor)

VOLUME II
(APPENDIX A THROUGH APPENDIX K)

August 2014

APPENDIX A

SB 151 LEGISLATION

GENERAL ASSEMBLY OF NORTH CAROLINA
SESSION 2013

SESSION LAW 2013-384
SENATE BILL 151

AN ACT TO AMEND MARINE FISHERIES LAWS; AMEND THE LAWS GOVERNING THE CONSTRUCTION OF TERMINAL GROINS; AND CLARIFY THAT CITIES MAY ENFORCE ORDINANCES WITHIN THE STATE'S PUBLIC TRUST AREAS.

The General Assembly of North Carolina enacts:

PART I. AMEND MARINE FISHERIES LAW

SECTION 1. G.S. 113-172 reads as rewritten:

"**§ 113-172. License agents.**

(a) The Secretary shall designate license agents for the Department. ~~At least one license agent shall be designated for each county that contains or borders on coastal fishing waters. The Secretary may designate additional license agents in any county if the Secretary determines that additional agents are needed to provide efficient service to the public.~~ The Division and license agents designated by the Secretary under this section shall issue licenses authorized under this Article in accordance with this Article and the rules of the Commission. The Secretary may require license agents to enter into a contract that provides for their duties and compensation, post a bond, and submit to reasonable inspections and audits. If a license agent violates any provision of this Article, the rules of the Commission, or the terms of the contract, the Secretary may initiate proceedings for the forfeiture of the license agent's bond and may summarily suspend, revoke, or refuse to renew a designation as a license agent and may impound or require the return of all licenses, moneys, record books, reports, license forms and other documents, ledgers, and materials pertinent or apparently pertinent to the license agency. The Secretary shall report evidence or misuse of State property, including license fees, by a license agent to the State Bureau of Investigation as provided by G.S. 114-15.1.

(b) License agents shall be compensated by adding a surcharge of one dollar ($1.00) to each license sold and retaining the surcharge. If more than one license is listed on a consolidated license form, the license agent shall be compensated as if a single license were sold. It is unlawful for a license agent to add more than the surcharge authorized by this section to the fee for each license sold."

SECTION 2.(a) G.S. 113-168.5 reads as rewritten:

"**§ 113-168.5. License endorsements for Standard Commercial Fishing License.**

(a), (b) Repealed by Session Laws 1998-225, s. 4.14.

~~(c) Menhaden Endorsements. – Except as provided in G.S. 113-169, it is unlawful to use a vessel to take menhaden by purse seine in coastal fishing waters, to land menhaden taken by purse seine, or to sell menhaden taken by purse seine without obtaining a menhaden endorsement of a SCFL. The fee for a menhaden endorsement shall be two dollars ($2.00) per ton, based on gross tonnage as determined by the custom house measurement for the mother ship. The menhaden endorsement shall be required for the mother ship but no separate endorsement shall be required for a purse boat carrying a purse seine. The application for a menhaden endorsement must state the name of the person in command of the vessel. Upon a change in command of a menhaden vessel, the owner must notify the Division in writing within 30 days.~~

(d) Shellfish Endorsement for North Carolina Residents. – The Division shall issue a shellfish endorsement of a SCFL to a North Carolina resident at no charge. The holder of a SCFL with a shellfish endorsement is authorized to take and sell shellfish."

SECTION 2.(b) G.S. 113-169 is repealed.

SECTION 2.(c) G.S. 113-168.2(a1) reads as rewritten:

"(a1) Use of Vessels. – The holder of a SCFL is authorized to use only one vessel in a commercial fishing operation at any given time. The Commission may adopt a rule to exempt from this requirement a person in command of a vessel that is auxiliary to a vessel engaged in a pound net operation, long-haul operation, or beach seine ~~operation, or menhaden~~ operation."

PART II. AMEND TERMINAL GROIN CONSTRUCTION LAW

SECTION 3.(a) G.S. 113A-115.1 reads as rewritten:

"**§ 113A-115.1. Limitations on erosion control structures.**

(a) As used in this section:

(1) "Erosion control structure" means a breakwater, bulkhead, groin, jetty, revetment, seawall, or any similar structure.

(1a) "Estuarine shoreline" means all shorelines that are not ocean shorelines that border estuarine waters as defined in G.S. 113A-113(b)(2).

(2) "Ocean shoreline" means the Atlantic Ocean, the oceanfront beaches, and frontal dunes. The term "ocean shoreline" includes an ocean inlet and lands adjacent to an ocean inlet but does not include that portion of any inlet and lands adjacent to the inlet that exhibits characteristics of estuarine shorelines.

~~(3) "Terminal groin" means a structure that is constructed on the side of an inlet at the terminus of an island generally perpendicular to the shoreline to limit or control sediment passage into the inlet channel.~~

(3) "Terminal groin" means one or more structures constructed at the terminus of an island or on the side of an inlet, with a main stem generally perpendicular to the beach shoreline, that is primarily intended to protect the terminus of the island from shoreline erosion and inlet migration. A "terminal groin" shall be pre-filled with beach quality sand and allow sand moving in the littoral zone to flow past the structure. A "terminal groin" may include other design features, such as a number of smaller supporting structures, that are consistent with sound engineering practices and as recommended by a professional engineer licensed to practice pursuant to Chapter 89C of the General Statutes. A "terminal groin" is not a jetty.

(b) No person shall construct a permanent erosion control structure in an ocean shoreline. The Commission shall not permit the construction of a temporary erosion control structure that consists of anything other than sandbags in an ocean shoreline. This ~~section~~ subsection shall not apply to any of the following:

(1) Any permanent erosion control structure that is approved pursuant to an exception set out in a rule adopted by the Commission prior to July 1, 2003.

(2) Any permanent erosion control structure that was originally constructed prior to July 1, 1974, and that has since been in continuous use to protect an inlet that is maintained for navigation.

(3) Any terminal groin permitted pursuant to this section.

(b1) This section shall not be construed to limit the authority of the Commission to adopt rules to designate or protect areas of environmental concern, to govern the use of sandbags, or to govern the use of erosion control structures in estuarine shorelines.

(c) The Commission may renew a permit for an erosion control structure issued pursuant to a variance granted by the Commission prior to July 1, 1995. The Commission may authorize the replacement of a permanent erosion control structure that was permitted by the Commission pursuant to a variance granted by the Commission prior to July 1, 1995, if the Commission finds that: (i) the structure will not be enlarged beyond the dimensions set out in the original permit; (ii) there is no practical alternative to replacing the structure that will provide the same or similar benefits; and (iii) the replacement structure will comply with all applicable laws and with all rules, other than the rule or rules with respect to which the Commission granted the variance, that are in effect at the time the structure is replaced.

(d) Any rule that prohibits permanent erosion control structures shall not apply to terminal groins permitted pursuant to this section.

(e) In addition to the requirements of Part 4 of Article 7 of Chapter 113A of the General Statutes, an applicant for a permit for the construction of a terminal groin shall submit all of the following to the Commission:

(1) Information to demonstrate that structures or infrastructure are ~~imminently threatened by erosion, and nonstructural approaches to erosion control,~~

~~including relocation of threatened structures, are impractical.~~threatened by erosion.

(2) An environmental impact statement that satisfies the requirements of G.S. 113A-4. An environmental impact statement prepared pursuant to the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321, et seq., for the construction of the terminal groin shall satisfy the requirements of this subdivision.

(3) A list of property owners and local governments that may be affected by the construction of the proposed terminal groin and its accompanying beach fill project and proof that the property owners and local governments have been notified of the application for construction of the terminal groin and its accompanying beach fill project.

(4) A plan for the construction and maintenance of the terminal groin and its accompanying beach fill project prepared by a professional engineer licensed to practice pursuant to Chapter 89C of the General Statutes.

(5) A plan for the management of the inlet and the estuarine and ocean shorelines immediately adjacent to and under the influence of the inlet. The inlet management plan monitoring and mitigation requirements must be reasonable and not impose requirements whose costs outweigh the benefits. The inlet management plan is not required to address sea level rise. The inlet management plan shall do all of the following relative to the terminal groin and its accompanying beach fill project:

- a. Describe the post-construction activities that the applicant will undertake to monitor the impacts on coastal resources.
- b. Define the baseline for assessing any adverse impacts and the thresholds for when the adverse impacts must be mitigated.
- c. Provide for mitigation measures to be implemented if adverse impacts reach the thresholds defined in the plan.
- d. Provide for modification or removal of the terminal groin if the adverse impacts cannot be mitigated.

(6) Proof of financial assurance verified by the Commission or the Secretary of Environment and Natural Resources in the form of a bond, insurance policy, escrow account, guaranty, local government taxing or assessment authority, a property owner association's approved assessment, or other financial instrument or combination of financial instruments that is adequate to cover the cost ~~of:~~of implementing all of the following components of the inlet management plan:

- a. Long-term maintenance and monitoring of the terminal groin.
- b. Implementation of mitigation ~~measures as provided in the inlet management plan.~~measures.
- c. Modification or removal of the terminal ~~groin as provided in the inlet management plan.~~groin.
- ~~d.~~ ~~Restoration of public, private, or public trust property if the groin has an adverse impact on the environment or property.~~

(f) The Commission shall issue a permit for the construction of a terminal groin if the Commission finds no grounds for denying the permit under G.S. 113A-120 and the Commission finds all of the following:

(1) The applicant has complied with all of the requirements of subsection (e) of this section.

~~(2)~~ ~~The applicant has demonstrated that structures or infrastructure are imminently threatened by erosion and that nonstructural approaches to erosion control, including relocation of threatened structures, are impractical.~~

(3) The terminal groin will be accompanied by a concurrent beach fill project to prefill the groin.

(4) Construction and maintenance of the terminal groin will not result in significant adverse impacts to private property or to the public recreational beach. In making this finding, the Commission shall take into account the potential benefits of the project, including protection of the terminus of the

island from shoreline erosion and inlet migration, beaches, protective dunes, wildlife habitats, roads, homes, and infrastructure, and mitigation measures, including the accompanying beach fill project, that will be incorporated into the project design and construction and the inlet management plan.

(5) The inlet management plan is adequate for purposes of monitoring the impacts of the proposed terminal groin and mitigating any adverse impacts identified as a result of the monitoring.

(6) Except to the extent expressly modified by this section, the project complies with State guidelines for coastal development adopted by the Commission pursuant to G.S. 113A-107.

(g) The Commission may issue no more than four permits for the construction of a terminal groin pursuant to this section.

(h) ~~No permit may be issued where funds are~~A local government may not use funds generated from any of the following financing mechanisms ~~and would be used~~ for any activity related to the terminal groin or its accompanying beach fill project:

(1) Special obligation bonds issued pursuant to Chapter 159I of the General Statutes.

(2) Nonvoted general obligation bonds issued pursuant to G.S. 159-48(b)(4).

(3) Financing contracts entered into under G.S. 160A-20 or G.S. 159-148.

(i) No later than September 1 of each year, the Coastal Resources Commission shall report to the Environmental Review Commission on the implementation of this section. The report shall provide a detailed description of each proposed and permitted terminal groin and its accompanying beach fill project, including the information required to be submitted pursuant to subsection (e) of this section. For each permitted terminal groin and its accompanying beach fill project, the report shall also provide all of the following:

(1) The findings of the Commission required pursuant to subsection (f) of this section.

(2) The status of construction and maintenance of the terminal groin and its accompanying beach fill project, including the status of the implementation of the plan for construction and maintenance and the inlet management plan.

(3) A description and assessment of the benefits of the terminal groin and its accompanying beach fill project, if any.

(4) A description and assessment of the adverse impacts of the terminal groin and its accompanying beach fill project, if any, including a description and assessment of any mitigation measures implemented to address adverse impacts."

SECTION 3.(b) Section 3 of S.L. 2011-387 is repealed.

PART III. CITIES ENFORCE ORDINANCES WITHIN PUBLIC TRUST AREAS

SECTION 4.(a) Article 8 of Chapter 160A of the General Statutes is amended by adding a new section to read as follows:

"**§ 160A-203. Cities enforce ordinances within public trust areas.**

(a) Notwithstanding the provisions of G.S. 113-131 or any other provision of law, a city may, by ordinance, define, prohibit, regulate, or abate acts, omissions, or conditions upon the State's ocean beaches and prevent or abate any unreasonable restriction of the public's rights to use the State's ocean beaches. In addition, a city may, in the interest of promoting the health, safety, and welfare of the public, regulate, restrict, or prohibit the placement, maintenance, location, or use of equipment, personal property, or debris upon the State's ocean beaches. A city may enforce any ordinance adopted pursuant to this section or any other provision of law upon the State's ocean beaches located within or adjacent to the city's jurisdictional boundaries to the same extent that a city may enforce ordinances within the city's jurisdictional boundaries. A city may enforce an ordinance adopted pursuant to this section by any remedy provided for in G.S. 160A-175. For purposes of this section, the term "ocean beaches" has the same meaning as in G.S. 77-20(e).

(b) Nothing in this section shall be construed to (i) limit the authority of the State or any State agency to regulate the State's ocean beaches as authorized by G.S. 113-131, or common law as interpreted and applied by the courts of this State; (ii) limit any other authority granted to cities by the State to regulate the State's ocean beaches; (iii) deny the existence of the authority recognized in this section prior to the date this section becomes effective; (iv) impair the right of the people of this State to the customary free use and enjoyment of the State's ocean beaches, which rights remain reserved to the people of this State as provided in G.S. 77-20(d); (v) change or modify the riparian, littoral, or other ownership rights of owners of property bounded by the Atlantic Ocean; or (vi) apply to the removal of permanent residential or commercial structures and appurtenances thereto from the State's ocean beaches."

SECTION 4.(b) G.S. 113-131 reads as rewritten:

"**§ 113-131. Resources belong to public; stewardship of conservation agencies; grant and delegation of powers; injunctive relief.**

(a) The marine and estuarine and wildlife resources of the State belong to the people of the State as a whole. The Department and the Wildlife Resources Commission are charged with stewardship of these resources.

(b) The following powers are hereby granted to the Department and the Wildlife Resources Commission and may be delegated to the Fisheries Director and the Executive Director:

(1) Comment on and object to permit applications submitted to State agencies which may affect the public trust resources in the land and water areas subject to their respective management duties so as to conserve and protect the public trust rights in such land and water areas;

(2) Investigate alleged encroachments upon, usurpations of, or other actions in violation of the public trust rights of the people of the State; and

(3) Initiate contested case proceedings under Chapter 150B for review of permit decisions by State agencies which will adversely affect the public trust rights of the people of the State or initiate civil actions to remove or restrain any unlawful or unauthorized encroachment upon, usurpation of, or any other violation of the public trust rights of the people of the State or legal rights of access to such public trust areas.

(c) Whenever there exists reasonable cause to believe that any person or other legal entity has unlawfully encroached upon, usurped, or otherwise violated the public trust rights of the people of the State or legal rights of access to such public trust areas, a civil action may be instituted by the responsible agency for injunctive relief to restrain the violation and for a mandatory preliminary injunction to restore the resources to an undisturbed condition. The action shall be brought in the superior court of the county in which the violation occurred. The institution of an action for injunctive relief under this section shall not relieve any party to such proceeding from any civil or criminal penalty otherwise prescribed for the violation.

(d) The Attorney General shall act as the attorney for the agencies and shall initiate actions in the name of and at the request of the Department or the Wildlife Resources Commission.

(e) In this section, the term "public trust resources" means land and water areas, both public and private, subject to public trust rights as that term is defined in G.S. 1-45.1.

(f) Notwithstanding the provisions of this section, a city may adopt and enforce ordinances as provided in G.S. 160A-203."

PART IV. EFFECTIVE DATE

SECTION 5. Section 3 of this act is effective when the act becomes law and applies to permit applications submitted on or after that date. The remainder of this act is effective when it becomes law.

In the General Assembly read three times and ratified this the 22nd day of July, 2013.

s/ Tom Apodaca
Presiding Officer of the Senate

s/ Thom Tillis
Speaker of the House of Representatives

s/ Pat McCrory
Governor

Approved 10:45 a.m. this 23rd day of August, 2013

APPENDIX B

INLET MANAGEMENT PLAN

(Prepared by the Village of Bald Head Island, Applicant)

17 July 2014

VILLAGE OF BALD HEAD ISLAND, NC
TERMINAL GROIN PROJECT

INLET MANAGEMENT PLAN

I. SETTING

In order to comply with the requirements of SB110 (as subsequently amended by SB151), an applicant for a permit to construct a terminal groin must formulate a plan for the "management of the inlet and the estuarine and ocean shorelines immediately adjacent to and under the influence of the inlet. The inlet management plan monitoring and mitigation requirements must be reasonable and not impose requirements whose costs outweigh the benefits. The inlet management plan is not required to address sea level rise. The inlet management plan shall do all of the following relative to the terminal groin and its accompanying beach fill project:

a. Describe the post-construction activities that the applicant will undertake to monitor the impacts on coastal resources.

b. Define the baseline for assessing any adverse impacts and the thresholds for when the adverse impacts must be mitigated.

c. Provide for mitigation measures to be implemented if adverse impacts reach the thresholds defined in the plan.

d. Provide for modification or removal of the terminal groin, if the adverse impacts cannot be mitigated." G.S. § 113A-115.1(e)(5).

On Bald Head Island, the section of shorefront subject to continuing monitoring and impact analysis as a downdrift shoreline potentially subject to structure induced damage and resulting mitigation is West Beach. On the Oak Island side of the inlet, the section of shorefront subject to similar project related monitoring is the Fort Caswell oceanfront shoreline from Sta. 60 to Sta. 30. The latter is under the influence of the inlet – but outside the limits of sand disposal routinely performed by the Wilmington District, USACOE at Oak Island.

Inlet management plan formulation will be significantly different for an inlet improved for commercial navigation versus one which is in a relatively unimproved condition or which provides only for recreational navigation. Also influencing various potential management precepts is the size of the inlet, its history and any associated sand disposal operation(s) which presently benefits one, or both, of the abutting coastal barrier shorelines. That is to say, beneficial inlet management must involve multiple considerations. Such is the case with the entrance to the Cape Fear River where a proactive Sand Management Plan has been in effect for over a decade. The subject Wilmington Harbor Sand Management Plan (WHSMP) is implemented by the Wilmington District, United States Army Corps of Engineers ("USACOE") during routine maintenance of the innermost three (3) segments of the Ocean Entrance Channel (Smith Island Reach and Bald Head Reaches 1 and 2) which comprise a portion of the Wilmington Harbor Navigation Project.

Until 1999, the Wilmington Harbor navigation project had historically not included the disposal of littoral sand on the adjacent beaches, or in the active littoral zone. This had been primarily due to the maintenance practices that were established with the inception of the project in the late 1800's. As a result, standard practice for maintaining the ocean entrance channel segments of the project was offshore disposal in water depths of 30 feet or more.

With the last harbor deepening project and coincident reorientation of the ocean entrance channel, the Wilmington District established a new standard for the disposal of littoral sediment. From an engineering perspective, a purpose of the Wilmington Harbor maintenance program was to avoid or mitigate potential erosion of the adjacent beaches by conserving the limited natural resource, sand, through deposition directly on the adjacent coastal barrier beaches.

Pursuant to the adopted Plan, the initial ratio of distribution of littoral sand excavated during routine maintenance operations between Bald Head Island and East Oak Island – Caswell Beach was proposed by the District in the ratio of two-thirds to one-third, respectively. The WHSMP was initiated as part of the first maintenance project following initial improvements of the deepening project. Beach quality sand originating from project widening, deepening and channel reconfiguration was likewise distributed between the two islands with sand being placed on Oak Island, as far westward as Holden Beach. It did not however include the Fort Caswell oceanfront shoreline. In addition, the N.C. Beach and Inlet Management Plan (BIMP) established for Region 1 – Brunswick County, specifically earmarks the use of Jay Bird Shoals and Middle Ground at the Cape Fear River Entrance as borrow areas for Region 1 shore stabilization projects – and in particular for Bald Head Island given its proximity to the two depositional features. The latter are predominately comprised of beach quality material.

The Cape Fear River Entrance is a historically federally improved tidal inlet which includes a deep draft commercial navigation project channel authorized by Congress intended to serve the Port of Wilmington Harbor, N.C. Both the inlet's interior flood shoals, the exterior ebb shoals, as well as portions of the navigation channel which are subject to shoaling with beach quality sand, all serve as potential sand sources necessary to meet the performance requirements of SB110 (as amended) regarding terminal groin mitigation – as well as supplemental beach fill necessary to prefill a terminal groin. Depending upon the timing of groin construction, the regularly scheduled disposal of large quantities of high quality sand (typically 1 Mcy per event, or more) associated with the WHSMP offers the opportunity for the applicant for a terminal groin permit to strategically schedule groin implementation in such a manner so as to utilize beach disposal sand to meet, or at least supplement the initial beach fill requirements of the enabling terminal groin legislation. This would not however, obviate potential alternate sand source requirements associated with long-term updrift fillet maintenance, downdrift mitigation at West Beach, etc.

II. PHYSICAL MONITORING PLAN

A. Existing Monitoring Programs

The Village of Bald Head Island, NC (Village) has performed comprehensive beach monitoring of South Beach, the Point and West Beach since 1999. Prior to that date, less formal surveys of the "dry" beach (only) were also accomplished at varying dates in time. In 2008, East Beach was added to the current Village monitoring plan. In 1999, the Wilmington District USACOE likewise initiated physical monitoring of Oak Island and Bald Head Island shorelines – prior to the construction of the last authorized channel deepening project. Elements of the present day federal survey program under the WHSMP have also included portions of the ebb shoal delta as well as annual condition surveys within the federal navigation project. Borrow sites have likewise been monitored by the Village for a minimum period of 3 years after any non-federally sponsored dredging project required for shore protection. Borrow site monitoring typically includes both physical and biological surveys.

A detailed Island-wide Monitoring Report is issued annually by the coastal engineering firm Olsen Associates, Inc., on behalf of the Village, which generally addresses:

1. Recent volume and shoreline position changes measured over the prior twelve (12) months.
2. Comparisons of existing and long-term conditions relative to pre-fill conditions documented since November 2000 by annual surveys.
3. Discussions of the performance of each last major sand placement project, (federal as well as non-federal).
4. Recent navigation channel changes including those at/or abutting the Point – an area of chronic shoaling and highly dynamic shoreline change.
5. Commentary regarding borrow site recovery (physical and biological) for three years following each Village sponsored dredging contract.

Long-term average annual shoreline change rates (1938-2000) for Oak Island/Caswell Beach portray, for the most part, a highly erosional condition, averaging slightly less than -5ft./yr. of recession. Conversely, during the same period of time the extreme easternmost end of the island near the inlet was determined to be increasingly accretional.

Both the ongoing (2000 - present) beach monitoring plans for Oak Island and Bald Head Island being implemented by the Village and the Wilmington District, quantitatively well-describe shoreline changes along both shorefronts. On Oak Island, all of the shorefront subject to episodic beach disposal from the channel is highly improved – relative to its pre-project condition. One exception (where disposal sand placement does *not* occur because of lack of public access) is at Fort Caswell where a section of oceanfront shoreline has experienced a documented persistent erosional hot spot since 1996. At that location, published average annual shoreline erosion “trend rates” between August 2000 and September 2010 have ranged between -4.5 ft/yr. and -8.8 ft/yr. Localized computed annual shoreline change rates at survey profiles 35 and 40, however, have been as high as -90 ft/yr and -200 ft/yr, respectively.

On Bald Head Island, shoreline conditions are much more spatially variable relative to the 1999 baseline survey condition. As expected however, the highest rates of documented shoreline change at any one time occur along the western end of South Beach nearest the inlet. Additionally, Bald Head Island has experienced more frequent sand placement from not only the navigation project pursuant to the WHSMP, but also from two (2) borrow sites – located at the entrance to Bald Head Creek to the north, and Jay Bird Shoals to the south. Ongoing erosion experienced on West Beach has likewise necessitated sand placements in 2006, 2009, 2012 and 2013.

B. Plan Purpose

The monitoring plan discussed herein is intended to meet the requirements of State and Federal law addressing a.) beach restoration activities on Bald Head Island including borrow site creation, as well as b.) permits for a terminal groin structure proposed for construction at the western end of South Beach – along with any attendant borrow site excavation (as necessary) and resultant sand fill(s). The plan is likewise intended to be reasonable and cost-effective as provided by the enabling legislation (G.S. 113A-115.1(e)(5)).

Specific elements of new work associated with the monitoring of the terminal groin will be directed toward the identification of – and quantification of – any detrimental project related downdrift changes to West Beach which could potentially warrant mitigation. Interpretation of post-construction surveys will be influenced by historical data detailing ongoing erosional trends at these two locations. For example, documented beach erosion at West Beach over the last decade (in the absence of the terminal structure) has necessitated several protective sand fills at that location, with the most recent event occurring in early 2013. The latter occurred as part of a federal maintenance dredging operation with sand disposal totaling 1.8 Mcy placed at Bald Head Island. Hence, an important component of the expanded monitoring program will be to not only evaluate structure performance, but also to discern any differences in downdrift erosion that could be associated with the construction of a terminal groin – and that warrant near term attention by the Village or which can be addressed by a reliably scheduled pending federal disposal operation.

Additionally, the Village as Applicant for a terminal groin is charged with preparing a plan for the management of the inlet and the estuarine and ocean shorelines *immediately adjacent to and under the influence of the inlet*. The Division of Coastal Management (DCM) has taken the position that, despite the presence of the approximately two (2) mile distance between islands, the spatial extent of the intervening ebb tidal shoal formations represented by Middle Ground and Jay Bird shoals, the intervening impacts of Western Channel and an episodically dredged navigation channel, some monitoring is required at the easternmost end of Oak Island. The shoreline immediately adjacent to and under the influence of the inlet is the oceanfront shorefront of Fort Caswell. Both the historical database and ongoing comprehensive beach monitoring program being implemented by the Wilmington District at Oak Island more than adequately meet the requirement for monitoring. Redundant surveying by the Applicant would therefore be both unreasonable and not cost-effective.

C. Beach Surveys

i. Bald Head Island

For purposes of documenting both future beach disposal and terminal groin project performance and shoreline change, The Village will continue to perform comprehensive annual beach monitoring as carried out over the past thirteen (13) years at Bald Head Island. The survey baseline for this work is depicted by **Figure 1**. Profiles are surveyed twice annually (seasonally) on approximately 400-ft. intervals. Profiles generally extend some 2400-ft. or more offshore and include the depth of closure for natural beach conditions – except where intersected by the federal navigation channel, or a major shoal feature. All surveys are performed by a certified hydrographic surveyor registered in the State of North Carolina.

Several additional profile lines will be added to the existing survey program in the vicinity of the terminal structure (see **Figure 2**). In addition, the project surveyor will be required to annually perform an approximate MHWL survey between Sta. 0+00 and 75+00 (see **Figure 3**). Each survey will be compared to prior surveys and utilized for trend analysis. Digitally controlled aerial photography taken at approximate 6-month intervals will likewise be used to supplement analysis of the post-terminal groin shoreline condition.

The first post-construction MHWL survey will be performed within 30 days of the completion of the proposed terminal groin and updrift beach fill, thereby documenting the as-built shoreline condition. The entire island-wide monitoring surveys will be performed on a six-month basis at the same approximate time as previous seasonal survey program addressed by the existing (pre-terminal groin) comprehensive island-wide beach monitoring program.

ii. Oak Island

For approximately the past 12 years, the Wilmington District, USACOE has performed comprehensive physical monitoring which included both the Oak Island and Bald Head Island shorelines. The purpose of this program has been to examine the response of adjacent beaches, entrance channel shoaling patterns and the ebb tidal delta to the Wilmington Harbor channel deepening and realignment project. As a result, a comprehensive data base has been developed which portrays shoreline changes at both locations for over a decade. For purposes of assessing post-construction oceanfront shoreline conditions on the eastern end of Oak Island, the Village's coastal engineering consultant will utilize publicly available survey data acquired by the Wilmington District, USACOE (see **Figure 4**). Similarly, the consultant shall access and utilize relevant federal aerial photography of the Oak Island area of interest.

Should the USACOE terminate the annual acquisition of survey data on Oak Island, the Village shall survey annually the east end of the island from Sta. 60 through Sta. 30, including half stations. The number of beach profiles surveyed shall not exceed seven (7). That data shall be added to the database acquired by the Wilmington District beginning in 2000. Note – Sta. 60 is the easternmost limit of beach disposal by the Wilmington District on Oak Island. It is essentially synonymous with the westernmost boundary of Fort Caswell.

The Village's responsibility for analysis of post-groin physical surveying on Oak Island will terminate if six (6) years of monitoring subsequent to terminal groin structure completion fails to indicate a cause and effect relationship between structure installation, or borrow-site utilization, and oceanfront shoreline change at the eastern end of Oak Island immediately adjacent to and under the influence of the inlet.

D. Borrow Site Monitoring Surveys

The existing permitted borrow area located on Jay Bird Shoals was surveyed both immediately prior to and after construction of the 09/10 Village sponsored 1.8 Mcy beach restoration project (see **Figure 5**). Subsequent surveys are being performed at 12-, 24- and 36-months and biennially thereafter. The area surveyed includes a minimum of 500-ft. of coverage outside the permit limits of the borrow site. The survey is performed by single beam sonar on a density line spacing of 100-ft. Due to shallow water portions of Jay Bird Shoal northward of the borrow area, up to 72-acres of shallow seabed may need to be surveyed by non-sonar methods. In this area the surveyor may use single beam sonar on a shallow draft boat, or wading profiles at low tide using RTKGPS. A100-ft. grid spacing will continue to be maintained at this location, irrespective of methodology required. Subsequent to a Post-Irene emergency dredging project at South and West Beach constructed in 2011/12, a Bald Head Creek borrow site is subject to annual surveys beginning in January 2013 (see **Figure 5**). The project fill volume was 120,000 cy.

Permitted borrow sites utilized for locally funded sand placement operations at Bald Head Island shall be monitored in accordance with the Permit Condition associated with each project. Subsequent to sand placements required by the construction of the terminal groin based upon the borrowing of sand from within the remaining (1 Mcy+) unexcavated (permitted) portion of the Jay Bird Shoal borrow site; the northward expansion of the borrow site at the entrance to Bald Head Creek; the Smith Island Range of the federal navigation channel, or any other permitted site, annual monitoring of that site shall be performed -- pursuant to the terms of the associated Permit(s). Monitoring results shall be addressed in each subsequent Village annual monitoring report.

E. Hydrographic Survey Standards

In general, the following will apply to *all* surveys:

- Surveys will be performed to meet or exceed the Minimum Performance Standards for the USACOE Hydrographic Surveys. Specifications manual EM 1110-2-1003, January 2002 (or its successor).
- All data will be corrected for tide and heave.
- The survey vessel will be positioned using RTKGPS. Soundings will be in feet and 10th's.
- Vertical Datum will be local NGVD29.
- Horizontal Datum will be NC NAD83.

F. Aerial Photography

The Village of Bald Head Island will continue to perform controlled (color) rectified digital aerial photography of the island shoreline(s) twice a year – usually coincident with the timing of each seasonal beach survey. The present minimum areas of coverage are the West Beach, South Beach and East Beach shorelines. Oblique low altitude photography is likewise performed periodically as required to document the occurrences of any storm, or man-made event of interest. Any repair of the sand tube groinfield is likewise documented by ground level digital photography.

G. Reporting

A comprehensive report-of-findings will continue to be issued annually which presents, analyses and discusses all data acquired over the prior twelve (12) month period. Of particular interest will be beach and borrow site changes which occur over time and any potential effects downdrift of the proposed terminal structure. Each report will likewise discuss, consider and compare the relevant portions of the historical database as it relates to the most current survey(s).

All patterns of erosion, accretion or shoaling will be documented, quantified and graphically depicted. For any project borrow site, map differencing will be performed annually (and cumulatively over time) for purposes of visually demonstrating spatially occurring changes in elevations due to shoaling. For the Point and West Beach downdrift shorelines, comparative MHWL and aerial mapping will be presented subsequent to terminal groin construction along with volumetric analyses currently being computed every 6 months.

The Village consultant will maintain and expand the present day comprehensive monitoring report format and deliverables to include specific Sections which specifically address borrow site construction and all subsequent changes over time, as well as terminal groin and sand fillet performance and downdrift (post-structure) shoreline history, on Bald Head Island. A separate Memorandum-of-Findings regarding oceanfront shoreline changes occurring along the eastern end of Oak Island shall be formulated annually. The latter will be based upon publicly accessible federal survey data provided by the Wilmington District, or additional data acquired by the Village, if necessary.

H. Deliverables

Each Annual Monitoring Report and Memorandum-of-Findings will be delivered to the Village of Bald Head Island, off-island Stakeholders and all relevant State or Federal regulatory agencies within 90-days of completion of the last survey performed for the reporting period of interest. Additionally, digital data acquired or addressed by each Annual Report or Memorandum-of-Findings can be transferred to an Agency or Stakeholder, upon request.

III. MITIGATION THRESHOLDS

A. Baselines for Evaluation

Both the West Beach downdrift shoreline and the cross-inlet Oak Island oceanfront shoreline immediately adjacent to and under the influence of the inlet have over 12 years' worth of post-deepening (1999-present) survey data sufficient to document present day shorefront conditions. Most data take the form of cross-shore profiling at intervals sufficient to document volumetric change and contour location along the shorefront of interest. Supplementary aerial photography is likewise available to assist with the interpretation of survey data on Bald Head Island.

The post-1999 survey data are considered most relevant due to associated changes in navigation project dimensions, corresponding episodic dredging operations within the entrance channel storm events and, most importantly, the equilibration of multiple beach disposal projects intended to improve shoreline conditions on both barrier islands. Interpretation of the latter phenomena will be extremely important since the temporal variation in shoreline change (volume and location) – after a beach fill – is typically significant. Segments of both Oak Island and Bald Head Island have received, and will continue to receive, large scale beach disposal projects (often exceeding 1 Mcy per event) in accordance with the Wilmington Harbor Sand Management Plan (WHSMP).

B. Impact Determination – West Beach (Bald Head Island) (Sta 0+00 to Sta 24+00)

Both West Beach and the depositional spit feature known as the Point lie downdrift of the terminal structure proposed for construction at the westernmost limit of South Beach. As a result, both are subject to change as the downdrift shorefront seeks a post-structure equilibrium condition. Currently, it is expected (and supported by in-depth modeling) that a portion of the West Beach shorefront will potentially require beach disposal on a 3-year basis – *with or without* terminal structure implementation. The principal borrow source for interim small scale sand placement at that location (if necessary) will be the expanded Bald Head Creek borrow site. The assignment of "impact" on West Beach due to a terminal structure will therefore need to weigh the following site specific factors potentially affecting shoreline conditions downdrift of the groin:

- Interval between sand placement projects?
- Have average annual shoreline recession rates (volumes and MHWL location) increased by over 50%? Has beach fill equilibration been accounted for? Is the duneline being impacted?
- Can a documented cause and effect relationship be assigned to downdrift shoreline reconfiguration, or is any newly developed "hot spot" isolated and therefore not the result of a quantifiable trend?
- Do numerical modeling results support or refute the observed shoreline erosion trends?
- Can extraordinary meteorological conditions be defined as a cause of accelerated erosion?
- Have navigation channel maintenance operations changed in frequency or scope

C. Baseline for Action – West Beach, Bald Head Island

The baseline for action along West Beach (Sta 0+00 – Sta 24+00 by definition) shall be determined by analysis of historical surveys along this reach acquired on almost a 6-month basis since 2000. Over this 14 year period, either the Village or the Corps have placed sand when the limit of erosion reached "critical" condition portions – in most cases where the limit of erosion was located at/or within the primary dune. All such landward limits of erosion locations are well documented by survey. Hence, the "baseline" for remedial actions by the Village along West Beach is the point at which the limit of upland erosion reaches its historical worst case condition – as documented by survey since 2000 – or is projected to reach such a condition in the next 6 months.

D. Impact Determination – Oak Island (Fort Caswell)

In depth numerical modeling analyses of Oak Island predict *no quantifiable impact* to littoral transport patterns or rates and associated shoreline change at that location due to either terminal groin construction or the continued use of the Jay Bird Shoal borrow area (to the limits of excavation permitted in 2008). The latter sand source was only partially dredged by the

Village in 09/10, however all modeling analyses (including the most recent DELFT 3D model) have assumed the borrow area has been excavated in its entirety. Similarly, the model predicts no changes in inlet hydrodynamics of significance to any stakeholder, be they federal or non-federal. Historical shoreline documentation included in the first USACOE physical monitoring report required for the deepening of the Wilmington Harbor Navigation Project depicted a strong trend of accretion for both the oceanfront and inlet facing shorelines located on the easternmost mile of Oak Island – for the period 1933 - 1983. Most of that segment is located within the privately held Fort Caswell parcel. Between 1983 and 1996, the same COE report documents a general trend of recession along the Fort oceanfront (E-W) shorefront and continuing modest accretion along the majority of the inlet facing (N-S) shoreline. Subsequently, the Corps likewise has documented (by survey) Post-Harbor Deepening annualized shoreline change rates of -90 and -200 ft/yr at survey profiles 35 and 40, respectively – for the survey period 2000 – 2010. Those profiles extend seaward of the Fort Caswell oceanfront shoreline.

The most recent, *published* USACOE survey monitoring data for Oak Island (through 2010) indicates a near term general trend of beach stability (after two disposal projects) on Oak Island with very modest average annual sediment losses. The littoral transport processes supporting such a condition are corroborated by the DELFT3D model. One *exception* to the measured trend is at Corps baseline monitoring stations 35 and 40 where the above discussed localized “hot spot” clearly continues to be in existence. Both back-beach and dune erosion at this location have been of recent concern to local interests associated with the Fort Caswell property. The latter shoreline is outside the limits of sand placement from navigation channel maintenance. It is likewise adjacent to a large scale marginal flood channel. Both the lack of direct beach disposal and the effects of the marginal flood channel can be considered to be two of several contributors to the present day erosional hot spot.

The comprehensive DELFT3D modeling performed on behalf of the Applicant demonstrates *no level of potential impact on any segment of Oak Island shoreline*. Nonetheless, the Village herein proffers a “baseline” for the initiation of “mitigation” pursuant to SB110 from Sta. 60 to Sta. 30, the oceanfront shoreline immediately adjacent to and under the influence of the inlet. The Village shall deliver annually to DCM a report of its monitoring results. In the event the monitoring results disclose any potential shoreline change exceeding a baseline trigger, a Technical Advisory Committee (TAC) shall be consulted. The latter shall be comprised of a

NC licensed professional engineer with substantial expertise and employment experience in coastal engineering from the Village, Oak Island Stakeholders and DCM (one from each, for three (3) total engineers) to review the results of the monitoring and analyses and to consider whether there is any terminal groin related impact on shoreline change exceeding the baseline trigger. The TAC shall be formally established prior to the completion of construction of the terminal groin project.

It shall be the responsibility of the TAC to confirm or refute any potential effects attributable to any element of the terminal groin project, including borrow site excavation. In no event shall the terminal groin be deemed responsible for any impacts or shoreline change from storms or other natural phenomena; including, without limitation, the influences of the adjacent shipping channel or Western Channel, channel maintenance dredging, federal beach disposal design, or any delay or absence of sand placement from channel maintenance dredging. The analysis by the TAC regarding potential impacts to the easternmost segments of Oak Island (*i.e.* Fort Caswell) will at a minimum need to weigh, without limitation, the following site specific factors:

- Are changes in oceanfront shoreline conditions isolated, or are they the result of a clear reversal or acceleration in trend?
- Has recent beach disposal occurred on Oak Island? Was the federal disposal project continuous and adequately tapered at its eastern end? Did it continue to exclude the Fort Caswell property? Is fill equilibration affecting rates of shoreline translation? Are there dissimilarities in disposal sediment composition, compared to the native beach at Fort Caswell?
- Can regionally experienced meteorological or other natural conditions be defined as a potential cause of accelerated erosion?
- Has the pre-existing erosional “hot spot” identified on the eastern Oak Island shorefront increased in magnitude (i.e. either volumetrically or spatially)?
- Does numerical modeling of terminal groin project related borrow site construction activities (for purposes of obtaining beach fill) refute or support a cause and effect relationship?

- Have navigational channel maintenance operations changed in frequency, location or scope?

If the majority of the TAC finds that a shoreline impact exists because of the terminal groin, and not because of other causes, the Village shall work with the TAC and affected interests at Fort Caswell to determine and implement appropriate adaptive response measures, consistent with the reasonableness and cost-benefit precepts of SB151, or subsequent law. These response measures are below described in Section IV(B). The TAC may likewise recommend changes to the design of the federal disposal project on Oak Island which would seek to strategically maximize benefits to all properties at that location.

E. Baseline for Action – Oak Island (Fort Caswell)

The baseline for consideration of action by a TAC from Sta. 60 to Sta. 30, the shoreline immediately adjacent to and under the influence of the inlet, shall be determined by analysis of surveyed beach profiles first initiated by the Wilmington District, USACOE in 2000. As discussed elsewhere, in this Plan, that data shall be updated at least once annually by either the Corps or the Village (if required).

The expanded database shall likewise be analyzed annually by the Village consultant and a determination as to recent changes in shoreline location reported in a Memorandum-of-Findings. Similarly, both an “annual profile by profile shoreline change” rate and an updated “trend rate” shall be computed for purpose of comparison with published annual and long term trend rates measured by survey since 2000 between oceanfront survey Stations 60-30. These are inclusive of the area of persistent observed recession (i.e. mol @STA 35 and 40). **Table 1** provides a summary of historical data for Sta 60 to Sta 30.

Should annual computed shoreline recession rates exceed by 50%, or more, the maximum measured annual recession rate (since 2000) at one or more of the designated survey locations, the TAC shall be requested to evaluate and determine the source of the additional erosion. Similarly, if the updated long term trend rate varies by 50%, or more from its last published value, the TAC shall be requested to evaluate and determine the source of the additional erosion or reduction in accretion (since 2000). In either event, a specific determination shall be made, and a report submitted to DCM, regarding any expectation that the causation of additional erosion is related to the terminal groin project.

IV. MITIGATION

A. West Beach

The highest priority for any required mitigation on West Beach would be alongshore sand placement sufficient to protect endangered residential structures and the total loss of protective dune formations. It is probable however that the timing of an expeditious (and sizeable) sand placement project may be adversely affected by other factors such as design document formulation, dredge availability, and public project bid requirements. As a result, the following interim actions may likewise need to be considered: (1) sand bag revetment construction along the section of shorefront where threatened structures exist, (2) temporary borrowing of sand mechanically from the updrift impoundment fillet of the terminal groin – with placement along the chronically eroded shorefront, or (3) both actions.

Coincident with any level of remedial action should be consideration of structure modification. In most instances, such an action would consist of rock removal from the structure crest sufficient to increase its transmissivity to sand transport. That is to say, its permeability (or "leakiness") would be increased. Such an action would *not* be expected to result in immediate benefits. Hence, it should be considered to be a secondary response in the hierarchy of remedial actions, as noted above, and as discussed in Section V.

B. Oak Island – Fort Caswell

As previously discussed, *no probability of shoreline change* at Oak Island is predicted by the comprehensive numerical modeling analyses performed on behalf of the Village. Hence, the previously discussed recommendation of the TAC if necessary – authorized to make a shoreline impact determination – in lieu of just the Applicant. Any recorded increase in erosion on the Eastern section of Oak Island that exceeds the baseline and is determined by the TAC to be caused by the Bald Head Island terminal groin project, would most likely need to be mitigated through direct sand placement. The most cost-effective future source of beach quality sand is the WHSMP, or sand dredged from within the limits of the federal navigation project by the Applicant. Alternately, the Village may consider, in consultation with the TAC, other measures to address the erosion, such as a sand push, sand stockpiling and transport of disposal sand, sandbag or other revetment, sand placement redesign of the federal disposal project limits of fill, or, in an extreme circumstance and absent more reasonable, cost-effective alternatives, reduction in size or removal of the terminal groin.

V. TERMINAL STRUCTURE ALTERATION

As discussed previously, the proposed terminal groin is to be constructed as a "leaky" structure with some level of reduced sediment transport continuing to occur either through and/or over the structure crest. As a rubble mound structure, sand permeability can be physically increased through the removal of stones. Any reduction in effective structural elevation will increase sediment transport across the groin. Increased transport would be conducive to spit or dry beach growth on the downdrift side of the structure which, in effect, would be expected to increase sediment transport to West Beach. Such "tuning" of a permeable structure is often desirable even if mitigation is not required. Normally, tuning would not occur without the benefit of significant post-construction monitoring, since the transmissivity of such a structure varies over time – dependent upon the condition (*i.e.* size and elevation) of the updrift sand fillet, seasonal wave climatology, storm effects and other site specific factors. In an extreme circumstance, and absent more reasonable, cost-effective alternatives, effective "removal" or major dismantling of the structure may be required.

To that end it should not be automatically assumed that if the Phase I terminal groin fails to meet its design goals that it should be completely removed from the shorefront. It is entirely likely, that the subject rock structure could be lowered to the point that it is almost entirely transparent to littoral transport – such that is posed no threat to the downdrift West Beach shoreline or other interests located on Oak Island. At the same time however, a very low level structure would serve to benefit the updrift – South Beach profile – albeit at a significantly lower level than originally proposed. That is to say, even without the creation of a protective updrift fillet, a low level rock structure could serve to beneficially act as a "template" to the overall updrift beach profile – thereby continuing to provide some level of benefit to both the island and the navigation project.

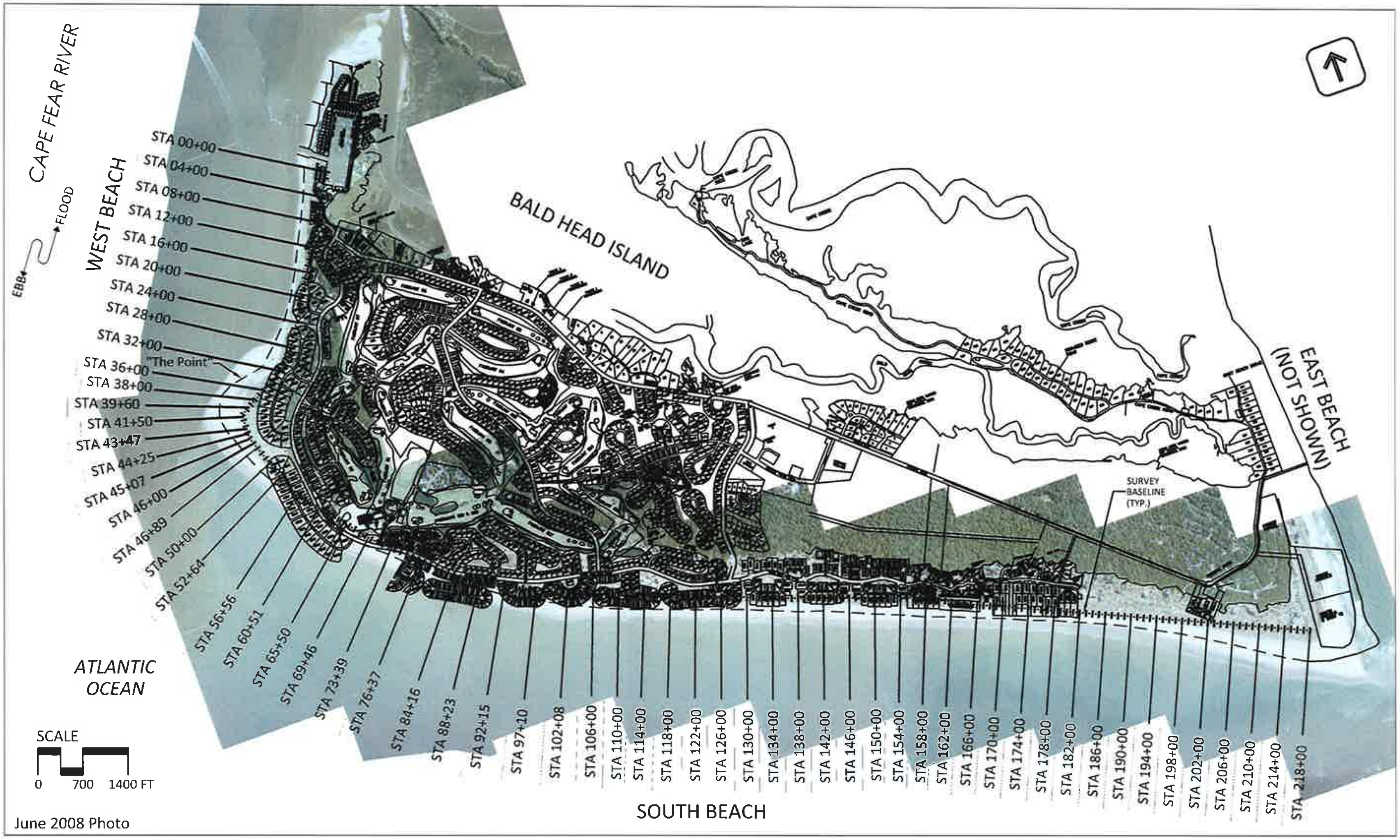


Figure 1: Island-wide beach monitoring baseline.

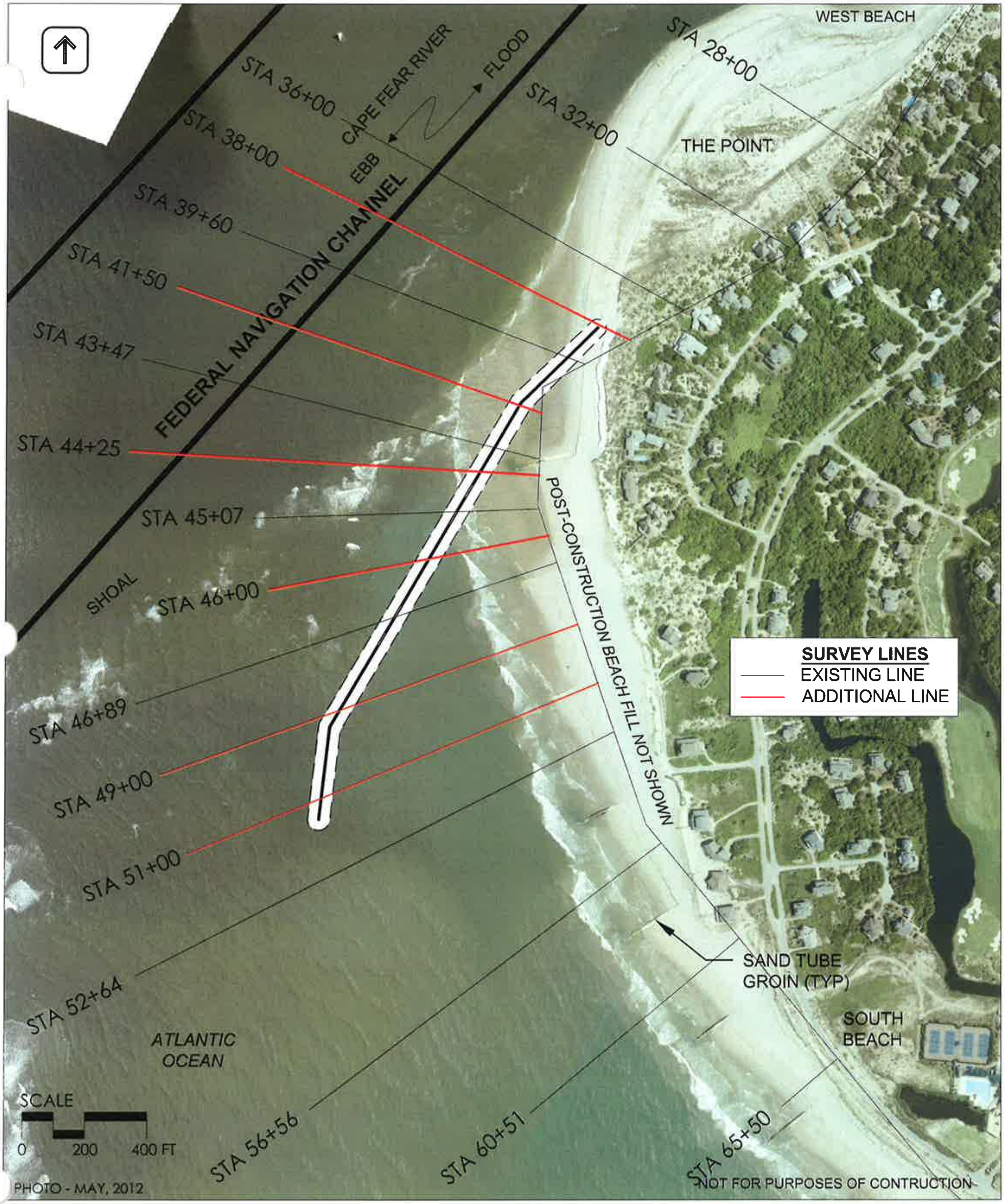


Figure 2: Survey Profile Lines in the Vicinity of the Terminal Structures

Figure 3: Location of Annual MHWL Surveys

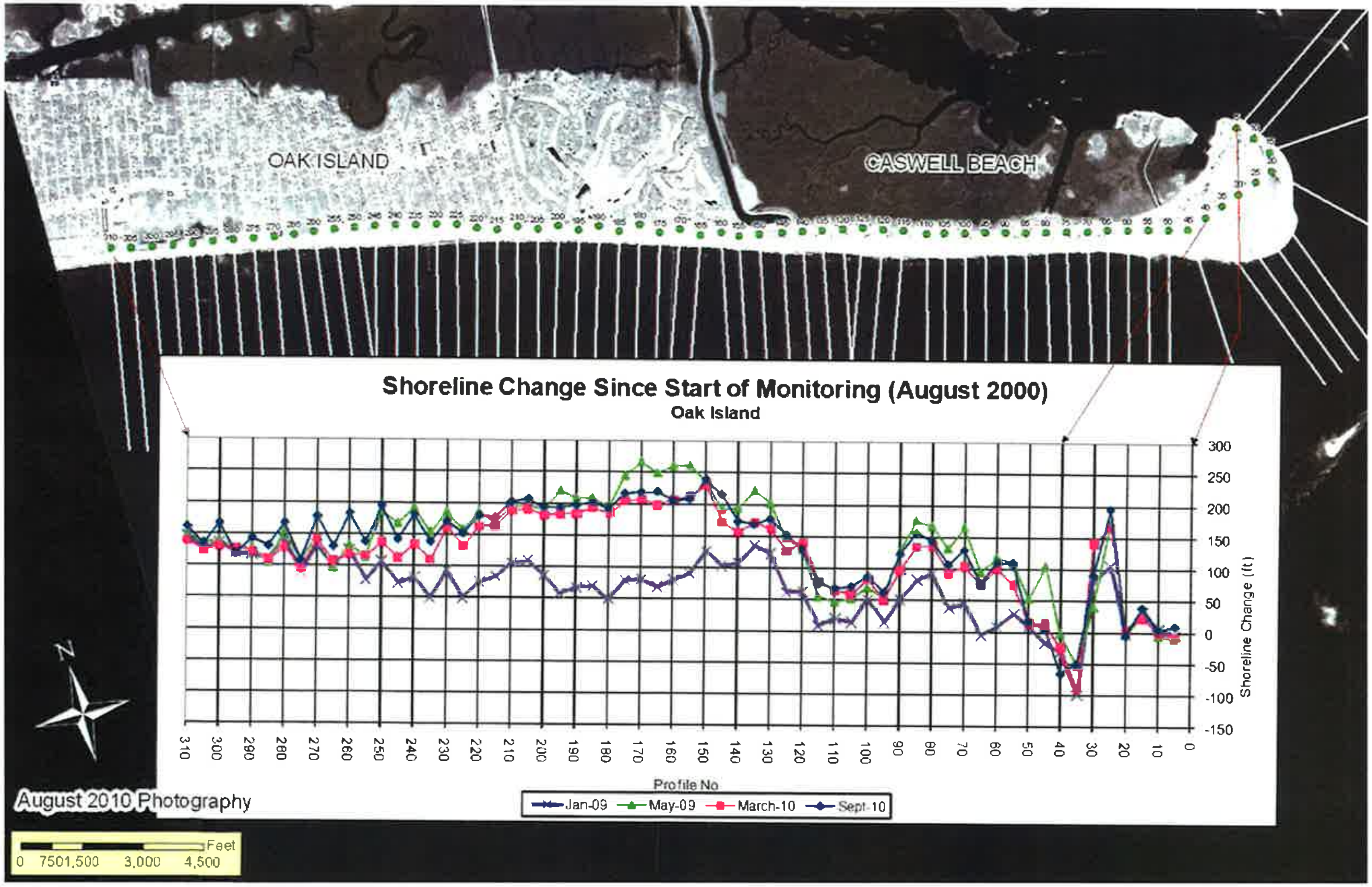


Figure 4: Example – Federal Monitoring Program for Oak Island.

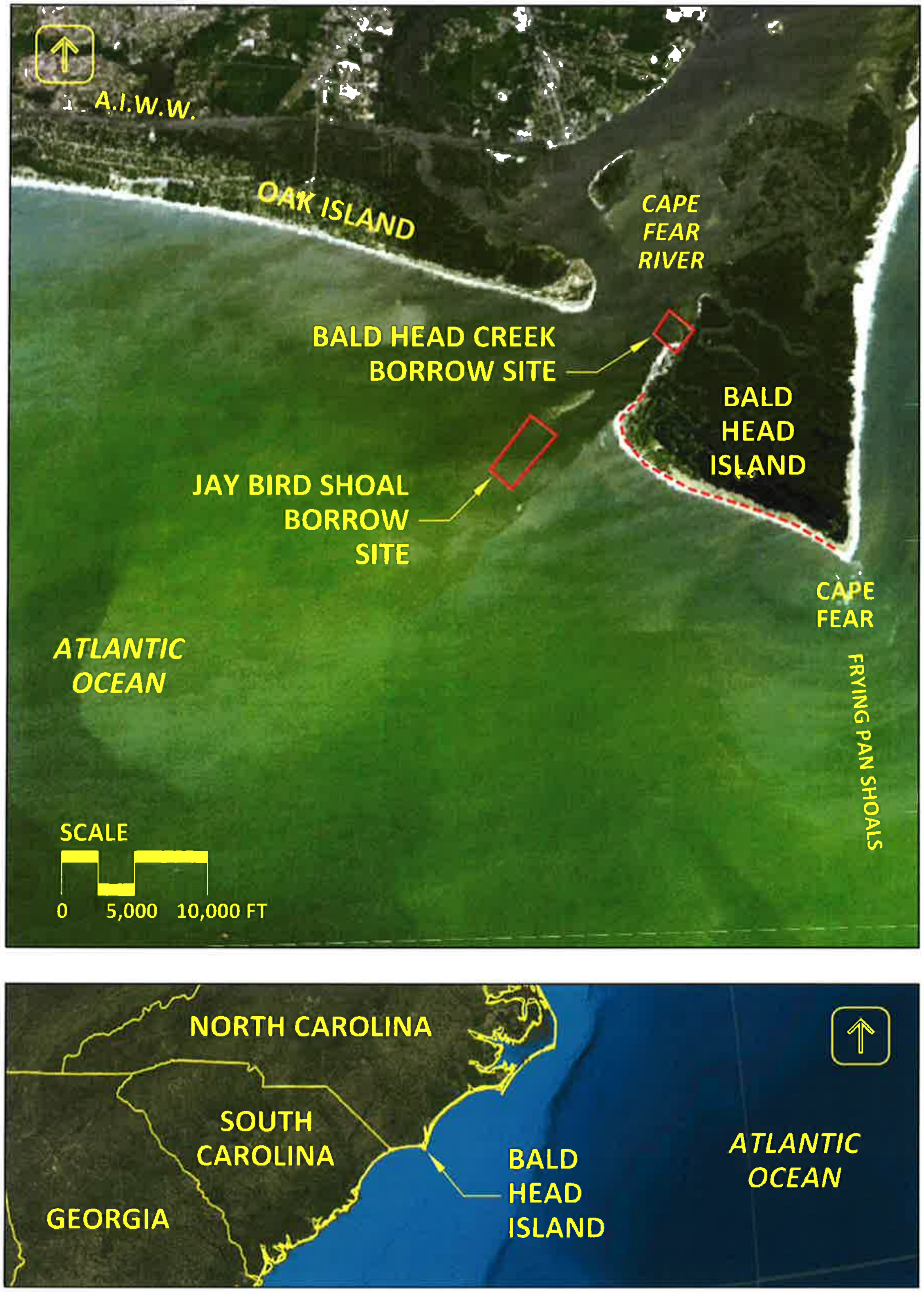


Figure 5: Borrow Sites Subject to Permit Required Monitoring

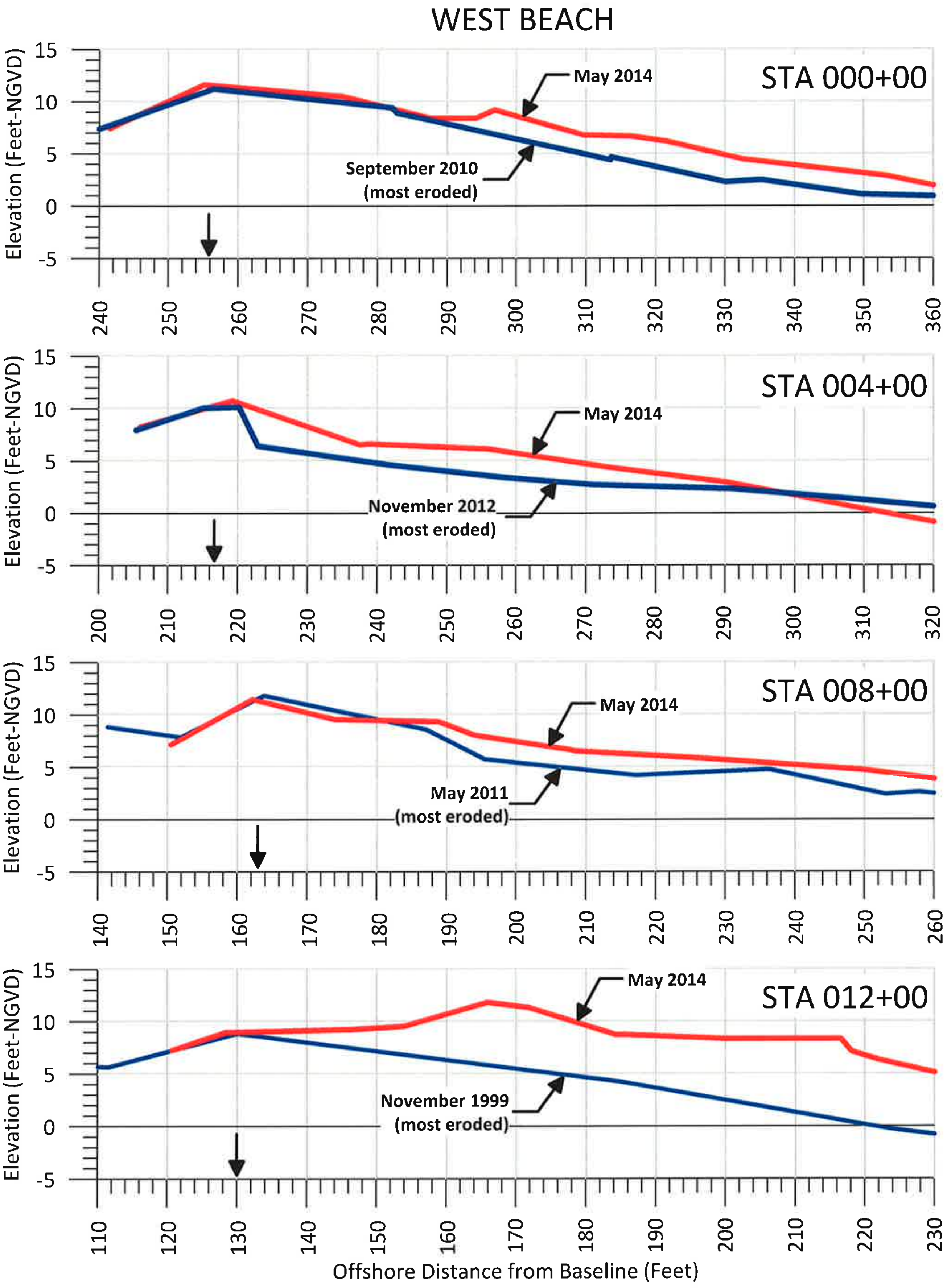


Figure 6: Location of maximum erosion at West Beach (2000-present).

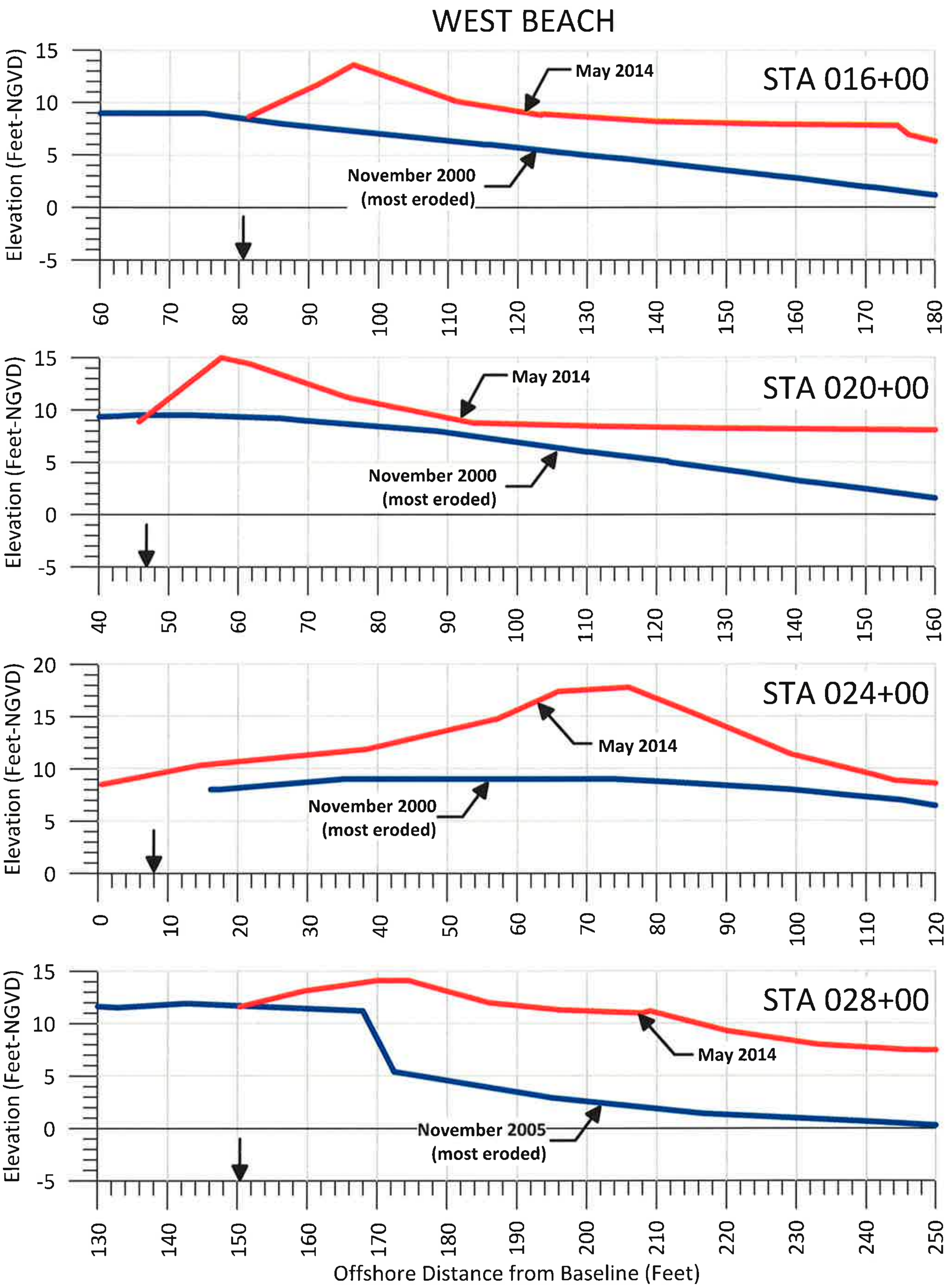


Figure 7: Location of maximum erosion at West Beach (2000-present).

TABLE 1

CASWELL BEACH MONITORING DATA[1] (STA 30 – 60)

Survey Station	Trend Long Term Rate (1)	Shoreline Maximum Annual Recession Rate (2)	Date of Occurrence
STA 60	+10.4 ft/yr.	-90 ft/yr.	2002
STA 55	+9.3 ft/yr.	-94 ft/yr.	2003
STA 50	+4.8 ft/yr.	-120 ft/yr.	2005
STA 45	+5.6 ft/yr.	-80 ft/yr.	2009
STA 40	-4.5 ft/yr.	-200 ft/yr.	2006
STA 35	-8.8 ft/yr.	-90 ft/yr.	2006
STA 30	+12.4 ft/yr.	-150 ft/yr.	2004

---

(1) Source – Wilmington District USACOE (2000-2010 – last published monitoring data – Report No. 8)

(2) Computed from COE survey data (6 mo. or 12 mo. Survey intervals)

APPENDIX C

SCOPING DOCUMENTS

ACTION: Notice to Delete a System of Records.

SUMMARY: The Defense Intelligence Agency is deleting a system of records notice in its existing inventory of record systems subject to the Privacy Act of 1974 (5 U.S.C. 552a), as amended.

DATES: This proposed action will be effective on April 13, 2012 unless comments are received which result in a contrary determination.

ADDRESSES: You may submit comments, identified by docket number and title, by any of the following methods:

* *Federal Rulemaking Portal: http://www.regulations.gov*. Follow the instructions for submitting comments.

* *Mail:* Federal Docket Management System Office, 4800 Mark Center Drive, East Tower, 2nd Floor, Suite 02G09, Alexandria, VA 22350–3100.

Instructions: All submissions received must include the agency name and docket number for this **Federal Register** document. The general policy for comments and other submissions from members of the public is to make these submissions available for public viewing on the Internet at *http://www.regulations.gov* as they are received without change, including any personal identifiers or contact information.

FOR FURTHER INFORMATION CONTACT: Ms. Theresa Lowery at (202) 231–1193.

SUPPLEMENTARY INFORMATION: The Defense Intelligence Agency systems of records notices subject to the Privacy Act of 1974 (5 U.S.C. 552a), as amended, have been published in the **Federal Register** and are available from the individual listed in **FOR FURTHER INFORMATION CONTACT**. The proposed deletion is not within the purview of subsection (r) of the Privacy Act of 1974 (5 U.S.C. 552a), as amended, which requires the submission of a new or altered system report.

Dated: March 8, 2012.

Aaron Siegel,

Alternate OSD Federal Register Liaison Officer, Department of Defense.

DELETION:

LDIA 06–0002

SYSTEM NAME:

Department of Defense Intelligence Information Systems Access, Authorization, and Control Records (April 11, 2007, 72 FR 18209).

REASON:

Records have been incorporated into LDIA 07–0003, entitled Department of Defense Intelligence Information System (DoDIIS) Customer Relationship Management System. The records will assume the same retention schedule as listed in LDIA 07–0003.

[FR Doc. 2012–6003 Filed 3–13–12; 8:45 am]

BILLING CODE 5001–06–P

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Intent To Prepare a Draft Environmental Impact Statement (DEIS) for the Installation of a Terminal Groin Structure at the Western End of South Beach, Bald Head Island, in Close Proximity to the Federal Wilmington Harbor Channel of the Cape Fear River (Brunswick County, NC)

AGENCY: Department of the Army, U.S. Army Corps of Engineers, DoD.

ACTION: Notice of intent.

SUMMARY: The U.S. Army Corps of Engineers (USACE), Wilmington District, Wilmington Regulatory Field Office has received a request for Department of the Army authorization, pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbor Act, from the Village of Bald Head Island (VBHI) to develop and implement a shoreline protection plan that includes the installation of a terminal groin structure on the east side of the Wilmington Harbor Baldhead Shoal Entrance Channel (a federally-maintained navigation channel of the Cape Fear River) at the "Point" of Bald Head Island. The structure will be designed to be strategically incorporated into the federal beach disposal operations associated with the Wilmington Harbor Sand Management Plan.

DATES: A public scoping meeting for the DEIS will be held at the ILA Hall, located at 211 West 10th Street in Southport (NC) on March 22, 2012 at 6 p.m. Written comments will be received until April 9, 2012.

ADDRESSES: Copies of comments and questions regarding scoping of the DEIS may be submitted to: U.S. Army Corps of Engineers, Wilmington District, Regulatory Division. ATTN: File Number SAW–2012–00040, 69 Darlington Avenue, Wilmington, NC 28403.

FOR FURTHER INFORMATION CONTACT: Questions about the proposed action and DEIS can be directed to Mr. David Timpy, Project Manager, Wilmington Regulatory Field Office, telephone: (910) 251–4634. Additional description of the VBHI's proposal can be found at the following link, *http://www.saw.usace.army.mil/WETLANDS/Projects/index.html,* under the Village of Bald Head Island Terminal Groin Project.

SUPPLEMENTARY INFORMATION:

1. Project Description

The west end of South Beach has experienced both chronic mid-term (decadal) and accelerated short-term erosion losses (with direct impacts to beaches and dunes of this segment of shoreline). A nourishment project has been employed by the VBHI to mitigate the effects of these losses. In addition, several million cubic yards of sand from a Federal navigation project has been disposed on the beach since 1991. Despite this sand placement on the beach, a portion of South Beach continues to experience substantial erosion, potentially impacting public infrastructure and homes. It is the VBHI's desire to implement a long-term beach and dune stabilization strategy. The applicant contends that a necessary component to the success of this strategy is the installation of a terminal groin that would (1) reduce inlet-directed sand losses from beach fill construction projects; and (2) stabilize shoreline alignment along the westernmost segment of South Beach in such a manner that alongshore transport rates are reduced. The VBHI proposal calls for the construction of a single terminal groin designed to compliment future placement of beach fill at South Beach. The structure will serve as a "template" for fill material placed eastward of the proposed terminal groin. In that regard, the groin will be designed as a "leaky" structure (i.e. semi-permeable) so as to provide for some level of sand transport to West Beach (located northward of the proposed groin).

2. Issues

There are several potential environmental and public interest issues that will be addressed in the DEIS. Additional issues may be identified during the scoping process. Issues initially identified as potentially significant include:

a. Potential impacts to marine biological resources (benthic organisms, passageway for fish and other marine life) and Essential Fish Habitat.

b. Potential impacts to threatened and endangered marine mammals, birds, fish, and plants.

c. Potential impacts to adjacent shoreline changes on West Beach of Bald Head Island and adjacent shorelines.

d. Potential impacts to Navigation, commercial and recreational.

e. Potential impacts to the long-term management of the oceanfront shorelines.

f. Potential effects on regional sand sources and how it relates to sand management practices and North Carolina's Beach Inlet Management Practices.

g. Potential effects of shoreline protection.

h. Potential impacts on public health and safety.

i. Potential impacts to recreational and commercial fishing.

j. Potential impacts to cultural resources.

k. Cumulative impacts of past, present, and foreseeable future dredging and nourishment activities.

3. Alternatives

Several alternatives are being considered for the development of the protection plan. These alternatives will be further formulated and developed during the scoping process and an appropriate range of alternatives, including the no federal action alternative, will be considered in the DEIS.

4. Scoping Process

A public scoping meeting (see **DATES**) will be held to receive public comment and assess public concerns regarding the appropriate scope and preparation of the DEIS. Participation in the public meeting by federal, state, and local agencies and other interested organizations and persons is encouraged.

The USACE will consult with the U.S. Fish and Wildlife Service under the Endangered Species Act and the Fish and Wildlife Coordination Act; with the National Marine Fisheries Service under the Magnuson-Stevens Fishery Conservation and Management Act and the Endangered Species Act; and with the North Carolina State Historic Preservation Office under the National Historic Preservation Act. Additionally, the USACE will coordinate the DEIS with the North Carolina Division of Water Quality (NCDWQ) to assess the potential water quality impacts pursuant to Section 401 of the Clean Water Act, and with the North Carolina Division of Coastal Management (NCDCM) to determine the projects consistency with the Coastal Zone Management Act. The USACE will closely work with NCDCM and NCDWQ in the development of the DEIS to ensure the process complies with current State Environmental Policy Act (SEPA) requirements. It is the intention of both the USACE and the State of North Carolina to consolidate the NEPA and SEPA processes thereby eliminating duplication.

6. Availability of the DEIS

The DEIS is expected to be published and circulated by the end of 2012. A public hearing will be held after the publication of the DEIS.

Dated: March 2, 2012.

Scott McLendon,

Assistant Chief, Regulatory Division.

[FR Doc. 2012–6127 Filed 3–13–12; 8:45 am]

BILLING CODE 3720–58–P

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Public Scoping Meeting and Preparation of Environmental Impact Statement for Baryonyx Corporation, Inc.'s Proposed Wind Farm, Offshore, Willacy and Cameron Counties, TX

AGENCY: Department of the Army, U.S. Army Corps of Engineers, DoD.

ACTION: Notice of Intent.

SUMMARY: The U.S. Army Corps of Engineers, Galveston District, has received a permit application for a Department of the Army (DA) Permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) and Section 404 of the Clean Water Act (33 U.S.C. 1344) from Baryonyx Corporation, Inc. (SWG–2011–00511) for the proposed approximately 300-turbine offshore wind farm located in the Gulf of Mexico state waters, offshore Willacy and Cameron Counties in state tracts: 1068, 1069, 1085, 1086, 1087, 1088, 1089, 1090, 1126, 1127, 1129, 1130 and 1131. The primary Federal involvement associated with the proposed action is the discharge or dredged or fill material into waters of the United States, and the construction of structures that may affect navigable waters. Federal authorizations for the proposed project would constitute a "major federal action." Based on the potential impacts, both individually and cumulatively, the Corps intends to prepare an Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act to render a final decision on the permit applications.

The Corps' decision will be to issue, issue with modification or deny DA permits for the proposed action. The EIS will assess the potential social, economic and environmental impacts of the construction and operation of the offshore wind farm, associated facilities, and appurtenances and is intended to be sufficient in scope to address Federal, State and local requirements, environmental and socio-economic issues concerning the proposed action, and permit reviews.

DATES: The agency must receive comments on or before May 14, 2012.

ADDRESSES: You may submit comments by any of the following methods: *Mail:* Jayson M. Hudson, U.S. Army Corps of Engineers, Regulatory Branch, P.O. Box 1229, Galveston, TX 77553–1229; *Fax:* (409) 766–3931 or *Email: SWG2011511@usace.army.mil.* Emailed comments, including attachments, should be provided in .doc, .docx, .pdf or .txt formats. Documents pertinent to the proposed project may be examined at *http://www.swg.usace.army.mil/reg/eis.asp.*

FOR FURTHER INFORMATION CONTACT: Mr. Jayson Hudson, (409) 766–3108.

SUPPLEMENTARY INFORMATION: The Galveston District intends to prepare an EIS on the proposed Baryonyx offshore wind farm which would include the proposed construction of approximately 300 offshore turbines in the Gulf of Mexico offshore Willacy and Cameron Counties, TX. Baryonyx Corporation, Inc. proposed this project and is the applicant for the DA permit SWG–2011–00511.

1. *Project Background:* The applicant proposes to construct an approximately 300-turbine wind farm in two areas referred to as the North Rio Grande Lease and Rio Grande Lease. The project is located in Gulf of Mexico state waters, offshore Willacy and Cameron Counties in state tracts: 1068, 1069, 1085, 1086, 1087, 1088, 1089, 1090, 1126, 1127, 1129, 1130 and 1131. The proposed project consists of the following:

a. *Wind Turbines and Foundations:* Each lease site will be comprised of 100–200 wind turbine generators in a grid pattern (turbine array). The final locations will be determined by consultation with appropriate state and federal agencies and consideration of constraints including: wind resource characteristics; safety and navigation; technical characteristics of the wind turbine generators; electrical collection system characteristics; geophysical site constraints; and environmental and ecological considerations. The specific turbine has not been selected so that Baryonyx may take advantage of the latest technologies in wind generation which may become commercially available at the time of procurement. Turbines will be installed onto individual platform foundations attached to the seabed. Foundation type

US Army Corps
Of Engineers
Wilmington District

PUBLIC NOTICE

Issue Date: March 14, 2012
Comment Deadline: April 13, 2012
Corps Action ID #: SAW-2012-00040

The Wilmington District, Corps of Engineers (Corps) has received a proposal from the Village of Bald Head Island (VBHI) seeking Department of the Army authorization to construct a terminal groin structure on Bald Head Island, Brunswick, North Carolina.

Current plans and location information are described below and shown on the attached plans. This Public Notice and all attached plans are also available on the Wilmington District Web Site at www.saw.usace.army.mil/wetlands

Applicant:

Calvin Peck
Village of Bald Head Island
Post Office Box 3009
Bald Head Island, North Carolina 28461-7000

AGENT (if applicable):

Erik J. Olsen
Olsen Associates, Inc.
2618 Herschel Street
Jacksonville, Florida 32204

Authority

The Corps will evaluate this application and a decide whether to issue, conditionally issue, or deny the proposed work pursuant to applicable procedures of Section 404 of the Clean Water Act (33 USC 1344) and Section 10 of the River and Harbors Act.

Location

Bald Head Island is located in Brunswick County, North Carolina at approximately 33°51' N, 78°00' W (Figure 1.1). It is roughly 25 miles south of the City of Wilmington and 32 miles east of the South Carolina/North Carolina state line. It is the southernmost of the coastal barrier islands which form the Smith Island complex at the mouth of the Cape Fear River. The southeastern tip of the island is Cape Fear (also referred to as Cape Fear Point) from which Frying Pan Shoals extend seaward over 20 miles to the southeast.

The island's east and south shorelines, "East Beach" and "South Beach", front the Atlantic shoreline. The west shoreline, or "West Beach", fronts the Cape Fear River. A depositional spit feature known as the "Point" lies at the juncture of West Beach and South Beach (see Figure 1.2). The north side of the island is bounded by the Bald Head Creek estuary, Middle Island and Bluff Island. The Cape Fear River entrance, over one mile in width, separates Bald Head Island from Oak Island (or Caswell Beach).

Existing Site Conditions

A temporary sand-filled tube groin field was constructed by the VBHI along the westernmost portion of South Beach in March 1996, immediately following completion of a1996 dredge disposal project constructed by the Wilmington District. Sixteen groins (sand-filled tubes) were constructed of geotextile material and filled with sand. These temporary groins were replaced by the applicant in 2005 and in 2009.

According to the applicant, the island's gross volumetric sediment loss over the period from November 2000 to May 2011 (excluding East Beach) was approximately 4.363 M cy, or approximately 415,000 cy per year. During this period, the largest erosion impacts occurred at the extreme west end of South Beach bordering the Cape Fear River entrance. Since 2001, the Wilmington District has placed approximately 4.09 mcy on the South Beach shoreline from material dredged during the Cape Fear River channel deepening/widening project and two channel maintenance projects. In 2009, the VBHI dredged approximately 1.85 mcy from Jay Bird shoals and placed this material onto South Beach and West Beach. In July 2011, the VBHI constructed an extension to groin no. 16 (located closest to the Cape Fear River Entrance). The need for this structure was due to severe erosion on the downdrift side of groin #16. In December 2011, the VBHI constructed approximately 350 ft. of sand bag revetment located downdrift of groin no. 16. The purpose of this structure is to alleviate erosion impacts to the adjacent dunes, roads, homes, habitat, and infrastructure occurring downdrift of groin #16. The VBHI recently placed approximately 140,000 cy of material at the western end of South Beach. The source of material for this project was Bald Head Creek shoal.

According to the applicant, the island's gross volumetric sediment loss over the November 2000 to May 2011 timeframe (excluding East Beach) was approximately 4.363 M cy, or approximately 415,000 cy per year – on "average". Most of this loss occurred at the extreme West end of South Beach bordering the Cape Fear River entrance. The assignment of an average annual long-term rate of sand loss at Bald Head Island however, is not necessarily a meaningful indicator of "erosional stress". According to the applicant, such a "rate" is temporally biased by factors such as periods of beach fill equilibrationand groin field performance as well as other physiographic phenomena. Figure 3.1 depicts the location of the MHWL over the time span extending from November 2000 through May 2011. A portion of the South Beach shoreline retreated by as much as 400 ft. since 2000 despite placement (approximately 6 mcy) of sand on South Beach. According to the applicant, this magnitude of shoreline realignment can be addressed by its proposed terminal groin structure – with concurrent beach fill.

The Applicant contends that dredging of the Wilmington Harbor Entrance Channel by the Corps of Engineers has caused accelerated erosion on South Beach. The Corps of Engineers recognizes that the VBHI has experienced serious erosion and dramatic shifts in shorelines over many years; however, we do not concur that maintenance of the Wilmington Harbor Entrance Channel is the cause of that erosion.

Applicant's Stated Purpose

According to information provided by the applicant, the purpose of the proposed work is to address accelerating erosion at the western end of South Beach and to thereby protect public infrastructure, roads, homes, beaches, protective dunes and wildlife habitat,.

Project Description

The VBHI is proposing to construct a single terminal groin designed to compliment future placement of beach fill at South Beach. The structure will serve as a "template" for fill material placed eastward of the proposed terminal groin. The proposed terminal groin will be designed as a "leaky" structure (i.e. semi-permeable) so as to provide for some level of sand transport to West Beach (located northward of the proposed groin). According to the applicant, this magnitude of shoreline realignment, as discussed above, can be addressed by its proposed terminal groin structure – with concurrent beach fill.

Other Required Authorizations

This notice and all applicable application materials are being forwarded to the appropriate State agencies for review. The Corps will generally not make a final permit decision until the North Carolina Division of Water Quality (NCDWQ) issues, denies, or waives State certification required by Section 401 of the Clean Water Act (PL 92-500). The receipt of the application and this public notice combined with appropriate application fee at the North Carolina Division of Water Quality central office in Raleigh will constitute initial receipt of an application for a 401 Water Quality Certification. A waiver will be deemed to occur if the NCDWQ fails to act on this request for certification within sixty days of the date of the receipt of this notice in the NCDWQ Central Office. Additional information regarding the Clean Water Act certification may be reviewed at the NCDWQ Central Office, 401 Oversight and Express Permits Unit, 2321 Crabtree Boulevard, Raleigh, North Carolina 27604-2260. All persons desiring to make comments regarding the application for certification under Section 401 of the Clean Water Act should do so in writing delivered to the North Carolina Division of Water Quality (NCDWQ), 1650 Mail Service Center, Raleigh, North Carolina 27699-1650 Attention: Ms Karen Higgins by April 6, 2012.

The applicant has not provided to the Corps, a certification statement that his/her proposed activity complies with and will be conducted in a manner that is consistent with the approved North Carolina Coastal Zone Management Program. Pursuant to 33 CFR 325.2(b)(2), the Corps can not issue a permit for the proposed work until the applicant submits such a certification to the Corps and the North Carolina Division of Coastal Management (NCDCM), and the NCDCM notifies the Corps that it concurs with the applicant's consistency certification.

Essential Fish Habitat

This notice initiates the Essential Fish Habitat (EFH) consultation requirements of the Magnuson-Stevens Fishery Conservation and Management Act. The Corps' initial determination is that the proposed project may adversely impact EFH or associated fisheries managed by the South Atlantic or Mid Atlantic Fishery Management Councils or the National Marine Fisheries Service. The potential impacts to EFH associated with the proposed groin structure and concurrent beach fill are not known at this time.

Cultural Resources

The Corps has consulted the latest published version of the National Register of Historic Places and is not aware that any registered properties, or properties listed as being eligible for inclusion therein are located within the project area or will be affected by the proposed work. Presently, unknown archeological, scientific, prehistoric, or historical data may be located within the project area and/or could be affected by the proposed work.

Endangered Species

The Corps has reviewed the project area, examined all information provided by the applicant and consulted the latest North Carolina Natural Heritage Database. Based on available information, the Corps has determined pursuant to the Endangered Species Act of 1973 (ESA), that the proposed project may affect federally listed endangered or threatened species or their formally designated critical habitat. The potential impacts associated with the construction of the proposed project to federal species protected under the ESA are not known at this time. Consultation under Section 7 of the ESA will be initiated and no permit will be issued until the consultation process is complete.

Evaluation

The decision whether to issue a permit will be based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity on the public interest.

That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, flood plain values (in accordance with Executive Order 11988), land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and, in general, the needs and welfare of the people. For activities involving the discharge of dredged or fill materials in waters of the United States, the evaluation of the impact of the activity on the public interest will include application of the Environmental Protection Agency's 404(b)(1) guidelines.

Commenting Information

The Corps of Engineers is soliciting comments from the public; Federal, State and local agencies and officials, including any consolidate State Viewpoint or written position of the Governor; Indian Tribes and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment (EA) and/or an Environmental Impact Statement (EIS) pursuant to the National Environmental Policy Act (NEPA). Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider the application. Requests for public hearings shall state, with particularity, the reasons for holding a public hearing. Requests for a public hearing shall be granted, unless the District Engineer determines that the issues raised are insubstantial or there is otherwise no valid interest to be served by a hearing.

Written comments pertinent to the proposed work, as outlined above, will be received by the Corps of Engineers, Wilmington District, until 5pm, April 13, 2012. Comments should be submitted to Dave Timpy, Project Manager, 69 Darlington Avenue, Wilmington, North Carolina, 28403, telephone (910) 251-4634.

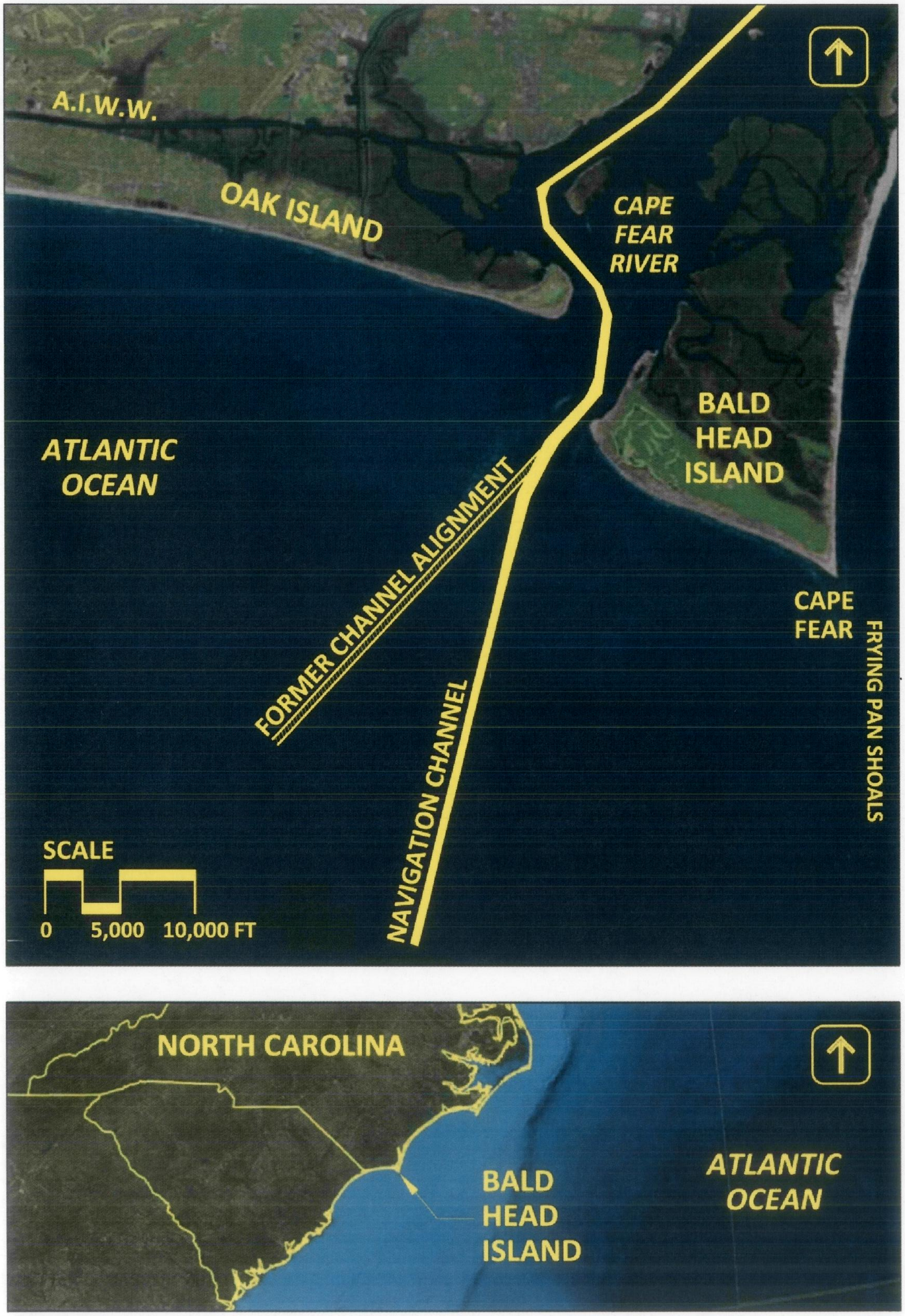


Figure 1.1: Location of Bald Head Island, N.C. and Federal Navigation Channel.

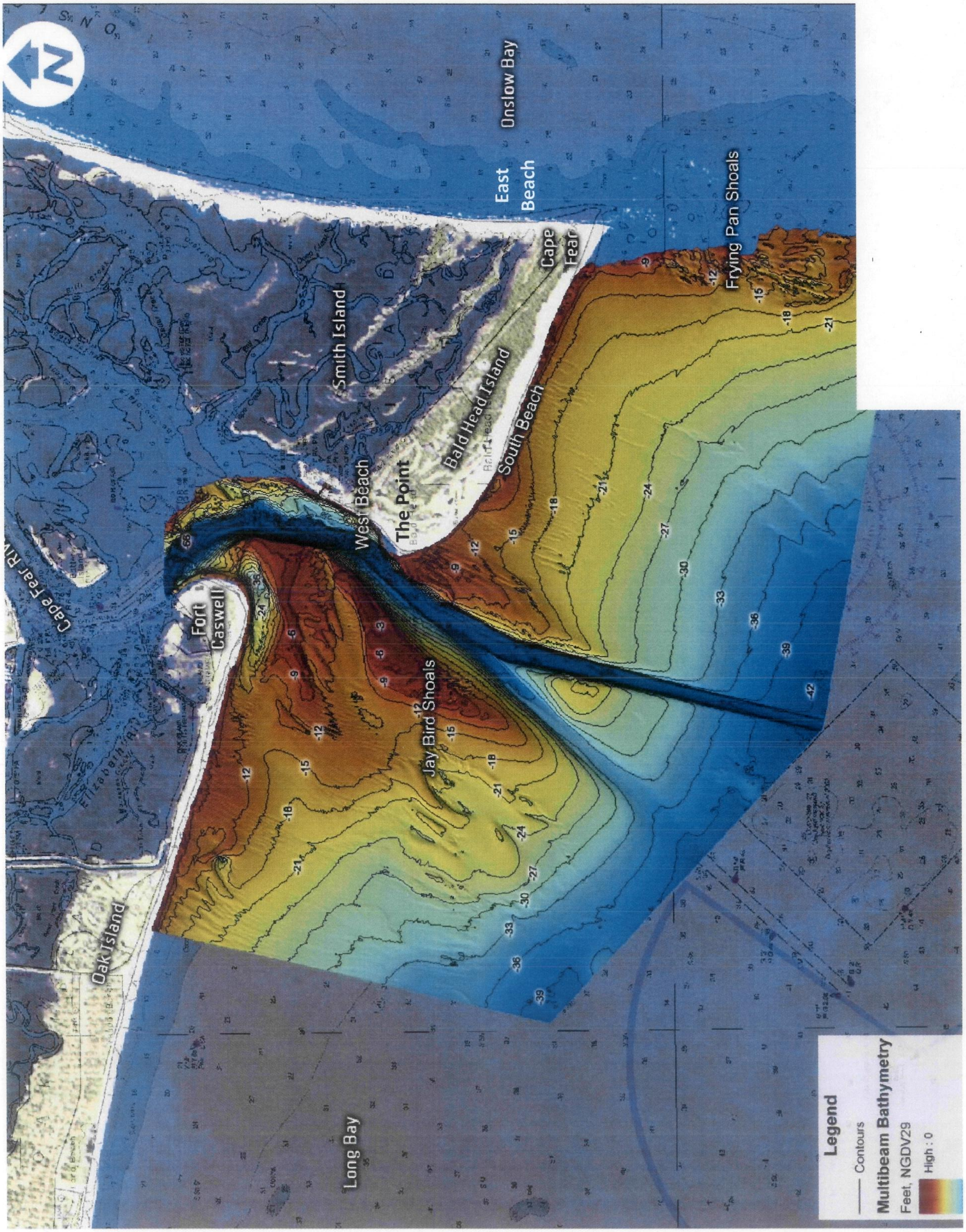


Figure 1.2: Bald Head Island/Oak Island/Cape Fear River.

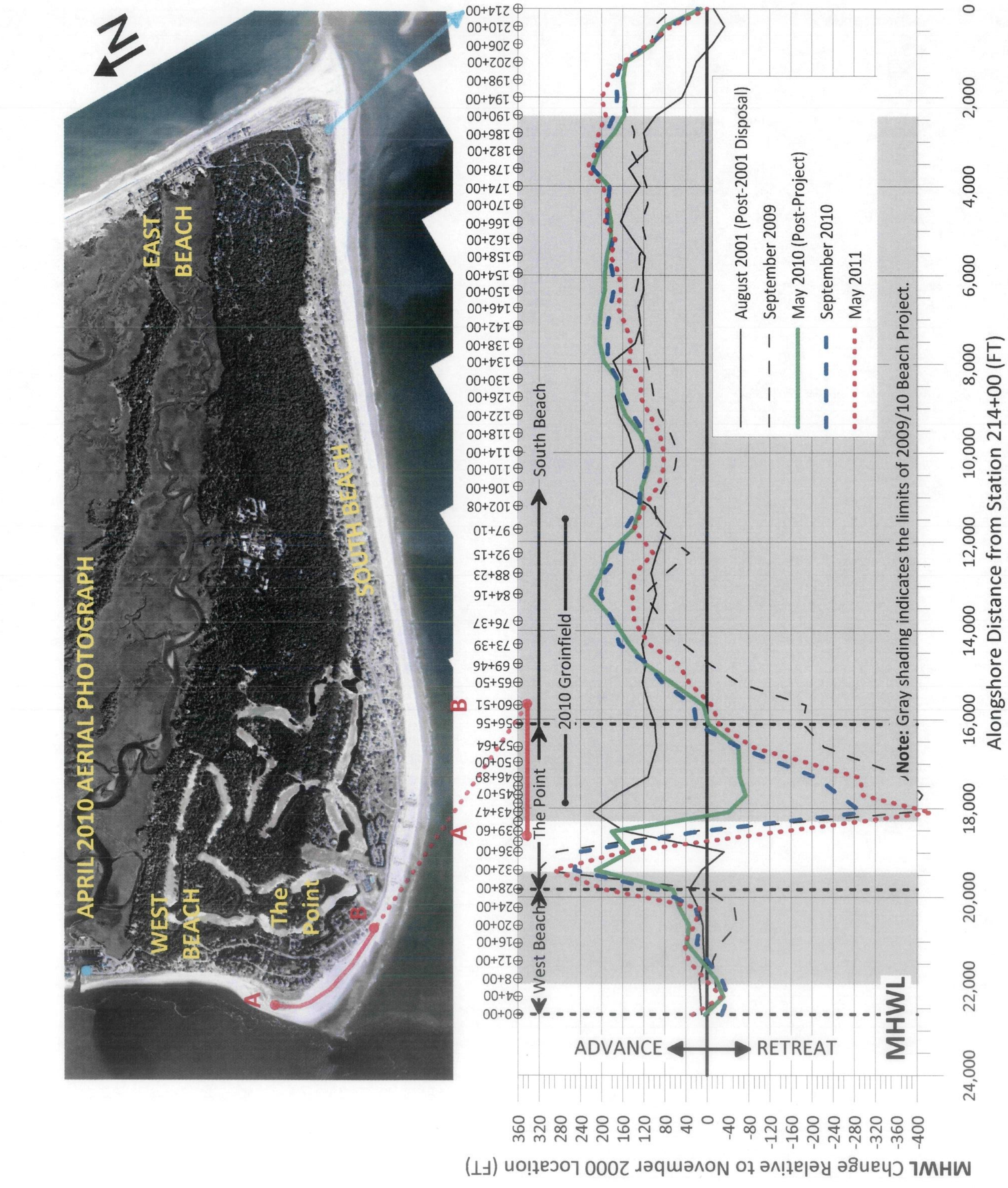


Figure 3.1: Location of the MHWL (+2.5 ft-NGVD) relative to the November 2000 survey.

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF:

May 11, 2012

Regulatory Division

Action ID No. SAW-2009-01242

Mr. Calvin Peck
Village of Bald Head Island
Post Office Box 3009
Bald Head Island, North Carolina 28461-7000

Dear Mr. Peck:

Reference our March 14, 2012 Public Notice describing the proposal by the Village of Bald Head Island to construct a shore protection project, including a terminal groin, on Bald Head Island, adjacent to the Northeast Cape Fear River, Brunswick County, North Carolina.

After review of your proposal, we have received comments from the North Carolina Division of Marine Fisheries (letter dated April 9, 2012), the North Carolina Division of Water Quality (letter dated March 21, 2012), the North Carolina State Historic Preservation Office (letter dated March 29, 2012), and the North Carolina Coastal Federation (letter dated April 12, 2012). Copies of all these letters are enclosed and have been previously provided to you by email. These comments and recommendations are due to anticipated adverse environmental impacts associated with your project.

Our administrative process provides you the opportunity to respond to the resource agency comments before we make a final permit decision. In this regard, please review the comments and recommendations and submit your written response to us on or before June 7th, 2012.

If you have questions or comments, please do not hesitate to contact me at telephone (910) 251-4634.

Sincerely,

Dave Timpy, Project Manager
Wilmington Regulatory Field Office

Enclosure

Copies Furnished (with enclosure):

Mr. Doug Huggett
Division of Coastal Management
North Carolina Department of
Environment and Natural Resources
400 Commerce Avenue
Morehead City, North Carolina 28557

Ms. Karen Higgins
Division of Environmental Management
North Carolina Department of
Environment and Natural Resources
1650 Mail Service Center
Raleigh, North Carolina 27699-1650

Mr. Ronald J. Mikulak, Chief
Wetlands Section - Region IV
Water Management Division
U.S. Environmental Protection Agency
61 Forsyth Street, SW
Atlanta, Georgia 30303

Mr. Pete Benjamin
U.S. Fish and Wildlife Service
Fish and Wildlife Enhancement
Post Office Box 33726
Raleigh, North Carolina 27636-3726

Mr. Ron Sechler
National Marine Fisheries Service
101 Pivers Island
Beaufort, North Carolina 28516

Ms. Rennee Gledhill Earley
North Carolina Department of Cultural
Resources
State Historic Preservation Office
4617 Mail Service Center
Raleigh, North Carolina 27699

Ms. Anne Deaton
Division of Marine Fisheries
North Carolina Department of
Environment and Natural Resources
127 Cardinal Drive Extension
Wilmington, North Carolina 28405

Ms. Jessi Baker
Division of Marine Fisheries
North Carolina Department of
Environment and Natural Resources
127 Cardinal Drive Extension
Wilmington, North Carolina 28405

Ms. Deborah Wilson
Division of Coastal Management
North Carolina Department of
Environment and Natural Resources
127 Cardinal Drive Extension
Wilmington, North Carolina 28405

Molly Ellwood
Southeastern Permit Coordinator
North Carolina Wildlife Resources
Commission, Habitat Conservation Program
127 Cardinal Drive
Wilmington, North Carolina 28405

✓ Christian Preziosi
Land Management Group, Inc
Post Office Box 2522
Wilmington, North Carolina 28402

NCDENR
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: Dave Timpy, Project Manager, Wilmington USACE Regulatory Field Office

THROUGH: Anne Deaton, DMF Habitat Section Chief

FROM: Jessi Baker, DMF Habitat Alteration Permit Reviewer

SUBJECT: Village of Bald Head Island Terminal Groin Draft EIS - Scoping

DATE: April 9, 2012

The North Carolina Division of Marine Fisheries (DMF) submits the following comments pursuant to General Statute 113-131. Representatives from DMF attended an agency scoping meeting in Wilmington, NC for the Village of Bald Head Island (VBHI) terminal groin on March 28, 2012. DMF has reviewed the Corps of Engineers Public Notice and the Bald Head Island Terminal Groin Work Plan for installing a terminal groin. The VBHI proposes to install a terminal groin with supplemental beach nourishment at the west end of South Beach (or "The Point") at the southernmost extent of the existing sand bag groin field.

The 2010 Coastal Habitat Protection Plan (CHPP) summarizes the latest scientific information available to assess the status and threats to marine fish habitats. The CHPP process brings state regulatory agencies together to implement the recommendations from the CHPP. The CHPP states that research is needed to determine when and where recruitment to adult fish stocks is limited by larval ingress to estuarine nursery habitats. The CHPP also states that the long-term consequences of hardened structures on larval transport and recruitment should also be thoroughly assessed prior to approval of such structures. DMF has concerns that terminal groins will alter larval transport and impact important fish habitats through altered beach and nearshore sediment and profile.

<u>Impacts to Larval Transport</u>

Terminal groins can potentially interfere with the passage of larvae and early juveniles from offshore spawning grounds into estuarine nursery areas. Successful transport of larvae through the inlet occurs within a narrow zone parallel to the shoreline and is highly dependent on along-shore transport processes (Blanton et al. 1999; Churchill et al. 1999; Hare et al. 1999). Obstacles such as jetties adjacent to inlets block the natural passage for larvae into inlets and reduce recruitment success (Kapolnai et al. 1996; Churchill et al. 1997; Blanton et al. 1999) (from 2010 CHPP).

DMF requests a detailed scientific field investigation, analysis, and modelling of larval transport dynamics that exist around Bald Head Island. This information should be used to model estimated impacts of the groin to larval ingress and egress through the inlet.

Impacts to Fish Habitat

DMF has significant concerns about the use of hardened shoreline stabilization techniques along high energy ocean shorelines due to accelerated erosion in some location along the shore as a result of the longshore sediment transport being altered. These structures may also modify sediment grain size, increase turbidity in the surf zone, narrow and steepen beaches, and result in reduced intertidal habitat and diversity and abundance of macroinvertebrates. Anchoring inlets may also prevent shoal formation and diminish ebb tidal deltas, which are important foraging grounds for many fish species (Deaton et al. 2010). Changes to the surf zone or inlet could affect species that depend on these areas for nursery, spawning, or foraging.

DMF requests a field investigation of the current distribution of larval and juvenile fishes in the vicinity of the inlet and the proposed groin location. These data can identify the most highly utilized habitat areas as well as serve as baseline data to compare to larval and juvenile fish monitoring data that should be collected after groin construction.

Due to the potential for altered sediment grain size, beach profile and intertidal habitat due to the influence of a groin, DMF requests benthic macroinvertebrate monitoring within the impact area of the proposed groins.

Based on these concerns, DMF also requests detailed discussions of the following be included in the EIS.

- All Essential Fish Habitat (EFH)and state protected habitats that occurs in this area
- All fish habitats outlined in the most recent NC Coastal Habitat Protection Plan (CHPP) that occur in the area
- Characterization of and potential impacts to fish and invertebrate community composition and abundance in the inlet and adjacent surf zone at Bald Head Island
- Compilation of relevant research regarding larval transport through inlets, especially inlets with hardened structures
- Potential impacts to the benthos of the surf/swash zone and nearshore areas and a detailed plan to monitor for impacts within the impact area of the proposed groins
- Potential impacts to commercial or recreational fishing including any indirect economic impacts due to adverse impacts to fish and fish habitat
- Potential direct impacts from dredging, beach placement and nearshore placement of sand, and how those impacts will be minimized
- Potential impacts on regional sand budgets

If the USACE would like assistance in locating information regarding the above topics or has any other questions, please contact Jessi Baker at (252) 808-8064 or jessi.baker@ncdenr.gov.

NCDENR
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: Dave Timpy, Project Manager, Wilmington USACE Regulatory Field Office

THROUGH: Anne Deaton, DMF Habitat Section Chief

FROM: Jessi Baker, DMF Habitat Alteration Permit Reviewer

SUBJECT: Village of Bald Head Island Terminal Groin Draft EIS - Scoping

DATE: April 9, 2012

The North Carolina Division of Marine Fisheries (DMF) submits the following comments pursuant to General Statute 113-131. Representatives from DMF attended an agency scoping meeting in Wilmington, NC for the Village of Bald Head Island (VBHI) terminal groin on March 28, 2012. DMF has reviewed the Corps of Engineers Public Notice and the Bald Head Island Terminal Groin Work Plan for installing a terminal groin. The VBHI proposes to install a terminal groin with supplemental beach nourishment at the west end of South Beach (or "The Point") at the southernmost extent of the existing sand bag groin field.

The 2010 Coastal Habitat Protection Plan (CHPP) summarizes the latest scientific information available to assess the status and threats to marine fish habitats. The CHPP process brings state regulatory agencies together to implement the recommendations from the CHPP. The CHPP states that research is needed to determine when and where recruitment to adult fish stocks is limited by larval ingress to estuarine nursery habitats. The CHPP also states that the long-term consequences of hardened structures on larval transport and recruitment should also be thoroughly assessed prior to approval of such structures. DMF has concerns that terminal groins will alter larval transport and impact important fish habitats through altered beach and nearshore sediment and profile.

Impacts to Larval Transport

Terminal groins can potentially interfere with the passage of larvae and early juveniles from offshore spawning grounds into estuarine nursery areas. Successful transport of larvae through the inlet occurs within a narrow zone parallel to the shoreline and is highly dependent on along-shore transport processes (Blanton et al. 1999; Churchill et al. 1999; Hare et al. 1999). Obstacles such as jetties adjacent to inlets block the natural passage for larvae into inlets and reduce recruitment success (Kapolnai et al. 1996; Churchill et al. 1997; Blanton et al. 1999) (from 2010 CHPP).

DMF requests a detailed scientific field investigation, analysis, and modelling of larval transport dynamics that exist around Bald Head Island. This information should be used to model estimated impacts of the groin to larval ingress and egress through the inlet.

2012-00040

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Water Quality

Beverly Eaves Perdue
Governor

Charles Wakild, P.E.
Director

Dee Freeman
Secretary

March 21, 2012

DWQ Project # 12-0288
Brunswick County

CERTIFIED RETURN RECEIPT REQUESTED

Village of Bald Head Island
Calvin Peck
PO Box 3009
Bald Head Island, North Carolina 28461-7000

RECEIVED
MAR 26 2012
REG. WILM. FLD. OFC.

Subject Property: **Village of Bald Head Island – Terminal Groin Structure**

REQUEST FOR MORE INFORMATION

Dear Mr. Peck,

The Division of Water Quality (DWQ) received a Public Notice issued by the US Army Corps of Engineers on March 15, 2012. An Individual 404 Permit will be required for this project (SAW-2012-00040). Please note that the following must be received prior to issuance of a 401 Water Quality Certification.

Additional Information Requested:

1. The 401 Certification cannot be processed until five (5) complete sets of the application and associated maps are received at the DWQ Central Office in Raleigh along with the appropriate fee.
   Any large scale maps that are provided also need to include a copy of the site plans on a cd. One (1) data CD of full size plans in TIFF Group 4 format (black and white, not grayscale or color). If the plans are too large to store in TIFF format, they can be stored in PDF. If you have questions pertaining to this, please call Bev Strickland at (919) 807-6350.

2. Application Fee: The fee for applications is now $240 for projects impacting less than an acre of wetland and less than 150 linear feet of streams (whether intermittent or perennial). For projects impacting one or more acres of wetland or 150 linear feet of streams (whether intermittent or perennial), the fee is $570.

Until the information requested in this letter is provided, I will request (by copy of this letter) that the Corps of Engineers place this project on hold. Also, this project will be placed on hold for our processing due to incomplete information (15A NCAC 2H .0507(a)).

Wetlands, Buffers, Stormwater, Compliance and Permitting unit (WBSCP)
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
Location: 512 N Salisbury Street Floor 9, Raleigh, North Carolina 27604-1170
Phone: 919-807-6300/Fax: 919-807-6494
Internet: www.ncwaterquality.org

Thank you for your attention. If you have any questions, please contact me in our Central Office in Raleigh at (919) 807-6360 or Ian McMillan at (919) 807-6364.

Sincerely,

Karen A. Higgins, Supervisor
Wetlands, Buffers, Stormwater, Compliance
and Permitting Unit (Webscape)

KAH/*ljd*

cc: USACE Wilmington Regulatory Field Office
Olsen Associates, Inc., Erik J Olsen, 2618 Herschel St, Jacksonville FL 32204
File Copy

Filename: 120288VBHITerminalGroinStructure(Brunswick)_Hold_ IP_NeedSets_Fee

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

RECEIVED
MAY 18 2012
REG. WILM. FLD. OFC.

May 14, 2012

Mr. David Timpy
U. S. Army Corps of Engineers
Wilmington Regulatory Field Office
P. O. Box 1890
Wilmington, North Carolina 28402-1890

Subject: Action ID #SAW- 2012-00040; Village of Bald Head Island
Brunswick County, NC

Dear Mr. Timpy:

This letter provides the comments of the U. S. Fish and Wildlife Service (Service) on the subject Public Notice (PN), dated March 14, 2012, and in response to a request for comments at the April 24, 2012 Project Delivery Team (PDT) meeting. The applicant, the Village of Bald Head Island (VBHI), has applied for a Department of the Army (DA) permit to construct a terminal groin structure on Bald Head Island in the Atlantic Ocean. These comments are submitted in accordance with the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661-667d). Comments related to the FWCA are to be used in your determination of compliance with 404(b)(1) guidelines (40 CFR 230) and in your public interest review (33 CFR 320.4) in relation to the protection of fish and wildlife resources. Additional comments are provided regarding the District Engineer's determination of project impacts pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543).

Project Area, Proposed Activities, and Anticipated Impacts

The project area is South Beach and the adjacent Atlantic Ocean on Bald Head Island. The waters of the project area are classified as SB. The area is not designated as a Primary Nursery Area (PNA) and is not closed to the taking of shellfish. The substrate of the project area is primarily sand.

The applicant proposes to construct a single terminal groin, to complement future placement of beach fill at South Beach. The groin is intended to be a "leaky" structure, so as to provide for a level of sand transport to West Beach, which is located northward of the proposed groin. According to information provided at the April 24, 2012 PDT meeting, the groin is proposed to be constructed in "the dry." In other words, the applicant proposes to place the sand first on the nearshore area, and then construct the terminal groin. The applicant states that the nourishment portion of the project is proposed to be conducted during the sea turtle nesting season.

Federally Protected Species

The Service has reviewed available information on federally-threatened or endangered species known to occur in Brunswick County. Our review indicates that several species may occur in the project area, including the West Indian manatee (*Trichechus manatus*), piping plovers (*Charadrius melodus*), seabeach amaranth (*Amaranthus pumilus*), and the Kemp's Ridley (*Lepidochelys kempi*), hawksbill (*Eretmochelys imbricata*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), and green (*Chelonia mydas*) sea turtles. Of the five sea turtle species, the loggerhead (*Caretta caretta*), and green (*Chelonia mydas*) sea turtle may nest in the project area. Whales, shortnose sturgeon (*Acipenser brevisrostrum*), Atlantic sturgeon (*Acipenser oxyrinchus*), and sea turtles in the water are under the jurisdiction of NOAA Fisheries' Protected Species Division.

Manatees move along the Atlantic Coast during summer months and are seasonal transients in North Carolina, primarily from June through October. Manatees may be found in water over one meter (3.3 feet) deep. The species moves extensively when in North Carolina waters and past occurrence records cannot be used to precisely determine the likelihood that it will be present at a particular construction site.

Seabeach amaranth, an annual plant, exists adjacent to inlets, along beaches between dunes and the high tide line, and in areas of extreme overwash. The plant helps to trap sand and build dunes. The species is listed as threatened by both the federal government and the State of North Carolina. Suitable habitat for this plant occurs in the project area. Seabeach amaranth begins to flower as soon as plants have reached sufficient size, sometimes as early as June, but more typically commencing in July and continuing until the death of the plant in late fall. Seed production begins in July or August and peaks in September during most years, but continues until the death of the plant. The proposed work period would place sand on the beach when only seeds are present. Sediment placement may bury seeds on the beach and delay germination the following year, but the seeds are likely to remain viable and may germinate when the imported sand washes away.

Piping plovers, designated as federally threatened, are known to occur in the project area, but there is no designated critical habitat on Bald Head Island. Piping plovers nest above the high tide line on coastal beaches; on sand flats at the ends of sand spits and barrier islands; on gently sloping foredunes; in blowout areas behind primary dunes (overwashes); in sparsely vegetated dunes; and in overwash areas cut into or between dunes. The species requires broad, open, sand flats for feeding, and undisturbed flats with low dunes and sparse dune grasses for nesting. Piping plovers from the federally endangered Great Lakes population as well birds from the threatened populations of the Atlantic Coast and Northern Great Plains overwinter on North Carolina beaches. Piping plovers arrive on their breeding grounds in late March or early April. Following establishment of nesting territories and courtship rituals, the pair forms a depression in the sand, where the female lays her eggs. By early September both adults and young depart for their wintering areas.

Service Concerns and Recommendations

As stated above, the applicant states that the nourishment portion of the project is proposed to be conducted during the sea turtle nesting season. It is also likely that the proposed window for beach nourishment includes the nesting period for piping plovers. The Service recommends that the environmental document(s) clearly discern the proposed timeframes for beach nourishment and potential impacts to nesting sea turtles, the West Indian manatee, seabeach amaranth, and piping plovers. Potential impacts to these species on Oak Island should also be fully considered. The environmental document(s) should discuss the potential impacts that may occur if sediment disposals associated with the Wilmington Harbor Sand Management Plan (SMP) occur on Oak Island within the same year.

Section 4.4 of the January 2012 NEPA/EIS work plan states "the proposed structure will be designed to be strategically incorporated into the beach disposal operations associated with the Wilmington Harbor Sand Management Plan. The latter program provides the equivalent of 1 M cy of high quality sand every two years. It is anticipated that construction of the proposed structure would be timed sufficient to take advantage of the beach disposal event's ability to fill the terminal groin to capacity so as to minimize the probability of downdrift impacts after installation." However, as mentioned above, the applicant stated at the April 24, 2012 meeting that the beach is proposed to be nourished before the groin is constructed. The EIS should outline the proposed construction logistics and timelines, and examine whether the available sources of sand are adequate to meet the proposed method and schedule of construction. The environmental documents should also examine the long-term effects to the listed species listed above from the proposed beach nourishment schedule (every two years).

Potential impacts to the levels of erosion on Oak Island and West Beach from the construction of the terminal groin should be fully examined in the environmental documents. The analysis should include how potential impacts to Oak Island will affect listed species.

The Cumulative Impacts Analysis should include an analysis of potential sea-level rise scenarios (similar to what is required by Engineer Circular EC 1165-2-211), and the potential influence that sea-level rise will have on the structural integrity of the terminal groin and the nourishment schedule during the proposed life of the project.

Summary

The Service appreciates the opportunity to comment on this PN. We look forward to working with the Project Development Team (PDT) to review the EIS/EA and Biological Assessment. If you have questions regarding these comments or wish to discuss the development of the coordinated federal position, please contact Kathy Matthews at 919-856-4520, ext. 27 or by e-mail at <kathryn_matthews@fws.gov >.

Sincerely,

John Ellis for

Peter Benjamin
Field Supervisor

cc:

Ron Sechler, NOAA Fisheries, Beaufort
Molly Ellwood , NC Wildlife Resources Commission, Wilmington
Doug Huggett, NC Division of Coastal Management, Morehead City
Jessi Baker, NC Division of Marine Fisheries, Wilmington
Chad Coburn, NC Division of Water Quality, Wilmington

North Carolina Coastal Federation
CITIZENS WORKING TOGETHER FOR A HEALTHY COAST
Celebrating 30 Years of Coastal Conservation
1982-2012

April 12, 2012

Dave Timpy
Project Manager
US Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403-1343

Re: Village of Bald Head Island Terminal Groin Scoping Comments: Corps Action ID#: SAW-2012-00040

Dear Mr. Timpy:

Please accept these comments regarding the needed scope of the Environmental Impact Statement (EIS) that will be prepared to evaluate a possible terminal groin at the Village of Bald Head Island to address the erosion at the western end of South Beach. These comments are based upon the federation's experience with beach and inlet management in North Carolina, and participation in the development of numerous environmental reviews for beach and inlet management projects. In addition, our direct participation in the development of terminal groin legislation in North Carolina during 2011 (NC General Assembly Senate Bill 110) as well as at the scoping meeting held by the Corps on March 8, 2012, allow us to provide some insights into issues that need to be thoroughly vetted by this environmental analysis.

To provide adequate and useful information to federal and state agencies to make permit decisions regarding this proposed project, the federal EIS that is ultimately prepared for this project must address and resolve significant regulatory requirements that are specified in the terminal groin law enacted in 2011 by the North Carolina General Assembly. This law is being incorporated into the federally approved coastal plan for North Carolina, and therefore, there is an obligation by all federal agencies to act in a manner consistent with the state's plan as mandated by the Coastal Zone Management Act of 1972.

Fortunately, the Council of Environmental Quality's (CEQ) guidelines call for detailed descriptions of proposed alternatives as well as for a thorough explanation of their rejection (CFR 40 § 1502.14(a-f)). This is further supported by the NCGS § 113A-4 that defines the information the state agency needs to include in an EIS to satisfy state environmental review requirements. Similarly, the NCGS § 113 A – 115.1 (e)(1) requires the applicant for the permit to submit "information to demonstrate that ... non structural approaches to erosion control including relocation of threatened structures, are impractical." Under state law, no permit for a terminal groin can be issued if nonstructural alternatives are practical and will achieve the project's purpose.

The applicant's stated purpose of the project is to implement an erosion control and beach/dune restoration that will provide long-term protection to residential structures and Town infrastructure along the western end of South Beach. The applicant also states the project would be expected to complement existing island wide nourishment activities and is expected to protect town infrastructure, roads, homes, beaches, protective dunes and wildlife habitat.

The project description is troublesome in that the applicant clearly states its preferred alternative before any alternatives have been thoroughly investigated and discussed during the formal EIS process. It would seem reasonable to limit the project's purpose as stated in the public notice, and vet all alternatives prior to selection of the preferred alternative by the applicant. The description of the project purpose in the Corps public notice dated March 14, 2012 would provide that overall general purpose of the applicant but it instead takes the leap from that stated purpose to the specific alternative of a terminal groin which would seem to prejudice the project's stated purpose from the beginning.

Clearly other alternatives must be evaluated, and non-structural alternatives may be much more practical once the total benefits and costs of this project are more fully understood. Other communities have selected to pursue non-structural alternatives to achieve similar project purposes. For example, the Town of North Topsail Beach has chosen the option of inlet channel relocation over the one of building a terminal groin. Similar inlet channel relocation projects have been permitted in the past at both Mason and Bogue Inlets.

In addition, the applicant also needs to provide detailed information necessary to "demonstrate that structures or infrastructures are imminently threatened by erosion." [NCGS § 113 A – 115.1 (e)(1))]. According to 15A NCAC 07H.0308, imminently threatened structures are defined as those which "foundation, septic system, or right-of-way in the case of roads, is less than 20 feet away from the erosion scarp." The actual number and location of structures that qualify as "imminently threatened" based upon the rules of the Coastal Resources Commission need to be identified.

In relation to the latter it is paramount for the applicant to demonstrate that "the construction and maintenance of the terminal groin will not result in significant adverse impacts to private property or to the public recreational beach" [NCGS § 113 A – 115.1 (f)(4)]. In order to comply with this requirement the applicant needs to identify what constitutes a significant "negative" impact that must be mitigated as well as what boundaries (and specifically why certain boundaries are chosen over others) the applicant is considering when demonstrating lack of significant adverse impacts.

NCGS § 113 A – 115.1 (f)(5) also requires the post-project monitoring and necessary mitigation. To comply with this the project application must show one crucial component

- the definition of thresholds. This definition will serve the dual purpose: serve as a baseline for determining mitigation of any future adverse impacts; and serve as a baseline for future monitoring. Shifting baselines, a widely accepted term among scientific community, is used to describe ways in which significant changes in a system are measured against previous reference points or baselines. Failure to identify correct baseline can significantly affect future assessment of not only monitoring of natural systems, but also of mitigation of the adverse impacts to the natural system and private property as well.

The federation suggests that the thresholds be determined based upon the predictions of future shoreline and inlet configurations that are associated with each individual project alternative identified in the EIS. In order to demonstrate that non-structural alternatives are impractical, the EIS must clearly prove that a terminal groin will result in more beneficial shoreline and inlet configurations that cost-effectively accomplish the project purposes. This means the terminal groin alternative must then deliver on what the applicant promises since any future shoreline and inlet configurations that could have been achieved with a non-structural alternative constitute unacceptable performance by the terminal groin. Therefore, the thresholds for mitigation of unacceptable impacts caused by the preferred alternative are any actual beach and inlet configurations that could have been achieved by using a non-structural alternative or no action.

In evaluating the costs and benefits of various project alternatives, the applicant should represent scenarios that include the effects of storms on the project area. The applicant should compare the effects of storms on the project area with a terminal groin, with non-structural alternatives, and with no action. If the applicant is unable to account for the effects of storms in predicting and comparing project benefits and costs among various alternatives, then the state law will make the applicant liable for future damages that result from storms once the terminal groin is constructed. In other words, if the EIS indicates that the terminal groin will protect property, and property--supposedly protected is later lost during a storm--that constitutes a project failure unless those losses are not accounted for upfront in the analysis of alternatives.

According to National Atmospheric and Oceanic Administration and the U.S. Geological Service, recent data show that the coast of North Carolina will likely be affected by more than 60 hurricanes in a 100-year period. It is, therefore, reasonable to assume that the proposed project will be affected by at least one major storm with catastrophic consequences over its projected lifetime (which in the case of terminal groins is 30 years). The CEQ defines those “impacts which have catastrophic consequences, even if their probability of occurrence is low” as “reasonably foreseeable” (CFR 40 § 1502.22(b)(4), and hence requires to the applicant to include them in the EIS. Therefore, the applicant should account for the impacts of storms when drafting the EIS for the proposed project.

State law requires that the applicant for a terminal groin submit proof of financial assurance (bond, escrow account or other financial instrument) that can cover the costs of monitoring and maintenance, implementation of mitigation measures and modification and/or removal of the structure, as well as of restoration of public and private property negatively affected by the structure. These exact costs of this bond, insurance policy, or escrow account need to be determined so they can be factored into the cost/benefit analysis that is done as part of the alternatives analysis. Additional project costs that need to be determined include the increased commitment to beach nourishment near the inlet as well as inlet management costs and how the proposed terminal groin will affect the inlet as well as the inlet inner beaches and estuarine ecosystems. Also, the EIS should detail the costs of preparing the EIS, obtaining permits, and expected legal proceedings since any permitting around this issue is likely to be challenged through the courts. These total costs of the project are necessary to fully evaluate project alternatives, and especially to determine if the terminal groin option is practical, feasible, and cost-effective.

Below is a list of other information and issues that the EIS should address:

- The CRC terminal groin report dated March 1, 2010 recommended strategies other than hardened structures to protect beaches and manage inlets should always be considered first. To comply with state policy, investigating non-structural alternatives should be the main objective of this analysis, not rationalizing the construction of a terminal groin. Non-structural approaches to erosion control include inlet channel relocation, beach nourishment, relocation of structures and relocation of power, water and sewer infrastructure in a manner and location to protect such infrastructure and public health and safety.
- Jurisdictional 404 wetlands throughout the project area must be identified and mapped. This area includes both sides of the inlet. Any impacts to jurisdictional wetlands need to be evaluated, and compliance with avoidance, minimization and mitigation requirements explained for each project alternative.
- “Critical habitat” as defined by the US Fish and Wildlife Service needs to be mapped on both sides of the inlet. The effects of the project alternatives need to be evaluated on this habitat. There now seems to be a general agreement by some regulators and agencies that some protected species, such as the federally listed endangered Piping Plover, can adapt to changes in its required habitat and “find new places to live” are troublesome to say the least. Critical habitats must be identified and protected as much as reasonably possible due to any impacts of proposed beach erosion measures.
- Structures or infrastructures that are imminently threatened by erosion” as defined by 15A NCAC 07H.0308 need to be identified and mapped. “Imminently threatened structures” are defined as those which “foundation, septic system, or right-of-way in the case of roads, is less than 20-feet away from the erosion scarp.”
- A plan for construction and maintenance of the proposed terminal groin and its accompanying beach fill project that is prepared by a professional engineer licensed to practice in North Carolina must be provided as part of the terminal groin option (NCGS § 113 A – 115.1(e)(4)).

- A plan for the management of the inlet and the estuarine and ocean shorelines immediately adjacent to and under the influence of the inlet must be provided. The inlet management plan shall do all of the following relative to the terminal groin alternative and its accompanying beach fill project (NCGS § 113 A – 115.1 (e)(5)):
    - Describe the post-construction activities that the applicant will undertake to monitor the impacts on coastal resources.
    - Define the baseline for assessing any adverse impacts and the thresholds for when the adverse impacts must be mitigated. (These thresholds should correlate with the various alternatives evaluated by the EIS, and any performance of the terminal groin alternative that could have been achieved by a non-structural alternative should be identified as an "adverse impact.")
    - Identify mitigation measures to be implemented if adverse impacts reach the thresholds defined above, and state the costs of these mitigation measures.
    - Provide for modification or removal of the terminal groin if the adverse impacts cannot be mitigated and the costs for these modifications and removal.
- Under each possible project alternative, identify those property owners and local governments on both sides of the inlet that may be affected.
- Identify funding sources necessary to fund the terminal groin and beach fill alternative (including the costs of developing this EIS and obtaining permits) over its design life given that no state funds are available for these projects, and local funds spent on these projects by a local government need voter approval. No permits for Terminal groins can be issued in North Carolina where funds are generated from any of the following financing mechanisms and would be used for any activity related to the terminal groin or its accompanying beach fill project (NCGS § 113 A – 115.1 (h)):
    - Special obligation bonds issued pursuant to Chapter 1591 of the General Statutes.
    - Nonvoted general obligation bonds issued pursuant to G.S. 1590148.
    - Financing contracts entered into under G.S. 160A-20 or G.S. 159-148.
- The applicant must provide cost estimates for the required financial assurances specified by state law for a terminal groin project. These assurances must be in the form of a bond, insurance policy, escrow account or other financial instrument, that is adequate to cover the cost of:
    - Removal of the terminal groin and restoration of the beach if it is determined by an independent third party that the groin has an adverse impact on the environment or on other properties, and;
    - Removal of the terminal groin and restoration of the beach if it is determined that the groin has an adverse impact on the environment or on other properties and on the federal navigation channel, and;
    - Long-term maintenance of the terminal groin, including the cost of any required mitigation measures and compliance with all conditions of the permit and variance.

- Detailed information about storm impact and effects upon the terminal groin and also on the inlet dynamics and morphology, the beach profile, sand resources, residential structures, private property, adjacent properties, and the natural resources and environment of the permit area due to the placement of the terminal groin.
- Detailed information and modeling on the impacts of sea level rise on the terminal groin and the resulting effects upon inlet dynamics, adjacent property, beach profiles, residential structures and the natural resources and environment of the island and adjacent islands and estuarine habitats and resources.
- The development of accurate cost-benefit analysis to ensure the costs of storm events is appropriately considered and modeled using real world and real time property appraisals for all project alternatives. The high risk of significant storm damage to beach front properties should be part of the cost-benefit analysis and used to discount the project benefits for each possible alternative considered.
- The economic costs and benefits of each project alternative should include the positive economic values associated with natural inlet processes (fishing, tourism, habitat creation, and larvae transport and fish migration).
- Detailed study and modeling of the effect of any proposed terminal groin on the inlet dynamics, which increase the frequency of, needed dredging and could have long-term negative impacts upon the structure itself and on adjacent shorelines both east and west of the groin. The effect of the groin on inlet narrowing and loss of natural inlet shoals and sand flats should be investigated as well at the possible increase in tidal flow due to inlet morphology changes.
- Thorough modeling of the effects of the terminal groin on the ebb shoal deflation should be considered along with both the economic and resource related costs. This loss of sediment volume could steepen the near shore beach profiles and in turn increase the wave energy reaching the coast and inner inlet areas.
- Thorough modeling of the effects of the terminal groin on the navigation channel and the effects of the continued required navigation channel maintenance and dredging on the integrity of the terminal groin itself and its proposed functions and purported benefits.
- Incorporation of the state Beach and Inlet Management plan into the EIS process and consideration of those recommendations for avoidance of hardened structures on the beach.
- Consideration of the proposed terminal groin and its possible effects of reducing the long shore transport of sediment to the area identified as “West Beach” and how that reduction of sediment will affect erosion or accretion at that location as and that potential effect upon the areas natural resources and public and private infrastructure.
- Identification of the purpose and need to keep the existing permitted sand filled tube groins in addition to the construction of a terminal groin as proposed. Detailed analysis of the success or failure of the permitted sand groins and detailed modeling of the effects of the terminal groin with the sand groins removed and kept upon the affected areas and requested terminal groin.
- Consideration of the proposed terminal groin and its possible effect upon the east end of Oak Island, the historic sites, public and private property. Detailed

modeling should be required to review the possible effects of the proposed groin upon the federal navigation project and detailed modeling and monitoring of any impacts upon that public project as a result of a terminal groin.

- The effects of the terminal groin on the critical piping plover habitat on each side of the inlet must be evaluated. How the project will comply with the Endangered Species Act must be addressed.
- The potential effects of the terminal groin upon the just listed Atlantic Sturgeon on the federal Endangered Species Act and upon the Short Eared Sturgeon, Eastern Manatee and other endangered marine life that utilize the Cape Fear River and inlet channel in their life cycle.
- The effects of the terminal groin upon endangered sea turtle habitat on both Bald Head Beaches and beaches at Oak Island should be thoroughly researched and analyzed.
  -The potential effects of the design of the proposed terminal groin as a "leaky" structure should be researched and analyzed and how any injury or death will be avoided due to the leaky structure design from trapping sea turtles and other critical marine and mammals within the groin itself.
- - How will both adult and hatching sea turtles survive storm and wave action in and around the terminal groin?
- The proposed terminal groin is described as a leaky structure. Detailed description of that structure should include it's "leakage" rate and how that will affect the required beach nourishment and identify milestones that should be established to address the groin's leakage rate. How will this leakage rate affect the use of the public beach and its affect upon the natural resources of the beach community? How will the leakage rate affect erosion or accretion on the "West Beach" area and how will that leakage rate be calculated.
- Consideration of the gradual blockage of the "leaky" groin due to growth of marine life, debris and other impediments and what measures and strategies will be designed to address this possibility.
- The potential effects of the groin upon the Cape Fear River inlet system, tidal flow and fish migration should be investigated as well as the effects upon Jaybird shoals and essential fish habitat identified in the inlet system.
- Proof and analysis that a terminal groin will reduce the frequency of required beach nourishment and address how the proposed "leaky" structure will affect that required frequency.
- A terminal groin could negatively affect an inlet's equilibrium and its ability to maintain a sediment balance. This could result in more manipulation of the inlet and associated costs to the overall long-term project. These long-term management costs need to be determined and factored into the alternatives analysis.
- One option that is not addressed in the proposal is to augment or enhance and improve the current permitted sand filled tubes to address the erosion issues and perform a detailed analysis of the sand filled tube groin field success and how those permitted structures could be revised to fulfill the projects stated purpose.
- If the permitted sand filled groin field is allowed to remain and a terminal groin is permitted will that violate the intent and language of Senate Bill 110? According

to the approved legislation only one terminal groin will be permitted at the end of a barrier island. The 16 sand filled groins, if left on the public beach, might violate the intent and spirit of the approved legislation. A legal opinion of this issue should be considered by the state and the Coastal Resources Commission.

The Federation has serious concerns about the proposed terminal groin project at Bald Head Island. A careful analysis of alternatives that are evaluated based upon the requirements established by the NC General Assembly are likely to show that non-structural alternatives are more cost-effective and practical. The Corps must ensure that the EIS addresses these explicit state mandates since they are part of the state's coastal management requirements and program.

We appreciate the opportunity to comment and be involved in this project. Please do not hesitate to contact us if you have any questions of need any clarification of these preliminary comments. We intend to fully participate in the development of this EIS, the review of project permits, and any court proceedings that might follow.

With best regards,

Mike Giles

Mike Giles
Coastal Advocate

Ana Zivanovic-Nenadovic
Program and Policy Analyst

North Carolina Department of Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Beverly Eaves Perdue, Governor
Linda A. Carlisle, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

RECEIVED
MAR 30 2012
REG. WILM. FLD. OFC.

March 29, 2012

Dave Timpy
US Army Corps of Engineers
Wilmington Regulatory Field Office
69 Darlington Avenue,
Wilmington, NC 28403

Re: Construction of a Terminal Groin at the Juncture of Bald Head Island and the Entrance to the Cape Fear River, SAW 2012-00040, Brunswick County, ER 12-0437

Dear Mr. Timpy,

We have reviewed the above public notice concerning proposed plans to construct a terminal groin at the juncture of Bald Head Island and the entrance to the Cape Fear River. Your agency and the applicant should be aware that the Office of State Archaeology underwater research files have references to extensive maritime activities and shipwreck losses in the general project vicinity; therefore, much of the project area holds a high potential for containing submerged cultural resources. Three known shipwrecks (*La Rosa de Bilbao*, 1804; *Ella*, 1864; USS *Violet*, 1864) and two probable shipwrecks are located within less than one mile of the proposed groin.

While no known archaeological sites are within the project boundaries, the project area has never been systematically surveyed to determine the location or significance of submerged cultural resources. As the project creates a bottom disturbance that may damage unknown elements of our underwater cultural heritage we recommend that a comprehensive survey be conducted by an experienced archaeologist to identify the presence and significance of submerged archaeological remains lying within the project boundaries. Potential effects on these resources should be assessed prior to the initiation of construction activities.

A list of archaeological consultants who have conducted or expressed an interest in contract work in North Carolina is available at http://www.archaeology.ncdcr.gov/ncarch/resource/consultants.htm. The archaeologists listed, or any other experienced archaeologist, may be contacted to conduct the recommended investigation.

These comments are made pursuant to Section 106 of the National Historic Preservation Act of 1966, North Carolina legislation (G.S. 121-22 to 28, Article 3), and the Abandoned Shipwreck Act of 1987 (P.L. 100-298).

We have determined that the project as proposed will not have an effect on any historic structures.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579. In all future communication concerning this project, please cite the above referenced ER tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

cc: Calvin Peck, Village of Bald Head Island
Eric Olsen, Olsen Associates, Inc.

RECEIVED

JAN 2 2 2013

North Carolina Department of Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Pat McCrory, Governor
Susan W. Kluttz, Secretary
Kevin Cherry, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

January 17, 2013

Dave Timpy
US Army Corps of Engineers
Wilmington Regulatory Field Office
69 Darlington Avenue,
Wilmington, NC 28403

Re: Construction of a Terminal Groin at the Juncture of Bald Head Island and the Entrance to the Cape Fear River, SAW 2012-00040, Brunswick County, ER 12-0437

Dear Mr. Timpy,

We have received the archaeological survey report "A Phase I Remote-Sensing Archaeological Survey & Phase II Shipwreck Assessment at the Location of a Proposed Terminal Groin at the Mouth of the Cape Fear River, Bald Head Island, Brunswick County, North Carolina" from Tidewater Atlantic Research, Inc. (TAR) for the above project. The report meets our office's guidelines and those of the Secretary of the Interior and we would like to take this opportunity to comment.

The terrestrial and underwater survey conducted by TAR identified 104 magnetic anomalies and two acoustic targets. A cluster of four magnetic anomalies (86, 89, 90, and 93) associated with one acoustic signature were generated by the remains of a vessel requiring additional archaeological investigation. The remaining targets were determined to not warrant further investigation.

A Phase II non-disturbance investigation of the shipwreck remains, determined it to be a large wood hull sailing vessel dating to the late 19th or early 20th century. This shipwreck is deemed potentially eligible and requires avoidance. Because the wreck is located within 70 feet of the proposed groin location, TAR proposed a shift in the construction alignment to provide a minimum 150 foot buffer. We concur with this recommendation that a 150 foot buffer is required around the wreck location. Additionally, during construction all contractors should be made aware of the location of the wreck and provide assurance that vessels and equipment engaged in construction of the groin will not infringe on the buffer created, to preserve the surviving vessel remains.

These comments are made pursuant to Section 106 of the National Historic Preservation Act of 1966, North Carolina legislation (G.S. 121-22 to 28, Article 3), and the Abandoned Shipwreck Act of 1987 (P.L. 100-298).

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579. In all future communication concerning this project, please cite the above referenced ER tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

cc: Chris McCall,Village of Bald Head Island
Eric Olsen, Olsen Associates, Inc.

Village of Bald Head Island Shoreline Protection Project - Scoping Comment Table

No.	Nature of Comment (Summary)	Agency/Entity	Category	Inclusion in DEIS
1	Limit project purpose as stated in public notice and vet all alternatives prior to selection of applicant's preferred alternative	NCCF	Alternatives Analysis	Sections 1.0 and 3.0
2	Provide detailed information necessary to "demonstrate that structures or infrastructures are imminently threatened by erosion"	NCCF	SB 110 State Regulation	Section 4.0 provides information to demonstrate that structures are threatened by erosion
3	Define mitigation thresholds and correct baseline/boundaries for determining mitigation	NCCF	SB 110 State Regulation	Inlet Management Plan (Appendix B)
4	Include information on impacts of storms on terminal groin and project area	NCCF	Meteorological/Storm	Storm Response Simulation (Appendix P)
5	Determine costs of financial assurance (bond, escrow account, insurance policy) and include cost/benefit analysis as part of alternatives analysis	NCCF	Financial/Economic	Beyond Scope of EIS
6	Include costs of preparation of document, obtaining permits and expected legal costs if final permit is challenged through the courts	NCCF	Financial/Economic	Beyond Scope of EIS
7	Investigate non-structural alternatives prior to rationalization of construction of terminal groin (ie. inlet channel relocation, beach nourishment, relocation of structure and infrastructure	NCCF	Physical	Section 3.0
8	Identify and map 404 wetlands on both sides of inlet, evaluate impacts of project alternatives on resource	NCCF	Wetlands	Section 4.0 (Bald Head Island wetlands), Oak Island wetland delineation beyond scope of EIS
9	Identify and map "critical habitat" as defined by USFWS on both sides of inlet, evaluate impacts of project alternatives on resource	NCCF	Habitat	No USFWS Critical Habitat in project area
10	Identify and map structures and infrastructure "imminently threatened by erosion" as defined by 15A NCAC 07H.0308	NCCF	Public/Private Property	Section 5.0 and Figures 5.30-5.37
11	Professional engineer licensed in NC should prepare plan for construction and maintenance of proposed terminal groin and accompanying beachfill project	NCCF	Physical	Olsen Associates Engineering Report (Olsen 2013)
12	Include "inlet management plan" for inlet, estuarine and ocean shorelines adjacent to and under influence of inlet	NCCF	SB 110 State Regulation	Inlet Management Plan (Appendix B)
13	Identify property owners and local governments on both sides of inlet that may be impacted for each project alternative	NCCF	Public/Private Property	CAMA Major Application

No.	Nature of Comment (Summary)	Agency/Entity	Category	Inclusion in DEIS
14	Identify funding sources for terminal groin and beachfill alternative assuming no state funds available and voter approval necessary for local government funding	NCCF	Financial/Economic	Not currently addressed
15	Provide cost estimates for required financial assurances specified by state law including removal of terminal groin/restoration of beach and long term maintenance of terminal groin	NCCF	Financial/Economic	Economic considerations identified in Section 5.14
16	Include information on potential storm impacts to inlet dynamics/morphology, beach profile, sand resources, residential structures, private property, adjacent property and natural resources in permit area	NCCF	Meteorological/Storm	Refer to Engineering Report
17	Include information and model of impacts of sea level rise on terminal groin and resultant impacts to inlet dynamics, adjacent property, beach profiles, residential structures, natural resources/environment of island, adjacent islands and estuarine habitats	NCCF	Sea Level Rise	Section 4.0 and Section 5.0; Scale of sea level rise not able to be accounted for in modeling
18	Include cost-benefit analysis associated with storms for each project alternative using real world property appraisals, including risk of storm damage to beach front properties	NCCF	Financial/Economic	Beyond Scope of EIS
19	Include cost-benefit analysis of positive economic values associated with natural inlet processes (fishing, tourism, habitat creation, larval transport and fish migration)	NCCF	Financial/Economic	Section 5.14
20	Study/model effects of terminal groin on inlet dynamics, including alteration of dredge frequency, structural integrity of groin, and impacts to shoreline east and west of terminal groin	NCCF	Physical	Olsen Associates Engineering Report (Olsen 2013)
21	Study/model effects of terminal groin on ebb shoal deflation and associated economic and resource related costs	NCCF	Physical/Economic	Olsen Associates Engineering Report (Olsen 2013), Economics of shoal deflation beyond scope of EIS
22	Study/model effects of terminal groin on federal navigation project (including impacts to terminal groin associated with future navigation channel maintenance events), include plan for monitoring these impacts	NCCF	Physical	Inlet Management Plan (Appendix B) and Olsen Associates Engineering Report (Olsen 2013)

Village of Bald Head Island Shoreline Protection Project - Scoping Comment Table

No.	Nature of Comment (Summary)	Agency/Entity	Category	Inclusion in DEIS
23	Assess impacts to longshore transport of sediment to West Beach and resultant erosion/accretion including impacts to natural resources and infrastructure from erosion/accretion	NCCF	Physical	Section 5.0 and Olsen Associates Engineering Report (Olsen 2013)
24	Study/model need for existing sand tube groin field in addition to construction of terminal groin, include effects of project without sand tube groin field	NCCF	Physical	Section 5.0 and Olsen Associates Engineering Report (Olsen 2013)
25	Assess effects of terminal groin on Oak Island (historic sites, public and private infrastructure)	NCCF	Physical	Olsen Associates Engineering Report (Olsen 2013)
26	Address impacts to piping plover habitat on both sides of inlet and compliance with Endangered Species Act	NCCF	Threatened and Endangered Species	Section 5.4 and Biological Assessment (to be submitted to USFWS)
27	Address impacts to Atlantic Sturgeon, Shortnose Sturgeon, Eastern Manatee and other endangered marine life in project area	NCCF	Threatened and Endangered Species	Section 5.4, Biological Assessment and Essential Fish Habitat (to be submitted to NMFS)
28	Address impacts to sea turtle habitat on Bald Head Island	NCCF	Sea Turtles	Section 5.4 and Biological Assessment
29	Address impacts to sea turtle habitat on Oak Island	NCCF	Sea Turtles	Section 5.0 addresses potential downdrift physical impacts. No impact to sea turtle nesting on Oak Island
30	Analysis of physical impacts of 'leaky' structure to sea turtles, critical marine and mammals	NCCF	Physical	Section 5.4, Biological Assessment and Essential Fish Habitat Report
31	Assess how adult and hatching turtles will survive storm and wave action in and around terminal groin	NCCF	Sea Turtles	Section 5.4 and Biological Assessment
32	Include 'leakage' rate of terminal groin, calculation of 'leakage' rate and milestones to address/monitor 'leakage' rate	NCCF	Physical	Section 3.0 and Engineering Report
33	Assess impacts of groin 'leakage' to beach nourishment, public beach, beach natural resources, erosion/accretion on West Beach	NCCF	Physical	Olsen Associates Engineering Report (Olsen 2013)

Village of Bald Head Island Shoreline Protection Project - Scoping Comment Table

No.	Nature of Comment (Summary)	Agency/Entity	Category	Inclusion in DEIS
34	Address potential blockage of 'leaky' groin (i.e. growth of marine life, debris, etc.) and strategies to address blockages	NCCF	Physical	Physical monitoring and maintenance as identified in Inlet Management Plan
35	Assess terminal groin impacts to Cape Fear River inlet system, tidal flow and fish migration, EFH and Jay Bird Shoals	NCCF	Physical	Section 5.5, Olsen Associates Engineering Report (Olsen 2013); Appendix M and Essential Fish Habitat Report
36	Provide proof and analysis that terminal groin will reduce beach nourishment	NCCF	Physical	Olsen Associates Engineering Report (Olsen 2013)
37	Assess effects of 'leaky' structure on frequency of beach nourishment	NCCF	Physical	Olsen Associates Engineering Report (Olsen 2013)
38	Study effects of terminal groin on inlet sediment balance and include resultant inlet/sediment management costs in project alternatives	NCCF	Physical	Olsen Associates Engineering Report (Olsen 2013) and Inlet Management Plan (Appendix B)
39	Include enhancement/revision of existing sand tube groin field as project alternative, including analysis of sand tube success on the Island	NCCF	Physical	Section 1.4 and 3.2
40	Is combination of both sand tube groin field permit plus TG permit a violation of SB 110? provide legal opinion from state and CRC	NCCF	SB 110 State Regulation	Not currently addressed
41	Determine if recruitment to adult fish stocks is limited by larval ingress to estuarine nursery habitats	NC DMF	Fisheries	Fish Larvae Response Model (Appendix M); EFH Report
42	Study effects of terminal groin on larval transport through altered beach and nearshore sediment profile	NC DMF	Fisheries	Fish Larvae Response Model (Appendix M); EFH Report
43	Provide detailed scientific field investigation, analysis and modeling of larval transport and distribution around Bald Head Island	NC DMF	Fisheries	Literature Review submitted under separate cover to NCDMF, Fish Larvae Response Model (Appendix M), and EFH Report

Village of Bald Head Island Shoreline Protection Project - Scoping Comment Table

No.	Nature of Comment (Summary)	Agency/Entity	Category	Inclusion in DEIS
44	Model estimated impacts of the groin to larval ingress and egress through inlet	NC DMF	Fisheries	Fish Larvae Response Model (Appendix M)
45	Provide field investigation of juvenile fishes in vicinity of the inlet and proposed groin location	NC DMF	Fisheries	Literature Review submitted under separate cover to NCDMF
46	Provide benthic macroinvertebrate monitoring within impact area of proposed groin	NC DMF	Fisheries	Literature Review, VBHI Monitoring Reports (2010 - 2013)
47	Provide discussion of all EFH and state protected habitats occurring in this area	NC DMF	Fisheries	Section 5.4, Essential Fish Habitat Report and Biological Assessment
48	Provide discussion of all fish habitats outline in NC CHPP occurring in this area	NC DMF	Fisheries	Essential Fish Habitat Report
49	Identify potential impacts to fish and invertebrate community composition and abundance in inlet and adjacent surf zone on BHI	NC DMF	Fisheries	Section 5.5 and Essential Fish Habitat Report
50	Provide literature review of research regarding larval transport through inlets, especially inlets with hardened structures and include in EIS	NC DMF	Fisheries	Literature Review submitted under separate cover to NCDMF
51	Identify potential impacts to benthos of the surf/swash zone and nearshore areas	NC DMF	Fisheries	Section 5.5 and Essential Fish Habitat Report
52	Provide detailed monitoring plan for impact assessment within project area	NC DMF	Fisheries	Appendix B – Inlet Management Plan (existing detailed survey monitoring program)
53	Identify potential impacts to commercial or recreational fishing	NC DMF	Fisheries	Section 5.9 and 5.11
54	Identify economic impacts due to adverse impacts to fish and fish habitat	NC DMF	Fisheries/Economic	Section 5.14
55	Identify impacts from dredging, beach placement and nearshore placement of sand and minimization efforts	NC DMF	Fisheries	Section 5.4; 5.5; 6.0; and pending BA and EFH Reports
56	Identify potential impacts to regional sand budgets	NC DMF	Fisheries	Olsen Associates Engineering Report (Olsen 2013)

Village of Bald Head Island Shoreline Protection Project - Scoping Comment Table

No.	Nature of Comment (Summary)	Agency/Entity	Category	Inclusion in DEIS
57	Clearly discern proposed timelines for beach nourishment and identify potential impacts to nesting sea turtles, West Indian manatee, seabeach amaranth and piping plover in project area	USFWS	Threatened and Endangered Species	Section 5.4 and Biological Assessment
58	Identify potential impacts to nesting sea turtles, West Indian manatee, seabeach amaranth and piping plover on Oak Island	USFWS	Threatened and Endangered Species	Beyond Scope of EIS
59	Assess impacts from sediment disposal from Wilmington Harbor SMP occurring on Oak Island within the same year	USFWS	Physical	Beyond Scope of EIS
60	Outline proposed construction logistics and timelines	USFWS	Physical	Section 3.2.5 and CAMA Major Application
61	Determine if available sources of sand are adequate to meet proposed method and schedule of construction	USFWS	Physical	Section 3.2.5
62	Examine long-term effects to sea turtles, West Indian manatee, seabeach amaranth and piping plover from proposed beach nourishment schedule (every 2 years)	USFWS	Threatened and Endangered Species	Cumulative Effects Analysis (Appendix Q)
63	Identify levels of erosion on Oak Island and West Beach from construction of terminal groin and resultant impacts to listed species	USFWS	Physical/Threatened and Endangered Species	Biological Assessment and Olsen Associates Engineering Report (Olsen 2013)
64	Include analysis of potential sea-level rise scenarios in Cumulative Impacts Analysis, including sea level rise impacts to structural integrity of terminal groin and nourishment schedule for life of the project	USFWS	Sea Level Rise	Section 5.0; Cumulative Effects Analysis (Appendix Q)
65	Assess sea level rise impacts to structural integrity of terminal groin and nourishment schedule for life of the project	USFWS	Sea Level Rise	Section 5.0
66	Provide underwater survey (conducted by experienced archaeologist) to identify presence of submerged archaeological remains in project boundaries, assess impacts of terminal groin construction on historical resources	SHPO	Cultural/Historical Resources	Archeological Report (Appendix H)
67	Provide 5 complete sets of the application and associated maps to DWQ Central Office in Raleigh	NC DWQ	Administrative	CAMA Major Application
68	Provide appropriate application fee	NC DWQ	Administrative	CAMA Major Application

Bald Head Terminal Groin &Beach Nourishment
Scoping Meeting March 22, 2012
ILA Hall @ 211 W 10th St, Southport

AGENDA

SIGN IN.

Welcome Remarks	Dave Timpy, Corps of Engineers
Elected officials remarks.	Mayor Pro Tem John Smith
EIS Process	Dale Beter, Corps of Engineers
Project Overview	Erik Olsen, Olsen & Associates
Break out into group sessions.	Corps of Engineers & Olsen & Associates

Meeting was adjourned.

Meeting Summary

The Bald Head Terminal Groin &Beach Nourishment scoping meeting was held on March 22, 2012 it the ILA Hall located in Southport, North Carolina. There were approximately 14 attendees with three citizens from Bald Head Island.

One group session was held. The comments obtained from this group were as follows:

1. Will the EIS address all the points in Senate Bill 110?
2. Does the Terminal Groin alleviate the need for the 16 sand filled groin tubes?
3. Will the EIS address changes of wave energy on the opposite side of the channel?
4. Will the EIS address how the groin will affect the navigation channel or vice versa?
5. How will the beach fill be affected by permeability of the groin?
6. Will the groin affect the need of beach sand on Bald Head Island?
7. How will the EIS address Sea Level Rise?

BALD HEAD ISLAND TERMINAL GROIN AND BEACH NOURISHMENT PROJECT - PUBLIC SCOPING MEETING
ILA HALL - SOUTHPORT (NC) - MARCH 22, 2012

SIGN-IN SHEET - GROUP 1

NAME	AFFILIATION	TELEPHONE OR EMAIL
1 Karen Ellison	Village of Bald Head Isle	Kellison@VillageBHI.org
2 JOE BRAWNER	BHI	BRAWNERPLAWO@msn.COM
3 CHRIS MCCALL	VBHI	cmccall@villagebhi.org
4 Layton Bedsole	DC&A	lbedsole@dialcordy.com
5 Steve Dial	DC&A	sdial@dialcordy.com
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

BALD HEAD ISLAND TERMINAL GROIN AND BEACH NOURISHMENT PROJECT - PUBLIC SCOPING MEETING
ILA HALL - SOUTHPORT (NC) - MARCH 22, 2012

SIGN-IN SHEET - GROUP 2

	NAME	AFFILIATION	TELEPHONE OR EMAIL
1	John Fisher	Village of BHI	Fisher5@att.net
2	CALVIN PECK	VILLAGE BHI	CPECK@VILLAGEBHI.ORG
3	BEN BROWN	STATE PORT PILOT	bbrown@stateportpilot.com
4	Harry Simmons	Caswell Beach	mayor@caswellbeach.org
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

BALD HEAD ISLAND TERMINAL GROIN AND BEACH NOURISHMENT PROJECT - PUBLIC SCOPING MEETING
ILA HALL - SOUTHPORT (NC) - MARCH 22, 2012

SIGN-IN SHEET - GROUP 3

	NAME	AFFILIATION	TELEPHONE OR EMAIL
1	Mike Giles	NC Coastal Federation	mikeg@nccoast.org
2	Ray Webb	Bald Head Island	~~4[illegible]~~ webb8636@BellSouth.NET
3	Michael Rice	Save the Cape	mike@savethecape.org
4	Bob Helgesen	Village of Bald Head	Khelgesen@ME.com
5	Jonathan Howell	DCM	252-808-2808
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Village of Bald Head Island Shore Protection Project
PDT Meeting #1

April 24, 2012
2:00 PM @ DENR Wilmington Office

Meeting Minutes

Cameron Weaver (DENR) initiated the meeting and asked attendants to introduce themselves and identify their respective affiliation. The following individuals were in attendance: Cameron Weaver (NCDENR-DEAO), Ron Sechler (NOAA-NMF) via conference call, John Ellis (USFWS) via conference call, Kathryn Matthews (USFWS) via conference call, Jessi Baker (DMF) via conference call, Doug Huggett (DCM), Debbie Wilson (DCM), Heather Coats (DCM), Jonathan Howell (DCM), Chad Coburn (DWQ), Molly Ellwood (WRC), Dave Timpy (USACE), Justin McCorkle (USACE), Todd Horton (USACE), Spencer Rogers (NC Sea Grant), Christian Preziosi (LMG), Jenny Johnson (LMG), Laura Stasavich (LMG), Erik Olsen (Olsen Associates, Inc), Andy Sayre (VBHI), Calvin Peck (VBHI), Chris McCall (VBHI), Charles Baldwin (Rountree, Losee &Baldwin, LLP), Suzanne Dorsey (BHI Conservancy), Dara Royal (Town of Oak Island) and Harry Simmons (Town of Caswell Beach).

Corps Presentation - Dave Timpy provided the PDT members with a summary of the PDT protocol including the primary roles of the Corps and the PDT members. Dave reiterated that the Corps will make the ultimate decisions with consideration to PDT input, and future permit decisions will be made through the individual permitting agencies (i.e. Corps, DCM and DWQ). Dave also indicated that the Corps permit decision will only be made after permit decisions are made by DCM and DWQ. The following specific roles of the Corps and PDT members were further discussed:

1. The Corps will establish a study schedule based on input from the applicant and PDT. This schedule will establish future dates of PDT meetings. These dates may be revised as needed. *Project Update: A DRAFT Study schedule has been prepared by LMG and the Corps and will be refined after today's meeting.*

2. The Corps will post all environmental documents and current study schedule on the Corps website at:

   http://www.saw.usace.army.mil/Wetlands/Projects/BaldHead_Terminal_Groin/index.html

3. In coordination with the NCDCM, the Corps will coordinate the time and place of all PDT meetings. The Corps will provide as much advance notice to the PDT as possible. The Corps of Engineers will moderate all PDT meetings.

4. The Corps will provide meeting agendas for each PDT meeting to ensure discussions are focused on selected topics. Extended discussions on singular topics may be limited by the Corps to a reasonable time frame.

5. PDT members will be provided information regarding the ongoing study and will be solicited for input on the study. At no time will the PDT be asked to vote on any item related to the Corps permit decision. In addition, PDT members are not to construe participation on the PDT as a way to "vote" on certain aspects of the project.

6. The Corps will document all PDT meetings. Meeting summaries will be provided to the PDT members. These summaries will likely be included in the EIS for this project.

7. Notification of PDT meetings will be sent to the PDT prior to each meeting. Due to the large number of PDT members on this project, it may be necessary to hold some meetings without full attendance by all members of the PDT. Meetings held prior to the scheduled PDT meetings by PDT members are not encouraged. Any such meetings shall be brought to the attention of the Corps and documented.

8. PDT members can at any time provide input and/or suggestions regarding the proposed project or PDT process to the Corps for consideration. PDT members can at any time submit a request for a PDT meeting to the Corps. The Corps, in coordination with the NCDCM, will decide if the requested PDT meeting is warranted.

9. The Corps, in close coordination with the NCDCM, will make final decisions regarding the project purpose and need, alternatives to be carried forward, the least environmentally damaging practicable alternative, and mitigation requirements associated with the proposed project.

10. The Corp's permit decision will only be made after permit decisions are made by the NC Division of Water Quality (i.e. 401 Water Quality Certification) and the NCDCM (CAMA Major Permit) for this project.

Doug Huggett asked if the study schedule has been sent to the PDT. Christian Preziosi indicated that the DRAFT has been sent to the PDT. Dave Timpy indicated that he will resend the DRAFT study schedule following the meeting. Doug also suggested that given the complexity of the process, future meetings be allotted more time for discussion. Dave indicated that PDT meeting minutes will be included in the EIS.

Olsen Associates, Inc Presentation - Erik Olsen from Olsen Associates, Inc. (project engineer for the Applicant) provided the group with a history of the bathymetry and hydrodynamics of the area prior to the construction of the federal navigation channel to present day conditions. Erik gave an overview of the draft proposed action (terminal groin) and provided the group with examples of similar structures that Olsen Associates, Inc. have successfully implemented in the southeast (including Hilton Head and Amelia Island). Erik also discussed the 'leaky' nature of the structure to allow for some level of sediment transport around the Point to West Beach. Jay Bird Shoals (JBS) was identified as an alternate sand source for the groin fillet. (JBS is a previously authorized borrow site with sufficient volume of beach quality sand remaining within the permitted limits of the borrow site.) Erik indicated that there is an existing inlet management plan by way of the Federal Sand Management Plan (SMP).

Justin McCorkle reminded members of the PDT that Erik's presentation is an analysis of the project as presented by Olsen Associates/VBHI. VBHI and Corps are presently engaged in a lawsuit and some of the information presented during the meeting is in the midst of litigation to which a resolution has yet to be determined. Justin indicated that the overall consensus is to reduce erosion for the VBHI. The Corps EIS document will try to contain facts independent of the issues presently in litigation.

<u>LMG, Inc Presentation</u> - Christian Preziosi provided a summary of the status of the project and the EIS process to date:

Jan 2012 – EIS process initiated
March 14, 2012 – Notice of Intent
March 14, 2012 – Public Notice
March 22, 2012 – Public Scoping Meeting, Southport, NC
March 28, 2012 – Interagency Meeting

Christian indicated that there are 3 PDT meetings planned, however, this may be subject to change. Christian indicated that currently the Corps and LMG (as the third-party contractor) are in the information gathering stage of the EIS. Christian provided a general description of the different sources of information to be used and a summary of the literature review by resource. He discussed the need to identify the study area by resource type and requested input from the PDT regarding any potential data/information needs.

Christian provided a brief description of the elements of the draft EIS – including the Purpose and Need and Alternatives advanced by the Applicant. He stated that the EIS will consider a full range of reasonable alternatives to address the purpose and need of the project. The actual alternatives to be included in the Draft EIS will be determined by the Corps with the input of the PDT. Christian described that the EIS will also include a description of the existing environment, potential effects of the alternatives on the existing environment, a Cumulative Effects Analysis (CEA), an Essential Fish Habitat (EFH) report, and a Biological Assessment (BA). Christian also provided a summary of the remaining tasks in the project processing (i.e. submittal of Final EIS, CAMA Major application, DA Permit application and the Record of Decision).

Doug Huggett reminded the PDT that the EIS process will result in a NEPA document; however a document compliant with SEPA must still be submitted to DCM for Clearinghouse review and public review/comment (45 day process depending on when notice is given in the Environmental Bulletin). Justin McCorkle suggested submitting SEPA document in conjunction with CAMA Major Permit application. Doug indicated that the Clearinghouse review will have to be completed before the CAMA Major application can be accepted as complete. Justin indicated that he would hope that the State Clearinghouse review period could align with the public review period for the EIS (NEPA process).

Dave Timpy asked for comments from NOAA-NMFS and USFWS concerning submittal of BA and EFH documents and formalized Section 7 consultation. Kathryn Matthews will consult will John Ellis and get back to Dave or Christian. Ron Sechler indicated that Atlantic Sturgeon has been recently listed and Fritz Rhode will be the point of contact concerning this species.

Calvin Peck indicated a concern for getting more agency comments circulating during present and future PDT meetings. Christian stated that the Corps will need feedback from the PDT for potential alternatives at the next PDT meeting. Justin indicated that this is a ‘phased’ process. Phase I is to get all relevant issues on the table while Phase II will be a response to data gathered. Justin suggested that we are still in Phase I and comments will be collected during PDT meetings and submittal of a DRAFT EIS.

Doug discussed the alternatives analysis as seen through NC Senate Bill 110 and suggested that mitigation costs and requirements, including project failure/removal of structure will need to be included in the alternatives analysis. Spencer Rogers asked if project removal will need to be included in the alternatives analysis. Doug Indicated yes, as project bonding, mitigation, etc. will need to be addressed, and the legislation requires the terminal groin alternative to include full failure in the EIS and CAMA Major Permit application. Charles Baldwin suggested that the Delft 3D model will give good insight to the potential level of failure, short of complete failure. Doug Huggett indicated that a financial threshold will need to be set so the cost is not open-ended if removal is required. Also, discovery of mitigative measures need to be identified on the front end of the project rather than the back end.

Christian asked if the legislation states that failure/removal must be included in the Alternatives Analysis section of the document or if it could be addressed elsewhere in the EIS. Doug suggested that detailed discussion of all alternatives need to be in the Alternatives Analysis section of the EIS, including project failure.

Justin indicated that this level of analysis is not required as part of NEPA; however, the document will need to meet all agency requirements, including DCM. Harry Simmons questioned the need to determine failure costs for all alternatives. Doug answered yes.

Doug further discussed portions of NC Senate Bill 110 including inlet management plan, post-construction activities, baseline for adverse impacts, threshold for mitigation including groin removal and establishment of error bars, etc. Spencer Rogers indicated that the Delft 3D model will be an advantage. Doug reminded PDT that if a data set already exists to use it.

Christian asked about the Regulatory Reform Act and how it affects the SEPA requirement of SB 110. Doug indicated that SB 110 requires SEPA since it is an individual item in a separate law. Spencer Rogers asked if this was a jetty project, would the SEPA process be triggered. Doug indicated that he believes there would be no SEPA process for a jetty project.

Jessi Baker indicated that she had submitted comments on behalf of DMF to the Corps and that the effects to larval transport will be especially important. Ron Sechler shares same concerns as DMF and will also submit a letter with comments/concerns to Corps.

Kathryn Matthews will discuss project with John Ellis and send a letter with comments/concerns on behalf of USFWS. Initial concerns include sea turtles and plover, but not necessarily seabeach amaranth.

Chad Coburn had no formal comments at this time. Dara Royal had no official comment at this time.

Dave Timpy indicated that he will send the meeting minutes and DRAFT project schedule to the PDT. The next meeting will help establish a definitive 'purpose and need' and the alternatives that will be carried forward in the Draft EIS.

The meeting was adjourned as approximately 4:00.

Village of Bald Head Island Shore Protection Project
PRT Meeting #2

September 12, 2012
10:00 AM @ DENR Wilmington Office

Meeting Minutes

Cameron Weaver (DENR) initiated the meeting and asked attendants to introduce themselves and identify their respective affiliation. The following individuals were in attendance: Cameron Weaver (NCDENR-DEAO), Kathryn Matthews (USFWS) via conference call, Jessi Baker (DMF), Fritz Rohde (NOAA-NMF), Doug Huggett (DCM), Debbie Wilson (DCM), Heather Coats (DCM), Jonathan Howell (DCM), Chad Coburn (DWQ), Jim Gregson (DWQ), Dave Timpy (USACE), Justin McCorkle (USACE), Bill Dennis (USACE), Dale Beter (USACE), Emily Hughes (USACE), Thekla Spencer (USACE), Spencer Rogers (NC Sea Grant), Christian Preziosi (LMG), Jenny Johnson (LMG), Erik Olsen (Olsen Associates, Inc), Calvin Peck (VBHI), Charles Baldwin (Rountree, Losee & Baldwin, LLP), Suzanne Dorsey (BHI Conservancy), Harry Simmons (Town of Caswell Beach), Peter Schuhmann (UNCW), Mike Giles (NCCF) and Anazivanovic Nenadovic (NCCF).

Dave Timpy provided a brief introduction before handing the meeting over to Land Management Group, Inc (LMG). Christian Preziosi stated the purpose and objectives of the meeting and encouraged attendees to feel free to have an open discussion on any items discussed during the meeting. The following Items highlight the meeting objectives and resultant PRT discussion.

1.0 Meeting Objectives

No comments.

2.0 Actions Completed Since PRT Meeting No. 1

No comments.

3.0 Purpose and Need Statement

Suzanne Dorsey suggests that the proposed terminal groin is an engineered response to an already engineered (non-natural) shoreline adjacent to a federal navigation channel which is important from a resource perspective.

Erik Olsen stated that there is already a structural component to reduce erosion on South Beach (existing sand tube groinfield). The proposed terminal groin will take the project to the next tier of structural stabilization. Existing groinfield has not been sufficient to solve current shoreline recession.

4.0 Range of Alternatives under Consideration

4.1 No Action Alternative

E. Olsen discussed that under this alternative the groinfield would not be removed and ultimately will be allowed to degrade (until required to remove due to degradation). This alternative would lead to ineffective nourishment efforts during federal channel maintenance/sand placement events and thus Corps would likely move sand placement further East away from the channel which would be detrimental to needs of VBHI.

H. Simmons asked if this alternative assumes current SMP will remain (ie. sand placement every 4 years).

D. Huggett indicated that the No-Action alternative should include additional components including a Status Quo option in which the Village would maintain the existing sand tube groinfield as well as providing for periodic nourishment.

C. Preziosi concurred with the Status Quo component of groinfield maintenance, but stated that additional nourishment events are best evaluated under separate alternative (as has been identified). J. McCorcle agreed that any additional nourishment action would be another alternative. J. McCorcle went on to state that federal disposal events under current SMP can be considered under the Village's No-Action Alternative.

S. Dorsey indicated that VBHI citizens would prefer not having the need of the sand tube groinfield for several reasons including expense and aesthetics. H. Simmons asked about sea turtle nesting in existing groinfield. S. Dorsey indicated that groinfield is not ideal habitat but better than no sand.

4.2 Retreat

S. Dorsey asked the PRT to recognize how hard this alternative would be for the citizens of VBHI, especially given the sensitive and sustainable land plan the Island has adopted.

D. Huggett indicated that this alternative is critical for satisfying SB 110 since it is a non-structural alternative. PRT members asked about public vs. private nature of golf course. C. Preziosi indicated that the lagoons are an integral aspect of stormwater management on the Island. C. Peck indicated that VBHI is not economically stable without golf course.

Several PRT members suggested adding business (particularly with respect to the BHI Club) to the Purpose and Need Statement.

S. Rogers stated that relocation was implemented in the past but given the extent of private and public infrastructure present today, this alternative is not practical.

E. Olsen also suggested the consideration of the effect of retreat on historic structures in the vicinity of the project. Village to provide information on historic structures.

4.3 Beach Nourishment/Beach Disposal w/ Existing Sand Tube Groinfield

D. Huggett indicated that this was the second half of the No-Action alternative that he suggested earlier in the meeting. E. Olsen indicated that it was considered a separate alternative because it is so proactive. C. Peck asked where/when the costs for Wilmington Harbor Entrance Channel will be discussed.

D. Huggett indicated that DCM will require an alternatives analysis for a permit decision and understood that the actual alternatives analysis is not performed in the DEIS but later in the NEPA process. The Village has identified a proposed action (terminal groin with sand tube groinfield remaining), but J. McCorcle stated that the Corps will not endorse or prefer any alternative during the EIS process. The Corps makes its determination on a permit through the 404(b)(1)/public interest review analysis (done in the ROD).

The PRT had a general conversation concerning the economic costs for the range of alternatives proposed for the DEIS. The Corps and DCM explained that a full range of analysis is required as part of the process and ultimately this information will be used to determine which alternatives may or may not be practicable.

S. Dorsey and C. Peck expressed concerns for the potential costs of some of the alternatives included in the document. The Corps indicated that costs considerations will be factored into the analysis, and that the Village can provide any supporting information they feel necessary to assist with the Corps' analysis. D. Huggett indicated that there may be items needed within DCM's permit application as a result of SB110 which might not necessarily be included for the Corps' ROD.

E. Olsen provided information on how he is initially evaluating costs – including the use of a long-term interest rate used by the Corps. D. Huggett indicated that there was no specific guidance in SB110 regarding the duration of the assessment, but stated that a 30-year analysis would be sufficient.

4.4 Beach Nourishment/Beach Disposal and Sand Tube Groinfield Removal

No Comments.

4.5 Terminal Groin with Beach Nourishment/Beach Disposal (Sand Tube Groinfield Remaining)

C. Preziosi discussed the range of proposed designs for the terminal groin and clarified that all options in this alternative would be considered in the Environmental Consequences Section of the EIS. This alternative represents the Village's proposed action.

D. Huggett asked if this alternative addresses future nourishment events.

The PRT discussed that this alternative assumes continuation of the SMP. Part of the analysis to be included in the document will discuss the frequency of nourishment events subsequent to project completion. E. Olsen indicated that the frequency of nourishment may not change; however, the volume of sand lost will be reduced once a stable beach condition is obtained. This will be a net benefit to the federal project but it will be hard to determine where the sand will end up upon construction of a terminal groin.

D. Huggett indicated that SB110 requires a plan for the fillet but does not mandate periodic sand placement. However, the required inlet management plan will likely include items such as maintenance of the fillet, etc. The plan would need to acknowledge contingencies for additional nourishment. Separate sand sources and mitigative thresholds would need to be identified in the permit application, and future nourishment may be authorized via permit modification prior to sand placement.

J. McCorcle suggested that the EIS could be used for a decision document on a 30-year permit if it incorporated sufficient information.

C. Peck expressed concern that the cost for analyzing separate sand sources is expensive. The Corps and DCM suggested analyzing sources that have been used in the past (ie. Jay Bird Shoals, Bald Head Shoal, Wilmington Harbor Entrance Channel). While permitting agencies made no commitment to authorizing the use of these areas for future sand source sites, it was agreed that new information on other sites may not be warranted since there are existing sites that have been thoroughly analyzed in other documents.

The PRT discussed the logistics of utilizing the existing Wilmington Harbor Entrance Channel. D. Timpy indicated that as long the request was within the confines of the approved project, a General Permit could be issued through Corps.

D. Huggett suggested including source sites for contingency nourishment so that it could be factored into DCM's permit decision.

4.6 Terminal Groin with Beach Nourishment/Beach Disposal and Removal of Sand Tube Groinfield

C. Peck asked if there was an 'intermediate' between Alternative #5 and #6 that would evaluate the redesign of the existing groinfield (i.e. converting the existing sand tubes to a rock groinfield). S. Rogers indicated that this was against State law.

E. Olsen indicated that he likely could not design a terminal groin long enough to justify complete removal of the sand tube groinfield; however, it is likely that some tubes could be removed. Physical monitoring would provide information necessary to determine need for maintenance or modification to groinfield.

4.7 Terminal Groin without Beach Nourishment

The PRT discussed if this alternative needed to be discussed further in the DEIS since it is a violation of SB110. The Corps indicated that the document would need to include the engineering rational of why this alternative may not be practicable. This alternative would be identified in the DEIS, but may be eliminated without a discussion of its consequences on the affected environment.

5.0 Study Areas

C. Preziosi provided a visual of the respective study areas (physical, biological, etc.). H. Simmons concurred that the study area was sufficient to address the concerns of Caswell Beach. S. Rogers suggested that the study area include the inlet hazard areas.

F. Rohde reminded LMG to make sure that the study area include Bald Head Creek Shoal area for any alternative that included that area as potential sand source.

6.0 Scoping Comments

C. Preziosi discussed the generalized scoping comments received to date. M. Giles asked if the comments could be distributed. The Corps will update their website for the project and will likely include scoping comments.

7.0 Next Steps

C. Baldwin and C. Peck asked about the timeline for submission of the DEIS and permit application. It was determined that permit applications will likely be submitted upon release of the Final EIS. The PRT discussed the timing for the next PRT meeting. The Corps will make a decision as to when the next PRT will be held.

LMG or Corps will supply copies of the meeting minutes and the Powerpoint Presentation to the PRT following the meeting.

Village of Bald Head Island Shoreline Protection Project

Interagency Scoping Meeting - March 28, 2012
2:00 PM @ DENR Wilmington Office

Meeting Notes

Cameron Weaver (DENR) initiated the meeting and asked attendants to introduce themselves and identify their respective affiliation. The following individuals were in attendance: Cameron Weaver (NCDENR-DEAO), Jessi Baker (DMF), Doug Huggett (DCM), Debbie Wilson (DCM), Heather Coats (DCM), Jonathan Howell (DCM), Shaun Simpson (DCM), Chad Coburn (DWQ), Molly Ellwood (WRC), David Cox (WRC), Jim Gregson (DWQ), Dave Timpy (USACE), Dale Beter (USACE), Christian Preziosi (LMG), Jenny Johnson (LMG), Erik Olsen (Olsen Associates, Inc), Calvin Peck (VBHI), Chris McCall (VBHI), Mike Giles (NCCF), Dawn York (Dial-Cordy) and Layton Bedsole (Dial-Cordy). NMFS and FWS did not participate in the meeting.

Cameron Weaver introduced Christian Preziosi from Land Management Group, Inc., the 3rd party contractor responsible for preparing the EIS and supporting documentation.

Christian Preziosi provided a brief status/schedule of the Public Notice for the EIS.

Doug Huggett followed with a discussion of NC Senate Bill 110. Mr. Huggett provided all attendants with a copy of the Senate Bill and provided the group with a overview of the legislation, specifically Section 1.(e)(5) discussing the inlet management plan. Chris McCall (VBH) asked about the science panel's framework/thresholds for monitoring. Mr. Huggett indicated that this information was available for review upon request.

Erik Olsen from Olsen Associates, Inc, (project engineer for the Applicant) provided the group with a history of the bathymetry and hydrodynamics of the area prior to the construction of the federal navigation channel to present day conditions. Erik gave an overview of the draft proposed project (terminal groin) and provided the group with examples of similar structures that Olsen Associates, Inc. have successfully implemented in the southeast (including Hilton Head and Amelia Island). Erik also discussed the 'leaky' nature of the structure to allow for some level of sediment transport around the Point to West Beach. Jay Bird Shoals (JBS) was identified as an alternate sand source for the groin fillet. (JBS is a previously authorized borrow site with sufficient volume of beach quality sand remaining within the permitted limits of the borrow site.) Erik indicated that there is an existing inlet management plan by way of the Federal Sand Management Plan (SMP).

Mr. Huggett gave agencies the opportunity to voice environmental concerns after the presentation was complete.

- DWQ – no comment at this time
- WRC – Ramifications of working in the moratorium
    - What is the frequency of nourishment on West Beach and South Beach?
    - How will the proposed project affect nourishment frequency on West Beach? (Will there be more erosion on West Beach?)
    - What will be the frequency and volume needs on West Beach post-construction?
- DCM – Response measures will need to be included in the EIS (*i.e.* account for cause and effect of proposed structure)

- DMF – Concerned about effect of TG on larval transport (i.e. longshore transport and daily migrations through water column)

  Possibly include additional fish trawls/sampling as baseline
  Is there a method to identify/model the effect on larval transport?
  Juvenile/larval data, possibly using existing database but may need additional sampling
  Benthic sampling and monitoring may be required
- USACE – Dale Beter reiterated that all resource issues will be evaluated through the EIS process. Dave Timpy identified need to finalize Project Delivery Team (PDT). A request for participation on PDT will be sent Week of April 2. USACE is tentatively planning for first PDT in late April.

Mr. Huggett adjourned the meeting at approximately 4:15 pm

APPENDIX D

COMMENT- RESPONSE ON DEIS

Village of Bald Head Island Shoreline Protection Project
Final Environmental Impact Statement
Appendix D

Comments Received on Draft Environmental Impact Statement (DEIS) and Summary Table of Comment-Response

Village of Bald Head Island Shoreline Stabilization Project
Summary of DEIS Comments and EIS Updates (July 18, 2014)

No.	Nature of Comment (Summary)*	Agency/Entity	Category	Included in EIS (Y/N)	Section Addressed	Notes/Comments
1	Change all references to the Division of Water Quality to the Division of Water Resources.	NCDCM	General	Y	Throughout EIS Document	All references updated.
2	Revise language regarding minor modification of CAMA Permit No. 9-95 to clarify CRC variance granted in July 2011 and modification issued in August 2011.	NCDCM	Project Purpose	Y	Section 1.4.4	Language revised to clarify as recommended.
3	Revise language to state per Session Law 2011-384 the NEPA document satisfies NCEPA requirements and that NC DCM is a commenting agency to the USACE.	NCDCM	Project Purpose	Y	Section 1.6	Language revised to clarify as recommended.
4	Note that the Coastal Area Management Act and the NC Dredge and Fill Law are two separate laws, both administered by the NC Division of Coastal Management.	NCDCM	Project Purpose	Y	Section 1.6	Language revised to clarify as recommended.
5	Factor in maintenance of the sand tube groinfield which may minimize the extent of retreat necessary.	NCDCM	Alternative 2	N	N/A	The Retreat Alternative by definition includes removal of the sand tube groinfield; Maintenance of the groinfield is not considered under this alternative.
6	Include evaluations of the likelihood of expanding the volume of sediment available from Bald Head Creek. Address whether sediment compatibility studies have been done on the referenced 200,000 cy of material in Bald Head Creek.	NCDCM	Alternative 3	Y	Section 3.2.3; Section 4.1.2; Appendix F (Olsen Geotech Report)	Applicant's engineer has identified the limits of the expanded sand source site. Updated geotechnical investigations and an archeaological assessement has been performed on the expanded borrow area. The findings of these assessments are summarized in Section 4.
7	Include any evaluations of the likelihood of expanding the volume of sediment available from Bald Head Creek. Address whether sediment compatibility studies have been done on the referenced 200,000 cy of material in Bald Head Creek.	NCDCM	Alternative 4	Y	Section 3.2.3; Section 4.1.2; Appendix F (Olsen Geotech Report)	See response to Comment #6 above.
8	Discuss avoidance, minimization or mitigative measures that would offset potential impacts associated with construction during turtle nesting season.	NCDCM	Alternative 5	Y	Reference in Section 3.2.5 refers reader to Section 6.0	Several avoidance, minimization, and mitigative measures have been identified to help offset potential impacts associated with the construction during the turtle nesting season. These measures are summarized in Section 6.0 of the FEIS. All conservation measures, reasonable and prudent measures (RPMs) and terms and conditions to offset potential effects to nesting sea turtles are identified in the Biological Opinion (Appendix S).
9	As a potential mitigative measure to turtle nesting, discuss whether relocation of one or more sand tubes would be consistent with existing variance/permit conditions.	NCDCM	Alternative 5	Y	Section 3.2.5	It is believed that the relocation of one or more sand tubes would require a modification to the existing sand tube groinfield permit (CAMA Major Permit No. 9-95). Such a modification was requested and subsequently issued in 2009 for the relocation of sand tube #16. This action was also deemed consistent with the DA General Permit No. 198000291.
10	Discuss the reliance on natural transport to create a fillet with regard to Session Law requirements that groins be pre-filled.	NCDCM	Alternative 5	Y	Section 3.2.5	The Applicant proposes to construct the Phase I structure (1,300 lf) which is predicted to impound rapidly as it is constructed immediately subsequent to the federal sand disposal. If this does not occur to a satisfactory level, the Applicant would implement a supplemental sand placement for the fillet formation.
11	Provide additional details on potential erosion response measures on West Beach.	NCDCM	Alternative 5	Y	Section 3.2.5; Appendix B - Inlet Management Plan; Section 6.2	Potential downdrift effects are identified in Section 3.2.5. Erosion response actions are detailed in Section 6.0 and within the Applicant's Inlet Management Plan (Appendix B).
12	Discuss whether changes in funding and altered ACOE construction or maintenance schedules (as in SMP) would negatively affect construction of the groin.	NCDCM	Alternative 5	Y	Section 3.2.5	Should the federal project be delayed, initiation of construction of the terminal groin will be similarly delayed.
13	Discuss relocation of one or more sand tubes as a possible modification and whether that would be consistent with CAMA variance/permit conditions.	NCDCM	Alternative 6	N	N/A	Alternative 6 includes removal of the sand tube groinfield. Question is not applicable to this alternative.
14	Discuss the reliance on natural transport to create a fillet in this alternative with regard to Session Law requirements that a groin be pre-filled.	NCDCM	Alternative 6	Y	Section 3.2.6	See response to Comment #10 above.
15	Provide additional details on potential erosion response measures on West Beach.	NCDCM	Alternative 6	Y	Reference in Section 3.2.6	See response to Comment #11 above.
16	Address the naturally accreting fillet verses Session Law requirements to pre-fill the groin. Discuss whether changes in funding and altered ACOE construction or maintenance schedules (as in SMP) would negatively affect construction of the groin.	NCDCM	Alternative 6	Y	Section 3.2.6	See response to Comment #12 above.
17	Detail assurances that schedules for groin construction and sand placement by the USACE will occur in a mutual fashion. Discuss the effect and contingency plan if groin construction is started and sand from the USACE becomes unavailable or delayed.	NCDCM	Alternative 6	Y	Section 3.2.6	Groin construction will occur immediately following the federal disposal event. If the federal disposal is delayed, then the groin construction will be similarly delayed.
18	Obtain NCDMF telemetry tracking data for sturgeon in the Cape Fear River for description of sturgeon distribution in the area.	NCDCM	Affected Environment	Y	Section 4.2.4 and Appendix N (DMF Summary of Telemetry Data)	Sturgeon telemetry data are discussed in Section 4.2.4. NCDMF summary of data is provided as an appendix (Appendix N)
19	Expand Soft Bottom Communities to include discussion of fish utilization of soft bottoms beyond foraging and of fish utilization of offshore shoals and inlets (i.e. borrow areas).	NCDCM	Affected Environment	Y	Section 4.3.3	Section 4.3.3 has been expanded to include the additional requested information.
20	Include a more accurate description of unconsolidated sediments.	NCDCM	Affected Environment	Y	Section 4.3.3	Text revised as recommended.
21	Use the term anadromous *fish* nursery areas.	NCDCM	Affected Environment	Y	Section 4.3.3	Text revised as recommended.
22	Provide discussion on recent scientific research related to larval fish transport through NC inlets.	NCDCM	Affected Environment	Y	Section 4.4	Section updated to include recent research including findings of the South Atlantic Bight Recruitment Experiment (SABRE).
23	Provide discussion on previously compiled data regarding larval fish geographic distribution and abundance in the area.	NCDCM	Affected Environment	Y	Section 4.3.3 and Appendix O (Annotated Bibliography)	Section updated to inlcude information on previously compiled larval fish distribution (including results of CP&L comprehensive monitoring program). In addition, an annotated bibliography of relevant studies is included as Appendix O.
24	Discuss construction activities that will occur during the sea turtle nesting season and mitigative measures.	NCDCM	Avoidance, Minimization and Mitigative Measures	Y	Section 3.2.5; Section 6.2; See USFWS Biological Opinion (Appendix S) with Conservation Measures, RPMs, and Terms and Conditions	Specific construction activities are described in Section 3.2.5. Mitigative measures are provided in Section 6.0 and within the project BO (Appendix S).
25	Post-construction monitoring for biological recovery of Frying Pan Shoals will likely be required.	NCDCM	Avoidance, Minimization and Mitigative Measures	N	N/A	Noted. Excavation of sand from a borrow site on Frying Pan Shoals is not part of the permit request. However, it has been identified as a future sand source site. It is understood that prior to authorization of its use, site-specific investigations and appropriate environmental documentation will need to be completed by the Applicant.

*Agency comments have been summarized. Please refer to individual agency letters for full content.

26	If a hopper dredge will be used, note as a minimization of impacts to offshore shoal habitat.	NCDCM	Avoidance, Minimization and Mitigative Measures	N	N/A	Hopper dredge not proposed to be used. In addition, USACE does not consider the use of a hopper dredge to necessarily be a minimization of impacts to offshore shoal habitat. Presumably, the commenter is referring to the fact that hopper dredges, when dredging an area, often tend to leave "stripes" of undisturbed sand between dredging passes, and that benthic organisms within these "stripes" can more rapidly recruit to adjacent areas. While this may indeed be a benefit, hoppers also tend to make shallower dredging passes, which can lead to an overall greater area of disturbance. We expect the applicant to select the appropriate dredge to do the work, based on efficiency and applicable environmental windows. Overall, the most efficient dredge is often the best tool for the job, based upon both cost and environmental considerations.
27	Provide additional detail on requirements of SB 151. Including: (1) determination and type of data to define a baseline (2) post-construction monitoring to compare baseline data and assess potential adverse impacts (3) timeframes for post-construction monitoring (4) specific thresholds for implementation of mitigative measures and (5) mitigative measures that may be implemented.	NCDCM	Appendix B-Inlet Management Plan	Y	Section 6.3; Appendx B (Inlet Management Plan)	Section 6.0 and the Applicant's Inlet Management Plan (Appendix B) have been updated to incorporate the items necessary to satisfy the requirements of SB 151.
28	The NCDCM's interpretation of SB 151 is that physical monitoring is required at the easternmost end of Oak Island.	NCDCM	Appendix B-Inlet Management Plan, Physical Monitoring	Y	Section 6.3; Appendix B (Inlet Management Plan)	Noted. A physical monitoring plan for the easternmost end of Oak Island has been developed and is identified in the Applicant's Inlet Management Plan (Appendix B).
29	Expand post-project physical surveying on Oak Island beyond three years. Increased monitoring frequency in years immediately following construction is recommended. After which time, an analysis of the data and conclusions regarding adverse impacts on Oak Island can be made. Include more detailed mitigative thresholds and descriptions of potential remedial actions.	NCDCM	Appendix B-Inlet Management Plan, Physical Monitoring	Y	Section 6.3; Appendix B (Inlet Management Plan)	Noted. See updated Inlet Management Plan and revised text in Section 6.0.
30	Describe anticipated volumes of sand to be borrowed from the fillet to nourish West Beach. Discuss anticipated impacts of same.	NCDCM	Appendix B-Inlet Management Plan, Mitigation	Y	Section 3.2.5	Any sand borrowing from the fillet would be for small-scale emergency responses (e.g. 5,000 to 10,000 cy). In light of the estimated volume of the updrift fillet (250,000 to 500,000 cy), such an action would have no measureable effect on the spatial extent of the fillet or the performance of the terminal groin.
31	Elaborate on the hierarchy of remedial actions and triggers to implement such actions (item # 30 above).	NCDCM	Appendix B-Inlet Management Plan, Mitigation	Y	Section 6.3; Appendix B (Inlet Management Plan)	See updated Section 6.3 and Inlet Management Plan (Appendix B).
32	The DCM states concern over reapportionment of sand under the WHSMP as a mitigative measure for this project.	NCDCM	Appendix B-Inlet Management Plan, Mitigation	N	N/A	Concur. The applicant should not presume that the navigation project would take any action to respond to a hot spot on Oak Island, particularly if that erosion were linked to the applicant's project. The burden for supplying required mitigation would logically be the applicant's. Refer to the updated IMP (Appendix B) for mitigation measures to be employed by the Applicant.
33	Describe timeframe and methodology for determining if fill equilibration has been reached.	NCDCM	Appendix B-Inlet Management Plan, Mitigation Thresholds	N	N/A	According to the Applicant's engineer, beach fill equilibration is best gaged by comparing surveyed beach profiles to both pre-project and to "naturally" receding beach profile conditions. Initial post-fill profiles along West Beach are typically extraordinarily "steep" due to the proximity of the inlet throat (i.e. deep water). Hence, initial fill profile equilibration (or reconfiguration) is generally very rapid and severe (particularly when compared to fill profile equilibration on South Beach where nearshore depths are much more modest and not directly influenced by the inlet gorge configuration.
34	Regarding an increase in shoreline recession rates by over 50%, discuss how long this condition needs to exist before action is taken and if the same threshold is appropriate for Caswell Beach.	NCDCM	Appendix B-Inlet Management Plan, Mitigation Thresholds	Y	See updated Appendix B (Inlet Management Plan)	Refer to updated Inlet Management Plan (Appendix B).
35	Regarding removal of armor rock to effectively eliminate the groin structure, address if buried rock would eventually expose and begin to trap sand again. Option should address total structure removal, not partial (per SB 151).	NCDCM	Appendix B-Inlet Management Plan, Terminal Structure Alteration	Y	Appendix B - Inlet Management Plan	See Inlet Management Plan. In the event event that the terminal groin structure is causing adverse affects, the terminal groin will be modifed or removed in its entirety.
35a.	The DEIS does not state the source of the species data and does not address the potential impacts to all the species	NC Natural Heritage Program	Threatened and Endangered Species	Y	Table 4.1; Section 4.2; Section 5.2	Sections 4.2 and 5.2 have been updated with species occurrence information and expanded discussion of potential impacts to listed species.
36	Include the Natural Heritage Database status for federally and state protected species within the project vicinity. Information on elemental occurrences is available.	NC Natural Heritage Program	Threatened and Endangered Species	Y	Section 4.2	Noted. Requested information included in Section 4.2.
37	Include Significant Natural Heritage Areas (SNHAs) within the project area, and rare species and natural communities within each SNHA.	NC Natural Heritage Program	Threatened and Endangered Species	Y	Section 4.2	Noted. Requested information included in Section 4.2.
38	Include Heritage Program records for high-quality Dune grass communities, least tern nest locations, and existing conservation/managed lands in the project vicinity.	NC Natural Heritage Program	Threatened and Endangered Species	Y	Section 4.2	Record of the high-quality dune grass community and least tern nests have been included. Protected lands on Bald Head Island include the Bald Head Island Natural Area (which comprises the estuarine waters adjacent to Middle Island), Bald Head Woods Coastal Reserve (comprising the maritime forest adjacent to Federal Road), the Silt Tracts (on East Beach), and the Smith Island Land Trust Tract (adjacent to Federal Road).
39	Recommends all work on the oceanfront for nourishment and groin construction be done outside the WRC sea turtle nesting moratorium of May 1st to November 15th.	NC WRC	Sea Turtles	N	N/A	Noted. Morratorium will be avoided to maximum extent practicable for nourishment. Groin construction during moratorium is unavoidable, but several mitigative measures will be employed to reduce potential adverse effects to sea turtles. These measures have been coordinated with, and approved by, USFWS.
40	Recommends all work be done outside the shorebird nesting season, April 1st to August 31st.	NC WRC	Shorebirds	N	N/A	Noted. Nourishment will avoid nesting season to the maximum extent practicable. Groin construction will be performed during the nesting season.
41	Requests pre-construction monitoring for overwintering birds to establish use of the inlet area by these species.	NC WRC	Shorebirds	Y	Section 6.4.2	No pre-construction monitoring is proposed other than the monitoring already performed by the Conservancy. More intensive site monitoring will be performed during construction and post-construction for a period of 3 years.
42	States concern over frequency of nourishment events necessary to maintain the groin and the potential impact to benthic invertebrate population (with nourishment events in frequencies greater than every five years).	NC WRC	Benthic invertebrates	Y	Section 5.3.5	Frequency and volume requirements for nourishment actions are expected to be less under the proposed action relative to those alternatives that consider nourishment as a component of a shoreline management strategy.
43	States concern over potential emergency beach nourishment events, resulting from increased erosion rates around the groin structure, if done during ecologically sensitive times of the year (nesting shorebird and sea turtle seasons).	NC WRC	Shorebirds, Sea turtles	Y	Section 5.3.5	Based upon analysis performed by the engineer, emergency fill operations in response to episodic erosion are not predicted to increase as a result of the implementation of Alternative #5.

*Agency comments have been summarized. Please refer to individual agency letters for full content.

44	States concern over permanent, cumulative loss of shorebird habitat at the inlet complex. Requests more detailed discussion on potential mitigation thresholds and options.	NC WRC	Shorebird Habitat	Y	Section 6.0 and Appendix S (BO with Conservation Measures)	More detailed discussion of mitigation thresholds and actions are described in Section 6.0 and within the Inlet Management Plan. Conservation measures and terms and conditions to avoid and minimize potential adverse effects to piping plover and red knot are identified in the BO (Appendix S).
45	Requests biological and physical post-project monitoring for sufficient time periods to determine if the groin has any effect on the immediate and surrounding areas. Requests monitoring reports be provided to all regulatory and resource agencies and that cessation of monitoring not be allowed without agencies consultation. Requests mitigation if adverse impacts are found or performance is not as planned.	NC WRC	Fisheries	Y	Section 6 and updated Appendix B (Inlet Management Plan)	Biological monitoring is outlined in Section 6.0 and within the BO (Appendix S), Physical monitoring is described in Section 6.0 and the Inlet Management Plan (Appendix B).
46	Requests confirmation of compliance with the guidelines of EO 11988 regarding special floodhazard areas. The eight-step process for determining whether adverse impacts may occur through occupancy or modification of floodplains is provided for assessment.	NC Emergency Management	Floodplain Management	Y	Section 5.22	Discussion of compliance with EO 11988 is provided as requested.
47	Requests a hydraulic study be completed to assure any grading of sand dunes in floodzones V1-30, VE and V will not increase flood damage potential.	NC Emergency Management	Floodplain Management	N	N/A	No grading of sand dunes proposed
48	The Town of Caswell Beach favors the Village's preferred alternative	Town of Caswell Beach	Alternative 5	N	N/A	Noted.
49	Opposition of use of Jay Bird Shoals for the project or any other sand need by the Village	Town/Fort of Caswell Beach	Borrow Site	Y	Appendix B - Inlet Management Plan	The Applicant has developed an Inlet Management Plan that identifies a specific monitoring protocol and evaluation process (inlcuding the use of a Technial Advisory Committee) to determine any potential adverse effects to the shorelines of Fort Caswell and Caswell Beach. The plan also identifies adaptive management measures including mitigation for any potential impacts to the Town of Caswell Beach and Fort Caswell shorelines.
50	DEIS does not address distribution of sand from federal maintenance of navigation channel (SMP)	Town/Fort of Caswell Beach	Sand Management Plan	See note.	N/A	The scope of this EIS does not include any re-evaluation of the management of dredged material from the Wilmington Harbor Navigation Project; that will be conducted separately and on its own schedule. Given that the specifics of future sand placement (location, quantities, and a start date for any change in plan) are not currently known, it is appropriate for the applicant to run models of the existing situation. Prior to any future placement of dredged material, the applicant will have to demonstrate its need for renourishment, taking into account upcoming disposal from the navigation project based upon the plan as it exists at the time.
51	Inlet Management Plan must adequately satisfy monitoring requirements of terminal groin and associated borrow site(s)	Town/Fort of Caswell Beach	Inlet Management Plan - Monitoring	Y	Updated Appendix B (Inlet Management Plan)	Note that the updated Inlet Management Plan has been reviewed by NC DCM. DCM believes that the plan is sufficient to satisfy the inlet management plan requirements of Session Law 2013-384 (Senate Bill 151).
52	DEIS does not adequately address cumulative effects of use of JBS as borrow site	Town/Fort of Caswell Beach	Cumulative Effects	Y	Section 5.2; Appendix B (Inlet Management Plan)	Discussion of potential effects of utilizing JBS as a borrow site is provided in Section 5.2 and within the updated Inlet Management Plan (Appendix B). In addition, potential cumulative effects are discussed in the Cumulative Effects Analysis (Appendix W).
53	EIS should clarify nourishment cycles (with recommendation for table, chart or figure for such in Section 3 and 5)	USFWS	Nourishment Cycles	Y	Section 5.2.4; Table 5.5 (updated)	Table 5.5 updated to clarify predicted sand volume requirements and source site by alternative.
54	FWS is concerned with long-term impacts from frequent nourishment to both macro-invertebrates and nesting sea turtles	USFWS	Nourishment Cycles	Y	Section 5.3.5	See response to Comment #42 above.
55	Change no effect determination to "may affect, but not likely to adversely affect" piping plover for Alternative 1 and change language in Section 6.5.5	USFWS	Piping Plover	Y	Section 5.4.1	Revision made as requested. The language in Section 6.0 has been removed and re-written.
56	FEIS should provide a more specific construction schedule	USFWS	Construction Schedule	Y	Section 3.2.5	Noted. More detailed information regarding the construction timing and sequencing is provided in Section 3.2.5.
57	FEIS should provide more information regarding removal of sand tubes if they are not needed	USFWS	Sand Tube Removal	Y	Section 3.2.5; Section 6.4	Noted. Refer to updated text as referenced.
58	FEIS should discuss potential remediation plans if terminal groin fails or is shown to be causing significant negative impacts (including discussion of financing the remediation measures)	USFWS	Remediation/Mitigation	Y	Section 6.3.3; Appendix B (Inlet Management Plan)	Noted. Remedial actions are described in Section 6.3.3. In addition, proof of financial assurance has been submitted to the State of NC for verification of compliance with SB 151 and G.S. 113A-115.1(h) in the form of a general obligation bond and local government taxing or assessment authority adequate to cover the cost of the proposed action including long-term maintenance and monitoring of the terminal groin, implementation of mitigation measures, and modification or removal of the terminal groin.
59	States DEIS fails to identify and evaluate all combined, cumulative, comprehensive and indirect impacts. Requests potential, future erosion control measures (as discussed in the NC DCM's Cape Fear River Area of Environmental Concern Study) be considered in the scope of the EIS.	NC Coastal Federation	Scope of Project	Y	Section 5.4; Section 5.5.2	The Applicant has recently advocated for coastal management rules (via NC DCM's Cape Fear River AEC Study) that would greatly increase the number and variety of shore stabilization measures allowed on VBHI. It is reasonable to expect that the Applicant will continue to advocate for changes to regulatory systems that would allow for additional use of sandbags, rock groins, breakwaters, and jetties in and will continue to advocate for more lenient rules related to setbacks and static lines. That said, the Applicant has unequivocally stated that no such plan exists for these types of shoreline stabilization strategies. The Applicant has stated that the proposed action is intended to be a single and complete erosion control project for this part of the island.
60	States the DEIS fails to analyze unavoidable, adverse impacts should the proposed action be implemented. Specifically as related to mitigation from down-drift erosion on West Beach and to potential structures allowed under a future Cape Fear AEC.	NC Coastal Federation	Consistency with NEPA	Y	Section 5.5	Discussion of potential adverse effects of proposed action has been expanded throughout Section 5.5 to include the effects of implementing mitigative/remedial actions (if any) in response to down-drift erosion.
61	States the DEIS fails to adequately and logically discuss relevant information. Provides six items for which additional information is requested. Including: (1) modeling for each of the groin length alternatives (2) modeling for the 30 year life of the project (3) the effect of weather events/storms on modeling and cost (4) time frame for evaluating the effectiveness of Phase I and additional performance criteria for initiation of Phase II (5) benchmarks for groin performance (6) construction during the turtle moratorium, sand compaction and impact of sand borrowing on habitat of adjacent shoals.	NC Coastal Federation	Consistency with NEPA	Y	Section 5.2; Appendix V (Storm Simulation Response); Section 3.2.5; Section 6; Appendix B (Inlet Management Plan); Appendix S (Biological Opinion)	The engineer analyzed three conceptual groin lengths under the initial design process. Groin lengths that either did not accomplish the desired updrift influence or posed too large an impact to down-drift shorelines were not modeled. DELFT3D modeling analyses were performed for the 1,900-lf structure. During the progression of the design process, additional numerical modeling analyses for a 1,300 ft-long (Phase I) structure were specifically performed for purposes of comparison with existing DELFT3D modeling results for the full 1,900 ft-long (Phase II) terminal groin length. Both discussion of approach and comparative modeling results are addressed in Appendix I.
62	States the DEIS is not consistent with state regulations regarding a single, terminal groin. Considers the sand tubes to be groins, for a total of 17 groin structures.	NC Coastal Federation	Consistency with State Law	N	N/A	By way of NC DCM review; compliance with SB 151 will be ensured.

*Agency comments have been summarized. Please refer to individual agency letters for full content.

63	States the DEIS is inconsistent with NEPA for reasons previously listed. Requests a supplement to the DEIS to address future shoreline protection plans by the Village.	NC Coastal Federation	Consistency with NEPA	Y	Section 5.22	Noted. The proposed action is considered a single and complete project. Future stabilization actions not evaluated in the EIS would be subject to NEPA review.
64	States concern regarding potential erosion on adjacent beaches to the south (Oak Island to Sunset Beach). Requests information on potential cumulative and indirect impacts to these beaches and mitigation plans for the same.	Patricia R. Blackwell	Impacts to Adjacent Brunswick Beaches	Y	Section 5 and Appendix B (Inlet Management Plan).	The reader is also referred to the report entitled "Shoreline Stabilization Analysis" (Olsen 2013) which provides detailed analyses of predicted physical effects of the proposed project on Bald Head Island and Caswell Beach shorelines. This report is referenced throughout the EIS and is available through the Village of Bald Head Island on their website: http://www.villagebhi.org/government/development_services/OAI.html
65	Resident of Bald Head Island, Cape Fear Trail, West Beach. States concern for erosion on West Beach. Specifically, on quantifying the amount of sand allowed to by-pass to West Beach and on the lack of beach nourishment on West Beach. Requests protection of West Beach be addressed in the project design.	James E. Harrington	Impact to West Beach	Y	Section 3.2.5.2	The predicted increase in erosion on West Beach resulting from the construction of the maximum length of the proposed groin is identified in Section 3.5.2. Detailed analyses and findings related to potential downdrift effects are described in the engineering report. Mitigative actions to address any potential effects to downdrift shorelines (i.e. West Beach) are described in Section 6.0 and in the Applicant's Inlet Management Plan (Appendix B).
66	Resident of 230 S. Bald Head Wynd. States support of project. Perceives benefits to shipping, residents and visitors of Bald Head Island, and sea turtles/wildlife/birds.	Louis S. Wetmore	General	N	N/A	Noted.
67	Member of Coastwalk. States sand tube groin field makes recreational walking unpleasant. Requests DEIS more fully address impact of sand tubes on public beach recreation, particularly Alternatives 5 and 6.	Peter K. Meyer	Sand Tubes / Public Beach Recreation	Y	Section 5.11	The effect of the presence of sand tubes on recreational walking on South Beach has been included.
68	States primary purpose of project is for protection of private property, not public property.	Peter K. Meyer	Purpose	N	N/A	Noted.
69	Considers use of Corps dredge material for nourishment of Bald Head beaches to be use of public money for protection of private property and objects to same.	Peter K. Meyer	General			Disposal of dredged material on Bald Head Island, Fort Caswell, and Caswell Beach pursuant to the federal navigation project is done for purposes of least-cost, environmentally acceptable, and engineeringly feasible disposal, and not for any shore protection benefits. Any re-evaluation of the navigation project and its sand disposal practices is beyond the scope of this EIS, which focuses solely on the applicant's proposed project and its effects.
70	Considers sand tubes to be a hardened structure and finds them to be inconsistent with state laws regarding the same.	Peter K. Meyer	Sand Tubes	Y	Section 5.22	By way of NC DCM review, compliance with SB 151 and other applicable state statutes will be ensured.
71	States Bald Head Island is accessible by public trust beaches, by walking and biking, from Fort Fisher/Pleasure Island.	Peter K. Meyer	General	Y	Section 4.15	Text revised as recommended.
72	Requests DEIS include an estimate of the full cost to remove groin.	Peter K. Meyer	Groin Removal Cost	Y	Section 5.14.2	The estimated costs to remove the groin are identified in the EIS.
73	Disagrees with a terminal groin where sand tubes remain on the basis of allowing for future expansion of structures in an inlet hazard area.	Peter K. Meyer	Sand Tubes	N	N/A	Noted. The Bald Head Island Club is an existing, conforming use within the planned unit development. Any improvements to existing facilities at the Club will be in compliance with all federal and state regulatory requirements (including NC DCM oceanfront setback requirements as measured from the static vegetation line) and Village zoning requirements.
74	Believes land-based and water-based recreational activities would improve under Alternative 6 (as compared to Alternative 5) since the sand tubes would be removed.	Peter K. Meyer	General	Y	Section 5.11	Noted. See revised text.
75	Prefers Alternative # 1, No Action, on the basis hardened structures do not work in the long term.	David Hill	Alternative # 1	N	N/A	Noted.
76	Supports Alternative # 5. Anticipates alternative will protect infrastructure, property, beaches and habitat. Supports two-phase approach with performance monitoring of Phase I.	Joshua Diaz	Alternative # 5	N	N/A	Noted.
77	Property owner Bald Head Island, supports preferred alternative. Proposed work will not affect neighboring beaches due to lack of directly abutting communities (navigation channel directly abutting rather than other communities/towns).	Richard Walsh	Alternative # 5	N	N/A	Noted.
78	Suggests analysis of expected benefits for each alternative. Suggests cost benefit analysis for each alternative.	Mirtha Escobar	General- Alternatives	N	N/A	Expected benefits are discussed. NEPA and CEQ regulations do not require that an EIS include cost-benefit analyses. Specifically 40 CFR 1502.23. Also, 33 CFR 325, Appendix B, 9.5.d states that the Corps shall not prepare a cost-benefit analysis for projects requiring Corps authorization.
79	Questions whether there are any measures to minimize or mitigate potential impacts to at-risk properties (for each alternative).	Mirtha Escobar	At-Risk Properties	Y	Section 3.2.5; Section 6.3.2; Appendix B (Inlet Management Plan)	The noted sections of the EIS include measures identified by the Applicant to mitigate potential adverse effects of Alternative #5 (the Applicant's proposed action).
80	Requests list of construction practices to minimize in-water construction impacts.	Mirtha Escobar	In-water Construction	Y	Section 6.2	Noted. See updated text.
81	Questions public interest factors considered when developing alternatives.	Mirtha Escobar	General- Alternatives	Y	Section 1 and Section 2	Yes. Public interest factors considered during scoping and public review. Project objectives are identified in Section 1.0 of EIS. When alternatives are evaluated, public interest factors are considered in accordance with 33 C.F.R. 320.
82	Questions whether there are benefits associated with construction of groins in relation to sea level rise.	Mirtha Escobar	Groin-Sea Level Rise	Y	Section 3.2 and Section 5.2	Effective elevation of rock groin can be adjusted to address potential effects of sea-level rise.
83	Questions if measures to protect property which allow for shoreline migration will be included.	Mirtha Escobar	General	Y	Section 3.0	The proposed erosion control measures for each alternative are decribed in Section 3.0
84	Requests additional detail on how dune protection will be achieved with preferred alternative.	Mirtha Escobar	Alternative 5-Dune Protection	Y	Section 5.2	Maintenance and protection of the dune system on Bald Head Island is recognized to be of critical importance to the continued stability, health and safety of the residents of the Village of Bald Head Island. As a result, the Village enforces a dune protection ordinance prohibiting any person to traverse or walk upon, over or across or to damage, in any manner whatsoever, the Frontal Dune at any point within the corporate limits of the Village of Bald Head Island other than at “Beach Access Points”. In addition, the ordinance strictly controls the construction of private accesses across dunes. Dune protection is also ensured through the oceanfront setback requirements as measured from the static vegetation line and as enforced through NC DCM.
85	Requests elaboration on cumulative sedimentation and erosion trade-offs between Alternative # 3 and # 5.	Mirtha Escobar	Alternatives # 3 and # 5	Y	Section 5.2 (see also Figures 5.2 thru 5.7)	See Olsen Engineering Report entitled *Shoreline Stabilization Analysis* (Olsen 2013). The report is available on the Village of Bald Head Island website: (http://www.villagebhi.org/government/development_services/OAI.html)

*Agency comments have been summarized. Please refer to individual agency letters for full content.

86	Include information on existing water quality in the project area-303(d) listed waters, any TMDLs, other relevant water quality conditions.	US EPA	Water Quality-Section 4.5	Y	Section 4.5	Requested information added on pages referenced.
87	Include a matrix summarizing potential environmental consequences by alternative. Use alternatives matrix in Appendix L and expand to include other resources discussed in Chapter 5, such as water quality and air quality.	US EPA	Environmental Consequences	See referenced appendix and note.	Appendix Q.	An environmental consequent matrix is included and formatted to summarize the potential adverse direct, indirect, and cumulative effects to permit area habitats and federally-listed species. Effects on other resource or public interest factors are described in Section 5.
88	Discuss why sea level rise is not addressed for the 30-year life of the project.	US EPA	Sea Level Rise	Y	Section 5.2	According to the Applicant's engineer, the principal goal of the modeling was to be able to compare the impacts or benefits of each alternative considered and not to make predictions of performance over a 30-year time period. A 30-year analysis would compromise the level of accuracy desired for this type of morphological modeling.
89	FEIS or Appendix should: clearly define model assumptions for all alternatives, discuss selection of parameters and values; provide any sensitivity analysis, any calibration periods and forcing conditions.	US EPA	Delft 3-D Model	Y	Section 5.0	The level of detail requested by EPA is not in the EIS nor associated appendices, but it is within the engineering report. The report is referenced in the EIS and is available through the Village of Bald Head Island (www.villagebhi.org)
90	Provide analysis of compliance with Executive Order 12898, Environmental Justice.	US EPA	Environmental Justice	Y	Section 5.22	Information regarding compliance with EO 12898 is provided on p. 5-205.
91	Revise cumulative impacts discussion to include future actions that may affect resources. Such as impact to maritime forest/interdunal wetlands with construction of existing lots under Alternatives 5 and 6.	US EPA	Cumulative Impacts	Y	Section 5.5.2	Cumulative effects discussion has been expanded to include information on potential impact to these resources from increase in lot construction for all alternatives.
92	Recommends continued consultation with USFWS regarding species protected under ESA, particularly related to construction impacts during moratorium.	US EPA	Threatened and Endangered Species/EFH	N	N/A	Noted. Final conservation measures received from USFWS
93	Recommends consultation with NMFS regarding potential impact to essential fish habitat.	US EPA	EFH	N	N/A	Noted. Received final conservation recommendation from NMFS.
94	Include results of any consultation with USFWS and NMFS in FEIS.	US EPA	Threatened and Endangered Species	Y	Section 5-4	Formal ESA Section 7 consultation with USFWS completed (see BO - Appendix S). Section 7 consultation has been initiated with NMFS.
95	Recommends continued consultation with SHPO throughout construction and life of project to ensure protection of known shipwreck and to ensure location remains properly mapped.	US EPA	SHPO	N	N/A	Concur.
96	FEIS should clarify that post construction monitoring and mitigation triggers meets required state standards, particularly related to physical monitoring on Oak Island.	US EPA	Inlet Management Plan - Appendix B	Y	Section 5.22	NC DCM has provided indication that the Applicant's updated Inlet Management Plan is sufficient to satisfy the inlet management requirements of Session Law 2013-384 (SB 151). However, DCM will take into consideration any comments received on the plan during the CAMA Major Permit application review process, and if necessary, will initiate further coordination with the Applicant prior to taking final action on the permit application.
97	Include a map of stations referenced in table.	US EPA	Editorial Comment-Table 1.2	Y	Appendix P	This map was included in the DEIS. It is Appendix P of the FEIS.
98	Include table summarizing sand sources and sediment characteristics of each source.	US EPA	Editorial Comment-Section 4.1.2	See section and note.	Section 4.1.2. and Table 5.5	Geotechnical information for all prospective source sites is provided in Section 4.1.2. Specific geotechnical data for the Bald Head Creek Shoal borrow site is provided in Appendix F. In addition, Table 5.5 provides the sand volume requirements by alternative and identifies the likely sand source site over the 30-year project life.
99	FEIS should clarify reference for benthic abundance comparison.	US EPA	Editorial Comment-Section 4.3.1	Y	Section 4.3.1; p.4-24	Text revised as recommended to clarify.
100	Define SA, SB, and SC in text.	US EPA	Editorial Comment-Pg 4-33	Y	Section 4.5; p.4-42	Text revised as recommended.
101	Clarify the meaning/significant of arrow sizes in the description of the figure.	US EPA	Editorial Comment-Figure 4-30	Y	Updated Figure 4-30	Description provided to clarify the meaning/significance of the arrows in the figure.
102	Include discussion regarding potential reasons for erosional "hot spots" on Oak Island near profiles 35 and 40.	US EPA	Editorial Comment-Pg.4-51	N	N/A	Beyond scope of EIS
103	If a Phase I Baseline Environmental Assessment has been completed for the project area, mention so in this section of the FEIS.	US EPA	Editorial Comment-Section 4.19.1	Y	Section 4.19.1	A review of EPA's Envirofacts website, the US Coast Guard's National Response Center website, and NC DENR's Inactive Hazardous Sites Branch website did not indicate the potential for any contaminant threat to the sand of any one of the sand source sites under consideration. As a result, a Phase I basline environmental assessment was not performed.
104	In the text of the FEIS regarding Tables 5.2 and 5.4, more clearly define "Area 1" and "Area 2".	US EPA	Editorial Comment-Tables 5.2 and 5.4	Y	Section 5.2.2	Description already provided but note added referring reader to text describing these areas.
105	Include maps of areas that may be closed to the public during construction.	US EPA	Editorial Comment-Section 5.9 and 5.11	Y	Section 5.9 and 5.11; Figures 3.3	A map of the limits of work has been included (see Figure 3.3). All work areas would be clearly marked and cordoned off to protect public health and safety.
106	States that the project need results from severe and chronic erosion on western end of South Beach since relocation of Wilmington Harbor Shipping Channel. States erosion-related cost since 2000 to be in excess of $25 million dollars.	Village of Bald Head Island	Cover Letter Comments Project Purpose/Need	See note.	N/A	Noted. No response required. To the extent the comment intends to express a cause-and-effect relationship between the Federal project realignment and the project need, this Regulatory action is not the appropriate forum for that discussion.
107	Terminal groin predicted to reorient the shoreline and slow the annual rate of alongshore transport into the Channel, but beneficial sand placement from future Channel dredging operations would continue to be needed.	Village of Bald Head Island	Cover Letter Comments Future Sand Needs	See note.	N/A	Noted. For purposes of this EIS, disposal of dredged material from the federal navigation project on VBHI beaches will be assumed to continue throughout the project life, although nothing in this Regulatory document should be read to make any commitments with regard to the federal navigation project.
108	References documentation that finds sand loss from Bald Head beaches greatly exceeds that of Oak Island/Casewell Beach. States Corps has discretionary authority to distribute sand under SMP as appropriate for the Channel and mitigation of environmental impacts. States allocation of sand between the Village and Oak Island/Caswell Beach (under the SMP) is beyond scope of EIS.	Village of Bald Head Island	Cover Letter Comments Sand Management Plan-Future Allocations	See note.	N/A	Concur that any discussion of future disposal of, or allocation of dredged material from the federal navigation project is beyond the scope of this Regulatory EIS, and will not be addressed here. For purposes of this EIS, disposal trends from the previous decade are projected to continue.
109	Conclusions regarding shoaling rates in the Channel are not indicative of adjacent island losses or mitigation needs. States the latest SMP document was based on a 1997 ERDC model that provided littoral transport rates for Bald Head and Oak Island/Caswell Beach but did not address a ratio of shoaling rates in the Channel.	Village of Bald Head Island	Cover Letter Comments Sand Management Plan-Pg 4-53	See note.	Section 4.14	The referenced sentence from Page 4-53 is not necessary for evaluation of this Regulatory project and has been removed. The purpose of this EIS is not to link shoaling in the channel to any shoreline losses; it is only to provide a basic background of existing littoral processes for the evaluation of alternatives to the applicant's proposed project.

*Agency comments have been summarized. Please refer to individual agency letters for full content.

110	Delft 3-D modeling by Olsen and Associates predicts peak littoral transport rate between Bald Head Island and Oak Island to be at a 4.2:1 ratio. Inlet Management Plan estimates ratio to be 7.8:1. States three coastal engineering firms have found 1999 ERDC model to be inaccurate.	Village of Bald Head Island	Cover Letter Comments Littoral Transport Rates	See note.	N/A	The ratio of littoral transport rates between the two islands does not appear to be particularly relevant to the evaluation of alternatives considered in this EIS. The Corps does not know why Mr. Olsen's critique of a 1999 ERDC report is relevant to this permit action. If the statement that the attached critique is "noted for the record" is intended for any purpose beyond the Regulatory evaluation of this permit action by Regulatory staff, VBHI should submit such critique directly to the Wilmington District Chief of Engineering or to ERDC under separate cover. This is not the forum for discussion of the applicant's issues with the federal navigation project, and this report will not be included in any administrative record for the navigation project unless it is provided appropriately to Engineering and Navigation staff for their consideration.
111	States three factors outlined on Page 8 of SMP should continue to be used to guide present/future maintenance dredging events.	Village of Bald Head Island	Cover Letter Comments Sand Management Plan-Future Allocations	See note.	N/A	Any discussion of future disposal of, or allocation of dredged material from the federal navigation project is beyond the scope of this Regulatory EIS, and will not be addressed here. If the applicant intends any of these comments to be directed to the Wilmington District in its Navigation or Civil Works capacity, VBHI should submit such comments directly to the Wilmington District Chief of Engineering and Chief of Navigation under separate cover. This is not the forum for discussion of the applicant's issues with the federal navigation project.
112	States need for secondary source of sand to maintain equilibrium of beach system (beyond future channel maintenance).	Village of Bald Head Island	Cover Letter Comments Future Sand Needs	Y	Section 3.2.5	Noted. Should sand quantities within the federal channel be shown to be inadequate, then secondary sand sources can be considered. Jay Bird Shoals is specifically considered as an additional sand source.
113	Monitoring following 2009-2010 use of Jay Bird Shoals borrow site found area recovered quickly with no impact to Caswell Beach or Fort Caswell. Additional monitoring would violate NCGC 113-A-115.1(e)(5). States Corps data documents the erosional hotspot at Fort Caswell predated Jay Bird Shoals borrow activities. States there is no engineering basis to conclude the Jaybird Shoals borrow area affected hydrodynamics at Oak Island/Caswell Beach/Fort Caswell. No engineering basis for further survey or hydromechanical studies.	Village of Bald Head Island	Cover Letter Comments Jay Bird Shoals 2009-2010 Borrow Site/Fort Caswell Erosion	See note.	N/A	Noted. SB 151 requires assessment via establishment of baseline conditions and post-construction monitoring.
114	Generally finds potential impacts from project to be negligible, limited to Bald Head Island, and outweighed by potential benefits. Anticipates potential benefit to environment, coastal resources, and Channel maintenance.	Village of Bald Head Island	Cover Letter Comments	N	N/A	Noted.
115	Currently threatened structures were originally built many hundreds of yards setback from ocean. Disagrees with comments that allege improvident development of the oceanfront.	Village of Bald Head Island	Cover Letter Comments	N	N/A	Noted.
116	Clarify funding for 2007 Corps O&M Project and Village contributions, see comment #1.	Village of Bald Head Island	Technical Comments - Pg 1-8	Y	Section 1.4	Text revised as recommended.
117	Clarify repair of sand tubes in 2013 following Hurricane Irene, see comment #2.	Village of Bald Head Island	Technical Comments - Pg 1-10	Y	Section 1.4	Text revised as recommended.
118	No easement from the State Property Office will be needed, see comment #3.	Village of Bald Head Island	Technical Comments - Pg 1-19	Y	Section 1.6	Text revised as recommended.
119	Change word "endangered" to "threatened", see comment #4.	Village of Bald Head Island	Technical Comments - Pg 3-13	Y	Section 3.2.5	Text revised as recommended.
120	Revise language regarding Hurrican Irene damage, see comment #5.	Village of Bald Head Island	Technical Comments - Pg 4-23	Y	Section 4.3	Text revised as recommended.
121	Change "Emergency Management" staff to "Public Safety" staff here and in all references throughout document, #6.	Village of Bald Head Island	Technical Comments - Pg 4-34	Y	Section 4.7	Text revised as recommended.
122	Revise language regarding beach accesses, see comment #7.	Village of Bald Head Island	Technical Comments - Pg 4-35	Y	Section 4.9	Text revised as recommended.
123	Specify type of tax revenue and where it is going, see comment #8.	Village of Bald Head Island	Technical Comments - Pg 4-38	Y	Section 4.12	Text revised as recommended.
124	Specify type of tax revenue (referenced Norton), see comment #9.	Village of Bald Head Island	Technical Comments - Pg 4-39	Y	Section 4.12	Text revised as recommended.
125	Revise incorporation date, see comment #10.	Village of Bald Head Island	Technical Comments - Pg 4-39	Y	Section 4.13	Text revised as recommended.
126	Revise to reference the Village of Bald Head Island's Land Use Plan, see comment #11 and comment #25.	Village of Bald Head Island	Technical Comments - Pg 4-40	Y	Section 4.13	Text revised as recommended.
127	Revise land use classifications to reflect Village's Land Use Plan, see comment #12.	Village of Bald Head Island	Technical Comments - Pg 4-40	Y	Section 4.13	Text revised as recommended.
128	Include collection system permit number, see comment #13.	Village of Bald Head Island	Technical Comments - Pg 4-57	Y	Section 4.17	Text revised as recommended.
129	Revise information regarding waste collection by Village Public Works, see comment #14.	Village of Bald Head Island	Technical Comments - Pg 4-57	Y	Section 4.17	Text revised as recommended.
130	Revise language regarding description of aquifer, see comment #15 and comment #19.	Village of Bald Head Island	Technical Comments - Pg 4-57	Y	Section 4.18	Text revised as recommended.
131	Revise language regarding age and operation of water main, see comment #16, comment #22, comment #17.	Village of Bald Head Island	Technical Comments - Pg 4-57	Y	Section 4.18	Text revised as recommended.
132	Revise language regarding peak water use, see comment #18.	Village of Bald Head Island	Technical Comments - Pg 4-57	Y	Section 4.18	Text revised as recommended.
133	Revise language regarding water system and osmosis units, see comment #20 and comment #21.	Village of Bald Head Island	Technical Comments - Pg 4-57	Y	Section 4.18	Text revised as recommended.
134	Revise language regarding incorporation, see comment #23.	Village of Bald Head Island	Technical Comments - Pg 5-66	Y	Section 5.5	Text revised as recommended.
135	Specify type of tax revenue from Bald Head Island Club, see comment #24.	Village of Bald Head Island	Technical Comments - Pg 5-160	Y	Section 5.14	Text revised as recommended.
	Public Hearing Comments	Public citizens	Varied.	See note.	Multiple sections.	Oral comments presented during the Public Hearing held on March 4, 2014 can be found in the Public Hearing Transcript which is available on the USACE Wilmington District's website (http://www.saw.usace.army.mil/Missions/RegulatoryPermitProgram/MajorProjects). All oral comments have been noted and/or addressed in the Final EIS.

*Agency comments have been summarized. Please refer to individual agency letters for full content.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

February 28, 2014

Mr. Ronnie D. Smith
U. S. Army Corps of Engineers
Wilmington Regulatory Field Office
P. O. Box 1890
Wilmington, North Carolina 28402-1890

Subject: Action ID #SAW- 2012-00040; Village of Bald Head Island
Brunswick County, NC

Dear Mr. Smith:

This letter provides the comments of the U. S. Fish and Wildlife Service (Service) on the subject Public Notice (PN), dated January 10, 2014, and the Draft Environmental Impact Statement (DEIS) for the Village of Bald Head Island (VBHI). VBHI proposes to construct a terminal groin structure on Bald Head Island in the Atlantic Ocean. These comments are submitted in accordance with the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661-667d). Comments related to the FWCA are to be used in your determination of compliance with 404(b)(1) guidelines (40 CFR 230) and in your public interest review (33 CFR 320.4) in relation to the protection of fish and wildlife resources. Comments related to the District Engineer's determination of project impacts in the BA, pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543) will be addressed during formal consultation.

Project Area, Proposed Activities, and Anticipated Impacts

The project area is South Beach and the adjacent Atlantic Ocean on Bald Head Island. The waters of the project area are classified as SB. The area is not designated as a Primary Nursery Area (PNA). The substrate of the project area is primarily sand.

The preferred alternative in the DEIS is Alternative 5, which includes the construction of a 1,900 linear foot terminal groin on the southeast end of Bald Head Island, concurrent with, and following a federal beach disposal operation. The terminal groin would be constructed in two phases and would serve as a template for fill material placed eastward thereof. In Alternative 5, the existing groin field of 16 sand tube groins is proposed to remain. The terminal groin is intended to be a "leaky" structure, so as to provide for a level of sand transport to West Beach, which is located northwest of the proposed groin. The applicant proposes that the Wilmington District Corps of Engineers (Corps) place the sand first on the nearshore area (from regular dredging of the Wilmington Harbor Channel project), and then the Village will construct the terminal groin in two phases within the sand fillet. Because Phase 1 of the groin will be constructed after a winter dredging and nourishment project, the applicant states that construction will likely stretch into the piping plover and sea turtle nesting seasons.

Federally Protected Species

The Service has reviewed available information on federally-threatened or endangered species known to occur in Brunswick County. Our review indicates that several species may occur in the project area, including the West Indian manatee (*Trichechus manatus*), piping plovers (*Charadrius melodus melodus*), seabeach amaranth (*Amaranthus pumilus*), and the Kemp's Ridley (*Lepidochelys kempi*), hawksbill (*Eretmochelys imbricata*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), and green (*Chelonia mydas*) sea turtles. Of the five sea turtle species, the loggerhead (*Caretta caretta*), and green (*Chelonia mydas*) sea turtle may nest in the project area. Whales, shortnose sturgeon (*Acipenser brevisrostrum*), Atlantic sturgeon (*Acipenser oxyrinchus*), and sea turtles in the water are under the jurisdiction of NOAA Fisheries' Protected Species Division.

On September 30, 2013, the Service proposed listing the rufa red knot (*Calidris canutus rufa*) (or red knot) as threatened throughout its range. Please refer to Federal Register Notice 78 FR 60023. The Service also plans to publish a proposal to designate critical habitat for the red knot in the very near future.

The Service is also proposing to designate portions North Carolina beaches as critical habitat for the Northwest Atlantic (NWA) population of loggerhead sea turtles. Bald Head Island is located within Critical Habitat Unit LOGG-T-NC-06 (Baldhead Island, Brunswick County). From the Federal Register (FR) Notice (see http://www.regulations.gov/#!documentDetail;D=FWS-R4-ES-2012-0103-0001), this unit consists of 15.1 km (9.4 miles) of island shoreline along the Atlantic Ocean. The island is part of the Smith Island Complex, which is a barrier spit that includes Bald Head, Middle, and Bluff Islands. The island is separated from the mainland by the Atlantic Intracoastal Waterway, Cape Fear River, Battery Island Channel, Lower Swash Channel Range, Buzzard Bay, Smith Island Range, Southport Channel, and salt marsh.

The unit extends from 33.91433 N, 77.94408 W (historic location of Corncake Inlet) to the mouth of the Cape Fear River. The unit includes lands from the MHW line to the toe of the secondary dune or developed structures.

The Corps has made a determination of May Affect, Not Likely to Adversely Affect the West Indian manatee, piping plover, red knot, seabeach amaranth, and Kemp's Ridley, hawksbill, loggerhead, leatherback, and green sea turtle.

Service Concerns and Recommendations

1. The EIS should clarify the proposed nourishment cycles. In several places, the DEIS states that nourishment would occur at 3 years post-construction, and then on 9-year intervals. The Service understands that this schedule is due to the Corps' Wilmington Harbor Sand Management Plan (SMP). However, the language is not clear in many places. We recommend that in order to make the schedule completely clear, the EIS include a table, chart, or figure in Sections 3 and 5 to spell out the expected or proposed nourishment schedule from all sources, for each alternative.

2. The Service recognizes that a 3-year beach nourishment cycle is likely to be needed in many cases. As stated in Section 8.3.3 of the draft BA, "studies have shown that intertidal macrofauna can recolonize a nourished area within one or two seasons…." This is a concern of the Service, because as soon as the macrofauna are recovered (by the end of the second season), the SMP nourishment schedule typically provides for beach disposal that season or the very next season. The Service is concerned with the long-term impacts from frequent beach nourishment. The schedule of nourishing every three years or so results in a healthy macrofauna population for as little as one year out of every three.

   The FR notice concerning loggerhead critical habitat states: "In most cases, a significantly larger proportion of turtles emerging on engineered beaches abandon their nesting attempts than turtles emerging on natural or prenourished beaches, even though more nesting habitat is available (Trindell et al. 1998; Ernest and Martin 1999; Herren 1999), with nesting success approximately 10 to 34 percent lower on nourished beaches than on control beaches during the first year post-nourishment. This reduction in nesting success is most pronounced during the first year following project construction and is most likely the result of changes in physical beach characteristics (beach profile, sediment grain size, beach compaction, frequency and extent of escarpments) associated with the nourishment project (Ernest and Martin 1999). During the first post-construction year, the time required for turtles to excavate an egg chamber on untilled, hard-packed sands increases significantly relative to natural beach conditions. Also during the first post-construction year, nests on nourished beaches are deposited significantly more seaward of the toe of the dune than nests on natural beaches. More nests are washed out on the wide, flat beaches of the nourished treatments than on the narrower steeply sloped natural beaches. This phenomenon may persist through the second post-construction year and result from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping, occur as the beach equilibrates to a more natural contour."

Because of the potential on-going impacts from a short nourishment cycle, we encourage the Corps and VBHI to consider extending the beach nourishment cycles to 4 and 5 years when possible to minimize impacts to nesting sea turtles, to benthic macroinvertebrate fauna, and to surf fishes and shorebirds.

3. Although we agree that it is unlikely (given the documented history) that piping plover would nest on Bald Head Island, we do not believe that a determination of "no effect" can be made for any of the alternatives that include continued nourishment or beach management activities (such as Alternative 1). Please change the language on Page 5-27 for Alternative 1 to state that the SMP events may affect, but are not likely to adversely affect piping plover. Also, please change the language in Section 6.5.5 of the DEIS to state that "piping plovers *are not known to* nest within the project boundaries…."

4. In Sections 3.2.5, 3.2.6, 5.4.5, and 5.4.6 (discussions of Alternatives 5 and 6), the Final EIS should include a more specific proposed construction schedule for the terminal groin. These sections state that Phase 1 construction of the terminal groin could theoretically start in November and December, but that construction would probably extend well into the sea turtle nesting season. What amount of time is estimated to be needed solely for construction of the groin, after sand placement?

5. In Sections 3.2.5 and 5.4.5 (discussions of Alternative 5), the Final EIS should include more discussion of the potential removal of some or all of the sand-tube groins, if it is shown that they are not needed.

6. In Sections 3.2.5, 3.2.6, 5.4.5, and 5.4.6 (discussions of Alternatives 5 and 6), the Final EIS should include a discussion of the potential remediation plans if the terminal groin fails or is shown to be causing significant negative impacts. We

recognize that Appendix B contains information from the applicant concerning potential impacts of the terminal groin, physical monitoring plans, and potential remediation or mitigating actions. The text of the Final EIS should at least refer to Appendix B for monitoring and remediation. In addition, the potential for removal of the groin (an example of the type or severity of negative impact that would necessitate consideration of removal) should be discussed in the EIS. The applicant should also discuss the method for financing remedial or terminal groin removal actions.

The Service appreciates the continued opportunity to comment on this project. We look forward to working with the Corps during formal consultation. If you have questions regarding these comments, please contact Kathy Matthews at 919-856-4520, ext. 27 or by e-mail at <kathryn_matthews@fws.gov >.

Sincerely,

John Ellis for

Peter Benjamin
Field Supervisor

cc:
Fritz Rohde, NOAA Fisheries, Beaufort
Maria Dunn, NCWRC, Washington
Doug Huggett, NC DCM, Morehead City
Debra Wilson, NC DCM, Wilmington
Chad Coburn, NC DWR, Wilmington
Karen Higgins, NC DWR, Raleigh

References:

Ernest, R.G. and R. E. Martin. 1999. Martin County Beach Nourishment Project: Sea Turtle Monitoring and Studies. 1997 Annual Report and Final Assessment. Ecological Associates, Inc., Jensen Beach, FL. 96 pp.

Herren, R.M. 1999. The effect of beach nourishment on loggerhead (*Caretta caretta*) nesting and reproductive success at Sebastian Inlet, Florida. M.S. Thesis. University of Central Florida. 150 pp.

Trindell, R., D. Arnold, K. Moody and B. Morford. 1998. Post-construction marine turtle nesting monitoring results on nourished beaches. Pages 77-92 in Tait, L.S. (compiler), Rethinking the Role of Structures in Shore Protection. – Proceedings of the 1998 National Conference on Beach Preservation Technology. Florida Shore and Beach Preservation Association, Tallahassee, Florida.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

March 4, 2014

Scott McLendon
Chief Regulatory Division
US Army Corps of Engineers
Wilmington District
Regulatory Field Office
69 Darlington Avenue
Wilmington, NC 28403

Subject: **EPA NEPA Comments on Draft Environmental Impact Statement (DEIS) for Village of Bald Head Island Shoreline Protection Project - CEQ Number: 20140000**

Dear Mr. McLendon:

Pursuant to Section 309 of the Clean Air Act and Section 102(2)(C) of the National Environmental Policy Act (NEPA), EPA Region 4 has reviewed the Draft Environmental Impact Statement (DEIS) for the Village of Bald Head Island (VBHI) Shoreline Protection Project. This DEIS features an evaluation of the environmental consequences of several alternative plans that would address chronic erosion at the western end of South Beach of VBHI with a goal of protecting public infrastructure, roads, homes, businesses and rental properties, golf course, beaches, recreational assets, and protective dunes.[1] The ongoing erosion issues associated with South Beach have been highlighted in a U.S. Army Corps of Engineers (USACE) report (USACE 2011) in which it was estimated that the subject beach retreated 315 ft over a 9 year period during which 6 million cubic yards of material was placed on the shoreline through beach nourishment activities. This area of the island has experienced erosion issues for several years and various shoreline management responses have been implemented (beach nourishments, relocation, sand bag revetments, etc).

Bald Head Island is a south-facing three mile long island located east of the mouth of the Cape Fear River. The island forms the southern end of the Smith Island complex at Cape Fear Point. Inlet management has been ongoing at the Cape Fear River entrance since 1822.[2] Several modifications to the navigation channel have occurred over the years to accommodate larger ships. Since 2000 the Wilmington District USACE has implemented the Wilmington Harbor Sand Management Plan which has included disposing of beach-quality sand from the maintenance activities of the inlet onto Bald Head Island and Oak Island/Caswell Beach. One of the main objectives of this plan was to keep beach-quality sand in the littoral system of the islands. Since 2000 there have been seven disposal events that have deposited beach-quality

---

[1] p. 1-1 of DEIS
[2] p. 1-3 of DEIS

sand on South Beach (Federal and Island Funded).[3] In addition to these nourishment activities, a sand tube groinfield was constructed in 1995. Due to frequent storms the groinfield has had several maintenance events, which have include replacing sand tube groins as needed. In addition to the sand tube groindfield, bag revetments have been constructed in the project area to slow chronic erosion at South Beach.

It is stated in the DEIS that the "Project Goal and Objectives" for the proposed action are the following:

- To reduce sand losses from beach disposal or construction (either federal disposal actions or Village-sponsored beach nourishment projects) along the inlet margin; and
- To effectively control shoreline alignment along the westernmost segment of South Beach in such a manner to reduce alongshore transport rates and shoreline recession.

The USACE appropriately provided an opportunity for the public, interested stakeholders, and federal and state agencies to provide comments on this proposed action in 2012. In addition to hosting a meeting (Meeting Notes – Appendix C), the USACE also created a project review team (PRT) to solicit input on main issues related to the proposed action. A list of members of the PRT is provided in Table 2.1 of the DEIS. A summary of comments received during scoping is provided in Appendix C. Examples of some of the issues highlighted during scoping include:

- Concerns about timing of construction and coordination with the Wilmington Harbor SMP
- Concerns that nourishment may coincide with piping plover and sea turtle nesting periods
- Concerns that the terminal groin will alter larval transport and impact important fish habitat
- Concerns that the project may cause adverse impacts downstream
- Request for the EIS to include a description of monitoring and adaptive management
- Request for the EIS to include detailed information about storm impact and effects upon the terminal groin and also on the inlet dynamics and morphology, the beach profile, sand resources, residential structures, private property, adjacent properties, and the natural resources and environment of the permit area due to the placement of the terminal groin
- Request for the EIS to include detailed information and modeling on the impacts of sea level rise on the terminal groin and the resulting effects upon inlet dynamics, adjacent property, beach profiles, residential structures and the natural resources and environment of the island and adjacent islands and estuarine habitats and resources.[4]

EPA also notes that the DEIS considers detailed alternatives for responding to the on-going erosion along the west end of South Beach of the Village of Bald Head Island. The DEIS includes detailed discussions of each alternative, how each was formulated, and the costs of

---

[3] Table 1.2 – p. 1-8 of DEIS

[4] This is not meant to include a summary of all of the comments and issues noted during scoping – just a sampling. For additional scoping comments see Appendix C of the DEIS.

implementation. An economic impact assessment on the existing island development and infrastructure is also included in the DEIS (Chapter 5). As requested by EPA for similar coastal erosion projects studied by the USACE, both "no action" and "abandon/retreat" were considered in the DEIS among the detailed alternatives:

- **Alternative 1** – No Action
- **Alternative 2** - Retreat
- **Alternative 3** – Beach Nourishment/Disposal with Existing Sand Tube Groinfield to Remain in Place
- **Alternative 4** - Beach Nourishment/Beach Disposal and Sand Tube Groinfield Removal
- **Alternative 5** – Terminal Groin with Beach Nourishment/Beach Disposal (Sand Tube Groinfield Remaining)
- **Alternative 6** - Terminal Groin with Beach Nourishment/Disposal (Removal of Sand Tube Groinfield)

General EPA Comments:

Water Quality – Section 4.5 provides a discussion of existing water quality conditions for the project area. EPA notes that discussions relating to waters meeting their designated use as defined by State Water Quality standards are missing in this section. **Recommendation:** EPA recommends the FEIS include additional information on existing water quality in the project area, such as 303(d) listed waters, TMDLs developed for waters in the area, and any other relevant water quality conditions. Maps are often useful when conveying existing water quality conditions in and around project areas.

Summary of Environmental Consequences – An alternatives matrix is provided in Appendix L. EPA notes that the table includes a summary of the alternatives in relation to threatened and endangered species and habitat type, but not other resources areas such as water quality and air quality. **Recommendation:** EPA appreciates the inclusion of this table in Appendix L; however we recommend that additional resources discussed in Chapter 5 be added.

Sea-Level Rise – It is stated in the DEIS that "Over a nine-year period, the range of potential sea level rise and corresponding influence on numerical morphological modeling is negligible."[5] While EPA agrees that sea-level rise over a 9-year period may be negligible, we are unclear on why the discussion of sea-level rise is not in the context of the entire project life (30-years). **Recommendation:** EPA recommends that additional discussion be added to the FEIS relating to why sea-level rise estimates are not discussed in the context of the entire project life (30 years).

Delft 3D Model Assumptions – The Delft 3D model is central to describing/predicting how the shoreline will respond to all of the alternatives evaluated in the DEIS. Several references are made regarding using a 9-year model simulation, however the project life is 30 years. EPA is

---

[5] p. 5-2 of DEIS

unclear on why model runs were 9-years while the project life is estimated much longer. In addition, EPA notes that minimal information is provided on assumptions and calibration of the Delft 3D model. **Recommendation:** EPA recommends additional discussion be provided in the FEIS main document or appendix which clearly outlines Delft 3D model assumptions used to evaluate all alternatives. We also recommend that the FEIS include a discussion relating to the the selection of all modeling parameters and justification for the values specified. We also recommend that the results of sensitivity analyses (if applicable) of all modeling parameters and that the selection of calibration/validation periods and application of forcing conditions be provided in the FEIS.

Environmental Justice – EPA notes that no Environmental Justice analysis was provided in the DEIS. **Recommendation:** Consistent with Executive Order 12898 entitled "Federal Actions to Address Environmental Justice In Minority Populations and Low-income Populations" and the accompanying Presidential Memorandum, EPA recommends that USACE analyze the potential for disproportionately high and adverse effects on low-income or minority populations for this project.

Cumulative Impacts - CEQ defined a cumulative effect as "an impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). EPA notes that for some resources discussed in the DEIS, consideration of future impacts from development may have not been fully considered. For example, for the discussion of the alternatives impacts on resources such as maritime thicket/forest and interdunal wetlands, it is stated that there will be no cumulative impacts associated with alternatives 5&6. However, it appears from Figure 3.1 that there may be undeveloped lots in the area that will be protected by alternatives 5&6. It's reasonable to anticipate additional future development in these areas, which would be considered a future impact on these resources. **Recommendation:** EPA recommends revising the cumulative impact discussions in the FEIS to include future actions (such as continued development of the island) that may impact resources.

Threatened and Endangered (T&E) Species – EPA notes that the construction of the terminal groin may require work to be conducted within the sea turtle moratorium.[6] EPA also notes that construction of the terminal groin and beach nourishment activities may impact nesting activities of shoreline birds such as the piping plover. EPA is concerned about these potential impacts to T&E species but defers to the US Fish and Wildlife Service. **Recommendation:** EPA recommends that the USACE continue consultation with the USFWS regarding species listed under the Endangered Species Act (ESA). In addition, EPA recommends that the USACE consult with the NMFS regarding potential impacts to essential fish habitat, if NMFS has not already been consulted. Additional information relating to consultations with USFWS or NMFS between the release of the DEIS and FEIS should be included in the FEIS.

---

[6] p. 5-23 of DEIS

Coordination with SHPO – EPA notes that the DEIS describes a potential historical shipwreck discovered during a 2012 marine remote-sensing survey that identified the remains of a 160- to 190-ft sailing vessel (potentially from the early 1900s) within the project area.[7] EPA also notes that the VBHI has engaged the State Historic Preservation Office (SHPO) and a 150ft buffer has been proposed to preserve the surviving vessel remains. **Recommendation:** EPA recommends continued coordination with the SHPO through the life of the project, and that all project construction operations avoid the shipwreck and follow-up investigations continue to keep this cultural resource accurately mapped in order to protect it during all construction activities, as well as future maintenance operations (including periodic nourishment).

Inlet Management Plan – Appendix B provides a copy of the VBHI Draft Inlet Management Plan, which is required by SB110. The plan is required to include the following elements:

1) Description of post-construction monitoring activities.
2) Define baseline for assessing adverse impacts and when these impacts must be mitigated.
3) Provide mitigation measures that would be implemented if impacts needed to be mitigated.
4) Provide for modification or removal of the terminal groin structure if the adverse impacts can't be mitigated.[8]

EPA is unclear on why post-construction surveys on Oak Island will terminate after 3 years "of monitoring subsequent to terminal groin structure completion fails to indicate any level of cause or effect relationship between structure installation and shoreline change."[9] Is this timeline defined in SB110? EPA is also unclear on what level of erosion or adverse impact to Oak Island would trigger mitigation and potentially the removal of the terminal groin structure. **Recommendation:** EPA recommends clarification of post-construction monitoring requirements and the triggers/thresholds for requiring mitigation be discussed in the FEIS.

Editorial Comments:

- **Table 1.2** – Station numbers are referenced in this table with no reference to a map of the actual stations. EPA recommends adding a reference in the FEIS to a map of the station numbers for the description of this table.
- **Section 4.1.2** – This section includes a description of several sources of sand for the sand fillet. EPA recommends these sources along with the sediment characteristics be summarized in a table in the FEIS for better comparison.
- **Section 4.3.1 (p. 4-20)** – End of 1st paragraph – The discussion of benthic taxa includes a statement from a report that says "In general, the mean taxa were low at all sites studied" What is the species abundance being compared to? Is the reference site comparable to the project site? EPA recommends this statement be clarified in the FEIS.

---

[7] p. 5-146 of DEIS

[8] Summarized from Appendix B

[9] p. 5 of Appendix B – Inlet Management Plan

- **Page 4-33 –** SA, SB, SC should be defined in the text.
- **Figure 4-30 –** It is assumed that the size of the arrows in this figure correspond with amount of sediment is being transported. EPA recommends this be clarified in the Figure description in the FEIS.
- **Page 4-51 - 1st Paragraph** – This section includes a discussion of beach profiles 35 and 40 at Oak Island/Caswell Beach. It is indicated in this section that prior to 2000 the beach was growing seaward then after 2000 these profiles indicated that the beach is moving landward or eroding. EPA recommends additional discussion be added to the FEIS regarding the potential reasons for this erosional "hot spot."
- **Section 4.19.1** – A statement is made in this section that "there have been no known sources of contamination (i.e. spillage, treatment, or storage of toxic substances) within or near the project area." Has this statement been substantiated with Phase I Baseline Environmental Assessment of the project area? If so, it should be noted in the FEIS.
- **Tables 5.2–5.4** "Area 1" and "Area 2" should be defined more clearly in the text and in the description of table 5.2.
- **Section 5.9 and 5.11 –** These sections cover impacts associated with the alternatives on Public Safety and Recreation. EPA recommends providing maps of areas that may be closed to the public during construction activities.

Thank you for the opportunity to comment on this DEIS. Based upon our review, a NEPA rating of EC- 2 has been assigned to this DEIS, meaning we have environmental concerns and have requested that the FEIS include updated information (where available) on a number of areas and issues. If we can be of further assistance, please contact me at (404) 562-9611 or Dan Holliman at (404) 562-9531 at holliman.daniel@epa.gov.

Sincerely,

Mueller

Heinz J. Mueller
Chief, NEPA Program Office
Office of Environmental Accountability

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Richard B. Russell Federal Building
75 Spring Street, S.W.
Atlanta, Georgia 30303

ER 14/0013
9043.1

February 21, 2014

Ronnie Smith
U.S. Army Corps of Engineers
Wilmington District - Regulatory Division
Attn: File Number SAW-2012-00040
69 Darlington Avenue
Wilmington, North Carolina 28403

Re: Comments and Recommendations on the Review of the Draft Environmental Impact Statement (DEIS) for the Installation of a Terminal Groin Structure at the Western End of South Beach, Bald Head Island, Adjacent to the Federal Wilmington Harbor Channel of the Cape Fear River, Brunswick County, NC

Dear Mr. Smith:

The United States Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (DEIS) for the Installation of a Terminal Groin Structure at the Western End of South Beach, Bald Head Island, Adjacent to the Federal Wilmington Harbor Channel of the Cape Fear River. We have no comments at this time.

Thank you for the opportunity to provide comments. I can be reached at (404) 331-4524 or via email at joyce_stanley@ios.doi.gov.

Sincerely,

J Stanley

Joyce Stanley, MPA
Regional Environmental Protection Specialist

cc:
Christine Willis – FWS
Gary Lecain - USGS
Anita Barnett – NPS
Chester McGhee – BIA
Robin Ferguson - OSRME
OEPC – WASH

North Carolina
Department of Administration

Pat McCrory, Governor

Bill Daughtridge, Jr., Secretary

February 20, 2014

Mr. Ronnie Smith
Department of the Army
U.S. Army Corps of Engineers
Wilmington District
69 Darlington Avenue
Wilmington, North Carolina 28403

Re: SCH File # 14-E-0000-0287; DEIS; Proposed project is for the construction of a terminal structure at the western end of South Beach and supplemental beach nourishment.

Dear Mr. Smith:

The above referenced environmental impact information has been submitted to the State Clearinghouse under the provisions of the National Environmental Policy Act. According to G.S. 113A-10, when a state agency is required to prepare an environmental document under the provisions of federal law, the environmental document meets the provisions of the State Environmental Policy Act. Attached to this letter for your consideration are the comments made by agencies in the course of this review.

If any further environmental review documents are prepared for this project, they should be forwarded to this office for intergovernmental review.

Should you have any questions, please do not hesitate to call.

Sincerely,

Crystal Best

Crystal Best
State Environmental Review Clearinghouse

Attachments

cc: Region O

NCDENR
North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

John E. Skvarla, III
Secretary

MEMORANDUM

TO: Crystal Best
State Clearinghouse

FROM: Lyn Hardison
Division of Environmental Assistance and Customer Service
Permit Assistance & Project Review Coordinator

RE: 14-0287
Draft Environmental Impact Statement
Proposed project is for the construction of a terminal structure at the western end of South Beach and supplemental beach nourishment
Brunswick County

Date: February 17, 2014

The Department of Environment and Natural Resources has reviewed the proposal for the referenced project. Based on the information provided, our agencies have identified permits that may be required. The Division of Coastal Management and NC Natural Heritage program has provide some specific guidance for the applicant consideration. These comments are attached.

The Department appreciates the cooperative efforts the applicant has with our agencies and we encourage these efforts to continue as they move forward with the project.

Thank you for the opportunity to respond.

Attachment

NCDENR

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

Pat McCrory
Governor

Braxton C. Davis
Director

John E. Skvarla, III
Secretary

February 14, 2014

U.S. Army Corps of Engineers – Wilmington District
c/o Dale Beter, Project Manager
69 Darlington Avenue
Wilmington, NC 28403-1343

Dear Sirs:

The Division of Coastal Management (DCM) has completed our review of the Draft Environmental Impact Statement (DEIS) for the proposed Village of Bald Head Island Shoreline Management Project located in New Hanover County, North Carolina. As you are aware, in 2011 the General Assembly of North Carolina enacted Senate Bill 110 (SB 110), that amended the Coastal Area Management Act (CAMA) to allow for the permitting of up to four terminal groins in North Carolina. SB 110 was further amended by Senate Bill 151 (SB 151) in 2013. For communities pursuing a terminal groin project, the amended SB 151 set out several specific requirements that must be met before a CAMA permit can be issued. DCM staff have therefore reviewed the DEIS in light of these requirements, as well as the laws of the CAMA and Dredge and Fill, and the rules of the Coastal Resources Commission, and we provide the following comments for your consideration.

General Comments

- In multiple locations throughout the document, the Division of Water Quality is referenced. This agency has been reorganized and is now within the Division of Water Resources. The document should be updated accordingly.

Section 1. - Project Purpose

- **Section 1.4.4 (Page 1-11)** - The first paragraph states: *"In July 2011, the NC Division of Coastal Management (NCDCM) granted a minor modification of existing Permit No.9-95 thereby authorizing the construction of a 350 linear-foot sandbag revetment"*. Please change to reflect the minor modification was granted by CRC variance in July 2011 with the resulting modification being issued in August 2011.

- **Section 1.6.11 (page 1-17)** - This section states: *"The NC Dept of Administration adopts rules to implement NCEPA, ensures compliance with the Act and maintains a State Environmental Review Clearinghouse of information; however, a state agency must take the lead on the NCEPA review of the project. The NC DCM will be the lead agency during the NCEPA review of the Village of Bald Head Island Shoreline Protection Project."* Please note that per Session Law 2011-384, an environmental impact statement prepared pursuant to the National Environmental Policy Act (NEPA) is considered to satisfy the NCEPA requirement. As such, the NC Division of Coastal Management is not the lead agency, but a commenting agency to the USACE.

- **Section 1.6.13 (page 1-18)** - This section refers to the *"CAMA Dredge and Fill Law"*. It should be noted that the Coastal Area Management Act (CAMA) and NC Dredge and Fill Law are two separate laws, both of which are administered by the NC Division of Coastal Management.

Section 2. Scoping

- **No comments**

Section 3. Project Alternatives

- **Alternative 1 - No Action/Status Quo Alternative**
  - ➢ No comments

- **Alternative 2 - Retreat**
  - ➢ The retreat alternative does not include maintenance of the sand tube groinfield which may minimize the extent of the retreat necessary. Please factor this into Alternative 2.

- **Alternative 3 - Beach Nourishment/Disposal with Existing Sand Tube Groinfield to Remain in Place**
  - ➢ Has there been any evaluation of the likelihood of expanding the volume of sediment available from Bald Head Creek?
  - ➢ Have any sediment compatibility studies been performed for this additional 200,000 cubic yards of material?

- **Alternative 4 - Beach Nourishment/Beach Disposal with Sand Tube Groinfield Removal**
  - ➢ Has there been any evaluation of the likelihood of expanding the volume of sediment available from Bald Head Creek?
  - ➢ Have any sediment compatibility studies been performed for this additional 200,000 cubic yards of material?

- **Alternative 5 - Terminal Groin with Beach Nourishment/Beach Disposal (Sand Tubes Remaining)**
    - Are there avoidance, minimization or mitigation measures that would offset potential impacts associated with the proposed construction during the turtle nesting season?
    - Example of modification activities would include the relocation of one or more sand tubes. Would such relocation be consistent with variance/permit conditions?
    - The legislation calls for the groin to be pre-filled and allow sand to flow past the structure. The descriptions in this alternative seem to rely on natural transport to create the fillet rather than hydraulic means.
    - *"The structure is not expected to resolve ongoing erosion issues on the downdrift side.... West Beach is downdrift of the terminal structure and remains prone to sand losses which may be exacerbated by the groin."* This alternative is somewhat vague on the responses to exacerbating the erosion on West Beach. The document should include more detail about these potential erosion response measures.
    - The models used in the Alternatives Analysis assumed pre-filling of the groin as required by law but the description seem to indicate that the fillet will accrete "naturally" after beach fill associated with the SMP. What if the USACE does not have funding again for the project, or if this funding is delayed? Would construction and/or maintenance schedules associated with the terminal groin be negatively impacted?
- **Alternative 6 - Terminal Groin with Beach Nourishment/Beach Disposal (Sand Tubes Removal)**
    - Example of modification activities would include the relocation of one or more sand tubes. Would such relocation be consistent with the variance/permit conditions?
    - The legislation calls for the groin to be pre-filled and allow sand to flow past the structure. The descriptions in this alternative seem to rely on natural transport to create the fillet rather than hydraulic means. Please provide clarification on this issue.
    - *"The structure is not expected to resolve ongoing erosion issues on the downdrift side.... West Beach is downdrift of the terminal structure and remain prone to sand losses which may be exacerbated by the groin."* This alternative should expand on the responses to exacerbating the erosion on West Beach. The document should include more detail about these potential erosion response measures.

- The models used in the Alternatives Analysis assumed pre-filling of the groin as required by law but the description seem to indicate that the fillet will accrete "naturally" after beach fill associated with the SMP. What if the USACE does not have funding again for the project, or if this funding is delayed? Would construction and/or maintenance schedules associated with the terminal groin be negatively impacted?

- The document should provide more information on how it can be assured that the schedules for construction of groin and sand placement behind the groin by USACE will take place in a mutually agreeable fashion. For example, what would happen if groin construction started based on an expected USACE sand placement event, and then for funding reasons the USACE project was postponed at the last minute?

Section 4. Affected Environment

- **Section 4.2.4 (Page 4-15/4-16)** - NCDMF has recently collected information about sturgeon distribution in the project area. Please contact Chip Collier (chip.collier@ncdenr.gov) for results of telemetry tracking of sturgeon in the Cape Fear River and update this section as appropriate.

- **Section 4.3.3 (Page 4-29/4-30)** - Soft Bottom Communities should be expanded to include discussions of the fish utilization of soft bottom beyond foraging and fish utilization of offshore shoals and inlets (ie. the borrow areas).

- **Section 4.3.3 Page 4-29** - A more accurate definition of unconsolidated sediments should be used.

- **Section 4.3.3 Page 4-29** – The document should utilize the term anadromous *fish* nursery areas.

- **General Comments** – The document should provide discussion on recent scientific research related to North Carolina regarding larval fish transport through inlets.

- **General Comments** – The document should provide discussion on the previously compiled data regarding larval fish geographic distribution and abundance in the area.

Section 5. Environmental Consequences

- **No Comment**

Section 6. Avoidance, Mitigation and Mitigative Measures

- **Section 6.5.1 (Page 6-9)** - What construction activities will occur during the sea turtle nesting season, and how will they be mitigated?

- **Section 6.2 (Page 6-4)** – It should be noted that post-construction monitoring for biological recovery of Frying Pan shoals will likely be required.

- **General Comments** - If a hopper dredge will be used, it should be included in Section 6 as a minimization measure to impacts of benthic offshore shoal habitat.

Appendices

- In general, the Division of Coastal Management does not believe that the Inlet Management Plan provided in Appendix B meets the requirements for such a plan set out in SB 151. Specifically, more detail should be provided on a) determination and type of data used for defining a baseline which will be used to assess potential adverse impacts associated with the terminal groin, b) post-construction monitoring that can be compared to baseline data for assessing potential adverse impacts, c) the timeframes for the post-construction monitoring, d) identification of specific thresholds which will in turn implement mitigative measures, and e) the potential list of mitigative measures that may be implemented. The Division would welcome the opportunity to meet with the applicant in an effort to provide additional guidance and/or comment on these issues. Specific comments on the Inlet Management Plan are provided below.

- **Inlet Management Plan (Page 4) Section II Physical Monitoring** - This section states: *"The Division of Coastal Management has taken the position that, despite the presence of the three mile distance and maintained navigation channel, some monitoring is required at the easternmost end of Oak Island at Caswell Beach"*. It should be noted that SB 151 requires the preparation of *"a plan for the management of the inlet and the estuarine and ocean shorelines immediately adjacent to and under the influence of the inlet"*. Oak Island is immediately adjacent to and under the influence of the Cape Fear River Inlet. Therefore, it is the Division of Coastal Management's interpretation of SB 151 that monitoring is required at the easternmost end of Oak Island at Caswell Beach. The language in this Appendix should be changed accordingly.

- **Inlet Management Plan (Page 5) Section II Physical Monitoring**- This section states: *"The Village's responsibility for post-groin physical surveying on Oak Island will terminate if three years of monitoring subsequent to terminal groin structure completion fails to indicate any level of cause or effect relationship between structure installation and shoreline change at Oak Island"*. Due to the scope and unpredictable nature of the impacts of the project due to varying conditions, the Division of Coastal Management does not believe that a 3-year limit on the required monitoring is adequate. The time limit on this monitoring should be expanded in a manner that would allow for the collection of baseline and post-construction data that would allow for an analysis of the causes (impacts resulting from construction of the terminal groin versus impacts resulting from other causes) of any post-construction erosion. The Division suggests developing a plan that samples more frequently in the years immediately following construction. If the data collected after a reasonable time support the assertion that the project is not resulting in adverse impacts to down drift beaches or on eastern Oak Island, then the monitoring requirements could be reevaluated at that time. The plan should also establish more detailed mitigative thresholds, and offer more description of potential remedial actions.

- **Inlet Management Plan (Page 9-10) Section IV Mitigation** – This mitigation includes borrowing sand from the fillet to nourish West Beach. What would be the anticipated impacts of this proposed action? What would be the expected volumes of this borrowed sand?

- **Inlet Management Plan (Page 9-10) Section IV Mitigation** – As was discussed above, the plan should include more detail on the hierarchy of remedial actions and triggers to implement such remedial actions.

- **Inlet Management Plan (Page 10) Section IV Mitigation** - This section states: *"The most logical source of beach quality sand is the WHSMP. Accordingly, mitigation would occur through a reapportionment of some portion of the federal disposal sand to that hot spot, rather than the placement of the sand at a more stable or accreting location."* The Division has concerns about the reapportionment of sand under the WHSMP as a mitigative measure for this project. Any such change in the details of the sand management plan would require additional coordination between and/or approval of various parties, including the USACE, State of North Carolina, Caswell Beach and the Village of Bald Head Island.

- **Inlet Management Plan Section (Page 8-9) Section III Mitigation Thresholds** – What is the timeframe and methodology for determining if fill equilibration has been reached?

- **Inlet Management Plan Section (Page 8-9) Section III Mitigation Thresholds** – This section states: *"Have shoreline recession rates (volumes and MHWL) increased by over 50%?* "How long does this condition need to exist before action is taken, and is this threshold be appropriate for Caswell Beach as well?

- **Inlet Management Plan Section (Page 9-10) Section V Terminal Structure Alteration** – This section states: *"Pragmatically, lowering of the structure to grade through armor rock removal would constitute "effective" structure elimination".* – Would this eventually expose buried rock which would effectively begin to trap sand again, or will the rocks be removed to grade as they are exposed? The Division of Coastal Management believes the SB 151 requires that this option be revised to address total structural removal, not partial.

The Division of Coastal Management appreciates the opportunity to comment on this project, and we look forward to further discussions on the issues raised in this letter. If you have any questions concerning any of these comments, please feel free to contact me at (252) 808-2808 ext. 212.

Sincerely

Doug Huggett

Doug Huggett
Manager, Major Permits & Federal Consistency Section

Cc: Braxton Davis, DCM
Lyn Hardison, DENR

NCDENR
North Carolina Department of Environment and Natural Resources
Office of Land and Water Stewardship

Pat McCrory
Governor

Bryan Gossage
Director

John E. Skvarla, III
Secretary

February 7, 2014

MEMORANDUM

TO: Lyn Hardison, NCDENR State Clearinghouse Coordinator

FROM: Allison (Schwarz) Weakley, North Carolina Natural Heritage Program AEW

SUBJECT: Draft EIS – Bald Head Island, South Beach Terminal Groin and Beach Nourishment, Brunswick County, North Carolina

REFERENCE: Project No. 14-0287

Thank you for the opportunity to provide information for the proposed project referenced above. The DEIS document includes a list of "Federally and State Protected Species Known to Occur in the Vicinity of the Study Area" (pg. 4-9) but does not state the source of those data, and does not address the potential impacts to all the species listed.

The NCNHP database (as of January 2014) contains records for a number of federally and state protected species within the project vicinity (see attached table). Please note the statuses for each species. We are happy to provide more information on the element occurrences for these species if requested. The use of Natural Heritage Program data should not be substituted for actual field surveys where they are needed, particularly if the project area contains suitable habitat for rare species or important natural communities.

The following four significant natural heritage areas (SNHA) are within the vicinity of the project:

SITE NAME	OVERALL SITE RATING
Bald Head Island	Exceptional
Fort Caswell Dunes and Marshes	Very High
Middle Island	Very High
Lower Cape Fear River Aquatic Habitat	Moderate

Please see the attached site reports that contain descriptions and a list of the rare species and important natural communities present in each SNHA.

The NCNHP database also shows records for a high-quality Dune Grass (Southern Subtype) natural community and a significant colony of least tern nests on the southeastern end of South Beach, and a number of records for conservation/managed lands within the project vicinity. Conservation/managed lands include properties owned by Bald Head Island Conservancy and Smith Island Land Trust, with conservation easements held by the Conservation Trust for North Carolina, and the Bald Head Island

State Natural Area Dedicated Nature Preserve (DNP) and Bald Head Coastal Reserve DNP, owned by the State of North Carolina.

The applicant may wish to visit the new NCNHP website (www.ncnhp.org) that offers access to data and other information on rare species, natural communities, significant natural areas, and lands managed for conservation. The online map viewer currently available shows boundaries of SNHAs conservation/managed areas, including those listed above, and can be searched for NCNHP records that occur within one mile to five miles of the project location.

Please feel free to contact me at 919-707-8629 or Allison.Weakley@ncdenr.gov if you have questions or need further information.

Table 1. Rare species within vicinity of South Beach, Bald Head Island. January 2014.

SCIENTIFIC NAME	COMMON NAME	ELEMENT OCCURRENCE STATUS*	ACCURACY	NC STATUS*	USA STATUS*
Acipenser brevirostrum	Shortnose Sturgeon	Current	Very Low	E	E
Acipenser oxyrinchus	Atlantic Sturgeon	Current	Low	SC	E
Amaranthus pumilus	Seabeach Amaranth	Current	Medium	T	T
Arenaria lanuginosa var. lanuginosa	Spreading Sandwort	Historical	Unknown	SR-P	----
Baccharis glomeruliflora	Silverling	Historical	Low	SC-H	----
Caretta caretta	Loggerhead Seaturtle	Current	High	T	T
Charadrius wilsonia	Wilson's Plover	Current	Medium	SC	----
Cheilolejeunea rigidula	A Liverwort	Current	Very Low	SR-P	----
Chelonia mydas	Green Seaturtle	Current	Medium	T	T
Columbina passerina	Common Ground-Dove	Historical	Low	SR	----
Cyperus tetragonus	Four-angled Flatsedge	Current	Medium	SC-V	----
Dermochelys coriacea	Leatherback Seaturtle	Current	Low	E	E
Dichanthelium aciculare ssp. *neuranthum*	Nerved Witch Grass	Historical	Medium	SC-V	----
Dichanthelium caerulescens	Blue Witch Grass	Historical	Very Low	E	----
Elymus virginicus var. halophilus	Terrell Grass	Current	Low	SC-V	----
Erythrina herbacea	Coralbean	Historical	Low	E	----
Euphorbia bombensis	Southern Seaside Spurge	Historical	Low	SR-T	----
Falco peregrinus	Peregrine Falcon	Current	Medium	E	----
Haematopus palliatus	American Oystercatcher	Current	Medium	SC	----
Ipomoea imperati	Beach Morning-glory	Current	Medium	T	----
Malaclemys terrapin	Diamondback Terrapin	Obscure	Very Low	SC	FSC, in part
Masticophis flagellum	Coachwhip	Current	Low	SR	----
Neotoma floridana floridana	Eastern Woodrat	Historical	Low	T	----
Oplismenus hirtellus ssp. setarius	Shortleaf Basket Grass	Current	Low	SR-P	----
Papilio cresphontes	Giant Swallowtail	Current	Low	SR	----
Parietaria praetermissa	Large-seed Pellitory	Historical	Very Low	SC-V	----
Passerina ciris ciris	Eastern Painted Bunting	Current	Low	SC	FSC

SCIENTIFIC NAME	COMMON NAME	ELEMENT OCCURRENCE STATUS*	ACCURACY	NC STATUS*	USA STATUS*
Plagiochila dubia	A Liverwort	Current	Low	SR-P	----
Polygonum glaucum	Seabeach Knotweed	Historical	Low	E	----
Sabal palmetto	Cabbage Palm	Current	Medium	T	----
Sideroxylon tenax	Tough Bumelia	Current	Low	T	FSC
Sporobolus virginicus	Saltmarsh Dropseed	Historical	Low	T	----
Sternula antillarum	Least Tern	Current	Low	SC	----
Syrrhopodon incompletus	Cuban Schliessmund	Historical	Low	SR-P	----
Teloschistes flavicans	Sunrise Lichen	Current	Medium	SR-P	----
Trichechus manatus	West Indian Manatee	Current	Very Low	E	E
Trichostema sp. 1	Dune Bluecurls	Current	High	SR-L	FSC
Yucca gloriosa	Moundlily Yucca	Current	Medium	SR-P	----

Significant Natural Heritage Area Report

07 February 2014

Name Bald Head Island

Site ID 1360

LOCATORS

County Brunswick (NC)

Quad Cape Fear
Kure Beach
Southport

Watershed Lower Cape Fear

Latitude 335135N **Longitude** 0775903W

Directions Bald Head Island proper, the southernmost and largest island of the Bald Head-Smith Island Complex at the mouth of the Cape Fear River.

Site Relations Middle Island lies about 1/2 mile to the north. Bluff Island and East Beach is about 1 miles to the north.

OWNERS

Owner	Details	Comments
NC DENR, Division of Coastal Management	Bald Head Woods Coastal Reserve	DNP
NC DENR, Division of Parks and Recreation	Bald Head Island State Natural Area	Part DNP
Private	Bald Head Development Corporation	

SITE DESCRIPTION

Minimum Elevation: **Feet** **Meters**

Maximum Elevation: 35 **Feet** 11 **Meters**

Site Description Island has a diversity of high quality maritime communities, including Dune Grass, Maritime Evergreen Forest, and Salt Marsh. Once one of the largest patches of Maritime Evergreen Forest, it has been severely reduced by development, but a significant area has been protected. The forests of the Baldhead Complex are unique in North Carolina in having cabbage palm (Sabal palmetto) and other more southern species as components. The open dunes support the newly discovered Bald Head blue curls (Trichostema sp.). Large number of loggerhead sea turtles nest on the island's beaches.

Land Use History

Cultural Features

SITE DESIGN

Designer

Mapped Date

Boundary Justification The boundary was revised in 2008 to exclude high density beachfront development (using 2006 aerial photos). The undeveloped sand dunes are important habitat for Trichostema sp. 1.

Acreage 1,322.07

Site Comments The western part of the island has already been developed. The rest of the island is threatened.

Ground Survey Date 1999-08-09 **Aerial Survey Date** 2006 **Survey Intensity** 1

SITE SIGNIFICANCE

Representational Rating R1 **Collective Rating** C1

Defining Element Occurrences Dermochelys coriacea, Maritime Evergreen Forest (South Atlantic Subtype), Trichostema sp. 1

PROTECTION

Conservation Intentions Conservation acquisition, dedication

Designation State Park
Dedicated Nature Preserve

Protection Comments State Division of Coastal Management owns and has dedicated 173 acres on Bald Head Island. State Division of Parks and Recreation owns 8 acres at Cape Fear itself. Other State-owned land (10,000 acres) is located on the nearby Bluff Island site and in the marshes.

MANAGEMENT

Management Comments

Land Use Comments

Significant Natural Heritage Area Report

07 February 2014

Name Bald Head Island

Site ID 1360

Natural Hazards

Exotics Comments

Offsite Developed area adjoin the remnant natural areas.

Information Needs Need to update site boundaries to reflect current remmants.

Management Needs

Managed Area Relations Bald Head Island Coastal Reserve Bald Head Island State Natural Area

ELEMENT OCCURRENCES

Scientific Name	Common Name	G Rank	S Rank	EO Rank	EO ID
Charadrius wilsonia	Wilson's Plover	G5	S2B	B	13905
Chelonia mydas	Green Seaturtle	G3	S1B,SUN	CD	20094
Columbina passerina	Common Ground-Dove	G5	SXB	X	15215
Dermochelys coriacea	Leatherback Seaturtle	G2	S1B,SUN	D	31880
Falco peregrinus	Peregrine Falcon	G4	S1B,S2N	C	5457
Haematopus palliatus	American Oystercatcher	G5	S2S3B,S3N	CD	27223
Lasiurus intermedius	Northern Yellow Bat	G4G5	S1	E	26220
Masticophis flagellum	Coachwhip	G5	S3	E	4781
Neotoma floridana floridana	Eastern Woodrat - Coastal Plain population	G5T5	S1	X	17129
Passerina ciris ciris	Eastern Painted Bunting	G5T3T4	S3B	A	16484
Sternula antillarum	Least Tern	G4	S3B	D	14325
Papilio cresphontes	Giant Swallowtail	G5	S2S3	B?	10534
Gull-Tern-Skimmer Colony	Colonial Waterbirds Nesting Site	G5	S3	BC	19172
Gull-Tern-Skimmer Colony	Colonial Waterbirds Nesting Site	G5	S3	D	20020
Amaranthus pumilus	Seabeach Amaranth	G2	S2	D	1618
Baccharis glomeruliflora	Silverling	G4	S1	H	19
Carex calcifugens	Calcium-fleeing Sedge	G2G4	S2?	A	23775
Cyperus tetragonus	Four-angled Flatsedge	G4?	S1	A?	10370
Dichanthelium aciculare ssp. neuranthum	Nerved Witch Grass	G5T3	S1	X?	13484
Elymus virginicus var. halophilus	Terrell Grass	G5T5	S1	E	28866
Oplismenus hirtellus ssp. setarius	Shortleaf Basket Grass	G5T5	S1	E	27016
Polygonum glaucum	Seabeach Knotweed	G3	S1	F	18615
Sabal palmetto	Cabbage Palm	G5	S1	A	7153
Sabal palmetto	Cabbage Palm	G5	S1	B	23235
Sideroxylon tenax	Tough Bumelia	G3?	S1	C?	4830
Sideroxylon tenax	Tough Bumelia	G3?	S1	E	23364
Sideroxylon tenax	Tough Bumelia	G3?	S1	X?	23363
Trichostema sp. 1	Dune Bluecurls	G2	S2	A	22845
Trichostema sp. 1	Dune Bluecurls	G2	S2	A	4034
Trichostema sp. 1	Dune Bluecurls	G2	S2	D	28838
Trichostema sp. 1	Dune Bluecurls	G2	S2	B?	28106
Trichostema sp. 1	Dune Bluecurls	G2	S2	B?	22844
Cheilolejeunea rigidula	A Liverwort	G5	S2	E	2137
Plagiochila dubia	A Liverwort	G4G5	S1	E	22058
Syrrhopodon incompletus	Cuban Schliessmund	G5	S1	H	8338
Teloschistes flavicans	Sunrise Lichen	G4G5	S1	A	10214
Dune Grass (Southern Subtype)		G3	S2	C	10109
Maritime Evergreen Forest (South Atlantic Subtype)		G2	S1	A	17316

REFERENCES

Significant Natural Heritage Area Report

07 February 2014

Name Bald Head Island **Site ID** 1360

Reference Code	Full Citation
F99NHP01NCUS	NCNHP Staff, 1999 Field Survey
U95LEB02NCUS	LeBlond, R.J. 1995. Inventory of the natural areas and rare species of Brunswick County, North Carolina. NC Natural Heritage Program, Division of Parks and Recreation, Raleigh, NC.
I06DOQ01NCUS	2006 NAIP aerial photography
R88NCV01NCUS	North Carolina Vegetation Survey. 1988. Vegetation sample data.

VERSION

Version Date 1999-12-01
Version Author Schafale

Significant Natural Heritage Area Report

07 February 2014

Name Fort Caswell Dunes and Marshes

Site ID 2080

LOCATORS

County Brunswick (NC) **Quad** Southport **Watershed** Lower Cape Fear

Latitude 335421N **Longitude** 0780236W

Directions At the eastern end of Oak Island, ranging west to the CP& L cooling canal.

Site Relations Fort Caswell Dunes and Marshes cover the far eastern end of Oak Island. Contiguous to the east is the Lower Cape Fear River Aquatic Habitat. Battery Island and Bald Head Island are the next significant terrestrial areas to the east, within 1 and 1.25 miles respectively. On the mainland opposite Oak Island are three additional sites: Sunset Harbor/Ash Swamp, Big Cypress Bay and Ponds, and the Boiling Spring Lakes Wetland Complex, which is less than 4 air miles to the northeast.

OWNERS

Owner	Details	Comments
Private	PRIVATE	
North Carolina Coastal Land Trust	NCCLT	

SITE DESCRIPTION

Minimum Elevation: 0 **Feet** 0 **Meters**

Maximum Elevation: 20 **Feet** 6 **Meters**

Site Description Fort Caswell Dunes and Marshes consists of several rows of dunes at Fort Caswell, plus extensive salt marshes on the back side of Oak Island. The lawns and developed areas at the fort are excluded from the site. The marshes are extensive and unaltered by mosquito ditching, making this one of the best examples of the Salt Marsh natural community in the state. The dunes, beaches, and marshes support several rare plant and animal species, including Federal and State Threatened seabeach amaranth (*Amaranthus pumilus*), loggerhead (*Caretta caretta*), and green turtle (*Chelonia mydas*). Other rare plants growing on the dunes include Yucca gloriosa, Ipomoea imperati, Erythrina, Trichostema sp. This natural area is an integral component of a large complex of natural areas associated with the lower Cape Fear River, including Bald Head Island, Battery Island, and Lower Cape Fear River Bird Nesting Islands.

Land Use History

Cultural Features

SITE DESIGN

Designer **Mapped Date**

Boundary Justification Site originially designed by Peacock and Moore (no year).

Acreage 1,306.26

Site Comments

Ground Survey Date 2000-01 **Aerial Survey Date** **Survey Intensity**

SITE SIGNIFICANCE

Representational Rating R2 **Collective Rating** C4

Defining Element Occurrences Amaranthus pumilus, Ipomoea imperati, Yucca gloriosa

PROTECTION

Conservation Intentions

Designation

Protection Comments

MANAGEMENT

Management Comments

Land Use Comments

Significant Natural Heritage Area Report

07 February 2014

Name Fort Caswell Dunes and Marshes

Site ID 2080

Natural Hazards

Exotics Comments

Offsite

Information Needs

Management Needs

Managed Area Relations

ELEMENT OCCURRENCES

Scientific Name	Common Name	G Rank	S Rank	EO Rank	EO ID
Caretta caretta	Loggerhead Seaturtle	G3	S3B,S3N	B	7050
Haematopus palliatus	American Oystercatcher	G5	S2S3B,S3	CD	27222
Amaranthus pumilus	Seabeach Amaranth	G2	S2	B	28745
Amaranthus pumilus	Seabeach Amaranth	G2	S2	C	7049
Euphorbia bombensis	Southern Seaside Spurge	G4G5	S2?	H?	28780
Ipomoea imperati	Beach Morning-glory	G5	S1	A	15283
Yucca gloriosa	Moundlily Yucca	G4?	S2?	A	18212
Salt Marsh (Carolinian Subtype)		G5	S4	A	16017

REFERENCES

Reference Code	Full Citation
F87NHP01NCUS	NHP Staff. 1987. Field Survey.

VERSION

Version Date	2006-09-20
Version Author	Sinclair

Significant Natural Heritage Area Report

07 February 2014

Name Lower Cape Fear River Aquatic Habitat

Site ID 1167

LOCATORS

County Brunswick (NC)
New Hanover (NC)

Quad Carolina Beach
Wilmington
Kure Beach
Southport

Watershed Lower Cape Fear

Latitude 340336N **Longitude** 0775548W

Directions The Cape Fear River from its merger with the Brunswick River south to Smith Island.

Site Relations

OWNERS

Owner	Details	Comments
Public Waters		

SITE DESCRIPTION

Minimum Elevation: **Feet** **Meters**

Maximum Elevation: **Feet** **Meters**

Site Description The lower Cape Fear River is brackish and contains numerous rare animals. The shortnose sturgeon is rare, whereas manatees occasionally occur, especially in summer. Alligators are present mainly in tributary streams. Freckled blenny and spinycheek sleeper are rare marine fishes of the river.

Land Use History

Cultural Features

SITE DESIGN

Designer

Mapped Date

Boundary Justification

Acreage 22,509.44

Site Comments

Ground Survey Date 1987-12 **Aerial Survey Date** **Survey Intensity** R

SITE SIGNIFICANCE

Representational Rating R? **Collective Rating** C4

Defining Element Occurrences Acipenser brevirostrum

PROTECTION

Conservation Intentions Outstanding Resource Water or High Quality Water designation.

Designation

Protection Comments No protection status.

MANAGEMENT

Management Comments

Land Use Comments

Natural Hazards

Exotics Comments

Offsite

Information Needs

Significant Natural Heritage Area Report

07 February 2014

Name Lower Cape Fear River Aquatic Habitat

Site ID 1167

Management Needs

Managed Area Relations

ELEMENT OCCURRENCES

Scientific Name	Common Name	G Rank	S Rank	EO Rank	EO ID
Acipenser brevirostrum	Shortnose Sturgeon	G3	S1	B	12176
Acipenser oxyrinchus	Atlantic Sturgeon	G3	S3	E	32417
Malaclemys terrapin	Diamondback Terrapin	G4	S3		3796

REFERENCES

Reference Code	Full Citation

VERSION

Version Date	1995-02-09
Version Author	Smith

Significant Natural Heritage Area Report

07 February 2014

Name Middle Island

Site ID 2044

LOCATORS

County Brunswick (NC)

Quad Cape Fear
Kure Beach

Watershed Lower Cape Fear

Latitude 335216N **Longitude** 0775917W

Directions Middle Island, between Bald Head and Bluff islands in the Bald Head-Smith Island Complex at the mouth of the Cape Fear River.

Site Relations

OWNERS

Owner	**Details**	**Comments**
Private	Charles Young	
NC DENR, Division of Parks and Recreation	N.C. Division of Parks and Recreation	
NC DENR, Division of Coastal Management	NC Division of Coastal Management	

SITE DESCRIPTION

Minimum Elevation: Feet Meters

Maximum Elevation: Feet Meters

Site Description Long, narrow sand ridge island covered with maritime forest, surrounded by salt marsh. The maritime forests of the Smith Island Complex are unique in North Carolina in containing cabbage palm (Sabal palmetto) and other more southern species as components.

Land Use History

Cultural Features

SITE DESIGN

Designer

Mapped Date

Boundary Justification

Acreage 1,042.89

Site Comments The narrow island is disturbed by roads running the length of the island.

Ground Survey Date **Aerial Survey Date** **Survey Intensity** P

SITE SIGNIFICANCE

Representational Rating R2 **Collective Rating** C5

Defining Element Occurrences Salt Marsh (Carolinian Subtype)

PROTECTION

Conservation Intentions

Designation

Protection Comments No protection status

MANAGEMENT

Management Comments

Land Use Comments

Natural Hazards

Exotics Comments

Offsite

Information Needs

Significant Natural Heritage Area Report

07 February 2014

Name Middle Island

Site ID 2044

Management Needs

Managed Area Relations

ELEMENT OCCURRENCES

Scientific Name	Common Name	G Rank	S Rank	EO Rank	EO ID
Baccharis glomeruliflora	Silverling	G4	S1	H	19
Cyperus tetragonus	Four-angled Flatsedge	G4?	S1	H	6587
Ludwigia alata	Winged Seedbox	G3G5	S2	H	6544
Sabal palmetto	Cabbage Palm	G5	S1	B	23235
Sabal palmetto	Cabbage Palm	G5	S1	C	9867
Sporobolus virginicus	Saltmarsh Dropseed	G5	S1	H	16057
Salt Marsh (Carolinian Subtype)		G5	S4	A	19097

REFERENCES

Reference Code **Full Citation**

VERSION

Version Date

Version Author

INTERGOVERNMENTAL REVIEW - PROJECT COMMENTS

Project Number: 14-0287 Due Date: 2/3/14

After review of this project it has been determined that the ENR permit(s) and/or approvals indicated may need to be obtained in order for this project to comply with North Carolina Law. Questions regarding these permits should be addressed to the Regional Office indicated on the reverse of the form. All applications, information and guidelines relative to these plans and permits are available from the same Regional Office.

	PERMITS	SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	Normal Process Time (statutory time limit)
☐	Permit to construct & operate wastewater treatment facilities, sewer system extensions & sewer systems not discharging into state surface waters.	Application 90 days before begin construction or award of construction contracts. On-site inspection. Post-application technical conference usual.	30 days (90 days)
☐	NPDES - permit to discharge into surface water and/or permit to operate and construct wastewater facilities discharging into state surface waters.	Application 180 days before begin activity. On-site inspection. Pre-application conference usual. Additionally, obtain permit to construct wastewater treatment facility-granted after NPDES. Reply time, 30 days after receipt of plans or issue of NPDES permit-whichever is later.	90-120 days (N/A)
☐	Water Use Permit	Pre-application technical conference usually necessary	30 days (N/A)
☐	Well Construction Permit	Complete application must be received and permit issued prior to the installation of a well.	7 days (15 days)
☐	Dredge and Fill Permit	Application copy must be served on each adjacent riparian property owner.On-site inspection. Pre-application conference usual. Filling may require Easement to Fill from N.C. Department of Administration and FederalDredge and Fill Permit.	55 days (90 days)
☐	Permit to construct & operate Air Pollution Abatement facilities and/or Emission Sources as per 15 A NCAC (2Q.0100 thru 2Q.0300)	Application must be submitted and permit received prior to construction and operation of the source. If a permit is required in an area without local zoning, then there are additional requirements and timelines (2Q.0113).	90 days
☐	Permit to construct & operate Transportation Facility as per 15 A NCAC (2D.0800, 2Q.0601)	Application must be submitted at least 90 days prior to construction or modification of the source.	90 days
☐	Any open burning associated with subject proposal must be in compliance with 15 A NCAC 2D.1900	N/A	60 days (90 days)
☐	Demolition or renovations of structures containing asbestos material must be in compliance with 15 A NCAC 20.1110 (a) (1) which requires notification and removal prior to demolition. Contact Asbestos Control Group 919-707-5950.		
☐	Complex Source Permit required under 15 A NCAC 2D.0800		
☒	The Sedimentation Pollution Control Act of 1973 must be properly addressed for any land disturbing activity. An erosion & sedimentation control plan will be required if one or more acres to be disturbed. Plan filed with proper Regional Office (Land Quality Section) At least 30 days before beginning activity. A fee of $65 for the first acre or any part of an acre. An express review option isavailable with additional fees.		20 days (30 days)
☐	Sedimentation and erosion control must be addressed in accordance with NCDOT's approved program. Particular attention should be given to design and installation of appropriate perimeter sediment trapping devices as well as stable stormwater conveyances and outlets.		(30 days)
☐	Mining Permit	On-site inspection usual. Surety bond filed with ENR Bond amount varies with type mine and number of acres of affected land. Any are mined greater than one acre must be permitted. The appropriate bond must be received before the permit can be issued.	30 days (60 days)
☐	North Carolina Burning permit	On-site inspection by N.C. Division Forest Resources if permit exceeds 4 days	1 day (N/A)
☐	Special Ground Clearance Burning Permit - 22 counties in coastal N.C. with organic soils	On-site inspection by N.C. Division Forest Resources required "if more than five acres of ground clearing activities are involved. Inspections should be requested at least ten days before actual burn is planned."	1 day (N/A)
☐	Oil Refining Facilities	N/A	90-120 days (N/A)
☐	Dam Safety Permit	If permit required, application 60 days before begin construction. Applicant must hire N.C. qualified engineer to: prepare plans, inspect construction, certify construction is according to ENR approved plans. May also require permit under mosquito control program. And a 404 permit from Corps of Engineers. An inspection of site is necessary to verify Hazard Classification. A minimum fee of $200.00 must accompany the application. An additional processing fee based on a percentage or the total project cost will be required upon completion.	30 days (60 days)

	PERMITS	SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	Normal Process Time (statutory time limit)
☐	Permit to drill exploratory oil or gas well	File surety bond of $5,000 with ENR running to State of NC conditional that any well opened by drill operator shall, upon abandonment, be plugged according to ENR rules and regulations.	10 days N/A
☐	Geophysical Exploration Permit	Application filed with ENR at least 10 days prior to issue of permit. Application by letter. No standard application form.	10 days N/A
☐	State Lakes Construction Permit	Applicationfee is charged based on structure size. Must include descriptions & drawings of structure & proof of ownership of riparianproperty.	15-20 days N/A
☑	401 Water Quality Certification	N/A	60 days (130 days)
☐	CAMA Permit for MAJOR development	$250.00 fee must accompany application	55 days (150 days)
☐	CAMA Permit for MINOR development	$50.00 fee must accompany application	22 days (25 days)
☐	Several geodetic monuments are located in or near the project area. If any monument needs to be moved or destroyed, please notify: N.C. Geodetic Survey, Box 27687 Raleigh, NC 27611		
☐	Abandonment of any wells, if required must be in accordance with Title 15A. Subchapter 2C.0100.		
☑	Notification of the proper regional office is requested if "orphan" underground storage tanks (USTS) are discovered during any excavation operation.		
☐	Compliance with 15A NCAC 2H 1000 (Coastal Stormwater Rules) is required.		45 days (N/A)
☐	Tar Pamlico or Neuse Riparian Buffer Rules required.		
☐	Plans and specifications for the construction, expansion, or alteration of a public water system must be approved by the Division of Water Resources/Public Water Supply Section prior to the award of a contract or the initiation of construction as per 15A NCAC 18C .0300 et. seq. Plans and specifications should be submitted to 1634 Mail Service Center, Raleigh, North Carolina 27699-1634. All public water supply systems must comply with state and federal drinking water monitoring requirements. For more information, contact the Public Water Supply Section, (919) 707-9100.		30 days
☐	If existing water lines will be relocated during the construction, plans for the water line relocation must be submitted to the Division of Water Resources/Public Water Supply Section at 1634 Mail Service Center, Raleigh, North Carolina 27699-1634. For more information, contact the Public Water Supply Section, (919) 707-9100.		30 days

* Other comments (attach additional pages as necessary, being certain to cite comment authority)

REGIONAL OFFICES

Questions regarding these permits should be addressed to the Regional Office marked below.

☐ **Asheville Regional Office**
2090 US Highway 70
Swannanoa, NC 28778
(828) 296-4500

☐ **Mooresville Regional Office**
610 East Center Avenue, Suite 301
Mooresville, NC 28115
(704) 663-1699

☐ **Wilmington Regional Office**
127 Cardinal Drive Extension
Wilmington, NC 28405
(910) 796-7215

☐ **Fayetteville Regional Office**
225 North Green Street, Suite 714
Fayetteville, NC 28301-5043
(910) 433-3300

☐ **Raleigh Regional Office**
3800 Barrett Drive, Suite 101
Raleigh, NC 27609
(919) 791-4200

☐ **Winston-Salem Regional Office**
585 Waughtown Street
Winston-Salem, NC 27107
(336) 771-5000

☐ **Washington Regional Office**
943 Washington Square Mall
Washington, NC 27889
(252) 946-6481

NCDENR
North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

John E. Skvarla, III
Secretary

MEMORANDUM

To: Crystal Best
State Clearinghouse

From: Lyn Hardison
Division of Environmental Assistance and Customer Service
Environmental Assistance and Project Review Coordinator

RE: 14-0287 Additional Comments
Draft Environmental Impact Statement
Proposed project is for the construction of a terminal structure at the western end of South Beach and supplemental beach nourishment
Brunswick County

Date: February 18, 2014

Please find attached additional comments from the NC Wildlife Resource Commission which was received in this office after the response due date. They have some recommendations that need to be forwarded to the applicant and assembled into our previous comment package.

Thank you for the opportunity to respond.

Attachment

⊜ North Carolina Wildlife Resources Commission ⊜
Gordon Myers, Executive Director

MEMORANDUM

TO: Lyn Hardison
Office of Legislative and Intergovernmental Affairs
North Carolina Department of Environment and Natural Resources

FROM: Maria T. Dunn, Coastal Region Coordinator
Habitat Conservation Program

DATE: February 18, 2014

SUBJECT: Draft Environmental Impact Statement, Village of Bald Head Island Shoreline Protection Project, Brunswick County, North Carolina.
OLIA No. 14-0287

Biologists with the NC Wildlife Resources Commission (NCWRC) have reviewed this Draft Environmental Impact Statement (DEIS) with regards to potential impacts to fish and wildlife resources. Our comments are provided in accordance with provisions of the Coastal Area Management Act (G.S. 113A-100 through 113A-128), as amended, and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). Representatives from the NCWRC were present at Project Development Team meetings during the planning and scoping phases of this project.

The Village of Bald Head Island has submitted a DEIS to describe an inlet management plan and terminal groin project proposed to address erosion and beach restoration. The project includes the construction of a terminal groin as allowed in the North Carolina General Assembly's 2011 Senate Bill 110 and 2013 Senate Bill 151 as well as subsequent nourishment activities around the structure and along the beaches.

Projects that affect oceanfront beaches and natural inlet processes such as beach nourishment, inlet dredging, inlet relocation and the construction of hardened structures on or along beaches may adversely affect nesting sea turtles and shorebird foraging and nesting areas.

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

Due to the scope of this project and the documented use of the beaches by sea turtles and shorebirds, the NCWRC has the following comments and recommendations:

- The NCWRC has an established sea turtle nesting moratorium that reduces the potential for unintended impacts to nesting sea turtle species that frequent the coast of North Carolina. To avoid impacts to these species, all work on the oceanfront shoreline, including mobilization and demobilization for all beach nourishment events and the construction of the terminal groin structure, should be conducted outside of the sea turtle nesting season which runs from 01 May until 15 November, or until the last known sea turtle nest has hatched.

- Inlet areas provide suitable nesting, foraging and roosting areas for multiple shorebird species. Nesting birds are sensitive to increased human activity and other disturbances around their nesting areas. To limit unintended impacts to nesting bird species in and near the project area, please avoid all work during the shorebird nesting period which runs from 01 April until 31 August.

- Preconstruction monitoring should be incorporated into the EIS for overwintering birds to better establish the use of the inlet area by these species. This information is beneficial in evaluating any impacts to the use by these bird species post construction during seasons that may not have been previously monitored by the applicant outside of the breeding season.

- The NCWRC is concerned that building a structure that is dependent upon regular nourishment events could potentially impact benthic invertebrate populations found in intertidal habitats. Benthic invertebrates are an important food source for foraging birds, both resident and migratory, during both the breeding and nonbreeding seasons. Regular beach nourishment events, such as every five years, can reduce benthic populations when populations are not given appropriate time for recovery.

- The NCWRC is concerned that the construction of a terminal groin may lead to a possible increase in requests to conduct emergency beach nourishment during ecologically sensitive times of the year, i.e. the nesting shorebird and nesting sea turtle moratoriums, due to potential increases in erosion rates around the groin structure.

- The NCWRC is concerned about permanent, cumulative habitat loss and changes to the inlet complex. "Coastal engineering projects can potentially create, enhance, degrade, or destroy foraging and nesting habitat at important coastal bird breeding, stopover, or wintering sites" (Harrington 2008). Senate Bill 110 (e)(5)(c) states the plan must provide for mitigation measures to be implemented if adverse impacts reach the thresholds defined in the plan. Mitigation would need to create or protect a similar habitat type that would offset the loss of this inlet area. Please provide a discussion on the potential mitigation options that may be available to offset any unintended direct and indirect impacts from the proposed terminal groin.

- Biological and physical post-project monitoring should be conducted for a long enough period of time to determine the effect a terminal groin structure has on the immediate and surrounding areas. Due to the dynamic nature of barrier islands, ocean facing beaches, and inlets, this period of time should be long enough to capture a "normal" period of time. Monitoring reports should be provided to the appropriate parties and consultation should be done with regulatory and resources agencies prior to ceasing any monitoring activity. If it is determined during this period of time the project has had a significant adverse impact or is not performing as intended, mitigation may have to be implemented.

Thank you for the opportunity to review and comment on the DEIS for this project. Please feel free to contact me at (252) 948-3916 if there are any questions or comments pertaining to this project.

Works Cited

Harrington, B. R. 2008. *Coastal inlets as strategic habitat for shorebirds in the southeastern United States*. DOER Technical Notes Collection. ERDC TN-DOER-E25. Vicksburg, MS: U.S. Army Engineer Research and Development Center. http://el.erdc.usace.army.mil/dots/doer/.

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

COUNTY: BRUNSWICK

H12: OTHER

STATE NUMBER: 14-E-0000-0287
DATE RECEIVED: 01/08/2014
AGENCY RESPONSE: 02/03/2014
REVIEW CLOSED: 02/07/2014

RECEIVED
JAN 10 2014
HISTORIC PRESERVATION OFFICE

MS RENEE GLEDHILL-EARLEY
CLEARINGHOUSE COORDINATOR
DEPT OF CULTURAL RESOURCES
STATE HISTORIC PRESERVATION OFFICE
MSC 4617 - ARCHIVES BUILDING
RALEIGH NC

ER 12-0437

A — JCS/ff 2-3-14

REVIEW DISTRIBUTION

CAPE FEAR COG
CC&PS - DIV OF EMERGENCY MANAGEMENT
DENR - COASTAL MGT
DENR LEGISLATIVE AFFAIRS
DEPT OF CULTURAL RESOURCES
DEPT OF TRANSPORTATION

Due 1/28/14

PROJECT INFORMATION

APPLICANT: Department of the Army

TYPE: National Environmental Policy Act
Draft Environmental Impact Statement

DESC: Proposed project is for the construction of a terminal structure at the western end of South Beach and supplemental beach nourishment. - View documents at: http://www.saw.usace.army.mil/Missions/RegulatoryPermitProgram/MajorProjects

The attached project has been submitted to the N. C. State Clearinghouse for intergovernmental review. Please review and submit your response by the above indicated date to 1301 Mail Service Center, Raleigh NC 27699-1301.

If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: ☒ NO COMMENT ☐ COMMENTS ATTACHED

SIGNED BY: Renee Gledhill-Earley

DATE: 2·6·14

FEB 2014
RECEIVED
Secretary's Office
DOA

JAN 13 2014

Kerry Morrow

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

COUNTY: BRUNSWICK

H12: OTHER

STATE NUMBER: 14-E-0000-0287
DATE RECEIVED: 01/08/2014
AGENCY RESPONSE: 02/03/2014
REVIEW CLOSED: 02/07/2014

MS CARRIE ATKINSON
CLEARINGHOUSE COORDINATOR
DEPT OF TRANSPORTATION
STATEWIDE PLANNING - MSC #1554
RALEIGH NC

REVIEW DISTRIBUTION

CAPE FEAR COG
CC&PS - DIV OF EMERGENCY MANAGEMENT
DENR - COASTAL MGT
DENR LEGISLATIVE AFFAIRS
DEPT OF CULTURAL RESOURCES
DEPT OF TRANSPORTATION

PROJECT INFORMATION

APPLICANT: Department of the Army

TYPE: National Environmental Policy Act
Draft Environmental Impact Statement

DESC: Proposed project is for the construction of a terminal structure at the western end of South Beach and supplemental beach nourishment. - View documents at: http://www.saw.usace.army.mil/Missions/RegulatoryPermitProgram/MajorProjects

The attached project has been submitted to the N. C. State Clearinghouse for intergovernmental review. Please review and submit your response by the above indicated date to 1301 Mail Service Center, Raleigh NC 27699-1301.

If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: ☑ NO COMMENT ☐ COMMENTS ATTACHED

SIGNED BY: ______________________ DATE: 1/17/14

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

COUNTY: BRUNSWICK

H12: OTHER

STATE NUMBER: 14-E-0000-0287
DATE RECEIVED: 01/08/2014
AGENCY RESPONSE: 02/03/2014
REVIEW CLOSED: 02/07/2014

MS CAROLYN PENNY
CLEARINGHOUSE COORDINATOR
CC&PS - DIV OF EMERGENCY MANAGEMENT
FLOODPLAIN MANAGEMENT PROGRAM
MSC # 4719
RALEIGH NC

Rec'd 1/10/2014

JAN 2014
RECEIVED
Secretary's Office
DOA

REVIEW DISTRIBUTION

CAPE FEAR COG
CC&PS - DIV OF EMERGENCY MANAGEMENT
DENR - COASTAL MGT
DENR LEGISLATIVE AFFAIRS
DEPT OF CULTURAL RESOURCES
DEPT OF TRANSPORTATION

PROJECT INFORMATION

APPLICANT: Department of the Army
TYPE: National Environmental Policy Act
Draft Environmental Impact Statement

DESC: Proposed project is for the construction of a terminal structure at the western end of South Beach and supplemental beach nourishment. - View documents at: http://www.saw.usace.army.mil/Missions/RegulatoryPermitProgram/MajorProjects

The attached project has been submitted to the N. C. State Clearinghouse for intergovernmental review. Please review and submit your response by the above indicated date to 1301 Mail Service Center, Raleigh NC 27699-1301.

If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: ☐ NO COMMENT ☒ COMMENTS ATTACHED

SIGNED BY:

DATE: 1/14/14

North Carolina Department of Public Safety

Emergency Management

Pat McCrory, Governor
Frank L. Perry, Secretary

Michael A. Sprayberry, Director

JAN 2014
RECEIVED
DOA

January 14, 2014

State Clearinghouse
N.C. Department of Administration
1301 Mail Service Center
Raleigh, North Carolina 27699-1301

Subject: Intergovernmental Review State Number: 14-E-0000-0287
Terminal Structure and Supplemental Beach Nourishment, Brunswick County

As requested by the North Carolina State Clearinghouse, the North Carolina Department of Crime Control and Public Safety Division of Emergency Management Office of Geospatial and Technology Management (GTM) reviewed the proposed project listed above and offer the following comments:

1) All federal agencies are required to follow the guidelines of Executive Order 11988, signed May 24, 1977. Any work within the Special Flood Hazard Area, based on the current Flood Insurance Rate Map, should follow these guidelines in order to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains. The guidelines address an eight-step process that agencies should carry out as part of their decision-making on projects that have potential impacts to or within the floodplain. The eight steps are summarized below.

    a. Determine if a proposed action is in the base floodplain (that area which has a one percent or greater chance of flooding in any given year).

    b. Conduct early public review, including public notice.

    c. Identify and evaluate practicable alternatives to locating in the base floodplain, including alternative sites outside of the floodplain.

    d. Identify impacts of the proposed action.

    e. If impacts cannot be avoided, develop measures to minimize the impacts and restore and preserve the floodplain, as appropriate.

    f. Reevaluate alternatives.

    g. Present the findings and a public explanation.

    h. Implement the action.

2) 44 CFR 60.3.e prohibits man-made alteration of sand dunes and mangrove stands within Zones V1-30, VE, and V on the community's FIRM which would increase potential flood damage. Grading activity within one of these zones shall be accompanied by a hydraulic study to assure there will be no increase in flood damage potential.

If you have any questions, please contact Dan Brubaker, P.E., CFM, the NC NFIP Engineer at (919) 825-2300, by email at dan.brubaker@ncdps.gov or at the address shown on the footer of this document.

Sincerely,

Kenneth W. Ashe, P.E., CFM
Assistant Director
Geospatial and Technology Management Office

cc: John Gerber, NFIP State Coordinator
Dan Brubaker, NFIP Engineer

North Carolina
Coastal Federation
Working Together for a Healthy Coast

March 17, 2014

Ronnie D. Smith
Project Manager
US Army Corps of Engineers
Wilmington Regulatory Field Office
69 Darlington Avenue
Wilmington, North Carolina 28403-1343

RE: Corps Action ID: SAW- 2012-00040

Dear Mr. Smith:

Please accept the following comments on the proposed terminal groin project on Bald Head Island on behalf of the N.C. Coastal Federation. For the past 33 years the federation has been taking an active role in the protection of North Carolina's coastal water quality, habitat, and public beach access.

The Draft Environmental Impact Statement (DEIS) is not consistent with National Environmental Policy Act (NEPA) because it segments the environmental evaluation of the project by disclosing and evaluating the direct effects of only one component of what is clearly planned to be a larger plan. Taking into account recent meetings and reports by the N.C. Division of Coastal Management as well as the Town of Bald Head, it is clear that plans to address erosion problems on Bald Head Island will encompass much more than the preferred alternative identified in the DEIS.

NEPA requires that this DEIS provide a comprehensive evaluation of all components of the proposed project. These components should be evaluated together and not in a piecemeal way into separate documents and analyses that fail to account for the *combined, cumulative, comprehensive and indirect impacts* of the overall plan to address the erosion issue at Bald Head Island.

The federation requests that the U.S. Corps of Engineers produce a supplemental EIS to address the significant new circumstances of information relevant to environmental concerns, described below, and bearing on the proposed action or its impacts, as required by the 40 CFR, Section 1502.9(c)(1)(ii).

Northeast Regional Office
128 Grenville Street
Manteo, NC 27954
252.473.1607

NC Coastal Federation Headquarters and Central Regional Office
3609 Highway 24 (Ocean) • Newport, NC 28570 • 252.393.8185 • www.nccoast.org

Southeast Regional Office
530 Causeway Drive Suite F1
Wrightsville Beach, NC 28480
910.509.2838

1. The DEIS fails to identify and evaluate combined, cumulative, comprehensive and indirect impacts of the proposed project.

The recent Draft Report entitled Cape Fear River Area of Environmental Concern Feasibility Study (Study) (November 5, 2013) prepared by the N.C. Division of Coastal Management resulted from various meetings and workshops that involved the city of Bald Head Island among other stakeholders. On pages 3 and 4 the reports states:

> "While the *Village is currently seeking a permit for the construction of a terminal groin, they do not believe it will address* *<u>all of the issues confronting Bald Head Island.</u>* *The Village indicated that the existing groin field on South Beach may need to be modified and there may also be a need for rock groins and/or breakwaters. The Village believes that there would be a public benefit to pursuing engineered solutions to non-natural beach erosion in reducing the need for and frequency of dredging to maintain the federal navigation channel."*

Furthermore, in the Study (as summarized on page 18) the city proposes a number of new rules that would allow it to greatly expand upon the scope of the terminal groin project. The city indicates that it plans to build:

(1) Permanent erosion control structures: This includes rock groins, terminal structures, breakwaters, jetties and other structures currently prohibited under CAMA.
(2) Temporary erosion control structures: It wants rules that remove restrictions on size, configuration, orientation, sandbag dimensions, underlayments and the time limits.
(3) Change of the definition of "imminently threatened" structures: It wants this to be determined by a certified coastal engineer rather than by the DCM director.
(4) Grandfathering existing oceanfront structures: Structures would be exempted from having to meeting current setbacks should they need to be replaced.

Moreover, as stated repeatedly in the DEIS, the dredging of the Cape Fear River is considered to be the major cause of the erosion problems on Bald Head. These dredging activities are subject to periodic NEPA review, and alternative dredging requirements should also be considered as part of the scope of this project.

2. The DEIS fails to properly analyze the unavoidable, adverse impacts should the proposed be implemented.

40 CFR, Section 1502.16 states that the DEIS needs to comprehensively address the direct as well as indirect impacts of the proposed project, "as well as any *<u>adverse environmental effects which cannot be avoided</u>* should the proposal be implemented, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, *<u>and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented... including</u>*:

(b) Indirect effects and their significance
(c) Possible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned
(h) Means to mitigate adverse environmental impacts."

On page 3-15 of the DEIS it is stated that the proposed terminal groin is <u>not expected</u> to necessarily resolve the ongoing erosion on the down-drift side of the island, and that it may in fact exacerbate down-drift erosion on the West Beach. This is clearly an indirect effect of the proposed project. However, the DEIS does not discuss in detail how this problem will be mitigated and resolved.

Taking into account this statement along with the recent DCM Study it is very clear that Bald Head plans a much more aggressive and comprehensive project that has as just one component the construction of the proposed terminal groin. NEPA requires that all components of the project be included and thoroughly analyzed in the DEIS, and that all indirect consequences be adequately addressed and analyzed.

3. **The DEIS fails to adequately and logically discuss relevant information pertaining to the proposed project.**

The Council of Environmental Quality requires federal agencies to clearly and logically present all relevant information pertaining to the environmental impacts of the proposed project in the NEPA process. For this reason, a number of components of the proposed project need further analysis:

(1) The modeling of performance of the three terminal groin lengths considered in the project was only done for the preferred 1900 feet groin alternative, whereas the performance of the shorter and the longer groin was extrapolated from the numbers obtained for the middle length groin. The modeling should be done for all three groin lengths.

(2) The Delft3D modeling of the preferred alternative was done for the time period of nine years, whereas the life of the project is 30 years. The modeling should include the entire life of the proposed project.

(3) None of the models take into account expected and normal weather events, such as major hurricanes and northeasters. These events, which will occur, cause all the predicted results of the computer models to be wrong, and the cost figures of the proposed structural alternatives to be grossly underestimated. This also skews the cost-benefit analysis since the cost of structural alternatives is not accurately estimated due to the failure to include normal storm conditions as part of the modeling.

(4) The DEIS states that before the second phase of the project is implemented two to four years will be necessary to observe the performance of the first phase of the groin. Several concerns arise with this proposal:

  (a) The timeframe given for the observation of the first phase is too short. As stated in the DEIS the proposed groin will reorient the South Beach shoreline. In the Appendix E of the DEIS it is stated that it took the shoreline 12 years to reorient clockwise, yet measurable outcomes are expected to be seen from Phase I only after two to four years. It is clear that this time frame is too short.
  (b) The DEIS needs to specify the criteria that will be used to determine whether the performance of the first phase was successful or not. No such information can be found in the DEIS.

(5) According to the DEIS, the engineer claims that the groin will be able to reorient the South Beach shoreline, as well as to decrease the effective angle between the shoreline and the incident breaking wave, and to reduce the rate of sand transport from the beach. Therefore, this goal should be the main benchmarks of the performance of the proposed terminal groin.

(6) The DEIS does not provide relevant discussion about how the proposed project would affect the natural habitats located inside the mouth of the inlet. These areas are important bird nesting habitats and shoals used as critical foraging areas by many species. Additional environmental concerns that need to be discussed in more detail include:

  (a) impacts of construction during the month of turtle moratorium;
  (b) impacts of sand compaction on turtle nesting; and
  (c) impact of sand borrowing sand from the surrounding shoals on natural habitat.

4. The DEIS describes a project that is not consistent with state regulations.

Terminal groins as commonly defined in N.C. have been repeatedly characterized as a single structure at the terminus of a barrier island (or inlet) that is designed to prevent beach erosion. Elsewhere in the nation, the term terminal groin has also been used to describe the last groin in a field of groins that stretches along an oceanfront beach. Lawmakers, local governments, and state regulators have repeatedly stated that terminal groins should not result in the expanded use of structures that harden the beachfront such as multiple groins or seawalls. This project that includes 17 groin structures, and not one single terminal groin, and is described by the town on numerous occasions in other public documents as a “groin field”, is likely in the future to also include additional rock structures, sand bags, and other erosion control measures that are not identified in the DEIS.

5. **In conclusion, the DEIS is inconsistent with the requirements of NEPA.**

In conclusion, Section 1.1 of the DEIS states that:

The purpose of the Village of Bald Head Island Shoreline Protection Project is to address on-going and chronic erosion at the western end of South Beach and to thereby protect public infrastructure, road, homes, businesses and rental properties, golf course, beaches, recreational assets, and protective dunes.

The DEIS is inadequate because it does not provide a comprehensive description or evaluation of all components of the project as have been described elsewhere in other government documents. The complete project needs to be clearly described, alternatives and costs of various options for achieving the project purpose need to be more fully identified, and the environmental and economic effects of this expanded number of options need further analysis and review. This can only be accomplished by producing a supplement to the DEIS that addresses all these additional elements of the city's plans that are not identified or evaluated in this DEIS.

Thank you.

Sincerely,

Ana Zivanovic-Nenadovic
Program and Policy Analyst

KILPATRICK
TOWNSEND
ATTORNEYS AT LAW

KILPATRICK TOWNSEND & STOCKTON LLP
www.kilpatricktownsend.com

Suite 1400, 4208 Six Forks Road
Raleigh, NC 27609
t 919 420 1700 f 919 420 1800

direct dial 919 420 1726
direct fax 919 510 6121
TRoessler@KilpatrickTownsend.com

March 17, 2014

Via Electronic Mail and First Class Mail

Mr. Ronnie Smith
U.S. Army Corps of Engineers – Wilmington District
69 Darlington Avenue
Wilmington, NC 28403

Re: Town of Caswell Beach and North Carolina Baptist Assembly at Fort Caswell Comments Regarding Village of Bald Head Island Shoreline Protection Project – Draft Environmental Impact Statement

Dear Mr. Smith:

The Town of Caswell Beach (the "Town") and the North Carolina Baptist Assembly at Fort Caswell ("Fort Caswell") appreciate the opportunity to provide comments on the draft Environmental Impact Statement ("EIS") Village of Bald Head Island (the "Village") Shoreline Protection Project. As discussed below, the Town and Fort Caswell generally support the Village's preferred alternative of constructing a terminal groin with beach replenishment and the sand tube groinfield remaining; however, the Town and Fort Caswell have concerns regarding the proposed borrow area and inlet management plan. As a result, the draft EIS is inadequate and fails to comply with the National Environmental Policy Act, 42 U.S.C. § 4321 *et seq.* ("NEPA"). The Town and Fort Caswell, therefore, request that the U.S. Army Corps of Engineers (the "Corps" or "USACE") prepare a revised EIS that addresses the deficiencies in the current document and complies with NEPA by: (i) adequately evaluating the potential impacts of using Jay Bird Shoals as a borrow site; (ii) confirming that if the Village receives all the dredged material from Year 4 of the Sand Management Plan, the Towns of Caswell Beach and Oak Island will receive the dredged material during Year 6 of the Sand Management Plan; and (iii) revising the inlet management plan to adequately monitor the impacts of the borrow area and mitigate any adverse impacts identified during monitoring.

1. The Town and Fort Caswell support the Village's preferred alternative of constructing a terminal groin with beach replenishment and the sand tube groinfield.

The Town and Fort Caswell believe that it is appropriate to construct a terminal structure in the vicinity of the Point with beach replenishment to address the long-term, chronic erosion in this area and protect island residences, public infrastructure, roads, and beaches and dunes, including their associated functions (*e.g.*, recreations) and values (*e.g.*, storm protection). We understand that the terminal groin is intended to partially capture the longshore transport of sand resulting in reduced erosion in this area and is not a structure that "armors" the shoreline. In addition, the proposed groin will likely also reduce shoaling into the channel therefore providing benefits to navigation.

2. **Because the modified channel essentially eliminates sand bypassing and the two littoral systems act independently, the Town and Fort Caswell oppose the Village obtaining any sand from Jay Bird Shoals during the construction of the terminal groin or at any other time.**

The Village has proposed a two-phased construction of the terminal groin. First, a 1,300-foot terminal groin would be constructed with concurrent beach fill. The Village proposes that dredged material from Jay Bird Shoals and possibly the maintenance of the federal navigation project (if timing allows), approximately 1.2 million cubic yards (250,000 cubic yards for the fillet), would be used for the Phase I beach fill. The Draft EIS states that if timing of the groin construction can coincide with a Wilmington Harbor maintenance project, sand from Jay Bird Shoals may not be needed for Phase I. Draft EIS, pp. 3-12 and 5-15. Second, the terminal groin would be extended seaward to its full design length (1,900 feet) with concurrent beach fill. The Village proposes that dredged material from Jay Bird Shoals, approximately 1.2 million cubic yards, would be used for beach fill during Phase II (500,000 cubic yards for the fillet). Draft EIS, pp. 3-12 and 5-15. However, it would appear that if Phase II groin construction is also coordinated with the Wilmington Harbor maintenance dredging, use of Jay Bird Shoals would not be required.

Consistent with past studies, the draft EIS recognizes that large-scale dredging has resulted in a segmentation of the ebb tidal delta and two distinct features. "[T]hese two littoral systems can be thought of as largely independent with little sand sharing between the islands." Draft EIS, p. 4-53 (citing USACE 2011 Reevaluation Report). Not only are there two independent littoral systems, tidal currents have the potential to move sand from each island to the ebb tidal delta and then back to the island from which the sand originated. "According to the applicant's engineer, material tidally removed from Oak Island appears to be directed towards Jay Bird Shoals and the navigation channel, suggesting to him that the material deposited into the shoals may remain in the local littoral system and/or be transported back onto Oak Island." Draft EIS, pp. 4-43 to 4-44.

The Town and Fort Caswell oppose using Jay Bird Shoals as a borrow area for construction of the terminal groin or at any other time. The systems act independently with little sand sharing between the two systems, and, as recognized by the Village's engineer, sand within Jay Bird Shoals may remain with the local littoral system and be transported back onto Oak Island; therefore, any sand removed from Jay Bird Shoals has the potential to cause a deficit within the Oak Island littoral system and result in adverse impacts, including erosion, to Oak Island's beaches. In fact, Fort Caswell, which was recently included in the National Register of Historic Places for its significance in the areas of military history, engineering, architecture, and archaeology, has experienced significant erosion and dune loss in recent years (and a significant portion of the measured change over the last decade has been experienced within the last few years based on USACE reports), which may be (at least partly) influenced by the Village's prior use of Jay Bird Shoals as a borrow site. Finally, use of Jay Bird Shoals as a borrow site has the potential to influence wave refraction and tidal currents resulting in impacts to sediment transport patterns, which again have the potential to adversely impact Oak Island. The Town and Fort Caswell appreciate the efforts that the Village has made to quantify potential wave impacts, but it must be realized that sediment transport patterns are influenced by waves and tidal currents. To date it does not appear that the potential effects of using Jay Bird Shoals as a borrow area on the local hydrodynamics have been quantified. The tidal current model runs shown in the report for larval transport could possibly be used for this effort; however, it appears that these model runs used pre-dredged bathymetry for Jay Bird Shoals.

The draft EIS fails to consider and evaluate the significant adverse impacts to the human environment that may result from using Jay Bird Shoals as a borrow area, and the Town and Fort Caswell oppose this alternative.

3. **The draft EIS does not address how sand from maintenance dredging associated with the federal navigation project will be allocated between the Village and the Towns of Caswell Beach and Oak Island (collectively, the "Towns"). Consistent with the Sand Management Plan, if the Village receives all the sand for next maintenance cycle, the Towns must receive all the sand the following maintenance cycle.**

The Corps has developed a Sand Management Plan ("SMP") and recently proposed a draft Revised SMP to address the disposal of dredged material associated with the deepening and maintenance of the Wilmington Harbor Channel. The SMP establishes a two-year dredging cycle for the Inner Ocean Bar. Based on numerical modeling results, the Corps determined that two-thirds of the sand shoaling into the channel originates from Bald Head and one-third is derived from Oak Island and Caswell Beach. These modeled ratios have closely tracked the actual shoaling rates. Based on a "back-passing" approach, the Corps indicated that dredged material would be placed on the adjacent beaches from which it originated. Thus, Bald Head Island would receive sand in Years 2 and 4, and Caswell Beach and Oak Island would receive sand in Year 6.

The Corps recently re-evaluated the SMP, and in January 2011 issued a draft Revised SMP. In the draft Revised SMP, the Corps proposed to no longer follow a fixed ratio to allocate sand between the adjacent islands. Rather, sand dredged from Baldhead Shoal Range (Reaches 1 and 2), which originates from Bald Head Island, would be returned to Bald Head Island, and sand dredged from Smith Island Range, which originates from Jay Bird Shoals (Oak Island is primary feeding mechanism for Jay Bird Shoals), would be returned to Caswell Beach and Oak Island. The Corps also recognizes that "longer time frames between sediment placements will result in larger beach recessions." (Corps 2011 Reevaluation Report, p. 23) As a result, the Corps proposed a "shoaling plan" in which dredged material would be placed on each island every two (2) years: the distribution of material would be based on shoaling location in the channel with sand dredged from Baldhead Shoal Channel Reaches 1 and 2 going to Bald Head and sand from Smith Island Range going to Oak Island and Caswell Beach.

The Corps has not adopted the Revised SMP and is currently operating under the existing SMP. The Village received approximately 1.524 million cubic yards of sand from maintenance of Inner Ocean Bar in 2013, representing "Year 2" of the SMP. If the Village receives all of the sand from the next maintenance cycle of the Inner Ocean Bar (Year 4), the Towns must receive all of the sand from the following maintenance cycle (Year 6).

While the Town and Fort Caswell appreciate the modeling efforts completed by the Village to evaluate the proposed alternatives, model runs with assumptions from the Revised SMP in which the Village would receive some volume of sand every 2 years (or 3 years as assumed in the EIS) would be helpful along with model runs with the Phase I groin length to estimate interim behavior. Considering the favorable modeling results with the terminal groin (shoreline positions and volumes of sand remaining after three years), additional model runs with a reduced nourishment volume should be performed to investigate whether locally funded projects by the Village could be avoided (especially if the Revised SMP is adopted).

4. **As required by N.C. Gen. Stat. § 113A-115.1, the inlet management plan must be adequate for the purposes of monitoring the impacts of the proposed terminal groin and mitigating any adverse impacts identified as a result of the monitoring.**

If Jay Bird Shoals is used as a borrow area (which the Town and Fort Caswell oppose), the inlet management plan must be adequate to monitor the impacts of the borrow area and mitigate any adverse impacts identified during monitoring.

For purposes of assessing post-construction shoreline conditions on the eastern end of Oak Island, the Village proposes to utilize survey data acquired by the Corps. The inlet management plan further provides that the Village's obligation to monitor Oak Island "will terminate if three (3) years of monitoring subsequent to terminal groin structure completion fails to indicate any level of cause or effect relationship between structure installation and shoreline change at Oak Island." Draft Inlet Management Plan, p. 5. First, the Town and Fort Caswell believe that Fort Caswell should be included in the monitoring plan. Second, the number of profiles to be utilized (12 are proposed by the Village if the USACE stops their monitoring program) would need to be increased to include areas of Fort Caswell and the final agreed upon number of profiles would also be influenced by whether Jay Bird Shoals is utilized or not. Third, three (3) years is not a long enough time period in these dynamic systems for trends to emerge; six (6) to nine (9) years would be more reasonable given the time frames used for assessing alternatives in the EIS.

The draft inlet management plan provides that "[b]orrow sites utilized for locally funded sand placement operations at Bald Head Island shall be monitored in accordance with the Permit Condition associated with each project." Draft Inlet Management Plan, p. 6. The inlet management plan is required to set forth the monitoring plan to adequately address impacts of the proposed terminal groin project. Relying on future permit conditions not only does not meet the statutory requirements, but the Town and Fort Caswell are unable to adequately review these permit conditions at this time. Moreover, the inlet management plan suggests there is sand "remaining (1 Mcy) [in the] unexcavated (permitted) portion of the Jay Bird Shoals borrow area." Draft Inlet Management Plan, p. 6. The permit obtained to use Jay Bird Shoals as a borrow site in 2009 was for a one-time event, and if the Village seeks to use Jay Bird Shoals as a borrow area for sand to be used as fill for its terminal groin, a new permit is required. Finally, because the Village's modeling results using Jay Bird Shoals as a borrow area showed the potential for increased wave height at Middle Ground Shoal, this area (Middle Ground Shoal) should also be surveyed. These borrow area surveys should be completed with multibeam surveys so that 100 percent coverage is achieved.

The draft inlet management plan fails to define the baseline for assessing any adverse impacts and the thresholds for when the adverse impacts must be mitigated. The draft inlet management plan sets forth certain conditions that will be considered in determining whether the terminal groin project adversely impacts eastern Oak Island, but states that it will be "difficult, if not impossible, to verify any increase in erosion on the Caswell Beach section of Oak Island that is attributed to the proposed . . . terminal groin." Draft Inlet Management Plan, pp. 9-10. The inlet management plan must be revised to clearly define baseline conditions and thresholds for when the adverse impacts must be mitigated. These conditions must also make the distinction between potential effects from the terminal groin and the borrow area to be meaningful.

The draft inlet management plan fails to provide adequate mitigation measures to be implemented if adverse impacts caused by the terminal groin project are identified. Although the Village provides that other measures may be considered, the Village proposes that any such impacts would be mitigated through direct sand placement through a reapportionment of some portion of the maintenance dredged material from the Inner Ocean Bar. With respect to Fort Caswell, dredged material from the Wilmington Harbor Navigation Project cannot be placed on Fort Caswell so additional options would need to be included and considered. With respect to Caswell Beach, if dredged material from the Wilmington Harbor Navigation Project is the source of sand for mitigation, the "reapportionment" should be to increase the Towns' allocation (*i.e.*, decrease the Village's allocation), not take it away from another area on Oak Island that is "more stable or accreting."

5. The draft EIS does not adequately evaluate the cumulative impacts of using Jay Bird Shoals as a borrow area.

The Village dredged 1.85 million cubic yards of sand from Jay Bird Shoals for a beach replenishment project in 2009. The Village now proposes to potentially use Jay Bird Shoals as a borrow area (which the Town and Fort Caswell oppose) for beach fill during both Phase I and Phase II of the construction of the proposed terminal groin. The Village is required to evaluate the cumulative impacts of removing sand from Oak Island's independent littoral system.

In closing, subject to the concerns raised above, we support the Village's preferred alternative of constructing a terminal groin with beach replenishment and the sand tube groinfield remaining and appreciate the opportunity to comment on the Village's proposed terminal groin project.

Sincerely,

KILPATRICK TOWNSEND & STOCKTON LLP

Todd S. Roessler

cc: The Honorable Harry Simmons, Mayor of Caswell Beach
Richard Holbrook
Johnny Martin
Charles S. Baldwin IV

The Village of Bald Head Island

March 17, 2014

VIA EMAIL

Corps of Engineers, Wilmington District
Wilmington Regulatory Field Office
69 Darlington Avenue
Wilmington, North Carolina 28403-1343
Email: ronnie.d.smith@usace.army.mil

ATTENTION: Mr. Ronnie Smith

Re: Village of Bald Head Island Terminal Groin ("Project")
Corps Action ID#: SAW-2012-00040

Ladies and Gentlemen:

The Village of Bald Head Island thanks the Wilmington District, Corps of Engineers ("Corps") for its work with the Village, other regulatory agencies and stakeholders in the preparation and review of permitting documents for this Project. In response to those public notices dated January 10 and February 13, 2014, the Village of Bald Head Island, North Carolina ("Village") submits its comments on the draft Environmental Impact Statement for the Project.

Simplistically, the need for this Project arises from the well-documented severe and chronic erosion experienced at the western end of South Beach, which threatens public infrastructure, roads, homes, beaches, dunes and wildlife habitat. Since deepening and relocation of the Wilmington Harbor Shipping Channel ("Channel") through the protective shoals at Bald Head Island, the Island has experienced unprecedented levels of erosion. In response to this erosion, the Village, at its cost, has incurred expenses since 2000 in excess of $25.0 million for beach nourishment projects and erosion control structures, such as the sixteen (16) tube geotextile groinfield at South Beach.

Following decades of study and extensive state of the art Delft3D numerical modeling by the Village's coastal engineering consultant, Olsen Associates, Inc., it was determined that a terminal groin structure, as proposed by the Village, would not solve but would assist to reduce

P.O. BOX 3009 • BALD HEAD ISLAND, NC 28461
(910) 457-9700 • FAX (910) 457-6206 • WEBSITE: http://www.villagebhi.org

erosion nearest the Channel by reorienting the shoreline and slowing the annual rate of alongshore sediment transport into the Channel. Following completion of the terminal groin Project however, beneficial sand placement from future Channel dredging operations would continue to be required on the Island's beaches.

The applicant is cognizant of comments by Caswell Beach and others on the Western side of the Channel that they should receive all the Channel maintenance sand from the Smith Island Reach and that Bald Head Island should only receive sand from the dredging of Bald Head Reaches 1 and 2. We hope that following construction of the Terminal Groin in 2014-15, assuming it can be built in that time window, the Bald Head Island beaches may be improved sufficiently to allow for an approximately 2/3 – 1/3 future sand split. However, monitoring to date and sound coastal engineering advise that if the Terminal Groin is not built concurrent with Channel dredging in 2014-15, substantial environmental harm would result and many millions of dollars of property and roads would be put in jeopardy. In that event, the Bald Head Island beaches would require, at a minimum, as shown by numerical modelling and beach surveys to date, the beneficial placement of all sand from the Channel maintenance dredging of the Smith Island Reach and Bald Head Reaches 1 and 2 during each dredging event. It is well documented by monitoring studies that Bald Head Island beaches lose in excess of 400,000 cubic yards/year, while the Oak Island and Caswell Beach beaches lose only a small fraction of that amount annually. The allocation of sand between the Village and the towns of Caswell Beach and Oak Island ("Towns") pursuant to the Sand Management Plan regarding disposal of dredged material associated with the maintenance of the Wilmington Harbor Channel is beyond the proper scope of the EIS for this local Project and need not be addressed by the Corps in any definitive manner. The Corps has consistently maintained that it has discretionary authority to distribute sand as appropriate for the Navigation Channel and to address environmental impacts.

The statement on Pages 4-53 regarding Bald Head Reaches 1 and 2 and the Smith Island Reach inaccurately characterizes the genesis and purpose of the year 2000 Sand Management Plan ("SMP") when it states that "the shoaling rates within those two channel reaches have occurred in a one-third to two-third proportion reflecting the basic assumption of the original Sand Management Plan" (emphasis added). The latter SMP document, based upon a 1997 Corps of Engineers Research and Development Center ("ERDC") study, concluded that littoral transport rates along the two islands was in the ratio of 2:1 (BHI:OI). It did *not* address a ratio of shoaling rates within the navigation channel. Hence, one cannot make the conclusion that location of Channel sand shoaling is indicative of adjacent island shoreline losses or need to mitigate impacts.

A reinvestigation of littoral transport rates utilizing a Delft 3D model (Olsen 2013) – Pg. 56 – predicts that the ratio of "peak" littoral transport rates between Bald Head Island and Oak Island is closer to 4.2:1. Furthermore, an inlet sediment budget prepared for the 2011 Beach and Inlet Management Plan report of the NC DENR, Division of Coastal Management, suggests a ratio closer to 7.8:1. It is noted for the record that the 1999 ERDC model was proven to have been in material error in its predictions by at least three (3) coastal engineering firms. An in-depth evaluation of the ERDC Study by the Village Consultant, Olsen Associates, Inc., is included as Attachment A.

Further, the SMP stated that "three factors were considered in the development of a dredged material disposal plan for maintenance of the harbor entrance, namely; engineering requirements of the Project, environmental impacts, and costs." Sand Management Plan, Page 8, Paragraph 17. These three factors should continue to guide present and future disposal for Channel maintenance dredging events.

It is a fundamental precept for the success of the terminal groin Project that a secondary sand source necessary to maintain the equilibrium of the beach system after groin construction be obtained from the proven and previously permitted sources of Jaybird Shoals and the entrance to Bald Head Creek, or potentially from Frying Pan Shoals in the more distant future, since the Channel, as dredged for navigation, contains insufficient sand for both supplemental sand budget purposes as well as sand fillet maintenance.

Jaybird Shoals was previously used as a borrow site by the Village in 2009-2010. The monitoring performed in connection with that project has proven adequate. Further, studies and monitoring have shown that the project area quickly recovered and that there was no impact associated with the project at Caswell Beach or Fort Caswell. Additional monitoring is not required and would violate N.C.G.S. §113-A-115.1(e)(5), "The inlet management plan monitoring and mitigation requirements must be reasonable and not impose requirements whose costs outweigh the benefits." Several decades of monitoring by the Corps established that the hotspot at Fort Caswell long pre-dated the Village project at Jaybird Shoals and there is no causal relation. The most recent Division of Coastal Management erosion rate maps indicate that the shorelines at the Towns have accreted and have the minimal erosion rates applicable of two (2) feet per year. The Towns have provided no engineering study or data to refute the Village's Jaybird Shoals project studies. There is no engineering basis to conclude that the Jaybird Shoals project has an effect on hydrodynamics at the Towns or Fort Caswell. Only wave energy is typically evaluated and the Village's coastal engineer has performed and published such studies. The predicted increased energy level at middle ground resulting from a fully-excavated Jaybird Shoal borrow site (as proposed) was almost unmeasurable. There is no engineering basis to survey middle ground or perform further hydromechanics study, as suggested by the Towns. Such an exercise would be extraordinarily expensive and non-productive.

The terminal groin Project considers extensive federal channel surveys and represents the results of in-depth Delft3D computer modeling as well as sound engineering practice. The terminal groin will result in healthier beaches and an improved sand budget for the benefit of the beaches of Bald Head Island. There do not appear to be any realistic or practical alternatives to the construction of a terminal groin. The draft Environmental Impact Statement shows that any potential impacts from a terminal groin are negligible, are limited to Bald Head Island and are far outweighed by the potential benefits. This Project can likewise be considered beneficial to the environment, coastal resources, maintenance of the shipping Channel and the State Port.

Bald Head Island was developed as an environmentally sound and sustainable community. Its Nature Conservancy and sea turtle monitoring programs are world class. The roads, homes and infrastructure now threatened were built many hundreds of yards set back from the oceanfront. This is not a case of improvident development at the oceanfront, as some public comments have alleged.

We look forward to working with you to see this Project to its successful conclusion. If the window of opportunity represented by the 2014-2015 channel dredging project is not met and the fillet of the terminal groin cannot be supplemented by the federal sand, a tremendous opportunity will be lost and substantial environmental harm will occur. We must, therefore, work together to ensure that unfortunate circumstance does not result. Following as Exhibits 1 and 2 are certain technical comments to the draft Environmental Impact Statement of January 2014.

Sincerely yours,

Debra M. Straub for J. Andrew Sayre

J. Andrew Sayre
Mayor

pc: Colonel Steven A. Baker, USACE District Commander
Doug Huggett, NC Division of Coastal Management
Honorable Mike McIntyre
Harry Simmons, Mayor, Caswell Beach
Justin McCorkle, Esquire
Calvin R. Peck, Jr., Village Manager
Chris McCall, Assistant Village Manager and Shoreline Protection Manager
Erik J. Olsen, P.E.
George W. House, Esquire
Charles S. Baldwin, IV, Esquire

Enclosures: Exhibits 1 and 2
Attachment A

EXHIBIT 1

1. Page 1-8. Sec. 1.4.2, Table 1.2 - 2007 Corps O&M Project was not 100% Federally funded, as stated. The State of North Carolina paid $3.9M and the Village paid $1.3M to the Corps $9.4M. It was agreed the Village would be refunded any amount left over and the Village ultimately paid approximately $900,000.00.

2. Page 1-10. Sec. 1.4.3, paragraph 1, 3rd sentence - Passage of Hurricane Irene occurred in late summer of 2011 in which the ends of five (5) groins were damaged. Groins #16, #1, #2, #3, and #4 were replaced as part of the FEMA project in conjunction with the Corps O&M project that was completed in 2013.

3. Page 1-19, Section 1.6.15. It is incorrect that the project requires an easement from the North Carolina State Property Office. No easement is required for this project as the Village is a political subdivision of the State and exempt from this requirement. N.C.G.S. § 146-12(n)(3).

4. Page 3-13. Sec. 3.2.5.2 - Terminal Groin Design Goals Item #3 - revise the word "endangered" to "threatened".

5. Page 4-23. Sec. 4.3.2 (A), 2nd paragraph, 3rd sentence - revise to indicate (damaged by Hurricane Irene in 2011).

6. Page 4-34. Sec. 4.7, Public Safety - Recommend revising "Emergency Management Staff" to "Public Safety" staff in all references contained within document.

7. Page 4-35. Sec. 4.9, 2nd paragraph, 2nd sentence - Revise to state there are approximately 27 "public beach accesses".

8. Page 4-38, Sec. 4.12, 2nd paragraph, 1st sentence - Recommend specifying the type of tax revenue and where it is going.

9. Page 4-39, Sec. 4.12, 1st paragraph, last sentence - Recommend specifying the type of tax revenue referenced in the personal communication of Robert Norton.

10. Page 4-39, Sec. 4.13, 1st paragraph, last sentence - Revise to indicate the Village of Bald Head Island incorporated as a municipality in 1985.

11. Page 4-40, Sec. 4.13, 1st paragraph, 1st sentence - Revise to indicate that the Village does NOT fall under the auspices of the Brunswick County Land Use Plan as the Village developed its own CAMA Land Use Plan certified by the CRC on May 22, 2008. Prior to that the Village did fall under the BC CAMA Land Use Plan with a limited number of policies specific to BHI.

12. 2nd paragraph, 2nd sentence - reference is made to Brunswick County Land Use Plan... would recommend that the Village's CAMA LUP be the reference for all land use classifications/descriptions etc.

13. Page 4-57, Sec. .4.17, 1st paragraph, 2nd sentence - Include the collection system permit number WQC500276.

14. Page 4-57, Sec. 4.17, 3rd paragraph - recommend revising to indicate the Village Public Works provides routine collection of yard debris and can take receipt of recyclable materials as its facility to be transported off island to the Brunswick County facility. In terms of household waste, the Village has a contract through Brunswick County for Waste Industries to provide household waste collection services.

15. Page 4-57, Sec. 4.18, 1st sentence - recommend revising to remove "the shallow" and "water table" as the aquifer is generally located approximately sixty (60') feet below.

16. Recommend revising the 3rd sentence to remove "recently" and that the water main is coming from Caswell Beach to BHI.

17. Recommend revising the 4th sentence to indicate the line is operated by the Village of Bald Head Island.

18. Recommend revising the 6th sentence to indicate a peak water usage average of 340,000 gallons per day.

19. Recommend revising the 2nd paragraph, 2nd sentence to indicate that the water supply wells are situated at an average depth of sixty (60') feet below the ground surface and remove "shallow".

20. Recommend revising the 2nd paragraph, 3rd sentence to remove "can".

21. Recommend revising the 2nd paragraph, 4th sentence to include three (3) reverse osmosis "units".

22. Page 4-57, Sec. 4.18, 1st paragraph, 3rd sentence - recommend revising to indicate the ten (10") inch water main was constructed in 2002???, not recently.

23. Page 5-66, Sec. 5.5, 1st paragraph, 2nd sentence - include the word "in" between the words incorporated and to.

24. Page 5-160, Sec. 5.14.2, 1st paragraph, 7th sentence - recommend revising to specify what type of tax revenue is the BHI Club the largest source of and for whom i.e. Brunswick County.

25. Page 5-176, Sec. 5.15 - refer to comments made regarding Sec. 4.13 above.

EXHIBIT 2

[Charles Baldwin's handwritten comments to the DEIS]

February 16, 2014

Mr. Ronnie Smith
Corp of Engineers, Wilmington District
Wilmington Regulatory Field Office
69 Darlington Ave
Wilmington, NC 28403-1343

Re: Draft Environmental Impact Statement for the Village of Bald Head Island Shoreline Protection Project (SAW-2012-00040).

Dear Mr. Smith,

My name is Pati Blackwell and I have vacationed for the past 26 years and for the foreseeable future at the beaches of Brunswick County located southwest of this proposed project. I am voicing concern about the scope of Draft Environmental Impact Statement (DEIS) for the Village of Bald Head Island Shoreline Protection Project. I feel that the DEIS for this project has not undergone full examination and that additional review of the existing studies and comments relating to the DEIS are necessary to help insure that adjacent islands and beaches are not negatively impacted by the project.

In light of recent legislation by the North Carolina General Assembly that changes long held policy regarding the use of terminal groins for erosion control, both cumulative and indirect impacts to the ecosystem of nearby islands is imminent. Some of the alternatives contained in the DEIS for the Bald Head Island project and potential future projects at newly approved inlets at Holden Beach, Ocean Isle Beach and Figure Eight Island are likely to create a domino effect of down-drift erosion issues for adjacent beaches. Terminal groins, coupled with intensive long-term beach nourishments has had some success in anchoring ends of barrier islands but the success of a groin and its associated maintenance has been shown to be site specific. The fact that portions of Bald Head Island continue to erode rapidly despite nearly 20 years of groin placement and beach nourishment projects designed to slow this erosion leaves much doubt to the economic and ecological prudence of several of the DEIS alternatives.

Many prominent coastal scientists have questioned the science behind using structures to retard erosion. To quote an open letter from 43 of the country's top coastal scientists,"…..structures placed at the terminus of a barrier island near an inlet, will interrupt the natural sand bypass system, deprive the ebb and flood tide deltas of sand and cause negative impacts to adjacent islands." And, "permitting the construction of terminal groins will harm the coast and place down-drift property at risk." I urge you to reconsider allowing this project to advance without additional review and amendment to the DEIS with the following considerations: 1) What are the potential cumulative impacts to the adjacent islands from Bald Head Island heading southwest to the last island in the chain, Sunset Beach? 2) What mitigation plan will be put in place to protect both the ecosystem and the property owners of the down-drift islands and beaches from these cumulative impacts? 3) Please provide additional study with an eye toward revision to the DEIS regarding potential indirect ecological and economic impacts on these down-drift beaches resulting from some of the DEIS alternatives for the Bald Head Island project.

Given, the proximity of these areas to the Bald Head Island project any failure to address and consider these points would be reckless and outside of the spirit of the DEIS. Attempting to rectify a beach erosion problem using strategies that are likely to result in negative environmental impacts to the entire Brunswick County shoreline does not reflect sound public policy. The interests of the Village of Bald

Head Island reflected in this DEIS appear to be prioritized ahead of the property owners and citizens of Brunswick County as a whole, not to mention the rest of the citizens of North Carolina and tourists who enjoy all of the beaches, not just Bald Head Island. I ask you to insert new and additional alternatives into the language of the current DEIS that will address my concerns on the impact on these down-drift beach locations.

Respectfully submitted,

Patricia R. Blackwell
42483 Cortez Terrace
Ashburn, VA 20148

Reference: Corps Action ID # SAW-2012-00040

VBHI Shoreline Protection Project

My name is James E. Harrington. I am a long-time (30+ years) resident at 21 Cape Fear Trail, Bald Head Island. My residence is located mid-way along Cape Fear Trail, and offers an observation point for activities along the western shore of Bald Head Island, the shipping channel, and the sand deposition/erosion history along this shore to and including the southwest corner ("point") of the island. I submit that my experience with coastal management and on-site observations are pertinent. My preference is Alternative #5, subject to the following comments.

The littoral sand drift along the south shore of Bald Head Island is predominantly east to west, with a majority of the sand drifting into the shipping channel, and a significant minority drifting around the "point" and then south to north along the west shore. This natural flow resulted in a buildup of the "point" westward toward the original shipping channel and significant accretion along the western shore. In my time observing this, the western shore has accreted and grown westward an estimated 700 +/- feet. Three new dune lines have been added to the west of the primary dune as it existed at the time of my initial occupancy.

During the relocation of the shipping channel, the then existing "point" was eliminated, as were protective dunes adjacent to and overlooking the "point". Dredging for this relocation was undertaken at what was at the time high ground. The natural sand drift was interrupted, with the effect that the normal accretion at the "point" no longer occurred, with the sand flow increased into the shipping channel and the south to north sand flow reduced. This probably resulted in the need for more frequent dredging of the shipping channel. Extension of the sandbag groin field at and north of the "point" further interrupted the natural littoral drift, and contributed to increased erosion along the west shoreline.

The proposed terminal groin is likely to result in restraining the littoral east-west drift of sand along the south shore, and reduce the shoaling in the shipping channel. I have concern that interruption of that portion of the littoral drift that normally would flow south to north from the 'point" will result in increased erosion along the western shore. I understand that the proposed groin is intended to be "semi-permeable", but I see no calculation as to whether the amount of sand movement that would be allowed to flow to the north of the "point" would be sufficient to mitigate erosion along the west shore. The proposed post-construction beach fill is shown as entirely along the south beach.

Attention to maintaining an adequate by-pass sand flow to and along the west beach, and additional beach fill in this area is necessary.

The notice indicates that the purpose of the project is to address erosion along the south beach, and relates this purpose to protection of elements in that area. I submit that a major beneficiary of the project will be reduced frequency of channel maintenance dredging, and that protection of properties and infrastructure on the western side of the island is also important and should be addressed in the project design.

Without current access to the DEIS I’m not able to comment on its content, but I hope to have an opportunity to review it and comment further.

Louis S. Wetmore
4152 1st Street Place NW
P.O. Box 2262
Hickory, NC 28601

RECEIVED
MAR 14 2014
REG. WILM. FLD. OFC.

February 24, 2014

US Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403

ATTENTION: Mr. Ronnie Smith

IN RE: Corps Action ID: SAW-2012-00040

Dear Mr. Smith:

My address on Bald Head Island is 230 South Bald Head Wynd. I have owned this home since 1999 and have seen on numerous occasions the severe erosion occurring on the South and West beaches.

I have also reviewed the DEIS and believe it to be an accurate assessment if the environmental issues concerning this project. I further believe that any negative impact of this project will be significantly offset by the positive benefits of the proposed project.

While I am not an expert in these matters, it seems entirely reasonable to me that protecting the Channel for continued unfettered shipping will benefit the people and the economy of our entire state. If this project, then, also assists in slowing the erosion on the areas around the channel the potential long term benefit is widespread.

It also seems to me that increasing the depth of the beach would benefit our Loggerhead Turtle nesting sites and would offer greater areas for all forms of wildlife including fish, crabs, oysters, all manner of birds and certainly the residents of and visitors to Bald Head Island.

Sincerely,

Louis S. Wetmore

March 4, 2014

Comments for the Public Record on

The Village of Bald Head Island Shoreline Protection Project DRAFT Environmental Impact Statement, January 2014

I am here to speak for public users of the beach — the beachcombers, beachwalkers, kayakers, surf fishermen — all the recreational beach users.

I am a Coastwalker.

My wife and I have walked the entire North Carolina coast, every foot of every barrier island beach accessible to the public, a hike of some 425 miles. I don't think many people know about this resource, that state laws of public trust grant us all unrestricted beach access. People are unaware that they can walk our beaches, from the SC border to the VA border. The public is unaware of Coastwalk North Carolina: a flatter, shorter, kinder Appalachian Trail — for beachcombers.

If they were aware, the public would be angry. Because, from walking the beaches of NC, we came to an inescapable conclusion: Hard structures on the beach impair the use of public trust beach. As such, placement of any hard structure on the shoreline should be avoided if at all possible — unless the structures are absolutely, positively necessary.

We have walked the 13-mile circuit of Bald Head Island/Ft. Fisher beaches many times. Overall, it's one of the best walks on the NC coast. Unfortunately, a groin field of enormous sand tubes makes walking on one section of BHI beaches one of the most *unpleasant* shorelines to walk in North Carolina. The mile of south beach marred by giant sand tubes is a painful pimple on the face of an otherwise beautiful set of island beaches.

I'm asking that the importance of the recreational use of public trust beach be considered before proceeding with this terminal groin proposal. The DRAFT EIS does NOT address this issue — it does not adequately consider the impact of the groin on the recreational use of public trust beach, *especially* with the option of leaving the infernal sand tubes in place. In fact, the brief opinion that is given in the EIS on the impact of this project on public beach recreation, especially comparing options #5 and #6, is absolutely incorrect.

The issue of public trust beach — how the recreational beach of Bald Head Island would be protected, and not adversely affected — should be properly addressed *before* this project proceeds.

Peter K. Meyer
Wilmington, NC

Further written points:

The Village of Bald Head Island Shoreline Protection Project DRAFT Environmental Impact Statement, January 2014, states:

> *The purpose of the Village of Bald Head Island Shoreline Protection Project is to address ongoing and chronic erosion at the western end of South Beach and to thereby protect public infrastructure, roads, homes, businesses and rental properties, golf course, beaches, recreational assets, and protective dunes.*

Clearly, the groin is intended to protect private property, not public property. To do so at the expense of damage to public beaches is unacceptable. The beaches and dunes will take care of themselves if no groin is constructed.

The Village of Bald Head Island Shoreline Protection Project DRAFT Environmental Impact Statement, January 2014, states:

Since completion of the deepening project in 2002, the Corps dredged the channel with beach disposal in 2004/2005, 2007, 2009 and 2013.

Clearly, this project is dependent of ongoing public funding of beach renourishment. Since the result is to protect private structures on Bald Head Island, this project is an unacceptable use of public funds to protect private property.

The Village of Bald Head Island Shoreline Protection Project DRAFT Environmental Impact Statement, January 2014, states:

The sand tube groinfield was authorized by CAMA Major Permit No. 9-95 (USACE Action ID No. SAW-1994-04687). Note that the CAMA Major Permit was issued by way of a variance in 1995 and is compliant with North Carolina G.S. 113A-115.1(c).

The sand tube groinfield should never have been authorized. Clearly, it was and is *illegal* under the rules established by CAMA: The rules permit an exception to the ban on construction of hardened structures only if a bridge or waterway vital to the pubic interest, or a historic site of national significance, is threatened.

CAMA should not have succumbed to political pressure and allowed sand tubes, thus opening the door to short-term shoreline protection, which resulted in more extensive and expensive building, more private homes and businesses, which are now said to need protection by a bigger and more expensive hardened structure.

The Village of Bald Head Island Shoreline Protection Project DRAFT Environmental Impact Statement, January 2014, states:

The Island is accessible by boat only with daily ferry service providing access from Southport, NC.

Bald Head Island is accessible by way of public trust beach access, walking or bicycling, from Fort Fisher and Pleasure Island beaches to the north.

The Village of Bald Head Island Shoreline Protection Project DRAFT Environmental Impact Statement, January 2014, states:

In the event of unanticipated negative impacts to the coastal and marine environment, removal of the groin structure may be necessary. Initial estimates for the physical costs associated with groin removal are $3.1 million (Erik J. Olsen, P.E., personal communication).

A formal, written estimate of the full cost of removal of the groin structure should be provided for consideration in the DRAFT EIS.

The Village of Bald Head Island Shoreline Protection Project DRAFT Environmental Impact Statement, January 2014, states:

Additional costs will include reduced recreation, diminished aesthetic appeal and habitat disturbance during the removal process. It should be noted that 100 percent removal of the proposed rock structure may not be feasible or desirable given the nature of the marine environment and substrate.

A formal, written estimate of the full cost of removal of the entire groin structure should be provided for consideration in the DRAFT EIS.

The Village of Bald Head Island Shoreline Protection Project DRAFT Environmental Impact Statement, January 2014, states:

As noted in Parsons and Powell (2001), active mitigation efforts such as beach armoring may also serve to encourage additional use and/or development. Such additional development can reasonably be anticipated in the case of the Bald Head Island Club, in the form of a planned $6 million expansion which is unlikely to transpire absent a hardened structure solution to the chronic erosion that characterizes South Beach. and

Further, given the location of the Club relative to the existing footprint of the groinfield, it is not known whether the proposed future expansion will take place under Alternative No. 6.

These statements are ironic. Because of poorly-planned development — that is the building of structures in an inlet hazard area — the whole issue of building hardened structures on the beach has reared its ugly head. So, by placing a large groin, the construction of *more* expensive structures/expansion of present structures will be encouraged, making the defense of these structures even more "necessary" and "cost-effective."

The anticipated development from the placement of the large, rocky groin and leaving the groinfield sand tubes in place is a reason *not* to proceed with these projects. Do we not learn from our folly?

The Village of Bald Head Island Shoreline Protection Project DRAFT Environmental Impact Statement, January 2014, states:

(6) Terminal Groin with Beach Nourishment/ Removal of Sand Tube Groinfield
(Alternative #6)
a. Direct, Indirect and Cumulative Impacts: Under Alternative #6, impacts to land-based and water-dependent recreation would be comparable to those discussed under Alternative #5. 5-136

This statement is absolutely incorrect: Land-based and water-based recreation would improve significantly with Alternative #6, due to the removal of the sand tubes. The sand tubes are a hardship and potential menace to people walking the beach, beachcombing, surf fishing, kayaking from the beach, etc.

If ever a decision is made to allow this giant groin, let it stand on it's own merits. At least remove the sand tubes and heal the festering pimple on the face of beautiful Bald Head Island beaches.

Christian Preziosi

From: tolberthill@att.net
Sent: Thursday, March 06, 2014 11:45 AM
To: Smith, Ronnie D SAW
Subject: [EXTERNAL] Bald Head Island Terminal Groin DEIS

Sent from Windows Mail

Mr. Smith:

I would like to comment on the Bald Head Island Terminal Groin DEIS. In my mind, the only acceptable choice on this project is Alternative #1, the No Action Alternative. This, and all hardened beach structures, do not work in the long term, per Dr. Orrin Pilkey. They are a waste of money. North Carolina should re-enact a total ban on all hardened beach structure projects along the entire length of our coast.

Thank you for listening.

David Hill
Graham, NC

Public Notice- Bald Head Island Project

Over the past 18 years, South Beach has experienced a tremendous amount of beach erosion and all areas are being impacted due to the persistent sand loss. Out of the six (6) proposed project alternatives, I personally feel that the best option would be Alternative #5. This specifies that a “Terminal Groin with Beach Nourishment/Beach Disposal (Sand Tube Groinfield)” will be utilized. The defined purpose of the project is to address erosion at the western end of South Beach and to protect the stated resources affected. One of the major issues and problems that are causing the erosion is due to the deep level channel that was cut in by the Army Corps of Engineers. With the implementation of “Alternative #5” the loss of sand will slow down progressively and the public infrastructure, roads, homes, beaches, dunes and wildlife habitat will be better off than they currently are. What really drew my attention to this particular method is the two separate phases in which they will be implemented. Phase II of the groin construction would be based upon two to four years of performance monitoring which is necessary for the overall effectiveness of the project.

Joshua Diaz

Christian Preziosi

From: wwyc@sbcglobal.net
Sent: Monday, March 10, 2014 11:33 PM
To: Smith, Ronnie D SAW
Subject: [EXTERNAL] The Terminal Groin at Bald Head Island, NC

Hello Mr. Smith,

I wanted to express my opinion about the proposed Terminal Groin that is being considered for Bald Head Island. I do own a home on the Island which gives me a direct interest in seeing that the Groin is constructed. What makes Bald Head Island unique is that as the name implies, we are an Island. We have no neighboring towns and no neighboring beaches. Unlike other communities who are threatened with gaining sand on their beaches at the cost of their neighbors beach, we have no such problem. Our only neighbor is the navigation channel that abuts the Island and who,whether right or wrong has been blamed for the brunt of our erosion. If our Island is willing to foot the bill for what could be a very successful project if it works, the only harm if it does not will be to the residence of the Island. If this project does not materialize, we and other vacationers who enjoy our beaches may not have any beaches left to enjoy not to rule out what the loss of beach has and will have on our wildlife.
Please help us save our beaches by voting in favor of this project. Thank You, Richard Walsh

Sent from Yahoo Mail on Android

Christian Preziosi

From: Mirtha Escobar <mescobar@vt.edu>
Sent: Sunday, February 23, 2014 6:46 PM
To: Smith, Ronnie D SAW
Subject: [EXTERNAL] Comments for the Village of Bald Head Island Shoreline Protection Project

Thanks for the opportunity to comment on the EIA for this Project. I would like to submit for your consideration the following:

- The objective of the project is listed as to address recently accelerating erosion at the western end of South Beach with the intent to protect wildlife habitat, public infrastructure, roads, homes, beaches and protective dunes. The assessment focuses on mainly on the impacts, whether direct or indirect, but does not describes how this measures protect wildlife habitat, public infrastructure, roads, homes, beaches and protective dunes.

- The analysis on expected benefits it is also relevant when analyzing each one of the alternatives. I understand that the current practice is beach nourishment with sand tube groin field and that the preferred alternative would be a terminal groin with beach nourishment and the sand tube groin field. In order to make an informed decision it would be important to include cost associated to each one of the alternatives. As the information is presented in the EIA is difficult to weight benefits against costs and impacts.

- The assessment includes information in relation to at-risk properties in every alternative analyze. What are the measures that will be put in place to minimize the impact or to provide compensation, mitigation for the affected properties?

- It would be important to include a list of construction practices that would minimize in-water construction impacts.

- What are the public interest factors that were taking into consideration to come up with each one of the alternatives?

- Are there any benefits associated to the constructions of groins in relation to the effects of climate change, particularly in relation to accelerated sea-level rise?

- Would the final assessment include information on measures to protect property, such as adding freeboards, allowing for shoreline migration, etc.?

- Although, the protection of protective dunes is included as one of the main objectives of the project, the document does not elaborate further on how this would be achieved.

- Please elaborate on the tradeoffs between alternatives 3 and 5 in terms of cumulative sedimentation and erosion.

I hope this comments are helpful during the finalization of the EIA for this Project.

Best,

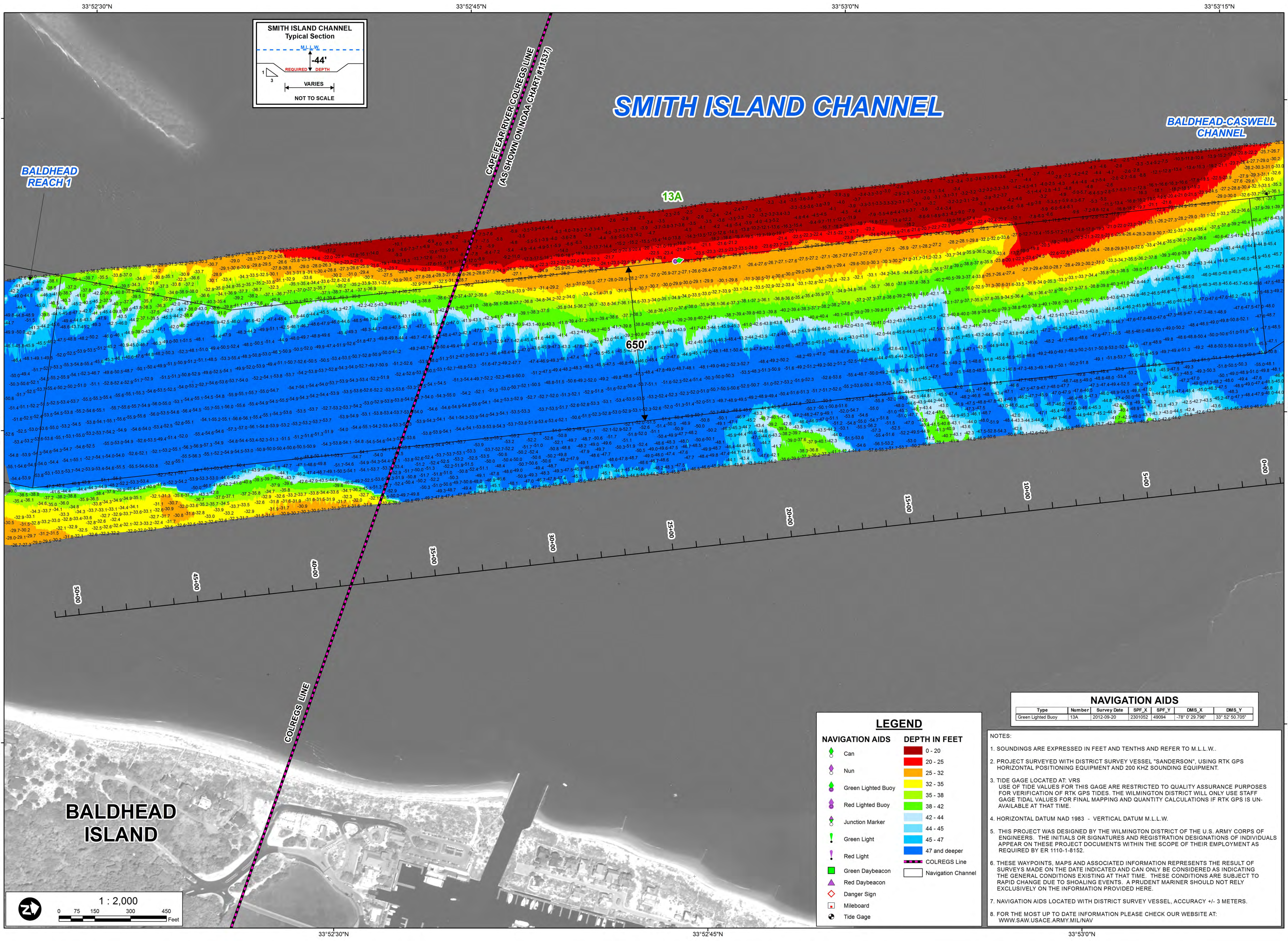
Mirtha Escobar

mescobar@vt.edu

571-839-8798

APPENDIX E

USACE HYDROGRAPHIC SURVEYS



LEGEND

NAVIGATION AIDS

- Can
- Nun
- Green Lighted Buoy
- Red Lighted Buoy
- Junction Marker
- Green Light
- Red Light
- Green Daybeacon
- Red Daybeacon
- Danger Sign
- Mileboard
- Tide Gage

DEPTH IN FEET

- 0 - 20
- 20 - 25
- 25 - 32
- 32 - 35
- 35 - 38
- 38 - 42
- 42 - 44
- 44 - 45
- 45 - 47
- 47 and deeper
- COLREGS Line
- Navigation Channel

NAVIGATION AIDS

Type	Number	Survey Date	SPF_X	SPF_Y	DMS_X	DMS_Y
Green Lighted Buoy	13A	2012-09-20	2301052	49094	-78° 0' 29.796"	33° 52' 50.705"

NOTES:

1. SOUNDINGS ARE EXPRESSED IN FEET AND TENTHS AND REFER TO M.L.L.W..

2. PROJECT SURVEYED WITH DISTRICT SURVEY VESSEL "SANDERSON", USING RTK GPS HORIZONTAL POSITIONING EQUIPMENT AND 200 KHZ SOUNDING EQUIPMENT.

3. TIDE GAGE LOCATED AT: VRS
USE OF TIDE VALUES FOR THIS GAGE ARE RESTRICTED TO QUALITY ASSURANCE PURPOSES FOR VERIFICATION OF RTK GPS TIDES. THE WILMINGTON DISTRICT WILL ONLY USE STAFF GAGE TIDAL VALUES FOR FINAL MAPPING AND QUANTITY CALCULATIONS IF RTK GPS IS UNAVAILABLE AT THAT TIME.

4. HORIZONTAL DATUM NAD 1983 - VERTICAL DATUM M.L.L.W.

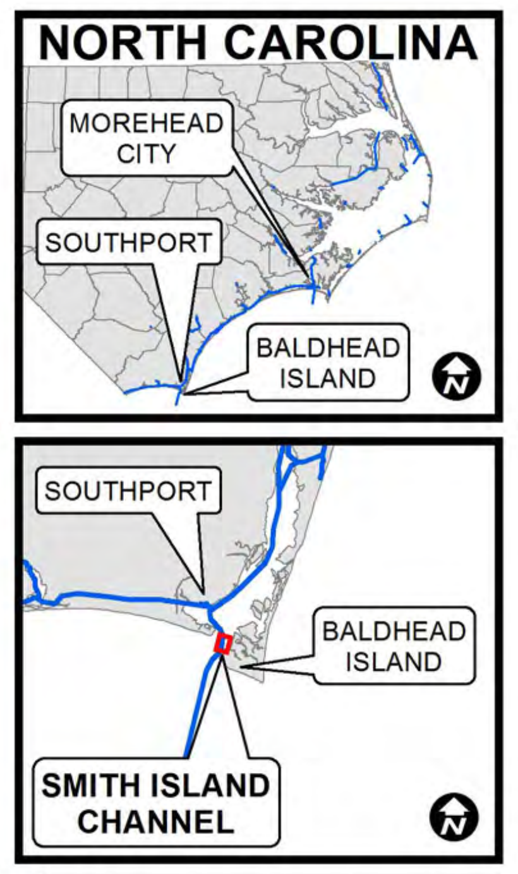
5. THIS PROJECT WAS DESIGNED BY THE WILMINGTON DISTRICT OF THE U.S. ARMY CORPS OF ENGINEERS. THE INITIALS OR SIGNATURES AND REGISTRATION DESIGNATIONS OF INDIVIDUALS APPEAR ON THESE PROJECT DOCUMENTS WITHIN THE SCOPE OF THEIR EMPLOYMENT AS REQUIRED BY ER 1110-1-8152.

6. THESE WAYPOINTS, MAPS AND ASSOCIATED INFORMATION REPRESENTS THE RESULT OF SURVEYS MADE ON THE DATE INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME. THESE CONDITIONS ARE SUBJECT TO RAPID CHANGE DUE TO SHOALING EVENTS. A PRUDENT MARINER SHOULD NOT RELY EXCLUSIVELY ON THE INFORMATION PROVIDED HERE.

7. NAVIGATION AIDS LOCATED WITH DISTRICT SURVEY VESSEL, ACCURACY +/- 3 METERS.

8. FOR THE MOST UP TO DATE INFORMATION PLEASE CHECK OUR WEBSITE AT: WWW.SAW.USACE.ARMY.MIL/NAV

US Army Corps of Engineers
Wilmington District



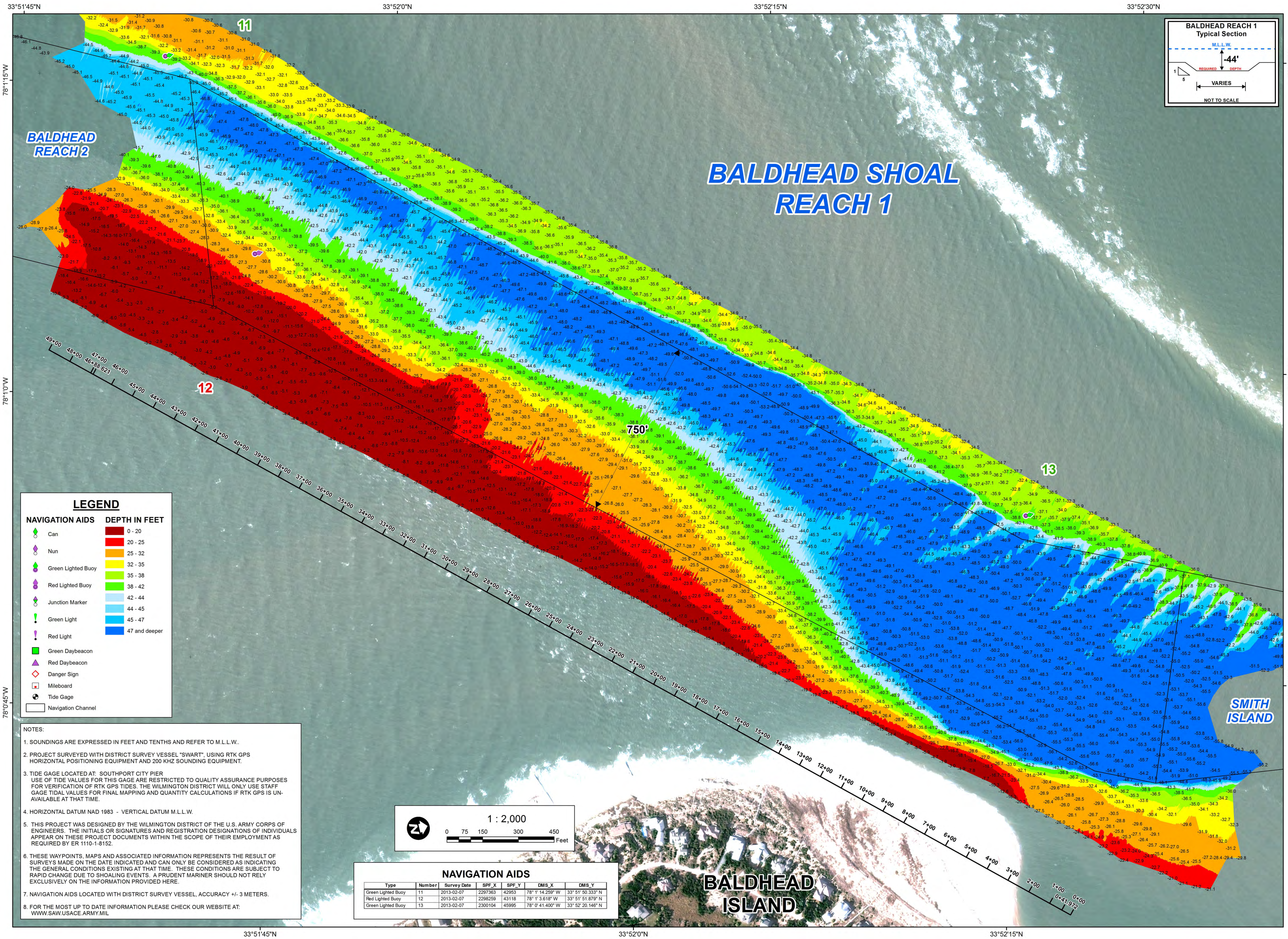
SURVEY DATE: SEPTEMBER 20, 2012
SURVEYED BY: MAS
MAP DATE: SEPTEMBER 24, 2012
MAPPED BY: MSA
MAP SCALE: 1 : 2,000
MAP FILE # WH 105-12-90
IMAGERY DATE: MAY 8, 2012 © 2012 DIGITALGLOBE INC.
MAP FILE NAME: WILHBR-SMITH-ISLAND_2012-09-20_CS.MXD

CONDITION SURVEY

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
WILMINGTON, NORTH CAROLINA

WILMINGTON HARBOR
SMITH ISLAND CHANNEL

WILMINGTON, NORTH CAROLINA



LEGEND

NAVIGATION AIDS	
▲	Can
◆	Nun
▲	Green Lighted Buoy
◆	Red Lighted Buoy
◆	Junction Marker
!	Green Light
!	Red Light
🟩	Green Daybeacon
▲	Red Daybeacon
◇	Danger Sign
▪	Mileboard
◐	Tide Gage
☐	Navigation Channel

DEPTH IN FEET	
🟥	0 - 20
🟥	20 - 25
🟧	25 - 32
🟨	32 - 35
🟩	35 - 38
🟩	38 - 42
🟦	42 - 44
🟦	44 - 45
🟦	45 - 47
🟦	47 and deeper

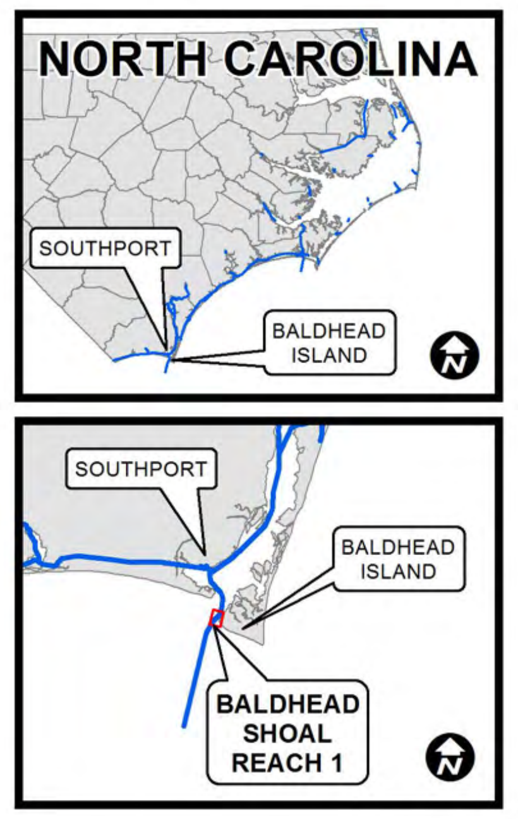
NOTES:

1. SOUNDINGS ARE EXPRESSED IN FEET AND TENTHS AND REFER TO M.L.L.W..
2. PROJECT SURVEYED WITH DISTRICT SURVEY VESSEL "SWART", USING RTK GPS HORIZONTAL POSITIONING EQUIPMENT AND 200 KHZ SOUNDING EQUIPMENT.
3. TIDE GAGE LOCATED AT: SOUTHPORT CITY PIER
   USE OF TIDE VALUES FOR THIS GAGE ARE RESTRICTED TO QUALITY ASSURANCE PURPOSES FOR VERIFICATION OF RTK GPS TIDES. THE WILMINGTON DISTRICT WILL ONLY USE STAFF GAGE TIDAL VALUES FOR FINAL MAPPING AND QUANTITY CALCULATIONS IF RTK GPS IS UNAVAILABLE AT THAT TIME.
4. HORIZONTAL DATUM NAD 1983 - VERTICAL DATUM M.L.L.W.
5. THIS PROJECT WAS DESIGNED BY THE WILMINGTON DISTRICT OF THE U.S. ARMY CORPS OF ENGINEERS. THE INITIALS OR SIGNATURES AND REGISTRATION DESIGNATIONS OF INDIVIDUALS APPEAR ON THESE PROJECT DOCUMENTS WITHIN THE SCOPE OF THEIR EMPLOYMENT AS REQUIRED BY ER 1110-1-8152.
6. THESE WAYPOINTS, MAPS AND ASSOCIATED INFORMATION REPRESENTS THE RESULT OF SURVEYS MADE ON THE DATE INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME. THESE CONDITIONS ARE SUBJECT TO RAPID CHANGE DUE TO SHOALING EVENTS. A PRUDENT MARINER SHOULD NOT RELY EXCLUSIVELY ON THE INFORMATION PROVIDED HERE.
7. NAVIGATION AIDS LOCATED WITH DISTRICT SURVEY VESSEL, ACCURACY +/- 3 METERS.
8. FOR THE MOST UP TO DATE INFORMATION PLEASE CHECK OUR WEBSITE AT: WWW.SAW.USACE.ARMY.MIL

NAVIGATION AIDS

Type	Number	Survey Date	SPF_X	SPF_Y	DMS_X	DMS_Y
Green Lighted Buoy	11	2013-02-07	2297363	42953	78° 1' 14.259" W	33° 51' 50.333" N
Red Lighted Buoy	12	2013-02-07	2298259	43118	78° 1' 3.618" W	33° 51' 51.879" N
Green Lighted Buoy	13	2013-02-07	2300104	45995	78° 0' 41.400" W	33° 52' 20.146" N

US Army Corps of Engineers
Wilmington District



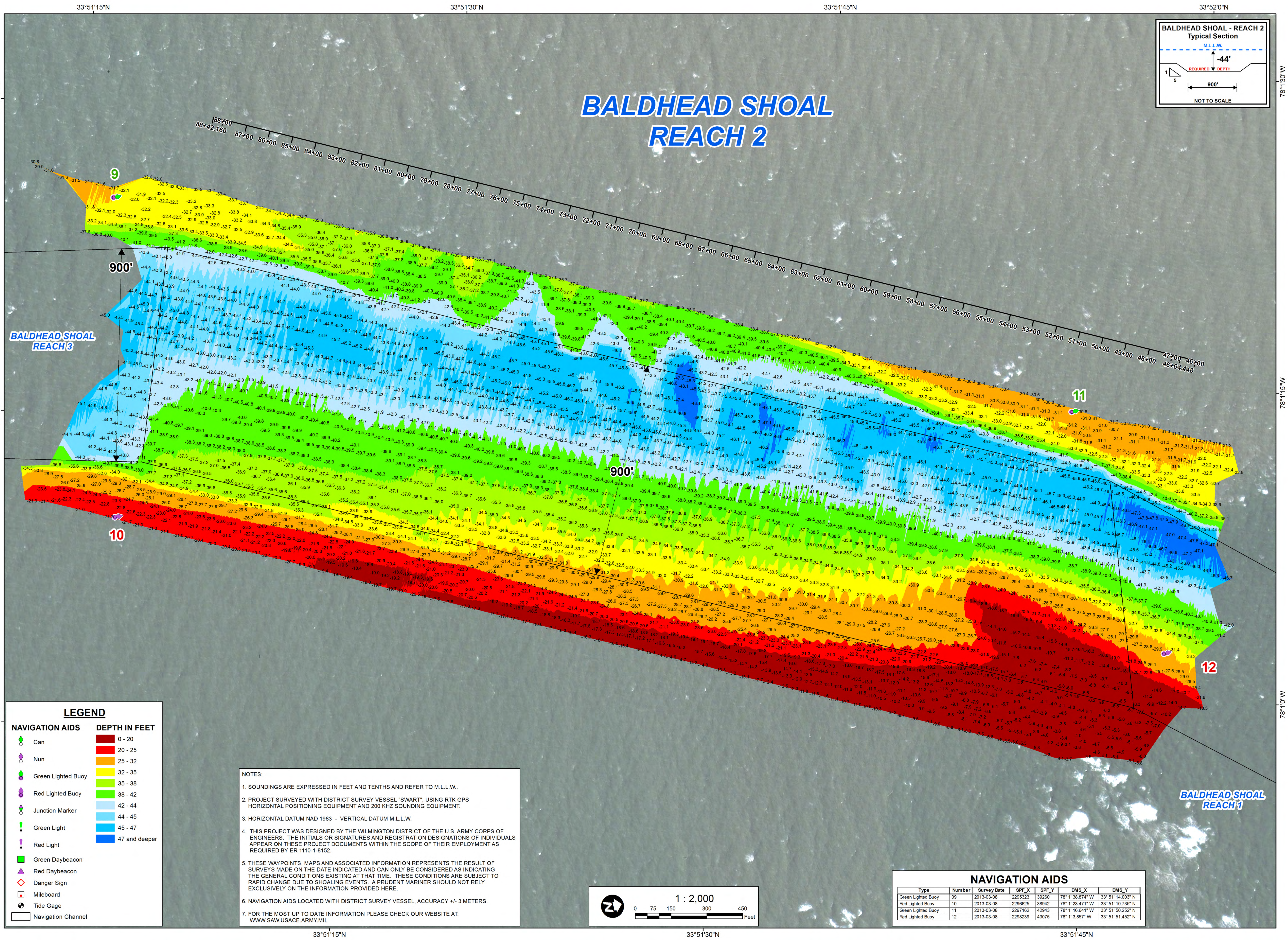
SURVEY DATE: FEBRUARY 6-7, 2013
SURVEYED BY: MAS, WWW
MAP DATE: FRBRUARY 11, 2013
MAPPED BY: MSA
MAP SCALE: 1 : 2,000
IMAGERY DATE: DECEMBER 19, 2012 © 2012 DIGITALGLOBE INC.
MAP FILE NAME: BALDHEADSHOAL1_2013-02-07_CS.MXD

BEFORE DREDGE SURVEY

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
WILMINGTON, NORTH CAROLINA

WILMINGTON HARBOR BALDHEAD SHOAL - REACH 1

WILMINGTON, NORTH CAROLINA



LEGEND

NAVIGATION AIDS

- Can
- Nun
- Green Lighted Buoy
- Red Lighted Buoy
- Junction Marker
- Green Light
- Red Light
- Green Daybeacon
- Red Daybeacon
- Danger Sign
- Mileboard
- Tide Gage
- Navigation Channel

DEPTH IN FEET

- 0 - 20
- 20 - 25
- 25 - 32
- 32 - 35
- 35 - 38
- 38 - 42
- 42 - 44
- 44 - 45
- 45 - 47
- 47 and deeper

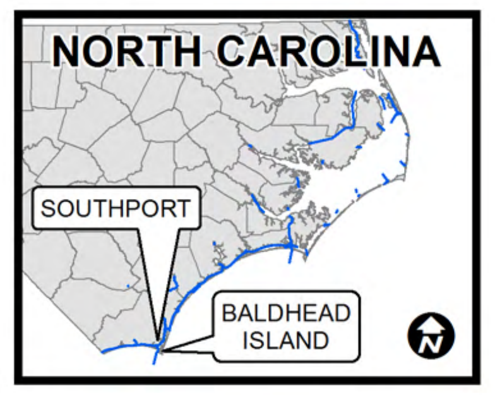
NOTES:

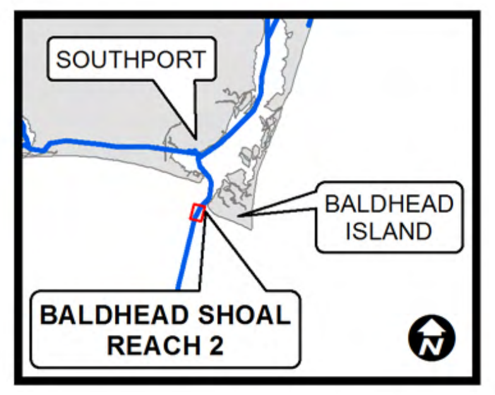
1. SOUNDINGS ARE EXPRESSED IN FEET AND TENTHS AND REFER TO M.L.L.W..
2. PROJECT SURVEYED WITH DISTRICT SURVEY VESSEL "SWART", USING RTK GPS HORIZONTAL POSITIONING EQUIPMENT AND 200 KHZ SOUNDING EQUIPMENT.
3. HORIZONTAL DATUM NAD 1983 - VERTICAL DATUM M.L.L.W.
4. THIS PROJECT WAS DESIGNED BY THE WILMINGTON DISTRICT OF THE U.S. ARMY CORPS OF ENGINEERS. THE INITIALS OR SIGNATURES AND REGISTRATION DESIGNATIONS OF INDIVIDUALS APPEAR ON THESE PROJECT DOCUMENTS WITHIN THE SCOPE OF THEIR EMPLOYMENT AS REQUIRED BY ER 1110-1-8152.
5. THESE WAYPOINTS, MAPS AND ASSOCIATED INFORMATION REPRESENTS THE RESULT OF SURVEYS MADE ON THE DATE INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME. THESE CONDITIONS ARE SUBJECT TO RAPID CHANGE DUE TO SHOALING EVENTS. A PRUDENT MARINER SHOULD NOT RELY EXCLUSIVELY ON THE INFORMATION PROVIDED HERE.
6. NAVIGATION AIDS LOCATED WITH DISTRICT SURVEY VESSEL, ACCURACY +/- 3 METERS.
7. FOR THE MOST UP TO DATE INFORMATION PLEASE CHECK OUR WEBSITE AT: WWW.SAW.USACE.ARMY.MIL

NAVIGATION AIDS

Type	Number	Survey Date	SPF_X	SPF_Y	DMS_X	DMS_Y
Green Lighted Buoy	09	2013-03-08	2295323	39260	78° 1' 38.874" W	33° 51' 14.003" N
Red Lighted Buoy	10	2013-03-08	2296625	38942	78° 1' 23.471" W	33° 51' 10.735" N
Green Lighted Buoy	11	2013-03-08	2297162	42943	78° 1' 16.641" W	33° 51' 50.252" N
Red Lighted Buoy	12	2013-03-08	2298239	43075	78° 1' 3.857" W	33° 51' 51.452" N

US Army Corps of Engineers
Wilmington District





SURVEY DATE(S): MARCH 8, 2013
SURVEYED BY: MAS, WWW
MAP DATE: MARCH 12, 2013
MAPPED BY: MSA
MAP SCALE: 1 : 2,000
IMAGERY DATE: FEBRUARY 28, 2013 © DIGITALGLOBE, INC.
MAP FILE NAME: BALDHEADSHOAL2_2013-03-08_AD.MXD

HYDROGRAPHIC SURVEY

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
WILMINGTON, NORTH CAROLINA

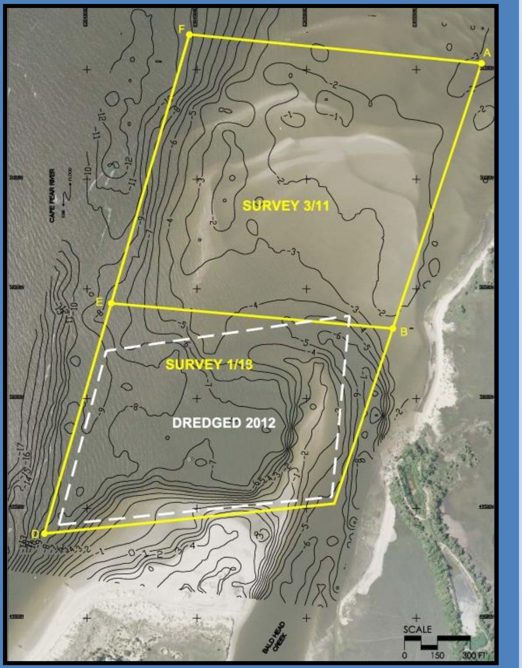
WILMINGTON HARBOR
BALDHEAD SHOAL - REACH 2

WILMINGTON, NORTH CAROLINA

APPENDIX F

BALD HEAD CREEK BORROW SITE EXPANSION AND GEOTECHNICAL ANALYSIS

(OLSEN AND ASSOCIATES, INC. APRIL 2014)

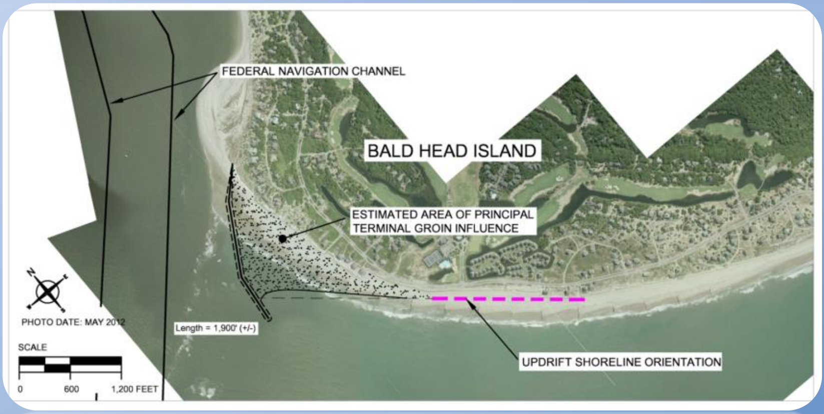


Village of Bald Head Island Terminal Groin Project

Bald Head Creek Borrow Site Expansion Geotechnical Analysis

Bald Head Island, N.C.

Prepared for:
Village of Bald Head Island



Prepared by:
Olsen Associates, Inc.
2618 Herschel Street
Jacksonville, FL 32204
(904) 387-6114
(Fax) 384-7368
olsen-associates.com
COA No. 1468

April 2014

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

BALD HEAD CREEK
BORROW SITE EXPANSION
GEOTECHNICAL ANALYSES

PURPOSE

The Village of Bald Head Island (Village) is permitting the construction of a terminal groin (ref: SAW-2012-00040) to be located at the westernmost portion of South Beach immediately abutting the federal navigation project located within the entrance to the Cape Fear River. The Public Notice for a federal DEIS required by the project was issued by the Wilmington District, USACOE on 10 January 2014. The terminal groin project necessitates the identification and permitting of ancillary sand sources required for initial groin fillet construction and future maintenance, as well as potential mitigation to the downdrift shoreline of West Beach, if necessary.

The Permit Application referenced above includes two (2) identifiable local sand sources: 1.) the unused portion of a borrow site (i.e. about 1 Mcy+) within Jay Bird Shoals as previously developed for a 2009/10 beach restoration project constructed by the Village, and 2.) an "expansion" of a prior borrow site developed (and dredged) located on the ebb shoals of Bald Head Creek. The current terminal groin Permit application likewise identifies the federal navigation channel as a potential sand source although the latter project is maintenance dredged by the Wilmington District, USACOE every two to three years. This geotechnical investigation addresses solely the proposed Bald Head Creek borrow site expansion which necessitated the acquisition of additional field data and subsequent analyses of the soils encountered via Vibracoring.

BACKGROUND

A 21.34 acre ebb shoal borrow site (see **Figure 1**) was previously permitted at the mouth of Bald Head Creek in 2010 (ref. CAMA 139-10; DWQ #040561V3; COE-2009-02334). In

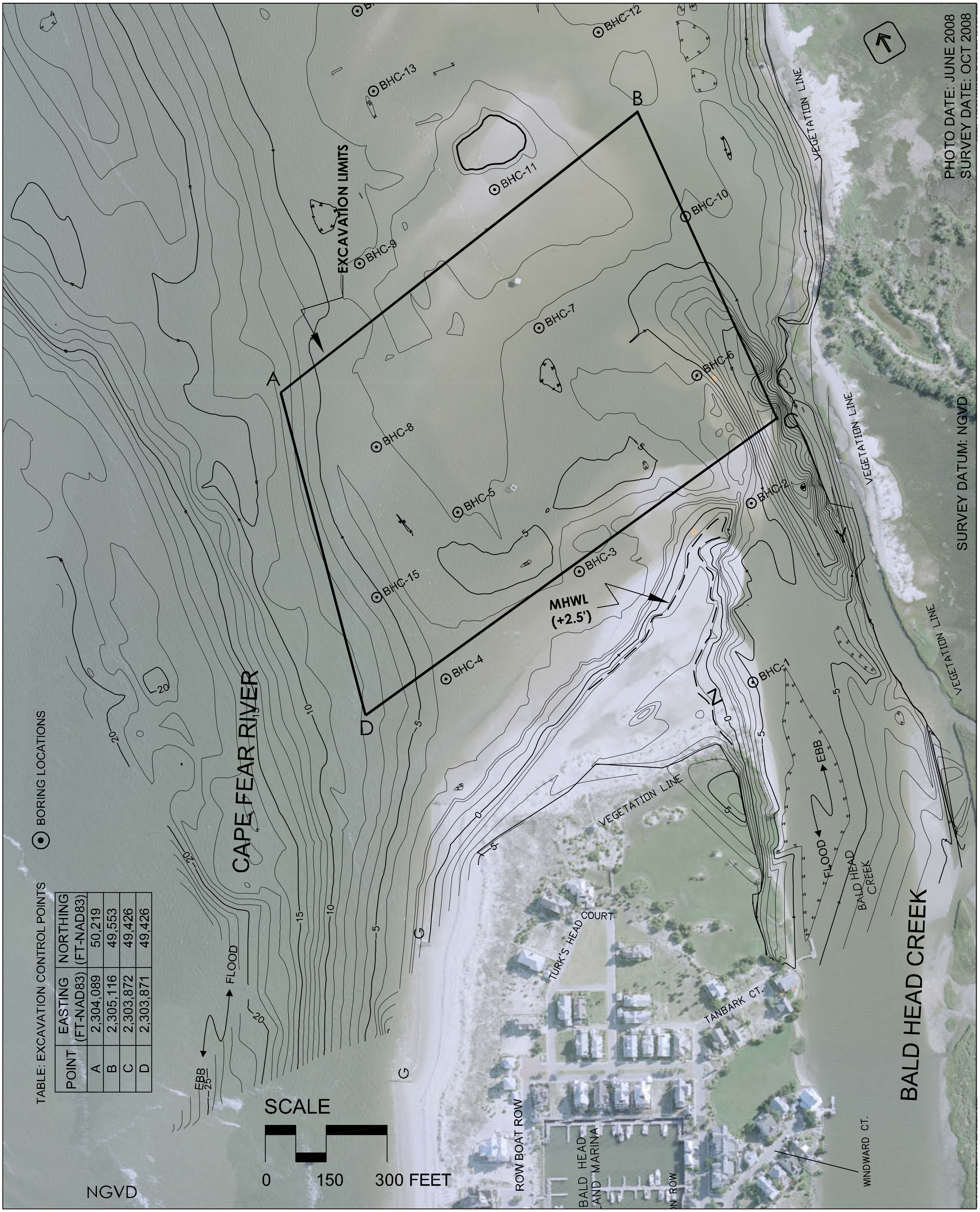


TABLE: EXCAVATION CONTROL POINTS

POINT	EASTING (FT-NAD83)	NORTHING (FT-NAD83)
A	2,304,089	50,219
B	2,305,116	49,553
C	2,303,872	49,426
D	2,303,871	49,426

REF: CAMA 139-10

FIGURE 1 - ORIGINAL BALD HEAD CREEK BORROW SITE (PRE-DREDGE CONDITION)

2006, approximately 47,800 cy had been dredged from the Creek mouth and placed along West Beach as a small scale beach restoration project located between baseline Sta. 16+00 and Sta. 34+00 (CAMA 02-05).

In 2012, following the offshore passage of Hurricane Irene, an *emergency* level beach fill operation partially funded by F.E.M.A. was performed along both West Beach and the westernmost segment of South Beach utilizing the 2010 permitted Bald Head Creek borrow site material. The total amount dredged at that time was 137,990 cy. This essentially depleted the majority of the sand potentially available within the limits of the 21.34 acre ebb shoal borrow site (see **Figure 2**).

A detailed description of the Bald Head Creek ebb tidal shoal environmental setting, the requisite geotechnical investigation by Olsen Associates, Inc. and the project specific Archaeological Report for the 2010 borrow area by Tidewater Atlantic Research, Inc., are all addressed within the original project *Environmental Assessm*ent, (LMG, Inc. 2013 and 2014). Certain design precepts associated with the use of the 2012 Bald Head Creek borrow site – intended to minimize environmental impacts of the permitted activity – included the following:

- A borrow site dredge depth limited to -8ft NGVD (+ 1 ft overdredge). This allowed for post-construction seabed sediment composition to remain unchanged. This factor served to facilitate rapid post-excavation benthic recolonization (LMG, Inc. 2013 and 2014),
- No SAVs were excavated, or located proximate to the proposed work,
- The borrow site configuration was selected in such a way to avoid supratidal and intertidal impacts to avian habitat, and
- Only high quality beach compatible material (with a low fines content) was identified for excavation so as to greatly minimize project related turbidity – at both the borrow and beach fill sites.

Since the 2012 Post-Irene dredging project, both physical and biological monitoring of the permitted original 21.34 acre borrow site has been performed by the Village. The Year-1 and Year 2 Biological Monitoring Reports (LMG, Inc. 2013 and 2014) indicated that at the borrow

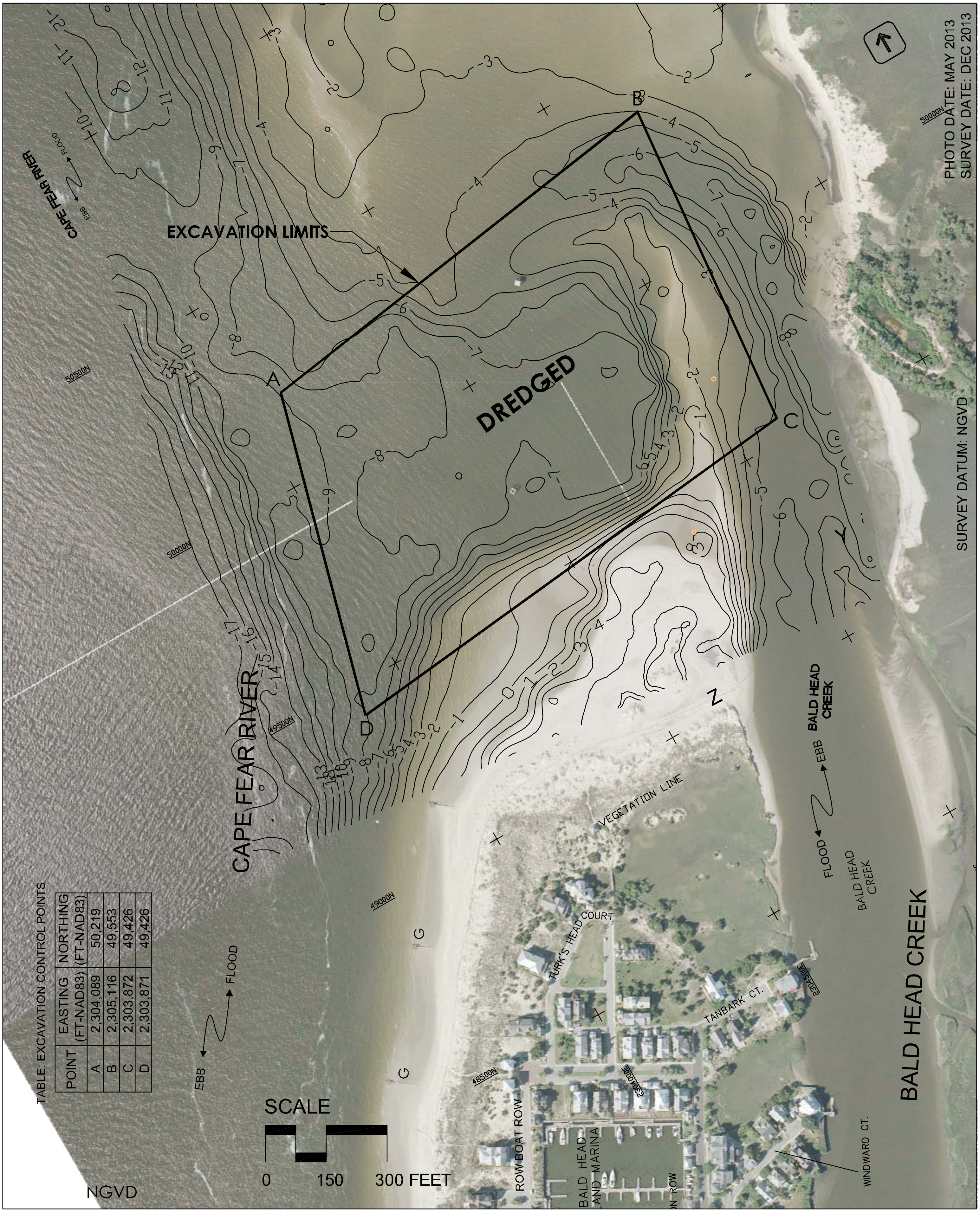


TABLE: EXCAVATION CONTROL POINTS

POINT	EASTING (FT-NAD83)	NORTHING (FT-NAD83)
A	2,304,089	50,219
B	2,305,116	49,553
C	2,303,872	49,426
D	2,303,871	49,426

REF: CAMA 139-10

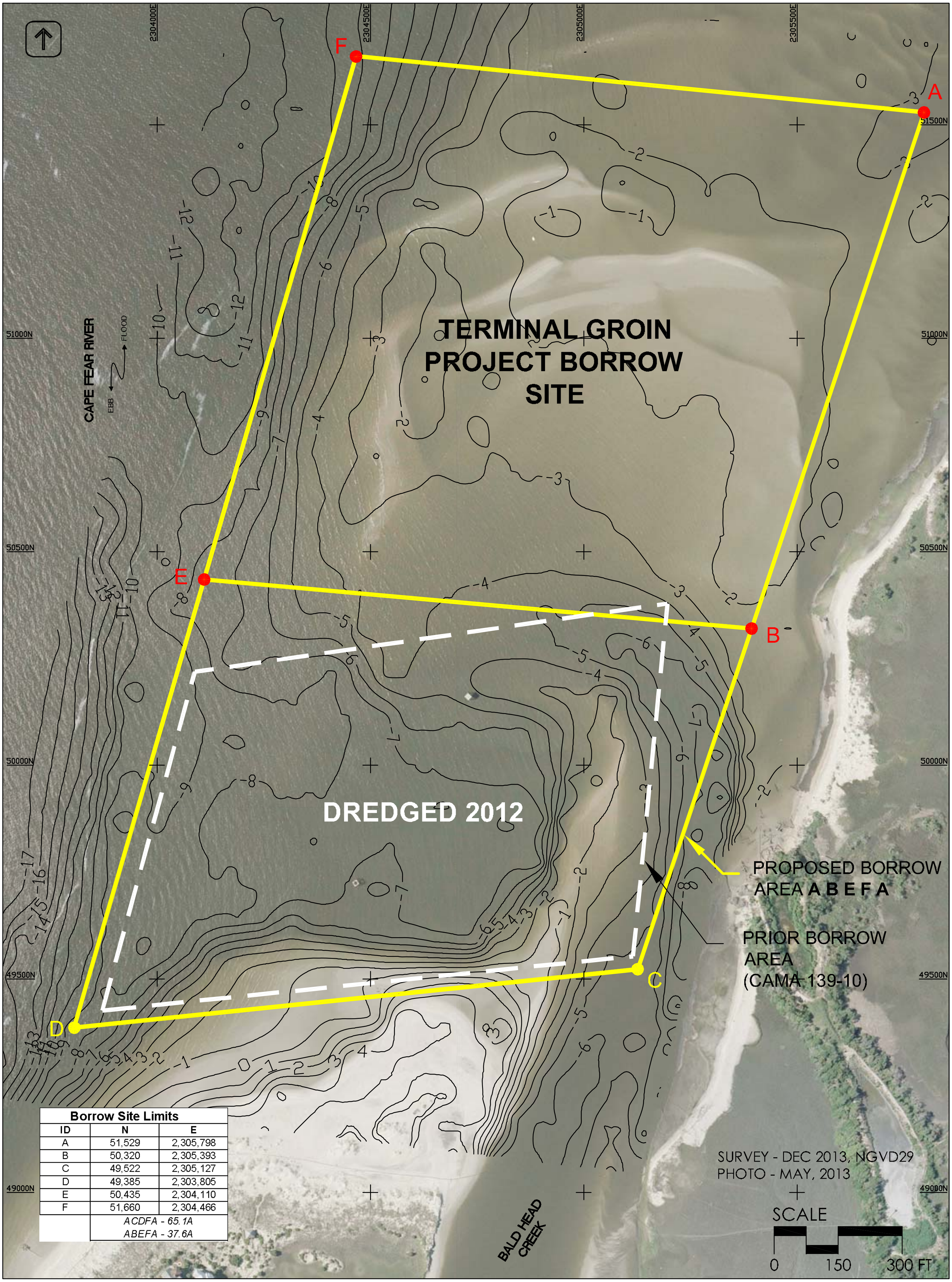
FIGURE 2 - ORIGINAL BALD HEAD CREEK BORROW SITE (POST-DREDGE CONDITION)

site, many of the same species that were dominant in pre-construction sampling were also dominant in the year-1 and 2 sampling. Diversity and richness were both significantly greater at the borrow site then at the reference sites during both the post- and year-1 and year-2 monitoring events. Physical monitoring surveys of the excavation has shown only limited shoaling (or recovery) resulting from sediment transport from Bald Head Creek, the Row Boat Row shorefront and the adjustment of side slopes. As a result, the 2012 borrow area has been recommended for expansion in a northward direction – with any near term excavation associated with terminal groin post-construction sand requirements being limited to *solely* that area (see **Figure 3**).

EXPANDED BORROW SITE - JUSTIFICATION

The designation of the proposed expanded 65.1 acre borrow area was predicated on the previously discussed design precepts associated with the original 21.34 acre borrow area permitted in 2010 as CAMA 139-10. In the near term, Contracts will *only* address the undredged 37.6 acre shoal area described by the boundary ABEFA, shown in **Figure 3**. That is to say, the 2012 original dredged borrow area in its entirety will remain undisturbed and be allowed to continue to physically recover over time. As noted above, however, biological recovery of the seabed is essentially complete at this time. Agency consent would be sought for purposes of its *futur*e reuse as a sand source.

An expanded borrow area is necessary to comply with the Terms and Conditions of S.B. 110 (as amended) in order to plan for the mitigation of any potential adverse impacts to the downdrift shoreline of West Beach and/or to address terminal groin fillet maintenance. The location and configuration of the Bald Head Creek borrow area – as expanded – allows for the use of a small hydraulic cutter suction dredge most suitable for low volume excavation type projects (i.e. less than 200,000 cy mol.). It likewise facilitates the use of a smaller, non-ocean certified dredge plant which allows for both better availability and shorter time from delineation of need – to excavation – to actual sand placement. Moreover, the very shallow nature of the proposed borrow site (i.e. to -8ft NGVD, mol), limits the size of dredge plant which can successfully access the site and comply with this important Permit Condition intended to foster



Borrow Site Limits

ID	N	E
A	51,529	2,305,798
B	50,320	2,305,393
C	49,522	2,305,127
D	49,385	2,303,805
E	50,435	2,304,110
F	51,660	2,304,466
	ACDFA - 65.1A *ABEFA - 37.6A*	

FIGURE 3 - EXPANDED BALD HEAD CREEK BORROW SITE (A,C,D,F,A)

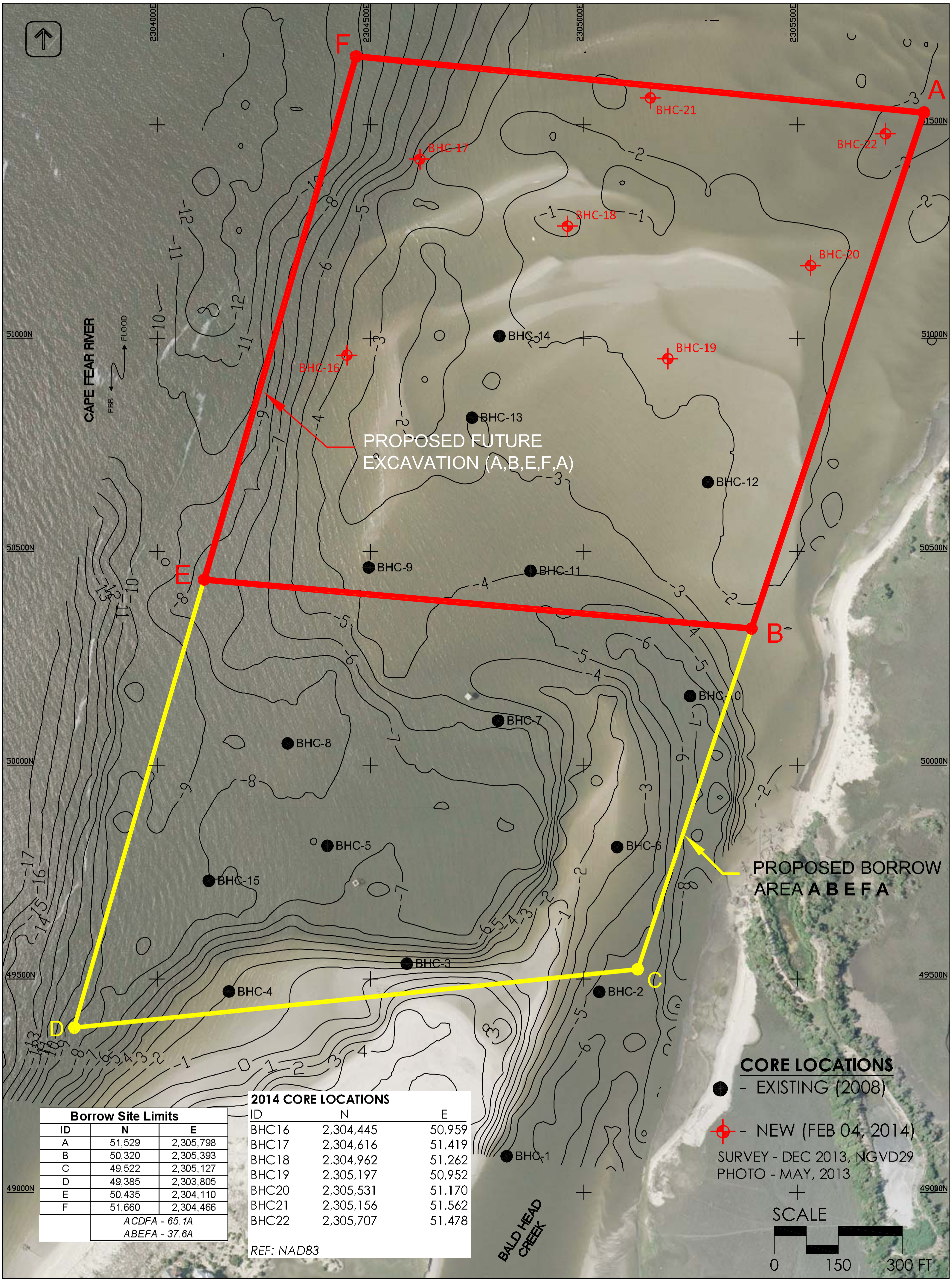
rapid post-construction physical as well as biological recovery. As with the 2012 project, a +1 ft. overdredge tolerance is requested in the Permit application.

In 2008, Athena Technologies, Inc. (ATI) acquired fifteen (15) Vibracores (designated as BHC-1 through BHC-15) located principally within the ebb tidal shoal formation of Bald Head Creek. Subsequent to laboratory analyses, all sediments located within the study area, above elevation -8 ft NGVD (or slightly deeper in many instances), were determined to be beach compatible (ref. LMG, 2010). This included some five (5) Vibracores located northward of the 21.34 acre permitted borrow area (see **Figure 1**). As a direct result, additional Vibracores were commissioned by the Village in 2014 for purposes of expanding the original borrow site permitted in 2010 and subsequently dredged in 2012.

2014 GEOTECHNICAL INVESTIGATION – EXPANDED BORROW AREA

In January 2014, ATI was contracted by Olsen Associates, Inc. to collect additional geotechnical Vibracore samples for the Village northward of the entrance to Bald Head Creek. More specifically, the firm was directed to acquire seven (7) additional cores (designated as BHC-16 through BHC-22) at predetermined locations to a depth of ten (10) ft., mol below the existing seabed. Subsequently the Vibracores were logged, photographed and sub-sampled for grain size and carbonate content. A depiction of the twenty two (22) locations representing both the 2008 and 2014 Vibracores sampling programs are represented by **Figure 4**.

Subsequent to photography and logging, ATI was requested to sample each core at the top and at the absolute elevation of -8ft. NGVD. The firm was also directed to formulate a continuous "composite" sample extending from the top of core to -8ft NGVD. As a result, each core provided three (3) samples for laboratory analysis. For each sample a grain size distribution (GSD) was plotted. A percentage fines passing a #200 sieve was recorded and a carbonate test performed for each sample. The results of the ATI investigation for 2014, including lab results color core photography and a geologic log for each Vibracore are included as **Appendix A**. The average percentage of fine-grained material (i.e. silt and clay) passing a #200 sieve (based upon the composite samples) was 1.4% with a maximum reported value of 2%. The average grain size was



Borrow Site Limits

ID	N	E
A	51,529	2,305,798
B	50,320	2,305,393
C	49,522	2,305,127
D	49,385	2,303,805
E	50,435	2,304,110
F	51,660	2,304,466
	ACDFA - 65.1A *ABEFA - 37.6A*	

2014 CORE LOCATIONS

ID	N	E
BHC16	2,304,445	50,959
BHC17	2,304,616	51,419
BHC18	2,304,962	51,262
BHC19	2,305,197	50,952
BHC20	2,305,531	51,170
BHC21	2,305,156	51,562
BHC22	2,305,707	51,478

REF: NAD83

FIGURE 4 - LOCATION OF VIBRACORES

.37mm. The average carbonate percentage for the composite samples was 10.7% with a maximum reported value of 21.3%. All of the core analyses reported relatively clean fine grained sand (SP) above elevation -8ft (NGVD 29). A few minor layers of SP-SM were noted in several cores above the depths of interest but numerous cores showed SP material to depths of -10 to -12 ft., (NVGD 29) or greater.

SUITABILITY ANALYSES

As depicted by **Figure 3**, the presently proposed borrow area defined as ABEFA, to be utilized in conjunction with the VBHI terminal groin project, is typified by the thirteen (13) cores numbered, 9,11,12,13,14,15, 16,17,18,19,20,21 and 22. Vibracores 9-16 were acquired in 2008. Vibracores 17-22 were taken in 2014. **Table 1** summarizes both carbonate and fines content for the composite samples derived from each of the thirteen Vibracores. As shown, carbonate averaged about 10%, whereas the fines content is *very low* at about 1.5%.

Table 2 presents additional geotechnical parameters of interest for the 13 Vibracore composite samples representing the expanded ebb shoal borrow area (see **Figure 3**). **Table 3** depicts the grain size characteristics which form the basis for the evaluation of sediment suitability in North Carolina – for the use intended, i.e. beach fill. Pursuant to Rule, the "sediment" size categories" and definitional scheme for Vibracore sediment analyzed are defined as follows:

Gravel: 4.76mm – 76mm
Granular: 2mm – less than 4.76mm
Sand: .0625mm – less than 2mm
Fines: Less than .0625mm

Table 1 Carbonate and Fines Content

Core (Comp)	%CO3	% Passing #200	% Passing #230
9	8.0	1.3	1.2
11	12.0	2.4	1.6
12	6.0	.9	.8
13	10.0	2.2	2.2
14	8.0	3.2	3.2
15	13.0	1.3	1.2
16	11.8	1.8	1.8
17	8.5	1.3	1.3
18	8.4	0.9	0.9
19	17.6	1.4	1.3
20	11.7	1.0	1.0
21	10.7	1.2	1.1
22	6.0	2.0	1.9
Average	**9.9**	**1.6**	**1.5**

Comp – A continuous composite soil sample from surface of seabed to the proposed depth-of-excavation, i.e. approximately -8.0 ft (NVGD).

TABLE 2: BALD HEAD CREEK Grain Size Data Summary

Point ID	Sample ID	Water Depth (NGVD)	Length of Core (Composite only)	Percent Fines (#200 Sieve)	Mean (phi)	D_{50} (phi)	Standard Deviation	Skewness	Kurtosis	Carbonate %
BHC-09	COMP	2.8	5.0	1.3	1.32	1.51	1.04	-.55	3.06	8.00
BHC-11	COMP	1.1	6.7	2.4	1.36	1.46	1.25	-.52	3.30	12.0
BHC-12	COMP	2.1	5.7	.9	1.50	1.73	1.01	-.51	2.46	6.0
BHC-13	COMP	2.6	5.2	2.2	1.45	1.78	1.11	-.79	3.46	10.0
BHC-14	COMP	2.2	5.6	3.2	1.69	2.04	.97	-.89	3.21	8.0
BHC-15	COMP	4.2	3.6	1.3	1.08	1.11	1.32	-.83	3.87	13.0
BHC-16	COMP	3.9	4.1	1.8	1.65	2.02	1.05	-1.28	4.85	11.8
BHC-17	COMP	4.0	4.0	1.3	1.81	2.05	.86	-1.79	8.05	8.5
BHC-18	COMP	3.0	5.0	.9	1.64	1.82	.91	-.91	4.22	8.4
BHC-19	COMP	1.8	6.2	1.4	1.55	1.00	.8	-.36	3.06	17.6
BHC-20	COMP	1.4	6.6	1.0	1.39	1.59	1.11	-.84	4.12	11.7
BHC-21	COMP	2.6	5.4	1.2	1.27	1.40	1.09	-.62	3.72	10.7
BHC-22	COMP	3.1	4.9	2.0	1.66	1.83	.97	-.48	2.63	6.0

Table 3. Bald Head Creek Borrow Site – Vibracore Sediment Characterization

Size Classification (%)

Core No.	Gravel	Granular	Sand	Fines	CaCO3
BHC-09 (Comp)	.1	1.9	96.8	1.16	8.0
BHC-11 (Comp)	.5	2.5	95.4	1.60	12.0
BHC-12 (Comp)	0	.5	98.7	.83	6.0
BHC-13 (Comp)	.1	1.4	96.4	2.15	10.0
BHC-14 (Comp)	0	.9	96.0	3.15	8.0
BHC-15 (Comp)	2.5	2.6	93.1	1.3	13.0
BHC-16 (Comp)	.41	1.33	96.5	1.81	11.8
BHC-17 (Comp)	.35	.48	97.9	1.29	8.5
BHC-18 (Comp)	.2	.55	98.3	.91	8.4
BHC-19 (Comp)	6.9	1.75	90.0	1.34	17.6
BHC-20 (Comp)	.66	1.35	97.0	.99	11.7
BHC-21 (Comp)	.65	1.1	97.2	1.11	10.7
BHC-22 (Comp)	0	.4	98.0	1.94	6.0
AVERAGE	**.95%**	**1.29%**	**95.5%**	**1.51%**	**10.1%**

- **Composite core sections only – expanded borrow site.**

Definition:

Gravel:	4.76mm – 76mm
Granular:	2mm – less than 4.76mm
Sand:	.0625mm – less than 2mm
Fines:	less than .0625mm

Not unexpectedly, the sediment size category results for the 2014 Bald Head Creek borrow site expansion, are *very self-similar* to those calculated for the most recent 2012 Bald Head Creek dredged borrow area. A comparison of the two is as follows:

% In Category By Weight

Year	Gravel	Granular	Sand	Fines	Carbonates	No. of Cores
2014	.95%	1.29%	95.5%	1.51%	10.1%	13
2012	1.4%	1.8%	95.6%	1.2%	9.8%	10

RECIPIENT BEACH SITES

The June 2010 geotechnical analyses associated with the 2012 dredging of the 21.34 A borrow site located on the Bald Head Creek ebb tidal platform are detailed in LMG (2010). That project design evaluated three (3) alternate disposal sites: a.) West Beach; b.) South Beach (west end) and c.) Rowboat Row shorefront to the north of marine channel entrance. The current sand disposal plan associated with the terminal groin project will consider *only* West Beach and the west end of South Beach.

With respect to the characterization of the areas of proposed fill placement, each of the two (2) recipient beaches has been the location of multiple sand placement projects – with sediment derived from Bald Head Creek, the federal navigation project, and Jay Bird Shoals. Sediment characterizations for South Beach (SB) were performed in coordination with CAMA for purposes of permitting the 2009/2010 1.5 Mcy beach restoration project (CAMA #67-09). In addition, per the request of CAMA, sediment samples had been acquired from West Beach along two (2) transects – one near the Point and one northward of the western limit of beach fill placement which occurred in 2009/10.

It is important to note that full beach sampling transects beyond the approximate mean low water line were *not* feasible at these locations due to the anomalous nature of the profile slopes where the Cape Fear River gorge affects the shoreline configuration. That is to say depths plummet to -20 to -50 ft. in a very short distance seaward of the MLWL as the (man-altered) channel literally impinges upon the shoreline at this location. None-the-less, the sampling protocol utilized was accepted by DCM for the shorefronts intended for sand placement.

A comparison of the expanded portion of the Bald Head Creek borrow site sediment characteristics typified by 13 Vibracores (see **Table 3**) – relative to the sediment characteristics for the two candidate beach fill sites – are described by **Table 4** below.

Table 4 – Sediment Characteristics

Composite Sample	**Gravel**	**Granular**	**Sand**	**Fines**	**Carbonate**
Bald Head Creek Borrow Site (Av)	.95	1.29	95.5	1.51	10.3%
South Beach (Av) Fill Site	.07	1.08	98.10	.75	7.57%
West Beach (Av) Fill Site	0	.09	99.65	.26	3.18%

BORROW SITE ANALYSES/FINDINGS

If one evaluates “compatibility” by the existing N.C. Rule for the currently proposed Bald Head Creek borrow source expanded area and the sediment characteristics associated with West Beach (WB) and South Beach (SB), it is clear that the proposed 37.6 A borrow area meets the State standards – as follows:

Requirement

a.) The average percentage (by weight) of ***fine*** grained sediment (less than 0.0625mm) shall not exceed the average percentage (by weight) of fine grained sediment of the recipient beach characterization by five (5%) percent.

- **Determination**
    - Bald Head Creek Borrow Site Av 1.51%
    - Recipient Beach
        - SB Mean .75%
        - WB Mean .26%
- **Result – Borrow Site complies with standard for each of the two beach segments considered.**

Requirement

b.) The average percentage (by weight) of ***granular*** sediment (greater than 2mm and less than 4.76mm) in the borrow site shall not exceed the average percentage (by weight) of coarse-sand sediment of the recipient beach characterization plus five (5%) percent.

- **Determination**
    - Bald Head Creek Borrow Site Av 1.29%
    - Recipient Beach
        - SB Mean 1.08 %
        - WB Mean .09%
- **Result – Borrow Site complies with standard for each of the two beach segments considered.**

Requirement

c.) The average percentage (by weight) of ***gravel*** sediment (greater than or equal to 4.76mm) in the borrow site shall not exceed the average percentage (by weight) of gravel-sized sediment of the recipient beach characterization plus five (5%) percent.

- **Determination**
  - Bald Head Creek Borrow Site Av .95%
  - Recipient Beach
    - SB Mean .07 %
    - WB Mean 0%
- **Result – Borrow Site complies with standard for each of the two beach segments considered.**

Requirement

d.) The average percentage (by weight) of ***calcium carbonate*** in the borrow site shall not exceed the average percentage (by weight) of calcium carbonate sediment of the recipient beach characterization plus fifteen (15%) percent.

- **Determination**
  - Bald Head Creek Borrow Site Av 10.3%
  - Recipient Beach
    - SB Mean 7.57 %
    - WB Mean 3.18%
- **Result – Borrow Site complies with standard for each of the two beach segments considered.**

CONCLUSION

In conclusion, the 37.6 acre segment of the expanded Bald Head Creek borrow site to be permitted as part of the terminal groin project, as described by thirteen (13) cores of interest (see **Table 3**), meets the State of N.C.'s standards for borrow site compatibility relative to known beach conditions typifying the two (2) alternate beach fill sites considered: 1.) the west end of South Beach and, 2.) West Beach.

REFERENCES

ATI (2014). “Geotechnical Investigation of Bald Head Creek,” McClellanville, S.C., 6 March 2014.

L.M.G., Inc. (2014), “Environmental Assessment, Bald Head Creek Dredging Project,” Wilmington, N.C., July 2010.

L.M.G., Inc. (2013), “Village of Bald Head Island – Bald Head Creek Dredge Project – Biological Monitoring Report No. 2,” Wilmington, N.C., April 2013.

L.M.G., Inc. (2014), “Village of Bald Head Island – Bald Head Creek Dredge Project – Biological Monitoring Report No. 3,” Wilmington, N.C., April 2014.

APPENDIX A

2014 ATI Investigation

Bald Head Creek

Bald Head Island, N.C.

PROJECT:

BORROW SITE EXPANSION

Geotechnical Investigation of Bald Head Creek
Bald Head Island, North Carolina

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458

Prepared for:

Olsen Associates, Inc.
2618 Herschel Street
Jacksonville, FL 32204

And

The Village of Bald Head Island
106 Lighthouse Wynd
Bald Head Island, NC 28461

March 6, 2014

TABLE OF CONTENTS

APPENDICES

Section 1: Investigation Scope

Athena Technologies, Inc. (Athena) was contracted by Olsen Associates, Inc. (Olsen) in January, 2014 to collect geotechnical vibracore samples for the Village of Bald Head Island. The purpose of the geotechnical investigation was to characterize sediments in a potential borrow area for beneficial use.

The scope of work for the geotechnical sampling project consisted of the collection of seven (7) vibracore samples to a depth of ten (10) feet below sediment surface. The vibracores were collected from the entrance of Bald Head Creek and were sub-sampled for grain size and carbonate analyses.

Section 2: Geological Setting

The project site is located adjacent to Bald Head Island in Brunswick County, North Carolina. The site is positioned between the Cape Fear River to the west and the Smith Island back-barrier marsh sequence to the east and north. The Village of Bald Head Island borders the site to the south. A map of the study area has been included as **Figure 1**.

The feature of interest is a subaqueous and intertidal shoal complex associated with a recurve spit feature located at the entrance to Bald Head Creek. The shoal complex exhibits large scale, flood oriented sand waves and shallow tidal channels. One such tidal channel, located along the eastern extent of the shoal complex, likely represents the natural orientation and position of Bald Head Creek. The setting experiences semidiurnal tides with a mean range of 4.5 feet (NOAA).

Section 3: Site Conditions

Athena mobilized to Southport, NC on February 3, 2014 in preparation for field sampling. Field sampling commenced and concluded on February 4. Sampling was schedule around a flooding tidal cycle in order to ensure that the sample locations could be accessed via vessel. Water depths at the sample sites averaged 4.6 feet, with a maximum depth of 6.4 feet at BHC-16, and a minimum of 3.0 feet at BHC-18. The wind direction was approximately 10 miles per hour (mph), with gusts to 20 mph, out of the North. The shallow water depths and predominant wind direction resulted in choppy conditions on top of the shoal complex. The average vibracore penetration and recovery for the Bald Head Creek cores was 10.4 and 8.6 feet, respectively. A map outlining the Bald Head Creek vibracore locations has been included as **Figure 2**.

Section 4: Field Sampling Methodology

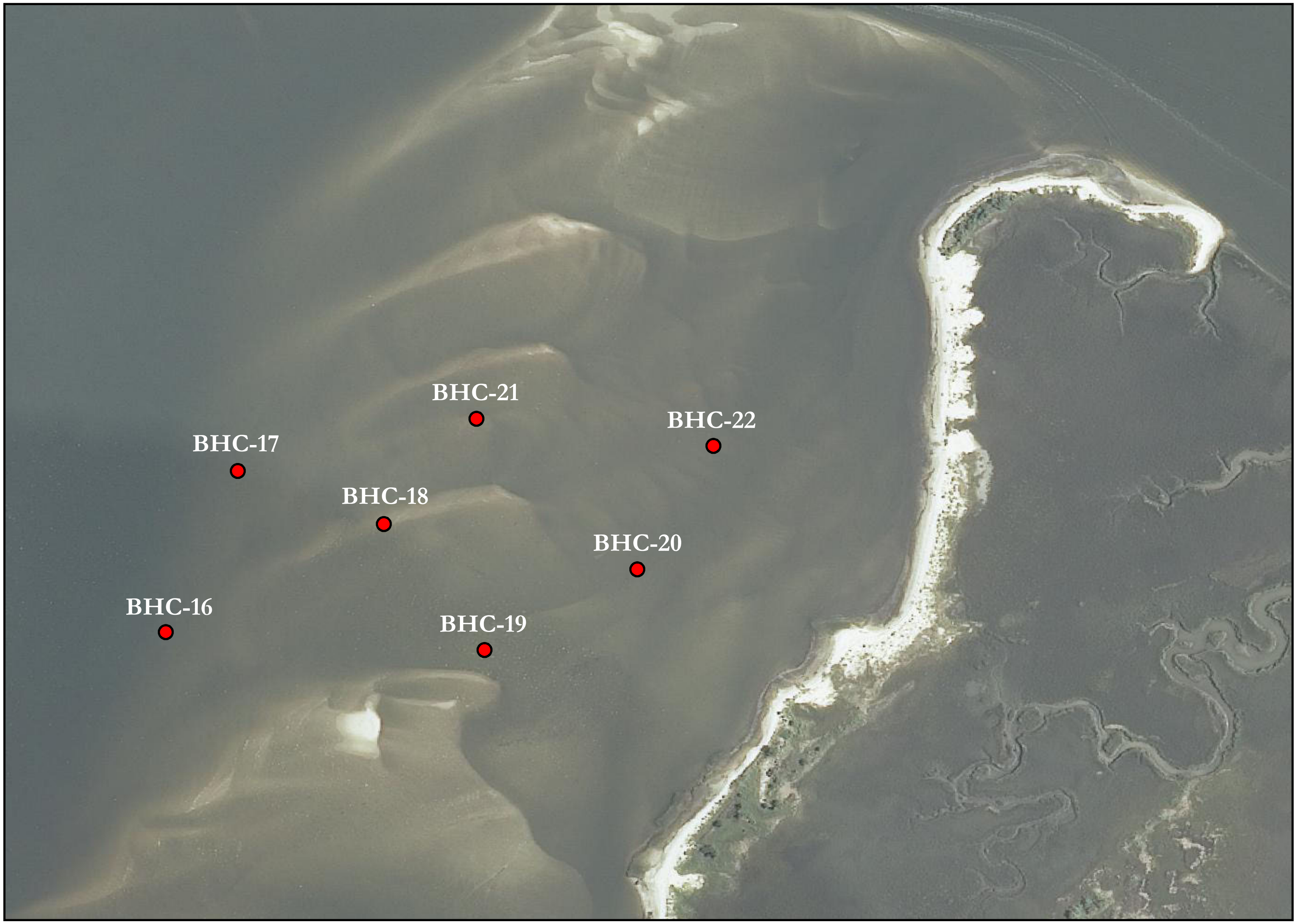
Athena utilized our twenty-four (24) foot research vessel as the sampling platform for this investigation. The vessel was equipped with all required US Coast Guard (USCG) safety gear and was operated by a USCG certified 100 Ton Master Captain. A Trimble Differential Global Positioning System (DGPS, sub-meter accuracy) interfaced with HYPACK was utilized for primary navigation. Horizontal coordinates were recorded in North American Datum of 1983 (NAD83) State Plane, North Carolina (Zone 3200), U.S. Survey Feet. The vessel was immobilized over the desired sample sites using spuds or a triple-point anchor system. Once on station, the coordinates at the current location were verified with the desired station coordinates to ensure accuracy. At this point, a water depth was collected via lead line.

Figure 1: Bald Head Creek Site Map

ATHENA
TECHNOLOGIES, INC.

1293 Graham Farm Road
McClellanville, SC 29458
(843) 887-3800
www.athenatechnologies.com

Figure 2: Bald Head Creek Vibracore Location Map



ATHENA
TECHNOLOGIES, INC.

1293 Graham Farm Road
McClellanville, SC 29458
(843) 887-3800
www.athenatechnologies.com

A custom-designed and built vibracore system was utilized in order to collect the geotechnical cores. The system consists of a generator with a mechanical vibrator attached via cable. The vibrator is attached directly to a three-inch (3") diameter, galvanized sample barrel. The sample barrel was lowered until the bottom of the barrel touched the sediment surface, at which point the barrel was raised until directly above the sediment surface. The vibracore machine was turned on and the sample barrel was allowed to penetrate to a depth of ten (10) feet below sediment surface, or to refusal. In certain cases (e.g., BHC-16 and BHC-22), the sample barrel was allowed to penetrate to a deeper depth in an attempt to counteract sediment loss during sample barrel retrieval. Once the sample barrel reached the desired depth, the machine was turned off and the sample barrel was retrieved using an electric winch. Once the sample was on deck, the recovered core length was measured to ensure at least eighty (80) percent recovery. Once recovery was verified, the core was then capped, labeled, and cut into five (5) foot sections. A vibracore summary, outlining penetration, recovery, etc., can be found in **Table 1.**

The completed vibracore samples were then transported to Athena's facility in McClellanville, SC and were cut open longitudinally. Once opened, one half of the core was transferred to labeled PVC, wrapped in plastic wrap, and inserted into a protective 6-mm plastic liner that was also labeled. The remaining half of the core was then scraped (to show sedimentary structures), logged, and photographed. The core logs were input into gINT and forwarded, as draft versions, to Olsen for sample interval determination. Sediment surface elevations were submitted by Olsen to Athena and are represented in National Geodetic Vertical Datum of 1929 (NGVD29). At this time, the digital core photographs were processed in order to develop a photo-mosaic image of the core, and those were also forwarded to Olsen. Once the photo-mosaic images and logs for each core were reviewed, Olsen forwarded a list of desired sample intervals to Athena for processing. The core logs, photo-mosaic images, sieve analysis curves, and granularmetric tables for Bald Head Creek have been provided in **Appendix A**.

Section 5: Laboratory Testing & Results

Physical samples were collected from the photographed half of the Bald Head Creek vibracores. The samples were delivered to Terracon Consultants, Inc. (Terracon) in Jacksonville, FL, a USACE certified laboratory. One (1) composite sample and two (2) discrete samples were collected from each vibracore for a total of twenty-one (21) physical samples. The discrete samples were collected from the top of each core, and from a depth of minus eight (-8) feet relative to NGVD29. The composite sample was comprised of the entire interval between the top of core to minus eight (-8) feet relative to NGVD29. The physical samples were analyzed using the following methods: grain size (ASTM D 422) and carbonate analysis (after Twenhofel & Tyler, 1941).

The average percent of fine-grained material (i.e., silt and clay passing the # 200 sieve) as reported from the composite samples from the Bald Head Creek cores was 1.4%, with a maximum value of 2.0% from BHC-22. The average grain size for the composite samples was 0.37 mm (fine sand); however that data is coarsely skewed due to the presence of bioclastic (i.e., shell) material in the physical samples. The actual grain size of the clastic fraction of the physical samples is likely smaller. The average carbonate percentage for the composite samples was 10.7%, with a maximum value of 21.3% at BHC-19-2. A summary of the laboratory data has been included as **Table 2**.

The average percent of fine-grained material from the top and bottom discrete samples was 1.0 and 1.5%, respectively. The average mean grain size for the top and bottom discrete samples

Table 1: Vibracore Summary

Olsen Associates, Inc.
Bald Head Creek Geotechnical Investigation
Village of Bald Head Island, North Carolina
February 2014

Boring ID	Date	Time	East (x)	North (y)	Water Depth (feet)	Penetration (feet)	Recovery (feet)	Notes
BHC-16	2/4/14	12:05:00	2304445.65	50959.48	6.4	11.7	9.8	
BHC-17	2/4/14	7:56:35	2304616.09	51419.38	3.2	10.0	8.2	
BHC-18	2/4/14	8:51:12	2304962.05	51262.48	3.0	10.0	8.3	
BHC-19	2/4/14	11:34:07	2305197.27	50952.09	4.7	9.0	7.3	Vibrated out first attempt - made second attempt.
						9.0	7.4	Retained second core.
BHC-20	2/4/14	11:01:31	2305531.69	51170.35	4.0	10.0	8.1	
BHC-21	2/4/14	9:42:25	2305156.25	51562.81	5.2	10.0	8.1	
BHC-22	2/4/14	10:36:45	2305707.27	51478.88	5.8	12.0	10.3	
Project Notes	Coordinates were recorded in NAD83, State Plane Coordinate System, North Carolina (Zone 3200), US Survey Feet.							
	NAD83 - North American Datum of 1983							

Table 2: Grain Size Data Summary

Olsen Associates, Inc.
Bald Head Creek Geotechnical Investigation
Village of Bald Head Island, North Carolina
February 2014

Boring ID	Sample ID	Sample Interval (feet)	Mean Grain Size (mm)	Percent Passing #200 Sieve (Fines)	Percent Carbonate	USCS Classification
BHC-16	BHC-16-1	0.0 - 0.4'	0.28	0.9	8.0	SP
	BHC-16-2	3.7 - 4.1'	0.25	1.7	8.9	SP
	Comp-1	0.0 - 4.1'	0.32	1.8	11.8	SP
BHC-17	BHC-17-1	0.0 - 0.4'	0.28	0.8	7.5	SP
	BHC-17-2	3.6 - 4.0'	0.41	1.0	13.7	SP
	Comp-1	0.0 - 4.0'	0.29	1.3	8.5	SP
BHC-18	BHC-18-1	0.0 - 0.4'	0.37	0.8	8.9	SP
	BHC-18-2	4.6 - 5.0'	0.38	1.4	12.4	SP
	Comp-1	0.0 - 5.0'	0.32	0.9	8.4	SP
BHC-19	BHC-19-1	0.0 - 0.4'	0.34	1.1	8.7	SP
	BHC-19-2	5.8 - 6.2'	0.53	1.5	21.3	SP
	Comp-1	0.0 - 6.2'	0.53	1.4	17.6	SP
BHC-20	BHC-20-1	0.0 - 0.4'	0.42	0.7	8.3	SP
	BHC-20-2	6.2 - 6.6'	0.35	1.3	12.6	SP
	Comp-1	0.0 - 6.6'	0.38	1.0	11.7	SP
BHC-21	BHC-21-1	0.0 - 0.4'	0.31	1.2	8.9	SP
	BHC-21-2	5.0 - 5.4'	0.49	1.1	15.3	SP
	Comp-1	0.0 - 5.4'	0.41	1.2	10.7	SP
BHC-22	BHC-22-1	0.0 - 0.4'	0.31	1.3	8.3	SP
	BHC-22-2	4.5 - 4.9'	0.35	2.3	2.7	SP
	Comp-1	0.0 - 4.9'	0.32	2.0	6.0	SP

Percent Carbonate - Analysis was performed according to the following method: Twenhofel and Tyler, 1941

USCS - Unified Soil Classification System was 0.33 and 0.39 mm, respectively. Average carbonate percentages for the top and bottom samples were 8.4 and 12.4%, respectively.

Section 6: Investigation Findings

In general, two lithologic units were commonly identified in the geotechnical vibracores collected from the Bald Head Creek project site. The top unit typically consisted of sub-rounded, fine quartz sand, with occasional layers of medium quartz sand and bioclastic (i.e., shell) material. The lower unit was similar to the top, however increased fine grained (i.e., silt and clay) material was noted in this interval. The fine grained material was typically incorporated into the cores via bioturbation, although occasional fine-grained flaser beds and rip-up clasts were also noted from this interval.

Four (4) of the cores, BHC-19 through BHC-22, terminated in, or encountered, a silty medium quartz sand with approximately 30 to 45% coarse sand to fine gravel size shell bioclastic material. In most cases, this shell rich interval acted as refusal, however BHC-22 was able to penetrate through this interval and terminated in a bioturbated, fine to medium quartz sand interval with silt percentages greater than 5%. The silty, shell rich interval was encountered at depths of approximately minus nine (-9) and minus eleven (-11) feet relative to NGVD29.

Discrete samples collected from six (6) of the Bald Head Creek cores reported carbonate percentages that increased between the top and bottom samples. On average, the carbonate percentages increased by approximately 60%. The exception is in core BHC-22, which reported a decrease in carbonate percentage between the top and bottom discrete samples. Silt percentages also increased slightly between the top and bottom discrete samples, however the increase was minimal and silt percentages in all samples were reported to be well below 5%.

Common marine bivalve and gastropod species identified in the cores consisted of the following: coquina clam (*Donax variabilis*), eastern oyster (*Crassostrea virginica*), lightning whelk (*Busycon contrarium*), and ponderous ark clam (*Noetia ponderosa*). In general, the bioclastic material in the cores appears to have been transported to the study area and does not necessarily reflect in-situ bioturbation by the abovementioned species. Mud shrimp (*Callianassa major*) burrow traces, which are commonly lined by fine-grained material, were commonly identified (e.g., BHC-16) in the Bald Head Creek cores and do represent in-situ bioturbation. Mud shrimp are common in relatively high energy marine settings. BHC-22 reported the highest level of bioturbation and, consequently, the highest silt percentage of 2.3%.

Section 7: References

United States Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Ocean Service, Tides & Currents, Station ID: 8659084 (Southport, NC), http://tidesandcurrents.noaa.gov/stationhome.html?id=8659084 (March 4, 2014).

Appendix A

Bald Head Creek Core Logs, Photographs, Sieve Analysis Curves, and Granularmetric Reports

Boring Designation BHC-16

DRILLING LOG	DIVISION Olsen Associates, Inc.	INSTALLATION Jacksonville, Florida	SHEET 1 OF 1 SHEETS

1. PROJECT
Village of Bald Head Island
Geotechnical Investigation of Bald Head Creek

2. BORING DESIGNATION BHC-16
LOCATION COORDINATES X = 2,304,446 Y = 50,959

3. DRILLING AGENCY Athena Technologies, Inc.
CONTRACTOR FILE NO.

4. NAME OF DRILLER P. McClellan

5. DIRECTION OF BORING
☒ VERTICAL
☐ INCLINED
DEG. FROM VERTICAL
BEARING

6. THICKNESS OF OVERBURDEN 0.0 Ft.

7. DEPTH DRILLED INTO ROCK 0.0 Ft.

8. TOTAL DEPTH OF BORING 11.7 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM North Carolina State Plane
HORIZONTAL NAD 1983
VERTICAL NGVD 29

11. MANUFACTURER'S DESIGNATION OF DRILL
☐ AUTO HAMMER
☐ MANUAL HAMMER

12. TOTAL SAMPLES
DISTURBED 1
UNDISTURBED (UD) 2

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER 6.4 Ft.

15. DATE BORING
STARTED 02-04-14 12:05
COMPLETED 02-04-14 12:55

16. ELEVATION TOP OF BORING -3.9 Ft.

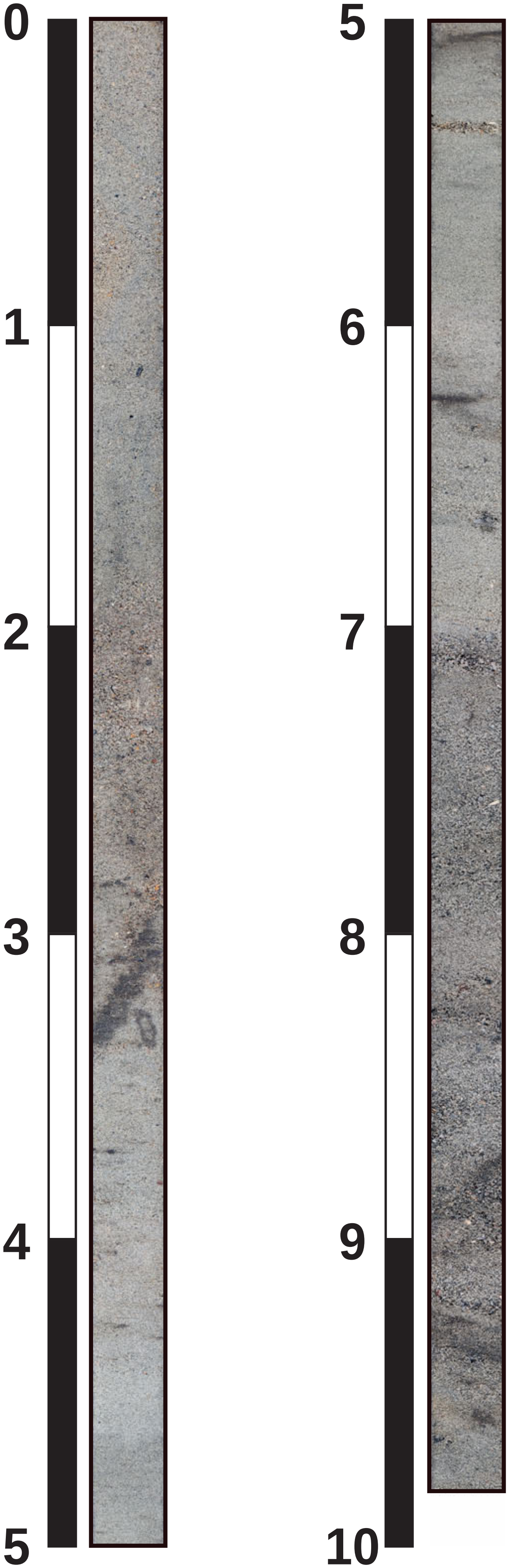
17. TOTAL RECOVERY FOR BORING 9.8 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
A. Freeze

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-3.9	0.0					
-5.8	1.9		Fine to medium quartz SAND, few fine to medium sand size shell, trace silt, poorly graded, subrounded, light brownish gray (2.5Y-6/2), (SP).		1 Comp	Sample #1, Depth = 0.0' - 0.4' Mean (mm): 0.28, Phi Sorting: 0.80 Carbonate: 8.0%, Fines (230): 0.86% (SP)
-6.8	2.9		Medium quartz SAND, few medium sand size shell, trace silt, poorly graded, subrounded, light brownish gray (2.5Y-6/2), (SP).			Sample #Comp, Depth = 0.0' - 4.1' Mean (mm): 0.32, Phi Sorting: 1.05 Carbonate: 11.8%, Fines (230): 1.81% (SP)
-8.6	4.7		Fine to medium quartz SAND, trace silt (in burrows), trace fine sand size shell, poorly graded, subrounded, bioturbated, 3.0' = Callianassa major burrow trace, light gray (2.5Y-7/2), (SP).		2	Sample #2, Depth = 3.7' - 4.1' Mean (mm): 0.25, Phi Sorting: 0.85 Carbonate: 8.9%, Fines (230): 1.68% (SP)
-10.2	6.3		Fine quartz SAND, trace silt (in layers), trace fine sand size shell, poorly graded, subrounded, 5.35' = layer of medium quartz SAND with little medium to coarse sand size shell, gray (2.5Y-6/1), (SP).			
-13.2	9.3		Medium quartz SAND, few medium sand size shell, fine sand in layers, poorly graded, subrounded, bi-directional bedding present, gray (2.5Y-6/1), (SP).			
-13.7	9.8		Fine to medium quartz SAND, trace silt (in layers), trace fine sand size shell, poorly graded, subrounded, gray (2.5Y-6/1), (SP).			

0
5
10

End of Boring



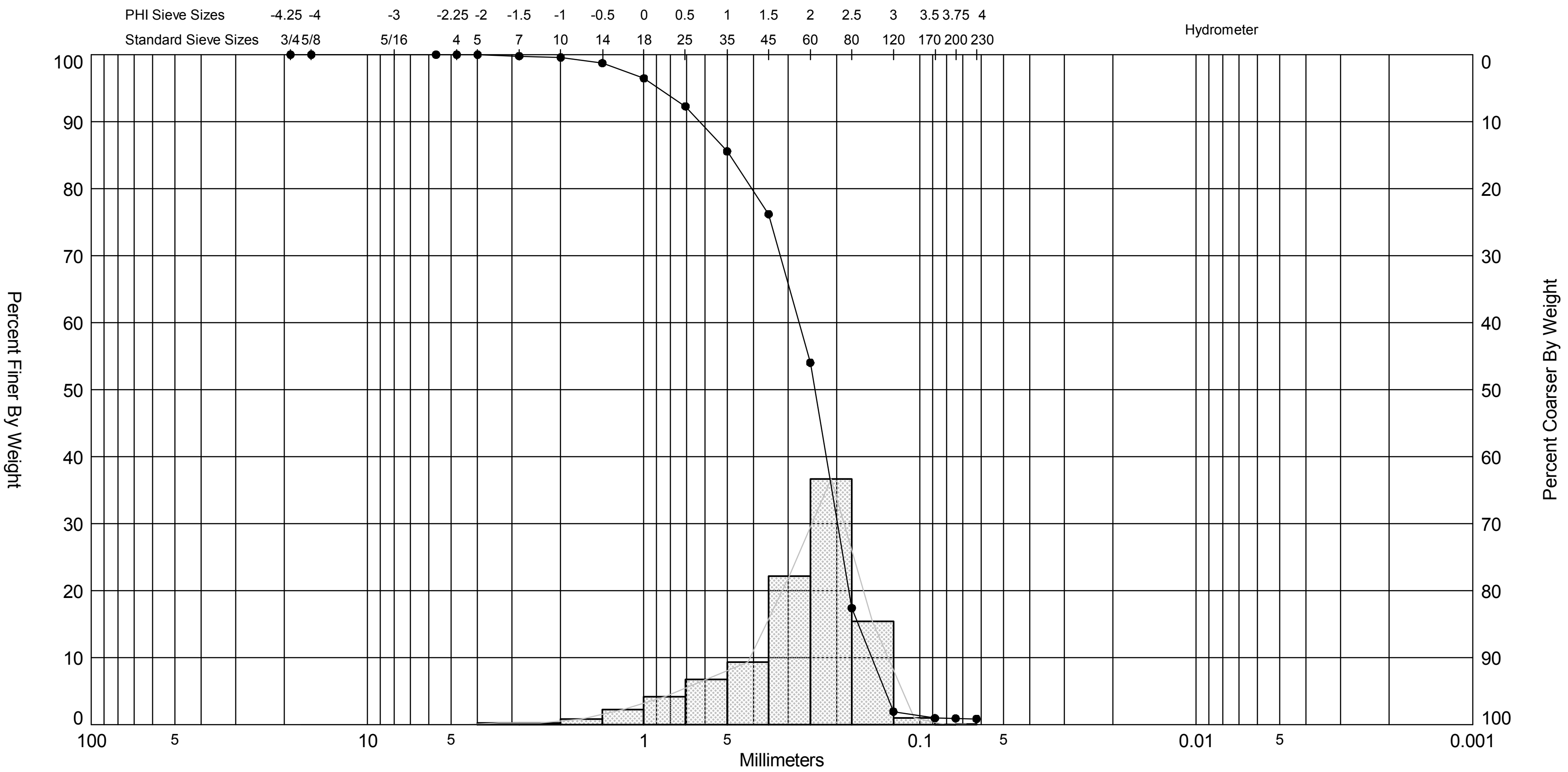
Bald Head Island
North Carolina
BHC-16

February 2014

Scale in Feet
Photo Mosaic Image

ATHENA
TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-16 #1	—●—	-3.9	SP	#200 - 0.93 #230 - 0.86		8.00	2.05	1.85	-1.23	4.7	0.8

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,304,446
Northing (Y, ft):	50,959
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island

Sample Name: BHC-16 #1

Analysis Date: 02-17-14

Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,304,446	50,959	North Carolina State Plane	-3.9 NGVD 29

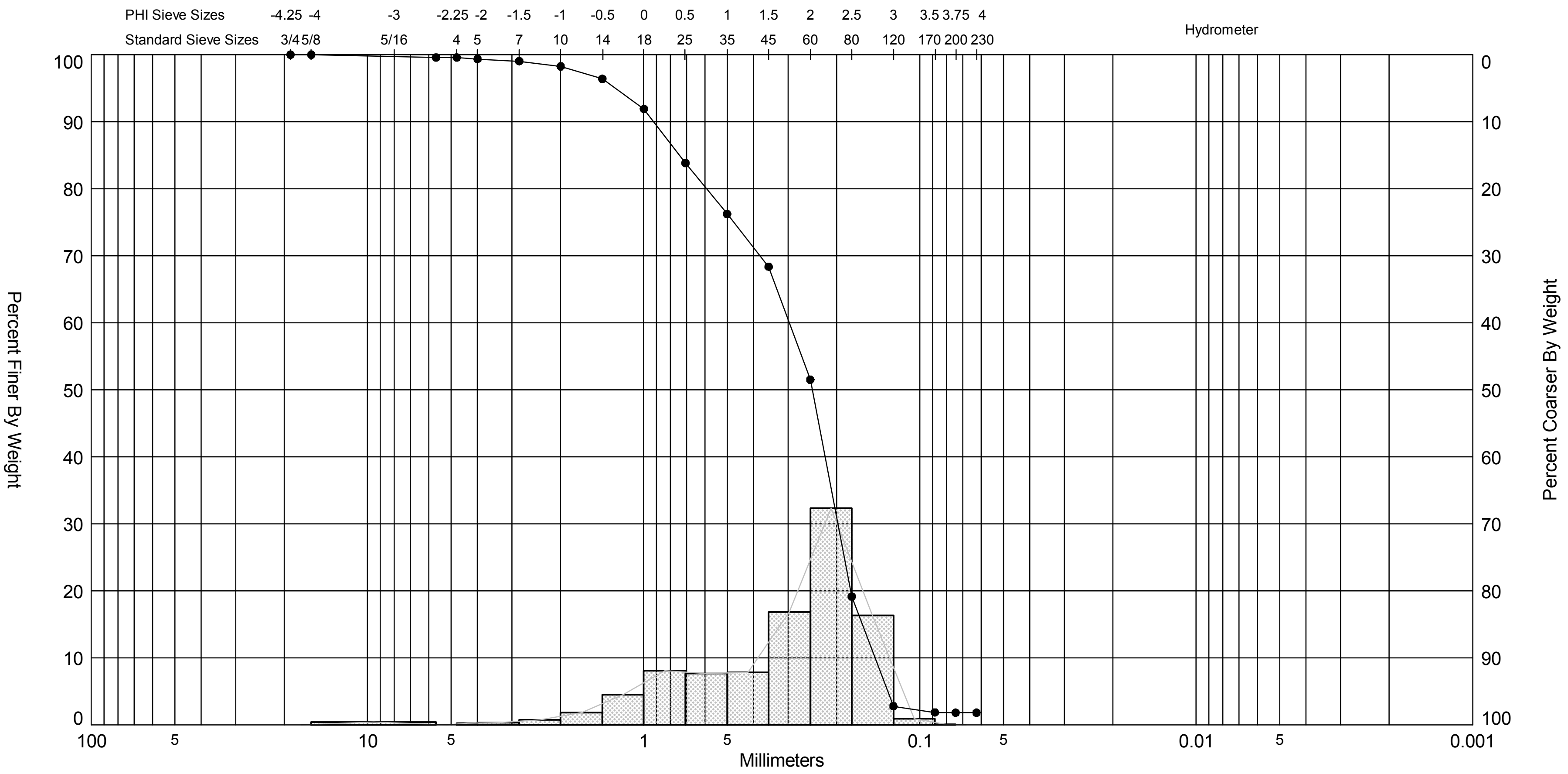
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
114.79	113.82			#200 - 0.93 #230 - 0.86		8.00	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.00	0.00	0.00	100.00
#4	-2.25	4.76	0.00	0.00	0.00	100.00
#5	-2.00	4.00	0.00	0.00	0.00	100.00
#7	-1.50	2.83	0.24	0.21	0.24	99.79
#10	-1.00	2.00	0.24	0.21	0.48	99.58
#14	-0.50	1.41	0.98	0.85	1.46	98.73
#18	0.00	1.00	2.60	2.27	4.06	96.46
#25	0.50	0.71	4.79	4.17	8.85	92.29
#35	1.00	0.50	7.74	6.74	16.59	85.55
#45	1.50	0.35	10.73	9.35	27.32	76.20
#60	2.00	0.25	25.45	22.17	52.77	54.03
#80	2.50	0.18	42.06	36.64	94.83	17.39
#120	3.00	0.13	17.74	15.45	112.57	1.94
#170	3.50	0.09	1.13	0.98	113.70	0.96
#200	3.75	0.07	0.04	0.03	113.74	0.93
#230	4.00	0.06	0.08	0.07	113.82	0.86

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.90	2.54	2.40	2.05	1.53	1.08	0.18

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.85	0.28	0.8	-1.23	4.7



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-16 #Comp	—●—	-3.9	SP	#200 - 1.81 #230 - 1.81		11.80	2.02	1.65	-1.28	4.85	1.05

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,304,446
Northing (Y, ft):	50,959
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

ATHENA
TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

SIEVE ANALYSIS BALD HEAD CREEK, NC, FEB. '14.GPJ FL DEP ROSS.GDT 3/3/14

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island
Sample Name: BHC-16 #Comp
Analysis Date: 02-17-14
Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,304,446	50,959	North Carolina State Plane	-3.9 NGVD 29

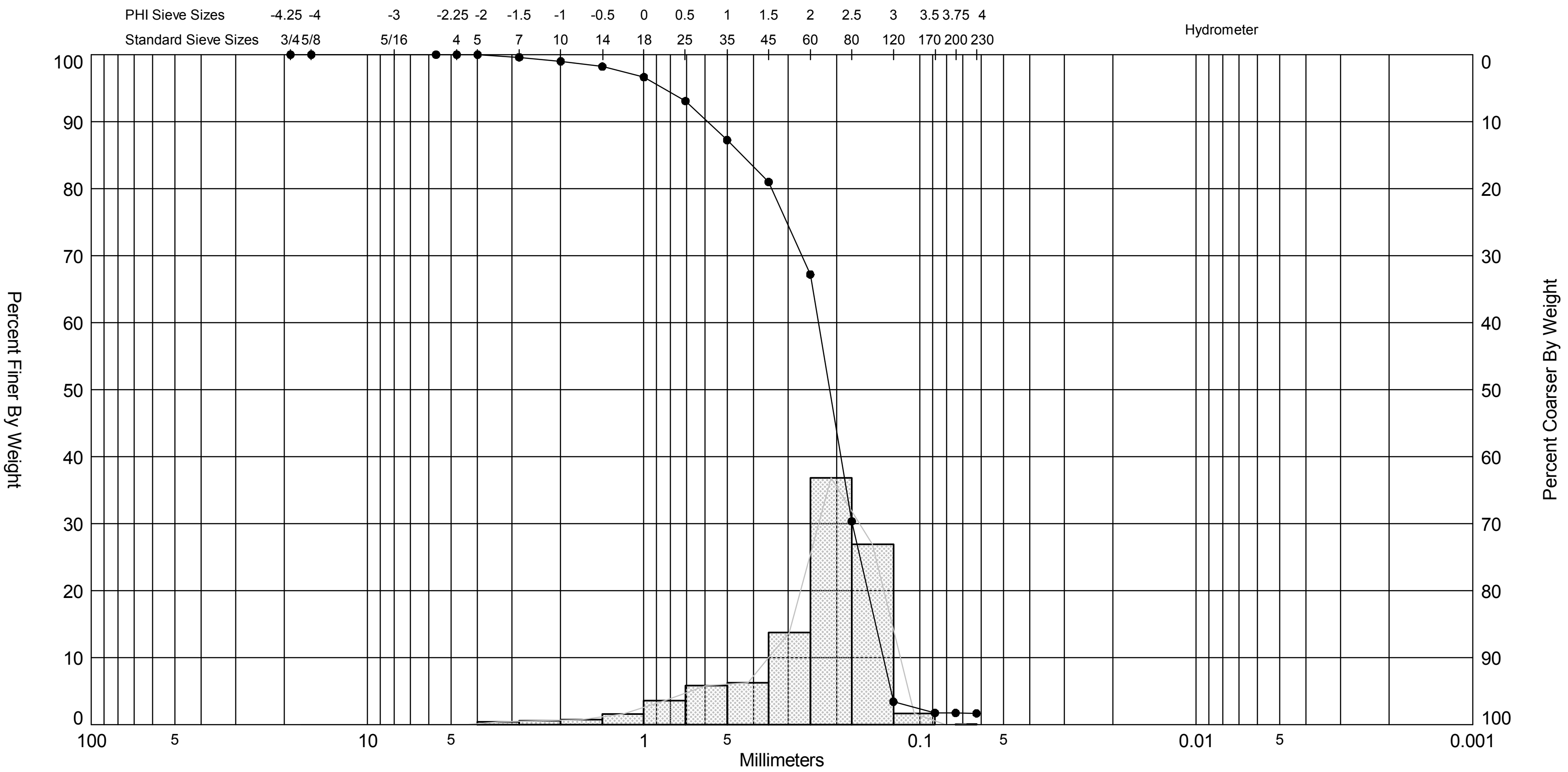
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
128.60	126.27			#200 - 1.81 #230 - 1.81		11.80	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.53	0.41	0.53	99.59
#4	-2.25	4.76	0.00	0.00	0.53	99.59
#5	-2.00	4.00	0.28	0.22	0.81	99.37
#7	-1.50	2.83	0.42	0.33	1.23	99.04
#10	-1.00	2.00	1.00	0.78	2.23	98.26
#14	-0.50	1.41	2.40	1.87	4.63	96.39
#18	0.00	1.00	5.78	4.49	10.41	91.90
#25	0.50	0.71	10.37	8.06	20.78	83.84
#35	1.00	0.50	9.81	7.63	30.59	76.21
#45	1.50	0.35	10.08	7.84	40.67	68.37
#60	2.00	0.25	21.68	16.86	62.35	51.51
#80	2.50	0.18	41.63	32.37	103.98	19.14
#120	3.00	0.13	21.03	16.35	125.01	2.79
#170	3.50	0.09	1.18	0.92	126.19	1.87
#200	3.75	0.07	0.08	0.06	126.27	1.81
#230	4.00	0.06	0.00	0.00	126.27	1.81

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.93	2.60	2.41	2.02	1.08	0.49	-0.35

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.65	0.32	1.05	-1.28	4.85



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-16 #2	—●—	-7.6	SP	#200 - 1.74 #230 - 1.68		8.90	2.23	2.01	-1.59	5.85	0.85

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,304,446
Northing (Y, ft):	50,959
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island

Sample Name: BHC-16 #2

Analysis Date: 02-17-14

Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,304,446	50,959	North Carolina State Plane	-7.6 NGVD 29

USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
115.78	113.86			#200 - 1.74 #230 - 1.68		8.90	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.00	0.00	0.00	100.00
#4	-2.25	4.76	0.00	0.00	0.00	100.00
#5	-2.00	4.00	0.00	0.00	0.00	100.00
#7	-1.50	2.83	0.45	0.39	0.45	99.61
#10	-1.00	2.00	0.70	0.60	1.15	99.01
#14	-0.50	1.41	0.92	0.79	2.07	98.22
#18	0.00	1.00	1.83	1.58	3.90	96.64
#25	0.50	0.71	4.15	3.58	8.05	93.06
#35	1.00	0.50	6.73	5.81	14.78	87.25
#45	1.50	0.35	7.25	6.26	22.03	80.99
#60	2.00	0.25	15.97	13.79	38.00	67.20
#80	2.50	0.18	42.67	36.85	80.67	30.35
#120	3.00	0.13	31.18	26.93	111.85	3.42
#170	3.50	0.09	1.94	1.68	113.79	1.74
#200	3.75	0.07	0.00	0.00	113.79	1.74
#230	4.00	0.06	0.07	0.06	113.86	1.68

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.97	2.77	2.60	2.23	1.72	1.26	0.23

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.01	0.25	0.85	-1.59	5.85

Boring Designation BHC-17

DRILLING LOG

DIVISION: Olsen Associates, Inc.

INSTALLATION: Jacksonville, Florida

SHEET 1 OF 1 SHEETS

1. PROJECT: Village of Bald Head Island
Geotechnical Investigation of Bald Head Creek

2. BORING DESIGNATION: BHC-17

LOCATION COORDINATES: X = 2,304,616 Y = 51,419

3. DRILLING AGENCY: Athena Technologies, Inc.

CONTRACTOR FILE NO.:

4. NAME OF DRILLER: P. McClellan

5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED

DEG. FROM VERTICAL:

BEARING:

6. THICKNESS OF OVERBURDEN: 0.0 Ft.

7. DEPTH DRILLED INTO ROCK: 0.0 Ft.

8. TOTAL DEPTH OF BORING: 10.0 Ft.

9. SIZE AND TYPE OF BIT: 3.0 In.

10. COORDINATE SYSTEM/DATUM: North Carolina State Plane | HORIZONTAL: NAD 1983 | VERTICAL: NGVD 29

11. MANUFACTURER'S DESIGNATION OF DRILL: ☐ AUTO HAMMER ☐ MANUAL HAMMER

12. TOTAL SAMPLES: DISTURBED 1 | UNDISTURBED (UD) 2

13. TOTAL NUMBER CORE BOXES:

14. ELEVATION GROUND WATER: 3.2 Ft.

15. DATE BORING: STARTED 02-04-14 07:56 | COMPLETED 02-04-14 08:41

16. ELEVATION TOP OF BORING: -4.0 Ft.

17. TOTAL RECOVERY FOR BORING: 8.2 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR: A. Freeze

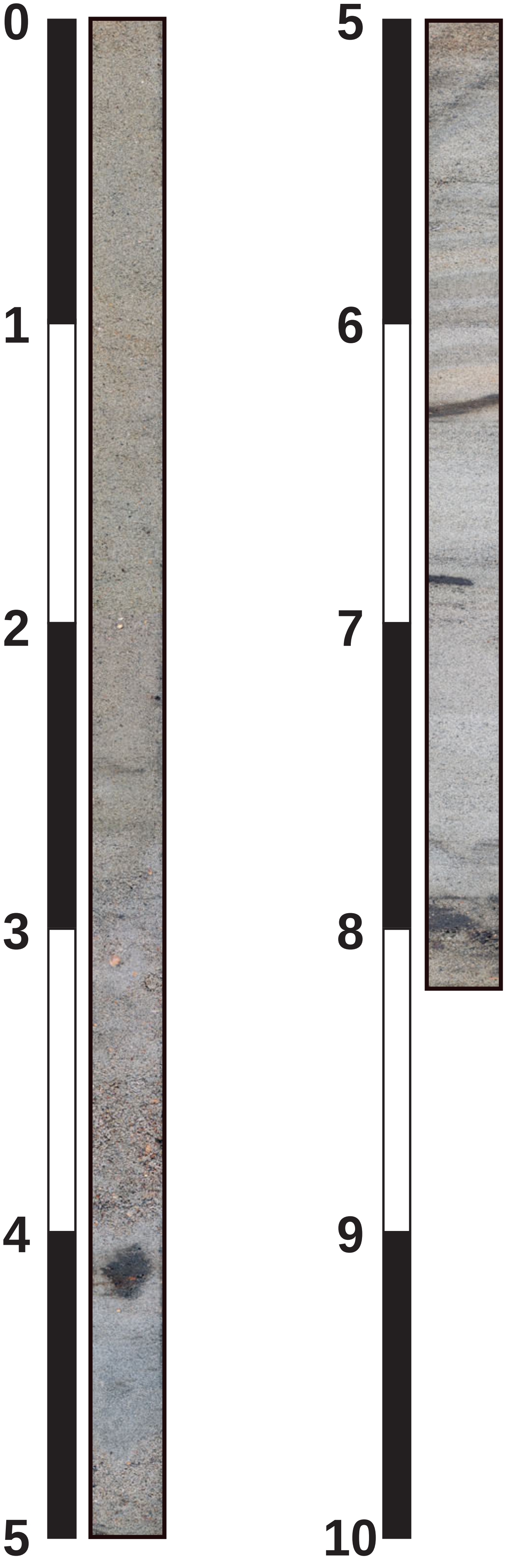
ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-4.0	0.0					
-6.8	2.8		Fine to medium quartz SAND, few fine sand size shell, trace silt, poorly graded, subrounded, bioturbated, light brownish gray (2.5Y-6/2), (SP).		1 Comp	Sample #1, Depth = 0.0' - 0.4' Mean (mm): 0.28, Phi Sorting: 0.68 Carbonate: 7.5%, Fines (230): 0.77% (SP) Sample #Comp, Depth = 0.0' - 4.0' Mean (mm): 0.29, Phi Sorting: 0.86 Carbonate: 8.5%, Fines (230): 1.29% (SP)
-7.5	3.5		Fine to medium quartz SAND, few medium sand size shell, trace silt, poorly graded, subrounded, bioturbated, light brownish gray (2.5Y-6/2), (SP).			
-8.0	4.0		Medium quartz SAND, little medium sand size shell, poorly graded, subrounded, light brownish gray (2.5Y-6/2), (SP).		2	Sample #2, Depth = 3.6' - 4.0' Mean (mm): 0.41, Phi Sorting: 1.26 Carbonate: 13.7%, Fines (230): 0.96% (SP)
-8.8	4.8		Fine quartz SAND, trace silt (in burrows), trace fine sand size shell, poorly graded, subrounded, 4.1' = burrow trace, gray (2.5Y-6/1), (SP).			
-9.2	5.2		Medium quartz SAND, little fine sand size shell, trace silt, poorly graded, subrounded, light brownish gray (2.5Y-6/2), (SP).			
-10.3	6.3		Fine to medium quartz SAND, few medium sand and fine sand size shell (in layers), trace silt (in layers/burrows), poorly graded, subrounded, bioturbated, 6.25' = organic SILT (OL) layer, gray (2.5Y-6/1), (SP).			
-11.9	7.9		Fine to medium quartz SAND, trace fine sand size shell, trace silt, poorly graded, subrounded, 6.9' = organic SILT (OL) rip-up, gray (2.5Y-6/1), (SP).			
-12.2	8.2		Silty fine to medium quartz SAND, little silt, trace fine sand size shell, subrounded, bioturbated, gray (2.5Y-5/1), (SM).			
			End of Boring			

0

5

10

FLORIDA DEP ROSS BALD HEAD CREEK, NC, FEB. '14.GPJ FL DEP ROSS.GDT 3/3/14



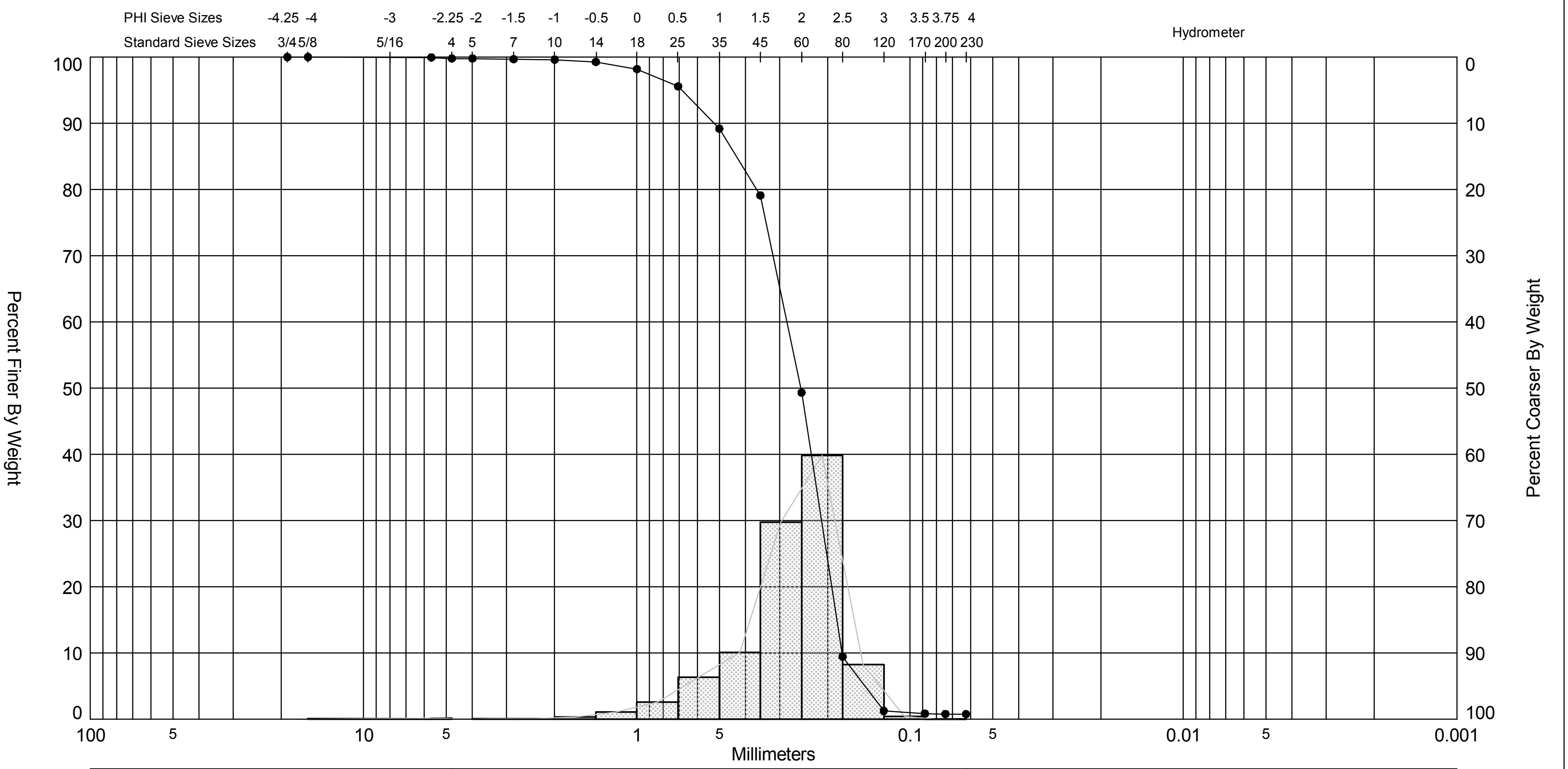
Bald Head Island
North Carolina
BHC-17

February 2014

Scale in Feet
Photo Mosaic Image

ATHENA
TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-17 #1	—●—	-4.0	SP	#200 - 0.79 #230 - 0.77		7.50	1.99	1.84	-1.67	8.54	0.68

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,304,616
Northing (Y, ft):	51,419
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island

Sample Name: BHC-17 #1

Analysis Date: 02-17-14

Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,304,616	51,419	North Carolina State Plane	-4.0 NGVD 29

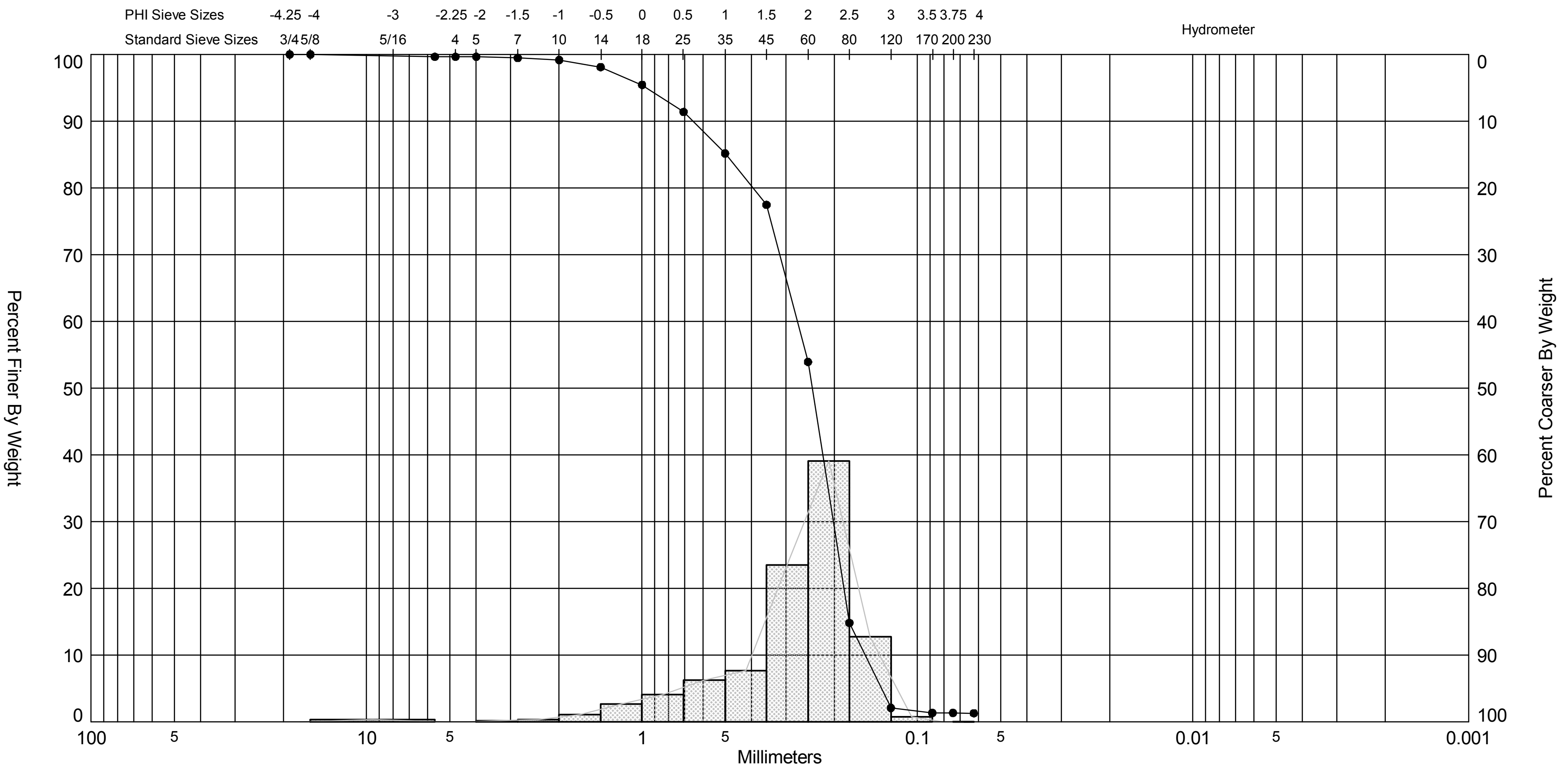
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
124.87	123.90			#200 - 0.79 #230 - 0.77		7.50	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.06	0.05	0.06	99.95
#4	-2.25	4.76	0.20	0.16	0.26	99.79
#5	-2.00	4.00	0.00	0.00	0.26	99.79
#7	-1.50	2.83	0.13	0.10	0.39	99.69
#10	-1.00	2.00	0.10	0.08	0.49	99.61
#14	-0.50	1.41	0.42	0.34	0.91	99.27
#18	0.00	1.00	1.36	1.09	2.27	98.18
#25	0.50	0.71	3.27	2.62	5.54	95.56
#35	1.00	0.50	7.95	6.37	13.49	89.19
#45	1.50	0.35	12.59	10.08	26.08	79.11
#60	2.00	0.25	37.20	29.79	63.28	49.32
#80	2.50	0.18	49.78	39.87	113.06	9.45
#120	3.00	0.13	10.25	8.21	123.31	1.24
#170	3.50	0.09	0.51	0.41	123.82	0.83
#200	3.75	0.07	0.05	0.04	123.87	0.79
#230	4.00	0.06	0.03	0.02	123.90	0.77

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.77	2.42	2.30	1.99	1.57	1.26	0.54

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.84	0.28	0.68	-1.67	8.54



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-17 #Comp	──●──	-4.0	SP	#200 - 1.33 #230 - 1.29		8.50	2.05	1.81	-1.79	8.05	0.86

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,304,616
Northing (Y, ft):	51,419
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

SIEVE ANALYSIS BALD HEAD CREEK, NC, FEB. '14.GPJ FL DEP ROSS.GDT 3/3/14

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island

Sample Name: BHC-17 #Comp

Analysis Date: 02-17-14

Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,304,616	51,419	North Carolina State Plane	-4.0 NGVD 29

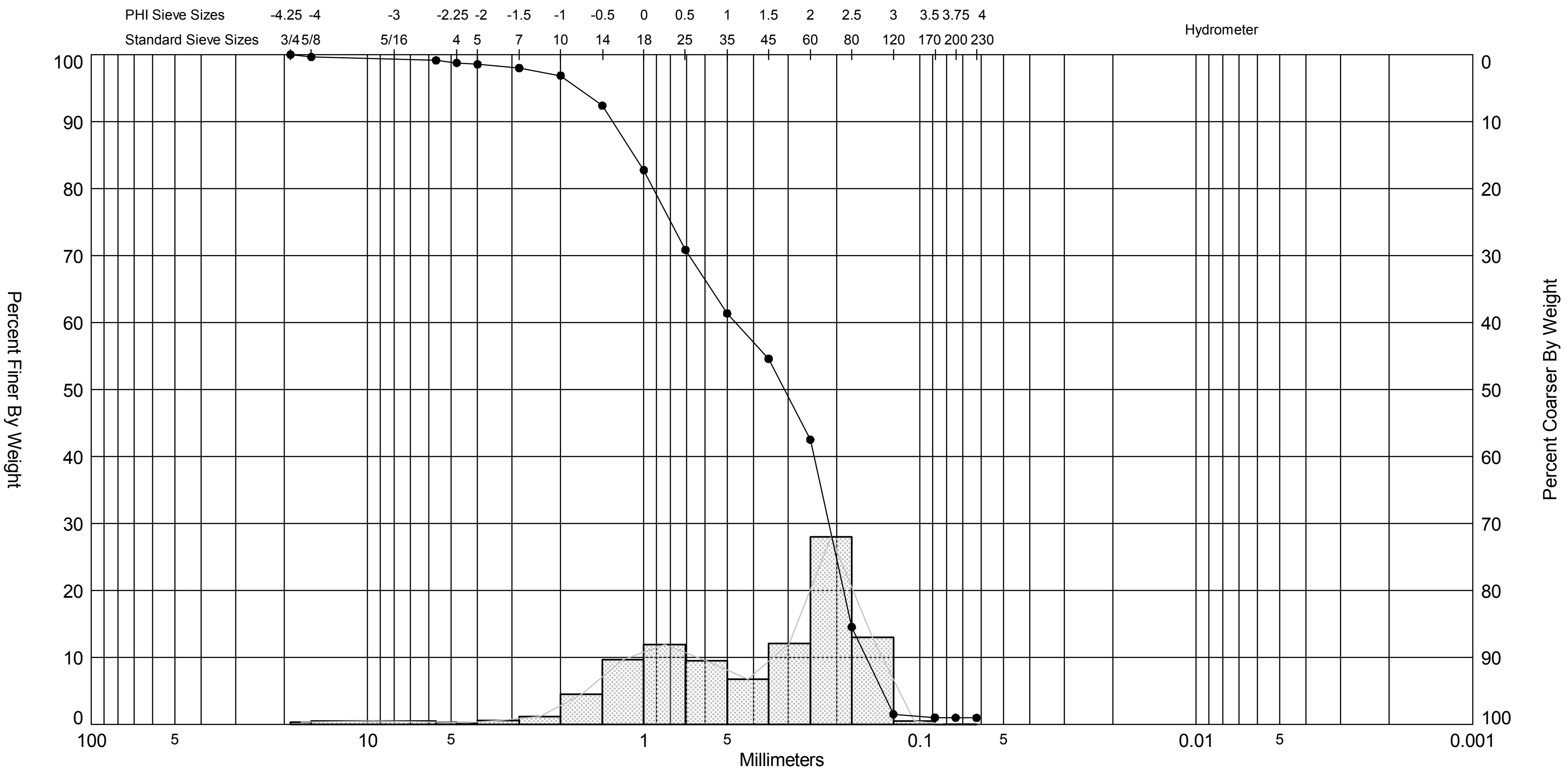
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
121.14	119.59			#200 - 1.33 #230 - 1.29		8.50	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.42	0.35	0.42	99.65
#4	-2.25	4.76	0.00	0.00	0.42	99.65
#5	-2.00	4.00	0.00	0.00	0.42	99.65
#7	-1.50	2.83	0.22	0.18	0.64	99.47
#10	-1.00	2.00	0.36	0.30	1.00	99.17
#14	-0.50	1.41	1.29	1.06	2.29	98.11
#18	0.00	1.00	3.22	2.66	5.51	95.45
#25	0.50	0.71	4.93	4.07	10.44	91.38
#35	1.00	0.50	7.54	6.22	17.98	85.16
#45	1.50	0.35	9.33	7.70	27.31	77.46
#60	2.00	0.25	28.51	23.53	55.82	53.93
#80	2.50	0.18	47.38	39.11	103.20	14.82
#120	3.00	0.13	15.42	12.73	118.62	2.09
#170	3.50	0.09	0.92	0.76	119.54	1.33
#200	3.75	0.07	0.00	0.00	119.54	1.33
#230	4.00	0.06	0.05	0.04	119.59	1.29

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.89	2.48	2.37	2.05	1.55	1.08	0.06

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.81	0.29	0.86	-1.79	8.05



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-17 #2	—●—	-7.6	SP	#200 - 0.98 #230 - 0.96		13.70	1.69	1.29	-0.92	3.84	1.26

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,304,616
Northing (Y, ft):	51,419
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island

Sample Name: BHC-17 #2

Analysis Date: 02-17-14

Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,304,616	51,419	North Carolina State Plane	-7.6 NGVD 29

USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
120.83	119.67			#200 - 0.98 #230 - 0.96		13.70	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.42	0.35	0.42	99.65
#3.5	-2.50	5.66	0.62	0.51	1.04	99.14
#4	-2.25	4.76	0.45	0.37	1.49	98.77
#5	-2.00	4.00	0.27	0.22	1.76	98.55
#7	-1.50	2.83	0.66	0.55	2.42	98.00
#10	-1.00	2.00	1.36	1.13	3.78	96.87
#14	-0.50	1.41	5.43	4.49	9.21	92.38
#18	0.00	1.00	11.65	9.64	20.86	82.74
#25	0.50	0.71	14.37	11.89	35.23	70.85
#35	1.00	0.50	11.45	9.48	46.68	61.37
#45	1.50	0.35	8.19	6.78	54.87	54.59
#60	2.00	0.25	14.58	12.07	69.45	42.52
#80	2.50	0.18	33.82	27.99	103.27	14.53
#120	3.00	0.13	15.73	13.02	119.00	1.51
#170	3.50	0.09	0.61	0.50	119.61	1.01
#200	3.75	0.07	0.04	0.03	119.65	0.98
#230	4.00	0.06	0.02	0.02	119.67	0.96

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.87	2.47	2.31	1.69	0.33	-0.07	-0.79

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.29	0.41	1.26	-0.92	3.84

Boring Designation BHC-18

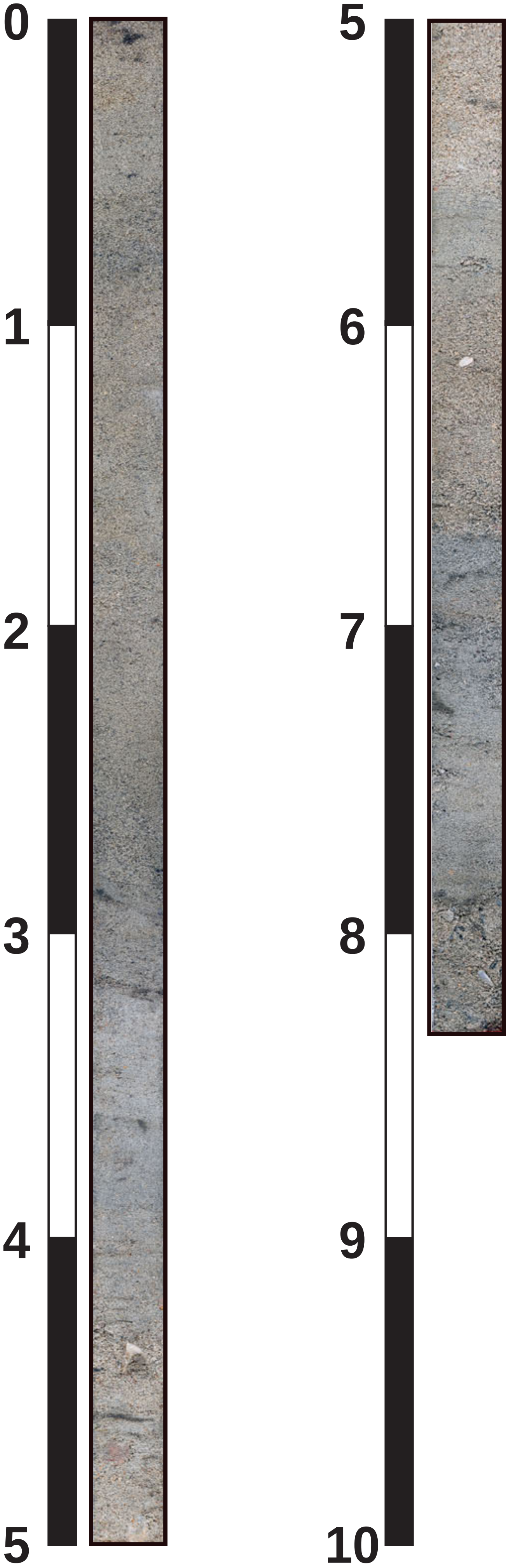
DRILLING LOG

DIVISION: Olsen Associates, Inc.
INSTALLATION: Jacksonville, Florida
SHEET 1 OF 1 SHEETS

1. PROJECT: Village of Bald Head Island
Geotechnical Investigation of Bald Head Creek
2. BORING DESIGNATION: BHC-18
LOCATION COORDINATES: X = 2,304,962 Y = 51,262
3. DRILLING AGENCY: Athena Technologies, Inc.
CONTRACTOR FILE NO.:
4. NAME OF DRILLER: P. McClellan
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL:
BEARING:
6. THICKNESS OF OVERBURDEN: 0.0 Ft.
7. DEPTH DRILLED INTO ROCK: 0.0 Ft.
8. TOTAL DEPTH OF BORING: 10.0 Ft.
9. SIZE AND TYPE OF BIT: 3.0 In.
10. COORDINATE SYSTEM/DATUM: North Carolina State Plane
HORIZONTAL: NAD 1983
VERTICAL: NGVD 29
11. MANUFACTURER'S DESIGNATION OF DRILL: ☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES: DISTURBED 1; UNDISTURBED (UD) 2
13. TOTAL NUMBER CORE BOXES:
14. ELEVATION GROUND WATER: 3.0 Ft.
15. DATE BORING: STARTED 02-04-14 08:51; COMPLETED 02-04-14 09:31
16. ELEVATION TOP OF BORING: -3.0 Ft.
17. TOTAL RECOVERY FOR BORING: 8.3 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR: A. Freeze

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-3.0	0.0					
-5.8	2.8	⁙	Medium quartz SAND, few fine sand size shell, trace silt (in rip-ups), poorly graded, subrounded, light brownish gray (2.5Y-6/2), (SP).		1 Comp	Sample #1, Depth = 0.0' - 0.4' Mean (mm): 0.37, Phi Sorting: 0.85 Carbonate: 8.9%, Fines (230): 0.75% (SP) Sample #Comp, Depth = 0.0' - 5.0' Mean (mm): 0.32, Phi Sorting: 0.91 Carbonate: 8.4%, Fines (230): 0.91% (SP)
-7.3	4.3	⁙	Fine to medium quartz SAND, trace silt (in burrows), trace fine sand size shell, poorly graded, subrounded, bioturbated, gray (2.5Y-6/1), (SP).			
-8.6	5.6	⁙	Medium quartz SAND, little medium sand size shell, poorly graded, subrounded, gravel size shell present, 4.55 - 4.85' = fine to medium quartz SAND layer with trace silt, pale yellow (2.5Y-7/3), (SP).		2	Sample #2, Depth = 4.6' - 5.0' Mean (mm): 0.38, Phi Sorting: 1.19 Carbonate: 12.4%, Fines (230): 1.31% (SP)
-9.7	6.7	⁙	Fine grading to medium quartz SAND, few medium sand size shell, poorly graded, subrounded, light brownish gray (2.5Y-6/2), (SP).			
-10.9	7.9	⁙	Fine to medium quartz SAND, few medium sand size shell, trace silt, poorly graded, subrounded, bioturbated, gray (2.5Y-6/1), (SP).			
-11.3	8.3	⁙	Medium quartz SAND, little medium to coarse sand size shell, trace gravel size shell, poorly graded, subrounded, grayish brown (2.5Y-5/2), (SP).			
			End of Boring			

FLORIDA DEP ROSS BALD HEAD CREEK, NC, FEB. '14.GPJ FL DEP ROSS.GDT 3/3/14



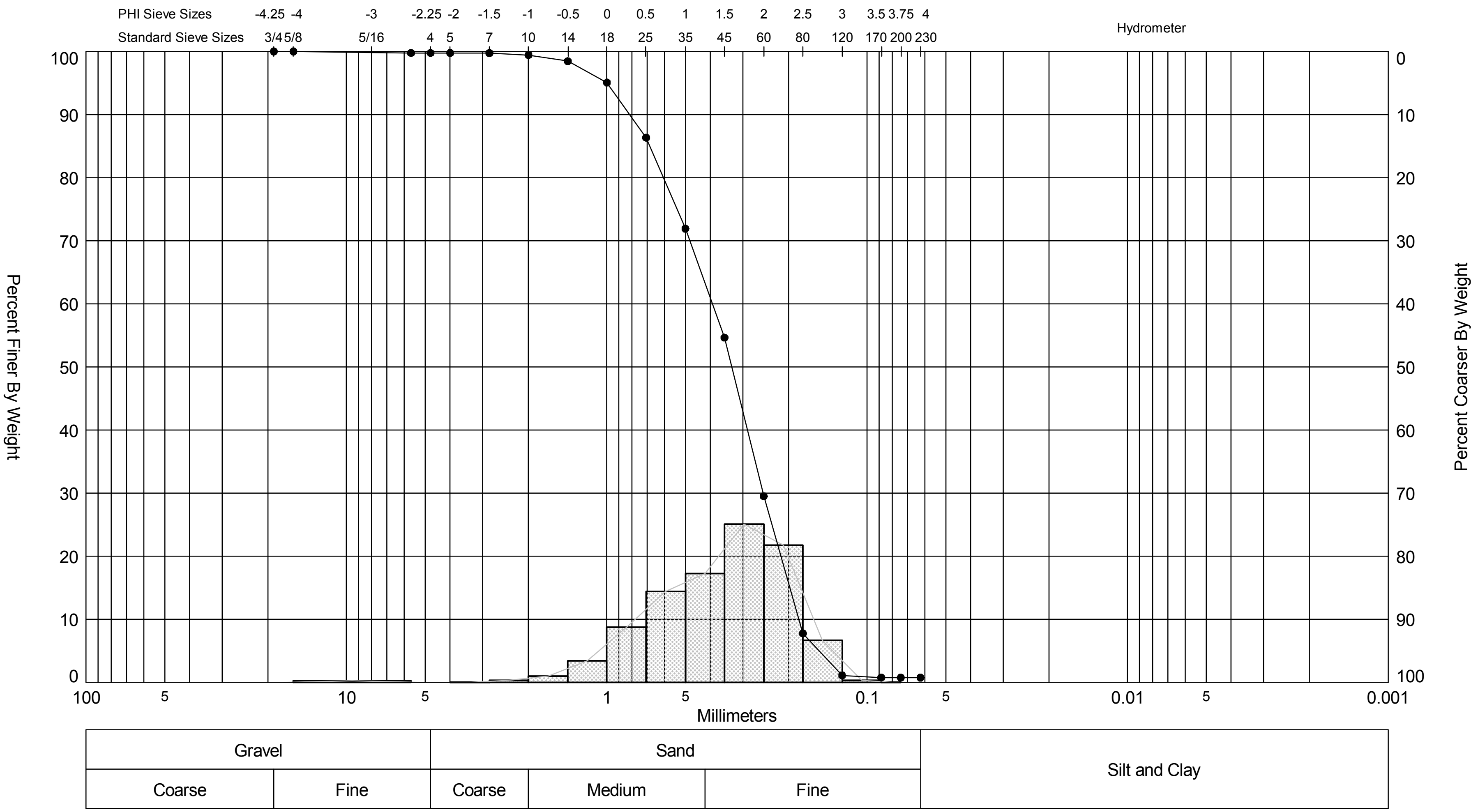
Bald Head Island
North Carolina
BHC-18

February 2014

Scale in Feet
Photo Mosaic Image

ATHENA
TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-18 #1	—●—	-3.0	SP	#200 - 0.75 #230 - 0.75		8.90	1.59	1.45	-0.82	4.62	0.85

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,304,962
Northing (Y, ft):	51,262
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island
Sample Name: BHC-18 #1
Analysis Date: 02-17-14
Analyzed By: CRM Sr.

ATHENA
TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,304,962	51,262	North Carolina State Plane	-3.0 NGVD 29

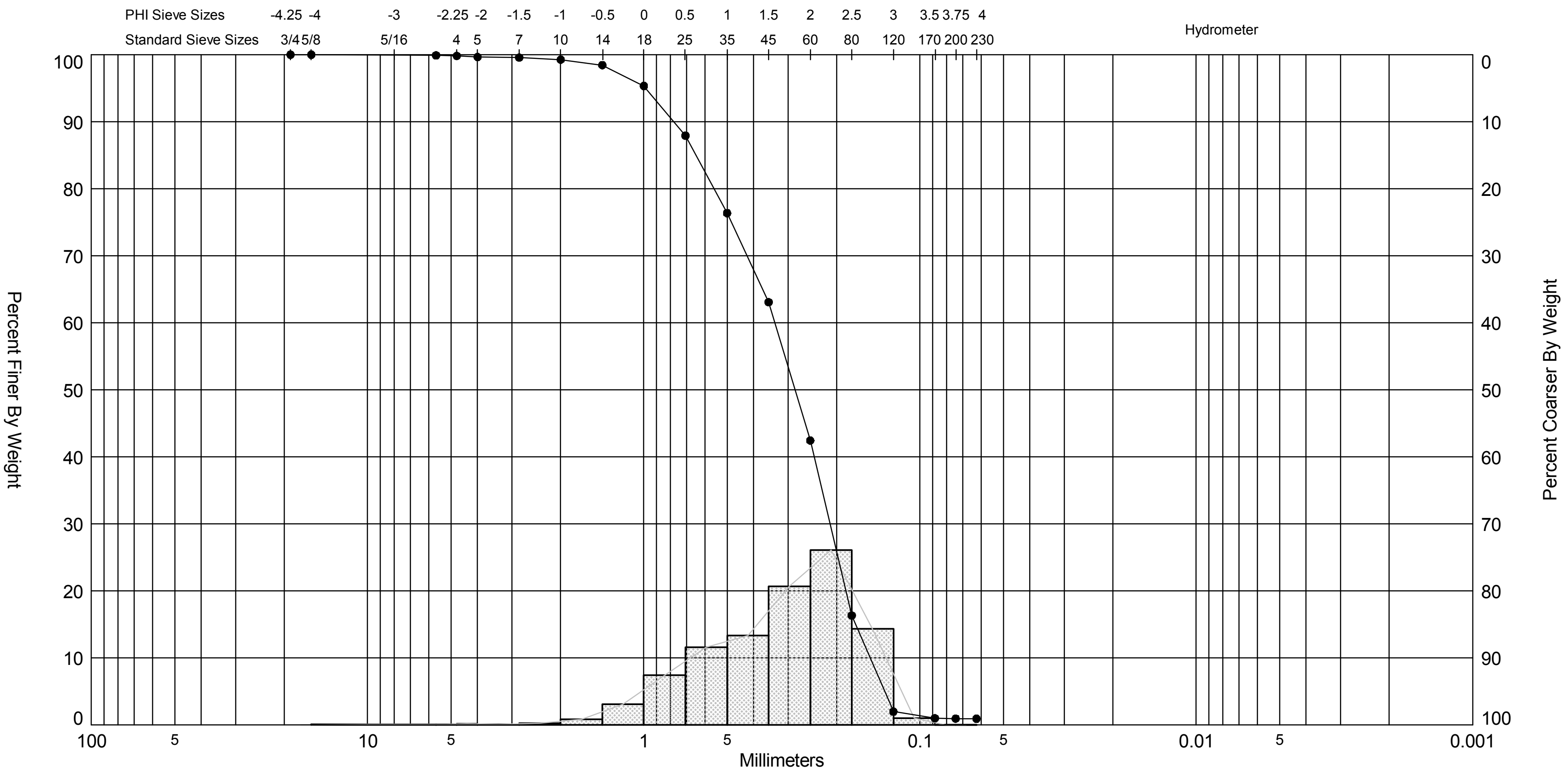
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
124.39	123.47			#200 - 0.75 #230 - 0.75		8.90	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.28	0.23	0.28	99.77
#4	-2.25	4.76	0.00	0.00	0.28	99.77
#5	-2.00	4.00	0.00	0.00	0.28	99.77
#7	-1.50	2.83	0.02	0.02	0.30	99.75
#10	-1.00	2.00	0.39	0.31	0.69	99.44
#14	-0.50	1.41	1.22	0.98	1.91	98.46
#18	0.00	1.00	4.22	3.39	6.13	95.07
#25	0.50	0.71	10.85	8.72	16.98	86.35
#35	1.00	0.50	17.95	14.43	34.93	71.92
#45	1.50	0.35	21.51	17.29	56.44	54.63
#60	2.00	0.25	31.25	25.12	87.69	29.51
#80	2.50	0.18	27.04	21.74	114.73	7.77
#120	3.00	0.13	8.29	6.66	123.02	1.11
#170	3.50	0.09	0.42	0.34	123.44	0.77
#200	3.75	0.07	0.03	0.02	123.47	0.75
#230	4.00	0.06	0.00	0.00	123.47	0.75

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.71	2.31	2.10	1.59	0.89	0.58	0.00

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.45	0.37	0.85	-0.82	4.62



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-18 #Comp	—●—	-3.0	SP	#200 - 0.94 #230 - 0.91		8.40	1.82	1.64	-0.91	4.22	0.91

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,304,962
Northing (Y, ft):	51,262
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

ATHENA
TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island
Sample Name: BHC-18 #Comp
Analysis Date: 02-17-14
Analyzed By: CRM Sr.

ATHENA
TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,304,962	51,262	North Carolina State Plane	-3.0 NGVD 29

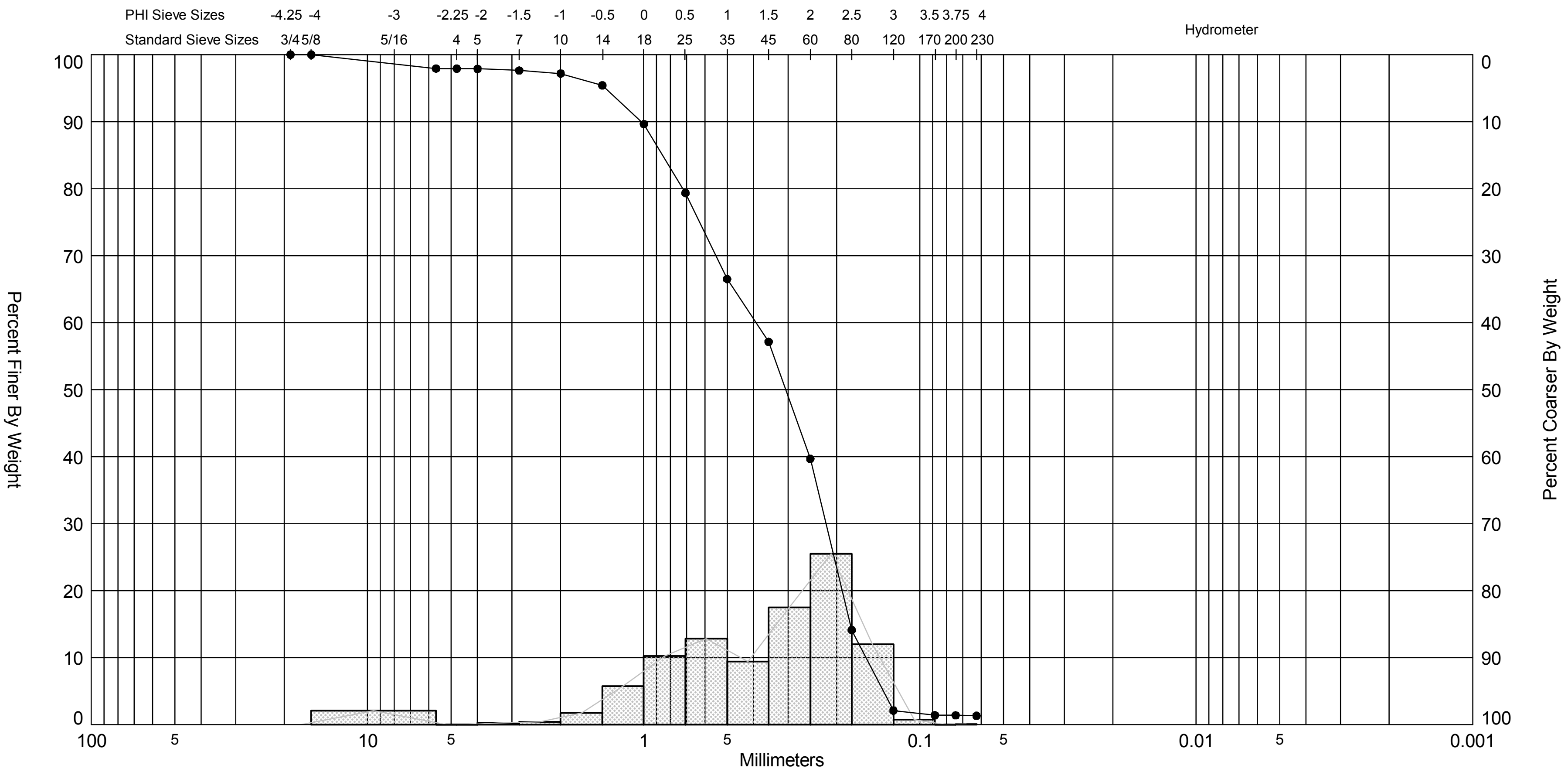
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
124.80	123.67			#200 - 0.94 #230 - 0.91		8.40	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.14	0.11	0.14	99.89
#4	-2.25	4.76	0.09	0.07	0.23	99.82
#5	-2.00	4.00	0.21	0.17	0.44	99.65
#7	-1.50	2.83	0.11	0.09	0.55	99.56
#10	-1.00	2.00	0.36	0.29	0.91	99.27
#14	-0.50	1.41	1.02	0.82	1.93	98.45
#18	0.00	1.00	3.90	3.13	5.83	95.33
#25	0.50	0.71	9.26	7.42	15.09	87.91
#35	1.00	0.50	14.41	11.55	29.50	76.36
#45	1.50	0.35	16.60	13.30	46.10	63.06
#60	2.00	0.25	25.75	20.63	71.85	42.43
#80	2.50	0.18	32.59	26.11	104.44	16.32
#120	3.00	0.13	17.91	14.35	122.35	1.97
#170	3.50	0.09	1.23	0.99	123.58	0.98
#200	3.75	0.07	0.05	0.04	123.63	0.94
#230	4.00	0.06	0.04	0.03	123.67	0.91

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.89	2.51	2.33	1.82	1.05	0.67	0.02

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.64	0.32	0.91	-0.91	4.22



<table>
<tr><th colspan="2">Gravel</th><th colspan="3">Sand</th><th rowspan="2">Silt and Clay</th></tr>
<tr><th>Coarse</th><th>Fine</th><th>Coarse</th><th>Medium</th><th>Fine</th></tr>
</table>

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-18 #2	—●—	-7.6	SP	#200 - 1.38 #230 - 1.31		12.40	1.7	1.39	-1.4	5.96	1.19

Comments:

Depths and elevations based on measured values

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,304,962
Northing (Y, ft):	51,262
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island

Sample Name: BHC-18 #2

Analysis Date: 02-17-14

Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,304,962	51,262	North Carolina State Plane	-7.6 NGVD 29

USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
129.85	128.15			#200 - 1.38 #230 - 1.31		12.40	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	2.67	2.06	2.67	97.94
#4	-2.25	4.76	0.03	0.02	2.70	97.92
#5	-2.00	4.00	0.05	0.04	2.75	97.88
#7	-1.50	2.83	0.33	0.25	3.08	97.63
#10	-1.00	2.00	0.57	0.44	3.65	97.19
#14	-0.50	1.41	2.31	1.78	5.96	95.41
#18	0.00	1.00	7.51	5.78	13.47	89.63
#25	0.50	0.71	13.34	10.27	26.81	79.36
#35	1.00	0.50	16.67	12.84	43.48	66.52
#45	1.50	0.35	12.19	9.39	55.67	57.13
#60	2.00	0.25	22.69	17.47	78.36	39.66
#80	2.50	0.18	33.16	25.54	111.52	14.12
#120	3.00	0.13	15.60	12.01	127.12	2.11
#170	3.50	0.09	0.93	0.72	128.05	1.39
#200	3.75	0.07	0.01	0.01	128.06	1.38
#230	4.00	0.06	0.09	0.07	128.15	1.31

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.88	2.46	2.29	1.70	0.67	0.27	-0.46

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.39	0.38	1.19	-1.4	5.96

Boring Designation BHC-19

DRILLING LOG

DIVISION
Olsen Associates, Inc.

INSTALLATION
Jacksonville, Florida

SHEET 1
OF 1 SHEETS

1. PROJECT
Village of Bald Head Island
Geotechnical Investigation of Bald Head Creek

2. BORING DESIGNATION
BHC-19

LOCATION COORDINATES
X = 2,305,197 Y = 50,952

3. DRILLING AGENCY
Athena Technologies, Inc.

CONTRACTOR FILE NO.

4. NAME OF DRILLER
P. McClellan

5. DIRECTION OF BORING
☒ VERTICAL
☐ INCLINED

DEG. FROM VERTICAL

BEARING

6. THICKNESS OF OVERBURDEN 0.0 Ft.

7. DEPTH DRILLED INTO ROCK 0.0 Ft.

8. TOTAL DEPTH OF BORING 9.0 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM
North Carolina State Plane

HORIZONTAL
NAD 1983

VERTICAL
NGVD 29

11. MANUFACTURER'S DESIGNATION OF DRILL
☐ AUTO HAMMER
☐ MANUAL HAMMER

12. TOTAL SAMPLES
DISTURBED 1
UNDISTURBED (UD) 2

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER 4.7 Ft.

15. DATE BORING
STARTED 02-04-14 11:34
COMPLETED 02-04-14 11:55

16. ELEVATION TOP OF BORING -1.8 Ft.

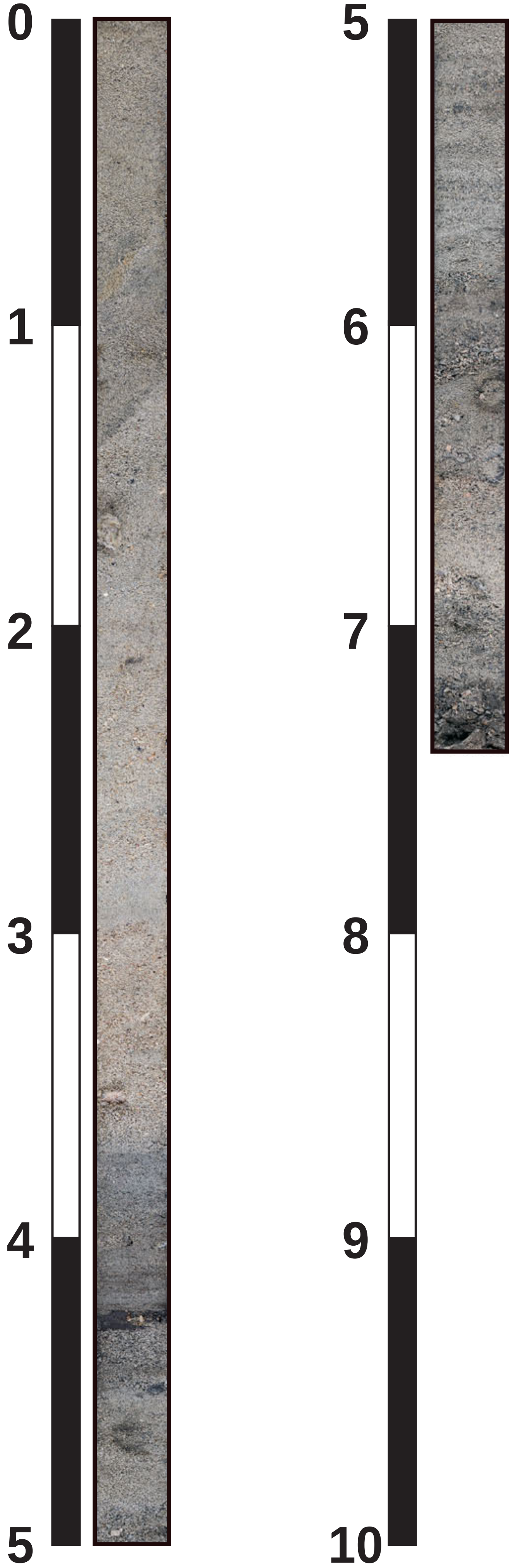
17. TOTAL RECOVERY FOR BORING 7.4 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
A. Freeze

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-1.8	0.0					
			Medium quartz SAND, few medium sand size shell, trace silt, poorly graded, subrounded, bioturbated, 2.8 - 3.0' = layer of fine quartz SAND with trace fine sand size shell, color grades to light gray (2.5Y 7/2), light brownish gray (2.5Y-6/2), (SP).		1 Comp	Sample #1, Depth = 0.0' - 0.4' Mean (mm): 0.34, Phi Sorting: 0.80 Carbonate: 8.7%, Fines (230): 0.98% (SP) Sample #Comp, Depth = 0.0' - 6.2' Mean (mm): 0.53, Phi Sorting: 1.08 Carbonate: 17.6%, Fines (230): 1.34% (SP)
-5.5	3.7					
-6.1	4.3		Fine to medium quartz SAND, few silt (in layers), few fine sand size shell, poorly graded, subrounded, gray (2.5Y-5/1), (SP-SM).			
			Medium quartz SAND, few medium to coarse sand size shell, few silt (in burrows), trace gravel size shell, poorly graded, subrounded, bioturbated, 6.2' = Callianassa major burrow trace, gray (2.5Y-6/1), (SP).		2	Sample #2, Depth = 5.8' - 6.2' Mean (mm): 0.53, Phi Sorting: 1.50 Carbonate: 21.3%, Fines (230): 1.47% (SP)
-9.0	7.2					
-9.2	7.4		Silty medium quartz SAND, some coarse sand to gravel size shell, little silt, subrounded, dark gray (2.5Y-4/1), (SM).			
			End of Boring			

0
5
10

FLORIDA DEP ROSS BALD HEAD CREEK, NC, FEB. '14.GPJ FL DEP ROSS.GDT 3/3/14



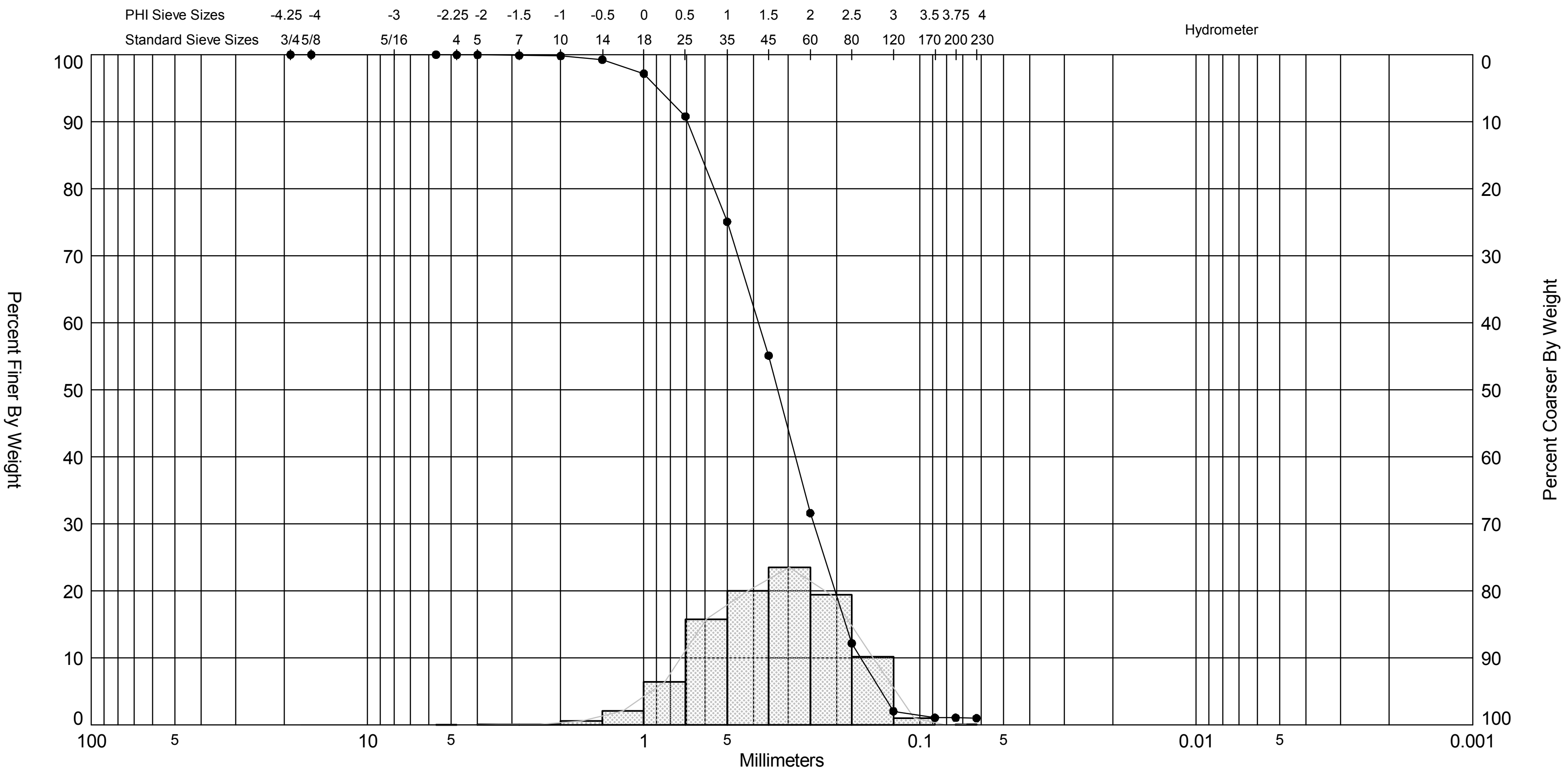
Bald Head Island
North Carolina
BHC-19

February 2014

Scale in Feet
Photo Mosaic Image

ATHENA
TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-19 #1	—●—	-1.8	SP	#200 - 1.05 #230 - 0.98		8.70	1.61	1.55	-0.36	3.06	0.8

Comments:

Depths and elevations based on measured values

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,305,197
Northing (Y, ft):	50,952
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island

Sample Name: BHC-19 #1

Analysis Date: 02-17-14

Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,305,197	50,952	North Carolina State Plane	-1.8 NGVD 29

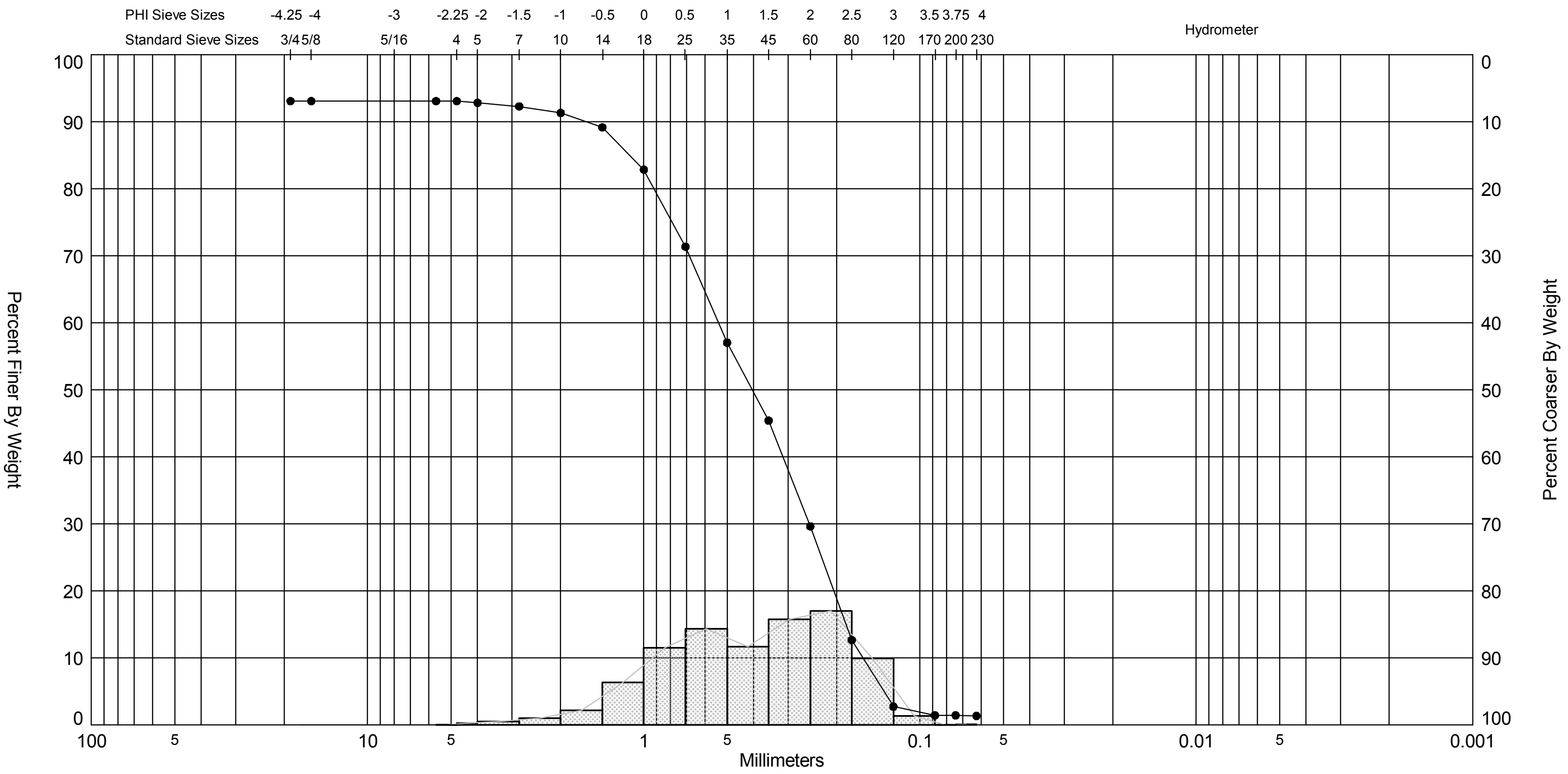
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
122.31	121.10			#200 - 1.05 #230 - 0.98		8.70	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.00	0.00	0.00	100.00
#4	-2.25	4.76	0.04	0.03	0.04	99.97
#5	-2.00	4.00	0.00	0.00	0.04	99.97
#7	-1.50	2.83	0.11	0.09	0.15	99.88
#10	-1.00	2.00	0.10	0.08	0.25	99.80
#14	-0.50	1.41	0.67	0.55	0.92	99.25
#18	0.00	1.00	2.54	2.08	3.46	97.17
#25	0.50	0.71	7.80	6.38	11.26	90.79
#35	1.00	0.50	19.23	15.72	30.49	75.07
#45	1.50	0.35	24.43	19.97	54.92	55.10
#60	2.00	0.25	28.74	23.50	83.66	31.60
#80	2.50	0.18	23.76	19.43	107.42	12.17
#120	3.00	0.13	12.40	10.14	119.82	2.03
#170	3.50	0.09	1.20	0.98	121.02	1.05
#200	3.75	0.07	0.00	0.00	121.02	1.05
#230	4.00	0.06	0.08	0.07	121.10	0.98

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.85	2.40	2.17	1.61	1.00	0.72	0.17

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.55	0.34	0.8	-0.36	3.06



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-19 #Comp	─●─	-1.8	SP	#200 - 1.41 #230 - 1.34		17.60	1.3	0.91	0.66	2.4	1.08

Comments:

Depths and elevations based on measured values

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,305,197
Northing (Y, ft):	50,952
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island
Sample Name: BHC-19 #Comp
Analysis Date: 02-17-14
Analyzed By: CRM Sr.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,305,197	50,952	North Carolina State Plane	-1.8 NGVD 29

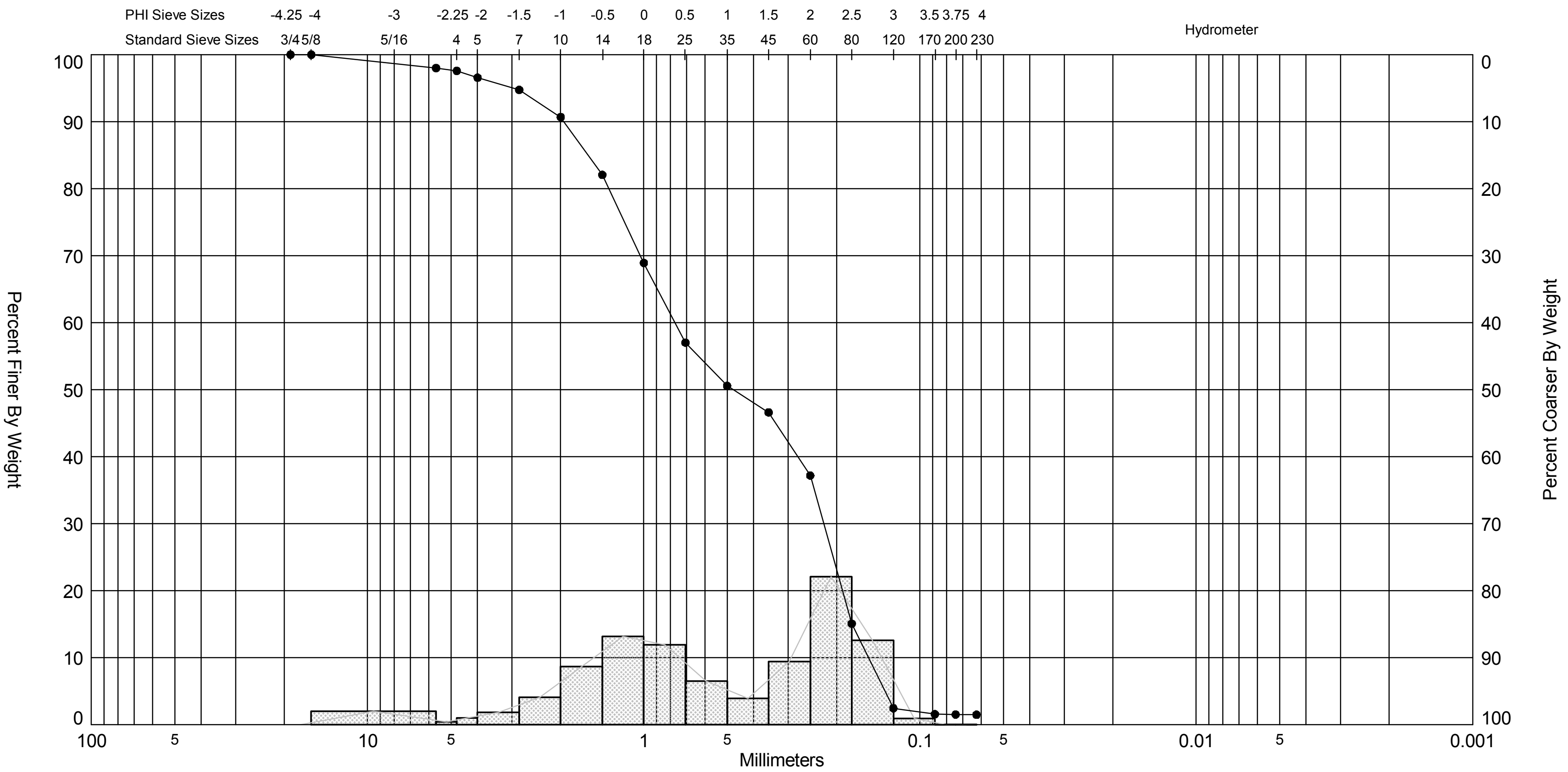
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
135.69	133.89			#200 - 1.41 #230 - 1.34		17.60	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		6.93	9.40	93.07
5/8"	-4.00	16.00	0.00	0.00	9.40	93.07
#3.5	-2.50	5.66	0.00	0.00	9.40	93.07
#4	-2.25	4.76	0.01	0.01	9.41	93.06
#5	-2.00	4.00	0.33	0.24	9.74	92.82
#7	-1.50	2.83	0.72	0.53	10.46	92.29
#10	-1.00	2.00	1.33	0.98	11.79	91.31
#14	-0.50	1.41	2.93	2.16	14.72	89.15
#18	0.00	1.00	8.55	6.30	23.27	82.85
#25	0.50	0.71	15.61	11.50	38.88	71.35
#35	1.00	0.50	19.43	14.32	58.31	57.03
#45	1.50	0.35	15.80	11.64	74.11	45.39
#60	2.00	0.25	21.40	15.77	95.51	29.62
#80	2.50	0.18	23.02	16.97	118.53	12.65
#120	3.00	0.13	13.48	9.93	132.01	2.72
#170	3.50	0.09	1.77	1.30	133.78	1.42
#200	3.75	0.07	0.01	0.01	133.79	1.41
#230	4.00	0.06	0.10	0.07	133.89	1.34

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.89	2.40	2.14	1.30	0.34	-0.09	

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	0.91	0.53	1.08	0.66	2.4



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-19 #2	—●—	-7.6	SP	#200 - 1.51 #230 - 1.47		21.30	1.07	0.91	-0.52	2.5	1.5

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,305,197
Northing (Y, ft):	50,952
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island
Sample Name: BHC-19 #2
Analysis Date: 02-17-14
Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,305,197	50,952	North Carolina State Plane	-7.6 NGVD 29

USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
134.88	132.89			#200 - 1.51 #230 - 1.47		21.30	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	2.70	2.00	2.70	98.00
#4	-2.25	4.76	0.55	0.41	3.25	97.59
#5	-2.00	4.00	1.39	1.03	4.64	96.56
#7	-1.50	2.83	2.45	1.82	7.09	94.74
#10	-1.00	2.00	5.46	4.05	12.55	90.69
#14	-0.50	1.41	11.65	8.64	24.20	82.05
#18	0.00	1.00	17.74	13.15	41.94	68.90
#25	0.50	0.71	16.02	11.88	57.96	57.02
#35	1.00	0.50	8.73	6.47	66.69	50.55
#45	1.50	0.35	5.31	3.94	72.00	46.61
#60	2.00	0.25	12.72	9.43	84.72	37.18
#80	2.50	0.18	29.82	22.11	114.54	15.07
#120	3.00	0.13	17.02	12.62	131.56	2.45
#170	3.50	0.09	1.21	0.90	132.77	1.55
#200	3.75	0.07	0.06	0.04	132.83	1.51
#230	4.00	0.06	0.06	0.04	132.89	1.47

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.90	2.48	2.28	1.07	-0.23	-0.61	-1.57

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	0.91	0.53	1.5	-0.52	2.5

Boring Designation BHC-20

DRILLING LOG

DIVISION: Olsen Associates, Inc.

INSTALLATION: Jacksonville, Florida

SHEET 1 OF 1 SHEETS

1. PROJECT
Village of Bald Head Island
Geotechnical Investigation of Bald Head Creek

2. BORING DESIGNATION: BHC-20
LOCATION COORDINATES: X = 2,305,532 Y = 51,170

3. DRILLING AGENCY: Athena Technologies, Inc.
CONTRACTOR FILE NO.:

4. NAME OF DRILLER: P. McClellan

5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL:
BEARING:

6. THICKNESS OF OVERBURDEN: 0.0 Ft.

7. DEPTH DRILLED INTO ROCK: 0.0 Ft.

8. TOTAL DEPTH OF BORING: 10.0 Ft.

9. SIZE AND TYPE OF BIT: 3.0 In.

10. COORDINATE SYSTEM/DATUM: North Carolina State Plane
HORIZONTAL: NAD 1983
VERTICAL: NGVD 29

11. MANUFACTURER'S DESIGNATION OF DRILL: ☐ AUTO HAMMER ☐ MANUAL HAMMER

12. TOTAL SAMPLES: DISTURBED 1, UNDISTURBED (UD) 2

13. TOTAL NUMBER CORE BOXES:

14. ELEVATION GROUND WATER: 4.0 Ft.

15. DATE BORING: STARTED 02-04-14 11:01, COMPLETED 02-04-14 11:21

16. ELEVATION TOP OF BORING: -1.4 Ft.

17. TOTAL RECOVERY FOR BORING: 8.1 Ft.

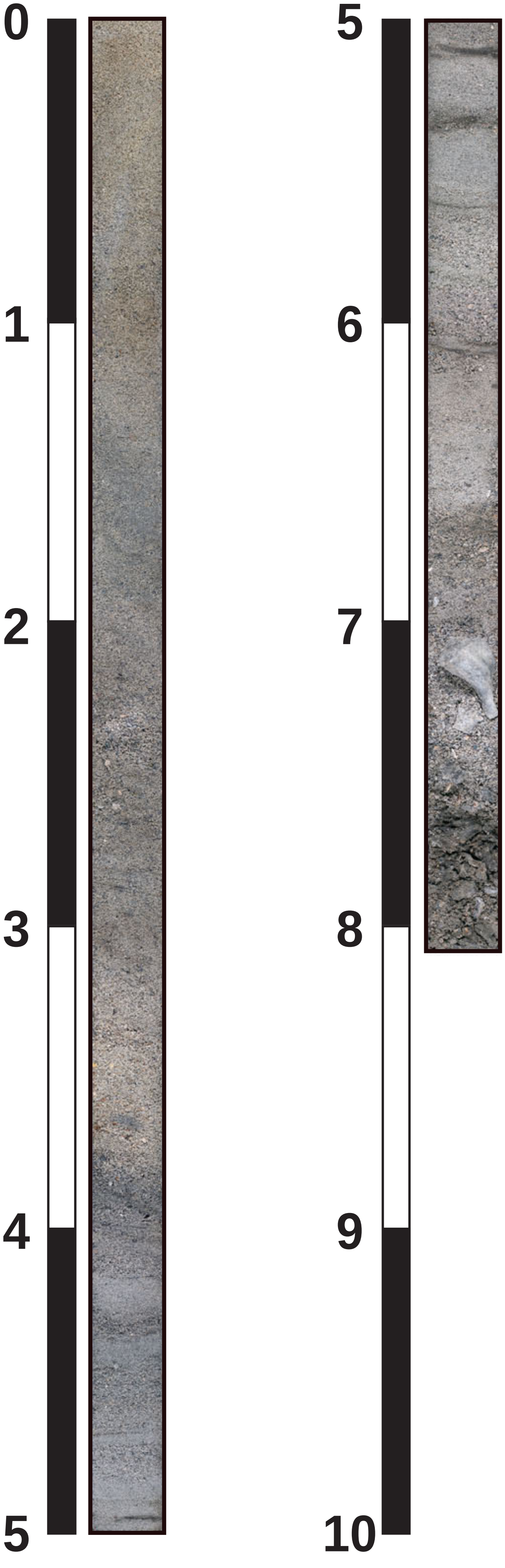
18. SIGNATURE AND TITLE OF INSPECTOR: A. Freeze

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-1.4	0.0					
-5.2	3.8		Medium quartz SAND, few medium sand size shell, trace silt (in burrows), poorly graded, subrounded, bioturbated, light brownish gray (2.5Y-6/2), (SP).		1 Comp	Sample #1, Depth = 0.0' - 0.4' Mean (mm): 0.42, Phi Sorting: 0.83 Carbonate: 8.3%, Fines (230): 0.66% (SP) Sample #Comp, Depth = 0.0' - 6.6' Mean (mm): 0.38, Phi Sorting: 1.11 Carbonate: 11.7%, Fines (230): 0.99% (SP)
-8.1	6.7		Fine to medium quartz SAND, few fine to medium sand size shell, trace silt (in layers), poorly graded, subrounded, gray (2.5Y-6/1), (SP).		2	Sample #2, Depth = 6.2' - 6.6' Mean (mm): 0.35, Phi Sorting: 1.15 Carbonate: 12.6%, Fines (230): 1.27% (SP)
-8.4	7.0		Medium quartz SAND, few medium to coarse sand size shell, few silt, poorly graded, subrounded, bioturbated, gray (2.5Y-5/1), (SP-SM).			
-9.0	7.6		Medium quartz SAND, little coarse sand size shell, trace silt / gravel size shell, poorly graded, subrounded, gray (2.5Y-6/1), (SP).			
-9.5	8.1		Silty medium quartz SAND, some coarse sand to gravel size shell, little silt, subrounded, dark gray (2.5Y-4/1), (SM).			
			End of Boring			

0
5
10

FLORIDA DEP ROSS BALD HEAD CREEK, NC, FEB. '14.GPJ FL DEP ROSS.GDT 3/3/14

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



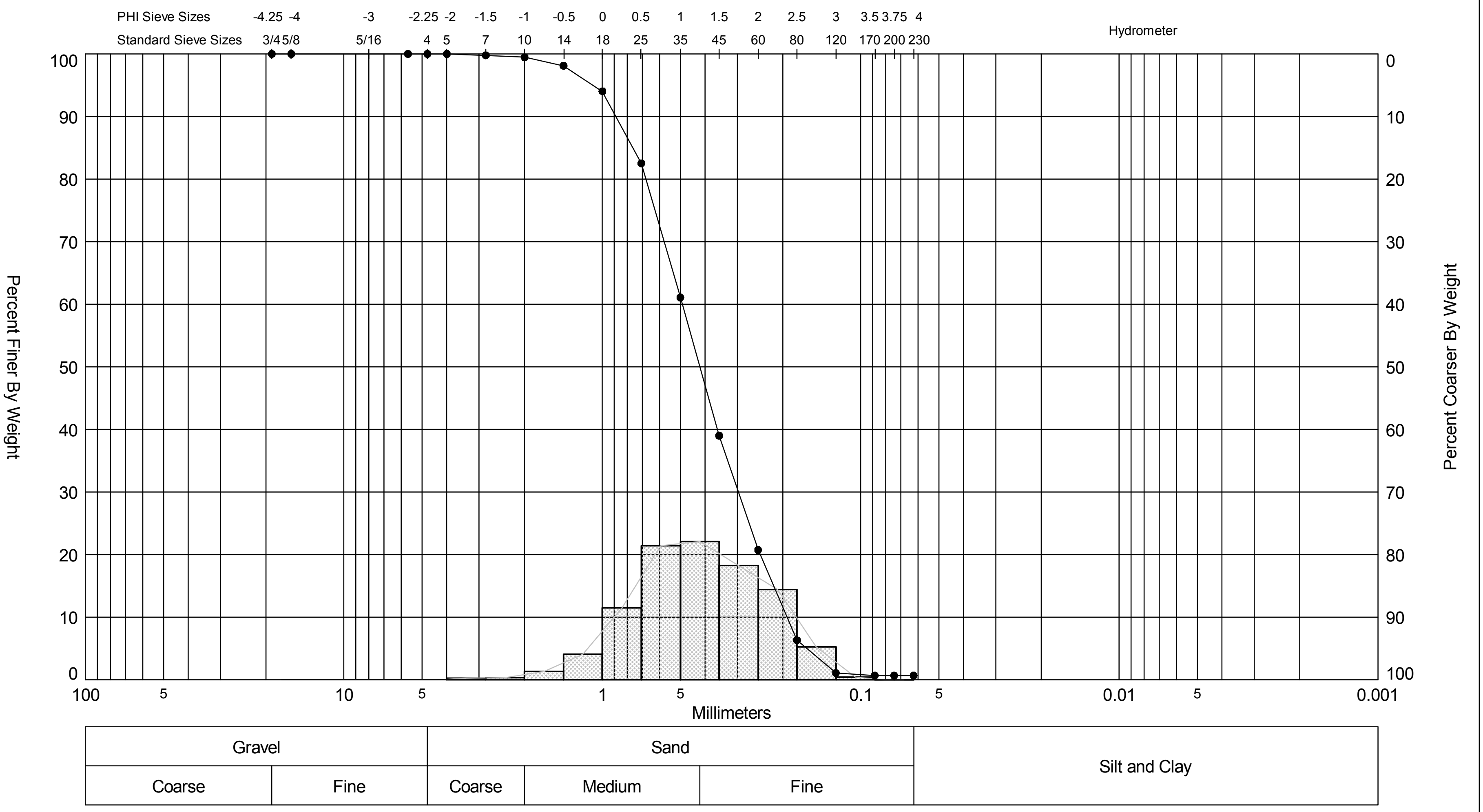
Bald Head Island
North Carolina
BHC-20

February 2014

Scale in Feet
Photo Mosaic Image

ATHENA
TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-20 #1	—●—	-1.4	SP	#200 - 0.67 #230 - 0.66		8.30	1.25	1.25	-0.2	2.89	0.83

Comments:

Depths and elevations based on measured values

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,305,532
Northing (Y, ft):	51,170
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island

Sample Name: BHC-20 #1

Analysis Date: 02-17-14

Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,305,532	51,170	North Carolina State Plane	-1.4 NGVD 29

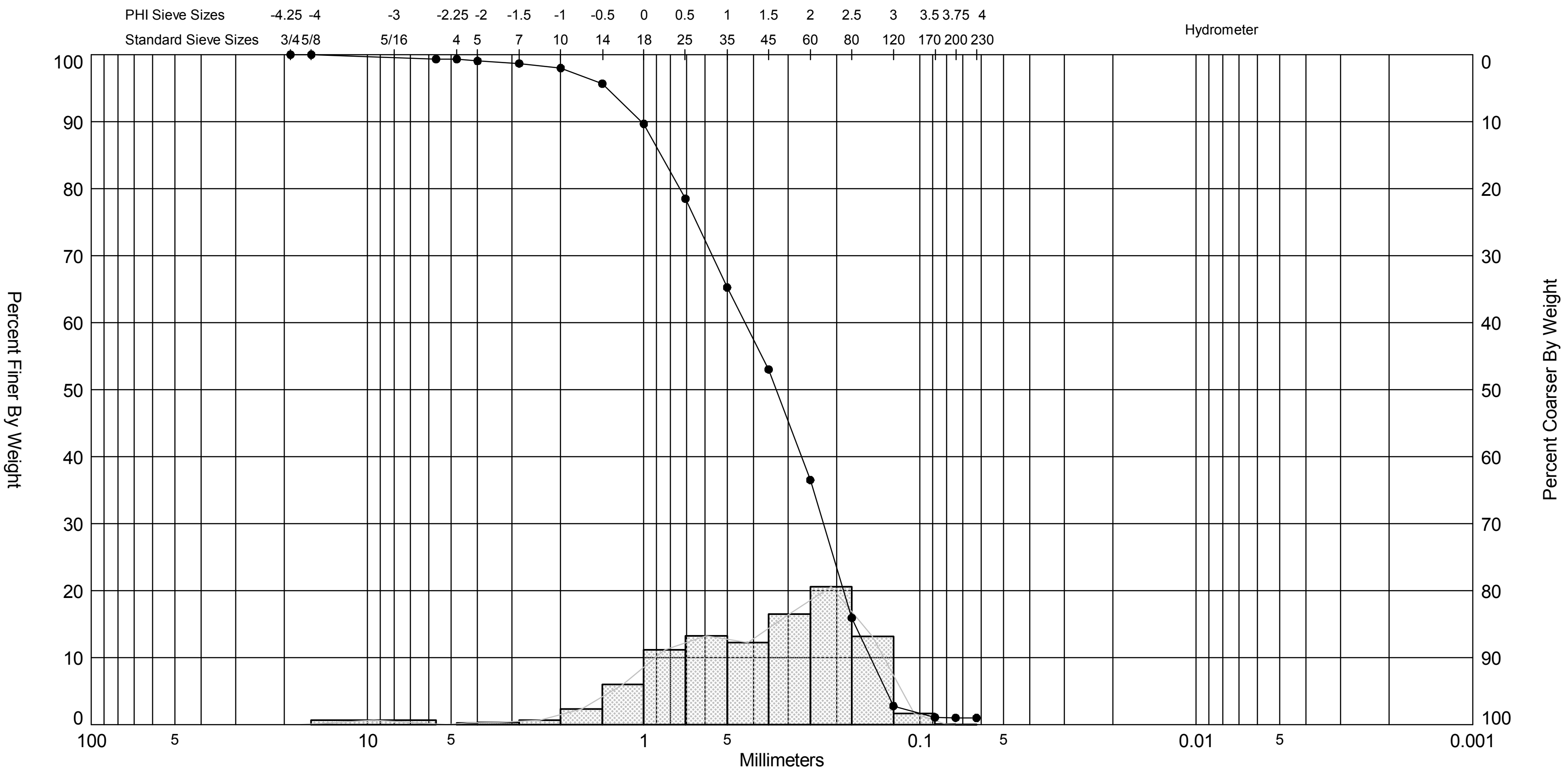
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
136.30	135.41			#200 - 0.67 #230 - 0.66		8.30	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.00	0.00	0.00	100.00
#4	-2.25	4.76	0.00	0.00	0.00	100.00
#5	-2.00	4.00	0.00	0.00	0.00	100.00
#7	-1.50	2.83	0.29	0.21	0.29	99.79
#10	-1.00	2.00	0.45	0.33	0.74	99.46
#14	-0.50	1.41	1.84	1.35	2.58	98.11
#18	0.00	1.00	5.55	4.07	8.13	94.04
#25	0.50	0.71	15.69	11.51	23.82	82.53
#35	1.00	0.50	29.23	21.45	53.05	61.08
#45	1.50	0.35	30.10	22.08	83.15	39.00
#60	2.00	0.25	24.89	18.26	108.04	20.74
#80	2.50	0.18	19.66	14.42	127.70	6.32
#120	3.00	0.13	7.15	5.25	134.85	1.07
#170	3.50	0.09	0.52	0.38	135.37	0.69
#200	3.75	0.07	0.03	0.02	135.40	0.67
#230	4.00	0.06	0.01	0.01	135.41	0.66

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.63	2.16	1.88	1.25	0.68	0.44	-0.12

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.25	0.42	0.83	-0.2	2.89



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-20 #Comp	—●—	-1.4	SP	#200 - 1.02 #230 - 0.99		11.70	1.59	1.39	-0.84	4.12	1.11

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,305,532
Northing (Y, ft):	51,170
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

SIEVE ANALYSIS BALD HEAD CREEK, NC, FEB. '14.GPJ FL DEP ROSS.GDT 3/3/14

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island
Sample Name: BHC-20 #Comp
Analysis Date: 02-17-14
Analyzed By: CRM Sr.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,305,532	51,170	North Carolina State Plane	-1.4 NGVD 29

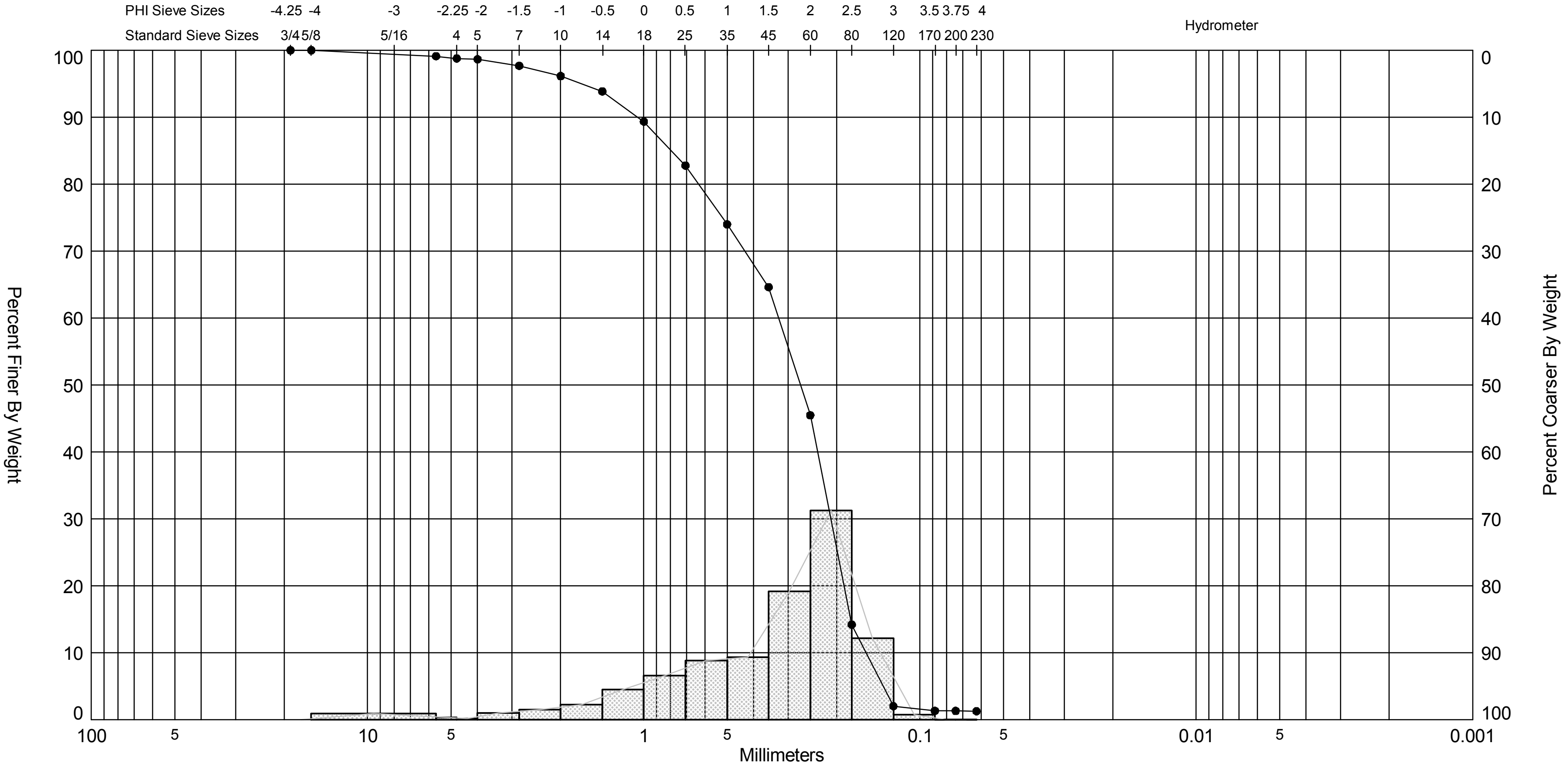
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
149.48	148.02			#200 - 1.02 #230 - 0.99		11.70	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.98	0.66	0.98	99.34
#4	-2.25	4.76	0.00	0.00	0.98	99.34
#5	-2.00	4.00	0.44	0.29	1.42	99.05
#7	-1.50	2.83	0.56	0.37	1.98	98.68
#10	-1.00	2.00	1.03	0.69	3.01	97.99
#14	-0.50	1.41	3.49	2.33	6.50	95.66
#18	0.00	1.00	8.97	6.00	15.47	89.66
#25	0.50	0.71	16.70	11.17	32.17	78.49
#35	1.00	0.50	19.77	13.23	51.94	65.26
#45	1.50	0.35	18.29	12.24	70.23	53.02
#60	2.00	0.25	24.66	16.50	94.89	36.52
#80	2.50	0.18	30.78	20.59	125.67	15.93
#120	3.00	0.13	19.66	13.15	145.33	2.78
#170	3.50	0.09	2.53	1.69	147.86	1.09
#200	3.75	0.07	0.11	0.07	147.97	1.02
#230	4.00	0.06	0.05	0.03	148.02	0.99

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.92	2.50	2.28	1.59	0.63	0.25	-0.44

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.39	0.38	1.11	-0.84	4.12



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-20 #2	—●—	-7.6	SP	#200 - 1.30 #230 - 1.27		12.60	1.88	1.51	-1.45	5.39	1.15

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,305,532
Northing (Y, ft):	51,170
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

SIEVE ANALYSIS BALD HEAD CREEK, NC, FEB. '14.GPJ FL DEP ROSS.GDT 3/3/14

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island
Sample Name: BHC-20 #2
Analysis Date: 02-17-14
Analyzed By: CRM Sr.

ATHENA
TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,305,532	51,170	North Carolina State Plane	-7.6 NGVD 29

USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
126.67	125.07			#200 - 1.30 #230 - 1.27		12.60	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	1.11	0.88	1.11	99.12
#4	-2.25	4.76	0.43	0.34	1.54	98.78
#5	-2.00	4.00	0.17	0.13	1.71	98.65
#7	-1.50	2.83	1.23	0.97	2.94	97.68
#10	-1.00	2.00	1.95	1.54	4.89	96.14
#14	-0.50	1.41	2.89	2.28	7.78	93.86
#18	0.00	1.00	5.71	4.51	13.49	89.35
#25	0.50	0.71	8.32	6.57	21.81	82.78
#35	1.00	0.50	11.15	8.80	32.96	73.98
#45	1.50	0.35	11.86	9.36	44.82	64.62
#60	2.00	0.25	24.27	19.16	69.09	45.46
#80	2.50	0.18	39.60	31.26	108.69	14.20
#120	3.00	0.13	15.43	12.18	124.12	2.02
#170	3.50	0.09	0.90	0.71	125.02	1.31
#200	3.75	0.07	0.01	0.01	125.03	1.30
#230	4.00	0.06	0.04	0.03	125.07	1.27

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.88	2.47	2.33	1.88	0.94	0.41	-0.75

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.51	0.35	1.15	-1.45	5.39

Boring Designation BHC-21

DRILLING LOG	DIVISION Olsen Associates, Inc.	INSTALLATION Jacksonville, Florida	SHEET 1 OF 1 SHEETS

1. PROJECT
Village of Bald Head Island
Geotechnical Investigation of Bald Head Creek

2. BORING DESIGNATION BHC-21 | LOCATION COORDINATES X = 2,305,156 Y = 51,563

3. DRILLING AGENCY Athena Technologies, Inc. | CONTRACTOR FILE NO.

4. NAME OF DRILLER P. McClellan

5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED | DEG. FROM VERTICAL | BEARING

6. THICKNESS OF OVERBURDEN 0.0 Ft.

7. DEPTH DRILLED INTO ROCK 0.0 Ft.

8. TOTAL DEPTH OF BORING 10.0 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM North Carolina State Plane | HORIZONTAL NAD 1983 | VERTICAL NGVD 29

11. MANUFACTURER'S DESIGNATION OF DRILL ☐ AUTO HAMMER ☐ MANUAL HAMMER

12. TOTAL SAMPLES | DISTURBED 1 | UNDISTURBED (UD) 2

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER 5.2 Ft.

15. DATE BORING | STARTED 02-04-14 09:42 | COMPLETED 02-04-14 10:27

16. ELEVATION TOP OF BORING -2.6 Ft.

17. TOTAL RECOVERY FOR BORING 8.1 Ft.

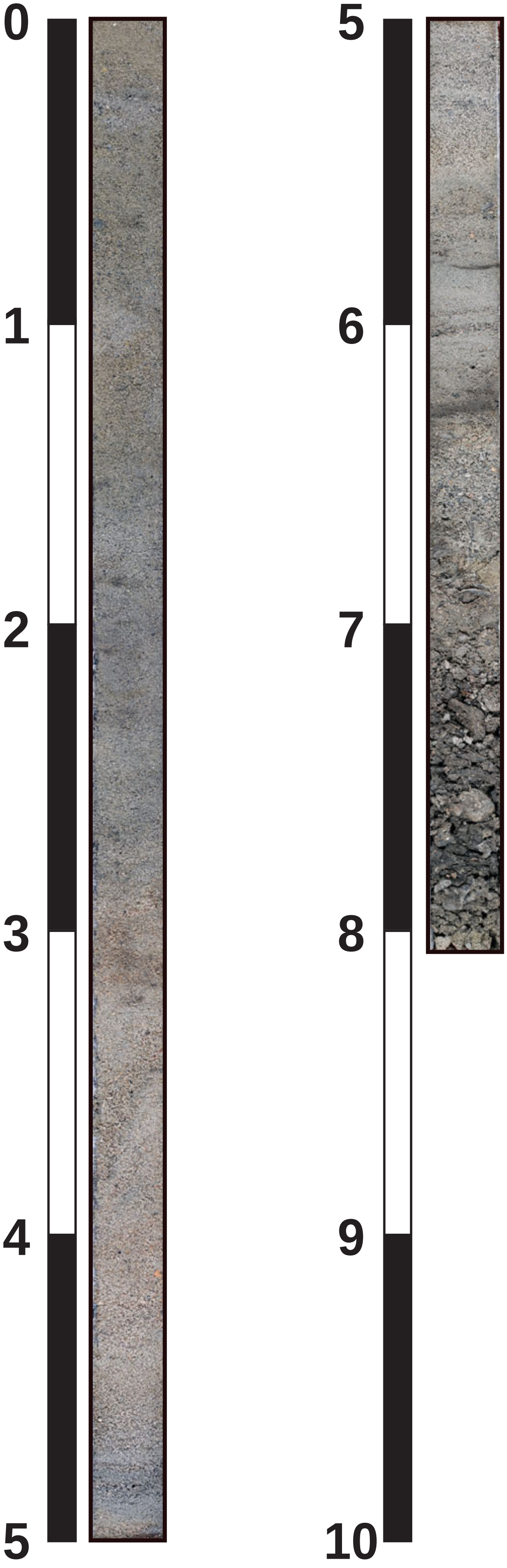
18. SIGNATURE AND TITLE OF INSPECTOR A. Freeze

ELEV. (ft) -2.6	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS	
-5.4	2.8		Medium quartz SAND, few fine sand size shell, trace silt, poorly graded, subrounded, bioturbated, color grades to gray (2.5Y 6/1), light brownish gray (2.5Y-6/2), (SP).		1 Comp	Sample #1, Depth = 0.0' - 0.4' Mean (mm): 0.31, Phi Sorting: 0.97 Carbonate: 8.9%, Fines (230): 1.16% (SP) Sample #Comp, Depth = 0.0' - 5.4' Mean (mm): 0.41, Phi Sorting: 1.09 Carbonate: 10.7%, Fines (230): 1.11% (SP)	0
-7.4	4.8		Medium quartz SAND, little medium sand size shell, poorly graded, subrounded, color grades to light gray (2.5Y 7/2), light brownish gray (2.5Y-6/2), (SP).				
-8.4	5.8		Medium quartz SAND, few medium sand size shell, trace silt, poorly graded, subrounded, gray (2.5Y-6/1), (SP).		2	Sample #2, Depth = 5.0' - 5.4' Mean (mm): 0.49, Phi Sorting: 1.19 Carbonate: 15.3%, Fines (230): 1.06% (SP)	5
-9.0	6.4		Fine quartz SAND, little medium quartz sand (in layers), trace fine sand size shell, trace silt (in layers), poorly graded, subrounded, gray (2.5Y-6/1), (SP).				
-9.7	7.1		Medium quartz SAND, little coarse sand to gravel size shell, trace silt, poorly graded, subrounded, gray (2.5Y-6/1), (SP).				
-10.7	8.1		Silty medium quartz SAND, some coarse sand to gravel size shell, little silt, subrounded, dark grayish brown (2.5Y-4/2), (SM).				
			End of Boring				10

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Bald Head Island
North Carolina
BHC-21

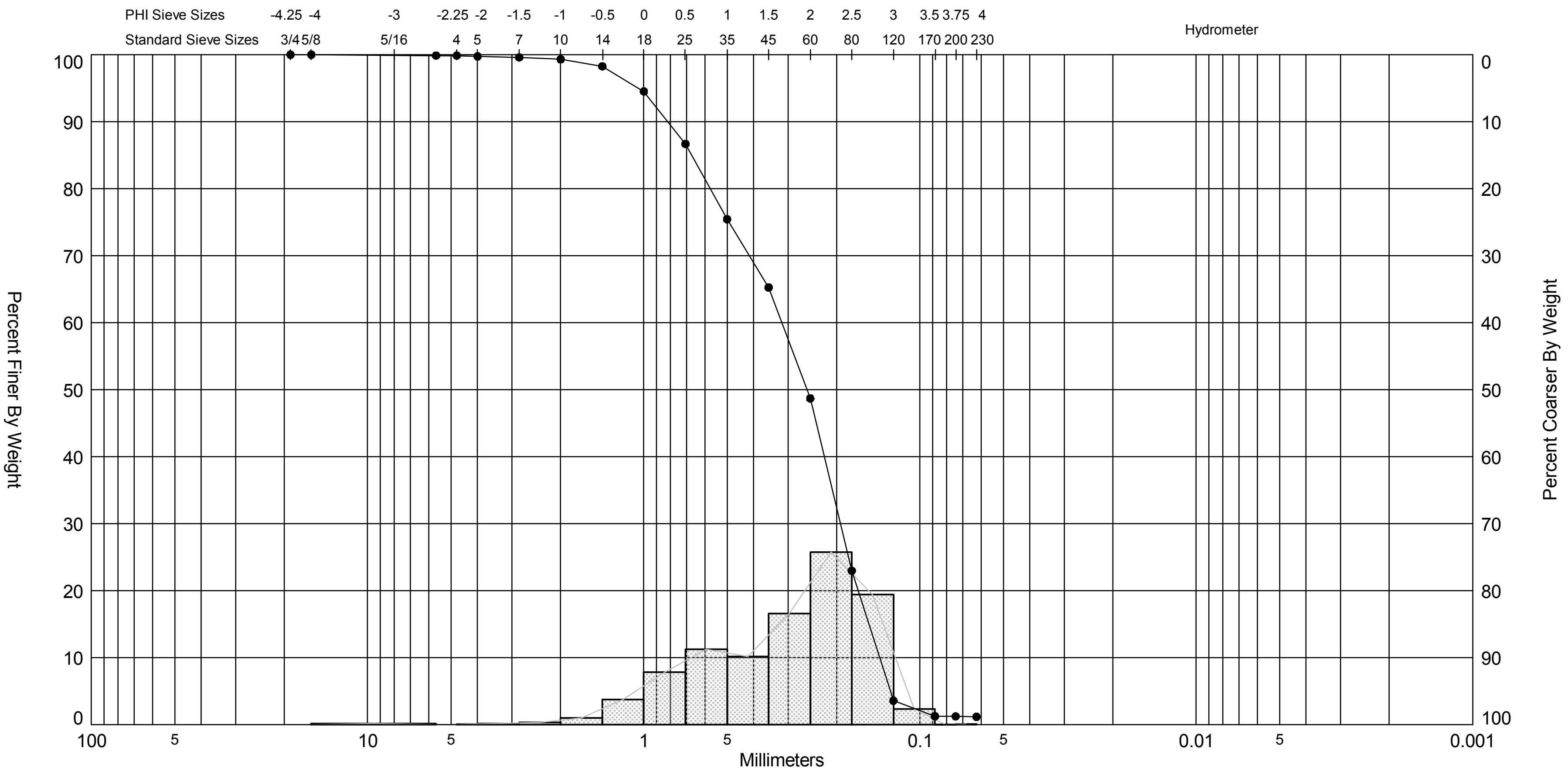
February 2014



Scale in Feet
Photo Mosaic Image

ATHENA
TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-21 #1	—●—	-2.6	SP	#200 - 1.23 #230 - 1.16		8.90	1.96	1.7	-0.85	3.65	0.97

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,305,156
Northing (Y, ft):	51,563
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island

Sample Name: BHC-21 #1

Analysis Date: 02-17-14

Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,305,156	51,563	North Carolina State Plane	-2.6 NGVD 29

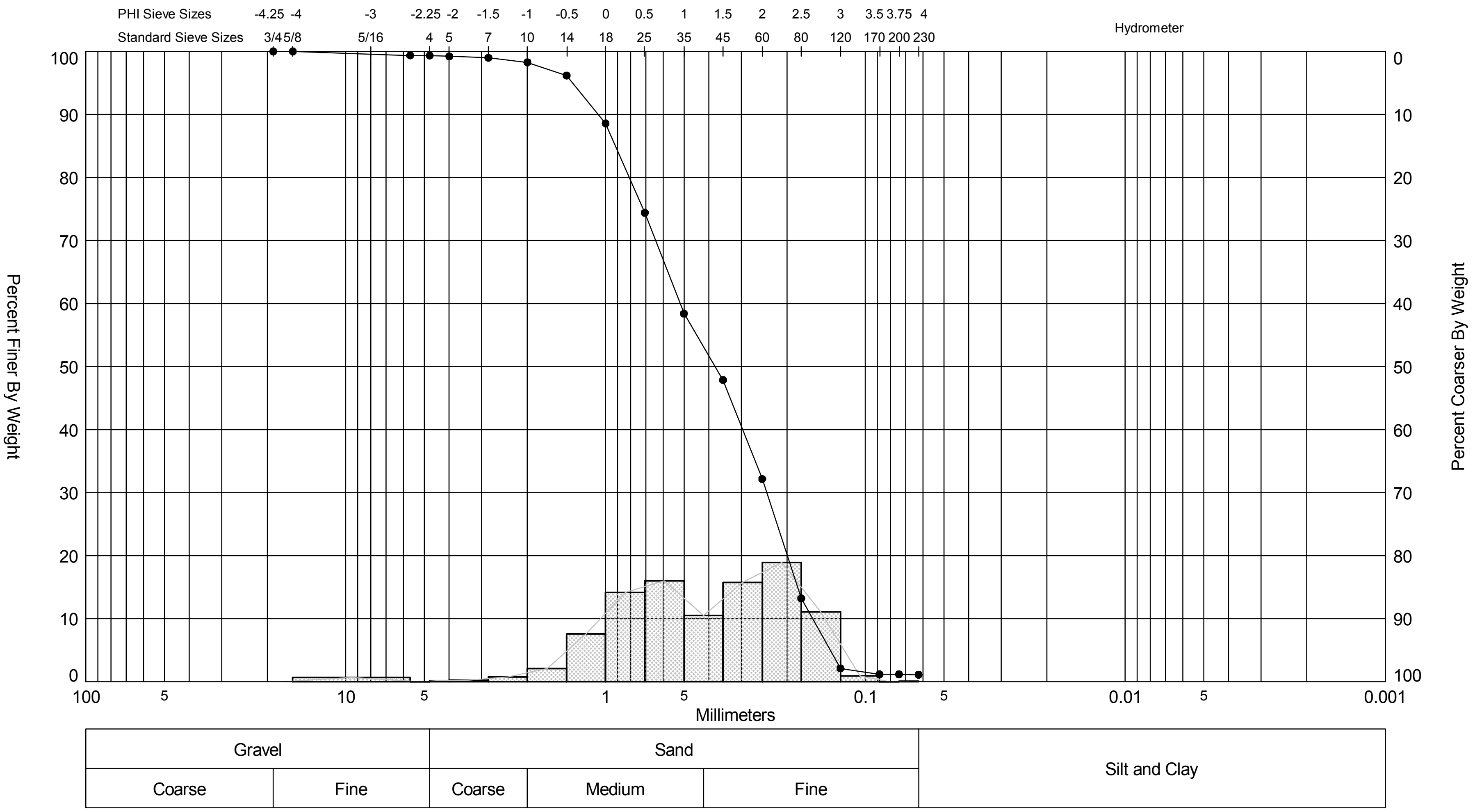
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
141.96	140.34			#200 - 1.23 #230 - 1.16		8.90	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.18	0.13	0.18	99.87
#4	-2.25	4.76	0.00	0.00	0.18	99.87
#5	-2.00	4.00	0.17	0.12	0.35	99.75
#7	-1.50	2.83	0.22	0.15	0.57	99.60
#10	-1.00	2.00	0.43	0.30	1.00	99.30
#14	-0.50	1.41	1.46	1.03	2.46	98.27
#18	0.00	1.00	5.33	3.75	7.79	94.52
#25	0.50	0.71	11.13	7.84	18.92	86.68
#35	1.00	0.50	15.96	11.24	34.88	75.44
#45	1.50	0.35	14.47	10.19	49.35	65.25
#60	2.00	0.25	23.49	16.55	72.84	48.70
#80	2.50	0.18	36.53	25.73	109.37	22.97
#120	3.00	0.13	27.53	19.39	136.90	3.58
#170	3.50	0.09	3.31	2.33	140.21	1.25
#200	3.75	0.07	0.03	0.02	140.24	1.23
#230	4.00	0.06	0.10	0.07	140.34	1.16

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.96	2.68	2.46	1.96	1.02	0.62	-0.06

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.7	0.31	0.97	-0.85	3.65



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-21 #Comp	—●—	-2.6	SP	#200 - 1.16 #230 - 1.11		10.70	1.4	1.27	-0.62	3.72	1.09

Comments:

Depths and elevations based on measured values

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,305,156
Northing (Y, ft):	51,563
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island

Sample Name: BHC-21 #Comp

Analysis Date: 02-17-14

Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,305,156	51,563	North Carolina State Plane	-2.6 NGVD 29

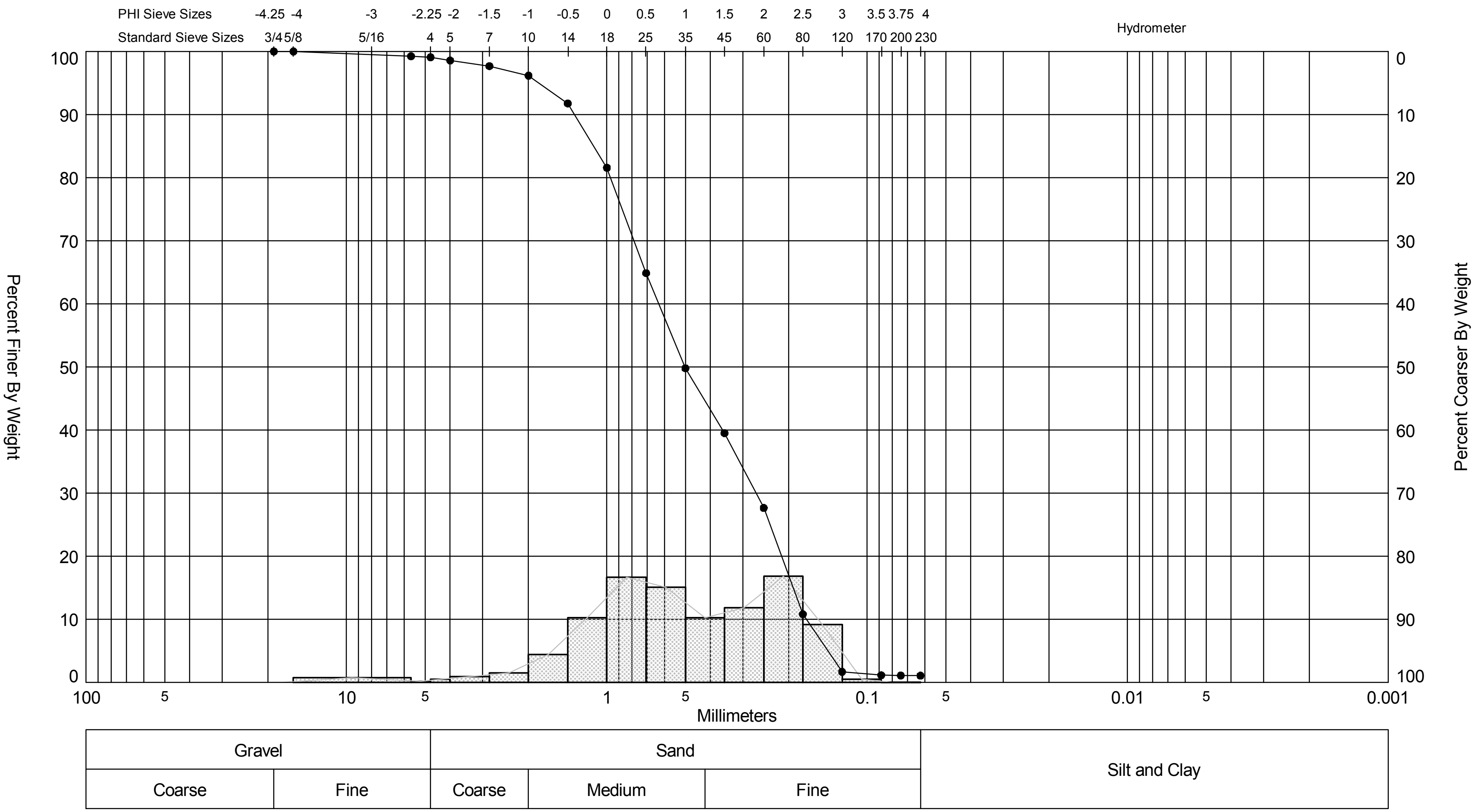
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
130.23	128.78			#200 - 1.16 #230 - 1.11		10.70	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.82	0.63	0.82	99.37
#4	-2.25	4.76	0.03	0.02	0.85	99.35
#5	-2.00	4.00	0.18	0.14	1.03	99.21
#7	-1.50	2.83	0.28	0.22	1.31	98.99
#10	-1.00	2.00	0.93	0.71	2.24	98.28
#14	-0.50	1.41	2.72	2.09	4.96	96.19
#18	0.00	1.00	9.92	7.62	14.88	88.57
#25	0.50	0.71	18.47	14.18	33.35	74.39
#35	1.00	0.50	20.84	16.00	54.19	58.39
#45	1.50	0.35	13.70	10.52	67.89	47.87
#60	2.00	0.25	20.47	15.72	88.36	32.15
#80	2.50	0.18	24.65	18.93	113.01	13.22
#120	3.00	0.13	14.46	11.10	127.47	2.12
#170	3.50	0.09	1.24	0.95	128.71	1.17
#200	3.75	0.07	0.01	0.01	128.72	1.16
#230	4.00	0.06	0.06	0.05	128.78	1.11

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.87	2.43	2.19	1.40	0.48	0.16	-0.42

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.27	0.41	1.09	-0.62	3.72



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-21 #2	—●—	-7.6	SP	#200 - 1.09 #230 - 1.06		15.30	0.99	1.02	-0.48	3.21	1.19

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,305,156
Northing (Y, ft):	51,563
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island
Sample Name: BHC-21 #2
Analysis Date: 02-17-14
Analyzed By: CRM Sr.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,305,156	51,563	North Carolina State Plane	-7.6 NGVD 29

USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
137.43	135.99			#200 - 1.09 #230 - 1.06		15.30	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	1.04	0.76	1.04	99.24
#4	-2.25	4.76	0.21	0.15	1.25	99.09
#5	-2.00	4.00	0.71	0.52	1.96	98.57
#7	-1.50	2.83	1.21	0.88	3.17	97.69
#10	-1.00	2.00	2.10	1.53	5.27	96.16
#14	-0.50	1.41	6.04	4.39	11.31	91.77
#18	0.00	1.00	14.03	10.21	25.34	81.56
#25	0.50	0.71	22.94	16.69	48.28	64.87
#35	1.00	0.50	20.73	15.08	69.01	49.79
#45	1.50	0.35	14.13	10.28	83.14	39.51
#60	2.00	0.25	16.31	11.87	99.45	27.64
#80	2.50	0.18	23.15	16.84	122.60	10.80
#120	3.00	0.13	12.56	9.14	135.16	1.66
#170	3.50	0.09	0.73	0.53	135.89	1.13
#200	3.75	0.07	0.06	0.04	135.95	1.09
#230	4.00	0.06	0.04	0.03	135.99	1.06

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.82	2.35	2.08	0.99	0.20	-0.12	-0.87

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.02	0.49	1.19	-0.48	3.21

Boring Designation BHC-22

DRILLING LOG

DIVISION: Olsen Associates, Inc.

INSTALLATION: Jacksonville, Florida

SHEET 1 OF 1 SHEETS

1. PROJECT
Village of Bald Head Island
Geotechnical Investigation of Bald Head Creek

2. BORING DESIGNATION: BHC-22
LOCATION COORDINATES: X = 2,305,707 Y = 51,479

3. DRILLING AGENCY: Athena Technologies, Inc.
CONTRACTOR FILE NO.:

4. NAME OF DRILLER: P. McClellan

5. DIRECTION OF BORING
☒ VERTICAL
☐ INCLINED
DEG. FROM VERTICAL:
BEARING:

6. THICKNESS OF OVERBURDEN: 0.0 Ft.

7. DEPTH DRILLED INTO ROCK: 0.0 Ft.

8. TOTAL DEPTH OF BORING: 12.0 Ft.

9. SIZE AND TYPE OF BIT: 3.0 In.

10. COORDINATE SYSTEM/DATUM: North Carolina State Plane
HORIZONTAL: NAD 1983
VERTICAL: NGVD 29

11. MANUFACTURER'S DESIGNATION OF DRILL
☐ AUTO HAMMER
☐ MANUAL HAMMER

12. TOTAL SAMPLES
DISTURBED: 1
UNDISTURBED (UD): 2

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER: 5.8 Ft.

15. DATE BORING
STARTED: 02-04-14 10:36
COMPLETED: 02-04-14 10:51

16. ELEVATION TOP OF BORING: -3.1 Ft.

17. TOTAL RECOVERY FOR BORING: 10.3 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR: A. Freeze

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-3.1	0.0					
-5.0	1.9		Medium quartz SAND, few fine to medium sand size shell, trace silt, poorly graded, subrounded, bioturbated, light brownish gray (2.5Y-6/2), (SP).		1 Comp	Sample #1, Depth = 0.0' - 0.4' Mean (mm): 0.31, Phi Sorting: 0.99 Carbonate: 8.3%, Fines (230): 1.20% (SP)
-6.0	2.9		Medium quartz SAND, trace silt / fine sand size shell, poorly graded, subrounded, bioturbated, BORDERLINE SP-SM, grayish brown (2.5Y-5/2), (SP).			Sample #Comp, Depth = 0.0' - 4.9' Mean (mm): 0.32, Phi Sorting: 0.97 Carbonate: 6.0%, Fines (230): 1.94% (SP)
-9.1	6.0		Medium quartz SAND, few silt, trace fine sand size shell, poorly graded, subrounded, bioturbated, gray (2.5Y-5/1), (SP-SM).		2	Sample #2, Depth = 4.5' - 4.9' Mean (mm): 0.35, Phi Sorting: 0.88 Carbonate: 2.7%, Fines (230): 2.20% (SP)
-9.8	6.7		Medium quartz SAND, trace silt (in layers), poorly graded, subrounded, bioturbated, bi-directional bedding present, gray (2.5Y-5/1), (SP).			
-10.4	7.3		Fine quartz SAND, trace silt / organic silt, poorly graded, subrounded, bioturbated, gray (2.5Y-6/1), (SP).			
-10.7	7.6		Medium quartz SAND, trace fine sand size shell / silt, poorly graded, subrounded, light gray (2.5Y-7/1), (SP).			
-12.1	9.0		Silty medium quartz SAND, some coarse sand to gravel size shell, little silt, subrounded, color grades to gray (2.5Y 5/1), dark gray (2.5Y-4/1), (SM).			
-12.7	9.6		Medium quartz SAND, few silt, trace fine sand size shell, poorly graded, subrounded, bioturbated, gray (2.5Y-6/1), (SP-SM).			
-13.4	10.3		Fine quartz SAND, few silt, trace fine sand size shell, poorly graded, subrounded, bioturbated, gray (2.5Y-5/1), (SP-SM).			

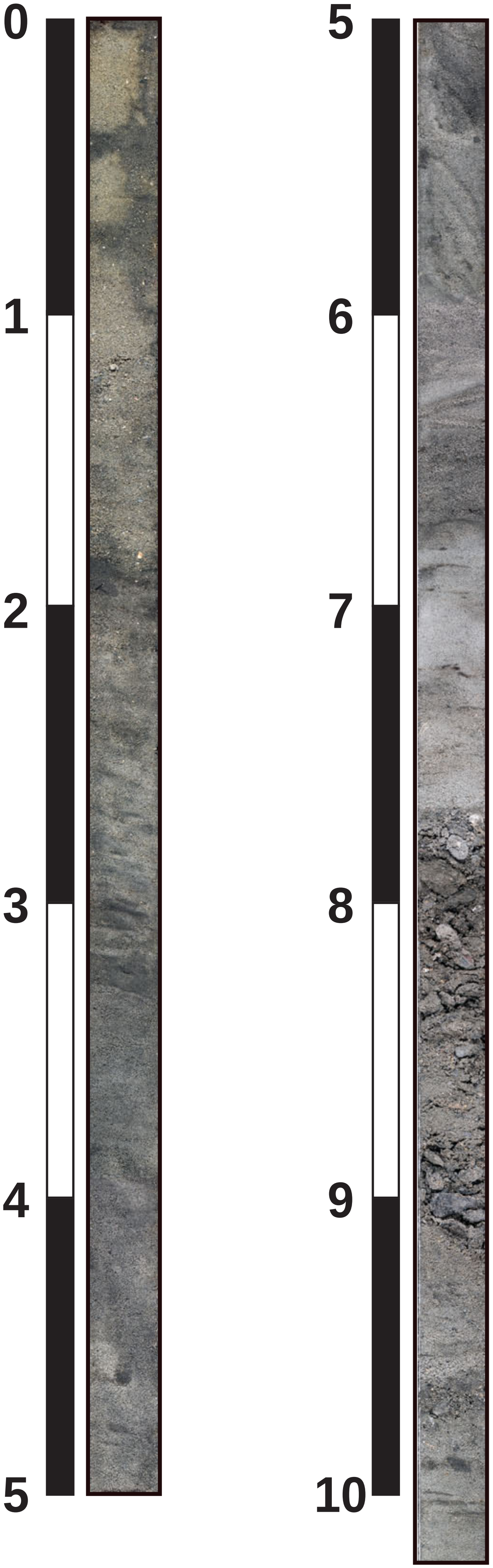
0
5
10

FLORIDA DEP ROSS BALD HEAD CREEK, NC, FEB. '14.GPJ FL DEP ROSS.GDT 3/3/14

SAJ FORM 1836
JUN 02

MODIFIED FOR THE FLORIDA DEP
JUN 04

End of Boring



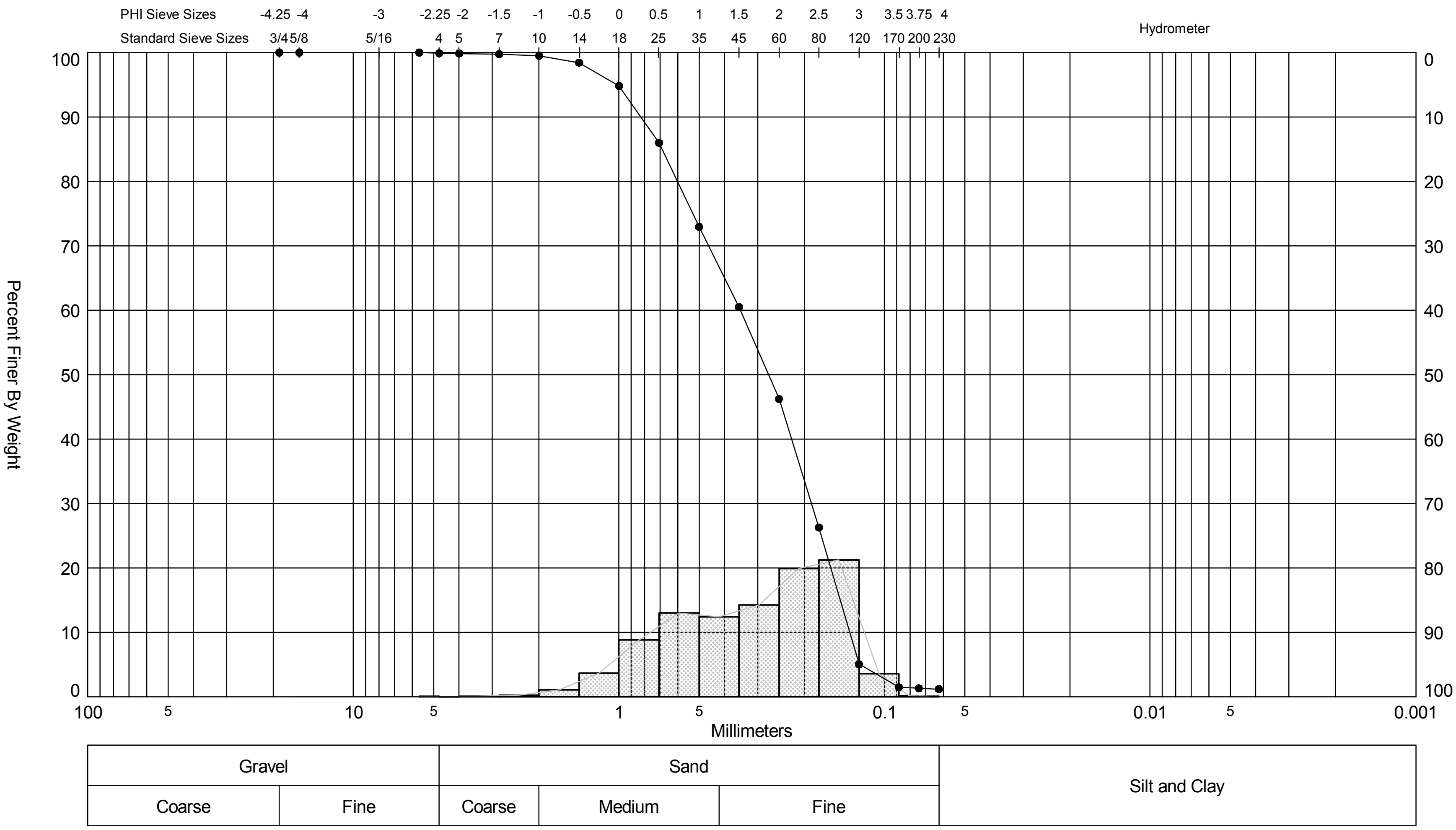
Bald Head Island
North Carolina
BHC-22

February 2014

Scale in Feet
Photo Mosaic Image

ATHENA
TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-22 #1	—●—	-3.1	SP	#200 - 1.31 #230 - 1.20		8.30	1.87	1.68	-0.53	2.66	0.99

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,305,707
Northing (Y, ft):	51,479
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island

Sample Name: BHC-22 #1

Analysis Date: 02-17-14

Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,305,707	51,479	North Carolina State Plane	-3.1 NGVD 29

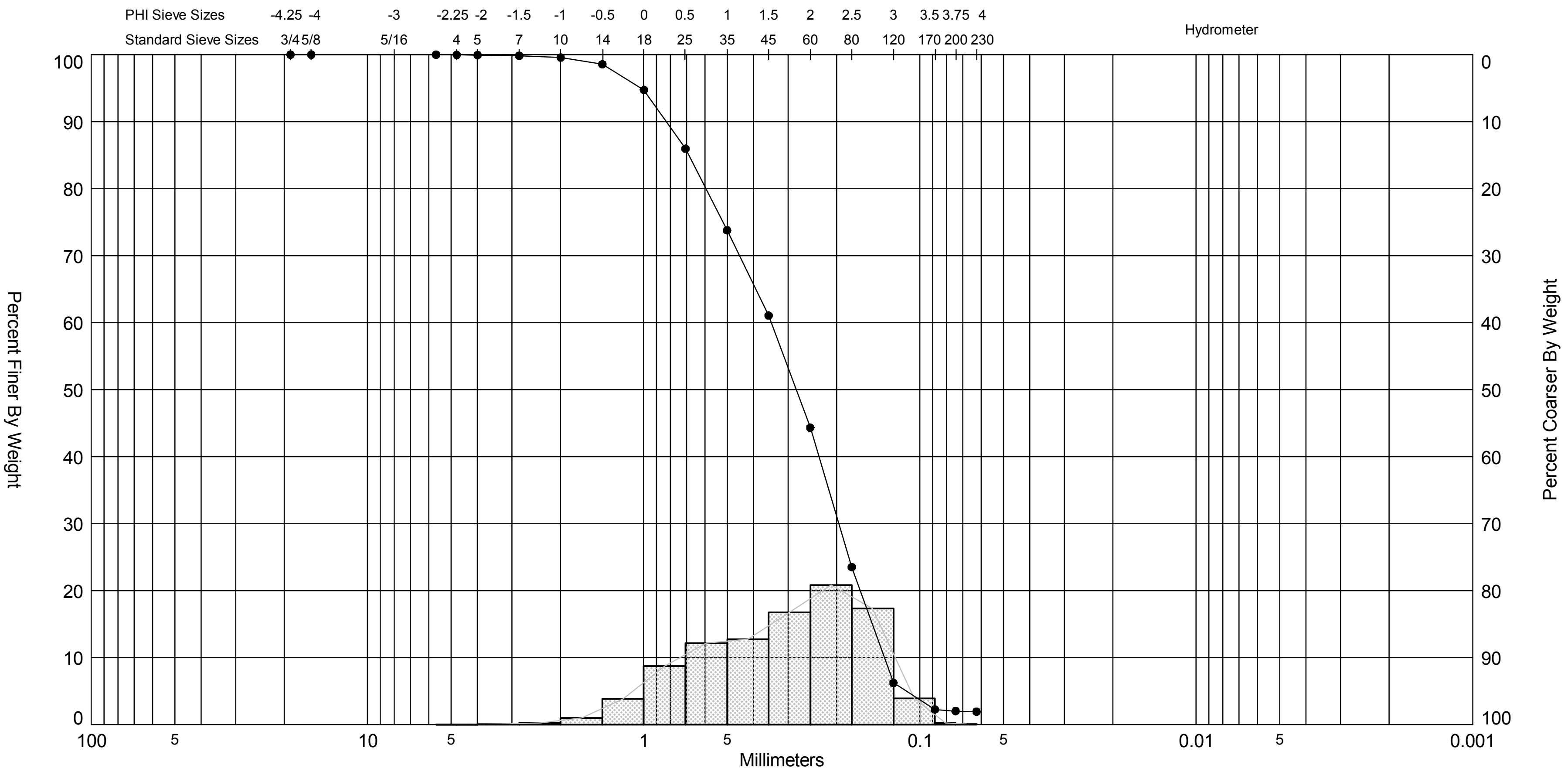
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
131.05	129.50			#200 - 1.31 #230 - 1.20		8.30	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.00	0.00	0.00	100.00
#4	-2.25	4.76	0.13	0.10	0.13	99.90
#5	-2.00	4.00	0.04	0.03	0.17	99.87
#7	-1.50	2.83	0.15	0.11	0.32	99.76
#10	-1.00	2.00	0.30	0.23	0.62	99.53
#14	-0.50	1.41	1.43	1.09	2.05	98.44
#18	0.00	1.00	4.77	3.64	6.82	94.80
#25	0.50	0.71	11.55	8.81	18.37	85.99
#35	1.00	0.50	17.09	13.04	35.46	72.95
#45	1.50	0.35	16.32	12.45	51.78	60.50
#60	2.00	0.25	18.73	14.29	70.51	46.21
#80	2.50	0.18	26.11	19.92	96.62	26.29
#120	3.00	0.13	27.84	21.24	124.46	5.05
#170	3.50	0.09	4.68	3.57	129.14	1.48
#200	3.75	0.07	0.22	0.17	129.36	1.31
#230	4.00	0.06	0.14	0.11	129.50	1.20

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.01	2.74	2.53	1.87	0.92	0.58	-0.03

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.68	0.31	0.99	-0.53	2.66



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-22 #Comp	—●—	-3.1	SP	#200 - 2.03 #230 - 1.94		6.00	1.83	1.66	-0.48	2.63	0.97

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,305,707
Northing (Y, ft):	51,479
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island
Sample Name: BHC-22 #Comp
Analysis Date: 02-17-14
Analyzed By: CRM Sr.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,305,707	51,479	North Carolina State Plane	-3.1 NGVD 29

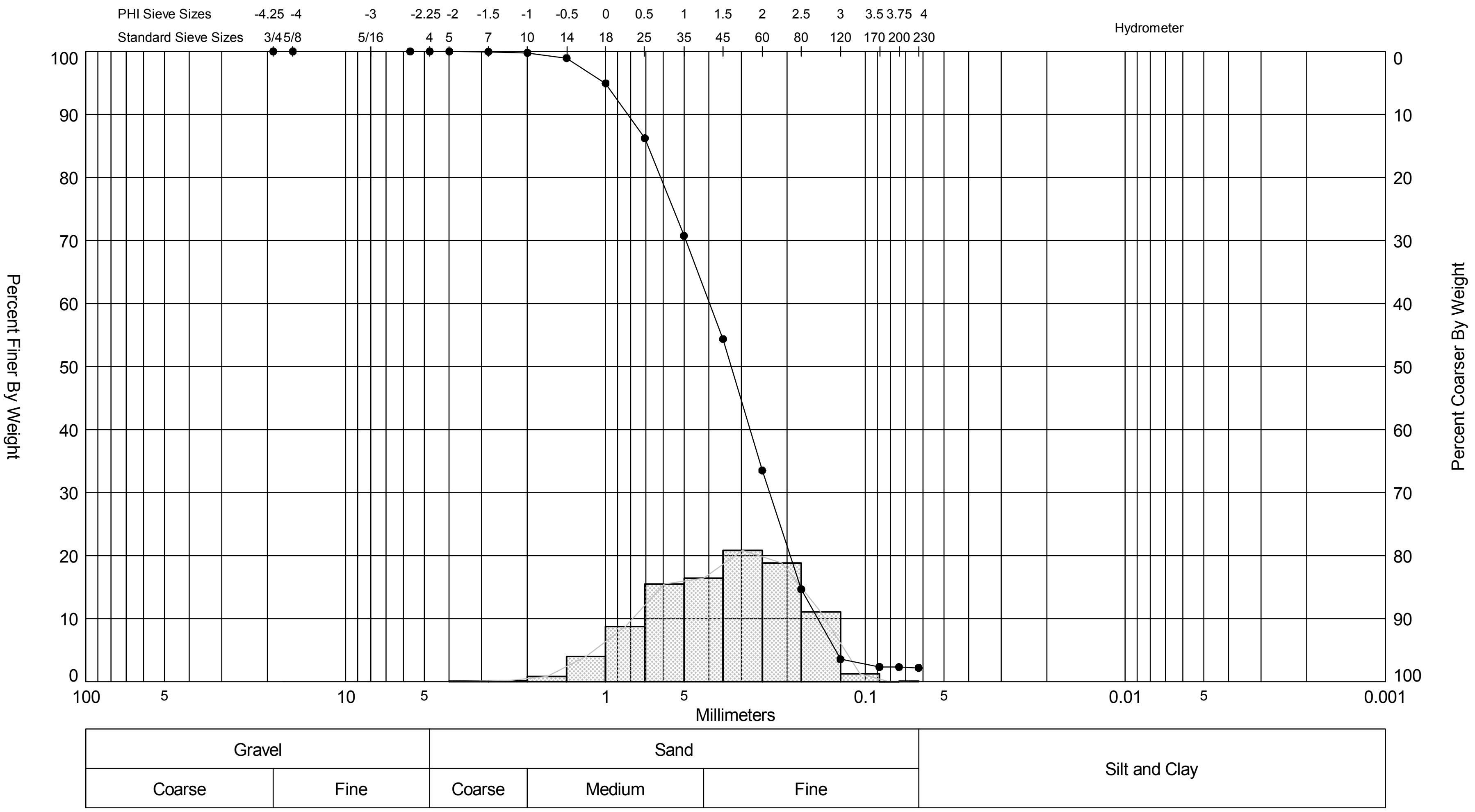
USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
135.53	132.87			#200 - 2.03 #230 - 1.94		6.00	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.00	0.00	0.00	100.00
#4	-2.25	4.76	0.04	0.03	0.04	99.97
#5	-2.00	4.00	0.04	0.03	0.08	99.94
#7	-1.50	2.83	0.14	0.10	0.22	99.84
#10	-1.00	2.00	0.37	0.27	0.59	99.57
#14	-0.50	1.41	1.35	1.00	1.94	98.57
#18	0.00	1.00	5.20	3.84	7.14	94.73
#25	0.50	0.71	11.88	8.77	19.02	85.96
#35	1.00	0.50	16.49	12.17	35.51	73.79
#45	1.50	0.35	17.26	12.74	52.77	61.05
#60	2.00	0.25	22.68	16.73	75.45	44.32
#80	2.50	0.18	28.19	20.80	103.64	23.52
#120	3.00	0.13	23.44	17.30	127.08	6.22
#170	3.50	0.09	5.35	3.95	132.43	2.27
#200	3.75	0.07	0.32	0.24	132.75	2.03
#230	4.00	0.06	0.12	0.09	132.87	1.94

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.15	2.72	2.46	1.83	0.95	0.58	-0.04

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.66	0.32	0.97	-0.48	2.63



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
BHC-22 #2	—●—	-7.6	SP	#200 - 2.31 #230 - 2.20		2.70	1.6	1.5	-0.32	2.56	0.88

Comments:

Depths and elevations based on measured values

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Sample Information	
Project Name:	Village of Bald Head Island
Analysis Date:	02-17-14
Analyzed By:	CRM Sr.
Easting (X, ft):	2,305,707
Northing (Y, ft):	51,479
Horizontal System:	NAD 1983
Vertical System:	NGVD 29

Granularmetric Report

Depths and elevations based on measured values

Project Name: Village of Bald Head Island
Sample Name: BHC-22 #2
Analysis Date: 02-17-14
Analyzed By: CRM Sr.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph (843) 887-3800
fax (843) 887-3801

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
2,305,707	51,479	North Carolina State Plane	-7.6 NGVD 29

USCS:	Munsell:	Comments:
SP		

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shells (%):
132.10	129.20			#200 - 2.31 #230 - 2.20		2.70	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	% Passing Sieve
3/4"	-4.25	19.03		0.00	0.00	100.00
5/8"	-4.00	16.00	0.00	0.00	0.00	100.00
#3.5	-2.50	5.66	0.00	0.00	0.00	100.00
#4	-2.25	4.76	0.00	0.00	0.00	100.00
#5	-2.00	4.00	0.00	0.00	0.00	100.00
#7	-1.50	2.83	0.07	0.05	0.07	99.95
#10	-1.00	2.00	0.22	0.17	0.29	99.78
#14	-0.50	1.41	1.10	0.83	1.39	98.95
#18	0.00	1.00	5.30	4.01	6.69	94.94
#25	0.50	0.71	11.52	8.72	18.21	86.22
#35	1.00	0.50	20.44	15.47	38.65	70.75
#45	1.50	0.35	21.64	16.38	60.29	54.37
#60	2.00	0.25	27.54	20.85	87.83	33.52
#80	2.50	0.18	24.92	18.86	112.75	14.66
#120	3.00	0.13	14.66	11.10	127.41	3.56
#170	3.50	0.09	1.63	1.23	129.04	2.33
#200	3.75	0.07	0.02	0.02	129.06	2.31
#230	4.00	0.06	0.14	0.11	129.20	2.20

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.94	2.46	2.23	1.60	0.86	0.57	-0.01

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.5	0.35	0.88	-0.32	2.56

APPENDIX G

BALD HEAD CREEK ARCHAEOLOGICAL SURVEY
(Tidewater Atlantic Research, Inc. April 2014)

and

NC STATE HISTORIC PRESERVATION OFFICE LETTER
(July 3, 2014)

A Phase I Remote-Sensing Archaeological Survey of a Proposed Borrow Area Extension off the Mouth of Bald Head Creek, Bald Head Island, Brunswick County, North Carolina

Submitted to:

Olsen Associates, Inc.
2618 Herschel Street
Jacksonville, Florida 32204

Submitted by:

Gordon P. Watts, Jr.
Principal Investigator

Tidewater Atlantic Research, Inc.
P. O. Box 2494
Washington, North Carolina 27889

8 April 2014

Abstract

Olsen Associates, Inc. (OA) is the project engineer representing the Village of Bald Head Island, North Carolina to plan and secure permitting for an extension of a proposed borrow site north of the mouth of Bald Head Creek. In order to determine the effects of proposed dredging on potentially significant submerged cultural resources, OA contracted with Tidewater Atlantic Research, Inc. of Washington, North Carolina to conduct a magnetometer and sidescan sonar survey of the proposed borrow site. Field research for the survey area was conducted on 10 March 2014. Analysis of the remote-sensing data generated during the Bald Head Creek survey identified a total of 38 magnetic anomalies. Four anomalies were located outside a 100-foot buffer surveyed beyond the borrow perimeter. Nine of the anomalies appear to be debris associated with previous navigation range structures. The remaining 25 anomalies appeared to have been generated by modern debris such as fish and crab traps, pipes, small diameter rods, cable, wire rope, chain and small boat anchors. Sonar could not be used in the survey area as water depths, even at high tide, were not sufficient for safe operations. Based on the survey data no National Register of Historic Places eligible submerged cultural resources will be impacted by dredging operations. No additional investigation of the anomalies is recommended in conjunction with the proposed project.

Table of Contents

List of Figures

Introduction

Olsen Associates, Inc. (OA) is the project engineer representing the Village of Bald Head Island, North Carolina in its efforts to permit an borrow area extension at the mouth of Bald Head Creek. The sand source for the project is a borrow area located near the mouth of Bald Head Creek on the northwest tip of Bald Head Island. In order to determine the proposed dredging effects on potentially significant submerged cultural resources, OA contracted with Tidewater Atlantic Research, Inc. (TAR) of Washington, North Carolina to conduct a magnetometer and sidescan sonar survey of the proposed borrow site.

The remote-sensing investigation conducted by TAR archaeologists was designed to provide accurate and reliable identification, assessment and documentation of submerged cultural resources in the study area. The assessment methodology was developed to comply with the criteria of the National Historic Preservation Act of 1966 (Public Law 89-665), the National Environmental Policy Act of 1969 (Public Law 11-190), Executive Order 11593, the Advisory Council on Historic Preservation Procedures for the protection of historic and cultural properties (36 CFR Part 800) and the updated guidelines described in 36 CFR 64 and 36 CFR 66. The results of the investigation were designed to furnish OA with the archaeological data required to comply with submerged cultural resource legislation and regulations.

The survey was conducted around high tide on 10 March 2014. Analysis of the remote-sensing data generated during the Bald Head Creek survey identified a total of 38 magnetic anomalies. Four anomalies were located outside a 100-foot buffer surveyed beyond the borrow perimeter. Nine of the anomalies appear to be debris associated with previous navigation range structures. The remaining 25 anomalies appeared to have been generated by modern debris such as fish and crab traps, pipes, small diameter rods, cable, wire rope, chain and small boat anchors. Sonar could not be used in the survey area as water depths, even at high tide, were not sufficient for safe operations. Based on the survey data no National Register of Historic Places (NRHP) eligible submerged cultural resources will be impacted by dredging operations and no additional investigation of the anomalies is recommended in conjunction with the proposed project.

Project survey personnel consisted of Gordon P. Watts, Jr., principal investigator and Matthew Thompson, remote-sensing operator. Historian Robin Arnold carried out the historical and literature research. Dr. Watts analyzed the remote-sensing data. Dr. Watts and Ms. Arnold prepared this report.

Project Location

The remote-sensing project area is situated at the mouth of Bald Head Creek, which is located on the east side of the Cape Fear River (Figure 1). The approximate center of the borrow site is located on the northwest corner of Baldhead Island approximately 3,500 feet north-northwest of Bald Head Lighthouse.

The initial survey area (red) is polygonal in shape measuring approximately 2,450 feet long and 1,400 feet wide. The polygon covers an area of approximately 65 acres. A previously surveyed area within the southern portion of the polygon (blue) is roughly trapezoidal in shape measuring approximately 1,200 feet long and 800 feet wide and covers an area of approximately 21.5 acres. To ensure sufficient data would be available to locate any potentially significant targets in the project area, remote-sensing data were collected along parallel lanes spaced on 50-foot intervals. The area surveyed also included a 100-foot buffer zone so that those targets located along the periphery of the borrow area could be identified and the impact from dredging assessed.

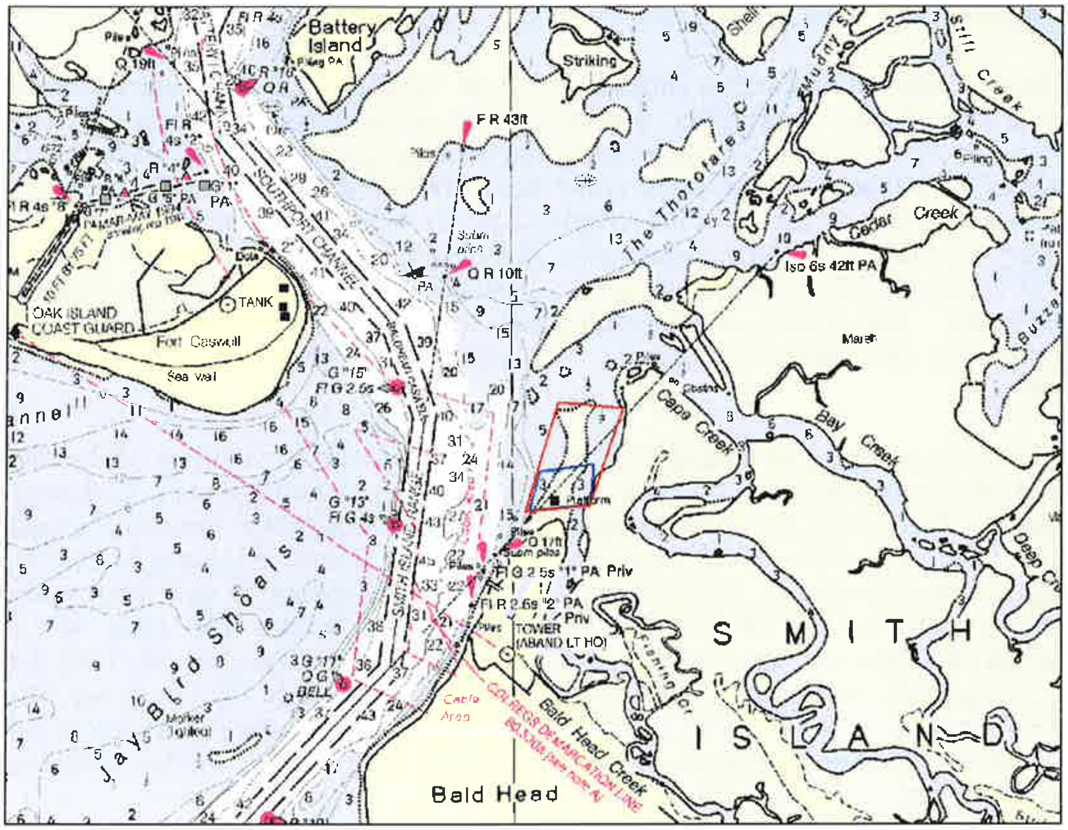


Figure 1. Project Location (NOAA Chart 11537 Cape Fear River).

Coordinates for the survey area (red), defined in North Carolina State Plane Coordinates, based on NAD 83, U.S. Survey Foot are as follows:

Control Point	X coordinate	Y coordinate
A	2304471.7	51659.5
B	2305798.0	51529.0
C	2305128.6	49526.7
D	2303805.0	49385.0

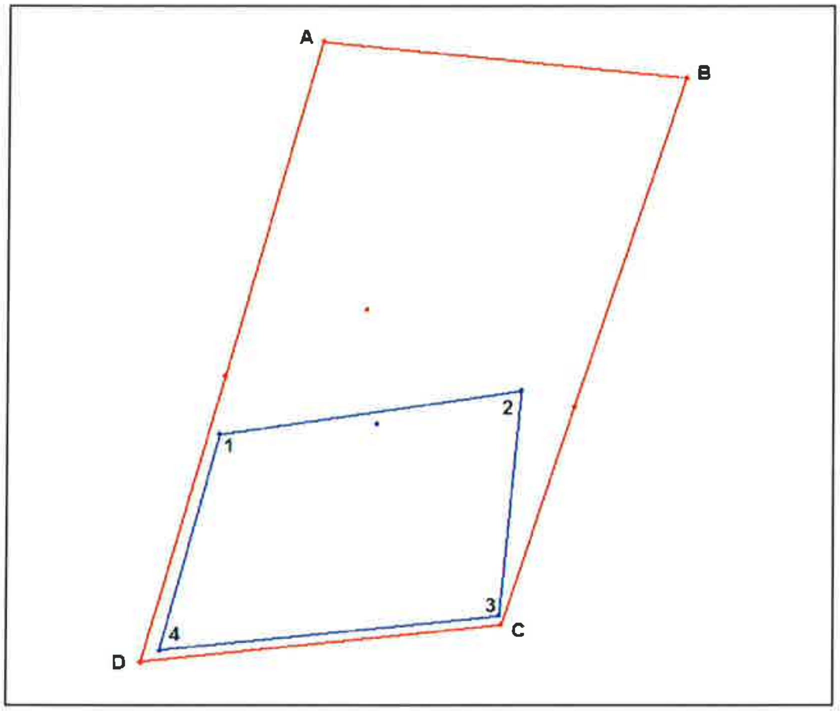


Figure 2. Control points for the 2014 survey area (red) and the area previously surveyed in 2010 (blue).

Coordinates for a previously surveyed area (blue), defined in North Carolina State Plane Coordinates, based on NAD 83, U.S. Survey Foot are as follows:

Control Point	X coordinate	Y coordinate
1	2304087.7	50214.2
2	2305195.5	50374.0
3	2305116.5	49557.8
4	2303876.9	49426.5

Research Methodology

Literature and Historical Research

TAR historians previously conducted a literature search of primary and secondary sources to assess the potential to find significant historical and/or cultural resources within the proposed dredge site. A general background history of Bald Head Island and the lower Cape Fear region was prepared from source material in the TAR research library. Preliminary wreck-specific information was collected from published sources including: *Disasters to American Vessels, Sail and Steam, 1841-1846* (Lockhead 1954), *Encyclopedia of American Shipwrecks* (Berman 1972), *Shipwrecks of the Civil War* (Shomette 1973), *Merchant Steam Vessels of the United States 1790 - 1868* (Lytle and Holdcamper 1975), *Shipwrecks of the Americas* (Marx 1983), and *Official Records of the Union and Confederate Navies in the War of the Rebellion* (National Historical Society 1987). In addition, the *National Register of Historic Places* online database (National Park Service n.d.), the Automated Wreck and Obstruction

Information System (NOAA n.d.) and the Northern Shipwrecks Database (Northern Maritime Research 2002) were queried for wreck-specific information.

Personnel at the Underwater Archaeology Branch (UAB) of the North Carolina Office of State Archaeology (Fort Fisher), the North Carolina Maritime Museum (Southport), the Brunswick County Library, and the Smith Island Museum of History were previously contacted for shipwreck data associated with Bald Head Island and the lower Cape Fear River. TAR personnel also interviewed area archaeologists and other individuals knowledgeable in maritime history and shipwreck research to solicit their assistance to generate wreck data.

Remote-Sensing Survey

In order to reliably identify submerged cultural resources, TAR archaeologists conducted a systematic remote-sensing survey of the proposed borrow site extension. Underwater survey activities were conducted from the 25-foot survey vessel *Tidewater Surveyor*. In order to fulfill the requirements for survey activities in North Carolina, both magnetic and acoustic remote-sensing equipment was to be employed. However, even at high tide there was not sufficient water in the survey area to deploy the sonar transducer fish (Figure 3). For the same reason, the magnetometer was mounted on the bow of the survey vessel rather than towed in the water column (Figure 4). Data collection was controlled using a differential global positioning system (DGPS). DGPS produces the highly accurate coordinates necessary to support a sophisticated navigation program and assures reliable target location.

An EG&G GEOMETRICS G-881 marine cesium magnetometer, capable of plus or minus 0.001 gamma resolution, was employed to collect magnetic data in the survey area. To produce the most comprehensive magnetic record, data was collected at 4 samples per second. Due to shoal water within the project area, the magnetometer sensor was towed just below the water surface at a speed of approximately three to four knots. Magnetic data were recorded as a data file associated with the computer navigation system. Data from the survey were contour plotted using QUICKSURF® computer software to facilitate anomaly location and definition of target signature characteristics. All magnetic data were correlated with the acoustic remote-sensing records.

A TRIMBLE AgGPS was used to control navigation and data collection in the survey area. That system has an accuracy of plus or minus three feet, and can be used to generate highly accurate coordinates for the computer navigation system on the survey vessel. The DGPS was employed in conjunction with an onboard COMPAQ 2.4 GHz laptop loaded with HYPACK navigation and data collection software (Figure 5). Positioning data generated by the navigation system were tied to magnetometer records by regular annotations to facilitate target location and anomaly analysis. All data is related to the North Carolina State Plane Coordinate System, NAD 83.

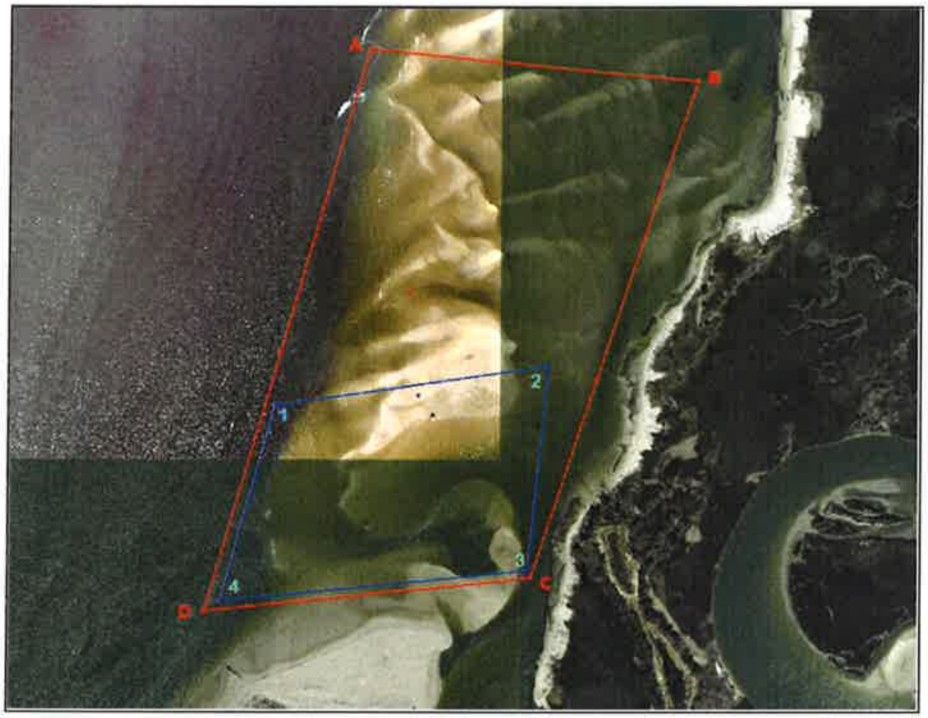


Figure 3. Aerial photographs illustrating the depth of water in the survey area.

Figure 4. Bow mounting the GEOMETRICS G-881 cesium vapor magnetometer.

Figure 5. Computer navigation system located at the research vessel helm.

Data Analysis

To ensure reliable target identification and assessment, analysis of the magnetic and acoustic data was carried out as it was generated. Using QUICKSURF® contouring software, magnetic data generated during the survey were contour plotted at 10-gamma intervals for analysis and accurate location of magnetic anomalies. The magnetic data was examined for anomalies, which were then isolated and analyzed in accordance with intensity, duration, areal extent and signature characteristics. Sonar records were analyzed to identify targets on the basis of configuration, areal extent, target intensity and contrast with background, elevation and shadow image, and were also reviewed for possible association with identified magnetic anomalies.

Data generated by the remote-sensing equipment were developed to support an assessment of each magnetic and acoustic signature. Analysis of each target signature included consideration of magnetic and sonar signature characteristics previously demonstrated to be reliable indicators of historically significant submerged cultural resources. Assessment of each target includes avoidance options and possible adjustments to avoid potential cultural resources. Where avoidance is not possible, the assessment includes recommendations for additional investigation to determine the exact nature of the cultural material generating the signature and its potential NRHP significance. Historical evidence was developed into a background context and an inventory of shipwreck sites that identified possible correlations with magnetic targets (Appendix A). A magnetic contour map of the survey area was produced to aid in the analysis of each target.

Historical Background

European settlement of the present day Cape Fear region began as early as 1526 when Lucas Vásquez de Ayllón led an expedition from Florida into the Cape Fear region. One of the Spanish vessels was recorded lost near the mouth of the Cape Fear River, referred to by the Spanish as the Jordon River. During the brief existence of the Spanish settlement, the area was known as the "Land of Ayllón" (Lee 1965:3-4).

The next attempt to settle the Cape Fear region came almost a century and a half later with the arrival of the English. Settlers from the New England colonies came to the area eager to establish a Puritan colony in the less harsh climate of the south. Under the leadership of Captain William Hilton, a group arrived in the summer of 1662 to find a suitable location. Arriving at the river and "Cape Fear" as he called it, the group remained for three weeks during which time they purchased the surrounding area from the Indians. The Puritan settlers that followed during the winter of 1662 remained in the Cape Fear vicinity for only a brief time before abandoning the area (Lee 1965:4-5).

In early 1663, King Charles II granted territory south of Virginia to eight noblemen in tribute for restoring the Stuart dynasty to the monarchy. That conveyance included the area from Georgia to the Albemarle Sound region of North Carolina. The territory was divided into three counties: Albermarle [Albemarle Sound area], Clarendon [Cape Fear region] and Craven [South Carolina]. Shortly after, the Lords Proprietors received a proposal from a group of Barbadians for a settlement within the Cape Fear region. In late spring 1664, a group of 200 settlers, under the command of John Vassall, established a colony at the confluence of the Charles [modern Cape Fear] River and Town Creek (Potter 1993:5-6). The capital, Charlestown, was the first English town in Carolina (Lee 1965:5). The colony was reported to have reached a population of 800 and extended some 60 miles along the river at its zenith.

In October 1665, a second expedition by the Barbadians was launched with the intent of establishing a colony in the vicinity of Port Royal. A small fleet consisting of a frigate, sloop and a flyboat, under command of Sir John Yeamans, stopped at the Charlestown settlement after an arduous journey from Barbados. While entering the river, the flyboat, carrying the new colony's armament, ran aground on the shoals on the west side of the channel [modern Jay Bird Shoals] and was lost (Potter 1993:9, 29). The loss of this important cargo abruptly ended the Port Royal venture. Within another two years Charlestown would also be abandoned. Difficulty in obtaining supplies, differences between the proprietors and settlers over land policies and hostilities with the Natives resulted in the colony being deserted by late 1667 (Potter 1993:10-11).

In 1726, permanent settlements on the lower Cape Fear were established by South Carolina and upper North Carolina colonists (Lee 1977:7). On the west bank of the river, about 12 miles above its mouth and several miles below a shoal in the river called "the Flats," Maurice Moore established the town of Brunswick. A shoal located at the mouth of Town Creek impeded larger ships from venturing further upstream. Situated below "the Flats" Brunswick was accessible to vessels of large or small size (Lee 1977:12). In April 1733, another community was established 15 miles upstream from Brunswick. The new settlement became known as New Town or Newton to distinguish it from the "old town" of Brunswick. In 1740, the town was incorporated and the name was changed to Wilmington (Lee 1977:12).

As hostilities with France and Spain grew during the 1740s Governor Gabriel Johnston authorized the construction of a fort along the lower Cape Fear to protect the burgeoning towns of Brunswick and Wilmington. Construction began in July 1745 on a small bluff overlooking the mouth of the river. Johnston's Fort, as it was called, was still uncompleted in 1748 when two Spanish vessels entered the river and raided Brunswick (Carson 1992:20). Efforts to finish construction intensified after the raid and in less than a year the fort was completed. The resulting structure was small and poorly constructed. It was manned by only three men and armed with four rusty cannons (Carson 1992:20). In 1751, the fort was assigned to double as a quarantine station.

Development based upon a maritime economy played a major role in the growth of both Wilmington and Brunswick during the eighteenth century. Vessels of varying size entered the Cape Fear from other coastal ports, the West Indies and Europe. Larger vessels, unable to cross over "the Flats," called at Brunswick, while vessels of smaller size could travel further up the river to Wilmington. Consequently, Brunswick was established as the center for overseas shipping and Wilmington as the center for local and West Indian trade (Lee 1977:16-17).

Rice, cattle, swine, lumber and naval stores made up the majority of the exports from the port district of Brunswick. Prior to the Revolution numerous ships left the Cape Fear River for other ports. The West Indies served as the main destination of these ships with English ports following a close second. A lesser number carried cargo to coastal ports, mostly in the northern colonies, but occasionally some ventured south, down the coast to Charleston (Lee 1977:33).

The Cape Fear region played a minor role in the events of the American Revolution. In June 1775, Royal Governor Martin fled from New Bern to Fort Johnston, then under the protection of the British man-of-war *Cruizer*. Growing patriot activity in the area forced the governor to relocate to the warship a month later. All portable materials were transferred to the ship and the fort's guns were spiked and pushed into the river (Carson 1992:22). Local forces later burned the fort and its outbuildings.

Knowing that a large number of Loyalists inhabited the interior of the colony Governor Martin initiated a plan to subjugate the region using a combination of British and Loyalist forces (Sprunt 2005:113). British reinforcements arrived off the North Carolina coast by the end of March, but by then the opportunity to subdue the colony had passed. On 27 February 1776, Colonel James Moore and the First North Carolina Continentals with a group of militia defeated a contingent of Scottish Loyalists at the battle of Moore's Creek Bridge. This battle, called the "Lexington and Concord of the south," kept the British from occupying the South at the beginning of the war (Powell 1989:180-182).

Naval operations were of limited importance in the Cape Fear region. In mid-1776, British warships began taking up regular station over the mouth of the river. In May of the following year two British men-of-war entered the river and destroyed a number of colonial vessels at anchor (Watson 1992:29). To counter the threat posed by British warships the General Assembly voted to purchase and arm three brigs for the defense of the Cape Fear River. However, these vessels proved inadequate for the task and suggestions were made for either selling them or sending them on trading or privateering expeditions (Watson 1992:29).

The lower Cape Fear remained quiet until 1781 when Major James H. Craig was dispatched by Lord Cornwallis in Charleston to take Wilmington. Craig, with a force of 18 vessels and 400 troops, quickly captured the defenseless town (Sprunt 2005:114). From Wilmington, Craig dispatched parties throughout the countryside to rally local Loyalists and to obtain supplies for Cornwallis's troops, then marching through North Carolina. After being checked by Colonial forces in the battle of Guilford Courthouse the British retreated to Wilmington to recoup and replenish supplies. Later, when Lord Cornwallis moved north to suppress Virginia, Craig remained behind in Wilmington to disrupt Colonial activity in that region. News of Cornwallis's surrender at Yorktown made the British position in Wilmington untenable and on 17 November Major Craig evacuated the city.

After the conclusion of the war there was a shift in the maritime development of the Cape Fear region. Almost all the ships that left the Cape Fear now went to Charleston and few to England or the West Indies (Lee 1977:33). Inbound ships now proceeded up to Wilmington. This shift brought about the decline of the town of Brunswick as was indicated by the change in name of the "Port of Brunswick" to the "Port of Wilmington" (Lee 1977:34).

During the last decades of the eighteenth century the area that would become the town of Southport consisted of little more than the remains of Fort Johnston and the homes of local river pilots. The region's potential, however, was realized by three men from Wilmington, Joshua Potts, John Brown and John Husk, who the viewed the area, with its salubrious sea breezes, as an ideal spot for a new town. Though the men's initial petition was rejected in 1790 the group persevered and on 15 November 1792, the General Assembly issued a charter for the establishment of a town on the bluff overlooking the mouth of the river.

The town was named Smithville, after Benjamin Smith who introduced the bill into the legislature. The town was laid out with lots offered for sale in Wilmington and Fayetteville newspapers (Figure 7). The charter specified that no person could purchase more than six lots in their name and the purchase price of lots was to be 40 shillings per lot (Carson 1992:26). The town plan also reserved space for Fort Johnston, which was rebuilt in 1804.

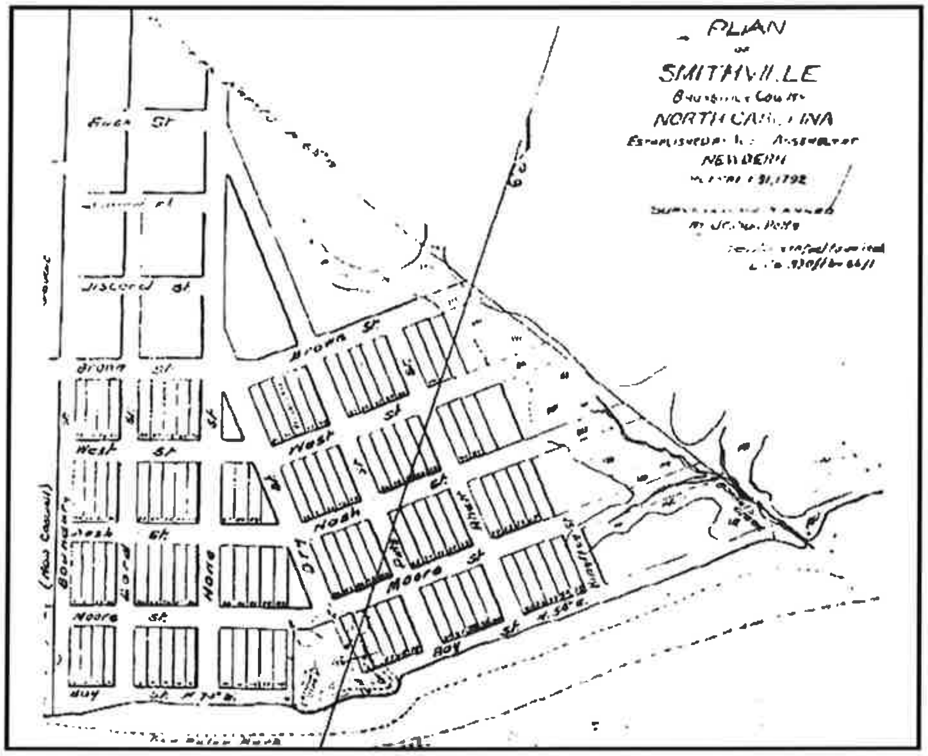


Figure 6. Plan of the town of Smithville, 1792 (Carson 1992:27).

With the growing amount of vessel traffic sailing up to Wilmington there arose a need for improvements in the navigability of the river. As early as 1784, measures were taken to improve the conditions of the lower Cape Fear River (Lee 1977:36). Improvements were needed at the treacherous entrances to the river, at the Bar and upstream at New Inlet. Three major shoals between Wilmington and the sea also caused problems for ships trying to navigate the river. The "upper shoal," located near the foot of Clarks Island, off the southern tip of Eagles Island, had eight and one-half feet of water. The "middle shoal," also known as "the Flats," had nine feet. The "lower shoal," at the foot of Campbell Island, had nine and one-half feet. The main channel of the river was then located in a narrow passage between Campbell Island, Clarks Island and the west bank (Lee 1978:112).

In addition to the shoals, ships deliberately sunk during the American Revolution as obstructions needed to be removed (Lee 1977:36-37). Around 1819, Hamilton Fulton, a noted English engineer, was hired to make improvements on the Cape Fear River mainly between Wilmington and the ocean where a system of jetties was planned. Work continued for six years until financial limitations halted this project. Some improvements were made on the river up until the start of the Civil War with sporadic financing by the state and local Wilmington businessmen (Lee 1977:37).

Steam vessels first appeared on the Cape Fear River in 1817. The first steamboat to arrive was the side-wheel *Prometheus*, built in Beaufort for a firm in Wilmington that intended to run the vessel from Wilmington to Fayetteville and Southport. The following year the Clarendon Steamboat Company was established at Wilmington. The company held the exclusive right to operate steamboats on the Cape Fear for a period of seven years provided that it kept one boat in service. In addition to the *Prometheus*, the side-wheel *Henrietta*, also made regular runs between Wilmington and Fayetteville (Lee 1977:37-38). By 1822, a second steamship venture, the Cape Fear Steamboat Company, had begun service on the river. With time the number of steamboats on the river increased significantly (Lee 1977:38). By the 1850s, nearly a hundred vessels of all types were in Wilmington at the same time. Many of the ships were large square-rigged foreign craft, while others were side-wheel steamers. Most, however, were American schooners engaged in the coastal trade (Lee 1978:116).

Development of the Cape Fear region was soon disrupted by the Civil War. After Confederate forces in South Carolina attacked the U.S. garrison at Fort Sumter, President Abraham Lincoln declared a state of open rebellion and called for volunteers to preserve the Union. Lincoln also issued a proclamation on 19 April 1861 establishing a blockade of Confederate ports in South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana and Texas. Eight days later, Lincoln extended the blockade to include ports in Virginia and North Carolina. With North Carolina's withdrawal from the Union, Governor John W. Ellis ordered the occupations of forts Johnston and Caswell.

Union naval forces were inadequate to properly enforce the blockade at the onset of the war. In 1861, U.S. navy registers listed 90 vessels, 50 of which were propelled by sail and were considered obsolete for the task at hand. The remaining 40 were steam, but several of the deep draft vessels proved unsuitable for the shallow southern waters. Eight others were laid up while 22 vessels remained at station off foreign shores and would require at least six months travel to reach the United States (Browning 1980:24). However, within a few months of Lincoln's proclamation, Secretary of the Navy Gideon Welles took steps to implement an effective blockade off the southern coastline.

The navy department bought or leased nearly any vessel that could be of service. In nine months, U.S. Navy agents purchased 136 ships, constructed 52 and commissioned and repaired another 76 (Engle and Lott 1975:180). The Union blockade in turn gave rise to the practice of blockade running. At the beginning of the blockade, practically any vessel was considered suitable for breaking through the Atlantic squadrons to carry cargo in or out of the isolated southern ports. The most successful of the early runners were steamers that had belonged to the Southern Coasting Lines and were idle due to the outbreak of the war. The illicit trade carried on by these ships reaped considerable profit, but failed to compare with the great capital resources brought in during the latter part of the war.

Wilmington provided North Carolina with a deepwater port. By 1860, Wilmington had emerged as a modern shipping center with excellent internal communication. Three railroads ran through the city and daily steamboat service to Charleston and New York, as well as, up the Cape Fear River to Fayetteville. With the capture of New Bern, Roanoke Island and Beaufort, Wilmington was the only North Carolina port left open for the importation and exportation of goods. As long as supplies were imported through the two inlets of the Cape Fear River and transported along the railroad lines, which connected with Lee's army in Virginia, the Confederacy had a lifeline. Wilmington soon became the most vital seaport in the "Southern Cause" (Pleasants 1979:15).

Wilmington became the key port for "runners" largely because of the area's topography. Located 28 miles from the mouth of the Cape Fear River, the port had access to the Atlantic through two separate entrances; eastward through New Inlet and southward through the river mouth (Figure 7). Although the two entrances were only six miles apart, Smith's Island, a strip of sand and shoal, lay in between. Continuing along Cape Fear were the dangerous Frying Pan Shoals, which extended 10 miles further into the Atlantic, making the distance by water between the two entrances a little less than 40 miles (Soley 1883:91).

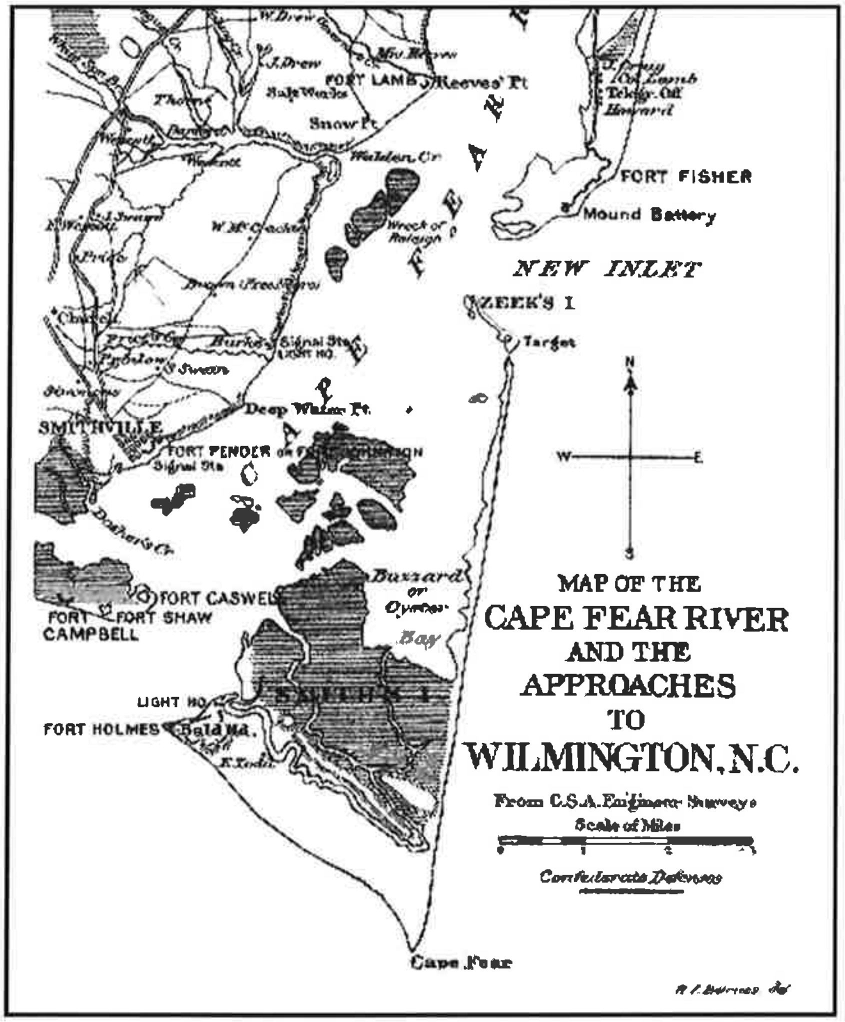


Figure 7. Chart depicting entrances into Cape Fear River (NHS 1987, ser. I, 12:38).

This geographical configuration proved highly advantageous for blockade runners and the initial blockade of Wilmington proved ineffective. When the *Daylight*, the first and at the time the only Union vessel sent to blockade these waters, arrived, it immediately experienced the difficulties associated with guarding the dual entrances of the Cape Fear River. While pursuing a steamer out of the western bar entrance, the *Daylight* inadvertently allowed several other small vessels to pass out of the New Inlet entrance. Within three months of the *Daylight's* arrival, 42 vessels either entered or cleared Wilmington (Browning 1980:27).

During a two-year period (January 1863-November 1864), Confederate naval sources listed numerous vessel stations on the Cape Fear. These vessels were identified as: the ironclad sloop *North Carolina*, the floating battery *Artic*, the steam gunboat *Yadkin*, the steam gunboat *Equator*, the torpedo boat *Squib*, and the ironclad sloop *Raleigh*, and two, long one-gun cutters. In November 1864, Confederate Secretary of the Navy Stephen Mallory also reported to President Jefferson Davis that two new torpedo boats were under construction at Wilmington (U.S. Navy [USN], 1921, ser. II, vol. 2, 1921:630,528-532, 630,743-745).

The capture of Wilmington proved difficult because both entrances to the Cape Fear were guarded by powerful fortifications and lesser works. Collectively those fortifications became known as the Lower Cape Fear Defense System. The central point of that system was Fort Fisher, located on Confederate Point. That fortification was originally a small earthworks constructed to protect New Inlet. By 1864, Fort Fisher had become the largest seacoast fortification in the Confederacy. Shaped like an inverted "L," Fort Fisher's land face ran 628 yards and was guarded by 20 of the heaviest seacoast guns. The sea face included a 130-pound Armstrong rifle and a 170-pound Blakely, both from England (Browning 1980:35).

Extending from the land face was a string of torpedoes, which could be exploded from inside of the fort (Pleasants 1979:22). Mound Battery, towering to a height of 60 feet with two mounted heavy guns, stood near the end of Confederate Point. Augusta Battery, which stood behind Mound Battery, was located near the river (Pleasants 1979:24).

Fort Holmes, on the other side of New Inlet on Smith's Island, shared the protection of Smith's Inlet in the Cape Fear River with the batteries at Oak Island. Oak Island, located opposite Fort Holmes, held another series of forts and batteries, such as Fort Campbell, Fort Caswell and Battery Shaw (Pleasants 1979:24). Fort Caswell guarded the western bar entrance. Captured by Confederate militia on 14 April 1861, Caswell was renovated into a strong casemated work with new armament consisting of seven 10-inch, four 8-inch Columbiads and a 9-inch Dahlgren gun (Browning 1980:35; Pleasants 1979:24). Both Fort Caswell and Fort Holmes were responsible for shelling union vessels in the Middle Ground area, including the stranded tug *Violet*, which went aground off the Western Bar Channel on the night of 7 August 1864.

After his tug struck the shoal Ensign Thomas Stothard requested assistance from the crew of the nearby 866-ton brig USS *Vicksburg* to attempt to re-float the *Violet.* Despite their quick response, the extra manpower and effort proved fruitless as Stothard was ordered to fire the *Violet* after midnight. In response to a court of enquiry [sic] investigation, Captain Stothard submitted an incident report to Captain B.F. Sands of the USS *Fort Jackson* and offered this account:

> After all preparations for sending officers, crew, and ship's effects off in boats that he [Lieutenant-Commander Braine of the USS *Vicksburg*] and Acting Volunteer Lieutenant Williams, of the *Emma*, had sent, all of which I did, sending property, a list of which you will find enclosed, also a list of crew, I made preparations for her destruction as follows: I put a lighted slow match to a powder tank in the magazine and closed the door, then filled a large, fine drawer

> with shavings and straw taken from pillows and mattresses, partially covered it with another, and sprinkled two quarts of spirits of turpentine over all and on the woodwork around it; hung up an oilcloth from the table, one corner hanging in the shavings, which I touched with a lighted match (in the wardroom), after all the boats, but mine in waiting, had left the side, and I followed about 2:00 o'clock a.m. this morning. The explosion of the magazine containing about 200 pounds of powder occurred within half an hour afterwards, and by daylight she was effectually consumed. One 12-pounder was thrown overboard, one left on the forecastle, spiked with rat-tail file, and the 24-pounder was directly over the magazine aft when it exploded, so that it was thrown into the sea (National Historical Society [NHS] 1987, Ser. I, 10:343,344).

Rear-Admiral S.P. Lee recommended that no action be taken to discipline the acting officer of the *Violet*. Lee remarked to Union Secretary of the Navy Gideon Welles, that: "Stothard is a very intelligent and efficient officer, notwithstanding this casualty" (NHS 1987, Ser. I, 10:344). Prior to its destruction, the *Violet* (ex-*Martha*) was described as a fourth-rate, wooden screw steamer measuring 85 feet in length, with a beam of 19 feet. The 166-ton tug housed one, inverted, direct-acting engine with a 30-inch diameter cylinder and one return flue boiler (U.S. Navy 1921, Ser. II, 1:233).

Farther up river from the *Viole*t wreck site there were a series of forts and batteries used as secondary defenses for Wilmington and as protection for blockade runners outbound from Smith's Inlet. Fort Lamb was located on the west side of the Cape Fear River on Reeve's Point. Above Fort Lamb was Fort Anderson, the most important of the secondary defenses. Partially built from the ruins of Old Brunswick Town, Anderson consisted of a series of trenches and earthworks approximately a mile long. Three smoothbore 24-pounders, three rifled 32-pounders and six smoothbore 32-pounders comprised the Fort's armaments. By 1864, Fort Anderson had become an inspection station for all craft heading up the Cape Fear River to Wilmington (Pleasants 1979:25). Several lesser forts, including Stokes, Lee, French, Campbell, Strong and Sugarloaf, were situated on the east side of the river (Pleasants 1979:25).

In addition to this impressive array of forts, a naval construction program was initiated in Wilmington to contribute to the defenses of the harbor. The success of the ironclad ram CSS *Virginia* in the March 1862 battles at Hampton Roads demonstrated the superiority of armored warships to naval officers of both the North and South. In late March 1862, Confederate Secretary of the Navy Stephen R. Mallory, sent "instructions relative to gunboats" to Commander William T. Muse, the ranking naval officer at Wilmington. Shortly thereafter, the navy began building two ironclads in the city, the *Raleigh* at James Cassidy's shipyard at the foot of Church Street, and the *North Carolina* at the Beery shipyard on Eagle Island (Still 1985:5-17, 79-92).

Both vessels utilized a design based on plans conceived by naval constructor John L. Porter. The plans called for a tightly framed hull, with a slight deadrise and a hard chine. The vessels were to be 174 feet long (150 feet between perpendiculars) with a draft of 13 feet. Amidships, a 105-foot long casemate, angled at thirty-five degrees and covered with 4 inches of iron plate, protected the gun deck. Two boilers provided steam for the vessel's two horizontal engines, which were geared to a single 10-foot screw. The first ironclad built on this design, the CSS *Richmond*, was completed in Richmond in 1862. Known as the *Richmond* class, this group, consisting of five vessels, was numerically the largest standardized class of ironclads constructed by the Confederacy (Holcombe 1993:63-64).

The two Cape Fear ironclads entered into active service by late 1863/early 1864 (*North Carolina* in December 1863 and the *Raleigh* in April 1864) after numerous delays resulting from material shortages, strikes and epidemics. However, the usefulness of these two vessels to the Confederacy's war effort was limited. *Raleigh* grounded on a shoal near the mouth of New Inlet and was destroyed after a sortie against the blockading squadron on 7 May 1864, less than a month after entering service. The *North Carolina*, on the other hand, was reduced to serving as a floating battery; its deep draft and lack of motive power rendered the vessel ineffective as a ram.

The ironclad was further hampered by the use of unseasoned timber in its construction. Warping and splitting timbers caused the ship to leak incessantly and an infestation by teredo worms further weakened the hull. For most of its career, the ironclad remained at anchor near Smithville, positioned to support the nearby forts in the defense of Wilmington. The *North Carolina* finally sank at its moorings in September 1864. Though useless as an offensive weapon, the *North Carolina* served as a deterrent, preventing the United States Navy from entering and seizing the lower Cape Fear until the fall of Fort Fisher in the closing days of the war.

When hostilities ended in 1865 so did some of the regular river trade. The prewar steamer service between Wilmington, Charleston and Savannah was not resumed, since rail service had been established. Steamship service did, however, resume to the northern cities of Baltimore, Philadelphia and New York (Lee 1977:91). The coastal trade also revived and was conducted mainly by schooners ranging between 150 and 600 tons. Because of the decimation of American shipping during the war international commerce was carried in foreign bottoms, usually of British, German or Scandinavian origins (Sprunt 2005:501).

Industry had been severely interrupted during the war, but was beginning to make a comeback. Naval stores and lumber continued to be the principal exports with the addition of some cotton. Exports recorded for the year 1871 amounted to some 95,000 bales of cotton, 100,000 bushels of peanuts, 112,024 barrels of spirits of turpentine, 568,441 barrels of rosin, 37,867 barrels of tar and 17,963 barrels of turpentine (Sprunt 2005:513-514). Without the use of slave labor the rice industry declined dramatically (Lee 1977:86-87). By the turn of the century, a decrease in the availability of pine trees resulted in a decline of the naval stores industry. With improvements in cultivation and transportation, cotton became a major industry in Wilmington until its decline in the 1930s. Guano from the West Indies was brought in for the new fertilizer plants. The production of creosote impregnated wood also helped increase shipping in the region (Lee 1977:87-88).

During the last quarter of the nineteenth century efforts were undertaken to develop Smithville into a port city. In 1886, the North and Southern Railroad Company announced plans to extend rail service from Wilmington to Smithville. Developers, envisioning a port that would rival Charleston and Norfolk, requested that the town's name be changed to Southport to draw attention to the "Port of the South" (Carson 1992:61). In anticipation of the expected development the town's dirt roads were paved in crushed shell and the dredge boat *Woodbury* began deepening and straightening the channel to accommodate increased vessel traffic. However, the proposed rail line did not materialize and Southport remained a small town relying on fishing and tourism for its economic livelihood. The Wilmington, Brunswick and Southport Railroad eventually extended a line to the town in 1911.

Improvements to navigation on the Cape Fear River had deteriorated during the war. Continual silting reduced the navigable channel. By 1870, federally financed projects were again started to improve the conditions of the river. One such project was the closure of one of the two inlets. New Inlet was closed in 1881 with the belief that the increased force of the concentrated flow would sweep out the channel. The closure was accomplished by placing a rock dam that extended for more than a mile from Federal Point to Zeke's Island. The dam was completed in 1881 and later became known as "the Rocks." Another rock barrier was later built between Zeke's Island and Smith's Island. The channel depth was dredged to accommodate the deeper draft vessels (Lee 1977:91).

Two life-saving stations were established near the mouth of the Cape Fear River during the 1880s. Those stations included the Cape Fear station (b. 1882) at east end of Bald Head Island and the Oak Island station (b. 1889) located west of Fort Caswell. Each station was equipped with line-throwing guns and self-righting surfboats (Sprunt 2005:527). Surfmen maintained a constant vigil of the sea from the station house and conducted regular nightly beach patrols; additional patrols were conducted in daylight during stormy weather. Both stations remained active until the 1930s when new Coast Guard facilities were constructed to replace them.

On 20 July 1895, the U.S. Marine Hospital Service appropriated $25,000 for the construction of a quarantine station at Southport. The new station was to be located on the river on the east side of the channel between the upper end of Battery Island and Price's Creek Lighthouse (Carson 1992:73). The entire station was to be built on a pier 600 feet long and to consist of a hospital building, a disinfecting house, attendant's quarters and a kitchen. The station opened for service by the middle of 1897 with Dr. J. M. Eager appointed as the station's first quarantine officer. A report for the fiscal year 1907 illustrates the level of activity at the station:

> [Eighty six] vessels spoken and passed; 19 steamers and 1 sailing vessels inspected and passed; 2 steamers and 3 sailing vessels disinfected; and 485 crew on steamers, 125 crew on sailing vessels, and 3 passengers on sailing vessels inspected. The vessels disinfected were from Bahia, Portobello, Santos, Rios, and Barbados (Brown 1974).

By 1937 the station had become obsolete and was placed on caretaker status. As the facility was located on water and not a navigation hazard it was left to deteriorate and on 19 August 1951, the abandoned station was destroyed by fire (Brown 1974).

The fishing industry provided the financial stamina for the economy on the lower Cape Fear during the early years of the twentieth century. The principal source of income for Southport was the menhaden fisheries. Most catches were processed into oil which was used in the manufacture of paints, linoleum, tanning solutions, soaps and waterproof fabrics (Carson 1992:96). Leftover scrap was ground up for fertilizer and feed for livestock. The Southport Fish Scrap and Oil Company and the Brunswick Navigation Company established processing plants along the Elizabeth River while additional plants could be found above the town on the Cape Fear River.

World War I initiated a revitalization of the economy with the establishment of the Carolina Shipyard in May 1918. At about the same time, the Liberty Shipyard started producing steel ships as well as experimental concrete ships. The success of the shipyards was short-lived and the economy fluctuated for several years until it fell during the 1930s. Though Wilmington saw moderate success in shipping and shipbuilding after the war, most of the yards had closed by the mid-1920s and competition from Norfolk and Charleston slowly relegated the city to an import distribution center catering mainly to regional trade (Watson 1992:145).

This trade averaged 200,000 or more tons through most of the 1920s, but with the coming of the Great Depression, the amount fell to 94,007 tons by 1932 (Watson 1992:150). Wilmington's economy would not fully recover from the effects of the depression until the end of the decade. Despite this economic uncertainty, foundations were laid for future development. By the beginning of World War II, Wilmington boasted 54 wharves, piers and docks and the opening of the Atlantic Intracoastal Waterway expanded the city's trade with its hinterland and increased its role in the coastal trade (Watson 1992:148-9).

With war in Europe and German submarines prowling the east coast during the early 1940s protection and defense of the coast became a top priority in Washington. The vulnerability of the Cape Fear had been confirmed during World War I and U.S. Navy officials were anxious to be prepared for future enemy intrusions (Gannon 1990:242-243). On 17 November 1941, the U.S. Navy reacquired the 248.8-acre Fort Caswell reservation, sold into private hands in 1929. The old fort grounds were to be used for training, communications and submarine tracking (Carson 1992:126).

The U-boat threat finally reached the Cape Fear region in early 1942. On 16 March, the 11,641-ton tanker *John D. Gill* was torpedoed in the coastal waters off the mouth of the river. As a result of the high number of vessel losses during the early stages of the war, defensive measures were put into place. Coastal communities were systematically blacked out, a more efficient convoy system was devised and additional planes and patrol vessels were put into service along the North Carolina coast (Stick 1952:237-239).

In addition to the menace that Axis submarines and aircraft represented during the conflict, a significant hurricane struck the project area in late summer 1944. On 1 August, the tropical storm made landfall near Southport and the Oak Island coast guard station reported maximum wind speeds of 80 miles per hour. To the north, "substantial damage" occurred in Wilmington and Wrightsville Beach and the combined losses of real estate and crops amounted to two million dollars (Galecki 2005:133-134).

World War II also brought renewed growth to the shipyards and relief to the area (Lee 1977:88-90). The increased jobs and higher wages allowed Wilmington's economy to increase and become stable. After the war many of the people brought in to build ships chose to stay and make Wilmington their home. In 1945, the State Port Authority was formed, promoting ports in Wilmington and Morehead City and creating new jobs. In 1955, the military established the Sunny Point Army Terminal [Military Ocean Terminal at Sunny Point]. The facility serves as a terminal for shipping military hardware and ammunition to

American forces around the globe. The base is a major employer in the area and local service and retail industries serving the military contribute to the economic prosperity of the region. By 1960, the population of Southport was reported as 2,034 residents. At that time, the town boasted a popular bookmobile, a new water tank, a "lighted" athletic field and a picnic area at the community park. Maritime news included the launch of a "big, new charter boat," the *Riptide*. Herman Sellers constructed the vessel for Glenn Trunnell of Southport. Other local commercial fishermen commenced discussions on the merits to install an artificial reef near the town. In September 1960, Hurricane *Donna* struck the region and fortunately caused only minimal damage in Brunswick County (Reaves 1999:169,172).

In early February 1970, the Atomic Energy Commission approved construction of a 385 million dollar nuclear power plant to be situated north of Southport. The downtown also experienced a significant economic boost when First-Citizens elected to build a bank in Southport, its first branch in Brunswick County. At the same time, waterfront interests offered services to the public such as the modern 150-seat restaurant Herman's and the new 450-foot long "fishing and pleasure pier" (Reaves 1999:243).

Today, the region presents a strong economy with a state port facility that is daily frequented by international cargo vessels. The economy is further augmented by the military and commercial fisheries, which provide an important source of income to area residents. In addition, Southport and the coastal communities on Oak Island and the resort on Bald Head Island are popular tourist destinations. The area's offshore waters are a sportsman's paradise catering to recreational boaters and sport fishermen alike.

Improvement History of the Entrance Channel to the Cape Fear River

In 1870, the U.S. Army Corps of Engineers (USACE) initiated a project to improve navigation on the Cape Fear River. An examination of the river conducted by a commission appointed by the War Department suggested that priorities at that time should be given to closing off the channel between Smith's and Zeke's Islands (U.S. Army Corps of Engineers [USACE] 1870:70). In 1874, the closing off of New Inlet increased the flow of water in the main navigation channel and scouring effects were noted to be deepening the channel over Bald Head Bar (USACE 1874:88-89). The officer in charge of operations also stated that a suction dredge was employed at Bald Head Bar to assist in the scouring process. Furthermore, the officer's report also noted that there were two channels into the river: a western channel with two bars (an outer with 14 feet at low water and an inner or "rip" with 10 feet at low water) and the Bald Head channel (USACE 1874:69). It was suggested that since the Bald Head channel was the natural channel all efforts should be directed towards maintaining a 12-foot level of water over it and that the western channel be disregarded.

In 1889, the project was modified to provide for a 20-foot depth, at low water, from Wilmington to the Ocean. Surveys conducted during the fiscal year ending 30 June 1890 reported that the depth of water over bar had reached 16 feet (USACE 1890:131). The wreck of a Civil War gunboat was uncovered during dredging activities on the bar in 1891. The boiler from the wreck reduced water depths in the channel to 13.5 feet providing a serious impediment to navigation (*The Messenger* [*TM*] 16 May 1891). Examinations of the wreck indicated that it was a wooden-hull vessel approximately 110 tons and 100 to 110 feet long (USACE 1893:1451). Portions, of the flue and boiler, were removed by the USACE in 1890. On 20 May 1893, Messrs. Johnston and Townsend were awarded a contract to remove the rest of the wreck structure (USACE 1893:1451). The wreck site was dynamited and remaining sections of boiler recovered for disposal. Subsequent inspections of the wreck area revealed no trace of the hull, and soundings in the vicinity indicated a depth of water of 22 feet (*TM* 7 July 1893; USACE 1893:1451).

The River and Harbor Act of 2 March 1907 provided for additional dredging for completing the channel to the mandated 20-foot depth level. In addition, this act also authorized for improvements in excess of 20 feet as appropriations permitted (USACE 1912:459). The project was modified again in the River and Harbor Act of 25 July 1912. Those modifications called for a channel of 26 feet deep at low water with widths of 300 feet in the river, increasing to 400 feet across the bar and in curves in the river (USACE 1912:459-460). The controlling depths of the channel were increased to 30 feet in the River and Harbor Act of 2 March 1919. In 1922, the USACE discontinued the contemporary entrance channel and authorized for a new one over the bar with the same dimensions as the previous one (USACE 1922:682-683). The new channel was to run in a southwesterly direction from Bald Head Point. These improvements were noted as being completed in 1932.

In the River and Harbor Act of 2 March 1945, the controlling dimensions for the navigation channels on the Cape Fear River were increased further. Water depths from the outer end of the bar to Wilmington were increased to 32 feet and all channels were now to maintain a width of 400 feet throughout (USACE 1945:632-631). The project was estimated to be 65 percent complete by the end of the fiscal year. In 1950, the controlling depths over the ocean bar were increased to 35 feet (USACE 1950:653-654). Additional modifications to the navigation channels were authorized in the River and Harbor Act of 23 October 1962. Among the provisions of that act was the deepening and widening of the entrance channel to 40 feet deep and 500 feet wide (USACE 1962:360-361). The channel was to maintain those dimensions as far as Southport were they were reduced to 38 feet deep and 400 feet wide up to Wilmington. The project was reported as being completed in 1973 (USACE 1979:6-9).

Previous Surveys

In conjunction with the efforts of OA to assist the Village of Bald Head Island in its actions to permit an excavation area at the mouth of Bald Head Creek, TAR carried out a magnetometer and sidescan sonar survey of an initial borrow site on 2 February and 8 March 2009. An extension of this area was surveyed by TAR on 29 April 2010 (Figure 8). Analysis of the remote-sensing data generated during the 2009 Bald Head Creek survey identified a total of 17 magnetic anomalies in the initial project area. Four magnetic anomalies had a related acoustic signature; these were associated with a modern reinforced concrete platform. All targets appeared to have been generated by modern debris such as fish and crab traps, pipes, small diameter rods, cable, wire rope, chain, small boat anchors, and the modern concrete platform. No additional investigation of those sites is recommended in conjunction with the proposed dredging. The extension of the survey area, investigated in 2010, contained 37 magnetic anomalies and two acoustic signatures. All targets appeared to have been generated by modern debris such as fish and crab traps, pipes, small diameter rods, cable, wire rope, chain, small boat anchors, and a modern wood platform. No additional investigation of those sites is recommended in conjunction with the proposed dredging (Figure 9).

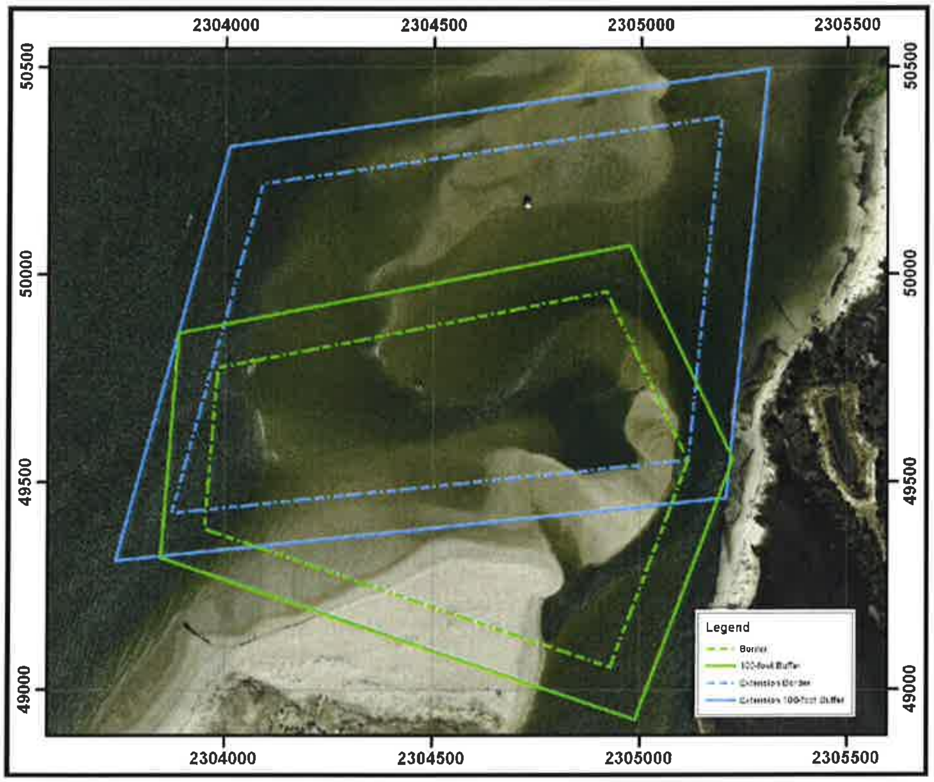


Figure 8. Image illustrating the 2009 and 2010 survey areas at the mouth of Bald Head Island Creek (Courtesy U.S. Geological Survey).

Description of Findings

Analysis and contouring of the remote-sensing data generated during the Bald Head Creek survey identified a total of 38 magnetic anomalies (Figure 9). Four anomalies were located outside a 100 foot buffer surveyed beyond the borrow perimeter. Nine of the anomalies appear to be debris associated with previous navigation range structures. The remaining 25 anomalies appeared to have been generated by modern debris such as fish and crab traps, pipes, small diameter rods, cable, wire rope, chain and small boat anchors (Appendix B).

Sonar could not be used in the survey area as water depths, even at high tide, were not sufficient for safe operations. Based on the survey data no NRHP eligible submerged cultural resources will be impacted by dredging operations and no additional investigation of the anomalies is recommended in conjunction with the proposed project.

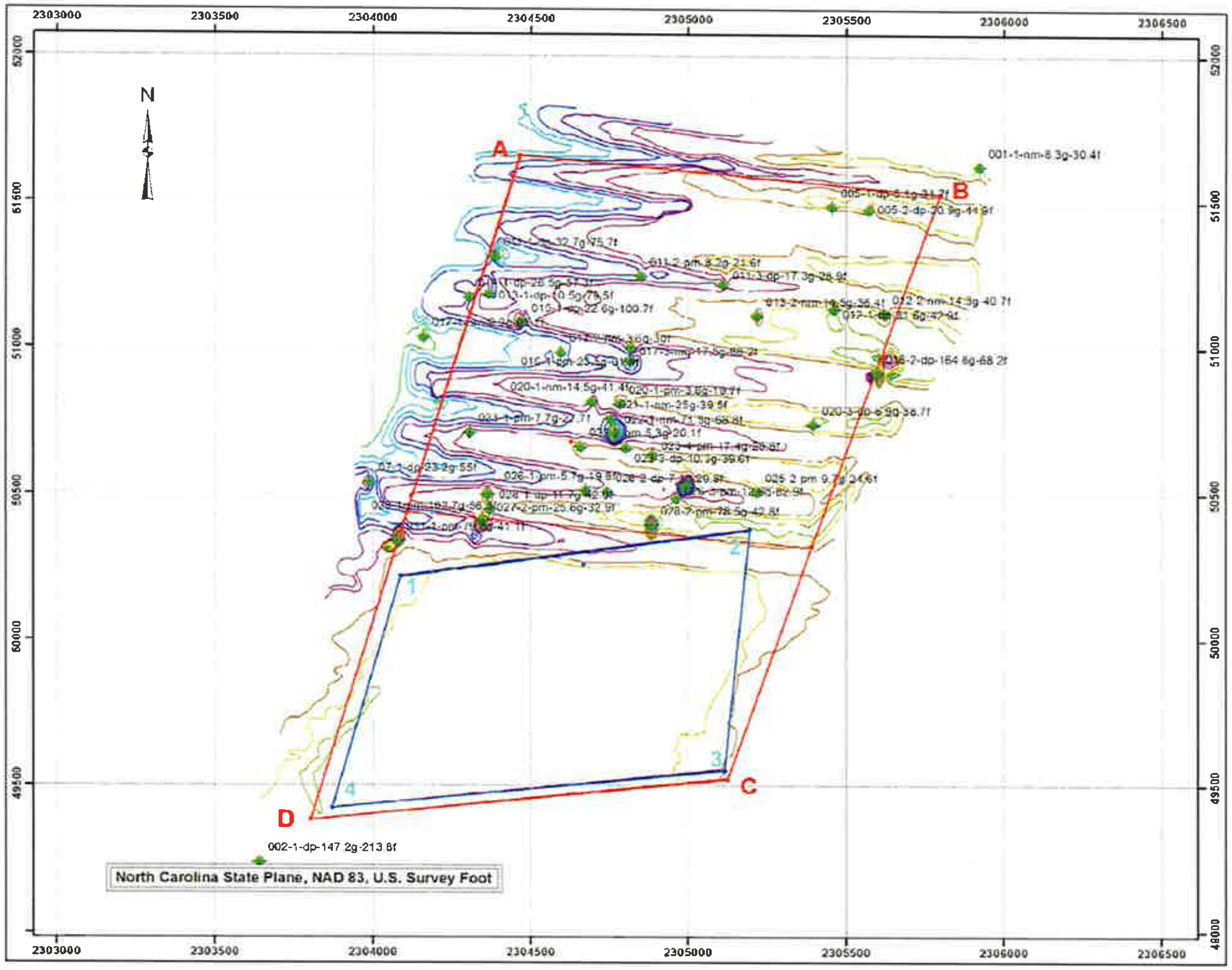


Figure 9. Magnetic contour map of the 2014 Bald Head Island Creek survey area.

Conclusions and Recommendations

A survey of historical and archaeological literature and background research confirmed evidence of sustained historic maritime activity associated with the Bald Head Island and Cape Fear River area that continues even today. Documented transportation activities in the vicinity of Bald Head Island and neighboring waterways date from the first half of the sixteenth century. The Cape Fear River region became a focus for European activities as early as 1526 when Lucas Vásquez de Ayllón led an expedition from Florida into the Cape Fear region. Permanent settlement along the banks of the Cape Fear River began during the second decade of the eighteenth century.

As a consequence of nearly 400 years of navigation in the coastal region of Brunswick County and settlement along the banks of the Cape Fear River since the eighteenth century, there is a high probability that historically significant submerged cultural resources are located in the area. While no shipwrecks in the project vicinity have been listed on the NRHP or with the UAB, previously identified vessel remains document that they exist; there are at least 27 shipwrecks recorded in the coastal waters near Bald Head Island and the mouth of the Cape Fear River (Appendix A). Because of their association with the broad patterns of North Carolina history, the remains of sunken vessels preserve important information about the maritime heritage of the North Carolina coast.

In spite of the high probability for cultural resources in the area, no potentially significant anomalies were identified in the 2014 survey area. Of the 38 magnetic anomalies identified during the survey four were located outside a 100 foot buffer surveyed beyond the borrow perimeter. Twenty-five anomalies have signature characteristics indicative of fish and crab traps, pipes, small diameter rods, cable, wire rope, chain, small boat anchors and other modern debris. The remaining nine anomalies appear to be debris associated with previous navigation structures.

The shallow area north of the mouth of Bald Head Creek has been the location of a number of channel range markers. As early as 1884 a front-range marker for the Bald Head Channel reach was located north of the mouth of the creek (Figure 10). By 1911, realignment of the Bald Head Channel required placement of a back-range beacon on the shoal north of Bald Head Creek (Figure 11). Within 12 years the Cape Fear Bar Channel realignment required shifting the Bald Head Channel reach beacon. A front-range beacon was also installed for the Smith Island Channel reach and another beacon was installed northwest of Bald Head Light to serve as front-range for the Southport Channel reach (Figure 12). The 1932 C&GS chart shows that only a front-range beacon for the Bald Head Channel reach was being maintained on the shoal north of the mouth of Bald Head Creek (Figure 13) and the previous range structures had been removed. Although the front-range location shifted in relation to a back range beacon in Cedar Creek that configuration persisted until sometime between 1988 and 1998. During that period the front-range beacon for the Cedar Creek back beacon was moved southwest to a location off the northwest point of Bald Head Island (Figure 14). That configuration remains intact today [2014], as the Bald Head Channel alignment has been stabilized by dredging.

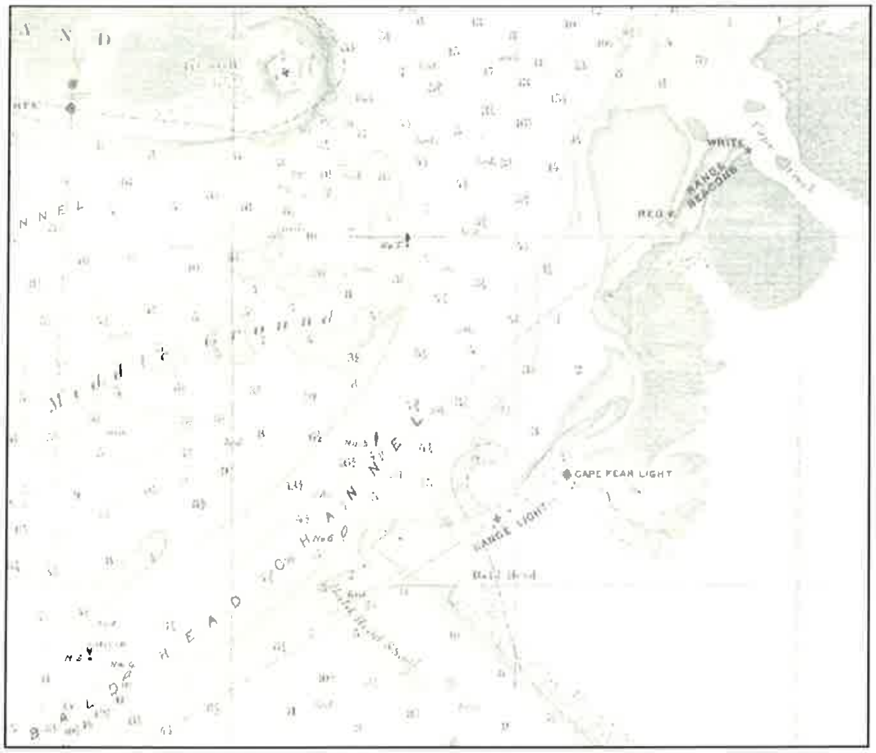


Figure 10. 1884 C&GS Chart showing a front range beacon for the Bald Head Channel reach in the survey area.

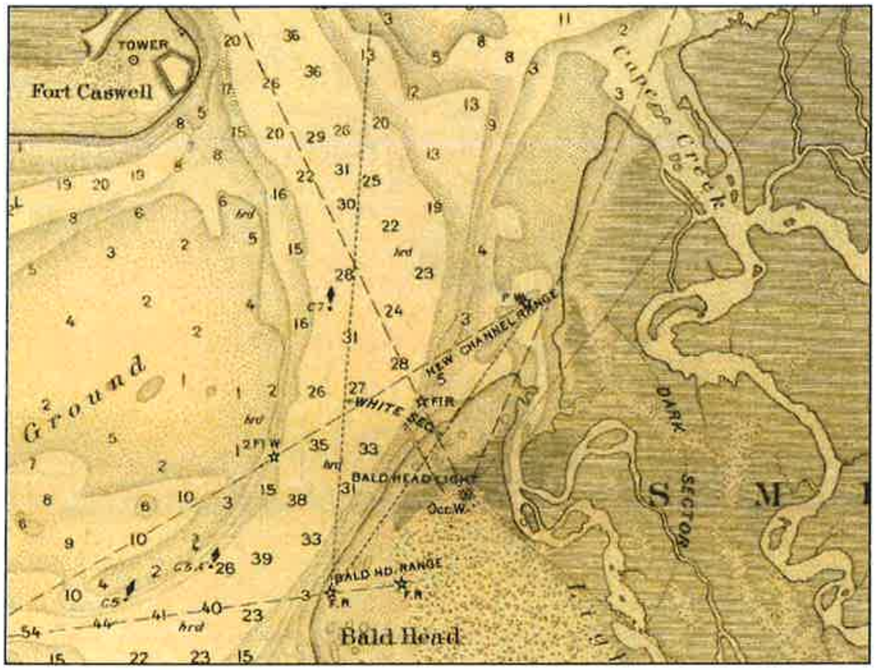


Figure 11. 1911 C&GS Chart showing a back range in the survey area for the Cape Fear Bar Channel reach.

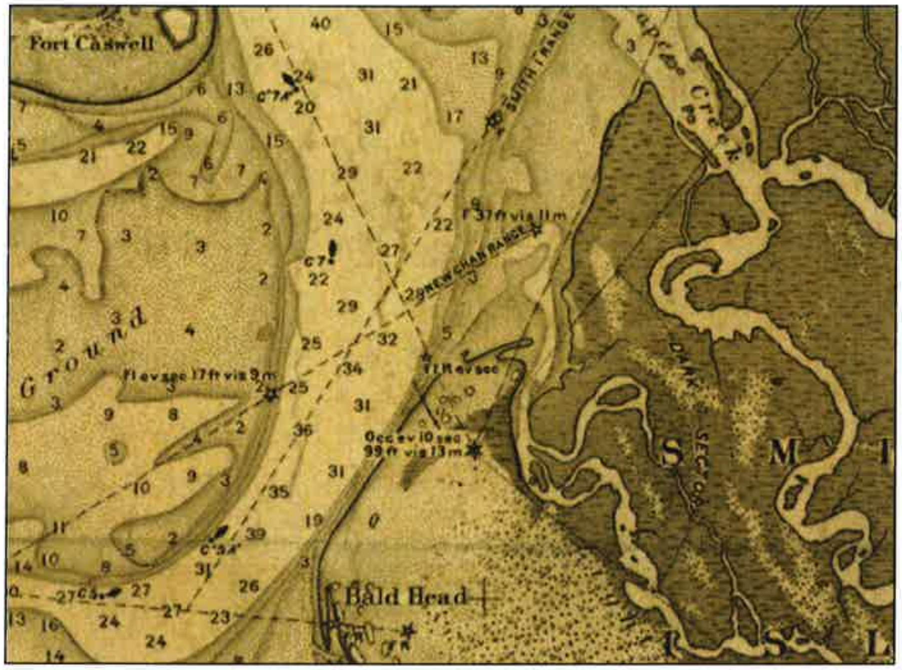


Figure 12. 1923 C&GS chart showing realignment of the Bald Head Channel reach beacon, installation of a front beacon for the Smith Island Channel reach and a front-range beacon for the Southport Channel reach.

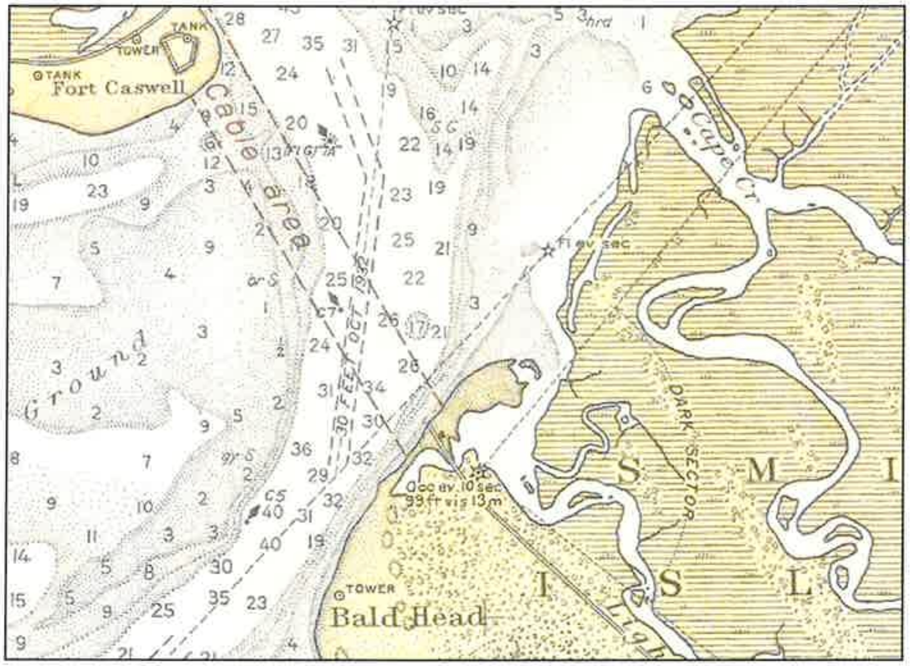


Figure 13. 1932 C&GS chart showing the Bald Head Channel reach front-range beacon in the survey area.

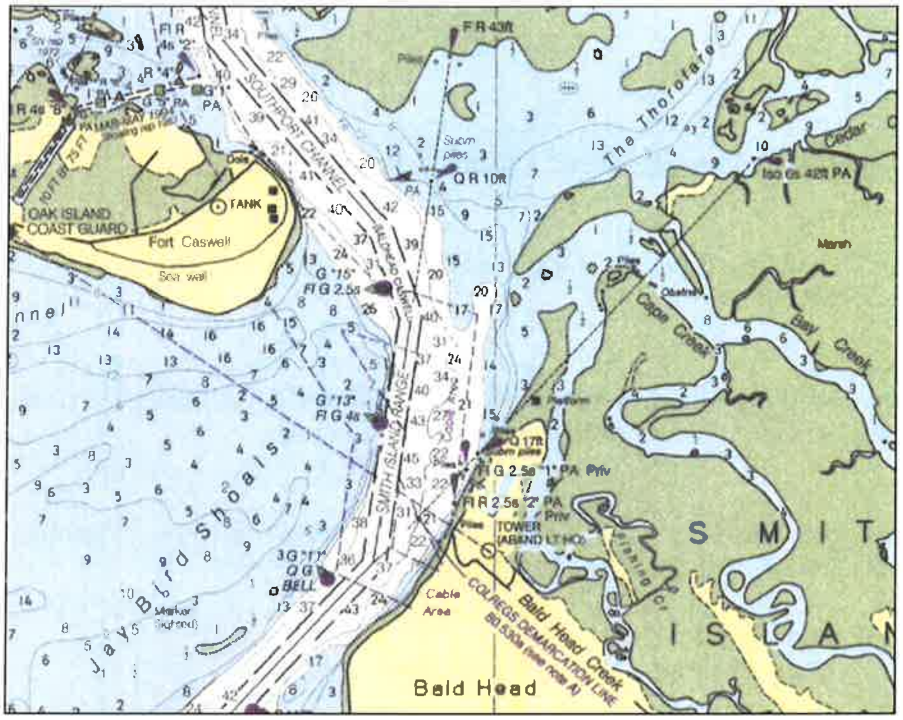


Figure 14. 1998 NOAA chart showing the current configuration of range markers in the survey area.

Although magnetic anomalies suggest that debris associated with range beacons in the project area remains at the site, the beacon light structure would have been salvaged and the supporting structure removed to prevent confusion by vessels navigating the Cape Fear. Although their design has not been researched, patent designs for lights and structure design information is likely available in the patent and Corps of Engineers records. The remaining debris is not appear likely to shed sufficient light on design and construction information to merit additional investigation unless the structures were destroyed by storms rather than salvaged.

Based on the historical and remote sensing survey data no NRHP eligible submerged cultural resources will be impacted by dredging operations and no additional investigation of the anomalies is recommended in conjunction with the proposed project. However, in the event that dredging exposes the remains of one or more of the range beacons, the UAB at Fort Fisher should be informed so that an assessment of the structures historical significance can be made and the remains documented. With that exception, no additional investigation is recommended in conjunction with the proposed project.

References Cited

Berman, Bruce D.
1972 *Encyclopedia of American Shipwrecks.* Mariners Press, Boston.

Brown, Landis G.
1974 Cape Fear Quarantine Station: Origin and Disease Barrier. *Brunswick County Historical Society Newsletter* 14(2).

Browning, Robert M., Jr.
1980 The Blockade of Wilmington, North Carolina: 1861-1865. Unpublished M.A. thesis, Department of History, East Carolina University, Greenville.

Carson, Susan S.
1992 *Joshua's Dream: The Story of Old Southport, A Town with Two Names.* Southport Historical Society, Southport, North Carolina.

Engle, Eloise, and Arnold S. Lott
1975 *America's Maritime Heritage.* Naval Institute Press, Annapolis.

Galecki, Bryan
2005 *Rum Runners, U-Boats, & Hurricanes: The Complete History of the Coast Guard Cutters Bedloe and Jackson.* Pine Belt Publishing, Wilmington, N.C.

Gannon, Michael
1991 *Operation Drumbeat: The Dramatic True Story of Germany's First U-Boat Attacks Along the American Coast in World War II.* Reprint of the 1990 edition. HarperPerennial, New York.

Holcombe, Robert
1993 The Evolution of Confederate Ironclad Design. Unpublished M. A. thesis, Department of History, East Carolina University, Greenville, North Carolina.

Lee, Lawrence
1965 *The Lower Cape Fear in Colonial Days.* University of North Carolina Press, Chapel Hill.

1977 *New Hanover County: A Brief History.* Division of Archives and History, North Carolina Department of Cultural Resources, Raleigh.

1978 *The History of Brunswick County North Carolina.* Board of County Commissioners, Brunswick County, North Carolina.

Lockhead, John L. (Compiler)
1954 *Disasters to American Vessels, Sail and Steam, 1841-1846.* Compiled from the New York Shipping and Commercial List, Mariners Museum, Newport News, Virginia.

Lytle, William M. and Forrest R. Holdcamper
1975 *Merchant Steam Vessels of the United States 1790-1868 "The Lytle-Holdcamper List."* Edited by C. Bradford Mitchell. The Steamship Historical Society of America, Staten Island, New York.

Marx, R. F.
1983 *Shipwrecks in the Americas*. Bonanza Books, New York.

National Historical Society
1987 *Official Records of the Union and Confederate Navies in the War of the Rebellion.* Ser. 1, vol. 12. Historical Times, Harrisburg, Pennsylvania.

National Oceanic and Atmospheric Administration [NOAA]
n.d. Wrecks and Obstructions (AWOIS). http://www.nauticalcharts.noaa.gov/hsd/awois.html (accessed 5 February 2009).

National Park Service
n.d. National Register of Historic Places Official Website. http://www.nps.gov/nr/ (accessed 5 February 2009).

Northern Maritime Research
2002 *Northern Shipwreck Database*. Bedford, Nova Scotia, Canada. CD-ROM.

Pleasants, James A.
1979 A Brief History of the Lower Cape During the Civil War. Ms. on file, Tidewater Atlantic Research, Washington, North Carolina.

Potter, Greg L.
1993 Report of Findings: The Yeamans' Expedition Flyboat. Submitted to the Underwater Archaeology Unit, Division of Archives and History, North Carolina Department of Cultural Resources, Fort Fisher.

Powell, William.
1989 *North Carolina Through Four Centuries*. University of North Carolina Press, Chapel Hill.

Reaves, Bill
1999 *Southport (Smithville), A Chronology (1941-1970).* Southport Historical Society, Southport, North Carolina.

Shomette, Donald G.
1973 *Shipwrecks of the Civil War, The Encyclopedia of Union and Confederate Naval Losses*. Donic Ltd., Washington, D. C.

Soley, James Russell
1883 *The Navy in the Civil War: The Blockade and the Cruisers*. Charles Schribner's, London.

Sprunt, James
2005 *Chronicles of the Cape Fear River.* Second Edition. Dram Tree Books, Wilmington, North Carolina.

Stick, David
1952 *Graveyard of the Atlantic: Shipwrecks of the North Carolina Coast.* University of North Carolina Press, Chapel Hill.

Still, Jr. William N.
1985 *Iron Afloat: The Story of the Confederate Armorclads.* University of South Carolina Press, Columbia.

The Messenger [Wilmington NC]
1891 *The Messenger*, 16 May 1891, 7 July 1892.

U. S. Army Corps of Engineers
1870-1979 *Annual Reports of the Chief of Engineers*, U.S. Government Printing Office, Washington, D.C.

U.S. Navy
1921 *Official Records of the Union and Confederate Navies in the War of the Rebellion.* Ser. II, Vol. 1. U.S. Government Printing Office, Washington, D.C.

Watson, Alan D.
1992 *Wilmington: Port of North Carolina.* University of South Carolina Press, Columbia.

Appendix A

Known shipwrecks in the vicinity of the mouth of the Cape Fear River, North Carolina

Vessel	Type	Use	Date of Loss	Location	Disposition
Spanish Vessel			1526	Mouth of the Cape Fear River	
Sir John	Fly Boat		Oct. 1665	Middle Ground	
Unknown			Feb. 1767	Cape Fear River Bar	
Enterprise			15 Feb. 1768	Mouth of the Cape Fear River	
Clementine			March 1775	Middle Ground	Salvaged(?)
Unknown			Feb. 1784	Mouth of the Cape Fear River	
Neptune	Brig		26 Jan. 1789	Middle Ground	
Sabine		Privateer	11 Sept. 1814		
Florie		Blockade Runner	Oct. 1864	Inside Bar	
Georgiana McCaw		Blockade Runner	2 June 1864	SW of Baldhead Light	
Violet		U.S.S. Gunboat	7 Aug. 1864	Western Bar	Possibly cleared by USACE
Frying Pan Shoals Lightship		Light Ship	20 Dec. 1861	North of Fort Caswell	Sunk by U.S.S. *Mount Vernon*
Ellen	Schooner	Blockade Runner	26 June 1862	Burned while ashore at Bald Head Channel	Taken in tow by U.S.S. *Victoria*. Sunk in 15 minutes.
Emily	Schooner	Blockade Runner	26 June 1862	Burned under the guns of Fort Caswell	
Lizzie	Sloop	Blockade Runner	1 August 1862	Captured and burned by U.S.S. *Penobscot* off Bald Head.	
Ella	Steamer	Blockade Runner	3 Dec. 1864	Run ashore on Bald Head Beach.	Partially Salvaged
Agnes Emily Frye	Steamer	Blockade Runner	27 Dec. 1864	Lost 2 miles south of Fort Caswell off Old Inlet	
Pine	Sloop		May 1868	Cape Fear Bar	
Alex Sprunt		Lighter	Feb. 1872		
Felicitus	Bark (Ger.)		July 1874	Main Bar	Salvaged
Maria Needham	Bark (Br.)		14 Jan. 1874	Middle Ground	Salvaged
Vapor	Schooner		5 Nov. 1895	Cape Fear Bar	
San Antonio	Bark (Br.)		13 Jan. 1890		Salvaged
Ogir	Bark (Nor.)		10 Nov. 1894	Middle Ground	Salvaged
Clarence H	Schooner		9 Dec. 1902	South of Cape Fear Bar	
Col. Thos. F. Austin	Schooner		24 Feb. 1916	Middle Ground	
Unknown	Bark		13 June 1930	Middle Ground	

Appendix B

Magnetometer Anomaly List

(All coordinates North Carolina State Plane, NAD 83, U.S. Survey Foot)

Designation	X Coordinate	Y Coordinate	Latitude	Longitude	Line #	Target #	Signature	Gammas	Feet	Assessment	Potential Identification
001-1-nm-8.3g-30.4f	2305923.6	51623.9	33.88756748	-77.99214441	1	1	Negative Monopolar	8.3g	30.4f	Small ferrous object	Possible Traps or Debris
005-1-dp-5.1g-31.7f	2305455.8	51485.6	33.88720056	-77.99369007	5	1	Dipolar	5.1g	31.7f	Small ferrous object	Possible Traps or Debris
005-2-dp-20.9g-44.9f	2305572.8	51475.6	33.88716983	-77.99330498	5	2	Dipolar	20.9g	44.9f	Small ferrous object	Possible Traps or Debris
011-1-dp-32.7g-75.7f	2304386.9	51311.8	33.88675279	-77.99721706	11	1	Dipolar	32.7g	75.7f	Small ferrous object	Possible Traps or Debris
011-2-pm-8.2g-21.6f	2304851.7	51244.8	33.8865558	-77.99568814	11	2	Positive Monopolar	8.2g	21.6f	Small ferrous object	Possible Traps or Debris
011-3-dp-17.3g-28.9f	2305112.8	51218.6	33.88647656	-77.9948289	11	3	Dipolar	17.3g	28.9f	Small ferrous object	Possible Traps or Debris
012-1-dp-31.6g-42.9f	2305463.4	51133.7	33.88623355	-77.99367679	12	1	Dipolar	31.6g	42.9f	Small ferrous object	Possible Traps or Debris
012-2-nm-14.3g-40.7f	2305619.6	51119.1	33.88618909	-77.99316273	12	2	Negative Monopolar	14.3g	40.7f	Small ferrous object	Possible Traps or Debris
013-1-dp-10.5g-79.5f	2304370.9	51184.1	33.88640239	-77.99727402	13	1	Dipolar	10.5g	79.5f	Small ferrous object	Possible Traps or Debris
013-2-nm-14.5g-36.4f	2305219.6	51111.7	33.8861799	-77.99448065	13	2	Negative Monopolar	14.5g	36.4f	Small ferrous object	Possible Traps or Debris
014-1-dp-26.5g-57.3f	2304306.8	51171.8	33.88637038	-77.99748558	14	1	Dipolar	26.5g	57.3f	Small ferrous object	Possible Traps or Debris
015-1-dp-22.6g-100.7f	2304475	51089.5	33.8861396	-77.99693424	15	1	Dipolar	22.6g	100.7f	Small ferrous object	Possible Traps or Debris
016-1-pm-23.5g-61.4f	2304821	50999.4	33.88588245	-77.99579745	16	1	Positive Monopolar	23.5g	61.4f	Small ferrous object	Possible Traps or Debris
016-2-dp-164.6g-68.2f	2305599.2	50917.7	33.88563634	-77.99323666	16	2	Dipolar	164.6g	68.2f	Moderate ferrous object	Possible Range Marker Debris
017-1-nm-9.2g-65.1f	2304162.3	51034.6	33.88599745	-77.99796616	17	1	Negative Monopolar	9.2g	65.1f	Small ferrous object	Possible Traps or Debris
017-2-nm-3.6g-30f	2304597	50983.3	33.88584445	-77.99653588	17	2	Negative Monopolar	3.6g	30f	Small ferrous object	Possible Traps or Debris
017-3-nm-17.5g-68.2f	2304818	50955.7	33.88576248	-77.99580879	17	3	Negative Monopolar	17.5g	68.2f	Small ferrous object	Possible Traps or Debris
020-1-nm-14.5g-41.4f	2304695.5	50816.6	33.88538372	-77.99621696	20	1	Negative Monopolar	14.5g	41.4f	Small ferrous object	Possible Traps or Debris
020-1-pm-3.8g-19.7f	2304784.7	50807.1	33.88535515	-77.99592344	20	1	Positive Monopolar	3.8g	19.7f	Small ferrous object	Possible Traps or Debris
020-3-dp-6.9g-38.7f	2305397.6	50738.8	33.88515045	-77.99390673	20	3	Dipolar	6.9g	38.7f	Small ferrous object	Possible Traps or Debris
021-1-nm-25g-39.5f	2304755.3	50755.8	33.88521502	-77.996022	21	1	Negative Monopolar	25g	39.5f	Moderate ferrous object	Possible Range Marker Debris
022-1-nm-71.5g-68.8f	2304770.4	50705.1	33.88507531	-77.99597394	22	1	Negative Monopolar	71.5g	68.8f	Moderate ferrous object	Possible Range Marker Debris
023-1-pm-7.7g-27.7f	2304308.5	50708.8	33.8850983	-77.99749539	23	1	Positive Monopolar	7.7g	27.7f	Small ferrous object	Possible Traps or Debris
023-2-pm-5.3g-20.1f	2304660.1	50660	33.88495447	-77.99633879	23	2	Positive Monopolar	5.3g	20.1f	Small ferrous object	Possible Traps or Debris
023-3-dp-10.3g-39.6f	2304802.5	50654.5	33.8849354	-77.99586989	23	3	Dipolar	10.3g	39.6f	Small ferrous object	Possible Traps or Debris
023-4-pm-17.4g-25.6f	2304888.3	50634.9	33.88487917	-77.9955879	23	4	Positive Monopolar	17.4g	25.6f	Small ferrous object	Possible Traps or Debris
025-1-nm-99.8g-44.7f	2304992	50523.6	33.88457051	-77.99525001	25	1	Negative Monopolar	99.8g	44.7f	Moderate ferrous object	Possible Range Marker Debris
025-2-pm-9.7g-24.6f	2305218.6	50507	33.8845186	-77.99450412	25	2	Positive Monopolar	9.7g	24.6f	Small ferrous object	Possible Traps or Debris
026-1-pm-5.7g-19.8f	2304676.6	50511.1	33.88454493	-77.9962894	26	1	Positive Monopolar	5.7g	19.8f	Small ferrous object	Possible Traps or Debris
026-2-dp-7.1g-29.8f	2304744	50505.2	33.88452685	-77.99606757	26	2	Dipolar	7.1g	29.8f	Small ferrous object	Possible Traps or Debris
026-3-pm-12.6g-62.9f	2304963.8	50484.9	33.88446497	-77.9953442	26	3	Positive Monopolar	12.6g	62.9f	Small ferrous object	Possible Range Marker Debris
07-1-dp-23.2g-55f	2303993.4	50538	33.88463779	-77.99853905	7	1	Dipolar	23.2g	55f	Small ferrous object	Possible Traps or Debris
027-2-pm-25.6g-32.9f	2304365.4	50496.7	33.88451401	-77.99731501	27	2	Positive Monopolar	25.6g	32.9f	Small ferrous object	Possible Traps or Debris
028-1-dp-11.7g-42.9f	2304372.8	50446.2	33.88437506	-77.99729231	28	1	Dipolar	11.7g	42.9f	Small ferrous object	Possible Traps or Debris
028-2-pm-78.5g-42.8f	2304886.2	50391.3	33.88420997	-77.99560294	28	2	Positive Monopolar	78.5g	42.8f	Moderate ferrous object	Possible Range Marker Debris
029-1-pm-102.7g-56.3f	2304350.7	50407.8	33.88427018	-77.99736639	29	1	Positive Monopolar	102.7g	56.3f	Moderate ferrous object	Possible Range Marker Debris
031-1-pm-79.8g-41.1f	2304079.1	50335.1	33.88407798	-77.99826349	31	1	Positive Monopolar	79.8g	41.1f	Moderate ferrous object	Possible Range Marker Debris
002-1-dp-147.2g-213.8f	2303642.7	49239.9	33.88108116	-77.99973739	2	1	Dipolar	147.2g	213.8f	Large ferrous object	Possible Range Marker Debris

North Carolina Department of Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Governor Pat McCrory
Secretary Susan Kluttz

Office of Archives and History
Deputy Secretary Kevin Cherry

July 3, 2014

Ronnie D. Smith
US Army Corps of Engineers
69 Darlington Avenue,
Wilmington, NC 28403

RE: Village of Bald Head Island, Dredge the Mouth of Bald Head Creek & Place Material Along the Shoreline of Bald Head Island, Brunswick County, ER 02-8817

Dear Mr. Smith:

We reviewed the report *A Phase I Remote-Sensing Archaeological Survey of a Proposed Borrow Area Extension off the Mouth of Bald Head Creek, Bald Head Island, Brunswick County, North Carolina*, transmitted to us electronically by Tidewater Atlantic Research, Inc.

The report meets our office's guidelines and those of the Secretary of the Interior. After careful review, our staff concurs with the findings and recommendations contained within the report. No further archaeological work is necessary in the proposed dredging area.

It should be noted that all previous comments regarding the placement of sand on Bald Head Island beaches and the proposed terminal groin remain in effect regarding the identified cultural resources. (ER 12-0437)

These comments are made pursuant to Section 106 of the National Historic Preservation Act of 1966, North Carolina legislation (G.S. 121-22 to 28, Article 3), and the Abandoned Shipwreck Act of 1987 (P.L. 100-298).

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or renee.gledhill-earley@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

cc: Gordon P. Watts, Jr., Tidewater Atlantic Research, Inc.
Erik Olsen, Olsen Associates, Inc.

APPENDIX H

PROJECT DESIGN DRAWINGS – PROPOSED ACTION

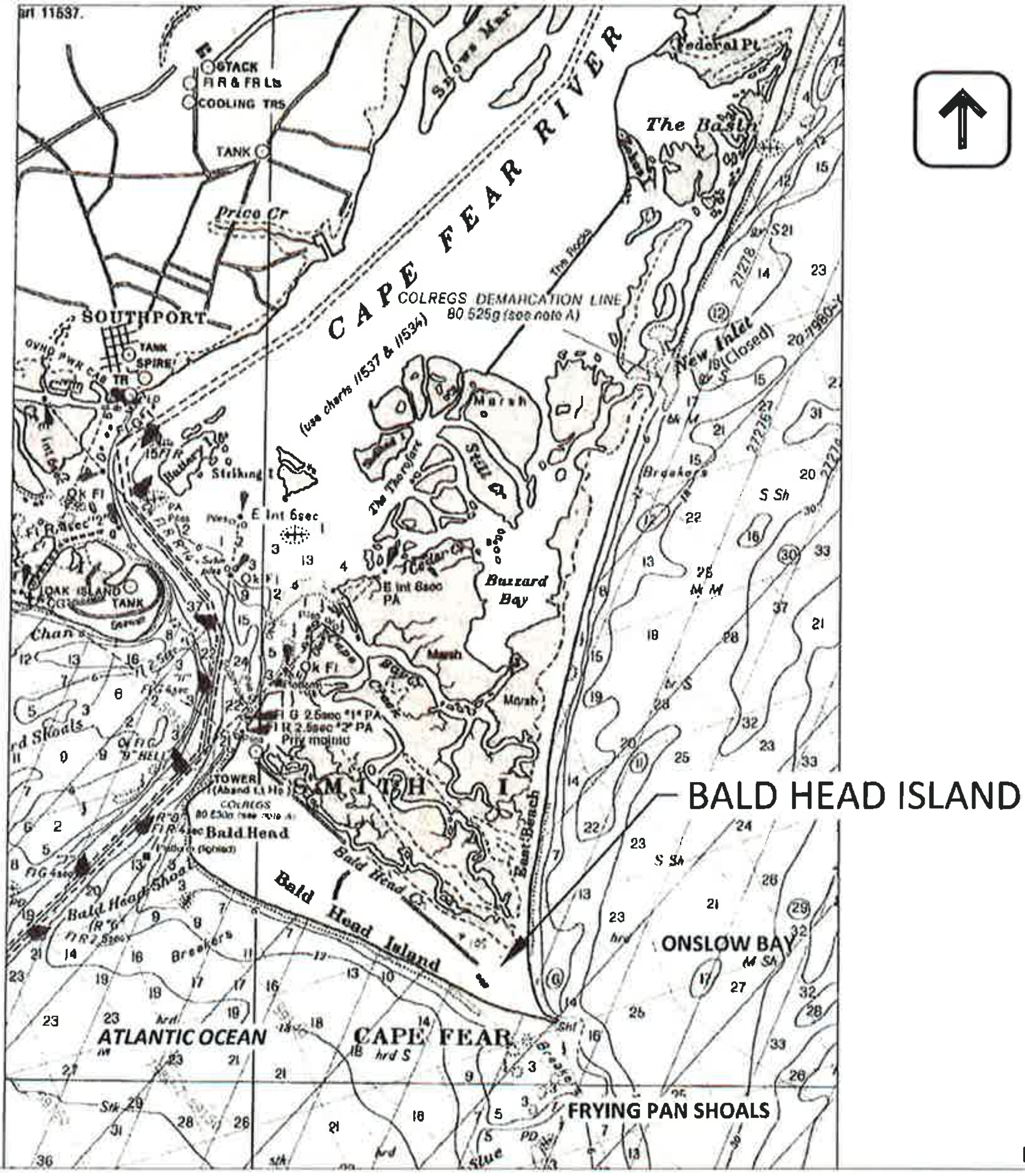
(Prepared by Olsen Associates, Inc.)

APPLICANT:
VILLAGE OF BALD HEAD ISLAND

ENGINEER:
OLSEN ASSOCIATES, INC.

AGENT:
ERIK J. OLSEN, P.E.

15828



DATUM: MLLW

NTS

NOT FOR PURPOSES OF CONSTRUCTION

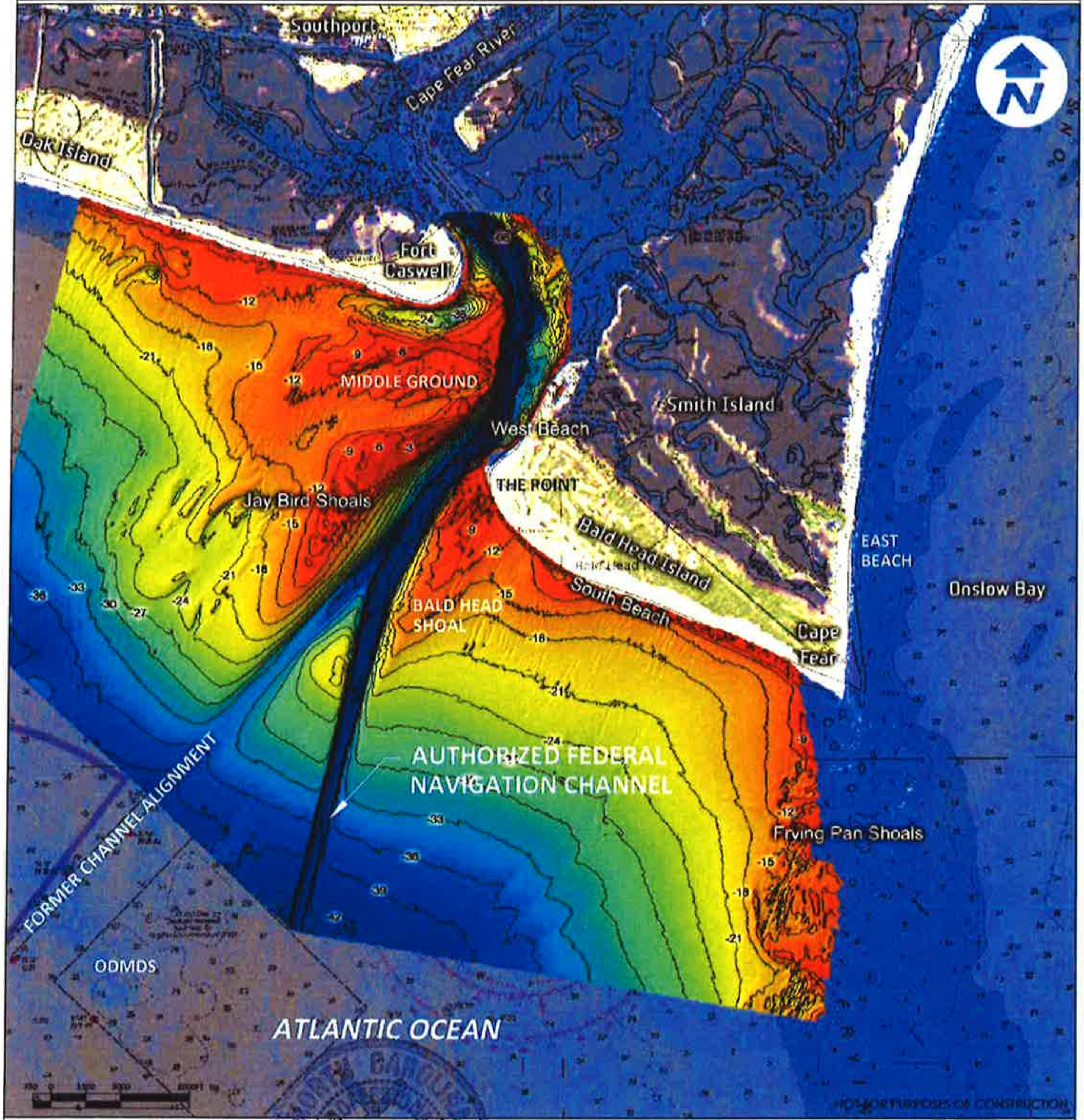
olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

PROJECT LOCATION

DATE	APPROVED	REVISION

09/30/2013
DRAWN BY:
ML
SHEET
1 of 21



2006 SURVEY-GEODYNAMICS, INC

2006 CONTOUR DATUM: NGVD 29
NAUTICAL CHART DATUM: MLLW

SEAL 15223
ERIK J. OLSEN
Dec 13

NOT FOR PURPOSES OF CONSTRUCTION

olsen
associates, inc.

2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

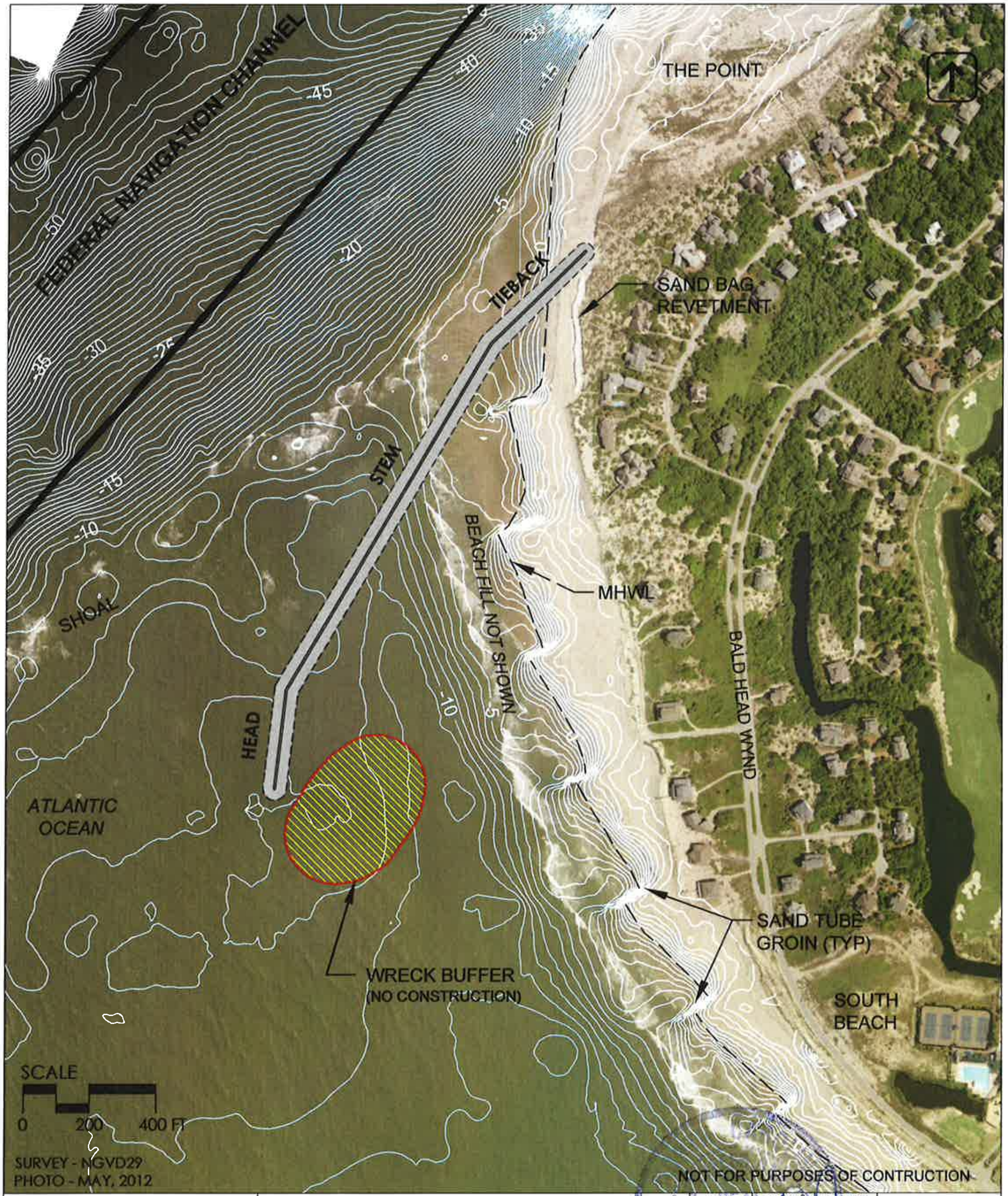
SITE CONDITIONS

DATE	APPROVED	REVISION

09/30/2013

DRAWN BY:
ML

SHEET
2 of 21



olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

GROIN LOCATION AND CONFIGURATION

DATE	APPROVED	REVISION
05-01-2014	EJO	1

21 May 14

09/30/2013

DRAWN BY:
ML

SHEET
3 of 21

NOTES:
1) MAXIMUM GROIN LENGTH IS 1900 FT.
2) FILLET NOT SHOWN

NOT FOR PURPOSES OF CONTRUCTION

olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

GROIN DESIGN SECTION LOCATIONS

DATE	APPROVED	REVISION
05-01-2014	EJO.	1

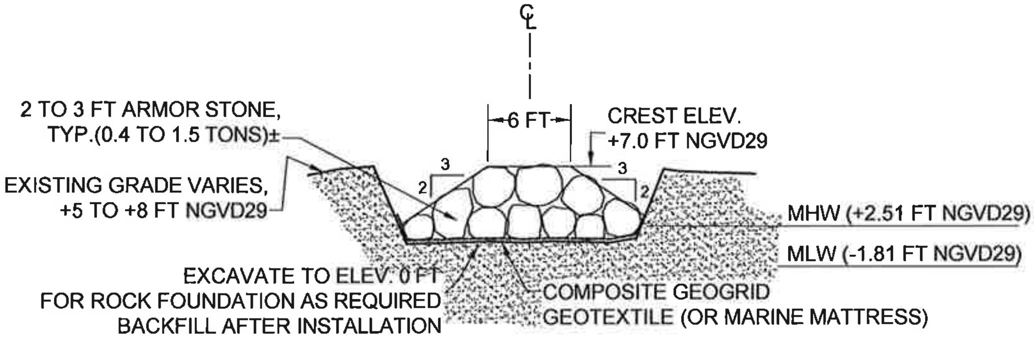
12 May 14

15626
ERIK J. OLSEN

09/30/2013

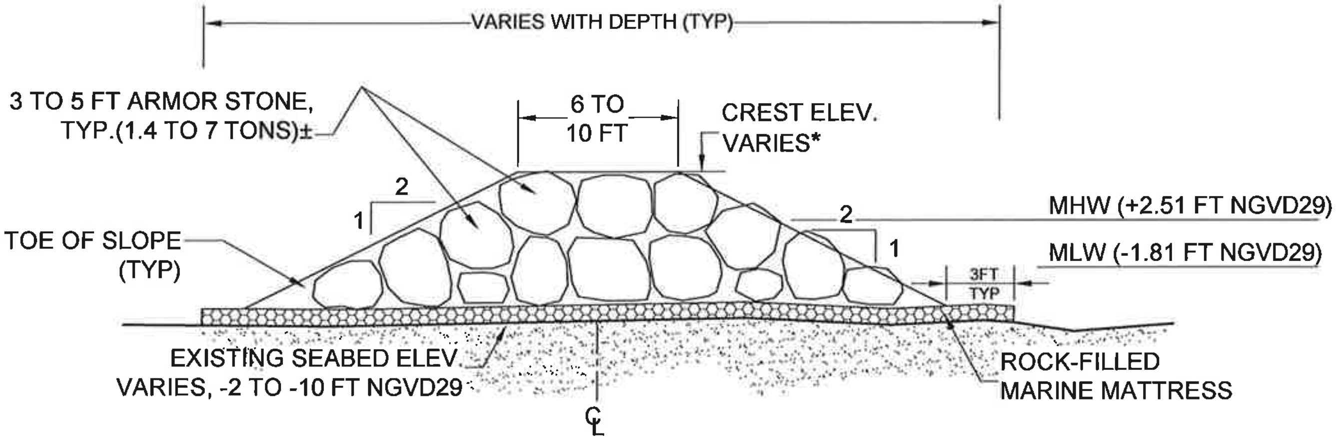
DRAWN BY:
ML

SHEET
4 of 21



NTS

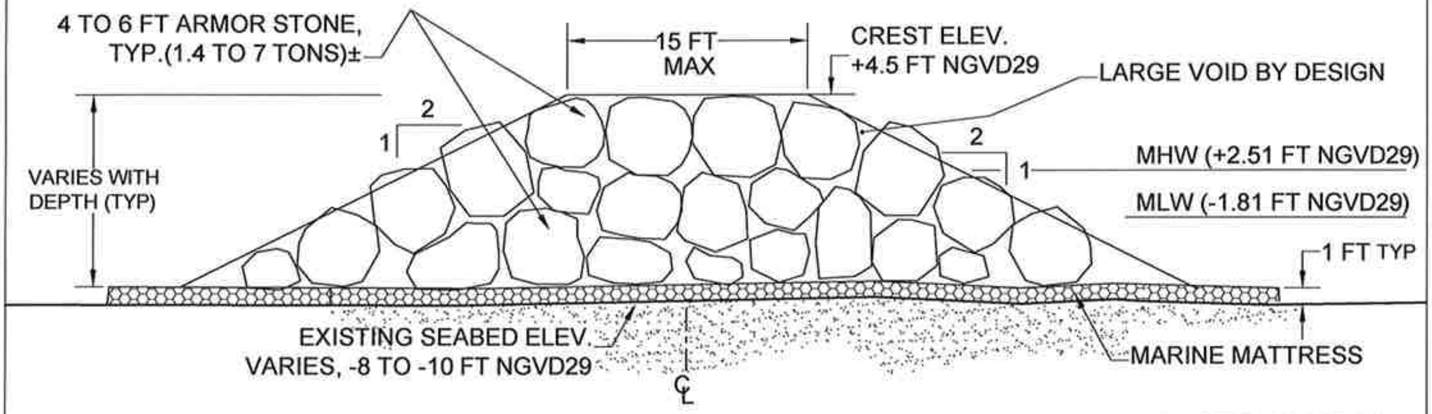
TIE BACK SECTION (A-A)



NTS

STEM SECTION (B-B)

* STEM ELEV VARIES FROM +4.5FT TO +7.0FT



NTS

HEAD SECTION (C-C)

℄ - CENTERLINE (TYP)

DATUM: NGVD'29

NOTE: 1) CREST ELEVATION VARIES ALONG STRUCTURE PROFILE

NOT FOR PURPOSES OF CONSTRUCTION - SUBJECT TO DESIGN REVISIONS BASED UPON SITE CONDITIONS

olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

TYPICAL CROSS SECTIONS

DATE	APPROVED	REVISION
05/01/2014	EJO	1

09/30/2013

DRAWN BY:
ML

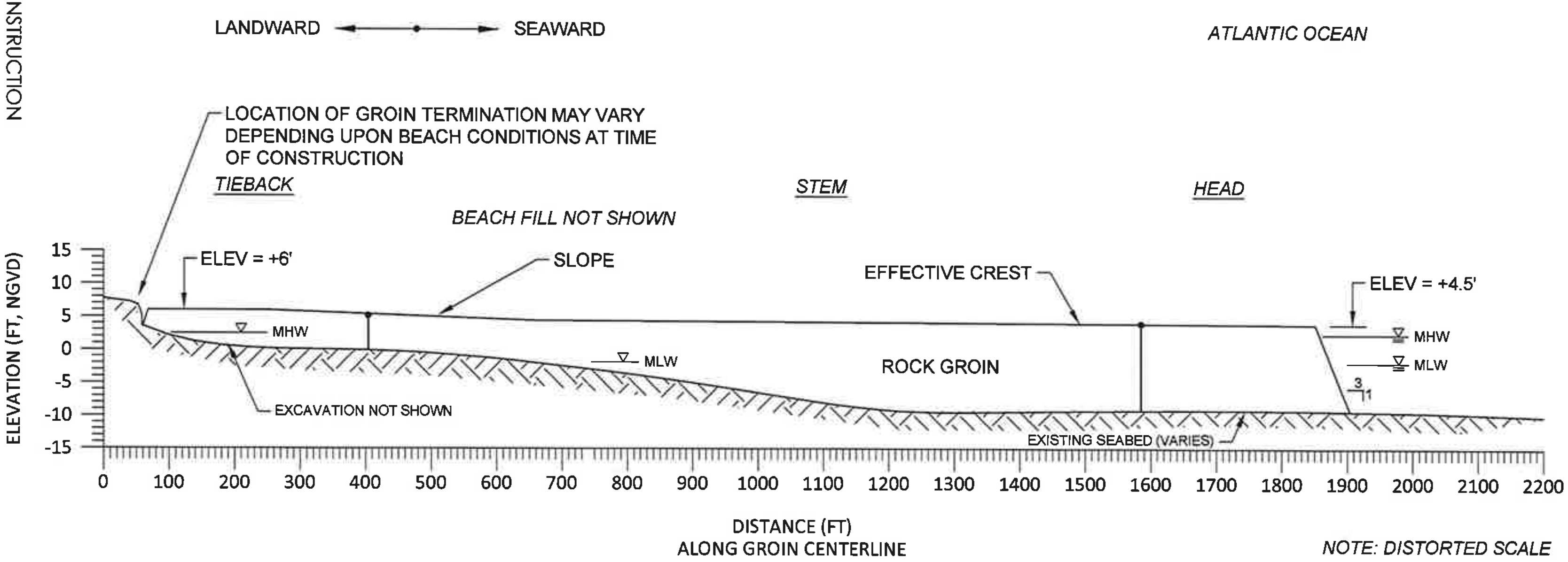
SHEET
5 of 21

15626
ERIK J. OLSEN

NOT FOR PURPOSES OF CONSTRUCTION

TIDAL DATUMS

MHHW = 2.82 FT
MHW = 2.51 FT
MTL = 0.35 FT
NGVD = 0.00 FT
MLW = -1.81 FT
MLLW = -1.98 FT



NOTE: DISTORTED SCALE

CENTERLINE SECTION (D-D)

NOTES:
1) NOT FOR PURPOSES OF CONTRUCTION
2) FINAL DESIGN ELEVATIONS MAY VARY
3) THE STRUCTURE STEM MAY HAVE MULTIPLE SLOPES AND ELEVATIONS
4) LENGTH IS COMPUTED ALONG GROIN CENTERLINE
5) GROIN LENGTH IS NOT SHORE NORMAL
6) THE STRUCTURE MAY BE CONSTRUCTED IN TWO PHASES
7) A TEMPORARY TRESTLE MAY BE INSTALLED DURING THE PERIOD OF CONSTRUCTION
8) TOTAL STRUCTURE LENGTH: 1900 FT

15828
ERIK J. OLSEN
2 MAY 14

DATUM - NGVD1929

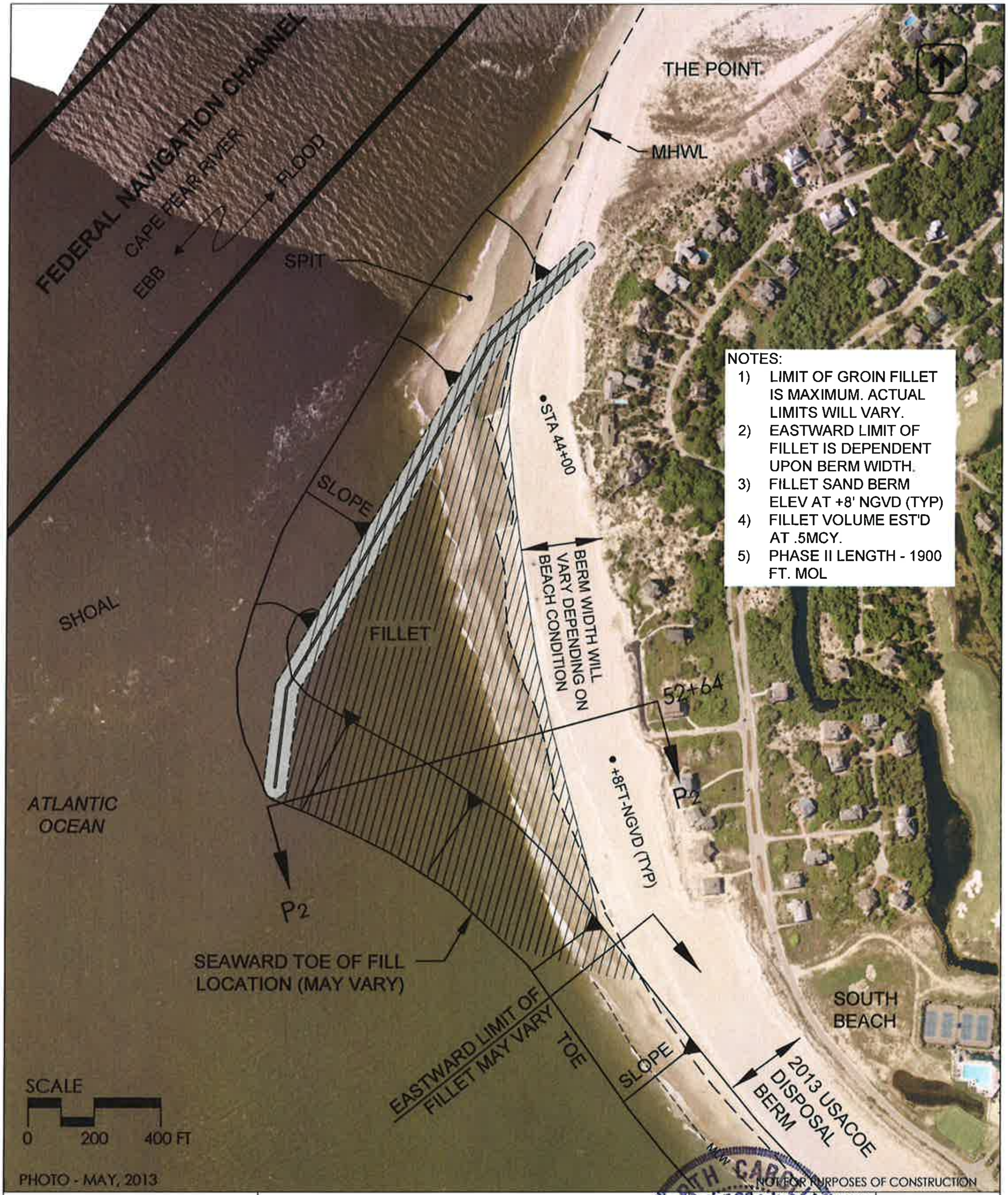
olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

GROIN PROFILE

DATE	APPROVED	REVISION
05-01-2014	EJO	1

09/30/2013
DRAWN BY:
ML
SHEET
6 of 21



NOTES:

1) LIMIT OF GROIN FILLET IS MAXIMUM. ACTUAL LIMITS WILL VARY.
2) EASTWARD LIMIT OF FILLET IS DEPENDENT UPON BERM WIDTH.
3) FILLET SAND BERM ELEV AT +8' NGVD (TYP)
4) FILLET VOLUME EST'D AT .5MCY.
5) PHASE II LENGTH - 1900 FT. MOL

NOT FOR PURPOSES OF CONSTRUCTION

olsen
associates, inc.

2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT
PHASE II GROIN FILLET
(MAXIMUM SEAWARD EXTENT)

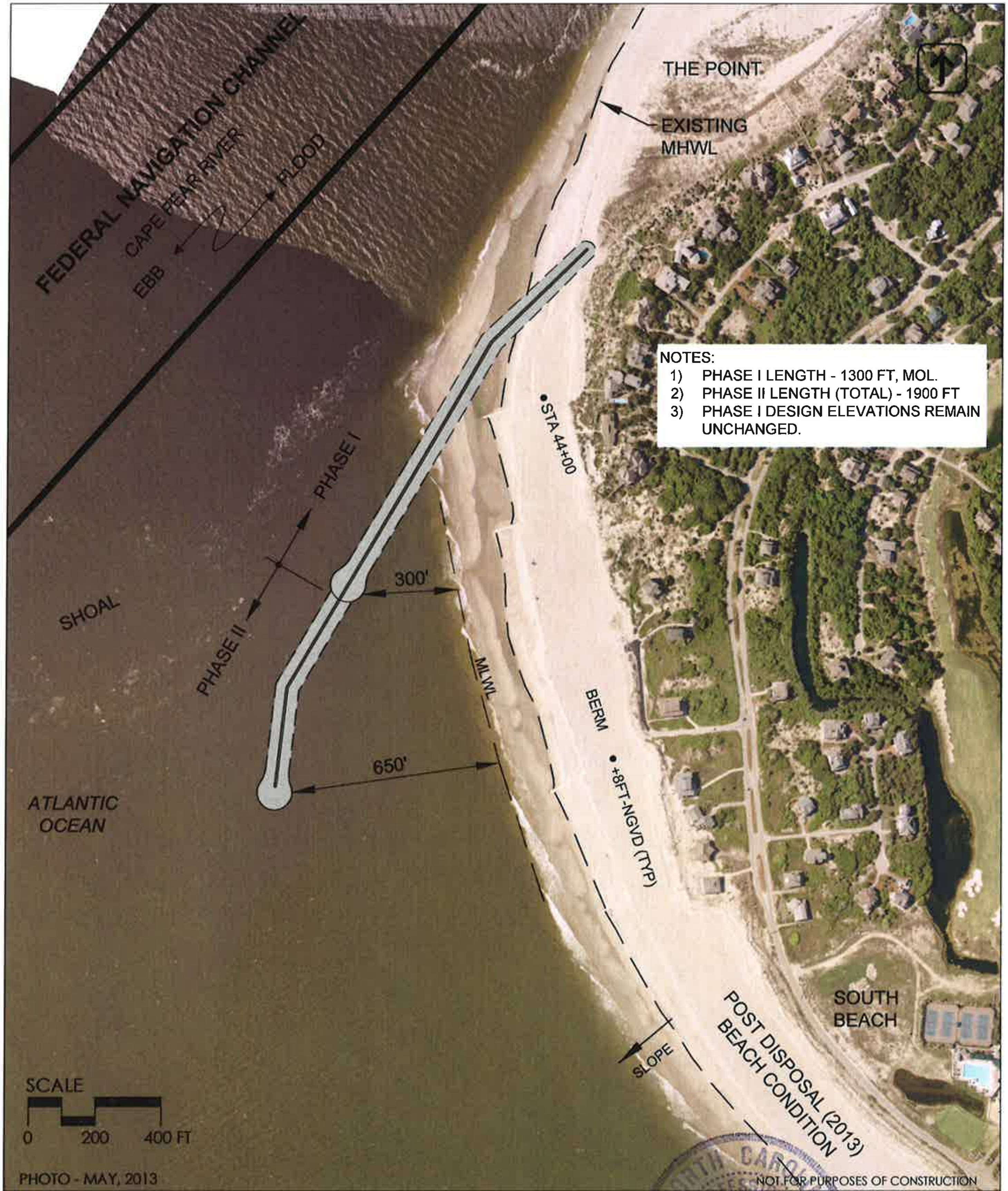
DATE	APPROVED	REVISION
[illegible]-01-2014	[illegible]	1

SEAL 15626
ERIK J. OLSEN

09/30/2013

DRAWN BY:
ML

SHEET
7 of 21



NOTES:

1) PHASE I LENGTH - 1300 FT, MOL.
2) PHASE II LENGTH (TOTAL) - 1900 FT
3) PHASE I DESIGN ELEVATIONS REMAIN UNCHANGED.

NOT FOR PURPOSES OF CONSTRUCTION

olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

PHASED GROIN PLAN

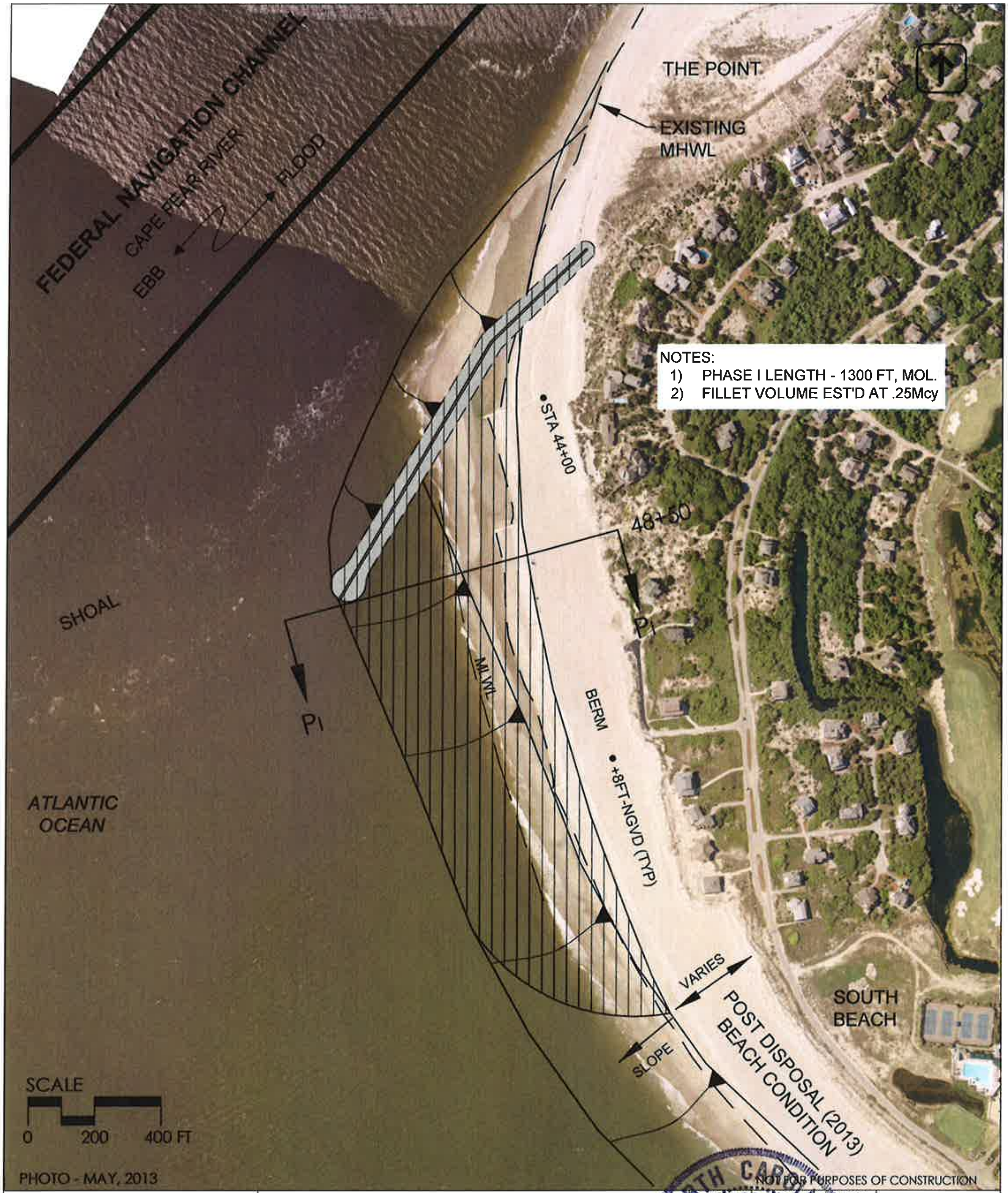
DATE	APPROVED	REVISION
05-01-2014	EJO	

09/30/2013

DRAWN BY:
ML

SHEET
8 of 21

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 15826 ERIK J. OLSEN



NOTES:
1) PHASE I LENGTH - 1300 FT, MOL.
2) FILLET VOLUME EST'D AT .25Mcy

PHOTO - MAY, 2013

NOT FOR PURPOSES OF CONSTRUCTION

olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

PHASE I GROIN FILLET
(INITIAL SEAWARD EXTENT)

DATE	APPROVED	REVISION
05-[illegible]-2014	EJO	

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 15826 ERIK J. OLSEN

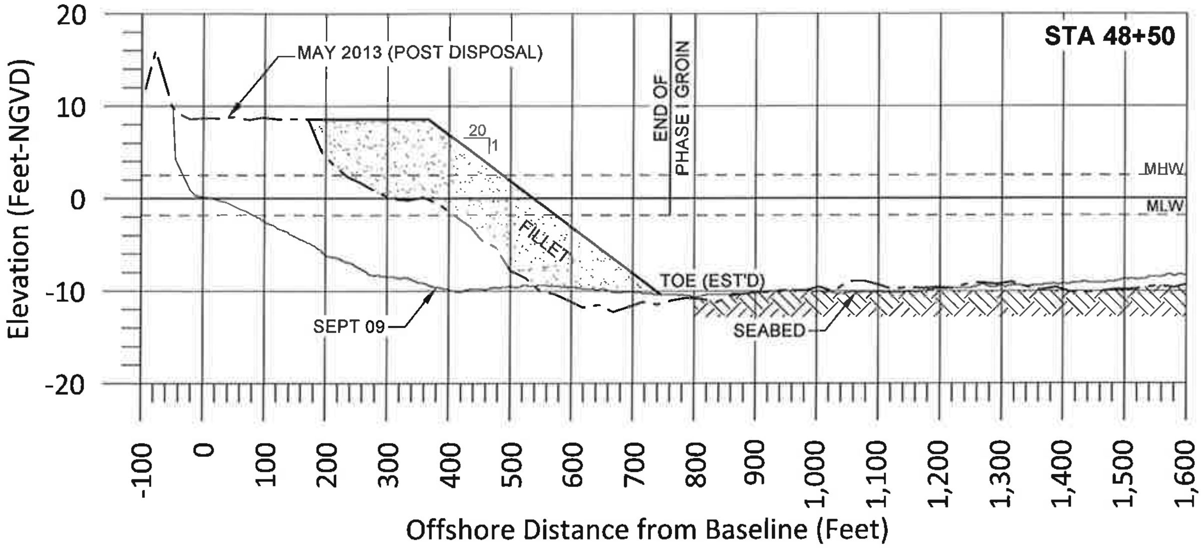
09/30/2013

DRAWN BY:
ML

SHEET
9 of 21

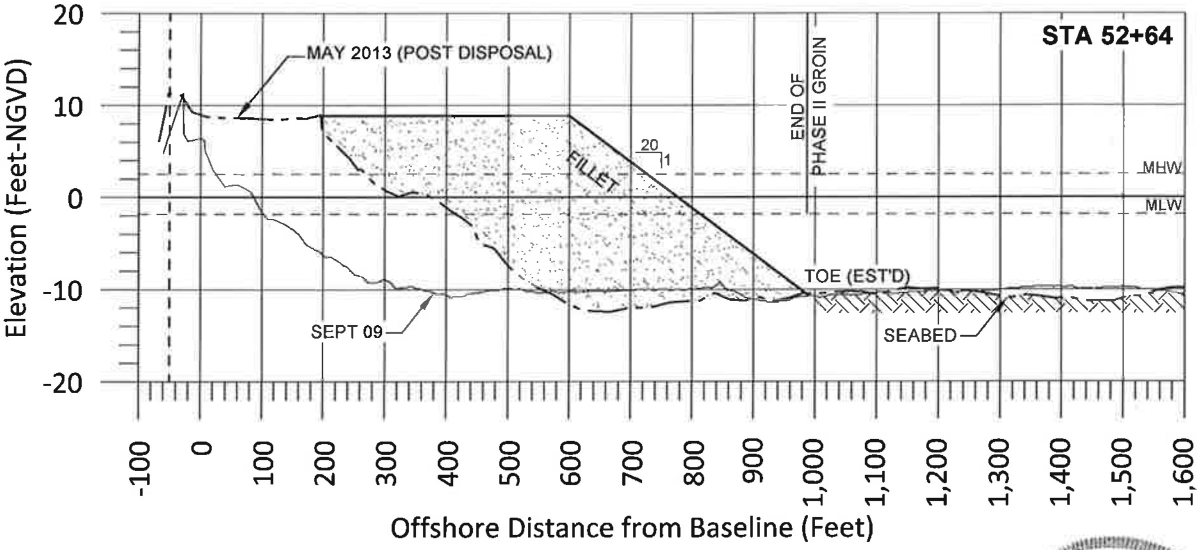
SECTION PI-PI

PHASE I GROIN



SECTION P2-P2

PHASE II GROIN



NOTES:

1. SEPT. '09 SURVEY FOR REFERENCE ONLY
2. MAY '13 SURVEY - POST DISPOSAL

SEAL 15626
J. OLSEN

NOT FOR PURPOSES OF CONSTRUCTION

olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

SAND FILLET SECTIONS

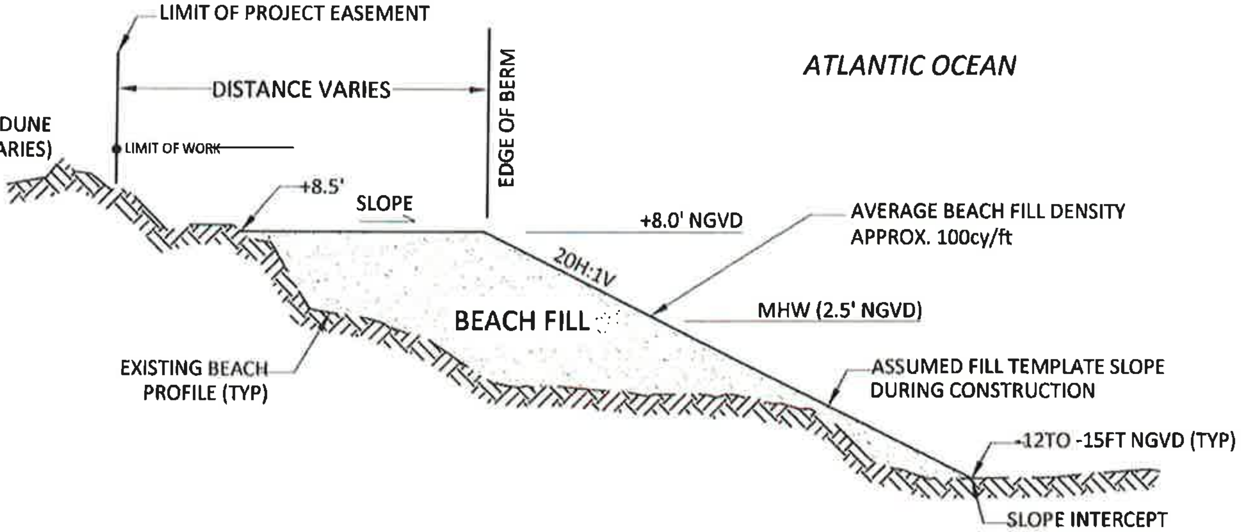
DATE	APPROVED	REVISION

09/30/2013

DRAWN BY:
ML

SHEET
10 of 21

SOUTH BEACH



TYPICAL SECTION

NOTE:
1) FILL DENSITY TO VARY SPATIALLY DEPENDING ON CONDITION OF BEACH AT TIME OF CONSTRUCTION.
2) GROIN FILLET FILL DENSITY VARIES AND MAY EXCEED 300 CY/FT

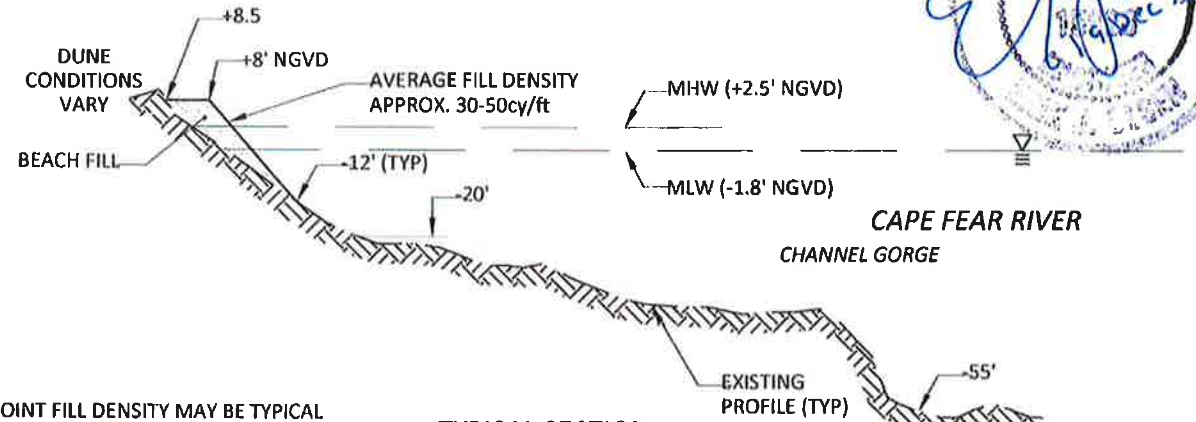
NTS

DATUM: NGVD 29

LOCAL TIDAL DATUMS (FT)

MHHW +2.8
MHW +2.5
NAVD +1.1
NGVD(29) 0.0
MLW -1.8
MLLW -2.0

WEST BEACH



TYPICAL SECTION

NOTE:
1) POINT FILL DENSITY MAY BE TYPICAL OF EITHER S. BEACH OR W. BEACH

NTS

DATUM: NGVD 29

NOT FOR PURPOSES OF CONSTRUCTION

olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

TYPICAL BEACH FILL SECTIONS

DATE	APPROVED	REVISION

09/30/2013

DRAWN BY:
ML

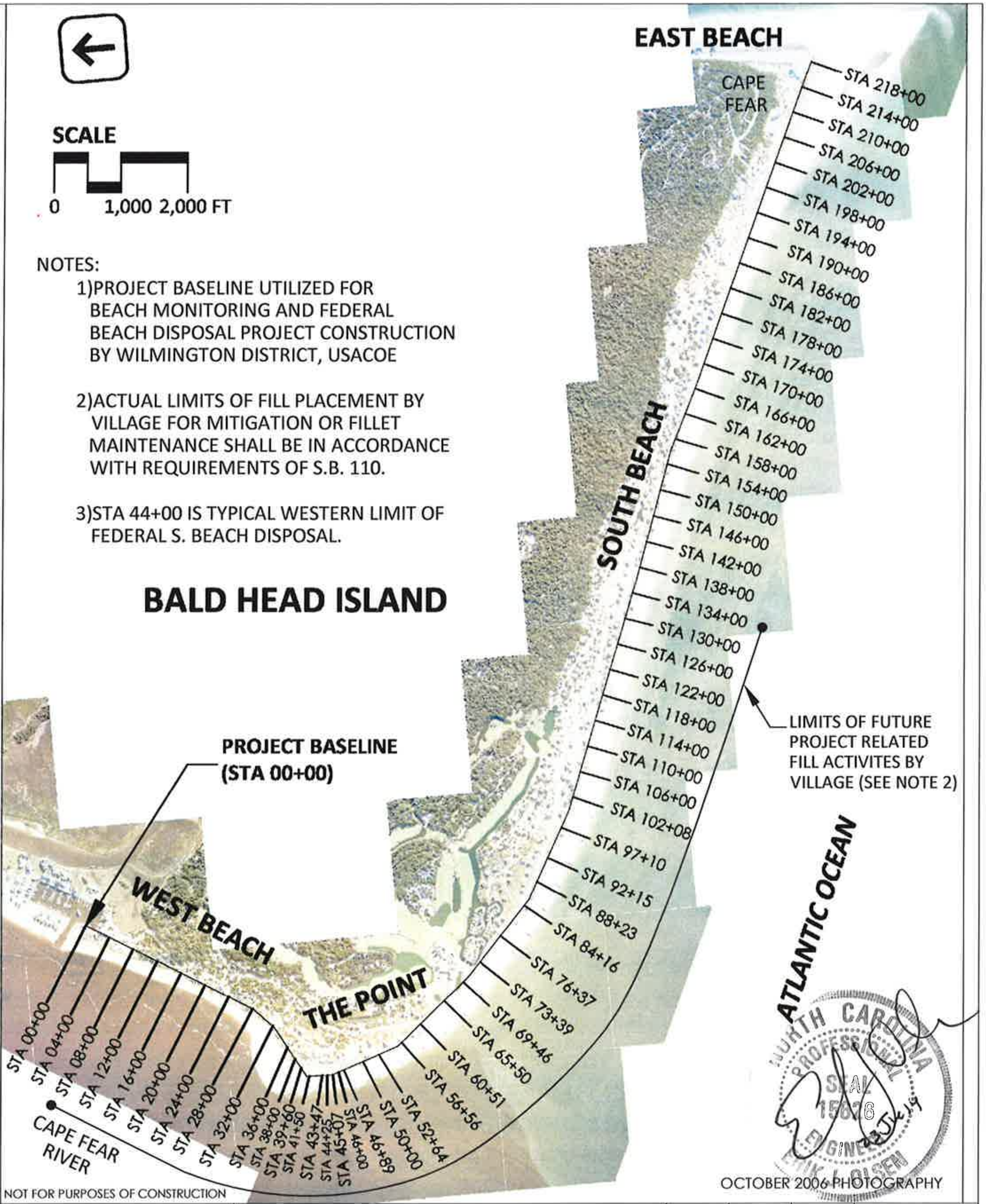
SHEET
11 of 21

NOTES:

1)PROJECT BASELINE UTILIZED FOR BEACH MONITORING AND FEDERAL BEACH DISPOSAL PROJECT CONSTRUCTION BY WILMINGTON DISTRICT, USACOE

2)ACTUAL LIMITS OF FILL PLACEMENT BY VILLAGE FOR MITIGATION OR FILLET MAINTENANCE SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF S.B. 110.

3)STA 44+00 IS TYPICAL WESTERN LIMIT OF FEDERAL S. BEACH DISPOSAL.



OCTOBER 2006 PHOTOGRAPHY

NOT FOR PURPOSES OF CONSTRUCTION

ERIK J. OLSEN
15626
23 JUNE 14

olsen
associates, inc.

2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT
PROJECT BASELINE
AND LIMITS OF FILL

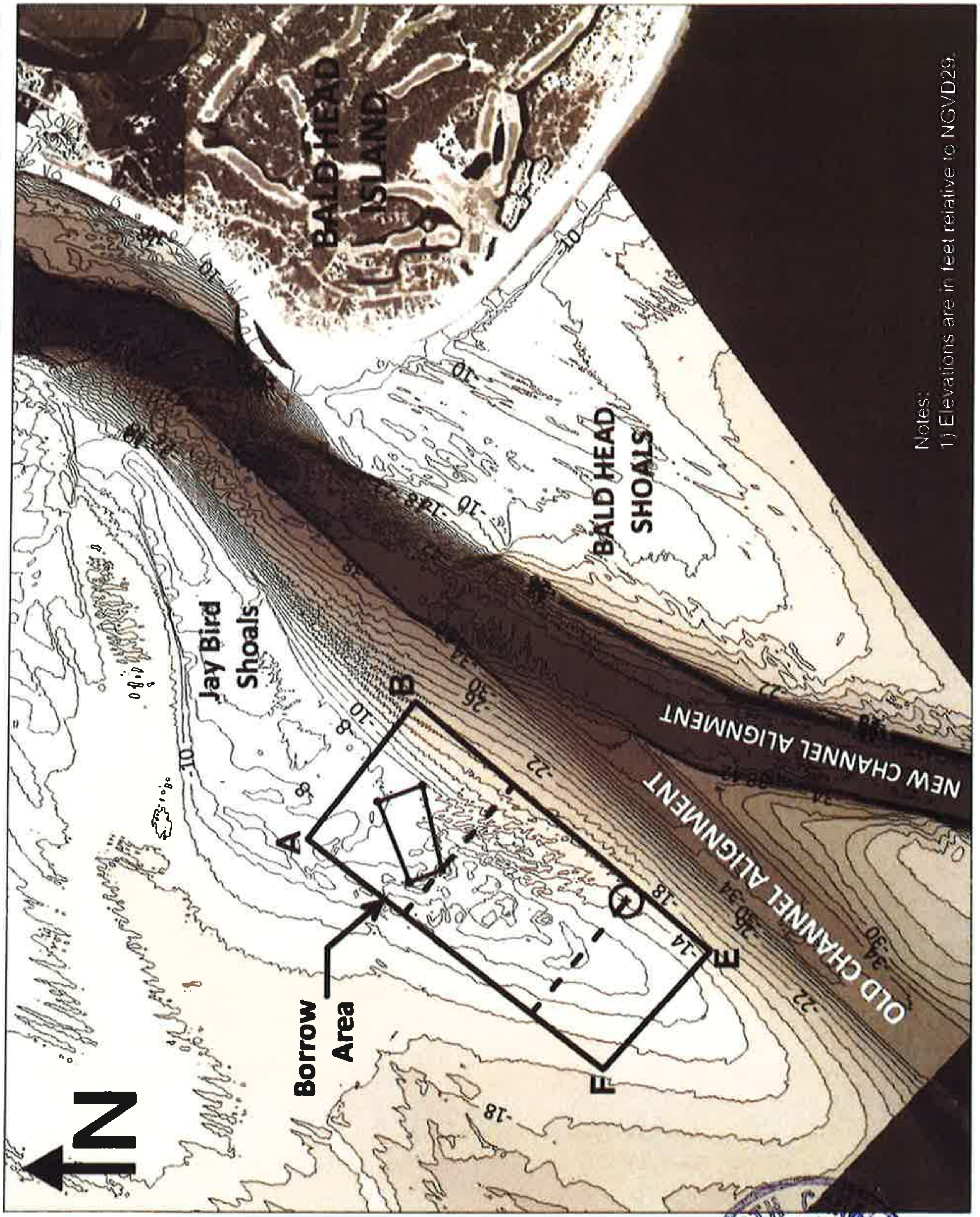
DATE	APPROVED	REVISION

09/30/2013

DRAWN BY:
ML

SHEET
12 of 21

VBHI RESTORATION PROJECT
2009 BORROW SITE PERMITS:
- CAMA-67-09
- COE-2007-02699



Notes:
1) Elevations are in feet relative to NGVD29.

2009 PROJECT PERMITTED BORROW AREA - A,B,E,F
TERMINAL GROIN BORROW SITE

NOT FOR PURPOSES OF CONSTRUCTION

olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

JAY BIRD SHOALS BORROW AREA

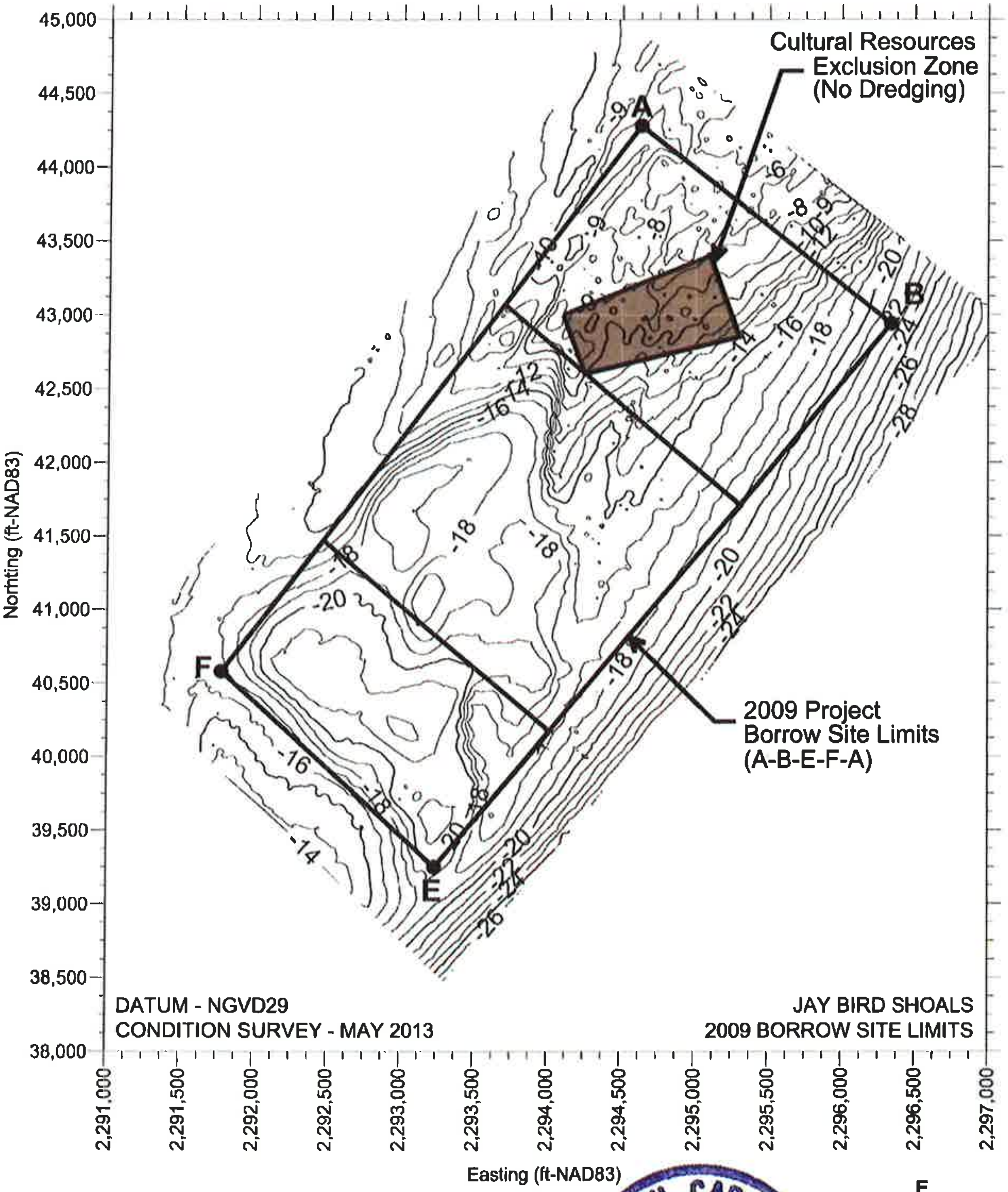
16828
ERIK J. OLSEN

DATE	APPROVED	REVISION

09/30/2013

DRAWN BY:
ML

SHEET
13 of 21



	E	N
A	2,294,630	44,280
B	2,296,340	42,940
E	2,293,240	39,250
F	2,291,780	40,580

VBHI RESTORATION PROJECT
2009 BORROW SITE PERMITS:

- CAMA-67-09
- COE-2007-02699

NOT FOR PURPOSES OF CONSTRUCTION

15626
ERIK J. OLSEN

olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

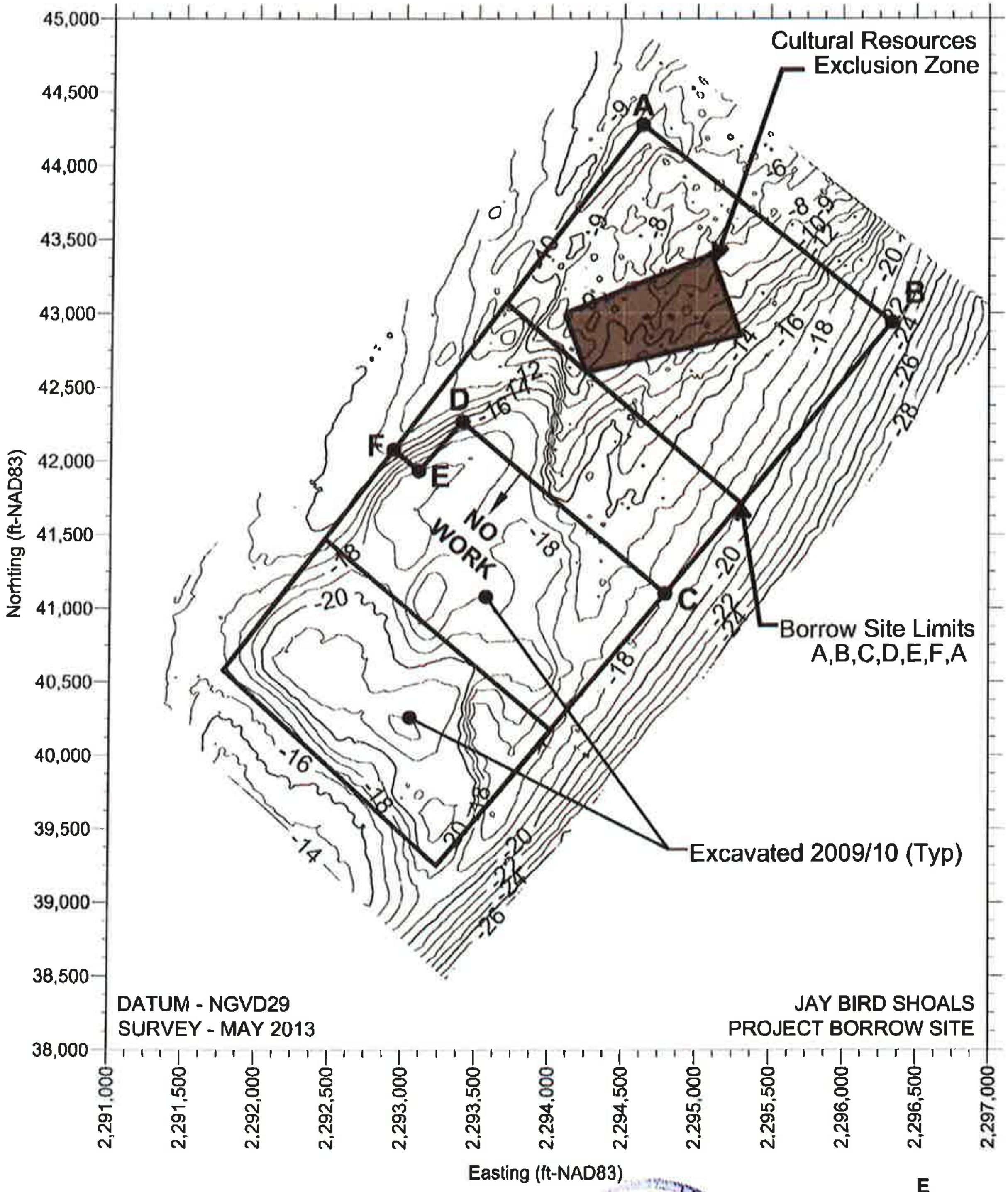
VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

2013 BORROW AREA CONDITION SURVEY

DATE	APPROVED	REVISION

09/30/2013
DRAWN BY:
ML

SHEET
14 of 21



	E	N
A	2,294,630	44,280
B	2,296,340	42,940
C	2,294,790	41,100
D	2,293,400	42,260
E	2,293,100	41,930
F	2,292,930	42,080

VBHI RESTORATION PROJECT
2009 BORROW SITE PERMITS:

- CAMA-67-09
- COE-2007-02699

ERIK J. OLSEN

Dec 13

NOT FOR PURPOSES OF CONSTRUCTION

olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

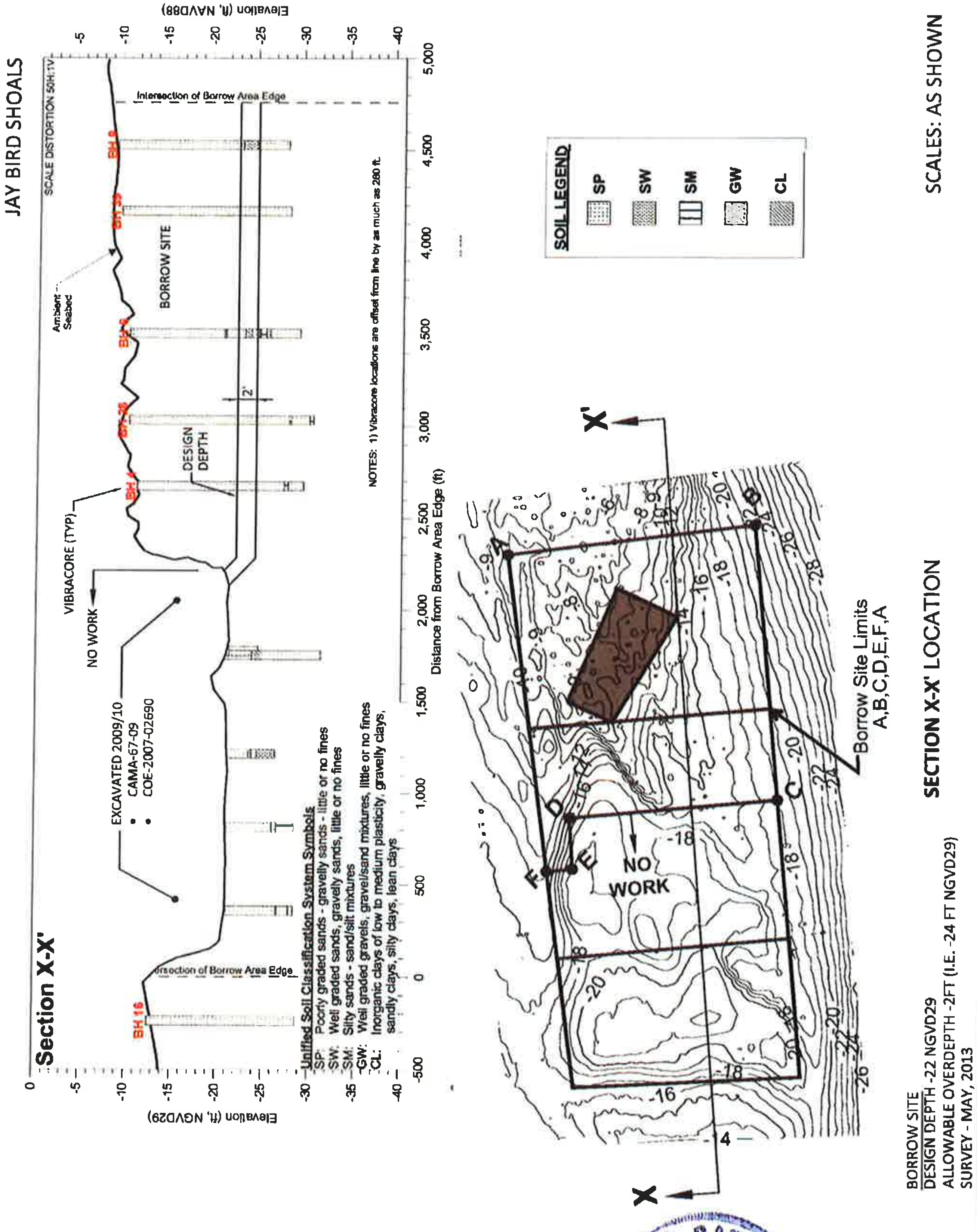
PROJECT BORROW SITE

DATE	APPROVED	REVISION

09/30/2013

DRAWN BY:
ML

SHEET
15 of 21



NOTES: 1) Vibracore locations are offset from line by as much as 280 ft.

Unified Soil Classification System Symbols
SP: Poorly graded sands - gravelly sands - little or no fines
SW: Well graded sands, gravelly sands, little or no fines
SM: Silty sands - sand/silt mixtures
GW: Well graded gravels, gravel/sand mixtures, little or no fines
CL: Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

BORROW SITE
DESIGN DEPTH -22 NGVD29
ALLOWABLE OVERDEPTH -2FT (I.E. -24 FT NGVD29)
SURVEY - MAY, 2013

SCALES: AS SHOWN

JAY BIRD SHOALS BORROW SITE

NOT FOR PURPOSES OF CONSTRUCTION

olsen associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

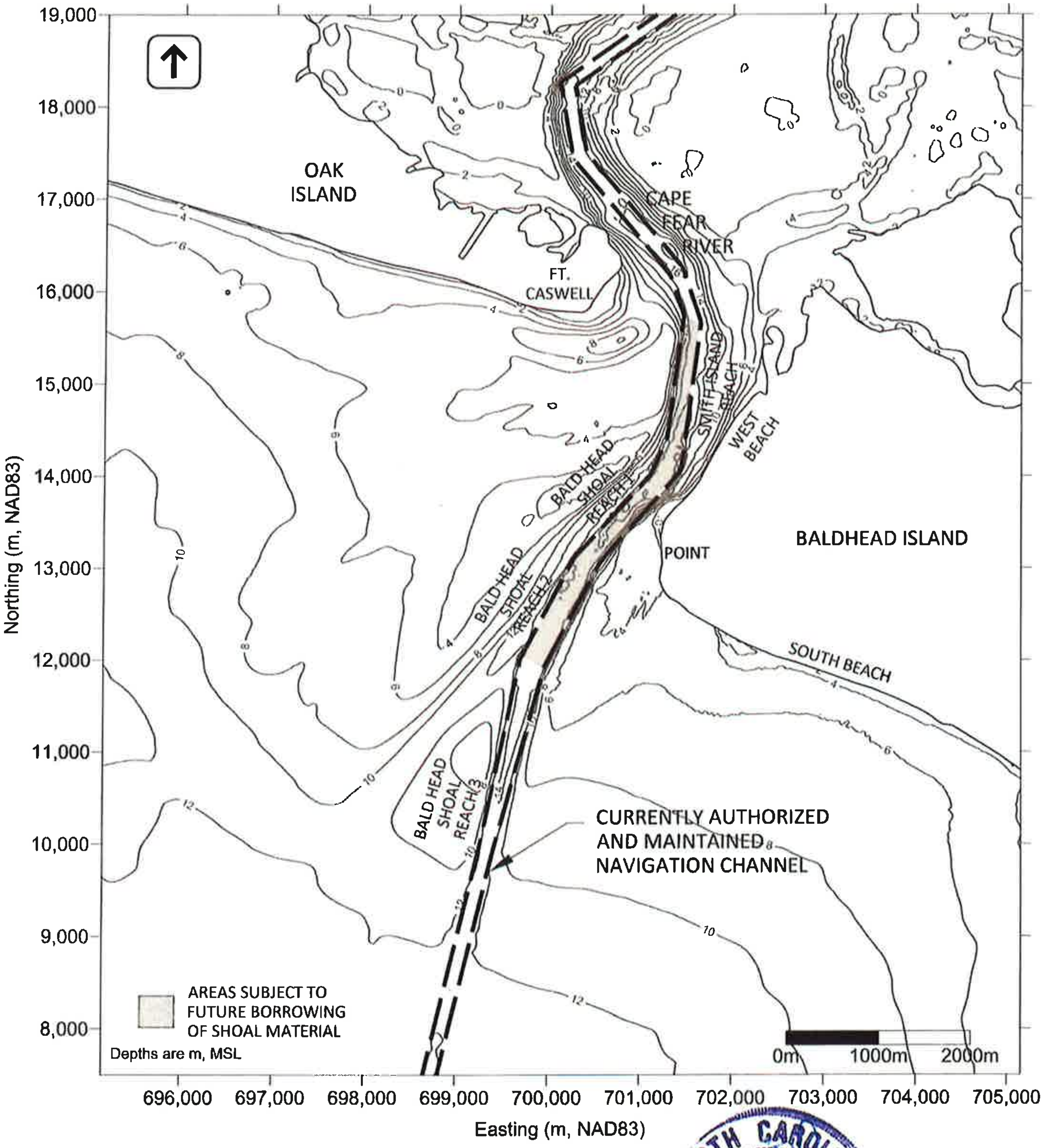
VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

BORROW SITE TYPICAL SECTION

DATE	APPROVED	REVISION

SEAL 18628
ERIK J. OLSEN

09/30/2013
DRAWN BY: ML
SHEET 16 of 21



NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 15826 ERIK J. OLSEN

NOT FOR PURPOSES OF CONSTRUCTION

olsen
associates, inc.

2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

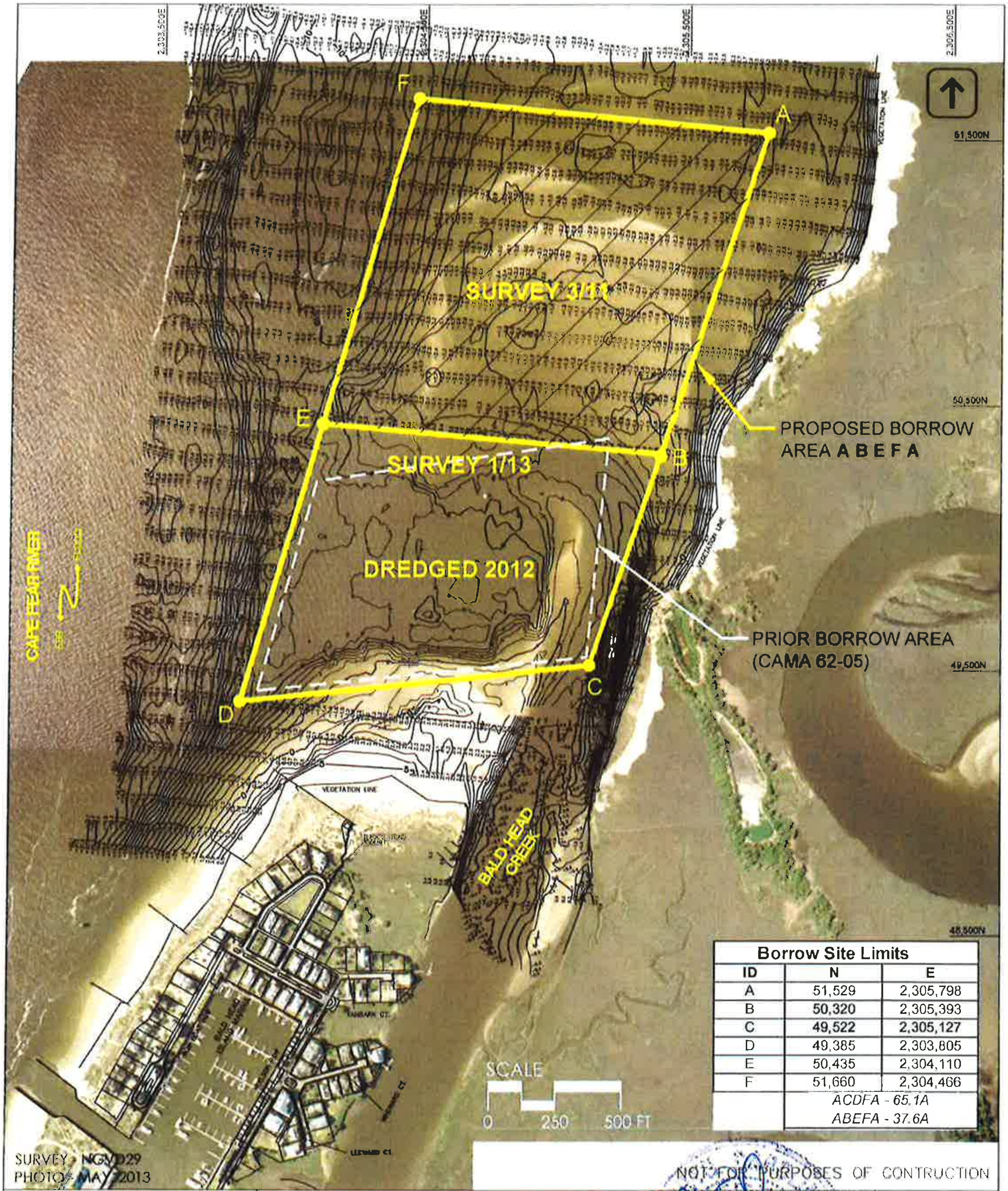
NAVIGATION PROJECT BORROW AREAS

APPROVED	REVISION

09/30/2013

DRAWN BY:
ML

SHEET
17 of 21



Borrow Site Limits

ID	N	E
A	51,529	2,305,798
B	50,320	2,305,393
C	49,522	2,305,127
D	49,385	2,303,805
E	50,435	2,304,110
F	51,660	2,304,466
	ACDFA - 65.1A *ABEFA - 37.6A*	

NOT FOR PURPOSES OF CONTRUCTION

olsen
associates, inc.

2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT
BALD HEAD CREEK
BORROW AREA

DATE	APPROVED	REVISION

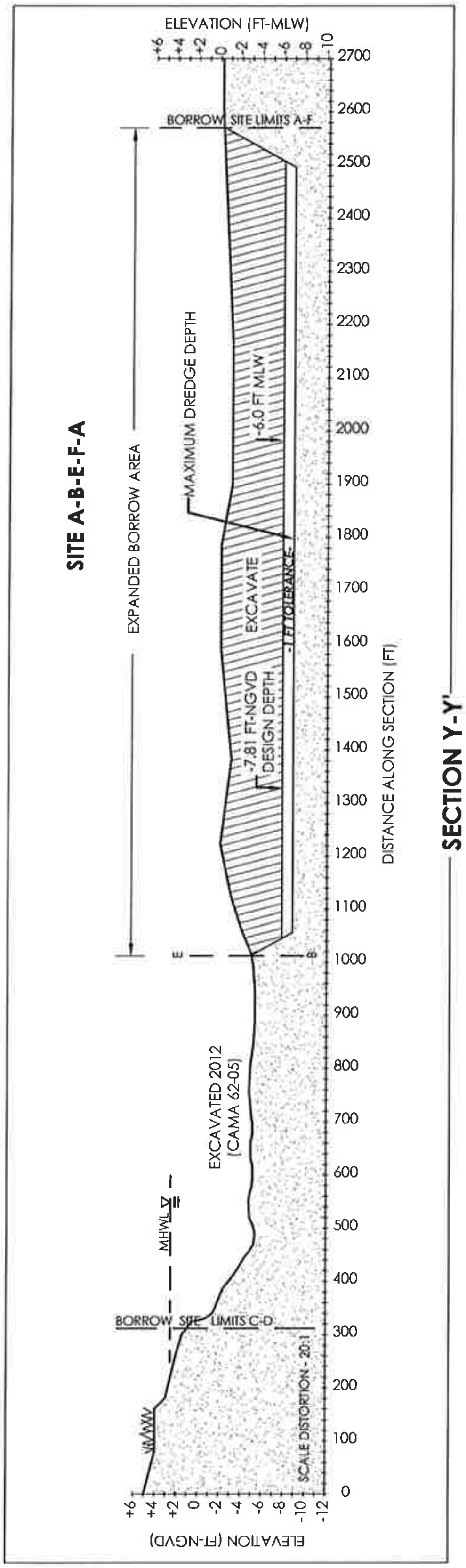
17 DEC 13

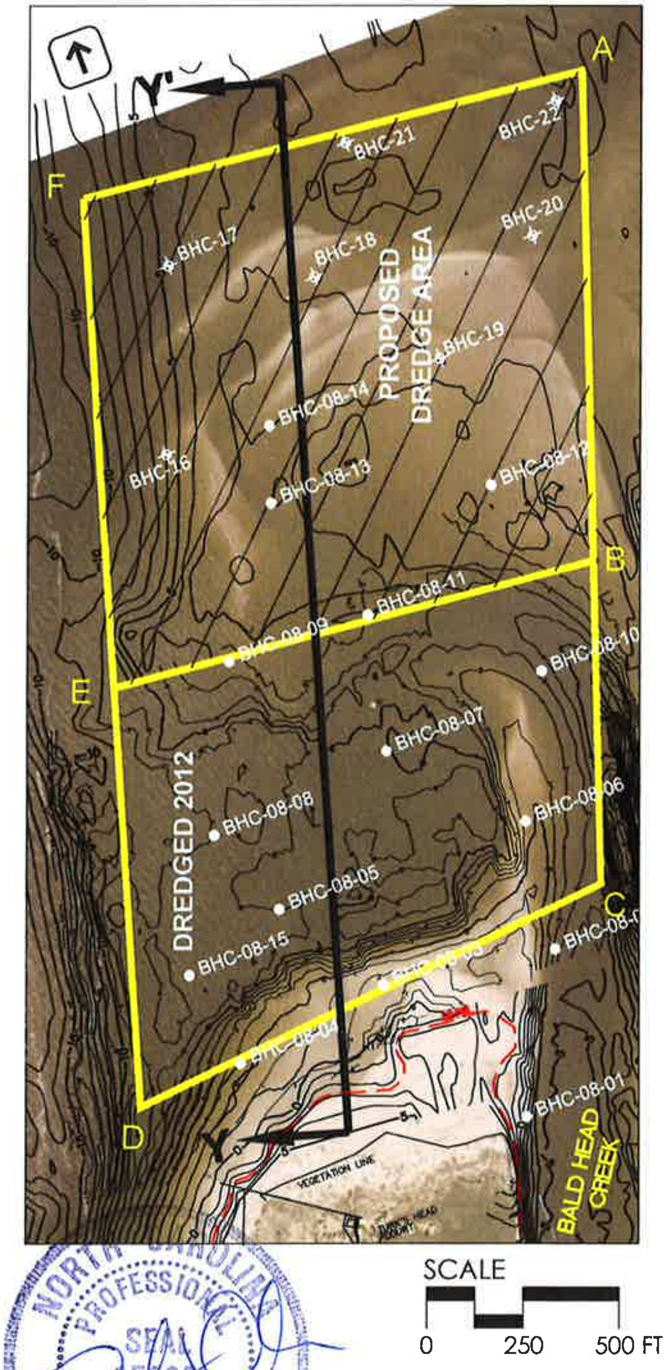
ENGINEER

10/18/13

DRAWN BY:
ML

SHEET
18 of 21





ERIK J. OLSEN
15820

SURVEY - NGVD29
PHOTO - MAY, 2013

NOT FOR PURPOSES OF CONTRUCTION

DATE	APPROVED	REVISION
05-01-2014	EJO	1

olsen
associates, inc.

2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

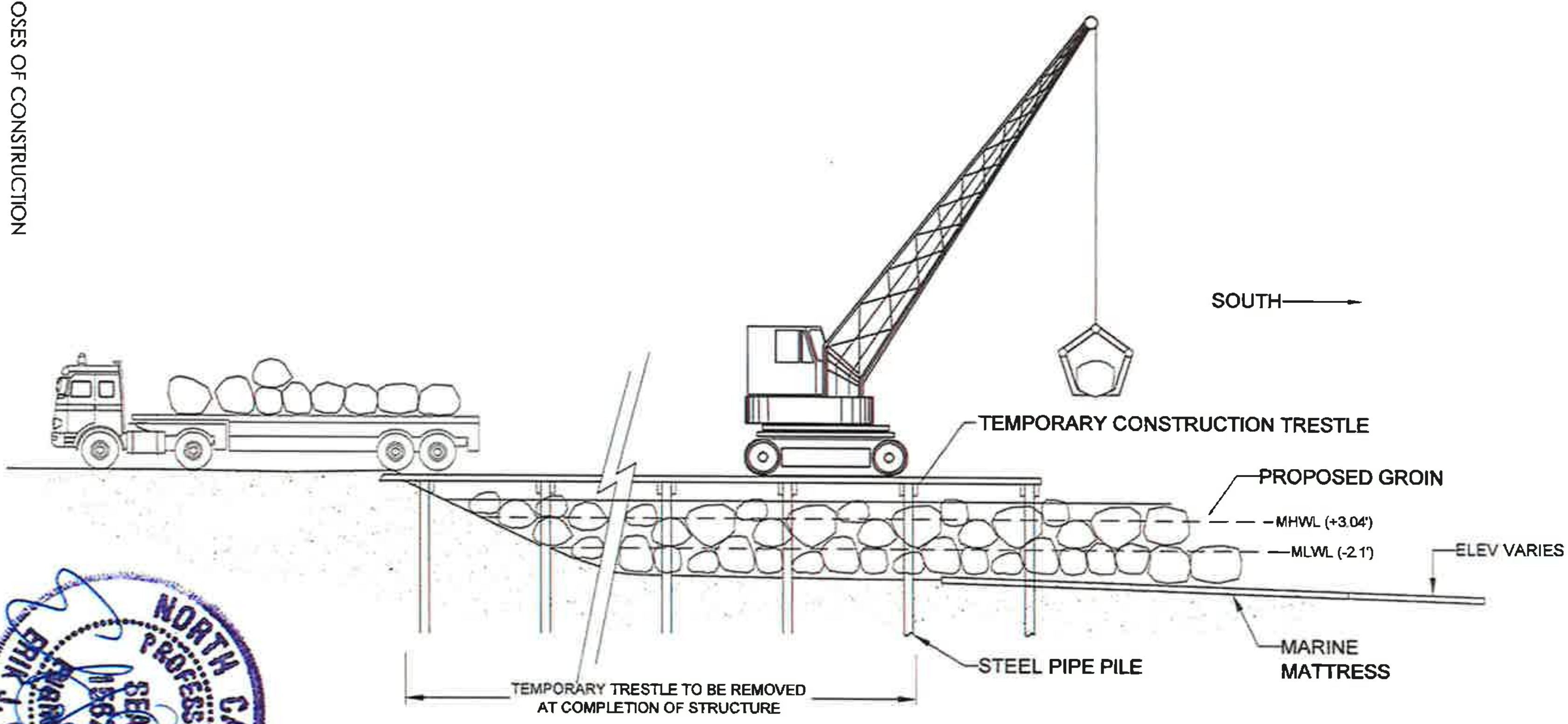
VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT
BALD HEAD CREEK BORROW SITE
TYPICAL SECTION

10/18/13

DRAWN BY:
ML

SHEET
19 of 21

NOT FOR PURPOSES OF CONSTRUCTION



TYPICAL TRESTLE INSTALLATION - OPTIONAL

NOTE:
1) TRESTLE SHALL BE CONSTRUCTED ALONGSIDE ROCK GROIN.
2) TRESTLE LENGTH TO BE DETERMINED BY BEACH CONDITIONS AT TIME OF CONSTRUCTION.
3) TRESTLE MAY NOT ENTER CULTURAL RESOURCE BUFFER AREA (SEE SHEET 3).
4) ALL TRESTLE MATERIAL TO BE REMOVED FROM SITE.

NORTH CAROLINA PROFESSIONAL ENGINEER
SEAL
15628
ERIK J. OLSEN

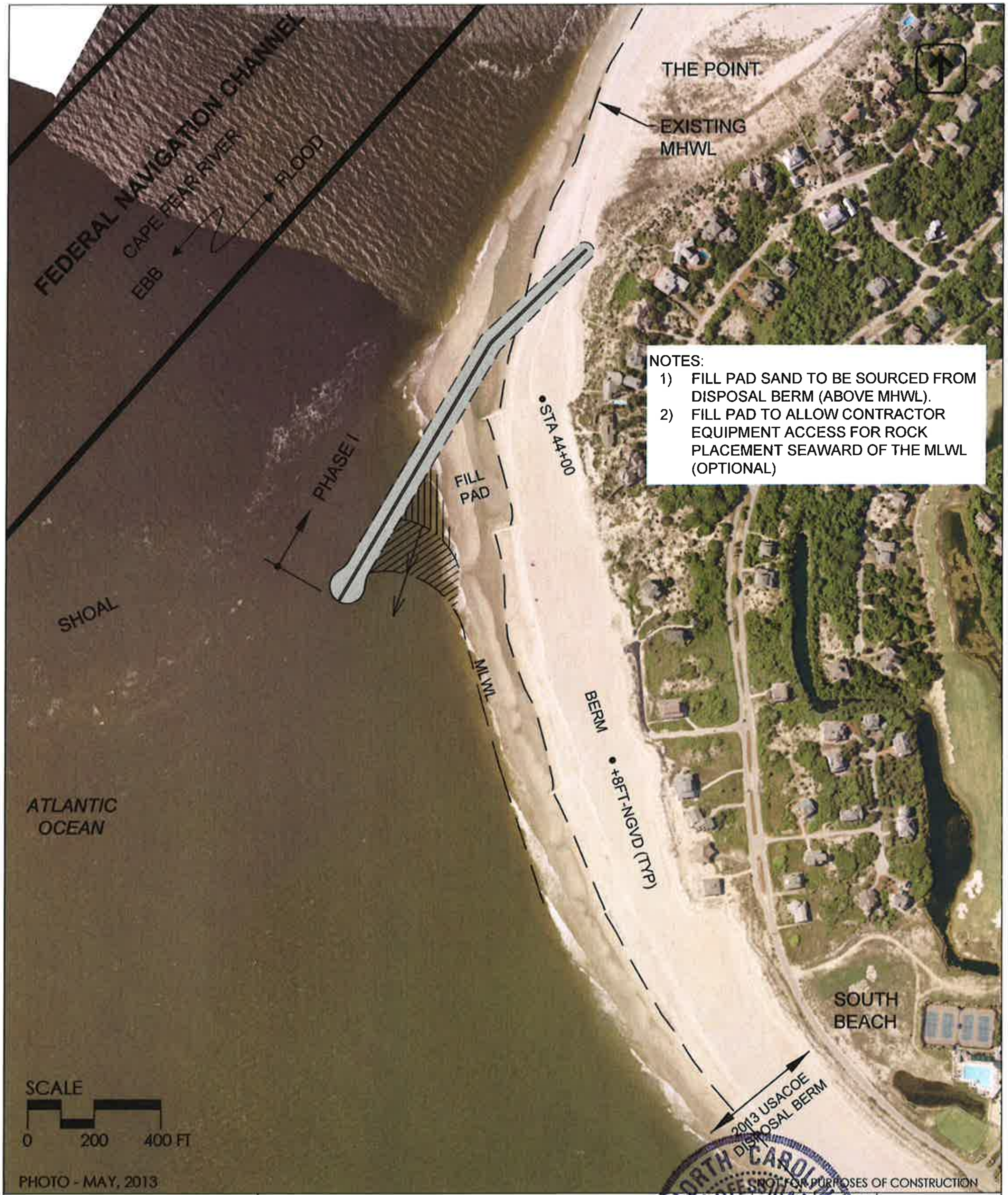
olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

TEMPORARY TRESTLE

DATE	APPROVED	REVISION

09/30/2013
DRAWN BY:
ML
SHEET
20 of 21



NOTES:
1) FILL PAD SAND TO BE SOURCED FROM DISPOSAL BERM (ABOVE MHWL).
2) FILL PAD TO ALLOW CONTRACTOR EQUIPMENT ACCESS FOR ROCK PLACEMENT SEAWARD OF THE MLWL (OPTIONAL)

NOT FOR PURPOSES OF CONSTRUCTION

olsen
associates, inc.
2618 Herschel Street
Jacksonville, FL. 32204
(904) 387-6114
C-1468

VILLAGE OF BALD HEAD ISLAND
TERMINAL GROIN PROJECT

PHASE I GROIN FILL PAD (OPTION)

DATE	APPROVED	REVISION
03-01-2014	EJO	1

SEAL 15628
ERIK J. OLSEN

09/30/2013

DRAWN BY:
ML

SHEET
21 of 21

APPENDIX I

DESIGN ENGINEERING ANALYSIS FOR TERMINAL GROIN LENGTH

(Prepared by Olsen Associates, Inc.)

An Evaluation of Varying Terminal Groin Lengths and the Feasibility of Phasing Construction

Olsen Associates, Inc.
2618 Herschel Street
Jacksonville, FL 32204
(904) 387-6114

September 23, 2013

An initially preferred (maximum) design length for the proposed terminal groin on Bald Head Island was investigated through extrapolation of numerical model results and application of practical coastal engineering principles and experience. The resulting analysis focused on the potential ability of different terminal groin lengths to protect varying lengths of updrift shoreline along South Beach while minimizing negative impacts to the downdrift (west) beaches. For purposes of discussion, the predicted performance of three (3) conceptual terminal groin lengths were compared: a short groin (~1,100 feet total length), a mid-length groin (~1,900 feet total length), and a long groin (~2,900 feet total length). The landward point of attachment and general structural orientation of each groin alternative are self-similar. Each alternative was considered to be relatively permeable with respect to its ability to allow some level of sand transport over and through the structure. This is in contrast to conventional groin or jetty structures which are typically designed to be “sand-tight”. The spatial extent of updrift benefits associated with a “leaky” terminal groin will be essentially proportional to the length of the terminal structure. Conversely, it is expected that at some point, potentially negative downdrift impacts are also proportional to increasing structure length. A mid-length terminal groin therefore appears to offer an acceptable balance between maintaining the updrift objective of the structure while minimizing the probability of downdrift impacts.

The primary purpose of a terminal groin at Bald Head is to stabilize the westernmost segment of South Beach nearest the inlet channel and to protect both private and public upland structures and infrastructure from chronic coastal erosion occurring immediately eastward thereof. Sediment transport at this location is directed strongly towards the inlet, in the net. Numerical studies and physical monitoring both indicate that the rate of alongshore sediment transport accelerates with proximity to the inlet. Once beach sediments reach the inlet they are either transported into the navigation channel or deposited into various shoal formations. In either event these sediments are effectively lost from the littoral system on Bald Head resulting in beach profile erosion that is significant enough to warrant repeated application of erosion control measures along the affected South Beach shoreline via beach fill, placement of sand filled tube groins, and sand bag revetments.

Over the last 12 years, the shoreline orientation at the west end of Bald Head has progressively rotated clockwise to an increasing north-to-south orientation thereby resulting in increased obliqueness between the island and incident breaking waves (see **Figure 1**). This relationship is currently a significant factor in the chronically *increasing* rate of sediment transport off the island at this location. The installation of a terminal groin and episodic beach fill are intended to strategically reorient the shoreline counter-clockwise to a more northwest-to-southeast orientation. This will decrease the effective angle between the shoreline and incident breaking waves -- thereby reducing sediment transport along the South Beach shoreline segment nearest the inlet. Simplistically, the resultant amount of shoreline reorientation can be considered to be directly dependent upon the effective length of any terminal groin constructed and its associated updrift impoundment fillet.

Along westernmost South Beach on Bald Head Island, three fundamental shoreline orientations are currently evident, A, B, and C, as presented in **Figure 1**. Shoreline orientation A, which trends north-to-south, is associated with the aforementioned highest present-day erosional segment of South Beach. Future terminal groin performance will be predicated on developing a stable westerly extension more typical of shoreline orientation B throughout the chronically eroded westernmost reach – thereby essentially reversing the significant negative effects that currently exist with orientation A. Establishing or approaching some variation of orientation B in the long-term, in order to decrease the strong erosional gradient existing along west Bald Head Island, requires large-scale structural stabilization – such as a terminal groin of suitable length.

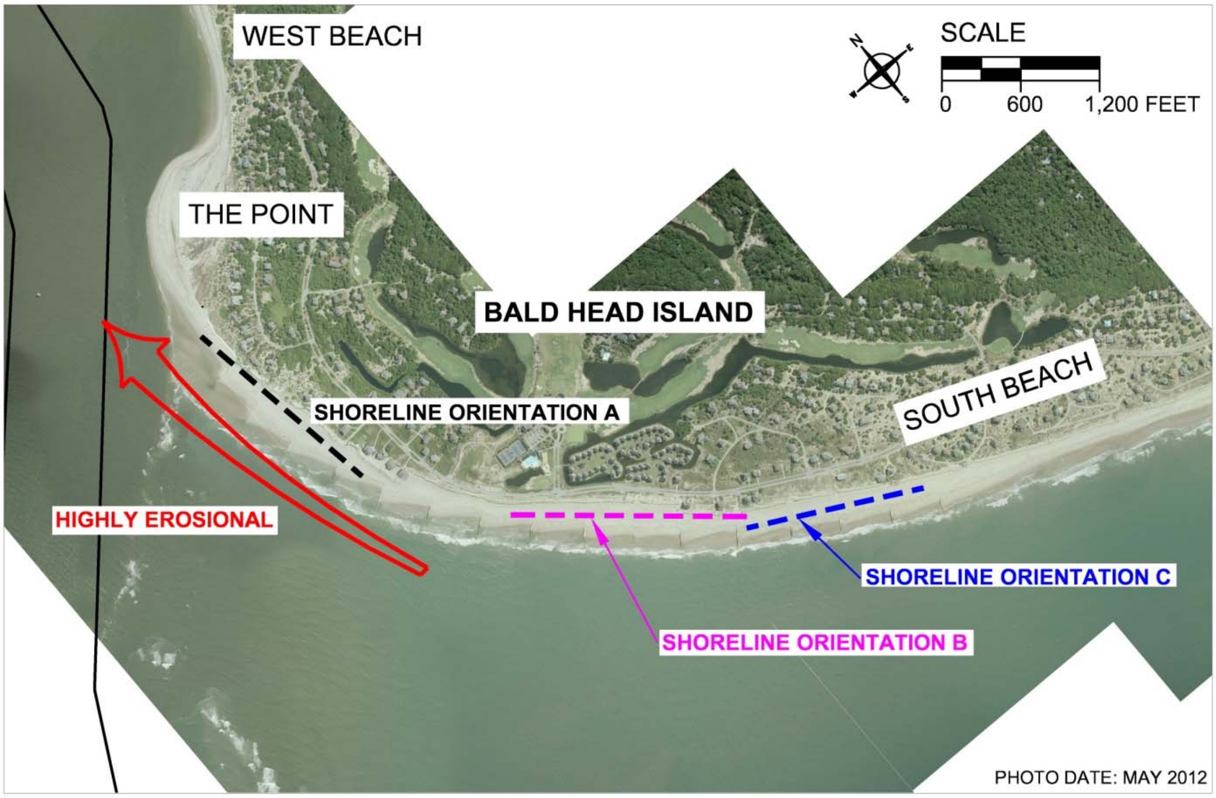


Figure 1: Fundamental shoreline orientations, A, B, and C, observed along western Bald Head Island.

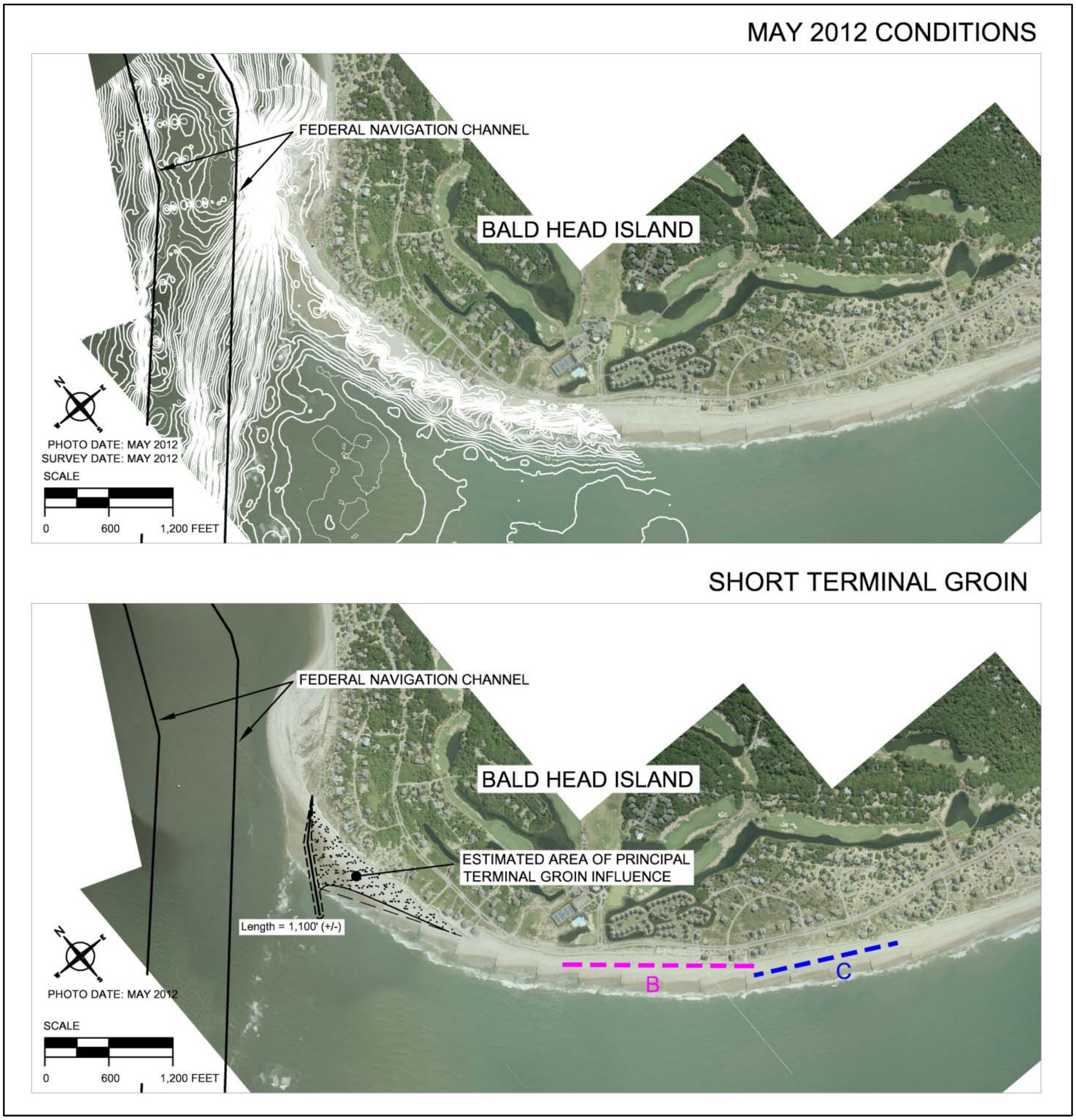
It can be readily seen that a very "short" groin alternative of 1,100 ft or less in length (see **Figure 2**) fails to achieve the most desirable shoreline orientation (i.e., B). Hence its expected updrift impoundment effect does not necessarily extend throughout the most critically eroded section of developed shorefront. Instead, the westerly extension of orientation B forms the basis for defining the requisite length of the "mid-length" terminal groin (see **Figure 3**), for which the updrift effects are predicted to extend through the critically eroded area. To emulate the westerly extension of orientation C would require a significantly longer terminal structure – approaching 2,900 feet (see **Figure 4**). Conversely, the updrift effects of a "long" terminal groin would likely extend eastward through most of the existing sand tube groinfield; however, it entails an exceptionally long structural footprint and presents much greater potential for adverse impacts to both of the inlet-facing shorelines located northward thereof (i.e., the Point and West Beach).

The calibrated Delft3D model was employed in order to predict the short- and long-term responses to construction of the proposed mid-length terminal groin. Delft3D model simulations are described by Olsen (2013). The results suggest that the mid-length terminal groin is capable of protecting currently threatened upland infrastructure and residential structures while reducing sediment transport along western Bald Head Island to rates consistent with those computed under historic shoreline conditions -- without significant or wide-spread downdrift impacts, relative to existing conditions. In order to ensure adequate post-construction sand bypassing such a structure would necessitate constructing a ~0.5 Mcy fillet of sand immediately updrift of the structure. Implementation would likewise need to be coincident with a federal beach disposal project that would function as a feeder beach.

Extrapolation of the numerical modeling results for the mid-length terminal groin was employed to initially infer the predicted physical performance of the shorter and longer terminal groin alternatives. For example, given the smaller post-construction impoundment fillet supported by the very short groin (**Figure 2**) this structure was predicted to offer benefits more akin to those afforded by the existing sand tube groins (with fill), albeit somewhat enhanced. That is, the area of direct updrift benefit is somewhat limited in scope and leaves several beachfront structures reliant upon the continued maintenance of the sand tube groins. Given that the Delft3D modeling of the mid-length groin suggests minimal short- and long-term downdrift impacts relative to existing conditions, it is reasonable to conclude that the increased sediment supply afforded by a shorter terminal structure would likewise achieve similar minimal downdrift impacts. However, relative to the mid-length structure a short terminal groin would over time allow a greater volume of sediment to pass onto the downdrift beaches. Moderation of this effect would be afforded by strategic beach disposal to the east on South Beach.

Conversely, extending the terminal groin a significant length beyond the mid-length shore normal dimension in order to maximize updrift impoundment potential (i.e., in general accordance with shoreline orientation C), would require a structure similar in length to that shown in **Figure 4**. The resulting fillet is defined by a shoreline that is nearly east-west in orientation and spans nearly the entire existing tube groin field. While theoretically possible, the resultant shoreline configuration would exceed that which would be expected at the terminal end of a barrier island at this location. In contrast to post-construction sediment transport rates predicted for the mid-length terminal groin, the very long terminal groin is likely to result in development of multiple updrift transport reversals including an increased potential for episodic crenulate bay formation immediately eastward of the structure. Additionally, the transport of sediment through and/or over the long terminal groin would likely occur predominantly near the structure's seaward terminus. This, combined with the overall length of the structure, suggests a decreased potential for sand to reach the downdrift shoreline, with sediment instead principally directed towards the navigation channel and/or onto Bald Head Shoal. Such a condition would be highly impactive to the Point and to West Beach.

From the preliminary investigation, it was concluded that the mid-length permeable terminal groin (on the order of 1,900 feet in total length, or less) is the longest length to reasonably and successfully achieve the objectives of decreasing erosion along the western end of South Beach and extending the easternmost limit of benefit. It is noted that this effective length was defined on the basis of the 2012 "eroded" shoreline location and includes a tie-back into both the existing upland and the requirement of a 0.5 Mcy fillet to be constructed concurrently with structure implementation. Hence, much of the structure stem would be below grade thereby resulting in an effectively much shorter length relative to the new (post-construction) mean high water location.


MAY 2012 CONDITIONS

SHORT TERMINAL GROIN

Figure 2: Conceptual illustration of updrift performance of a short terminal groin.

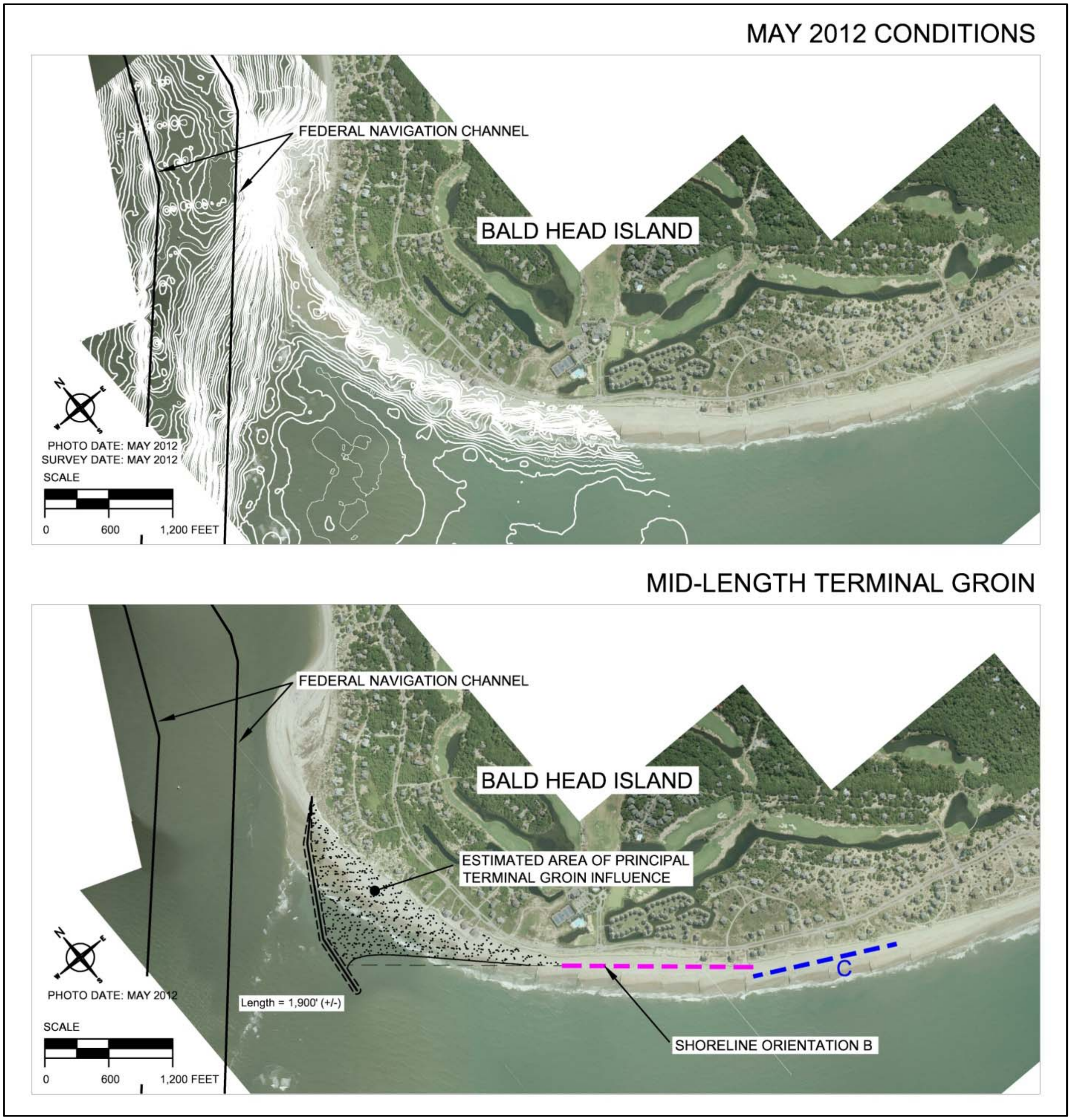


Figure 3: Conceptual illustration of updrift performance of a mid-length terminal groin.

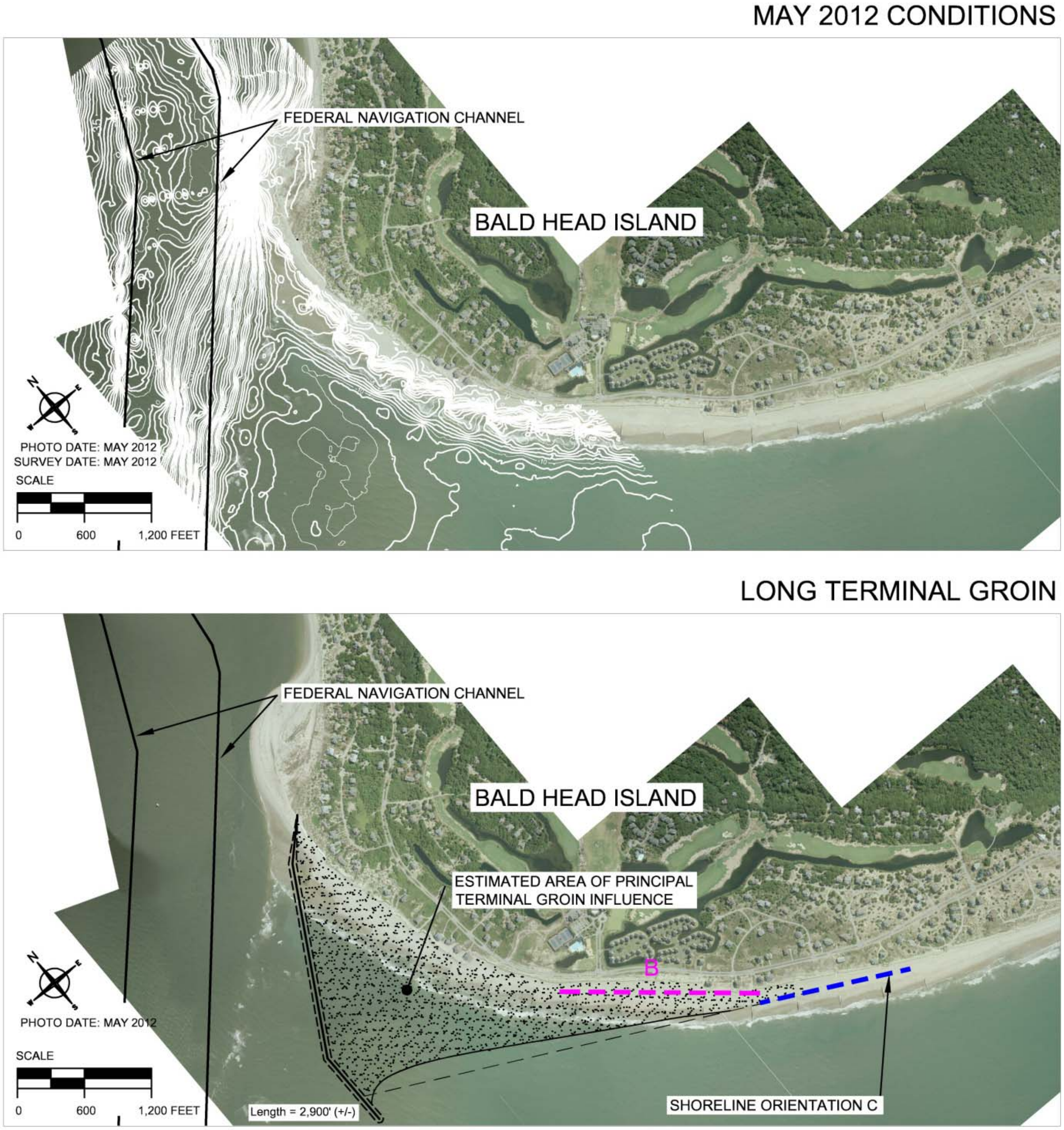


Figure 4: Conceptual illustration of updrift performance of a long terminal groin.

The Village of Bald Head Island intends to permit the construction of a terminal structure extending a maximum of 1,900 ft +/- in length seaward of the existing, seaward-most upland dune line. Such a project would be initiated in concert with a federal beach disposal project constructed eastward thereof in order to maximize benefits to the South Beach littoral system. Additional sand – beyond that placed by the federal maintenance dredging and disposal to the beach – would need to be placed updrift of an approximately 1,900 ft long terminal groin in order to facilitate rapid and complete infilling of the requisite sand fillet at the structure. A supplementary sand (borrow) source located at Jay Bird Shoals would be required to dredge and place approximately 0.5 Mcy of sand needed for fillet creation.

In order to expedite beneficial post-groin shoreline equilibration conditions (both updrift and downdrift of the structure, and including formation of the sand fillet), the Village will permit the option to address construction of a terminal groin in Two phases. Phase I would first construct the landward two-thirds of the structure's overall length, more or less, coincident with the next beach disposal of dredged material from the navigation channel. Phase II would extend the seaward end of the structure to complete the structure's overall length, at an appropriately timed future date. A Phase I structure (currently estimated at 1,300 ft +/- in length) would be shorter than the terminal groin's overall design length, but is nonetheless deemed sufficient to initiate stabilization of the western limit of South Beach through beneficial shoreline realignment and associated reduction of sediment losses to the inlet. Moreover, the shorter Phase I structure is expected to be more conducive to the timely facilitation of sand bypassing to the downdrift shoreline. Supplementary sand source requirements for a Phase I structure would be substantially less. Fillet formation through entrapment of sand placed upon South Beach from the federal channel dredging may potentially obviate the immediate need for the use of a remote (additional) sand source. At the very least, supplementary sand placement if deemed necessary, would be substantially reduced over the 0.5 Mcy initially required for the full 1,900 ft structure.

Additional numerical modeling analyses for a 1,300 foot-long (Phase I) structure were specifically performed for purposes of comparison with existing model results for the full 1,900 ft (Phase II) terminal groin length. More specifically, the Delft3D model was used to simulate the near-term response of Bald Head Island to the construction of a Phase I permeable terminal groin along with periodic beach fill placement. Under this scenario, beach fill sand is derived from both the maintenance dredging of the federal navigation channel and non-federally sponsored beach disposal/nourishment projects. Disposal of maintenance material excavated from the federal project is assumed to be placed onto Bald Head Island in conjunction with two of every three maintenance events, in accordance with the tenets of the current WHSMP. The aforementioned non-federal beach nourishment efforts are intended to supplement the federal disposal during every third maintenance event. For the purposes of this analysis, sand was numerically placed onto Bald Head Island concurrent with channel dredging every three years throughout the nine year model run.

For the simulation, the initial modeled bathymetry was identical to that applied to all other long-term modeling efforts conducted in support of developing an EIS. The present bathymetry includes the addition of a semi-permeable terminal groin located at the western end of the Island's South Beach along with the existing sand-filled tube groin field. The modeled terminal groin was approximately 1,300 feet long and is designed to work in conjunction with a beach fill placement east of the structure -- the intent of which is to reorient the shoreline towards the southwest, a more historically appropriate orientation. Initial structural conditions used for model input are shown in **Figure 5**. The figure graphically compares the Phase I "shortened" terminal groin to the previously simulated Phase II terminal structure. The Phase I structure therefore represents the partial construction of the originally proposed and modeled 1,900 foot-long terminal groin in the EIS documentation (ref: Alternatives 5 and 6). The Phase I terminal groin lies on the same footprint as the full Phase II terminal groin.

The Phase I terminal groin was likewise modeled as "leaky" using porous plates which are by definition infinitely high, semi-permeable numerical structures. The permeability of porous plates is numerically controlled by a friction term, roughly representing a level of permeability between about 10 and 30 percent, which is identical to the Phase II structure previously modeled. The existing tube groins are included in the model and are numerically described as thin dams, which act as impermeable, infinitely high barriers to sediment transport, which are mildly transmissive with respect to wave energy.

The depth-averaged Delft3D model of Bald Head Island and the Cape Fear River Entrance was previously calibrated in order to accurately simulate average annual alongshore sediment transport along Bald Head Island's South Beach shoreline (Olsen, 2012). The initial modeled bathymetry comprising the nearshore zone and navigation channel were updated to reflect nearshore conditions existing in spring 2011. Nearshore bathymetry was described by survey data measured in May 2011 while upland topography away from the beach was described by LIDAR data collected in 2005/06. Conditions within the navigation channel were initially described by those measured in February 2011 in conjunction with the U.S. Army Corps of Engineers (USACE) condition survey. These conditions describe a generally eroded beach condition and a shoaled navigation channel, particularly in the Bald Head Shoal I and II reaches, as shown in **Figure 6**.

The numerical model was set up in order to simulate periodic channel dredging along with coincident placement of sand onto the Bald Head shoreline. Dredging and/or disposal/nourishment operations were initiated every three years during the simulation. Upon initiation of the dredge and fill operations, the entire navigation channel was numerically 'dredged' to a uniform depth of –(44+2) feet, the presently authorized channel depth. All dredge spoils were removed from the model. At the same time step, approximately 1,200,000 cubic yards (cy) of sand were placed onto South Beach within a fixed boundary extending from about Station 44+25 near the terminal groin to about Station 156+00 (see **Figure 6**). The offshore limits of sand placement remain the same as in previously analyzed simulations of the Phase II terminal groin (except in the immediate vicinity of the terminal groin). Relative to the Phase II terminal groin, the eastern limit of fill for the Phase I was adjusted westward in order to accommodate the reduced fill area required for the pre-construction of a fillet updrift of the Phase I groin, which is required by Statute. As such, the simulated western limit of fill includes the entire length of the terminal groin. For purposes of direct comparison with previous analyses, an initial dredge and sand placement event was specified to occur immediately after the start of the simulation (time zero) with the subsequent events occurring at years 3 and 6. This simulation assumes sediment availability every three years and does not consider the effects of skipping fill placement/disposal on Bald Head Island.

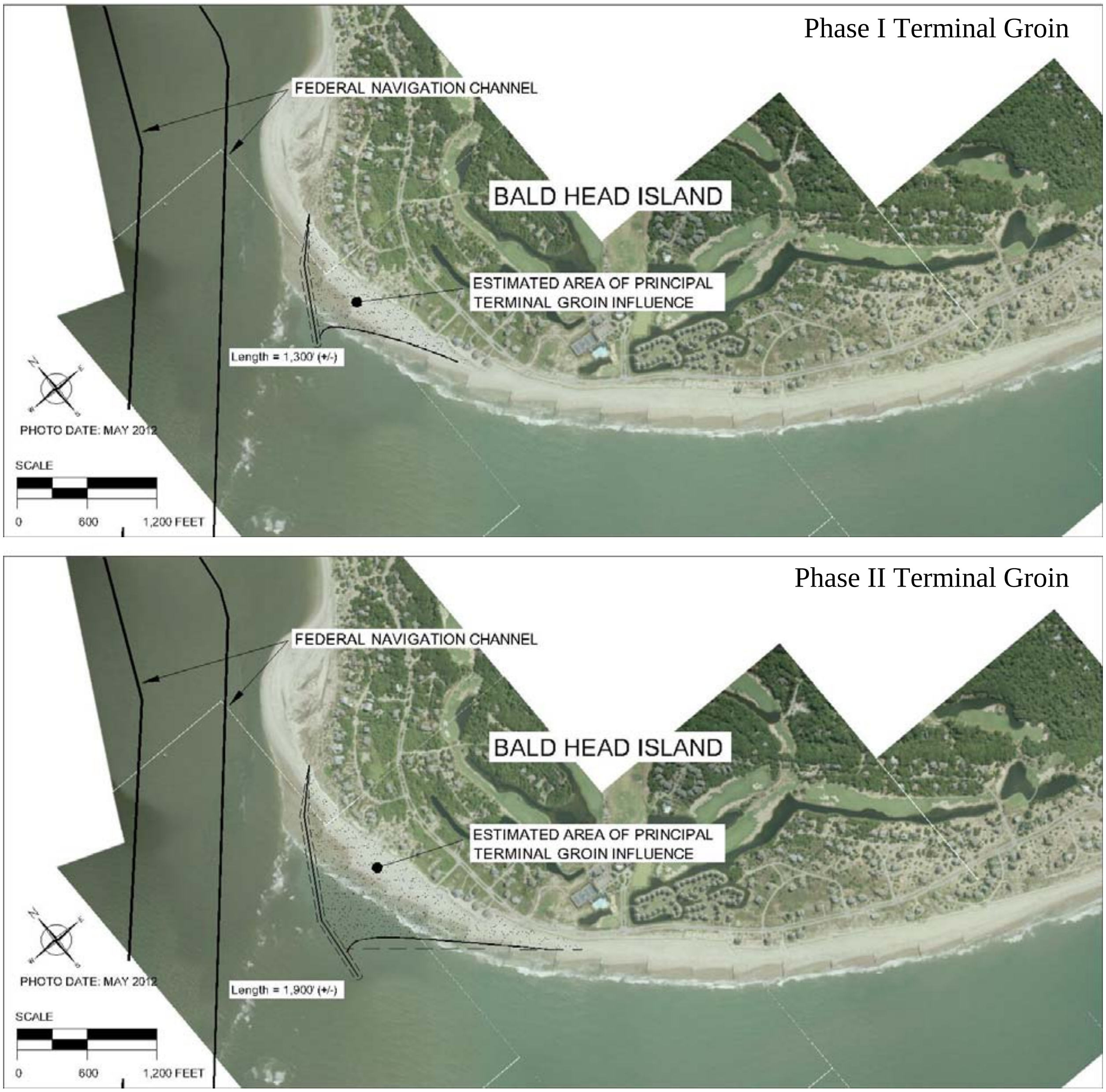


Figure 5: Conceptual illustrations of the presently simulated Phase I terminal groin and the previously modeled Phase II terminal groin (beach disposal not shown). Note: the estimated area of principal terminal groin influence is hypothetical and not based on model results.

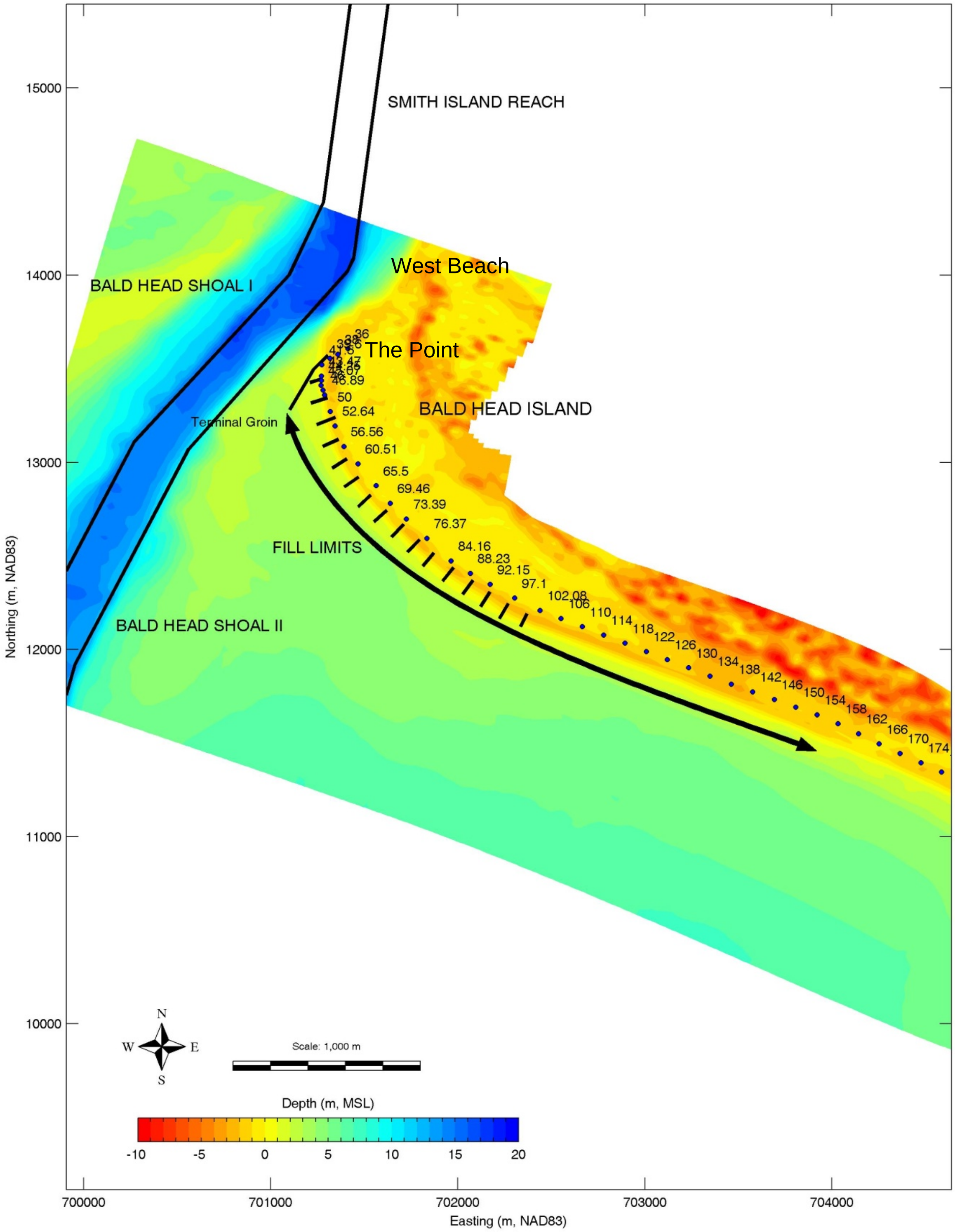


Figure 6: Approximate limits of periodic sand placement for simulation of a Phase I terminal groin. In the model simulations, beach placement occurs every three years and is coincident with channel dredging.

Figure 7 plots the predicted bathymetry throughout the 9 year simulation for the Phase I terminal groin with sand-filled tube groin scenario. Each pane of the plot represents bathymetries predicted in the project area at years 3, 6, and 9 immediately prior to the next placement/dredge event. The approximate mean lower low water (MLLW) contour is shown in bold for reference in each plot. Areas shaded in green represent those which are expected to remain dry for at least a portion of the tidal cycle – typically areas above the MLLW elevation. The model results indicate that with the porous Phase I terminal groin and sand-filled tube groins in-place, the downdrift shoreline, "the Point", is expected to remain accretional throughout the 9-year simulation. The majority of this accretion is predicted to occur on the downdrift (west) side of the terminal groin, just north of the structure's landward end. This result is similar to that indicated for the Phase II terminal groin (see **Figure 8**) although the MLLW shoreline at Point tends to migrate into a broader tidally-influenced shoal feature relative to the Phase I structure. The subaqueous shoal at the seaward end of the Phase I terminal groin, however, is significantly smaller than that resulting from the Phase II groin, which is expected.

Figure 9 plots the predicted MLLW contours at years 3, 6, and 9 for the Phase I terminal groin condition. For comparison, **Figure 10** plots the predicted MLLW contours at years 3, 6, and 9 following construction of the Phase II terminal groin. The results are similar for both structural lengths and highlight the aforementioned continued accretion of the Point throughout the simulation period under both terminal groin lengths. This is in comparison to a northward rolling back of the Point shoal under each non-terminal groin condition investigated for the EIS documentation (Olsen, 2013).

The model indicates continued erosion along portions of West Beach throughout both the Phase I and II terminal groin simulations, which is consistent with existing conditions as well as other non-terminal groin modeling results. The severity of the erosion signal indicated along West Beach (north of the Point) is similar between the Phase I and Phase II results but is likely overstated in both instances. That said, the model predicts that after 9 years the location of the shoreline coincides with the existing escarpment (bluff) along West Beach -- similar erosion patterns in the nearshore portions of West Beach are indicated in all simulations (structural and non-structural), away from areas affected by Point migration (Olsen, 2013).

North of the Point, West Beach is generally protected from ocean waves and its location inside the entrance suggests that the principal physical mechanisms for morphological change along West Beach are not solely governed by normal open coast processes. It is likely that sediment transport here is dominated by local wind generated waves, river currents, ship wakes, etc., which, excepting typical currents, are not described in the model. The response along West Beach should therefore be estimated by relative comparison between similar model simulations and not as an absolute prediction of beach response. Such a comparison suggests few significant differences along West Beach as a result of phasing the construction of the terminal groin.

Figure 11 compares the predicted MLLW shorelines for the Phase I and II scenarios at year 9 of the simulations. The resulting growth of an impoundment fillet on the east side of the terminal groin in time is clearly visible in both terminal groin scenarios. For the Phase I terminal groin the updrift fillet is predicted to extend through the westernmost three or four existing tube groins by year 9. The remainder of the South Beach shoreline presently within the groin field would continue to be dependent upon their maintenance and performance in order to avoid potential impacts from erosion. For the Phase II terminal groin, the fillet is predicted to extend through the westernmost six or seven tube groins, which should afford greater protection to habitable structures which have historically been at risk within the groin field (principally those which are seaward of the vegetation line).

For both terminal groin phases, seaward growth of the fillet slows over time in the model, likely as a result of the terminal groin approaching its capacity with respect to the volume of material is can impound. While the defined beach placement area extends to the seaward end of the terminal groin, the initial disposal event does not create an elevated berm along the eastern edge of the terminal groin due to the nature in which the model places sediment for beach placement. Rather than fully fill the terminal structure with a berm that extends near the groin’s seaward end (which is what might be constructed), the Delft3D model inherently places the specified volume of sediment uniformly within the placement area up to a specified berm elevation. This process results in placement of material along the terminal groin at every event. Periodic sand placement along with the natural impoundment of sediment against the terminal groin, results in a more gradual formation of a full berm across the terminal groin. The process indicated herein is likely conservative with respect to the evolution of both the updrift and downdrift shorelines.

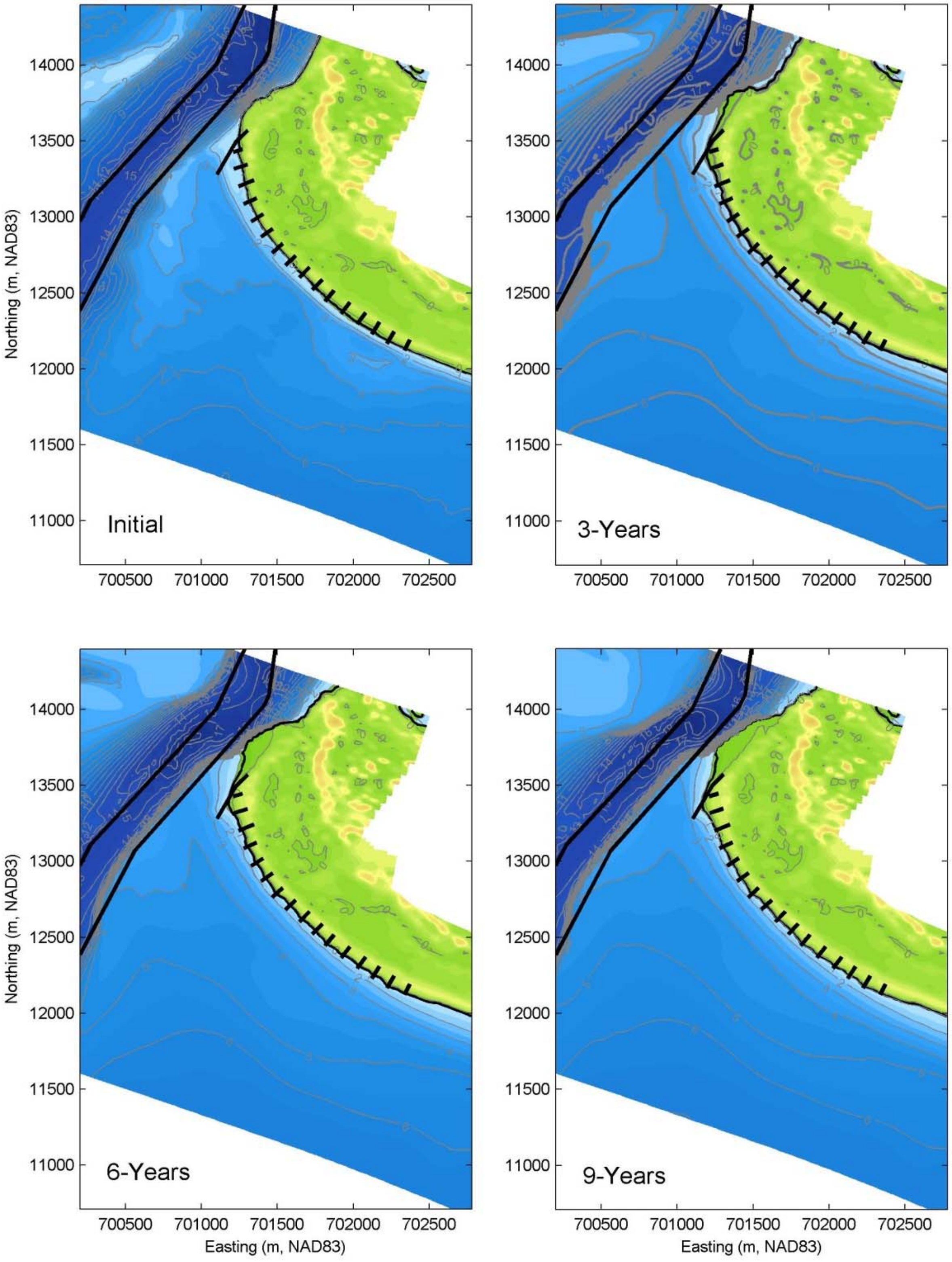


Figure 7: Bathymetry predicted throughout the simulation at years 3, 6, and 9 for a Phase I groin alternative. Each depicts conditions prior to the subsequent sand placement interval.

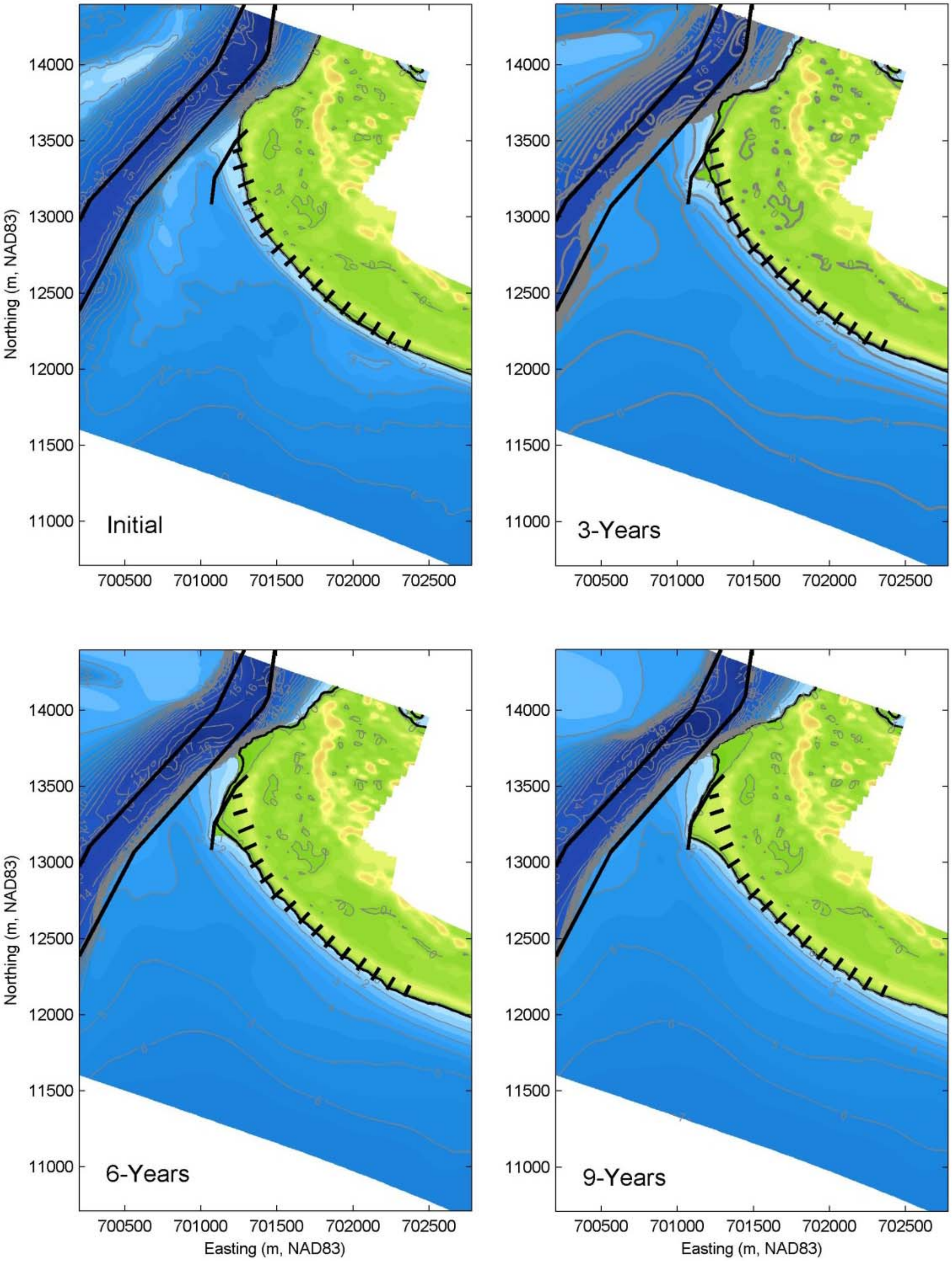


Figure 8: Bathymetry predicted throughout the simulation at years 3, 6, and 9 for a mid-length groin alternative. Each depicts conditions prior to the subsequent sand placement interval.

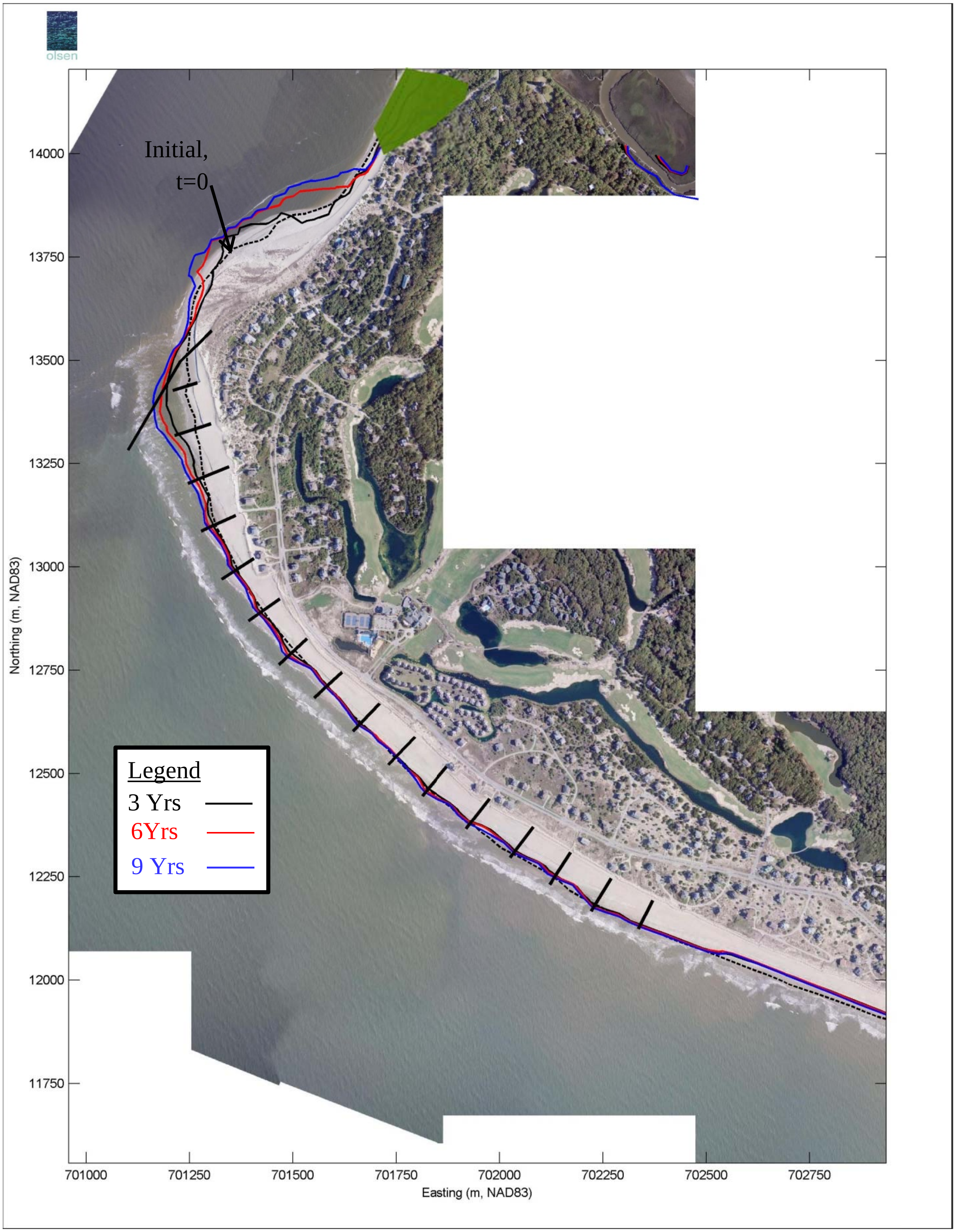


Figure 9: Approximate MLLW contour predicted at years 0, 3, 6, and 9 years for the Phase I groin scenario prior to the subsequent sand placement/dredge event.

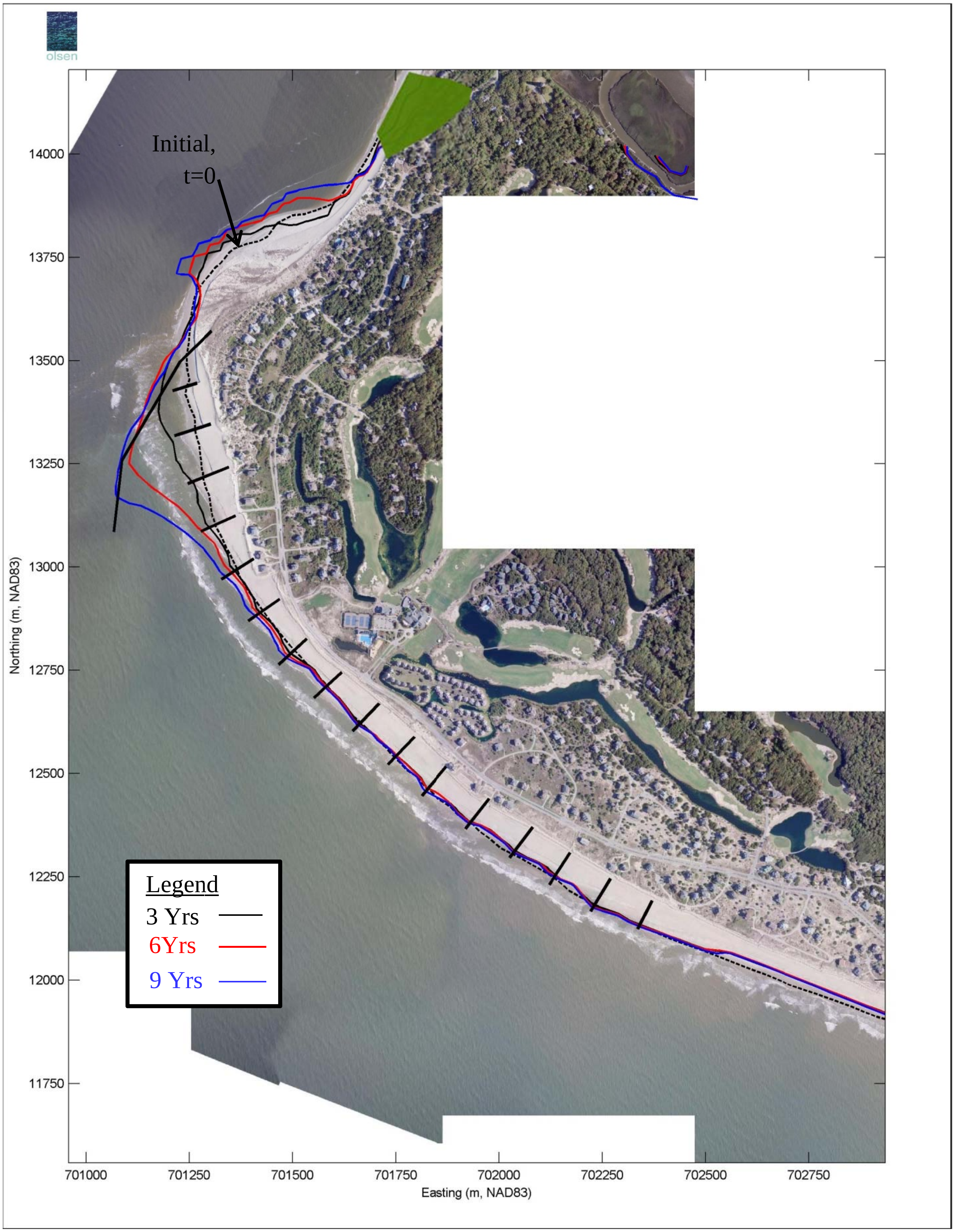


Figure 10: Approximate MLLW contour predicted at years 0, 3, 6, and 9 years for the Phase II groin scenario prior to the subsequent sand placement/dredge event.

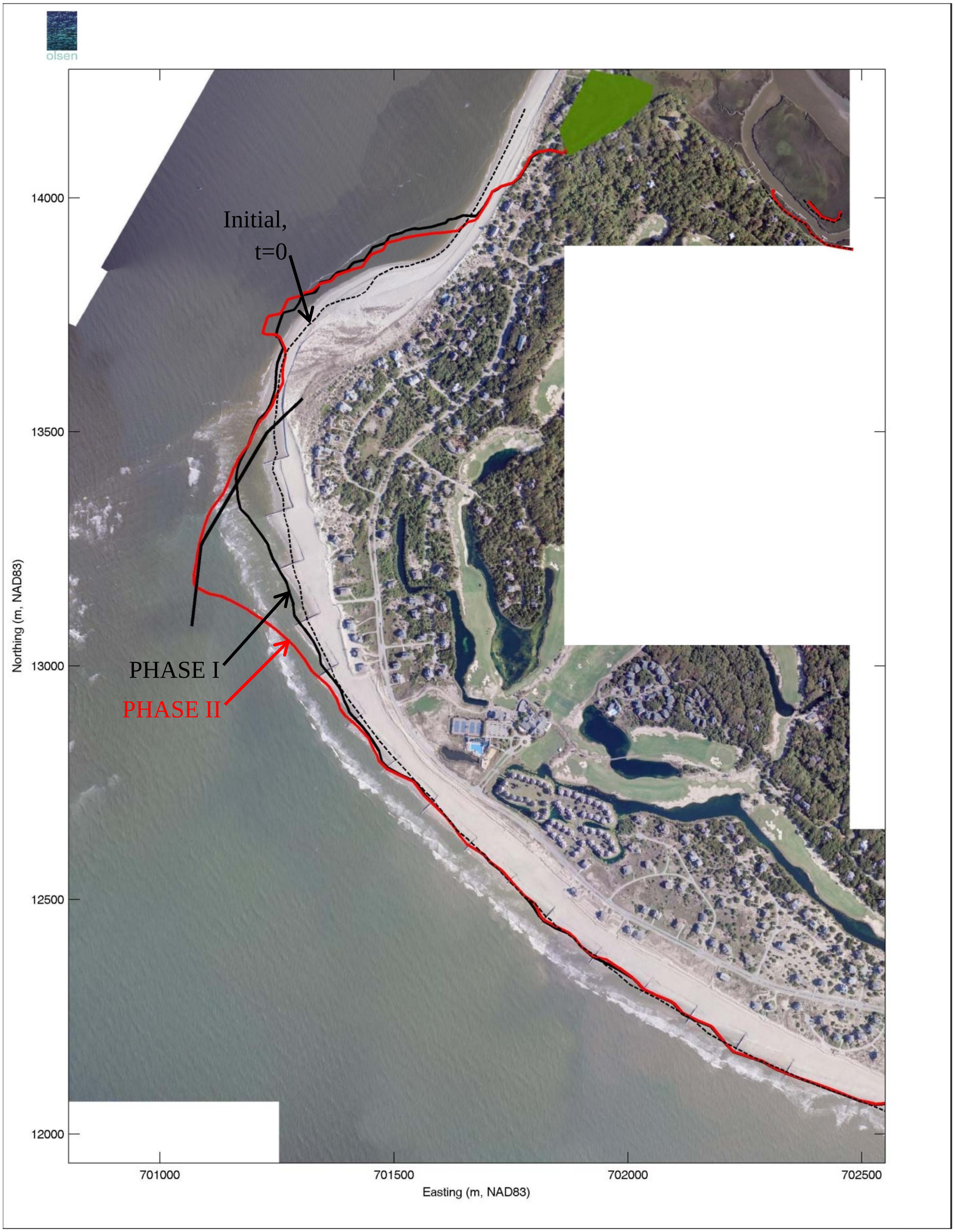


Figure 11: Comparison of MLLW predicted shoreline contours at year 9 for the Phase I and Phase II terminal groin scenarios.

Figures 12 through **14** plot the predicted cumulative sedimentation and erosion patterns for the short terminal groin alternative after 3, 6, and 9 years, respectively. Red shading in the model indicates net erosion of the seabed while blue shading suggests net sedimentation. The approximate seaward limit of development is indicated by the black dashed line. The vectors represent the direction and scaled magnitude of mean total transport which is computed throughout the simulation. The effects of recurrent sand placement are included in these results.

Similar to the predicted results for the Phase II terminal structure described under separate cover, the model suggests that the South Beach shoreline is effectively maintained by the combination of the Phase I terminal groin, existing tube groins, and periodic sand placement. North of the terminal groin, the model indicates the development of a largely submerged sand platform immediately adjacent to the Phase I terminal groin – owing to the transport of sand through, over, and around the structure. Net erosion along the Point and southern West Beach is indicated by the results and is manifest as a northward migration of the existing spit shoal. This erosion does not propagate into the limit of development after 9 years. Further north along West Beach (but away from the numerical boundary), the model predicts erosion which extends to the seaward limit of development after 9 years. This result is consistent with model predictions made for the simulation of existing conditions and does not appear to be induced by either the Phase I or Phase II terminal groins (Olsen, 2013). That said, the results predict a modest increase in erosion of the nearshore which is limited in scope resulting from the Phase I terminal groin. The northern model boundary behaves similarly to all other modeled conditions suggesting no causation between this alternative and the (likely grossly overestimated) erosion predicted there.

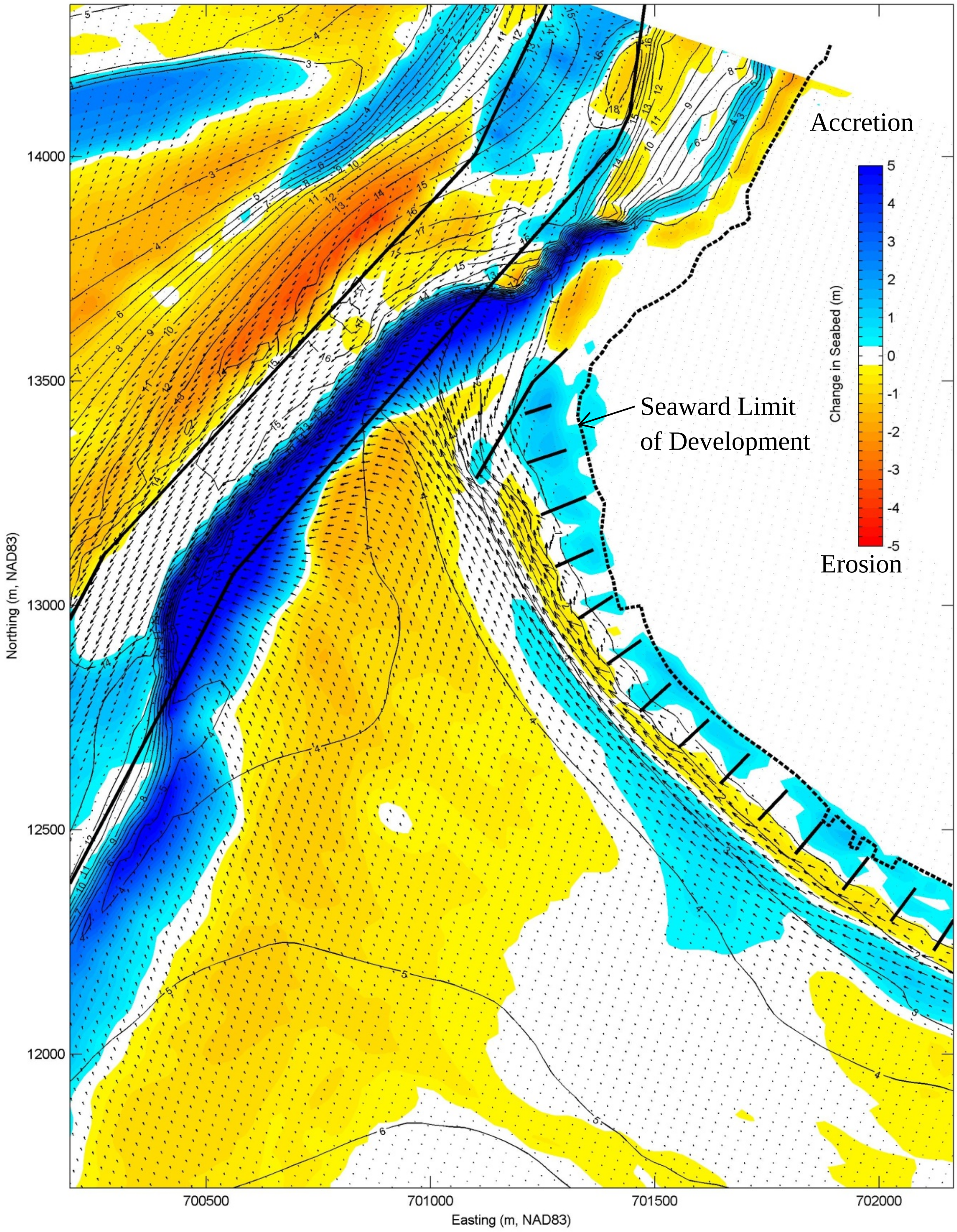


Figure 12: Cumulative sedimentation and erosion after 3 years for a short terminal groin alternative. The effects of repeated sand placement events are included in this result.

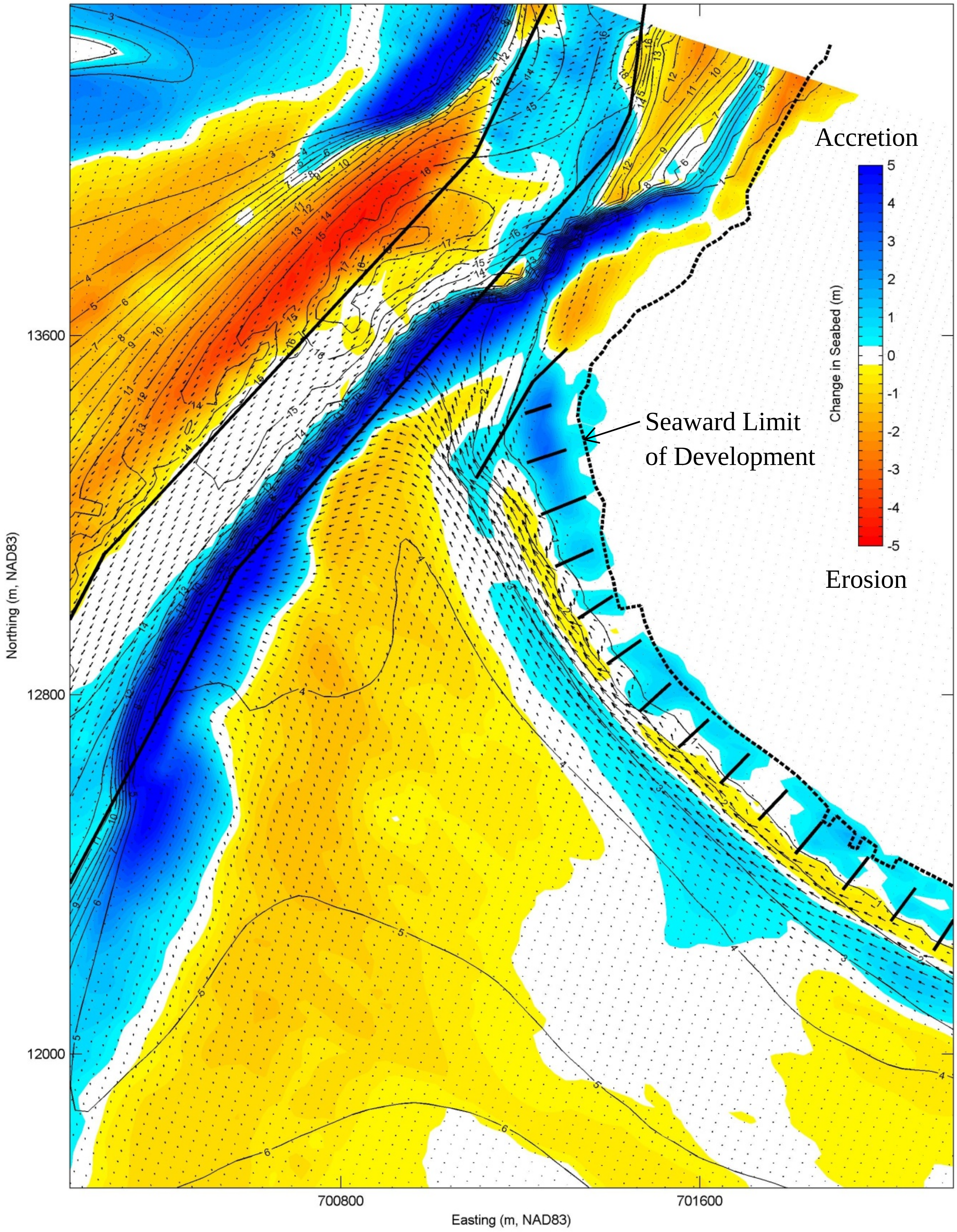


Figure 13: Cumulative sedimentation and erosion after 6 years for a short terminal groin alternative. The effects of repeated sand placement events are included in this result.

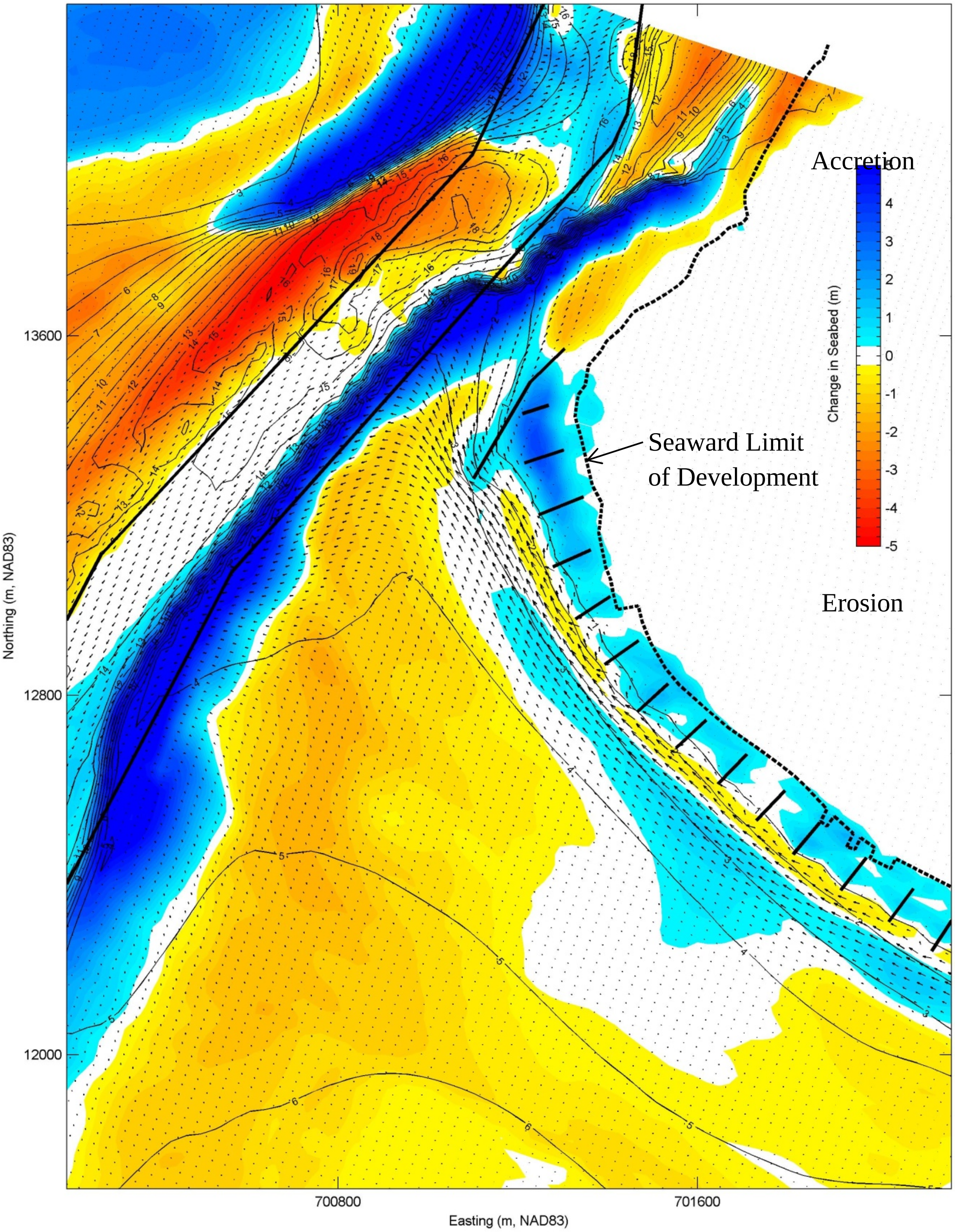


Figure 14: Cumulative sedimentation and erosion after 9 years for a short terminal groin alternative. The effects of repeated sand placement events are included in this result.

The Phase I terminal groin model results indicate continued post-construction accretion at the Point, particularly within the subaqueous and tidally influenced portions of this feature. The model suggests continued mild erosion along West Beach under this scenario (see **Figure 14**). In order to assess the predicted magnitude of downdrift changes attributable to the Phase I terminal groin alternative, the final predicted bathymetries for the Phase I terminal groin and sand-filled tube groin only (existing condition) were directly compared (differenced) and the results are plotted in **Figure 15**. Red shading in the figure indicates areas where the seabed is lower with the Phase I terminal groin while blue shading indicates areas where the seabed is higher with the Phase I terminal groin, relative to the sand-filled tube groin alternative.

The results of this comparative analysis reflect the prediction of a much improved Point condition particularly at the landward base of the terminal groin 9 years after construction of a Phase I terminal groin (blue shading) relative to a tube groin only alternative. The results also suggest relative volume losses which are attributable to the terminal groin along more northerly portions of West Beach principally associated with a reduction in the size of the shoal near the navigation channel (denoted by red shading). These losses represent reduced accretion or increased erosion relative to the results predicted for the tube groin only scenario. It does not appear that the Phase I terminal groin induces large scale downdrift erosion along West Beach.

Relative differences in volumetric changes between the Phase I terminal structure and sand-filled tube groin *only* condition (i.e., Alternative No. 3) west and north of the Phase I terminal groin were computed based on the results shown in **Figure 15**. Under the Phase I terminal groin scenario, the nearshore area north of the terminal groin (from the landward terminus of the groin northward) is predicted to experience a total relative *net volume increase* of about +1,785 cy through 9 years. This nearshore net difference is comprised of a gross gain of about +33,842 cy and a gross loss of about -32,057 cy, over the 9 year period. On an average annual basis, the predicted gross losses attributable to the Phase I terminal groin are about -3,600 cy/yr. Gross nearshore gains induced by the Phase I structure tend to align with accretion of the nearshore immediately north of the terminal groin along the Point. Gross nearshore losses induced by the Phase I terminal groin are realized along a narrow reach of northern West Beach and tend to align with an existing escarpment visible in the aerial photography. This volume computation does not include the losses seaward of the -3 or -4m contour as such volume change, interpreted as reduced accretion which is attributable to the Phase I terminal groin's predicted ability to arrest, or slow, the northward migration of the Point which would otherwise occur. Quantification of the predicted volume changes attributable to the Phase I terminal groin along West Beach suggest either little to no direct impacts or those which are mild in scope and mitigated for via the ongoing management of erosion along West Beach, plus an estimated additional 3,600 cy per year to offset the predicted gross effects of the Phase I terminal groin. For reference, the additional sediment requirement along West Beach following construction of the Phase II terminal groin was estimated to be about 5,200 cy/yr, on average (Olsen, 2013).

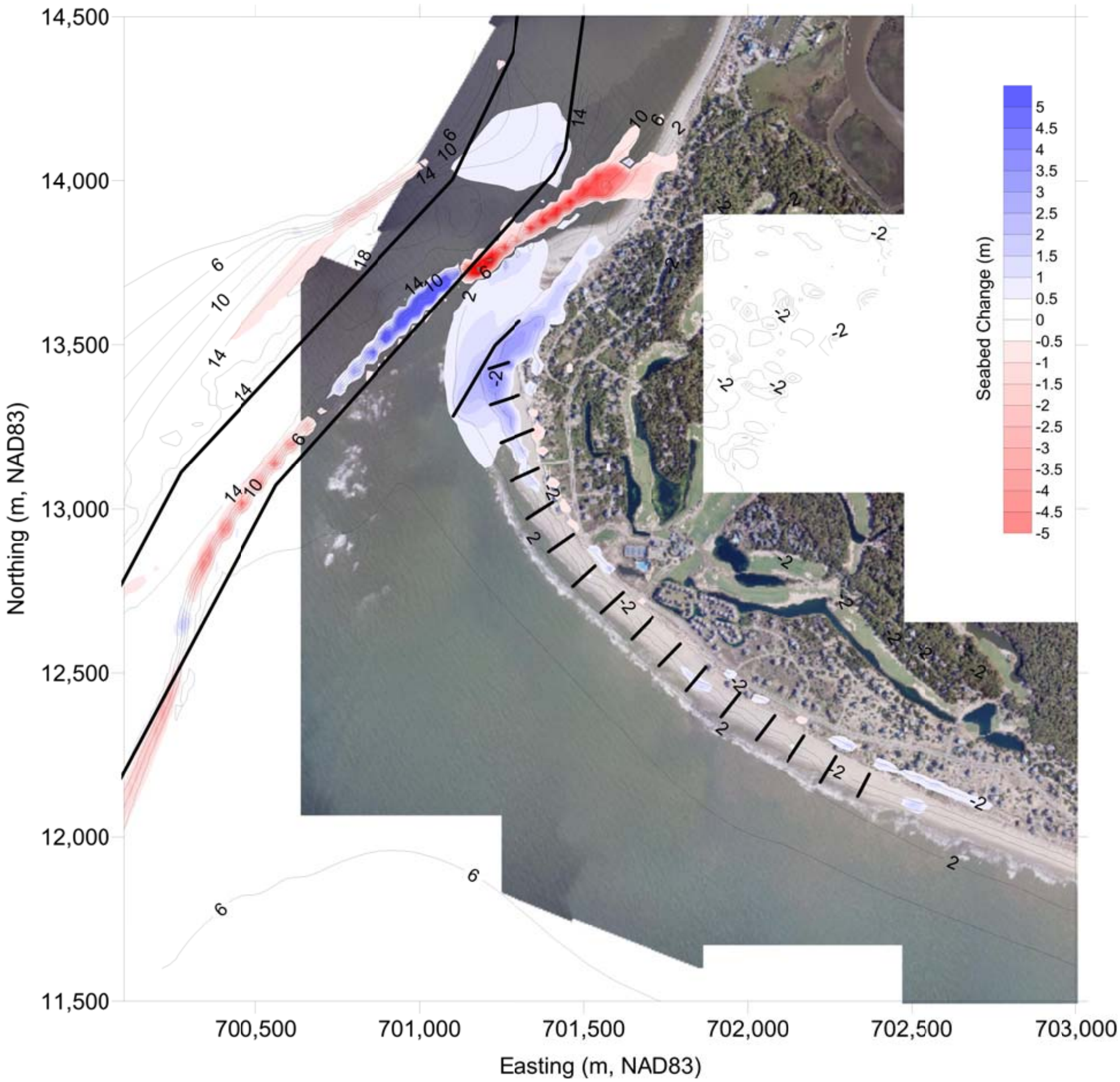


Figure 15: Difference in seabed elevation after 9 years between the Phase I terminal groin and sand-tube groin only (existing condition) scenario. Red shading in the figure indicates areas where the seabed is lower with the Phase I terminal groin while blue shading indicates areas where the seabed is higher with the Phase I terminal groin, relative to the sand-filled tube groin alternative.

Along South Beach, the comparison of the with Phase I terminal groin and sand-filled tube groin results suggests that the spatial extent of the shortened terminal groin's impact is limited to an area extending about 400 meters east of the terminal groin (see **Figure 15**). The net effect is induced deposition owing to both the direct placement of sand and the groin's ability to impound sand naturally transported from the east. Over the 9 year simulation, the periodic addition of 1.2Mcy in combination with the Phase I terminal groin and the existing sand-filled tube groin field is predicted to be sufficient to provide stabilization of the western end of Bald Head Island, albeit at a reduced scale than that predicted for the Phase II terminal structure. Similar results were identified by modeling of the Phase II terminal groin. Simulations which do not include a terminal groin do *not* achieve this goal as the model predicts impacts to upland infrastructure due to erosion at and immediately west of the existing westernmost tube groin. Accordingly, the sand-tube groin field with fill only scenario (existing condition) is expected to require implementation of emergency measures in addition to the periodic deposition of 1.2 Mcy of sand in order to avoid property damage – similar in nature to what was required between 2010 and 2013, prior to the most recent federal beach disposal event (Spring 2013).

A cyclic renourishment volume of 1.2Mcy every three years represents a conservatively likely volume of material available from the navigation channel under the current SMP – typically there is 1.5 to 1.8 Mcy available. However, the current SMP requires that Bald Head Island receive no sand every third renourishment. This requires the Village to supplement the entire volume with supplementary sediment from an alternate borrow source.

In summary, the Delft3D model was used to simulate 9 years of morphological change following construction of a semi-permeable Phase I terminal groin at the west end of Bald Head Island. The modeled Phase I terminal structure measures about 1,300 feet long and represents the potential initial construction phase of the Phase II terminal groin which is about 1,800 feet long in the model. Both structures are identical in location and model characteristics excepting overall length. The existing sand-filled tube groins were included in the model in their current locations. Periodic sand placement on South Beach was prescribed to occur at years 0, 3, and 6 concurrent with maintenance of the federal channel. Sand volume was held constant at 1.2 Mcy and placed between Station 44+25 near the terminal groin and Station 156+00. The initial beach and channel conditions were representative of those measured in the spring of 2011. The first dredge/disposal event is simulated to occur immediately after the model's initiation (at time zero).

The model results indicate the Phase I terminal groin in combination with the existing sand-filled tube groins and recurrent sand placement is sufficient to maintain the South Beach and Point shorelines through the 9 year simulation, thereby fulfilling its design objective in a manner similar to the Phase II structure. Upland development located more than 350-400 meters east of the terminal groin would continue to depend on the existing soft armoring for protection from erosion. Construction of the Phase II terminal groin is expected to provide a direct benefit which extends further east an additional 200 to 250 meters.

The present depth-averaged model suggests continued northward migration of material passing through the Phase I terminal groin which is deposited as a predominantly subaqueous platform immediately adjacent to, and slightly north of, the terminal groin. Further, a spit shoal north of the terminal groin is expected to continue to provide a near-term, post-construction Point feature -- in contrast to comparative non-terminal groin scenarios which result in the predicted erosion of such a Point at the west end of the island. The model predicts continued erosion along West Beach which is generally consistent in spatial area to that indicated by simulation of scenarios containing only sand-filled tube groins (existing conditions). Erosion along West Beach is expected to continue as a maintenance issue rather than a significant project-related impact. Specifically, the Phase I terminal groin is expected to require a maintenance volume of about 3,600 cy per year in addition to that presently provided by episodic renourishment events.

It is anticipated that the post-construction performance of the Phase I terminal structure would be monitored with respect to its ability to (a) facilitate sand bypassing to the downdrift shoreline, (b) reduce the rate of sand loss from South Beach, and (c) maintain an updrift fillet, and to assess the alongshore extent of benefits derived therefrom. The timing and extent of the Phase II construction would benefit from the guidance provided by the Phase I monitoring program. It is reasonable to assume that the minimum time required to adequately assess the performance of the Phase I structure would be one to two channel-dredging and beach disposal cycles (approximately 2 to 4 years). Additionally, the implementation of a Phase I structure would reduce the amount of time that beachfront construction operations would extend beyond the typical 1 May Moratorium date. Depending upon shoreline conditions at the time, it is likely that any Phase II extension contract activities may potentially be scheduled to better coincide with construction outside of the Moratorium window.

Both the Phase I and Phase II terminal groin lengths continue to necessitate the maintenance of the existing sand tube groinfield located eastward of the new structure. Ultimately, however, any sand tube groins considered by the Village to be non-essential or counter-productive to terminal groin performance would be removed or modified. A decision in this regard would be based upon the results of shoreline monitoring.

A post-construction monitoring program for the Phase I structure would consist of biannual surveys intended to specifically quantify fillet volume, spit or platform formations associated with sand bypassing, and the condition of immediate updrift and downdrift shorelines. In order to facilitate the effort, only minor modifications to the Village’s existing comprehensive shoreline monitoring program would be required. More specifically, these modifications would include additional survey lines in the vicinity of the groin structure, the fillet, and the downdrift shoreline. The existing biannual controlled aerial photography program would be continued; however, interim (quarterly) oblique photography would be acquired for purposes of high-frequency qualitative assessments of shoreline conditions.

Any decision as to when and how far to extend the Phase I structure would be closely coordinated with both State and Federal regulatory staff. In no event, however, would the groin be extended beyond its full 1,900 ft permitted length. A Notice-to-Proceed (NTP) for a Phase II extension would be given by the Village for purposes of notification to all affected agencies, stakeholders and navigational interests.

References Cited

Olsen (2012). "Calibration of a Delft3D model for Bald Head Island and the Cape Fear River Entrance Phase I." Prepared for Village of Bald Head Island. Prepared by Olsen Associates, Inc. 2618 Hershel Street, Jacksonville, FL 32204. April 2012.

Olsen (2013). "Shoreline Stabilization Analysis. Bald Head Island, N.C." Prepared for Village of Bald Head Island. Prepared by Olsen Associates, Inc. 2618 Herschel Street. Jacksonville, FL 32204, July 2013.

APPENDIX J

SOUTH AMELIA ISLAND TERMINAL GROIN – AERIAL PHOTOGRAPHS

Figure x.x: Chronology of South Amelia Island Leaky Terminal Structure constructed at Amelia Island State Park, Nassau County, Florida.

APPENDIX K

ARCHAEOLOGICAL SURVEY AND SHPO LETTER

A Phase I Remote-Sensing Archaeological Survey & Phase II Shipwreck Assessment at the Location Of a Proposed Terminal Groin at the Mouth of the Cape Fear River, Bald Head Island, Brunswick County, North Carolina

Submitted to:

Mr. Chris McCall

Shoreline Protection Manager
P. O. Box 3009
Bald Head Island, North Carolina 28461

Submitted by:

Dr. Gordon P. Watts, Jr., RPA
Principal Investigator

Tidewater Atlantic Research, Inc.
P. O. Box 2494
Washington, North Carolina 27889

6 October 2012

Abstract

Olsen Associates, Inc. (OA) is the project engineer representing the Village of Bald Head Island, North Carolina in its efforts to control erosion at the western end of Bald Head Island at the mouth of the Cape Fear River. In order to determine the effects of proposed terminal groin construction activities on potentially significant submerged cultural resources, OA contracted with Tidewater Atlantic Research, Inc. of Washington, North Carolina to conduct a magnetometer and sidescan sonar survey of the proposed construction area. Field research for the project was conducted on 24 May and 3 August 2012. Analysis of the remote-sensing data generated by the Bald Head Island survey identified a total of 104 magnetic anomalies. Four magnetic anomalies had a related acoustic signature and were determined to be associated with a shipwreck. As the wreck is potentially significant and eligible for Nomination to the National Register of Historic Places a 150-foot buffer has been established to protect the wreck. In addition, the exposed remains were subsequently investigated and mapped by archaeological divers between 2 and 5 August 2012. Documentation of the wreck remains mitigates the potential impact of sediment accretion at the site due to construction of the proposed groin. All other targets appeared to have been generated by modern debris such as fish and crab traps, pipes, small diameter rods, cable, wire rope, chain, small boat anchors, boardwalks, temporary sand-filled tube groins, and a tire. No additional investigation of those sites or the wreck remains is recommended in conjunction with proposed groin construction.

Table of Contents

List of Figures

Introduction

The Village of Bald Head Island, North Carolina plans to construct a terminal groin at the mouth of the Cape Fear River on the western shore of Bald Head Island. In order to determine the effects of proposed construction activities on potentially significant submerged cultural resources the project engineering firm, Olsen Associates, Inc., of Jacksonville, Florida contracted with Tidewater Atlantic Research, Inc. (TAR) of Washington, North Carolina to conduct a magnetometer and sidescan sonar survey of the proposed construction area. The remote-sensing investigation conducted by TAR archaeologists was designed to provide accurate and reliable identification, assessment and documentation of submerged cultural resources in the study area. The assessment methodology was developed to comply with the criteria of the National Historic Preservation Act of 1966 (Public Law 89-665), the National Environmental Policy Act of 1969 (Public Law 11-190), Executive Order 11593, the Advisory Council on Historic Preservation Procedures for the protection of historic and cultural properties (36 CFR Part 800) and the updated guidelines described in 36 CFR 64 and 36 CFR 66. The results of the investigation were designed to furnish OA with the archaeological data required to comply with submerged cultural resource legislation and regulations.

The terrestrial portion of the remote-sensing survey was conducted around low tide on 24 May 2012, and the underwater portion around high tide on 3 August 2012. Analysis of the remote-sensing data generated during the Bald Head Island terrestrial and marine surveys identified a total of 104 magnetic anomalies. A cluster of four magnetic anomalies had related acoustic signatures clearly associated with a shipwreck. Following consultation with NCDCR personnel at Fort Fisher, the vessel was investigated by TAR archaeological divers. Between 2 and 5 August 2012, exposed sections of the surviving hull structure were documented. As the wreck is potentially significant and eligible for nomination to the National Register of Historic Places (NRHP) a 150-foot buffer has been established to protect the wreck. In addition, the exposed remains were subsequently investigated and mapped by archaeological divers between 2 and 5 August 2012. Documentation of the wreck remains mitigates the potential impact of sediment accretion at the site due to construction of the proposed groin. All other magnetic targets appear to have been generated by modern debris such as fish and crab traps, pipes, small diameter rods, cable, wire rope, chain, small boat anchors, temporary sand-filled tube groins, and a tire and are not recommended for avoidance. No additional investigation of those sites or the wreck remains is recommended in conjunction with proposed groin construction.

Project personnel consisted of Gordon P. Watts, Jr., principal investigator, John W. Morris, Joshua A. Daniel and Robin C. Arnold. Dr. Watts and archaeologist John W. Morris conducted the terrestrial portion of the survey. Dr. Watts, Mr. Daniel and Mr. Morris carried out the marine portion of the remote-sensing survey and vessel documentation. Ms. Arnold and Dr. Watts carried out the historical and literature research. Dr. Watts and Mr. Daniel analyzed the remote-sensing data. Dr. Watts, Mr. Daniel, and Ms. Arnold prepared this report.

Project Location

The remote-sensing project area is situated at the mouth of the Cape Fear River. The remote-sensing investigation area is located on the western side of Bald Head Island approximately 2,700 feet south-southwest of Bald Head Lighthouse. The area surveyed is polygonal in shape measuring approximately 2,915 feet long and 960 feet wide at its extreme points and covers an area of 46.06 acres. To ensure sufficient data would be available to locate any potentially significant targets in the project area, with the exception of an inaccessible surf zone, remote-sensing data were collected along 22 parallel lanes spaced on 50-foot intervals.

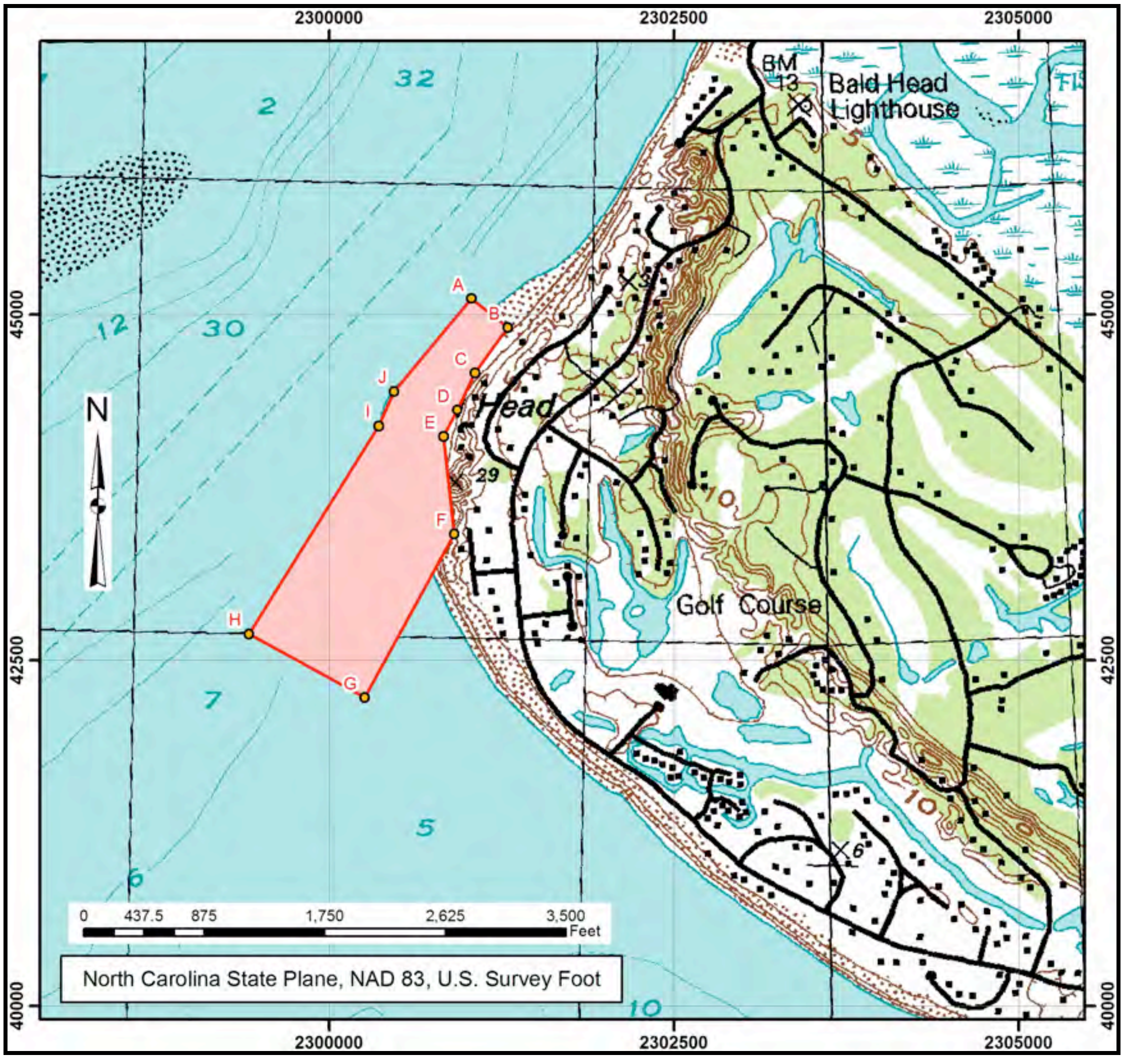


Figure 1. Project Location Map (USGS "Cape Fear, North Carolina" 1:24,000).

The survey boundaries are defined in North Carolina State Plane Coordinates, based on NAD 83, U.S. Survey Foot. Ten points define the terrestrial and marine survey areas. Geographical coordinates for those points are as follows:

Control Point	X coordinate	Y coordinate
A	2301030.1	45118.2
B	2301294.7	44907.8
C	2301054.6	44578.9
D	2300927.9	44309.3
E	2300825.7	44120.9
F	2300905.5	43413.2
G	2300255.7	42229.9
H	2299414.2	42692.0
I	2300355.1	44197.1
J	2300470.1	44446.8

Research Methodology

Literature and Historical Research

TAR historians conducted a literature search of primary and secondary sources to assess the potential to find significant historic and/or cultural resources within the proposed project site. A general background history of Bald Head Island and the lower Cape Fear region was prepared from source material in the TAR research library. Preliminary wreck-specific information was collected from sources including: *Derelicts* (Sprunt 1920), *Disasters to American Vessels, Sail and Steam, 1841-1846* (Lockhead 1954), *Encyclopedia of American Shipwrecks* (Berman 1972), *Shipwrecks of the Civil War* (Shomette 1973), *Merchant Steam Vessels of the United States 1790-1868* (Lytle and Holdcamper 1975), *Shipwrecks of the Americas* (Marx 1983), *Official Records of the Union and Confederate Navies in the War of the Rebellion* (National Historical Society 1987), *Ship Ashore!* (Mobley 1994), The Cape Fear-Northeast Cape Fear Rivers Comprehensive Study (Underwater Archaeology Unit [2 vols.] 1996), *North Carolina Shipwreck Accounts,* (Charles 2004), and *The Big Book of the Cape Fear River* (Jackson 2008). In addition, the NRHP online database (National Park Service n.d.), the Automated Wreck and Obstruction Information System (NOAA n.d.) the Northern Shipwrecks Database (Northern Maritime Research 2002), and "Lifesaving Station No. *Cape Fear*, District No. *Six*" (Gottshall [transcriber] n.d.) were queried for wreck-specific information.

Personnel at the Underwater Archaeology Branch (UAB) of the North Carolina Office of State Archaeology (Fort Fisher), the North Carolina Maritime Museum (Southport), the Brunswick County Library, and the Smith Island Museum of History were contacted for shipwreck data associated with Bald Head Island and the lower Cape Fear River.

Terrestrial Remote-Sensing Survey

The project terrestrial and inter-tidal areas were examined visually and investigated using a cesium magnetometer at low tide. Where possible, archaeologists walked the shoreline to identify evidence of vessel remains or other cultural features. Magnetic anomalies were located using GPS. A TRIMBLE GeoExplorer Series GeoXT handheld DGPS capable of +/-3 feet was employed to collect positioning data for cultural material located within the survey area. The GeoXT utilizes WAAS satellites to provide differential corrections in the field. A display shows both transects and target locations. The GeoXT was interfaced with a small PC running Hypack survey software to identify survey lanes and collect magnetometer data. A GEOMETRICS 856 cesium vapor magnetometer was used to identify buried ferromagnetic cultural material along each of the terrestrial survey lanes (Figure 2).

Figure 2. The G-856 magnetometer, Trimble DGPS and PC used for the terrestrial remote sensing survey.

Marine Remote-Sensing Survey

In order to reliably identify submerged cultural resources, TAR archaeologists conducted a systematic remote-sensing survey of the proposed groin site. Underwater survey activities were conducted from the 24-foot survey vessel *Atlantic Surveyor*, and a pedestrian survey collected data on the beach during low tide. In order to fulfill the requirements for survey activities in North Carolina, magnetic and acoustic remote-sensing equipment were employed. This combination of remote sensing represents the state of the art in submerged cultural resource location technology and offers the most reliable and cost effective method to locate and identify potentially significant targets. Data collection was controlled using a differential global positioning system (DGPS). DGPS produces the highly accurate coordinates necessary to support a sophisticated navigation program and assures reliable target location.

An EG&G GEOMETRICS G-881 marine cesium magnetometer, capable of plus or minus 0.001 gamma resolution, was employed to collect magnetic data in the survey area. To produce the most comprehensive magnetic record, data was collected at 10 samples per second. Due to shoal water within the project area, the magnetometer sensor was towed just below the water surface at a speed of approximately three to four knots. Magnetic data were recorded as a data file associated with the computer navigation system. Data from the survey were contour plotted using QUICKSURF® computer software to facilitate anomaly location and definition of target signature characteristics. All magnetic data were correlated with the acoustic remote-sensing records.

Figure 2. Launching the EG&G GEOMETRICS G-881 magnetometer.

A 445/900 kHz KLEIN SYSTEM 3900 digital sidescan sonar (interfaced with SONARPRO SONAR PROCESSING SYSTEM) was employed to collect acoustic data in the survey area (Figure 3). Due to shoal water within the project area, the sidescan sonar transducer was deployed and maintained between 3 and 5 feet below the water surface. Acoustic data were collected using a range scale of 30 and 50 meters to provide a minimum of 200% coverage and high target signature definition. Acoustic data were recorded as a digital file with SONARPRO and tied to the magnetic and positioning data by the computer navigation system.

Figure 3. Launching the KLEIN SYSTEM 3900 digital sidescan sonar.

A TRIMBLE AgGPS was used to control navigation and data collection in the survey area. That system has an accuracy of plus or minus three feet, and can be used to generate highly accurate coordinates for the computer navigation system on the survey vessel. The DGPS was employed in conjunction with an onboard laptop loaded with HYPACK navigation and data collection software (Figure 4). Positioning data generated by the navigation system were tied to magnetometer records by regular annotations to facilitate target location and anomaly analysis. All data is related to the North Carolina State Plane Coordinate System, NAD 83.

Vessel Documentation

Shipwreck remains were relocated using DGPS and sidescan sonar. Reference buoys were placed on the extremities of exposed structure to facilitate mapping and establishing the precise location of the hull remains. Archaeological divers equipped with wireless communications (Figure 5) recorded the wreck using a baseline web and measured drawings. Once buoys were moved to specific locations on the wreck remains, baseline stations A and F, and DGPS was used to establish those geographical positions.

Figure 4. Computer navigation system located at the research vessel helm.

Remote-Sensing Data Analysis

To ensure reliable target identification and assessment, analysis of the magnetic and acoustic data was carried out as it was generated. Using QUICKSURF® contouring software, magnetic data generated during the survey were contour plotted at 3-gamma intervals for analysis and accurate location of magnetic anomalies. The magnetic data was examined for anomalies, which were then isolated and analyzed in accordance with intensity, duration, areal extent and signature characteristics. Sonar records were analyzed to identify targets on the basis of configuration, areal extent, target intensity and contrast with background, elevation and shadow image, and were also reviewed for possible association with identified magnetic anomalies.

Data generated by the remote-sensing equipment were developed to support an assessment of each magnetic and acoustic signature. Analysis of each target signature included consideration of magnetic and sonar signature characteristics previously demonstrated to be reliable indicators of historically significant submerged cultural resources. Assessment of each target includes avoidance options and possible adjustments to avoid potential cultural resources. Where avoidance is not possible the assessment includes recommendations for additional investigation to determine the exact nature of the cultural material generating the signature and its potential NRHP significance. Historical evidence was developed into a background context and an inventory of shipwreck sites that identified possible correlations with magnetic targets (Appendix A). A magnetic contour map of the survey area was produced to aid in the analysis of each target.

Figure 5. Diver with wireless communications mask suiting up.

Historical Background

European settlement of the present day Cape Fear region began as early as 1526 when Lucas Vásquez de Ayllón led an expedition from Florida into the Cape Fear region. One of the Spanish vessels was recorded lost near the mouth of the Cape Fear River, referred to by the Spanish as the Jordon River. During the brief existence of the Spanish settlement, the area was known as the "Land of Ayllón" (Lee 1965:3-4).

The next attempt to settle the Cape Fear region came almost a century and a half later with the arrival of the English. Settlers from the New England colonies came to the area eager to establish a Puritan colony in the less harsh climate of the south. Under the leadership of Captain William Hilton, a group arrived in the summer of 1662 to find a suitable location. Arriving at the river and "Cape Fear" as he called it, the group remained for three weeks during which time they purchased the surrounding area from the Indians. The Puritan settlers that followed during the winter of 1662 remained in the Cape Fear vicinity for only a brief time before abandoning the area (Lee 1965:4-5).

In early 1663, King Charles II granted territory south of Virginia to eight noblemen in tribute for restoring the Stuart dynasty to the monarchy. That conveyance included the area from Georgia to the Albemarle Sound region of North Carolina. The territory was divided into three counties: Albemarle [Albemarle Sound area], Clarendon [Cape Fear region] and Craven [South Carolina]. Shortly after, the Lords Proprietors received a proposal from a group of Barbadians for a settlement within the Cape Fear region. In late spring 1664, a group of 200 settlers, under the command of John Vassall, established a colony at the confluence of the Charles [modern Cape Fear] River and Town Creek (Potter 1993:5-6). The capital, Charlestown, was the first English town in Carolina (Lee 1965:5). The colony was reported to have reached a population of 800 and extended some 60 miles along the river at its zenith.

In October 1665, a second expedition by the Barbadians was launched with the intent of establishing a colony in the vicinity of Port Royal. A small fleet consisting of a frigate, sloop and a flyboat, under command of Sir John Yeamans, stopped at the Charlestown settlement after an arduous journey from Barbados. While entering the river, the flyboat, carrying the new colony's armament, ran aground on the shoals on the west side of the channel [modern Jay Bird Shoals] and was lost (Potter 1993:9, 29). The loss of this important cargo abruptly ended the Port Royal venture. Within another two years Charlestown would also be abandoned. Difficulty in obtaining supplies, differences between the proprietors and settlers over land policies and hostilities with the Natives resulted in the colony being deserted by late 1667 (Potter 1993:10-11).

In 1726, permanent settlements on the lower Cape Fear were established by South Carolina and upper North Carolina colonists (Lee 1977:7). On the west bank of the river, about 12 miles above its mouth and several miles below a shoal in the river called "the Flats," Maurice Moore established the town of Brunswick. A shoal located at the mouth of Town Creek impeded larger ships from venturing further upstream. Situated below "the Flats", Brunswick was accessible to vessels of large or small size (Lee 1977:12).

In April 1733, another community was established 15 miles upstream from Brunswick. The new settlement became known as New Town or Newton to distinguish it from the "old town" of Brunswick. In 1740, the town was incorporated and the name was changed to Wilmington (Lee 1977:12).

As hostilities with France and Spain grew during the 1740s Governor Gabriel Johnston authorized the construction of a fort along the lower Cape Fear to protect the burgeoning towns of Brunswick and Wilmington. Construction began in July 1745 on a small bluff overlooking the mouth of the river. Johnston's Fort, as it was called, was still uncompleted in 1748 when two Spanish vessels entered the river and raided Brunswick (Carson 1992:20). Efforts to finish construction intensified after the raid and in less than a year the fort was completed. The resulting structure was small and poorly constructed. It was manned by only three men and armed with four rusty cannons (Carson 1992:20). In 1751, the fort was assigned to double as a quarantine station.

Development based upon a maritime economy played a major role in the growth of both Wilmington and Brunswick during the eighteenth century. Vessels of varying size entered the Cape Fear from other coastal ports, the West Indies and Europe. Larger vessels, unable to cross over "the Flats," called at Brunswick, while vessels of smaller size could travel further up the river to Wilmington. Consequently, Brunswick was established as the center for overseas shipping and Wilmington as the center for local and West Indian trade (Lee 1977:16-17).

Rice, cattle, swine, lumber and naval stores made up the majority of the exports from the port district of Brunswick. Prior to the Revolution numerous ships left the Cape Fear River for other ports. The West Indies served as the main destination of these ships with English ports following a close second. A lesser number carried cargo to coastal ports, mostly in the northern colonies, but occasionally some ventured south, down the coast to Charleston (Lee 1977:33).

The Cape Fear region played a minor role in the events of the American Revolution. In June 1775, Royal Governor Martin fled from New Bern to Fort Johnston, then under the protection of the British man-of-war *Cruizer*. Growing patriot activity in the area forced the governor to relocate to the warship a month later. All portable materials were transferred to the ship and the fort's guns were spiked and pushed into the river (Carson 1992:22). Local forces later burned the fort and its outbuildings.

Knowing that a large number of Loyalists inhabited the interior of the colony Governor Martin initiated a plan to subjugate the region using a combination of British and Loyalist forces (Sprunt 2005:113). British reinforcements arrived off the North Carolina coast by the end of March, but by then the opportunity to subdue the colony had passed. On 27 February 1776, Colonel James Moore and the First North Carolina Continentals with a group of militia defeated a contingent of Scottish Loyalists at the battle of Moore's Creek Bridge. This battle, called the "Lexington and Concord of the south," kept the British from occupying the South at the beginning of the war (Powell 1989:180-182).

Naval operations were of limited importance in the Cape Fear region. In mid-1776, British warships began taking up regular station over the mouth of the river. In May of the following year two British men-of-war entered the river and destroyed a number of colonial vessels at anchor (Watson 1992:29). To counter the threat posed by British warships the General Assembly voted to purchase and arm three brigs for the defense of the Cape Fear River. However, these vessels proved inadequate for the task and suggestions were made for either selling them or sending them on trading or privateering expeditions (Watson 1992:29).

The lower Cape Fear remained quiet until 1781 when Major James H. Craig was dispatched by Lord Cornwallis in Charleston to take Wilmington. Craig, with a force of 18 vessels and 400 troops, quickly captured the defenseless town (Sprunt 2005:114). From Wilmington, Craig dispatched parties throughout the countryside to rally local Loyalists and to obtain supplies for Cornwallis's troops, then marching through North Carolina. After being checked by Colonial forces in the battle of Guilford Courthouse the British retreated to Wilmington to recoup and replenish supplies. Later, when Lord Cornwallis moved north to suppress Virginia, Craig remained behind in Wilmington to disrupt Colonial activity in that region. News of Cornwallis's surrender at Yorktown made the British position in Wilmington untenable and on 17 November Major Craig evacuated the city.

After the conclusion of the war there was a shift in the maritime development of the Cape Fear region. Almost all the ships that left the Cape Fear now went to Charleston and few to England or the West Indies (Lee 1977:33). Inbound ships now proceeded up to Wilmington. This shift brought about the decline of the town of Brunswick as was indicated by the change in name of the "Port of Brunswick" to the "Port of Wilmington" (Lee 1977:34).

During the last decades of the eighteenth century the area that would become the town of Southport consisted of little more than the remains of Fort Johnston and the homes of local river pilots. The region's potential, however, was realized by three men from Wilmington, Joshua Potts, John Brown and John Husk, who the viewed the area, with its salubrious sea breezes, as an ideal spot for a new town. Though the men's initial petition was rejected in 1790 the group persevered and on 15 November 1792, the General Assembly issued a charter for the establishment of a town on the bluff overlooking the mouth of the river.

The town was named Smithville, after Benjamin Smith who introduced the bill into the legislature. The town was laid out with lots offered for sale in Wilmington and Fayetteville newspapers (Figure 6). The charter specified that no person could purchase more than six lots in their name and the purchase price of lots was to be 40 shillings per lot (Carson 1992:26). The town plan also reserved space for Fort Johnston, which was rebuilt in 1804.

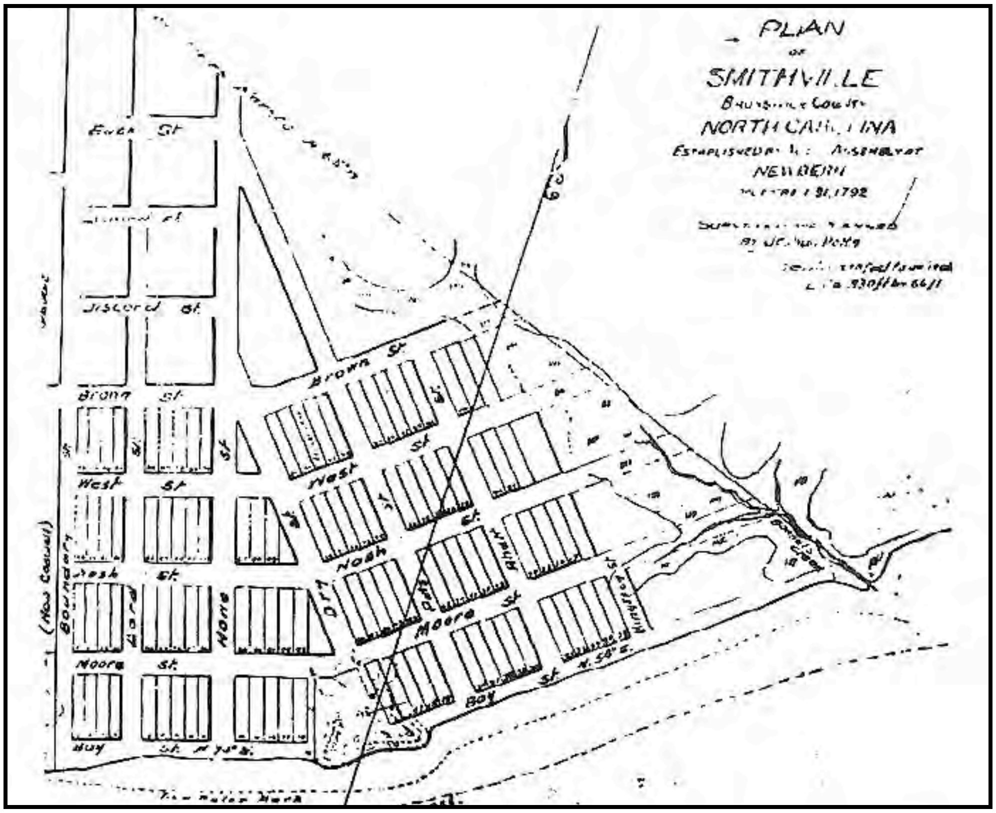


Figure 6. Plan of the town of Smithville, 1792 (Carson 1992:27).

With the growing amount of vessel traffic sailing up to Wilmington there arose a need for improvements in the navigability of the river. As early as 1784, measures were taken to improve the conditions of the lower Cape Fear River (Lee 1977:36). Improvements were needed at the treacherous entrances to the river, at the Bar and upstream at New Inlet. Three major shoals between Wilmington and the sea also caused problems for ships trying to navigate the river. The "upper shoal," located near the foot of Clarks Island, off the southern tip of Eagles Island, had eight and one-half feet of water. The "middle shoal," also known as "the Flats," had nine feet. The "lower shoal," at the foot of Campbell Island, had nine and one-half feet. The main channel of the river was then located in a narrow passage between Campbell Island, Clarks Island and the west bank (Lee 1978:112).

In addition to the shoals, ships deliberately sunk during the American Revolution as obstructions needed to be removed (Lee 1977:36-37). Around 1819, Hamilton Fulton, a noted English engineer, was hired to make improvements on the Cape Fear River mainly between Wilmington and the ocean where a system of jetties was planned. Work continued for six years until financial limitations halted this project. Some improvements were made on the river up until the start of the Civil War with sporadic financing by the state and local Wilmington businessmen (Lee 1977:37).

Steam vessels first appeared on the Cape Fear River in 1817. The first steamboat to arrive was the side-wheel *Prometheus*, built in Beaufort for a firm in Wilmington that intended to run the vessel from Wilmington to Fayetteville and Southport. The following year the Clarendon Steamboat Company was established at Wilmington. The company held the exclusive right to operate steamboats on the Cape Fear for a period of seven years provided that it kept one boat in service. In addition to the *Prometheus*, the side-wheel *Henrietta*, also made regular runs between Wilmington and Fayetteville (Lee 1977:37-38). By 1822, a second steamship venture, the Cape Fear Steamboat Company, had begun service on the river. With time the number of steamboats on the river increased significantly (Lee 1977:38).

By the 1850s, nearly a hundred vessels of all types were in Wilmington at the same time. Many of the ships were large square-rigged foreign craft, while others were side-wheel steamers. Most, however, were American schooners engaged in the coastal trade (Lee 1978:116).

Development of the Cape Fear region was soon disrupted by the Civil War. After Confederate forces in South Carolina attacked the U.S. garrison at Fort Sumter, President Abraham Lincoln declared a state of open rebellion and called for volunteers to preserve the Union. Lincoln also issued a proclamation on 19 April 1861 establishing a blockade of Confederate ports in South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana and Texas. Eight days later, Lincoln extended the blockade to include ports in Virginia and North Carolina. With North Carolina's withdrawal from the Union, Governor John W. Ellis ordered the occupations of forts Johnston and Caswell.

Union naval forces were inadequate to properly enforce the blockade at the onset of the war. In 1861, U.S. navy registers listed 90 vessels, 50 of which were propelled by sail and were considered obsolete for the task at hand. The remaining 40 were steam, but several of the deep draft vessels proved unsuitable for the shallow southern waters. Eight others were laid up while 22 vessels remained at station off foreign shores and would require at least six months travel to reach the United States (Browning 1980:24). However, within a few months of Lincoln's proclamation, Secretary of the Navy Gideon Welles took steps to implement an effective blockade off the southern coastline.

The navy department bought or leased nearly any vessel that could be of service. In nine months, U.S. Navy agents purchased 136 ships, constructed 52 and commissioned and repaired another 76 (Engle and Lott 1975:180). The Union blockade in turn gave rise to the practice of blockade running. At the beginning of the blockade, practically any vessel was considered suitable for breaking through the Atlantic squadrons to carry cargo in or out of the isolated southern ports. The most successful of the early runners were steamers that had belonged to the Southern Coasting Lines and were idle due to the outbreak of the war. The illicit trade carried on by these ships reaped considerable profit, but failed to compare with the great capital resources brought in during the latter part of the war.

Wilmington provided North Carolina with a deep-water port. By 1860, Wilmington had emerged as a modern shipping center with excellent internal communication. Three railroads ran through the city and daily steamboat service to Charleston and New York, as well as, up the Cape Fear River to Fayetteville. With the capture of New Bern, Roanoke Island and Beaufort, Wilmington was the only North Carolina port left open for the importation and exportation of goods. As long as supplies were imported through the two inlets of the Cape

Fear River and transported along the railroad lines, which connected with Lee's army in Virginia, the Confederacy had a lifeline. Wilmington soon became the most vital seaport in the "Southern Cause" (Pleasants 1979:15).

Wilmington became the key port for "runners" largely because of the area's topography. Located 28 miles from the mouth of the Cape Fear River, the port had access to the Atlantic through two separate entrances; eastward through New Inlet and southward through the river mouth (Figure 7). Although the two entrances were only six miles apart, Smith's Island, a strip of sand and shoal, lay in between. Continuing along Cape Fear were the dangerous Frying Pan Shoals, which extended 10 miles further into the Atlantic, making the distance by water between the two entrances a little less than 40 miles (Soley 1883:91).

Figure 7. Chart that depicts the two entrances into the Cape Fear River (National Historical Society 1987, I 12:38).

This geographical configuration proved highly advantageous for blockade runners and the initial blockade of Wilmington proved ineffective. When the *Daylight*, the first and at the time the only Union vessel sent to blockade these waters, arrived, it immediately experienced the difficulties associated with guarding the dual entrances of the Cape Fear River. While pursuing a steamer out of the western bar entrance, the *Daylight* inadvertently allowed several other small vessels to pass out of the New Inlet entrance. Within three months of the *Daylight's* arrival, 42 vessels either entered or cleared Wilmington (Browning 1980:27).

During a two-year period (January 1863-November 1864), Confederate naval sources listed numerous vessel stations on the Cape Fear. These vessels were identified as: the ironclad sloop *North Carolina*, the floating battery *Artic*, the steam gunboat *Yadkin*, the steam gunboat *Equator*, the torpedo boat *Squib*, and the ironclad sloop *Raleigh*, and two, long one-gun cutters. In November 1864, Confederate Secretary of the Navy Stephen Mallory also reported to President Jefferson Davis that two new torpedo boats were under construction at Wilmington (U.S. Navy [USN], 1921, ser. II, vol. 2, 1921:630,528-532, 630,743-745).

The capture of Wilmington proved difficult because both entrances to the Cape Fear were guarded by powerful fortifications and lesser works. Collectively those fortifications became known as the Lower Cape Fear Defense System. The central point of that system was Fort Fisher, located on Confederate Point. That fortification was originally a small earthworks constructed to protect New Inlet. By 1864, Fort Fisher had become the largest seacoast fortification in the Confederacy. Shaped like an inverted "L," Fort Fisher's land face ran 628 yards and was guarded by 20 of the heaviest seacoast guns. The sea face included a 130-pound Armstrong rifle and a 170-pound Blakely, both from England (Browning 1980:35). Extending from the land face was a string of torpedoes, which could be exploded from inside of the fort (Pleasants 1979:22). Mound Battery, towering to a height of 60 feet with two mounted heavy guns, stood near the end of Confederate Point. Augusta Battery, which stood behind Mound Battery, was located near the river (Pleasants 1979:24).

Fort Holmes, on the other side of New Inlet on Smith's Island, shared the protection of Smith's Inlet in the Cape Fear River with the batteries at Oak Island. Oak Island, located opposite Fort Holmes, held another series of forts and batteries, such as Fort Campbell, Fort Caswell and Battery Shaw (Pleasants 1979:24). Fort Caswell guarded the western bar entrance. Captured by Confederate militia on 14 April 1861, Caswell was renovated into a strong casemated work with new armament consisting of seven 10-inch, four 8-inch Columbiads and a 9-inch Dahlgren gun (Browning 1980:35; Pleasants 1979:24). Both Fort Caswell and Fort Holmes were responsible for shelling union vessels in the Middle Ground area, including the stranded tug *Violet*, which went aground off the Western Bar Channel on the night of 7 August 1864.

After his tug struck the shoal Ensign Thomas Stothard requested assistance from the crew of the nearby 866-ton brig USS *Vicksburg* to attempt to re-float the *Violet.* Despite their quick response, the extra manpower and effort proved fruitless as Stothard was ordered to fire the *Violet* after midnight. In response to a court of enquiry [sic] investigation, Captain Stothard submitted an incident report to Captain B.F. Sands of the USS *Fort Jackson* and offered this account:

> After all preparations for sending officers, crew, and ship's effects off in boats that he [Lieutenant-Commander Braine of the USS *Vicksburg*] and Acting Volunteer Lieutenant Williams, of the *Emma*, had sent, all of which I did, sending property, a list of which you will find enclosed, also a list of crew, I made preparations for her destruction as follows: I put a lighted slow match to a powder tank in the magazine and closed the door, then filled a large, fine drawer with shavings and straw taken from pillows and mattresses, partially covered it with another, and sprinkled two quarts of spirits of turpentine over all and on the woodwork around it; hung up an oilcloth from the table, one corner hanging in the shavings, which I touched with a lighted match (in the wardroom), after all the boats, but mine in waiting, had left the side, and I followed about 2:00 o'clock a.m. this morning. The explosion of the magazine containing about 200 pounds of powder occurred within half an hour afterwards, and by daylight she was effectually consumed. One 12-pounder was thrown overboard, one left on the forecastle, spiked with rat-tail file, and the 24-pounder was directly over the magazine aft when it exploded, so that it was thrown into the sea (National Historical Society [NHS] 1987, Ser. I, 10:343,344).

Rear-Admiral S.P. Lee recommended that no action be taken to discipline the acting officer of the *Violet*. Lee remarked to Union Secretary of the Navy Gideon Welles, that: "Stothard is a very intelligent and efficient officer, notwithstanding this casualty" (NHS 1987, Ser. I, 10:344). Prior to its destruction, the *Violet* (ex-*Martha*) was described as a fourth-rate, wooden screw steamer measuring 85 feet in length, with a beam of 19 feet. The 166-ton tug housed one, inverted, direct-acting engine with a 30-inch diameter cylinder and one return flue boiler (U.S. Navy 1921, Ser. II, 1:233).

Farther up river from the *Viole*t wreck site there were a series of forts and batteries used as secondary defenses for Wilmington and as protection for blockade runners outbound from Smith's Inlet. Fort Lamb was located on the west side of the Cape Fear River on Reeve's Point. Above Fort Lamb was Fort Anderson, the most important of the secondary defenses. Partially built from the ruins of Old Brunswick Town, Anderson consisted of a series of trenches and earthworks approximately a mile long. Three smoothbore 24-pounders, three rifled 32-pounders and six smoothbore 32-pounders comprised the Fort's armaments. By 1864, Fort Anderson had become an inspection station for all craft heading up the Cape Fear River to Wilmington (Pleasants 1979:25). Several lesser forts, including Stokes, Lee, French, Campbell, Strong and Sugarloaf, were situated on the east side of the river (Pleasants 1979:25).

In addition to this impressive array of forts, a naval construction program was initiated in Wilmington to contribute to the defenses of the harbor. The success of the ironclad ram CSS *Virginia* in the March 1862 battles at Hampton Roads demonstrated the superiority of armored warships to naval officers of both the North and South. In late March 1862, Confederate Secretary of the Navy Stephen R. Mallory, sent "instructions relative to gunboats" to Commander William T. Muse, the ranking naval officer at Wilmington. Shortly thereafter, the navy began building two ironclads in the city, the *Raleigh* at James Cassidy's shipyard at the foot of Church Street, and the *North Carolina* at the Beery shipyard on Eagle Island (Still 1985:5-17, 79-92).

Both vessels utilized a design based on plans conceived by naval constructor John L. Porter. The plans called for a tightly framed hull, with a slight deadrise and a hard chine. The vessels were to be 174 feet long (150 feet between perpendiculars) with a draft of 13 feet. Amidships, a 105-foot long casemate, angled at thirty-five degrees and covered with 4 inches of iron plate, protected the gun deck. Two boilers provided steam for the vessel's two horizontal engines, which were geared to a single 10-foot screw. The first ironclad built on this design, the CSS *Richmond*, was completed in Richmond in 1862. Known as the *Richmond* class, this group, consisting of five vessels, was numerically the largest standardized class of ironclads constructed by the Confederacy (Holcombe 1993:63-64).

The two Cape Fear ironclads entered into active service by late 1863/early 1864 (*North Carolina* in December 1863 and the *Raleigh* in April 1864) after numerous delays resulting from material shortages, strikes and epidemics. However, the usefulness of these two vessels to the Confederacy's war effort was limited. *Raleigh* grounded on a shoal near the mouth of New Inlet and was destroyed after a sortie against the blockading squadron on 7 May 1864, less than a month after entering service. The *North Carolina*, on the other hand, was reduced to serving as a floating battery; its deep draft and lack of motive power rendered the vessel ineffective as a ram.

The ironclad was further hampered by the use of unseasoned timber in its construction. Warping and splitting timbers caused the ship to leak incessantly and an infestation by teredo worms further weakened the hull. For most of its career, the ironclad remained at anchor near Smithville, positioned to support the nearby forts in the defense of Wilmington. The *North Carolina* finally sank at its moorings in September 1864. Though useless as an offensive weapon, the *North Carolina* served as a deterrent, preventing the United States Navy from entering and seizing the lower Cape Fear until the fall of Fort Fisher in the closing days of the war.

When hostilities ended in 1865 so did some of the regular river trade. The prewar steamer service between Wilmington, Charleston and Savannah was not resumed, since rail service had been established. Steamship service did, however, resume to the northern cities of Baltimore, Philadelphia and New York (Lee 1977:91). The coastal trade also revived and was conducted mainly by schooners ranging between 150 and 600 tons. Because of the decimation of American shipping during the war international commerce was carried in foreign bottoms, usually of British, German or Scandinavian origins (Sprunt 2005:501).

Industry had been severely interrupted during the war, but was beginning to make a comeback. Naval stores and lumber continued to be the principal exports with the addition of some cotton. Exports recorded for the year 1871 amounted to some 95,000 bales of cotton, 100,000 bushels of peanuts, 112,024 barrels of spirits of turpentine, 568,441 barrels of rosin, 37,867 barrels of tar and 17,963 barrels of turpentine (Sprunt 2005:513-514). Without the use of slave labor the rice industry declined dramatically (Lee 1977:86-87). By the turn of the century, a decrease in the availability of pine trees resulted in a decline of the naval stores industry. With improvements in cultivation and transportation, cotton became a major industry in Wilmington until its decline in the 1930s. Guano from the West Indies was brought in for the new fertilizer plants. The production of creosote impregnated wood also helped increase shipping in the region (Lee 1977:87-88).

During the last quarter of the nineteenth century efforts were undertaken to develop Smithville into a port city. In 1886, the North and Southern Railroad Company announced plans to extend rail service from Wilmington to Smithville. Developers, envisioning a port that would rival Charleston and Norfolk, requested that the town's name be changed to Southport to draw attention to the "Port of the South" (Carson 1992:61). In anticipation of the expected development the town's dirt roads were paved in crushed shell and the dredge boat *Woodbury* began deepening and straightening the channel to accommodate increased vessel traffic. However, the proposed rail line did not materialize and Southport remained a small town relying on fishing and tourism for its economic livelihood. The Wilmington, Brunswick and Southport Railroad eventually extended a line to the town in 1911.

Improvements to navigation on the Cape Fear River had deteriorated during the war. Continual silting reduced the navigable channel. By 1870, federally financed projects were again started to improve the conditions of the river. One such project was the closure of one of the two inlets. New Inlet was closed in 1881 with the belief that the increased force of the concentrated flow would sweep out the channel. The closure was accomplished by placing a rock dam that extended for more than a mile from Federal Point to Zeke's Island. The dam was completed in 1881 and later became known as "the Rocks." Another rock barrier was later built between Zeke's Island and Smith's Island. The channel depth was dredged to accommodate the deeper draft vessels (Lee 1977:91).

Two life-saving stations were established near the mouth of the Cape Fear River during the 1880s. Those stations included the Cape Fear station (b. 1882) at east end of Bald Head Island and the Oak Island station (b. 1889) located west of Fort Caswell. Each station was equipped with line-throwing guns and self-righting surfboats (Sprunt 2005:527). Surfmen maintained a constant vigil of the sea from the station house and conducted regular nightly beach patrols; additional patrols were conducted in daylight during stormy weather. Both stations remained active until the 1930s when new Coast Guard facilities were constructed to replace them.

A particularly severe hurricane struck the Cape Fear region during late August 1893. Originating in the Cape Verde islands, the powerful storm intensified as it passed Cuba on 26 August and shortly afterwards made landfall at Charleston. Roving bands of its destructive winds "sank or disabled five ships" in southeastern North Carolina. These maritime losses included: the schooners *Kate E. Gifford* and *Enchantress,* brig *Wustrow* (all west of Oak Island), the schooner *Jennie Thomas* (disabled south of Oak Island), and the schooner *Three Sisters* that "floundered [sic] near Bald Head Island" (Mobley 1994:117). Local lifesaving station keepers Dunbar Davis [Oak Island] and J. L. Watts [Cape Fear] cooperated with volunteer surfmen who "exhaustively went from wreck to wreck utilizing breeches buoy, surfboat[s], a team of oxen, and sheer fortitude to render assistance to the disaster victims" (Mobley 1994:117).

In the aftermath of the hurricane, several derelicts were towed into Southport after 29 August and well into September 1893. According to a Federal report, the American three-masted schooner *Three Sisters* was first among the number (U.S. Hydrographic Office [USHO] 1894:13, 17; U.S. Treasury Department 1895:). On 1 September, the Norwegian bark *Linda* was towed to Southport by the British steamship *Eric*. The tug *Blanche* reportedly towed an unknown potential hurricane casualty to the port on 7 September. On the following day, the tug *Alexander Jones* towed the American three-masted schooner *William Smith* to Southport. Another schooner of the same type [identity unknown] was also towed there on 21 September 1893. On 17 October, the *Julia A. Trubee* was towed to Southport by an unknown vessel. In this instance, the cause of the American three-masted schooner abandonment was not recorded (USHO 1894:13, 17).

On 20 July 1895, the U.S. Marine Hospital Service appropriated $25,000 for the construction of a quarantine station at Southport. The new station was to be located on the river on the east side of the channel between the upper end of Battery Island and Price's Creek Lighthouse (Carson 1992:73). The entire station was to be built on a pier 600 feet long and to consist of a hospital building, a disinfecting house, attendant's quarters and a kitchen. The station opened for service by the middle of 1897 with Dr. J. M. Eager appointed as the station's first quarantine officer. A report for the fiscal year 1907 illustrates the level of activity at the station:

> [Eighty six] vessels spoken and passed; 19 steamers and 1 sailing vessels inspected and passed; 2 steamers and 3 sailing vessels disinfected; and 485 crew on steamers, 125 crew on sailing vessels, and 3 passengers on sailing vessels inspected. The vessels disinfected were from Bahia, Portobello, Santos, Rios, and Barbados (Brown 1974).

By 1937 the station had become obsolete and was placed on caretaker status. As the facility was located on water and not a navigation hazard it was left to deteriorate and on 19 August 1951, the abandoned station was destroyed by fire (Brown 1974).

The fishing industry provided the financial stamina for the economy on the lower Cape Fear during the early years of the twentieth century. The principal source of income for Southport was the menhaden fisheries. Most catches were processed into oil, which was used in the manufacture of paints, linoleum, tanning solutions, soaps and waterproof fabrics (Carson 1992:96). Leftover scrap was ground up for fertilizer and feed for livestock. The Southport Fish Scrap and Oil Company and the Brunswick Navigation Company established processing plants along the Elizabeth River while additional plants could be found above the town on the Cape Fear River.

World War I initiated a revitalization of the economy with the establishment of the Carolina Shipyard in May 1918. At about the same time, the Liberty Shipyard started producing steel ships as well as experimental concrete ships. The success of the shipyards was short-lived and the economy fluctuated for several years until it fell during the 1930s. Though Wilmington saw moderate success in shipping and shipbuilding after the war, most of the yards had closed by the mid-1920s and competition from Norfolk and Charleston slowly relegated the city to an import distribution center catering mainly to regional trade (Watson 1992:145).

This trade averaged 200,000 or more tons through most of the 1920s, but with the coming of the Great Depression, the amount fell to 94,007 tons by 1932 (Watson 1992:150). Wilmington's economy would not fully recover from the effects of the depression until the end of the decade. Despite this economic uncertainty, foundations were laid for future development. By the beginning of World War II, Wilmington boasted 54 wharves, piers and docks and the opening of the Atlantic Intracoastal Waterway expanded the city's trade with its hinterland and increased its role in the coastal trade (Watson 1992:148-9).

With war in Europe and German submarines prowling the east coast during the early 1940s protection and defense of the coast became a top priority in Washington. The vulnerability of the Cape Fear had been confirmed during World War I and U.S. Navy officials were anxious to be prepared for future enemy intrusions (Gannon 1990:242-243). On 17 November 1941, the U.S. Navy reacquired the 248.8-acre Fort Caswell reservation, sold into private hands in 1929. The old fort grounds were to be used for training, communications and submarine tracking (Carson 1992:126).

The U-boat threat finally reached the Cape Fear region in early 1942. On 16 March, the 11,641-ton tanker *John D. Gill* was torpedoed in the coastal waters off the mouth of the river. As a result of the high number of vessel losses during the early stages of the war, defensive measures were put into place. Coastal communities were systematically blacked out, a more efficient convoy system was devised and additional planes and patrol vessels were put into service along the North Carolina coast (Stick 1952:237-239).

In addition to the menace that Axis submarines and aircraft represented during the conflict, a significant hurricane struck the project area in late summer 1944. On 1 August, the tropical storm made landfall near Southport and the Oak Island coast guard station reported maximum wind speeds of 80 miles per hour. To the north, "substantial damage" occurred in Wilmington and Wrightsville Beach and the combined losses of real estate and crops amounted to two million dollars (Galecki 2005:133-134).

World War II also brought renewed growth to the shipyards and relief to the area (Lee 1977:88-90). The increased jobs and higher wages allowed Wilmington's economy to increase and become stable. After the war many of the people brought in to build ships chose to stay and make Wilmington their home. In 1945, the State Port Authority was formed, promoting ports in Wilmington and Morehead City and creating new jobs. In 1955, the military established the Sunny Point Army Terminal [Military Ocean Terminal at Sunny Point]. The facility serves as a terminal for shipping military hardware and ammunition to American forces around the globe. The base is a major employer in the area and local service and retail industries serving the military contribute to the economic prosperity of the region. By 1960, the population of Southport was reported as 2,034 residents. At that time, the town boasted a popular bookmobile, a new water tank, a "lighted" athletic field and a picnic area at the community park. Maritime news included the launch of a "big, new charter boat," the *Riptide*. Herman Sellers constructed the vessel for Glenn Trunnell of Southport. Other local commercial fishermen commenced discussions on the merits to install an artificial reef near the town. In September 1960, Hurricane *Donna* struck the region and fortunately caused only minimal damage in Brunswick County (Reaves 1999:169,172).

In early February 1970, the Atomic Energy Commission approved construction of a 385 million dollar nuclear power plant to be situated north of Southport. The downtown also experienced a significant economic boost when First-Citizens elected to build a bank in Southport, its first branch in Brunswick County. At the same time, waterfront interests offered services to the public such as the modern 150-seat restaurant Herman's and the new 450-foot long "fishing and pleasure pier" (Reaves 1999:243).

Today, the region presents a strong economy with a state port facility that is daily frequented by international cargo vessels. The economy is further augmented by the military and commercial fisheries, which provide an important source of income to area residents. In addition, Southport and the coastal communities on Oak Island and the resort on Bald Head Island are popular tourist destinations. The area's offshore waters are a sportsman's paradise catering to recreational boaters and sport fishermen alike.

Improvement History of the Entrance Channel to the Cape Fear River

In 1870, the U.S. Army Corps of Engineers (USACE) initiated a project to improve navigation on the Cape Fear River. An examination of the river conducted by a commission appointed by the War Department suggested that priorities at that time should be given to closing off the channel between Smith's and Zeke's Islands (U.S. Army Corps of Engineers [USACE] 1870:70). In 1874, the closing off of New Inlet had increased the flow of water in the main navigation channel and scouring effects were noted to be deepening the channel over Bald Head Bar (USACE 1874:88-89). The officer in charge of operations also stated that a suction dredge was employed at Bald Head Bar to assist in the scouring process. Furthermore, the officer's report also noted that there were two channels into the river: a western channel with two bars (an outer with 14 feet at low water and an inner or "rip" with 10 feet at low water) and the Bald Head channel (USACE 1874:69). It was suggested that since the Bald Head channel was the natural channel all efforts should be directed towards maintaining a 12-foot level of water over it and that the western channel be disregarded.

In 1889, the project was modified to provide for a 20-foot depth, at low water, from Wilmington to the Ocean. Surveys conducted during the fiscal year ending 30 June 1890 reported that the depth of water over bar had reached 16 feet (USACE 1890:131). The wreck of a Civil War gunboat was uncovered during dredging activities on the bar in 1891. The boiler from the wreck reduced water depths in the channel to 13.5 feet providing a serious impediment to navigation (*The Messenger* [*TM*] 16 May 1891). Examinations of the wreck indicated that it was a wooden-hull vessel approximately 110 tons and 100 to 110 feet long (USACE 1893; Appendix L:1451). Portions of the flue and the boiler were removed by agents of the Federal government in 1890. On 20 May 1893, Messrs. Johnston and Townsend were awarded a contract to remove the rest of the wreck structure (USACE 1893, Appendix L:1451). The wreck site was dynamited and remaining sections of boiler recovered for disposal. Inspections of the wreck area by First Lieutenant E. W. Lucas, E. D. Thompson and Robert Merritt revealed no trace of the hull and soundings in the vicinity indicated a depth of water of 22 feet (*TM* 7 July 1893; USACE 1893, Appendix L:1451).

The River and Harbor Act of 2 March 1907 provided for additional dredging for completing the channel to the mandated 20-foot depth level. In addition, the Act also authorized for improvements in excess of 20 feet as appropriations permitted (USACE 1912:459). The project was modified again in the River and Harbor Act of 25 July 1912. Those modifications called for a channel of 26 feet deep at low water with widths of 300 feet in the river, increasing to 400 feet across the bar and in curves in the river (USACE 1912:459-460). The controlling depths of the channel were increased to 30 feet in the River and Harbor Act of 2 March 1919. In 1922, the USACE discontinued the contemporary current entrance channel and authorized for a new one over the bar with the same dimensions as the previous one (USACE 1922:682-683). The new channel was to run in a southwesterly direction from Bald Head Point. These improvements were noted as being completed in 1932.

In the River and Harbor Act of 2 March 1945, the controlling dimensions for the navigation channels on the Cape Fear River were increased further. Water depths from the outer end of the bar to Wilmington were increased to 32 feet and all channels were now to maintain a width of 400 feet throughout (USACE 1945:632-631). The project was estimated to be 65 per cent complete by the end of the fiscal year. In 1950, the controlling depths over the ocean bar were increased to 35 feet (USACE 1950:653-654). Additional modifications to the navigation channels were authorized in the River and Harbor Act of 23 October 1962. Among the provisions of that Act was the deepening and widening of the entrance channel to 40 feet deep and 500 feet wide (USACE 1962:360-361). The channel was to maintain those dimensions as far as Southport were they were reduced to 38 feet deep and 400 feet wide up to Wilmington. The project was reported as being completed in 1973 (USACE 1979:6-9).

Description of Findings

The remote-sensing survey of the Bald Head Island investigation area identified a total of 104 magnetic anomalies and two acoustic targets (Figure 8).

None of the terrestrial anomalies were determined to have signature characteristics suggestive of potentially significant cultural resources. All were associated with modern construction features such as walkways, sand bags or modern debris visible on the ground surface. With the exception of a four anomalies, none of the marine magnetic signatures were determined to have characteristics suggestive of potentially significant cultural resources.

That cluster of four magnetic anomalies (86, 89, 90, and 93) (Appendix B) was associated with acoustic signatures (Appendix C) created by a shipwreck (Figures 9 and 10). One additional acoustic target and one associated magnetic signature (103) were generated by a vehicle tire. No additional investigation of this target is recommended.

Shipwreck Documentation

After consultation with UAB personnel at Fort Fisher, a Phase II investigation of the shipwreck site was determined to be necessary. Archaeological diver investigation of material generating the shipwreck signatures confirmed that the site was indeed the remains of a vessel. The surviving hull remains were found in three basic sections that include: a fragment of the bow, a large section of the lower hull, and a section of the stern (Figure 11).

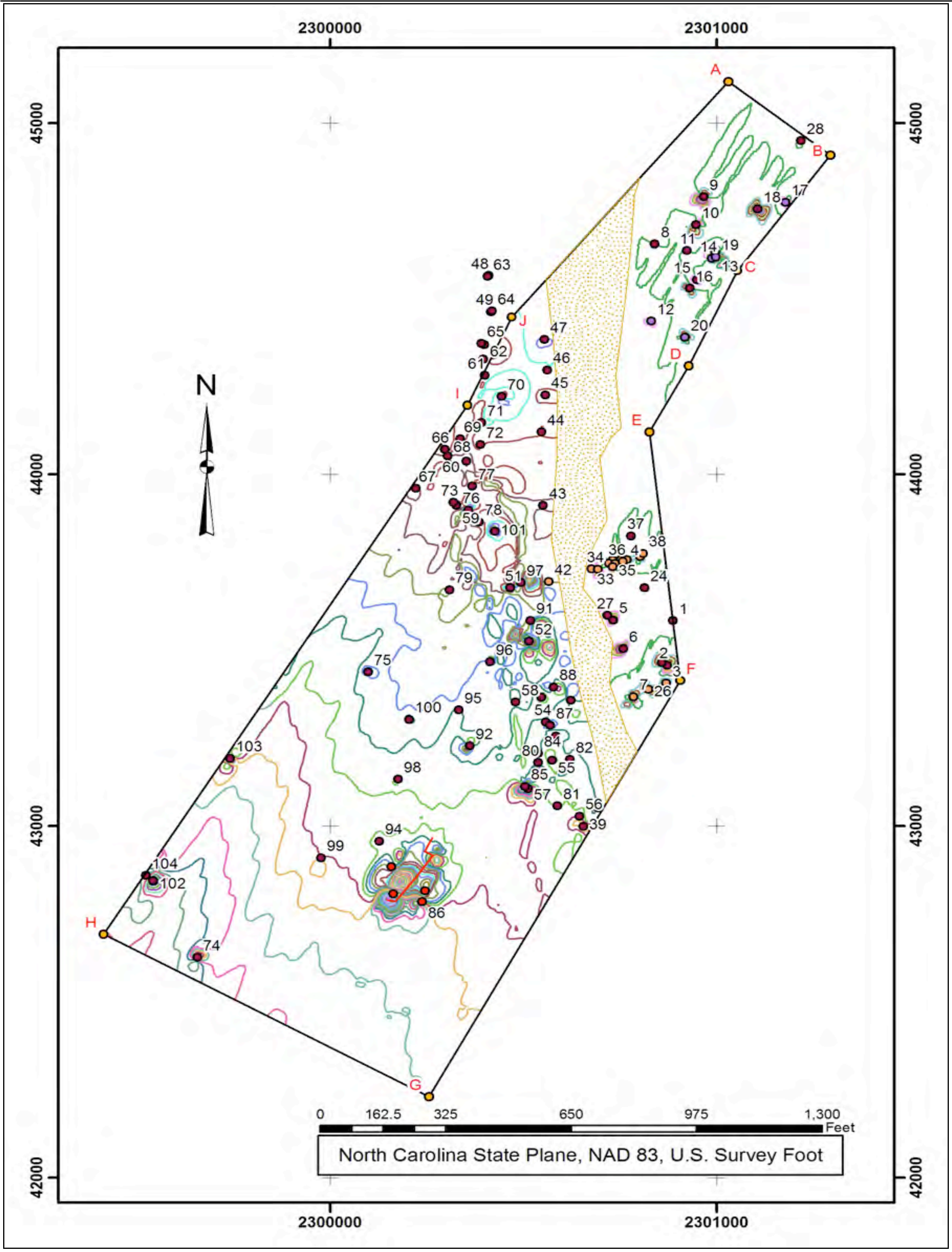


Figure 8. Magnetic contour map with anomalies.

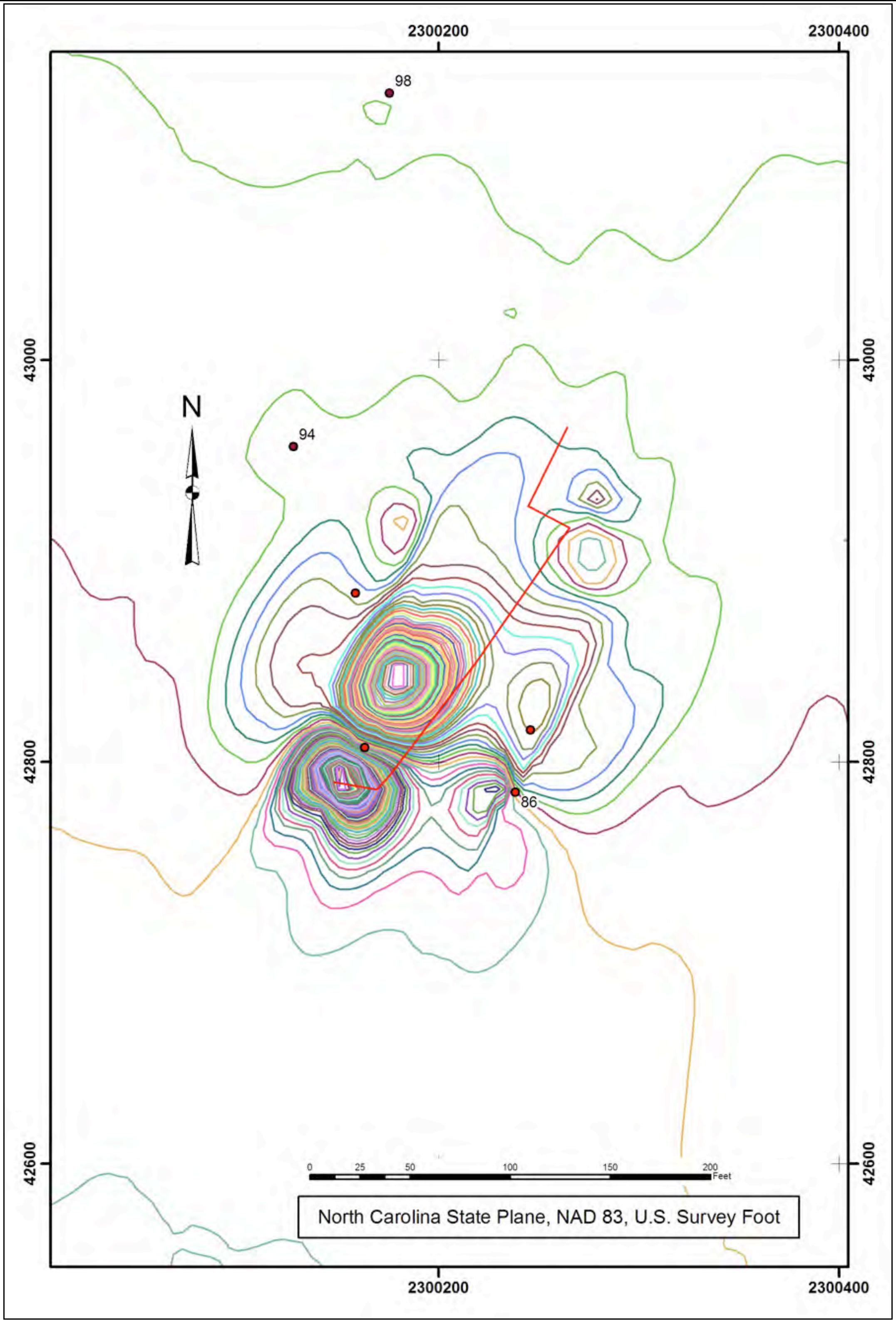


Figure 9. Shipwreck magnetic anomaly with shipwreck baseline.

Figure 10. Shipwreck sonar image with baseline.

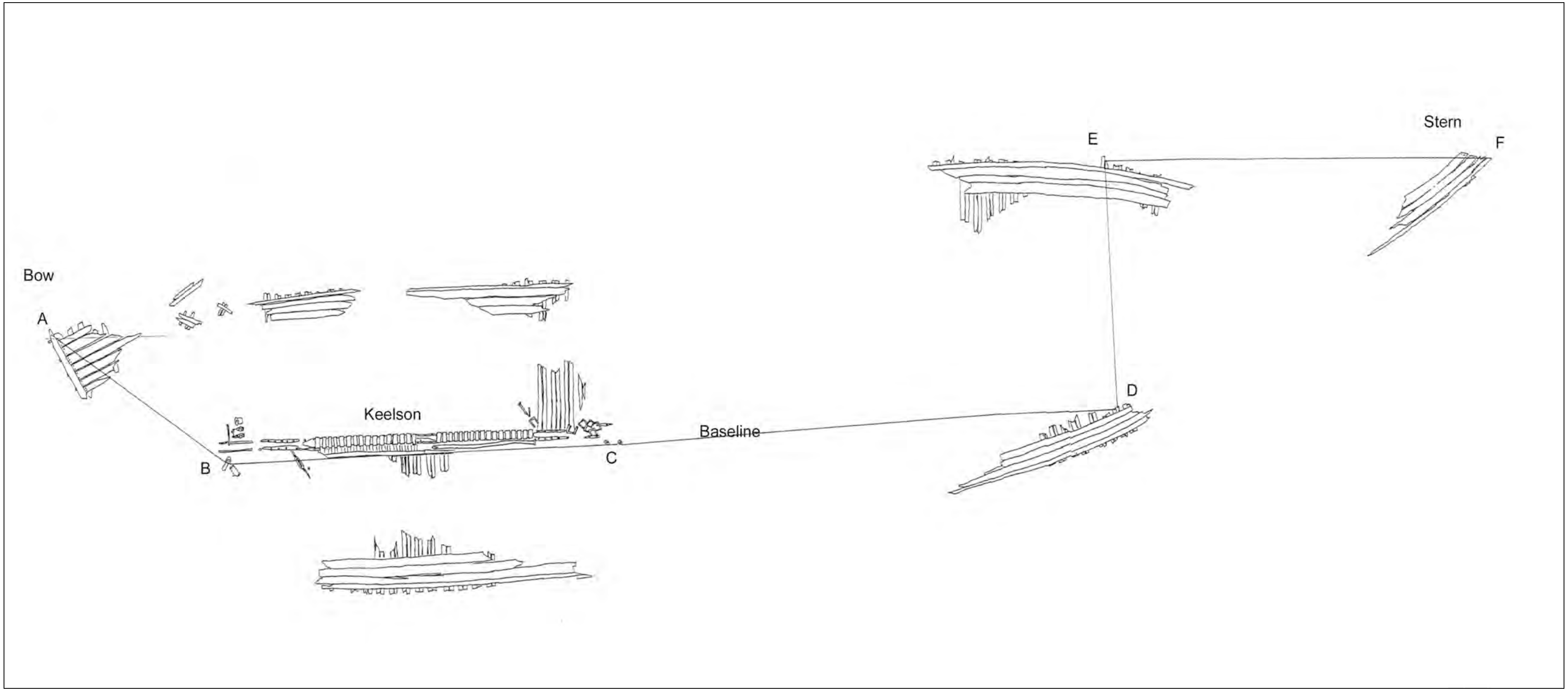


Figure 11. Plan of exposed wreck remains.

Remains of the bow lay southwest of the largest section of hull remains. It consisted of an eight-foot section of the stem, inner stem, port cant frames, exterior planking and a cast-iron hawse pipe. Due to deterioration, the exact dimensions of the cant frames and planking could not be determined. The stem section measured 5 inches across the face and 12 inches fore and aft. The aft face and measurements for the inner stem were inaccessible.

The largest section of remains was the lower hull. That section of exposed hull was approximately 48 feet in length and 32 feet in width. It consists of the keel, keelson, reinforcing iron straps on the keelson, floors, futtocks, ceiling strakes and bilge wales. The keelson was only exposed at the forward end of the hull section and measured 12 inches sided and 20 inches moulded. Two 11-foot, 6-inch sections of the keelson were reinforced by “U” shaped wrought iron straps. The straps measured 6 inches in width, 2 inches in thickness and were installed every 3 inches. Each strap was 17 inches in length and 15 inches across the base of the “U” (Figure 12). A cluster of the wrought iron straps was located aft of those that remained attached to the keelson. No evidence of mast steps was found on the surviving remains of the keelson.

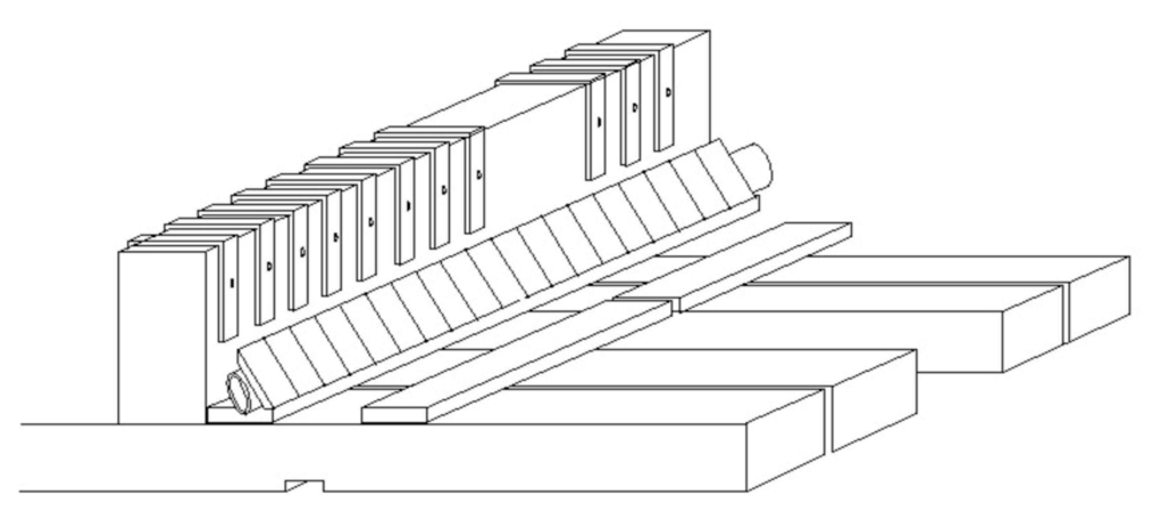


Figure 12. Illustration of the keelson configuration.

The floors immediately outboard of the keel/keelson measured 9 inches sided and 12 inches moulded. At the turn of the bilge the futtocks measured 9 inches sided and 8 inches moulded. Space measured at 10 inches. All of the examined floors and futtocks were oak. Two inboard ceiling planks were exposed on the port side and both measured 12 inches wide and 3 inches thick. At the turn of the bilge a composite wale covered the compass timber. The bilge wales on both sides of the hull were composed of three 12-inch sided by 10-inch moulded timbers. The size of a fourth wale timber could not be determined due to deterioration but appeared to be fashioned to make the turn of the bilge. Hull planking was 11 to 12 inches wide and 2.5 inches at the turn of the bilge.

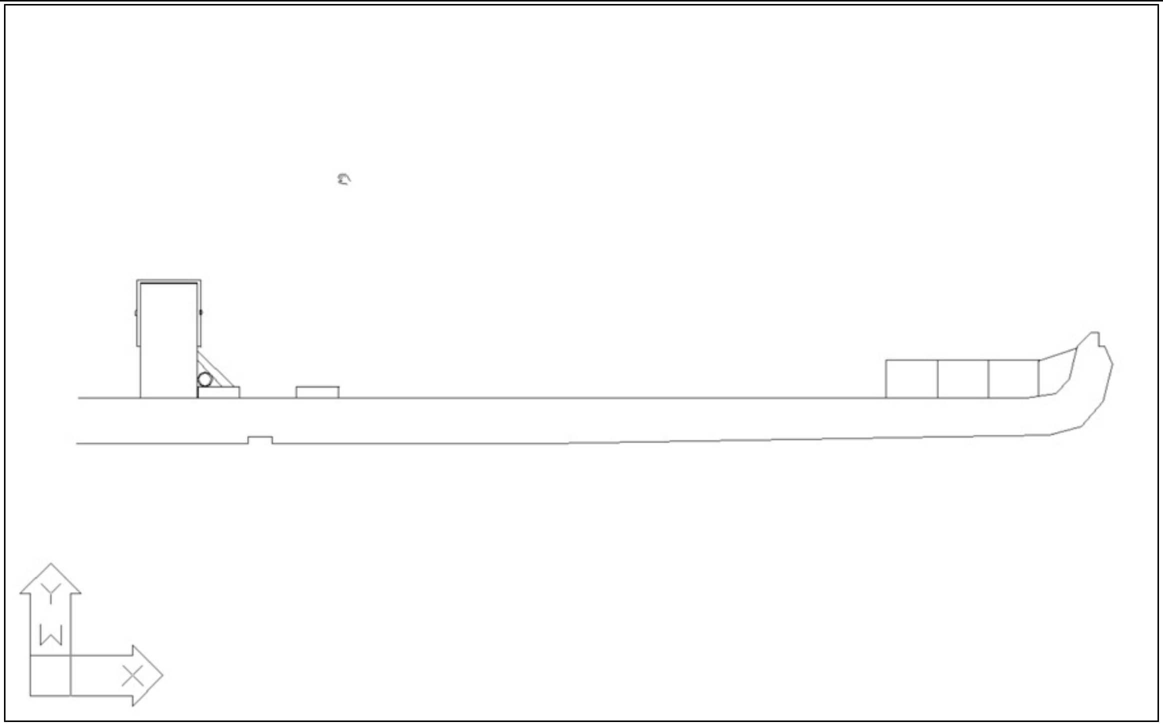


Figure 13. Cross section of the port side of the hull approximately midships (looking aft).

An iron pipe approximately 5 inches in diameter was attached longitudinally to the port base of the keelson and was protected by covering boards. It terminated near the forward end of intact keelson structure. Near that point off the starboard side of the keelson, the remains of what appeared to be a heavily concreted Worthington steam pump was found. Immediately outboard of the pump, what appears to be a steam cylinder was partially exposed. On the port side of the keelson, immediately aft of the pump and cylinder, a second hawse pipe and two other iron pipes were found (Figure 11 at Station B).

A fragment of lower hull in the stern was found off the north end of the main section of wreckage. That section of hull measured approximately 30 feet in length. That portion did not contain the remains of the keelson and the bilge wales were approximately 10 to 12 feet outboard of the location of the keel/keelson. No evidence of the stern deadwood or sternpost was identified in the area.

Conclusions and Recommendations

A survey of historical and archaeological literature and background research confirmed evidence of sustained historical maritime activity associated with Bald Head Island and the Cape Fear River area that continues to the contemporary date. Documented transportation activities in the vicinity of Bald Head Island and neighboring waterways date from the first half of the sixteenth century. The Cape Fear River region became a focus for European activities as early as 1526 when Lucas Vásquez de Ayllón led an expedition from Florida into the Cape Fear region. Permanent settlement along the banks of the Cape Fear River began during the second decade of the eighteenth century.

As a consequence of nearly 400 years of navigation in the coastal region of Brunswick County and settlement along the banks of the Cape Fear River since the eighteenth century, there is a high probability that historically significant submerged cultural resources are located in the area. While no shipwrecks in the project vicinity have been listed on the NRHP or with the UAB, previously identified vessel remains document that they exist; as there are at least 27 shipwrecks recorded in the coastal waters near Bald Head Island and the mouth of the Cape Fear River (Appendix A). Because of their association with the broad patterns of North Carolina history, the remains of sunken vessels preserve important information about the maritime heritage of the North Carolina coast.

Remote sensing of the terrestrial survey area identified 104 magnetic anomalies. However, none of those magnetic anomalies are considered to be associated with potentially significant cultural resources. No additional investigation of that area is recommended in conjunction with the currently proposed project. The marine remote-sensing survey identified 104 magnetic and two acoustic targets. Two of the magnetic anomalies and the corresponding sonar images were determined to be generated by the remains of a vessel. That site was recommended for additional investigation. Archaeological diver reconnaissance of the wreck confirmed that it consisted of fragments of a large wood hull vessel.

The wreck remains appear to be those of a vessel approximately 160 to 190 feet in length. As no evidence of steam propulsion was discovered, it appears that the ship was a sailing vessel. The most likely candidates appear to be a large schooner or possibly a ship or bark rigged cargo vessel. The steam pump and cylinder appear to most likely represent machinery for dewatering, firefighting and/or power for a steam windlass or capstan for sail and/or cargo handling or ground tackle.

An accurate estimate of tonnage is impossible based on the available data. However, a reasonable range could vary from about 460 to approximately 700 tons using the formula: estimated length times estimated beam times estimated depth of hold divided by 100. Historical research indicates that at least three vessels could be candidates for association with the wreck remains. The largest of those vessels is the 704-ton schooner barge *Virginia* that foundered in 1906. The smallest is the 404-ton bark *Aphid* wrecked on Ella Shoal in 1893. Perhaps the most-likely candidate is the 639-ton schooner *Charles H. Valentine* wrecked off Bald Head Point on Smith Island in 1911.

Because the wreck is located within 70 feet of the initially proposed groin location (Figure 14) a shift in the construction alignment is recommended to provide a minimum of 150 feet of clearance (Figure 15). As the groin is designed to cause sand to accrete along the southwestern shoreline of Bald Head Point, the wreck remains will likely be covered with several feet of sediment. That sediment will afford protection for the surviving hull remains. Because a preliminary plan for the exposed hull structure has been developed and details of design and construction recorded, burial of the remains will be a positive impact on the site and no additional investigation is recommended.

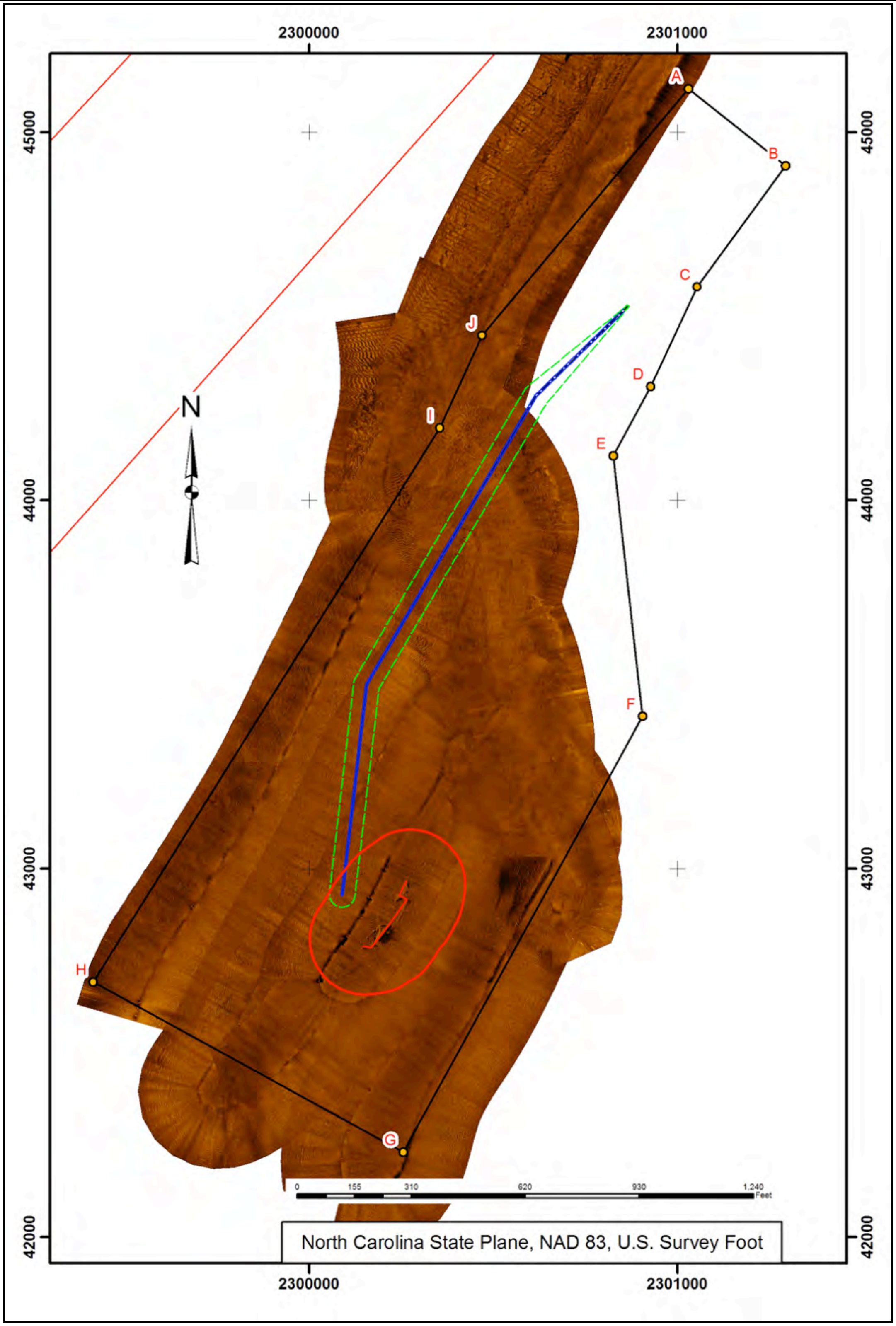


Figure 14. Wreck location with 150-foot buffer on the original groin location.

Figure 15. Location of the 150-foot wreck buffer and realigned groin.

Based on the remote sensing data only one significant anomaly was identified. That proved to be the lower hull remains of a large wooden vessel from the late 19th century or early 20th century. Documentation of the Bald Head Point shipwreck generated sufficient data to satisfy Phase II non-disturbance investigation of the vessel identified by UAB. Alteration of the alignment of the proposed groin will leave the wreck remains 150 feet southeast of the southeastern extent of construction. During construction, the contractor should be made aware of the location of the wreck and provide assurance that vessels engaged in construction of the groin will not infringe on the buffer created to preserve the surviving vessel remains. As the proposed groin is designed to foster sediment accretion along the shoreline south of Bald Head Point, the wreck remains should be recovered and thus protected. Unless changes are necessary in proposed groin construction plans, no additional investigation of the wreck is recommended.

References Cited

Berman, Bruce D.
1972 *Encyclopedia of American Shipwrecks.* Mariners Press, Boston, MA.

Brown, Landis G.
1974 Cape Fear Quarantine Station: Origin and Disease Barrier. *Brunswick County Historical Society Newsletter* 14(2).

Browning, Robert M., Jr.
1980 The Blockade of Wilmington, North Carolina: 1861-1865. Master's thesis submitted to the Department of History, East Carolina University, Greenville, NC.

Carson, Susan S.
1992 *Joshua's Dream: The Story of Old Southport, A Town with Two Names*. Southport Historical Society, Southport, NC.

Charles, Joan D.
2004 North Carolina Shipwreck Accounts: 1709-1950. Published by the author.

Engle, Eloise, and Arnold S. Lott
1975 *America's Maritime Heritage*. Naval Institute Press, Annapolis, MD.

Galecki, Bryan
2005 *Rum Runners, U-Boats, & Hurricanes: The Complete History of the Coast Guard Cutters Bedloe and Jackson*. Pine Belt Publishing, Wilmington, NC.

Gannon, Michael
1991 *Operation Drumbeat: The Dramatic True Story of Germany's First U-Boat Attacks Along the American Coast in World War II.* Reprint of the 1990 edition. HarperPerennial, New York.

Holcombe, Robert
1993 The Evolution of Confederate Ironclad Design. Master's thesis submitted to the Department of History, East Carolina University, Greenville, NC.

Lee, Lawrence
1965 *The Lower Cape Fear in Colonial Days*. University of North Carolina Press, Chapel Hill.

1977 *New Hanover County: A Brief History*. Division of Archives and History, North Carolina Department of Cultural Resources, Raleigh.

1978 *The History of Brunswick County North Carolina*. Board of County Commissioners, Brunswick County, NC.

Lockhead, John L. (compiler)
1954 *Disasters to American Vessels, Sail and Steam, 1841-1846.* Compiled from the New York Shipping and Commercial List, Mariners Museum, Newport News, VA.

Lytle, William M. and Forrest R. Holdcamper
1975 *Merchant Steam Vessels of the United States 1790-1868* "*The Lytle-Holdcamper List.*" Edited by C. Bradford Mitchell. The Steamship Historical Society of America, Staten Island, NY.

Marx, Robert F.
1983 *Shipwrecks in the Americas*. Bonanza Books, New York, NY.

Mobley, Joe A.
1994 *Ship Ashore!: The U.S. Lifesavers of Coastal North Carolina*. Division of Archives and History, North Carolina Department of Cultural Resources, Raleigh.

National Historical Society
1987 *Official Records of the Union and Confederate Navies in the War of the Rebellion*. Ser. 1, vol. 12. Historical Times, Harrisburg, PA.

National Oceanic and Atmospheric Administration (NOAA)
n.d. Wrecks and Obstructions (AWOIS) http://www.nauticalcharts.noaa.gov/hsd/awois.html, accessed 5 February 2009.

National Park Service
n.d. National Register of Historic Places <http://www.nps.gov/nr/>, accessed 5 February 2009.

Northern Maritime Research
2002 Northern Shipwreck Database-CD-ROM. Bedford, Nova Scotia, Canada.

Pleasants, James A.
1979 A Brief History of the Lower Cape During the Civil War. Ms. On file at Tidewater Atlantic Research, Washington, NC.

Potter, Greg L.
1993 Report of Findings: The Yeamans' Expedition Flyboat. Report to the Underwater Archaeology Unit, Division of Archives and History, North Carolina Department of Cultural Resources, Fort Fisher.

Powell, William.
1989 *North Carolina Through Four Centuries*. University of North Carolina Press, Chapel Hill.

Reaves, Bill
1999 *Southport (Smithville), A Chronology (1941-1970).* Southport Historical Society, Southport, NC.

Shomette, Donald G.
1973 *Shipwrecks of the Civil War, The Encyclopedia of Union and Confederate Naval Losses*. Donic Ltd., Washington, DC.

Soley, James Russell
1883 *The Navy in the Civil War: The Blockade and the Cruisers*. Charles Schribner's, London, England.

Sprunt, James
2005 *Chronicles of the Cape Fear River*, 1660-1916. Second reprint of the original 1916 edition. Dram Tree Books, Wilmington, NC.

Stick, David
1952 *Graveyard of the Atlantic: Shipwrecks of the North Carolina Coast.* University of North Carolina Press, Chapel Hill.

Still, William N.
1985 *Iron Afloat: The Story of the Confederate Armorclads*. University of South Carolina Press, Columbia.

The Messenger
1891 No title. *The Messenger*, 16 May. Wilmington, NC.

1892 No title. *The Messenger* 7 July. Wilmington, NC.

U. S. Army Corps of Engineers
1870-1979 *Annual Reports of the Chief of Engineers*, U.S. Department of Defense, Washington, DC.

U.S. Hydrographic Office
1894 *Wrecks and Derelicts in the North Atlantic Ocean, 1887 to 1893, inclusive. Their Location, Publication, Destruction, Etc. No. 107*. U.S. Hydrographic Office, Bureau of Navigation, U.S. Navy Department, Washington, DC.

U.S. Navy Department
1921 *Official Records of the Union and Confederate Navies in the War of the Rebellion.* Ser. II, Vol. 1. U.S. Navy Department, Washington, D.C.

U.S. Treasury Department
1895 Annual Report of the Operations of the United States Life-Saving Service For the Fiscal Year Ending June 30, 1894. Document No. 1740. Office of Life-Saving Service, U.S. Treasury Department, Washington, DC.

Watson, Alan D.
1992 *Wilmington: Port of North Carolina*. University of South Carolina Press, Columbia.

Appendix A

Known shipwrecks in the vicinity of the mouth of the Cape Fear River, North Carolina

Vessel	Type	Use	Date of Loss	Location	Disposition
Spanish Vessel			1526	Mouth of the Cape Fear River	
Sir John	Fly Boat		Oct. 1665	Middle Ground	
Unknown			Feb. 1767	Cape Fear River Bar	
Enterprise			15 Feb. 1768	Mouth of the Cape Fear River	
Clementine			March 1775	Middle Ground	Salvaged(?)
Unknown			Feb. 1784	Mouth of the Cape Fear River	
Neptune	Brig		26 Jan. 1789	Middle Ground	
Sabine		Privateer	11 Sept. 1814		
Florie		Blockade Runner	Oct. 1864	Inside Bar	
Georgiana McCaw		Blockade Runner	2 June 1864	SW of Baldhead Light	
Violet		U.S.S. Gunboat	7 Aug. 1864	Western Bar	Possibly cleared by USACE
Frying Pan Shoals Lightship		Light Ship	20 Dec. 1861	North of Fort Caswell	Sunk by U.S.S. *Mount Vernon*
Ellen	Schooner	Blockade Runner	26 June 1862	Burned while ashore at Bald Head Channel	Taken in tow by U.S.S. *Victoria*. Sunk in 15 minutes.
Emily	Schooner	Blockade Runner	26 June 1862	Burned under the guns of Fort Caswell	
Lizzie	Sloop	Blockade Runner	1 August 1862	Captured and burned by U.S.S. *Penobscot* off Bald Head.	
Ella	Steamer	Blockade Runner	3 Dec. 1864	Run ashore on Bald Head Beach.	Partially Salvaged
Agnes Emily Frye	Steamer	Blockade Runner	27 Dec. 1864	Lost 2 miles south of Fort Caswell off Old Inlet	
Pine	Sloop		May 1868	Cape Fear Bar	
Alex Sprunt		Lighter	Feb. 1872		
Felicitus	Bark (Ger.)		July 1874	Main Bar	Salvaged
Maria Needham	Bark (Br.)		14 Jan. 1874	Middle Ground	Salvaged
Vapor	Schooner		5 Nov. 1895	Cape Fear Bar	
San Antonio	Bark (Br.)		13 Jan. 1890		Salvaged
Ogir	Bark (Nor.)		10 Nov. 1894	Middle Ground	Salvaged
Clarence H	Schooner		9 Dec. 1902	South of Cape Fear Bar	
Col. Thos. F. Austin	Schooner		24 Feb. 1916	Middle Ground	
Unknown	Bark		13 June 1930	Middle Ground	

Appendix B

Magnetic Anomaly List

(All coordinates North Carolina State Plane, NAD 83, U.S. Survey Foot)

Map Designation	Lane	Number	Characteristics	Intensity (gammas)	Duration (feet)	X	Y	Assessment
1	2	1	Positive Monopolar	21	34	2300887.1	43583.7	Small single object
2	2	2	Dipolar	52	46	2300871.9	43457.4	Small single object
3	2	3	Negative Monopolar	23	11	2300870.3	43405.7	Associated with a temporary groin
4	1	1	Dipolar	98	34	2300762.3	43750.6	Associated with a temporary groin
5	1	2	Positive Monopolar	24	31	2300732.4	43585.7	Small single object
6	1	3	Positive Monopolar	38	24	2300758.7	43504.4	Small single object
7	1	4	Dipolar	80	43	2300785.8	43367.8	Associated with a temporary groin
8	6	1	Dipolar	8	40	2300840.3	44655.4	Small single object
9	7	1	Dipolar	61	49	2300966.7	44790.0	Small single object
10	8	1	Dipolar	44	56	2300946.8	44709.7	Small single object
11	8	2	Dipolar	17	14	2300923.8	44636.7	Small single object
12	8	3	Positive Monopolar	22	24	2300831.4	44435.8	Associated with a boardwalk
13	9	1	Positive Monopolar	65	17	2300996.6	44631.8	Associated with a boardwalk
14	9	2	Positive Monopolar	71	19	2300987.7	44614.2	Associated with a boardwalk
15	9	3	Dipolar	61	13	2300949.3	44553.8	Small single object
16	9	4	Dipolar	63	26	2300930.6	44529.4	Small single object
17	10	1	Positive Monopolar	43	27	2301178.8	44774.0	Associated with a boardwalk
18	12	1	Negative Monopolar	57	36	2301107.0	44754.5	Small single object
19	12	2	Multicomponent	192	22	2300998.5	44618.4	Associated with a boardwalk
20	12	3	Dipolar	84	25	2300918.1	44389.6	Associated with a boardwalk
21	14	1	Dipolar	84	25	2300747.5	43750.0	Associated with a temporary groin
22	15	1	Positive Monopolar	65	38	2300731.8	43756.0	Associated with a temporary groin
23	16	1	Dipolar	46	27	2300803.2	43766.3	Associated with a temporary groin
24	17	1	Positive Monopolar	11	18	2300814.2	43677.1	Small single object
25	20	1	Negative Monopolar	22	39	2300859.3	43465.1	Small single object
26	20	2	Negative Monopolar	21	19	2300824.0	43388.6	Associated with a temporary groin
27	16	2	Positive Monopolar	17	43	2300717.6	43598.9	Small single object
28	12	4	Positive Monopolar	24	11	2301218.1	44949.0	Small single object
29	14	2	Multicomponent	29	10	2300676.7	43731.7	Associated with a temporary groin
30	14	3	Dipolar	21	24	2300721.2	43746.8	Associated with a temporary groin
31	14	4	Dipolar	9	12	2300752.6	43757.3	Associated with a temporary groin
32	14	5	Positive Monopolar	127	14	2300768.2	43757.0	Associated with a temporary groin
33	14	6	Dipolar	120	27	2300737.7	43746.5	Associated with a temporary groin
34	1	7	Positive Monopolar	114	22	2300692.7	43730.2	Associated with a temporary groin

Map Designation	Lane	Number	Characteristics	Intensity (gammas)	Duration (feet)	X	Y	Assessment
35	15	2	Dipolar	90	25	2300731.8	43737.2	Associated with a temporary groin
36	15	3	Dipolar	101	20	2300758.0	43751.8	Associated with a temporary groin
37	15	4	Dipolar	10	11	2300778.7	43825.0	Small single object
38	16	3	Dipolar	25	14	2300810.0	43775.2	Associated with a temporary groin
39	1	1	Negative Monopolar	18	64	2300655.8	42998.7	Small single object
40	1	2	Positive Monopolar	2	42	2300695.7	43051.2	Small single object
41	1	3	Multicomponent	10	130	2300623.4	43357.8	Moderate single object
42	1	4	Multicomponent	10	95	2300565.7	43694.5	Associated with a temporary groin
43	1	5	Positive Monopolar	6	37	2300551.6	43911.5	Small single object
44	1	6	Negative Monopolar	6	43	2300547.5	44120.6	Small single object
45	1	7	Multicomponent	6	58	2300557.6	44226.1	Small single object
46	1	8	Dipolar	3	33	2300562.0	44297.1	Small single object
47	1	9	Dipolar	6	64	2300555.3	44383.3	Small single object
48	19	1	Positive Monopolar	6	75	2300410.6	44565.9	Small single object
49	19	2	Dipolar	10	68	2300415.9	44462.7	Small single object
50	19	3	Multicomponent	14	84	2300397.0	44327.5	Small single object
51	19	4	Multicomponent	28	122	2300466.9	43677.4	Moderate single object
52	19	5	Multicomponent	43	155	2300515.0	43525.2	Moderate single object
53	19	6	Positive Monopolar	4	29	2300547.3	43366.7	Small single object
54	19	7	Negative Monopolar	7	58	2300559.1	43295.5	Small single object
55	19	8	Positive Monopolar	3	30	2300575.2	43187.2	Small single object
56	19	9	Multicomponent	8	116	2300645.2	43027.7	Small single object
57	20	1	Dipolar	22	133	2300512.4	43105.8	Moderate single object
58	20	2	Negative Monopolar	4	42	2300479.9	43352.6	Small single object
59	20	3	Negative Monopolar	9	66	2300327.1	43911.9	Possible Cable
60	20	4	Dipolar	3	37	2300352.8	44037.7	Small single object
61	20	5	Positive Monopolar	8	49	2300399.9	44281.5	Small single object
62	20	6	Dipolar	11	93	2300398.7	44369.1	Small single object
63	20	7	Positive Monopolar	6	65	2300407.2	44562.9	Small single object
64	20	1	Dipolar	6	56	2300419.5	44464.8	Small single object
65	20	2	Dipolar	21	90	2300391.8	44372.8	Moderate single object
66	20	3	Positive Monopolar	4	49	2300296.6	44071.1	Small single object
67	20	4	Dipolar	4	53	2300222.2	43960.2	Small single object
68	18	1	Positive Monopolar	3	36	2300304.7	44052.3	Small single object

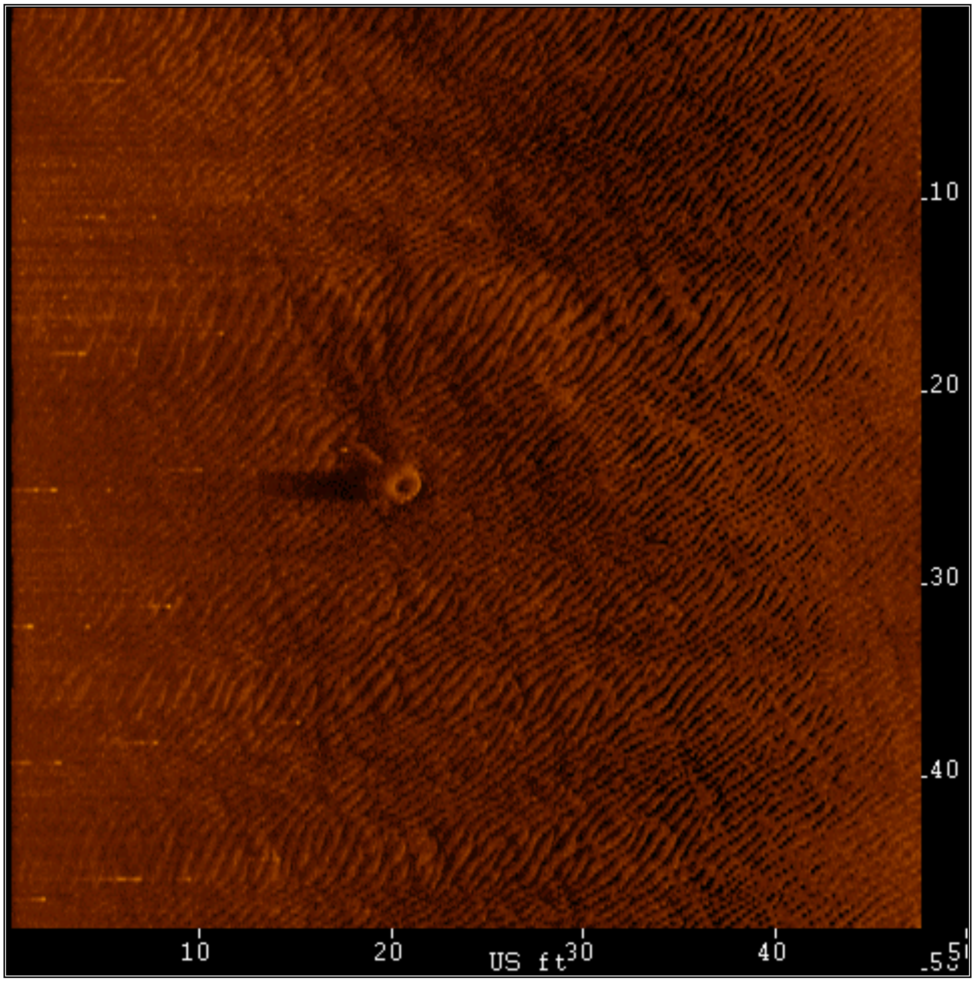
Map Designation	Lane	Number	Characteristics	Intensity (gammas)	Duration (feet)	X	Y	Assessment
69	18	2	Dipolar	3	39	2300336.6	44101.2	Small single object
70	17	1	Dipolar	19	49	2300443.4	44221.4	Moderate single object
71	17	2	Multicomponent	6	44	2300391.0	44147.4	Small single object
72	17	3	Dipolar	4	58	2300388.7	44084.7	Small single object
73	17	4	Negative Monopolar	2	59	2300318.8	43919.9	Possible Cable
74	16	1	Dipolar	27	104	2299656.6	42625.7	Moderate single object
75	16	2	Negative Monopolar	8	48	2300099.2	43438.2	Small single object
76	15	1	Dipolar	54	87	2300357.5	43898.4	Possible Cable
77	15	2	Positive Monopolar	5	42	2300367.9	43966.7	Small single object
78	15	3	Multicomponent	6	101	2300384.9	43864.7	Possible Cable
79	15	4	Positive Monopolar	4	62	2300308.9	43671.7	Small single object
80	3	1	Multicomponent	18	96	2300539.1	43180.4	Moderate single object
81	3	2	Dipolar	4	55	2300588.0	43057.4	Small single object
82	5	1	Positive Monopolar	4	68	2300621.2	43188.8	Small single object
83	5	2	Positive Monopolar	3	57	2300584.5	43255.2	Small single object
84	5	3	Negative Monopolar	3	40	2300538.2	43206.7	Small single object
85	5	4	Dipolar	58	85	2300504.5	43112.6	Moderate single object
86	**6**	**1**	**Multicomponent**	**24**	**286**	**2300238.4**	**42784.8**	**Associated with a shipwreck**
87	7	1	Negative Monopolar	3	56	2300569.9	43286.3	Small single object
88	7	2	Dipolar	13	92	2300578.9	43395.1	Small single object
89	**7**	**3**	**Multicomponent**	**68**	**275**	**2300246.0**	**42815.8**	**Associated with a shipwreck**
90	**8**	**1**	**Multicomponent**	**362**	**320**	**2300163.2**	**42806.9**	**Associated with a shipwreck**
91	10	1	Multicomponent	86	77	2300518.1	43584.4	Moderate single object
92	10	2	Dipolar	23	78	2300361.1	43227.7	Moderate single object
93	**10**	**3**	**Multicomponent**	**22**	**263**	**2300158.5**	**42883.8**	**Associated with a shipwreck**
94	11	1	Negative Monopolar	4	87	2300127.5	42956.7	Small single object
95	11	2	Dipolar	4	44	2300333.3	43329.4	Small single object
96	11	3	Dipolar	9	52	2300414.1	43466.9	Small single object
97	12	1	Multicomponent	53	104	2300494.1	43692.5	Moderate single object
98	12	2	Dipolar	3	41	2300175.5	43132.7	Small single object
99	13	1	Dipolar	6	103	2299976.6	42909.3	Small single object
100	13	2	Positive Monopolar	5	90	2300204.9	43303.2	Small single object
101	14	1	Multicomponent	19	58	2300426.0	43838.4	Possible Cable
102	21	1	Positive Monopolar	26	139	2299542.3	42844.4	Moderate single object

Map Designation	Lane	Number	Characteristics	Intensity (gammas)	Duration (feet)	X	Y	Assessment
103	21	2	Multicomponent	30	173	2299741.5	43192.3	Tire
104	22	1	Positive Monopolar	6	78	2299523.5	42859.3	Small single object

Appendix C

Sonar Targets

SS-1



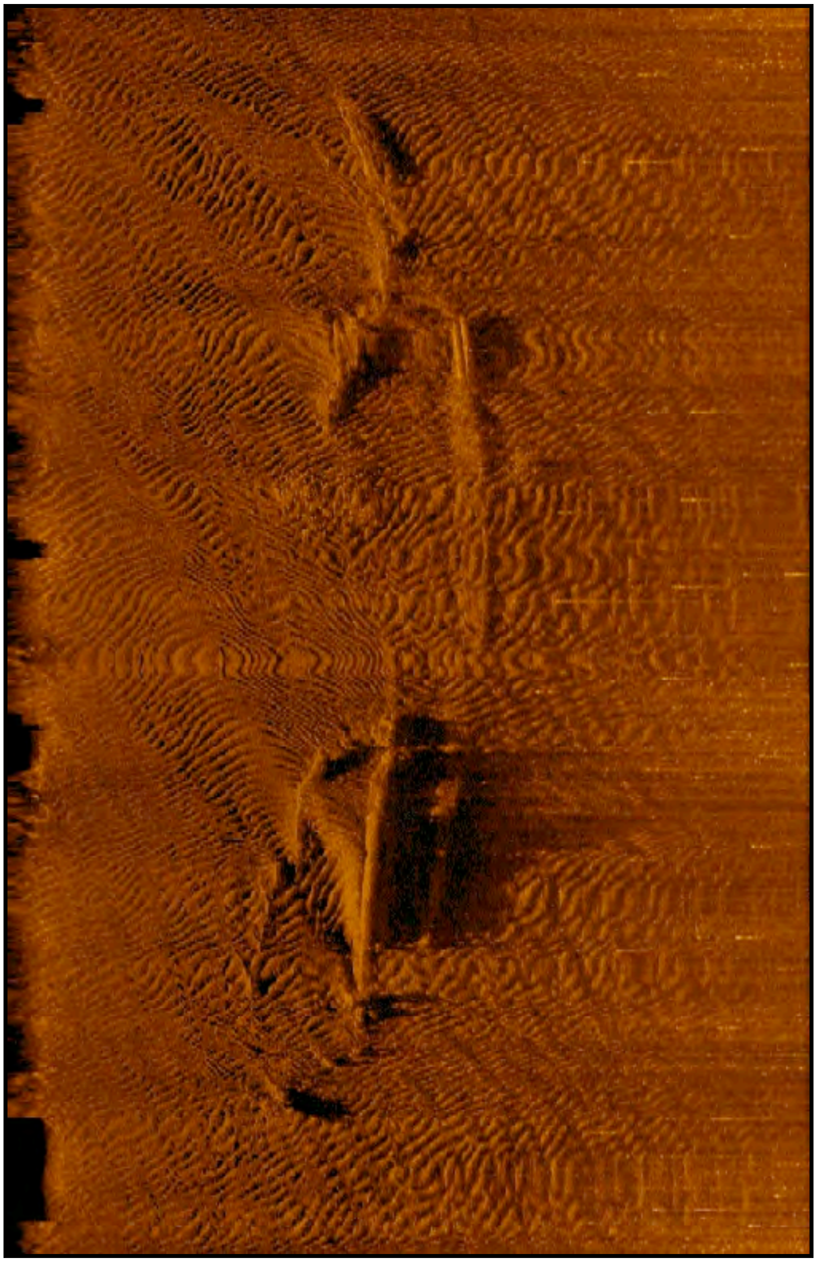
Contact Info: SS-1

- Sonar Time at Target: 08/03/2012 12:37:14
- Click Position (Lat/Lon Coordinates)
  33.8645264736   -78.0127738223 (WGS84)
- Click Position (Projected Coordinates)
  (X) 2299745.37 (Y) 43175.20
- Map Proj: NC83F
- Acoustic Source File: BHI12_L_15_120803085400.xtf
- Ping Number: 5268
- Range to Target: 29.63 US Feet
- Fish Height: 3.86 US Feet
- Heading: 55.500 degrees
- Event Number: 0
- Water Depth: 0.00
- Line Name: 15

User Entered Info

Target Height: 2.2 US Feet
Target Length: 6.9 US Feet
Target Shadow: 20.6 US Feet
Target Width: 6.9 US Feet
Mag Anomaly: 103
Avoidance Area: No
Classification 1: Tire
Area: Bald Head Island
Description: A single tire.

SS-2



Contact Info: SS-2

- Sonar Time at Target: 08/03/2012 13:06:32
- Click Position (Lat/Lon Coordinates)
  33.8636447571   -78.0112168790 (WGS84)
- Click Position (Projected Coordinates)
  (X) 2300221.28 (Y) 42859.00
- Map Proj: NC83F
- Acoustic Source File: BHI12_L_15_120803092000.xtf
- Ping Number: 31243
- Range to Target: 23.73 US Feet
- Fish Height: 3.42 US Feet
- Heading: 206.600 degrees
- Event Number: 0
- Water Depth: 0.00
- Line Name: 15

User Entered Info

Target Height: 4.6 US Feet
Target Length: 194.3 US Feet
Target Shadow: 54.1 US Feet
Target Width: 31.7 US Feet
Mag Anomaly: 86, 89, 90, 93
Avoidance Area: Yes
Classification 1: Wreck
Area: Bald Head Island
Description: Shipwreck

North Carolina Department of Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Pat McCrory, Governor
Susan W. Kluttz, Secretary
Kevin Cherry, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

January 17, 2013

Dave Timpy
US Army Corps of Engineers
Wilmington Regulatory Field Office
69 Darlington Avenue,
Wilmington, NC 28403

Re: Construction of a Terminal Groin at the Juncture of Bald Head Island and the Entrance to the Cape Fear River, SAW 2012-00040, Brunswick County, ER 12-0437

Dear Mr. Timpy,

We have received the archaeological survey report "A Phase I Remote-Sensing Archaeological Survey & Phase II Shipwreck Assessment at the Location of a Proposed Terminal Groin at the Mouth of the Cape Fear River, Bald Head Island, Brunswick County, North Carolina" from Tidewater Atlantic Research, Inc. (TAR) for the above project. The report meets our office's guidelines and those of the Secretary of the Interior and we would like to take this opportunity to comment.

The terrestrial and underwater survey conducted by TAR identified 104 magnetic anomalies and two acoustic targets. A cluster of four magnetic anomalies (86, 89, 90, and 93) associated with one acoustic signature were generated by the remains of a vessel requiring additional archaeological investigation. The remaining targets were determined to not warrant further investigation.

A Phase II non-disturbance investigation of the shipwreck remains, determined it to be a large wood hull sailing vessel dating to the late 19th or early 20th century. This shipwreck is deemed potentially eligible and requires avoidance. Because the wreck is located within 70 feet of the proposed groin location, TAR proposed a shift in the construction alignment to provide a minimum 150 foot buffer. We concur with this recommendation that a 150 foot buffer is required around the wreck location. Additionally, during construction all contractors should be made aware of the location of the wreck and provide assurance that vessels and equipment engaged in construction of the groin will not infringe on the buffer created, to preserve the surviving vessel remains.

These comments are made pursuant to Section 106 of the National Historic Preservation Act of 1966, North Carolina legislation (G.S. 121-22 to 28, Article 3), and the Abandoned Shipwreck Act of 1987 (P.L. 100-298).

Location: 109 East Jones Street, Raleigh NC 27601 **Mailing Address:** 4617 Mail Service Center, Raleigh NC 27699-4617 **Telephone/Fax:** (919) 807-6570/807-6599

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579. In all future communication concerning this project, please cite the above referenced ER tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

cc: Chris McCall,Village of Bald Head Island
Eric Olsen, Olsen Associates, Inc.