IFBC NO. 21-R075936CD

COQUINA BEACH STORM DAMAGE RESTORATION PROJECT

(PROEJCT NO. 6003412 & 6003415)

(959-35)

DECEMBER 14, 2020

Manatee County BCC
Procurement Division
1112 Manatee Avenue West Ste 803
Bradenton, FL 34205
purchasing@mymanatee.org

ADVERTISEMENT

INVITATION FOR BID CONSTRUCTION, NO. 21-R075936CD
COQUINA BEACH STORM DAMAGE RESTORATION PROJECT

Manatee County, a political subdivision of the State of Florida (hereinafter referred to as County), will receive sealed bids from individuals, corporations, partnerships, and other legal entities authorized to do business in the State of Florida, to provide Coquina Beach Storm Damage Restroration Project, as specified in this Invitation for Bid Construction to include hydraulic placement of fill on Coquina Beach.

DATE, TIME AND PLACE DUE:
The Due Date and Time for submission of Bids in response to this IFBC **is January 13, 2021 at 3:00 PM ET.** Bids must be delivered to the following location: Manatee County Administration Building, 1112 Manatee Ave. W., Suite 803, Bradenton, FL 34205 prior to the Due Date and Time.

SOLICITATION INFORMATION CONFERENCE:
A non-mandatory virtual Information Conference will be held at 10:00 AM on December 21, 2020 via Zoom at: https://manateecounty.zoom.us/j/87472246208.

DEADLINE FOR QUESTIONS AND CLARIFICATION REQUESTS:
The deadline to submit all questions, inquiries, or requests concerning interpretation, clarification or additional information pertaining to this Invitation for Bid Construction to the Manatee County Procurement Division is December 31, 2020. Questions and inquiries should be submitted via email to the Designated Procurement Contact shown below.

Important: A prohibition of lobbying is in place. Review Section A.13 carefully to avoid violation and possible sanctions.

DESIGNATED PROCUREMENT CONTACT: Chris Daley - CPPO, CPPB, Procurement Project Manager
(941) 749-3048, Fax (941) 749-3034
Email: chris.daley@mymanatee.org
Manatee County Financial Management Department
Procurement Division

AUTHORIZED FOR RELEASE: Jacob Erickson, MBA, CPPO, NIGP-CPP

Digitally signed by Jacob Erickson, MBA, CPPO, NIGP-CPP
Date: 2020.12.14 15:23:02 -05'00'

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SECTION A, INFORMATION FOR BIDDERS

To receive consideration, entities who submit a response to this Invitation for Bid Construction (Bidders) must meet the minimum qualification requirements and comply with the following instructions. Bid responses (Bids) will be accepted from single business entities, joint ventures, partnerships or corporations.

A.01 BID DUE DATE

The Due Date and Time for submission of Bids in response to this Invitation for Bid Construction (IFBC) **is January 13, 2021 at 3:00 PM ET.** Bids must be delivered to the following location: Manatee County Administration Building, 1112 Manatee Ave. W., Suite 803, Bradenton, FL 34205 and time stamped by a Procurement representative prior to the Due Date and Time.

Bids received after the Due Date and Time will not be considered. It will be the sole responsibility of the Bidder to deliver its Bid to the Manatee County Procurement Division for receipt on or before the Due Date and Time. If a Bid is sent by U.S. Mail, courier or other delivery services, the Bidder will be responsible for its timely delivery to the Procurement Division. Bids delayed in delivery will not be considered, will not be opened at the public opening, and arrangements will be made for their return at the Bidder's request and expense.

A.02 SOLICITATION INFORMATION CONFERENCE:

A non-mandatory virtual Information Conference will be held at 10:00 AM on December 21, 2020 via Zoom at: https://manateecounty.zoom.us/j/87472246208.

Attendance to mandatory information conferences and/or site visits are required to meet the minimum qualification requirements of the IFBC. Attendance to non-mandatory information conferences is not required, but is strongly encouraged.

A.03 PUBLIC OPENING OF BIDS

Bids will be opened immediately following the Due Date and Time at the Manatee County Administration Building, Suite 803 in the presence of County officials. Bidders or their representatives may attend the Bid opening virtually by accessing the link below:

Zoom® Webinar Link: https://manateecounty.zoom.us/j/83903227451

Manatee County will make public at the opening the names of the business entities which submitted a Bid and the total bid price submitted. No review or analysis of the Bids will be conducted at the virtual Bid opening.

A.04 SUBMISSION OF BIDS

The contents of the Bid sealed package must include:

- One (1) bound original clearly identifying Bidder and marked “ORIGINAL”.
- One (1) electronic format copy clearly identifying Bidder.

Electronic format copy should be submitted on a Universal Serial Bus (USB) portable flash memory drive or compact disc (CD) in Microsoft Office® or Adobe Acrobat® portable document format (PDF) in one continuous file. Do not password protect or otherwise encrypt electronic Bid copies. Electronic copies must be searchable and contain an identical Bid to the original.

Submit the Bid package in a sealed container with the following information clearly marked on the outside of the package: IFBC NO. 21-R075936CD, Coquina Beach Storm Damage Restroration Project, Bidder's name, and Bidder's address. Bids must be delivered to the Manatee County Procurement Division prior to the Due Date and Time at the following address:

Manatee County Procurement Division
1112 Manatee Ave. West, Ste. 803
Bradenton, FL 34205

A.05 DISTRIBUTION OF SOLICITATION DOCUMENTS

All documents issued pursuant to this IFBC are distributed electronically and available for download at no charge at www.mymanatee.org > *Bids and Proposals.* Documents may be viewed and downloaded for printing using Adobe Reader® software.

At its sole discretion, the County may utilize third-party providers to distribute proposals. Visit the third-party's website for more information regarding this service. Participation in the third-party system is not a requirement for doing business with Manatee County.

Additionally, the IFBC and all related documents are available for public inspection at the Manatee County Procurement Division, 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205. Call (941) 749-3014 to schedule an appointment. Documents are available between the hours of 8:00 A.M. and 5:00 P.M., Monday through Friday, with the exception of County holidays.

As a courtesy, Manatee County notifies the Manatee County Chamber of Commerce and the Manatee County Black Chamber of Commerce of all active solicitations, who then distributes the information to its members.

A.06 EXAMINATION OF BID DOCUMENTS AND SITE(S)

It is the responsibility of each bidder before submitting a bid, to (a) examine the IFBC documents thoroughly; (b) visit the Project Site(s) to become familiar with local conditions that may affect cost, progress, performance, or furnishing of the Work; (c) consider federal, state, and local codes, laws, and regulations that may affect costs, progress, performance, or furnishing of the Work; (d) study and carefully correlate bidder's observations with the IFBC documents; and (e) notify County in writing of all conflicts, errors, or discrepancies in the IFBC documents.

Each bidder may, at bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies, and obtain any additional information and data which pertain to the physical conditions at or contiguous to the Project Site(s) or otherwise which may affect cost, progress, performance or furnishing of the Work and which bidder deems necessary to determine his bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of the IFBC documents. County will provide each bidder access to the site(s) to conduct such explorations and tests.

Bidder shall fill all holes, clean up and restore the Project Site(s) to its former condition upon completion of such explorations. The lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and other lands designated for use by successful bidder in performing the Work are identified in the IFBC documents.

All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by successful bidder. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by County unless otherwise provided in the IFBC documents.

Inspection of the Project Site(s) is a requirement to be considered for award of this bid. Prior to submitting a bid, each bidder shall examine the Project Site(s) and all conditions thereon fully familiarizing themselves with the full scope of the Work. Failure to become familiar with Project Site conditions will in no way relieve the successful bidder from the necessity of furnishing any materials or performing any Work that is required to complete the Project in accordance with the Project Plans and Specifications. Bidder shall acknowledge inspection of the Project Site(s) on his/her signed, submitted Bid Form.

A.07 ADDENDA

Any interpretations, corrections or changes to this IFBC will be made by addenda. Addenda will be posted on the Procurement Division’s web page of the County website at http://www.mymanatee.org/purchasing > *Bids and Proposals*. For those solicitations that are advertised on a third-party website, addenda will also be posted on the third-party’s distribution system on the ‘Planholders’ link.

All addenda are a part of the IFBC and each Bidder will be bound by such addenda. It is the responsibility of each Bidder to read and comprehend all addenda issued. Failure of any Bidder to acknowledge an issued addendum in its Bid will not relieve the Bidder from any obligation contained therein.

A.08 BID FORMS

Bids must include the forms provided in this IFBC. If needed, additional pages may be attached to a form. Bidders must fully complete and execute all Bid Forms. Bid Forms must be executed by an authorized official of the company who has the legal authority to bind the company.

A.09 BID EXPENSES

All costs incurred by Bidder in responding to this IFBC will be the sole responsibility of the Bidder.

A.10 QUESTION AND CLARIFICATION PERIOD

Each Bidder shall examine all IFBC documents and will judge all matters relating to the adequacy and accuracy of such documents. Any questions or requests concerning interpretation, clarification or additional information pertaining to this IFBC, including the sample Agreement, shall be made in writing via email to the Manatee County Procurement Division to the Designated Procurement Contact or to purchasing@mymanatee.org. All questions received and responses given will be provided to potential bidders via an addendum to this IFBC.

Manatee County will not be responsible for oral interpretations given by other sources including County staff, representative, or others. The issuance of a written addendum by the Procurement Division is the only official method whereby interpretation, clarification or additional information will be given.

A.11 FALSE OR MISLEADING STATEMENTS

Bids which contain false or misleading statements, or which provide references which do not support an attribute or condition claimed by the Bidder, may be rejected. If, in the opinion of the County, such information was intended to mislead the County in its evaluation of the Bid, and the attribute, condition or capability is a requirement of this IFBC. Such Bidder will be disqualified from consideration for this IFBC and may be disqualified from submitting a response on future solicitation opportunities with the County.

A.12 CONFIDENTIALITY OF SECURITY RELATED RECORDS

a. Pursuant to Florida Statutes § 119.071(3), the following records (hereinafter referred to collectively as “the Confidential Security Records”) are confidential and exempt from the disclosure requirements of Florida Statutes § 119.07(1):

   i. A Security System Plan or portion thereof for any property owned by or leased to County or any privately owned or leased property held by County.
   ii. Building plans, blueprints, schematic drawings, and diagrams, including draft, preliminary, and final formats, which depict the internal layout and structural elements of a building, arena, stadium, water treatment facility, or other structure owned or operated by County.
   iii. Building plans, blueprints, schematic drawings, and diagrams, including draft, preliminary, and final formats, which depict the internal layout or structural elements of an attractions and recreation facility, entertainment or resort complex, industrial complex, retail and service development, office development, or hotel or motel development in the possession of, submitted to County.

b. Successful Bidder agrees that, as provided by Florida Statute, it shall not, as a result of a public records request, or for other reason disclose the contents of, or release or provide copies of the Confidential Security Records to any other party absent the express written authorization of County’s Property Management Director or to comply with a court order requiring such release or disclosure. To the extent successful Bidder receives a request for such records, it shall immediately contact the County’s designated Contract administrator who shall coordinate County’s response to the request.

A.13 LOBBYING

After the issuance of any IFBC, prospective bidders, bidders, or their agents, representatives or persons acting at the request of such bidder shall not contact, communicate with or discuss any matter relating to the IFBC with any officer, agent or employee of Manatee County other than the Procurement Official or the contact identified in this IFBC, pursuant to the Manatee County Code of Laws. This prohibition includes copying such persons on all written communication, including email correspondence. This requirement begins with the issuance of an IFBC and ends upon execution of the final Agreement or when the IFBC has been cancelled. Violators of this prohibition shall be subject to sanctions as provided in the Manatee County Code of Laws.

A.14 UNBALANCED BIDDING PROHIBITED

County recognizes that large and/or complex projects will often result in a variety of methods, sources, and prices. However, where in the opinion of the County such variation does not appear to be justified given bid requirements and industry and market conditions, the Bid will be presumed to be unbalanced. Examples of unbalanced Bids will include:

a. Bids showing omissions, alterations of form, additions not specified, or required conditional or unauthorized alternate bids.
b. Bids quoting prices that substantially deviate, either higher or lower, from those included in the Bids of competitive Bidders for the same line item unit costs.
c. Bids where the unit costs offered are in excess of, or below reasonable cost analysis values.

In the event County determines that a Bid is presumed unbalanced, it will request the opportunity to and reserves the right to, review all source quotes, bids, price lists, letters of intent, and other supporting documentation which the Bidder obtained and upon which the Bidder relied upon to develop its Bid. County reserves the right to deem any presumptive unbalanced Bid where the Bidder is unable to demonstrate the validity and/or necessity of the unbalanced unit costs as non-responsive.

A.15 FRONT LOADING OF BID PRICING PROHIBITED

Prices offered for performance and/or acquisition activities which occur early in the Project Schedule, such as mobilization; clearing and grubbing; or maintenance of traffic; that are substantially higher than pricing of competitive bidders within the same portion of the Project Schedule, will be presumed to be front loaded. Front loaded bids could reasonably appear to be an attempt to obtain unjustified early payments creating a risk of insufficient incentive for the bidder to complete the Work or otherwise creating an appearance of an undercapitalized bidder.

In the event County determines that a bid is presumed to be front loaded, it will request the opportunity to, and reserves the right to, review all source quotes, bids, price lists, letters of intent, and other documents which the bidder obtained and upon which the bidder relied IFBC

upon to develop the pricing or acquisition timing for these bid items. County reserves the right to reject as nonresponsive any presumptive front-loaded bids where the bidder is unable to demonstrate the validity and/or necessity of the front-loaded costs.

A.16 WITHDRAWAL OR REVISION OF BIDS

Bidders may withdraw Bids under the following circumstances:

a. If Bidder discovers a mistake(s) prior to the Due Date and Time. Bidder may withdraw its Bid by submitting a written notice to the Procurement Division. The notice must be received in the Procurement Division prior to the Due Date and Time for receiving Bids. A copy of the request shall be retained, and the unopened Bid returned to the Bidder; or

b. After the Bids are opened but before a contract is signed, Bidder alleges a material mistake of fact if:

    1. The mistake is clearly evident in the solicitation document; or
    2. Bidder submits evidence which clearly and convincingly demonstrates that a mistake was made in the Bid. Request to withdraw a Bid must be in writing and approved by the Procurement Official.

A.17 IRREVOCABLE OFFER

Any Bid may be withdrawn up until the Due Date and Time. Any Bid not so withdrawn shall, upon opening, constitute an irrevocable offer for a period of ninety (90) days to provide the goods or services set forth in this IFBC or until one or more of the Bids have been duly accepted by County, whichever occurs first.

A.18 RESERVED RIGHTS

County reserves the right to accept or reject any and/or all bids, to waive irregularities and minor technicalities, and to request resubmission. Also, County reserves the right to accept all or any part of the bid and to increase or decrease quantities to meet additional or reduced requirements of County. Any sole response received by the first submission date may or may not be rejected by County depending on available competition and current needs of County. For all items combined, the bid of the lowest, responsive, responsible bidder will be accepted, unless all bids are rejected.

The lowest, responsible bidder shall mean that Bidder who makes the lowest Bid to sell goods and/or services of a quality which meets or exceeds the quality of goods and/or services set forth in the IFBC documents or otherwise required by County.

To be responsive, a Bidder shall submit a Bid which conforms in all material respects to the requirements set forth in the IFBC.

To be a responsible bidder, the bidder shall have the capability in all respects to perform fully the bid requirements, and the tenacity, perseverance, experience, integrity, reliability, capacity, facilities, equipment, and credit which will assure good faith performance.

Also, County reserves the right to make such investigation as it deems necessary to determine the ability of any bidder to furnish the service requested. Information County deems necessary to make this determination shall be provided by the bidder. Such information may include, but shall not be limited to current financial statements, verification of availability of equipment and personnel, and past performance records.

A.19 APPLICABLE LAWS

Bidder must be authorized to transact business in the State of Florida. All applicable laws and regulations of the State of Florida and ordinances and regulations of Manatee County will apply to any resulting Agreement. Any involvement with the Manatee County Procurement Division shall be in accordance with the Manatee County Procurement Ordinance as amended.

A.20 COLLUSION

By submitting a bid in response to this IFBC, Bidder certifies that it has not divulged, discussed or compared its bid with any other bidder, and has not colluded with any other bidder or parties to this bid whatsoever. Further, Bidder, and in the case of a joint bid each party thereto, certifies as to their own organization, that in connection with this IFBC that:

a. All prices and/or cost data submitted have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices and/or cost data, with any other bidder or with any competitor;

b. All prices and/or cost data quoted for this bid have not been knowingly disclosed by the Bidder and will not knowingly be disclosed by the Bidder, prior to the scheduled opening, directly or indirectly to any other bidder or to any competitor;

c. No attempt has been made, or will be made, by Bidder to induce any other person or firm to submit or not to submit a bid for the purpose of restricting competition;

d. The only person or persons interested in this bid is/are named in Bidder’s Bid and that no person other than those identified has any interest in the Bid or in the resulting Agreement to be entered into.

e. No person or agency has been employed or retained to solicit or secure the resulting Agreement upon an agreement or understanding or a commission, percentage, brokerage, or contingent fee except bona fide employees or established commercial agencies maintained by Bidder for purpose of doing business.

A.21 CODE OF ETHICS

With respect to this and any bid, if a Bidder violates, directly or indirectly, the ethics provisions of the Manatee County Procurement Code and/or Florida criminal or civil laws related to public procurement, including but not limited to Florida Statutes Chapter 112, Part II, Code of Ethics for Public Officers and Employees, such Bidder will be ineligible for award to perform the work described in this IFBC, and may be disqualified from submitting on any future quote or bid requests to supply goods or services to Manatee County. By submitting a bid, the Bidder represents to County that all statements made, and materials submitted are truthful, with no relevant facts withheld.

A.22 PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES

A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime, as that term is defined in Section 287.133, Florida Statutes, may not submit a bid to provide any goods or services to a public entity; may not submit a bid with a public entity for the construction or repair of a public building or public work; may not submit bids on leases of real property to a public entity; may not be awarded or perform Work as a contractor, supplier, Subcontractor, or consultant under an agreement with any public entity; and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, Florida Statutes, for CATEGORY TWO for a period of thirty-six (36) months following the date of being placed on the convicted list.

In addition, the Manatee County Code of Laws prohibits the award of any bid to any person or entity who/which has, within the past five (5) years, been convicted of, or admitted to in court or sworn to under oath, a public entity crime or of any environmental law that, in the reasonable opinion of the Procurement Official, establishes reasonable grounds to believe the person or business entity will not conduct business in a responsible matter.

To ensure compliance with the foregoing, the Code requires all persons or entities desiring to do business with County to execute and file with the Purchasing Official an affidavit, executed under the pain and penalties of perjury, confirming that person, entity and any person(s) affiliated with the entity, does not have such a record and is therefore eligible to seek and be awarded business with County. In the case of a business entity other than a partnership or a corporation, such affidavit shall be executed by an authorized agent of the entity. In the case of a partnership, such affidavit shall be executed by the general partner(s). A Public Contracting and Environmental Crimes Certification form is attached herein for this purpose.

A.23 SCRUTINIZED COMPANIES

Florida Statutes § 287.135, as amended from time to time, may contain limitations on the part of a company to conduct business with the County. Submission of a response to this solicitation shall be subject to all procedural requirements contained within that statute including the submission of any required certification of eligibility to contract with the County. It shall be the responsibility of the company responding to this solicitation to concurrently review the current version of the statute and ensure it is compliant. To the extent a certification is required, it shall be provided on the form located at Appendix F *Vendor Certification Regarding Scrutinized Companies Lists*.

A.24 AGREEMENT

The successful Bidder will be required to execute the Agreement, a sample of which is attached hereto and made a part hereof. The County will transmit the Agreement to the successful Bidder for execution. The successful Bidder agrees to deliver the required number of duly executed copies of the Agreement, with any other required documents, to the County within ten calendar days of receipt.

A.25 LEGAL NAME

Bidders shall clearly indicate the full legal name, including any d/b/a, address, email address, and telephone number on the Bid Form. Bid Forms shall be signed above the typed or printed name and title of the signer. The signer must be an official of the organization and have the authority to bind the bidder to the submitted bid.

When bidder is a partnership, the Bid Form shall be signed in the name of the firm and by all partners required under the terms of the partnership agreement. When a corporation is a bidder, the authorized corporate officers shall sign.

Bidders who are corporations or limited partnerships shall provide a certified copy of their permit to transact business in the State of Florida, preferably along with the Bid Form, or within forty-eight (48) hours after request by County.

When submitting a bid as a joint venture, it must have filed paper documents with the Division of Profession’s Construction Industry Licensing Board prior to submitting a bid.

A.26 DISCOUNTS

All discounts must be incorporated in the prices contained in the bid and not shown separately. Unless otherwise specified in this IFBC, pricing must be all inclusive, including delivery costs. The prices indicated on the Pricing Form shall be the prices used in determining award.

A.27 TAXES

Manatee County is exempt from Federal Excise and State Sales Taxes. (F.E.T. Cert. No. 59-78-0089K; Florida Sales Tax Exempt Cert. No. 85-8012622206C-6). Therefore, the Bidder is prohibited from delineating a separate line item in its bid for any sales or service taxes.

The successful Bidder will be responsible for the payment of taxes of any kind, including but not limited to sales, consumer, use, and other similar taxes payable on account of the work performed and/or materials furnished under the award in accordance with all applicable laws and regulations.

A.28 QUALITY

Unless otherwise specifically provided in the IFBC documents, all goods provided shall be new, the latest make or model, of the best quality, of the highest grade of workmanship, and of the most suitable for the purpose intended.

Unless otherwise specifically provided in the IFBC documents, reference to any equipment, material, article or patented process, by trade name, brand name, make or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition.

A.29 AUTHORIZED PRODUCT REPRESENTATION

Bidder, by virtue of submitting the name and specifications of a manufacturer's product, will be required to furnish the named manufacturer's product. Failure to do so may, in the County's sole discretion, be deemed a material breach of the resulting agreement and shall constitute grounds for County's immediate termination of the resulting agreement.

A.30 ROYALTIES AND PATENTS

The successful Bidder shall pay all royalties and license fees for equipment or processes in conjunction with the equipment and/or services being furnished. Successful Bidder shall defend all suits or claims for infringement of any patent, trademark or copyright, and shall save County harmless from loss on account thereof, including costs and attorney's fees.

A.31 AMERICANS WITH DISABILITIES ACT

Manatee County does not discriminate upon the basis of any individual's disability status. This non-discrimination policy involves every aspect of County's functions including one's access to participation, employment, or treatment in its programs or activities. Anyone requiring reasonable accommodation for an information conference or bid opening should contact the person named on the cover page of this document at least twenty-four (24) hours in advance of either activity.

A.32 EQUAL EMPLOYMENT OPPORTUNITY

In accordance with Title VI of the Civil Rights Act of 1964, Title 15, Part 8 of the Code of Federal Regulations and the Civil Rights Act of 1992, Manatee County hereby notifies all Bidders that it will affirmatively ensure minority business enterprises are afforded full opportunity to participate in response to this IFBC and will not be discriminated against on the grounds of race, color, national origin, religion, sex, age, handicap, or marital status in consideration of award.

A.33 MINORITY AND/OR DISADVANTAGED BUSINESS ENTERPRISES

The State of Florida Office of Supplier Diversity provides the certification process and maintains the database of certified MBE/DBE firms. Additional information may be obtained at https://www.dms.myflorida.com/agency_administration/office_of_supplier_diversity_osd or by calling (850) 487-0915.

A.34 DELIVERY

Unless otherwise specified, all prices shall include all delivery cost (FOB Destination).

A.35 MATHEMATICAL ERRORS

a. Bid pricing forms without imbedded mathematical formulas: In the event of multiplication/extension error(s), the unit price shall prevail. In the event of addition error(s) the extension totals will prevail. In the event the dollar amount for contract contingency is omitted, it will be added to the total price of the Bid.

b. Bid pricing forms with imbedded mathematical formulas: Interactive bid pricing forms that contain mathematical formulas may be provided to automate lengthy and complex bid forms. In the event bid pricing forms with imbedded formulas are used and a multiplication/extension error(s) is discovered in the formula, the unit price entered by the Bidder shall prevail.

c. Bidder shall assume the responsibility and accuracy of the information input in the bid pricing form and therefore shall verify that the calculations are correct before submitting its Bid.

d. Regardless of the type of bid pricing form used, all Bids shall be reviewed mathematically by the County using these standards.

A.36 SUBCONTRACTORS

The successful bidder will obtain prior written approval from the County for any subcontractor(s) and the work each will perform. A subcontractor is defined as any entity performing work within the scope of the project who is not an employee of the successful Bidder.

Bidders subcontracting any portion of the work shall include a list of subcontractors along with their bid. The list shall include: name and address of subcontractor, type of work to be performed and the percent of the contract amount to be subcontracted.

A.37 E-Verify

Prior to the employment of any person under this contract, the successful Bidder shall utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of (a) all persons employed during the contract term by the successful Bidder to perform employment duties within Florida and (b) all persons, including subcontractors, assigned by the successful Bidder to perform work pursuant to the contract with Manatee County. For more information on this process, please refer to United States Citizenship and Immigration Service site at: http://www.uscis.gov/.

Only those individuals determined eligible to work in the United States shall be employed under this contract.

By submission of a bid in response to this IFBC, the successful Bidder commits that all employees and subcontractors will undergo e-verification before placement on this contract.

The successful Bidder shall maintain sole responsibility for the actions of its employees and subcontractors. For the life of the contract, all employees and new employees brought in after contract award shall be verified under the same requirement stated above.

A.38 DISCLOSURE

Upon receipt, all inquiries and responses to inquiries related to this IFBC become "Public Records," and shall be subject to public disclosure consistent with Florida Statues, Chapter 119.

Bids become subject to disclosure thirty (30) days after the opening or if a notice of intent to award decision is made earlier than this time as provided by Florida Statutes § 119.071(1)(b). No announcement or review of the bids shall be conducted at the public opening.

Based on the above, County will receive bids at the time and date stated and will make public at the opening the names of the business entities of all that submitted a bid.

If County rejects all bids and concurrently notices its intent to reissue the solicitation, the rejected bids are exempt from public disclosure until such time as County provides notice of an intended decision concerning the reissued solicitation or until County withdraws the reissued

solicitation. A bid is not exempt for longer than twelve (12) months after the initial notice rejecting all bids.

Pursuant to Florida Statutes 119.0701, to the extent successful Bidder is performing services on behalf of the County, successful Bidder must:

a. Keep and maintain public records required by public agency to perform the service.

b. Upon request from the public agency's custodian of public records, provide the public agency with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Florida Statutes, Chapter 119, or as otherwise provided by law.

c. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of the contract if the successful Bidder does not transfer the records to the public agency.

d. Upon completion of the contract, transfer, at no cost, to the public agency all public records in possession of contractor or keep and maintain public records required by the public agency to perform the service. If the successful Bidder transfers all public records to the public agency upon completion of the contract, the successful Bidder shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the successful Bidder keeps and maintains public records upon completion of the contract, the successful Bidder shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the public agency, upon request from public agency's custodian of public records, in a format that is compatible with the information technology systems of the public agency.

IF THE SUCCESSFUL BIDDER HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE SUCCESSFUL BIDDER'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO ANY RESULTING CONTRACT, CONTACT COUNTY'S CUSTODIAN OF PUBLIC RECORDS AT:

Phone: (941) 742-5845
Email: debbie.scaccianoce@mymanatee.org
Mail: Manatee County BCC
Attn: Records Manager
1112 Manatee Ave W.
Bradenton, FL 34205.

A.39 LOCAL PREFERENCE

Local business is defined as a business legally authorized to engage in the sale of the goods and/or services, and which certifies within its Bid that for at least six (6) full months prior to the advertisement of this IFBC it has maintained a physical place of business in Manatee, Desoto, Hardee, Hillsborough, Pinellas or Sarasota County with at least one full-time employee at that location.

Local preference shall not apply to the following categories of agreements:

a. Purchases or agreements which are funded, in whole or in part, by a governmental or other funding entity, where the terms and conditions governing the funds prohibit the preference.
b. Any bid announcement which specifically provides that local preference, as set forth in this section, is suspended due to the unique nature of the goods or services sought, the existence of an emergency as found by either the County Commission or County Administrator, or where such suspension is, in the opinion of the County Attorney, required by law.
c. For a competitive solicitation for construction services in which fifty percent (50%) or more of the cost will be paid from state.

d. To qualify for local preference under this section, **a local business must certify to County** by completing an "**Affidavit as to Local Business Form,"** which is available for download at www.mymanatee.org/vendor. Click on "Affidavit for Local Business" to access and print the form. Complete, notarize, and mail the notarized original to the following address: Manatee County Procurement Division, 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205.

e. It is the responsibility of the bidder to ensure accuracy of the Affidavit as to Local Business and notify County of any changes affecting same.

A.40 VENDOR REGISTRATION

Registering your business will provide Manatee County a sourcing opportunity to identify suppliers of needed goods and services and identify local businesses. To register as a supplier with the County go to www.mymanatee.org/vendor. For assistance with supplier registration, call the Procurement Division main number at (941) 749-3014. Office hours are Monday – Friday, 8:00 A.M. to 5:00 P.M., excluding County holidays.

A link to Vendor Registration is listed on the Procurement Division's web page at http://www.mymanatee.org/home/government/departments/financial-management/purchasing.html. Click on *"Register as a Vendor",* then "*Vendor Registration Form"*. Registration is not mandatory to submit a Bid.

A.41 ENVIRONMENTAL SUSTAINABILITY

All bidders are encouraged to use as many environmentally preferable "green" products, materials, as supplies, as possible to promote a safe and healthy environment. Environmentally preferable are products or services that have a reduced adverse effect on the environment.

Bidder shall acknowledge in its Bid if Bidder has an environmental sustainability initiative. In addition, Bidder shall submit with its Bid a brief summary of Bidder's environmental sustainability initiative. This information will be used as a determining factor in the award decision when all other factors, including local preference, are otherwise equal.

A.42 ePAYABLES

Manatee County Board of County Commissioners and the Manatee County Clerk of the Circuit Court have partnered to offer the ePayables program, which allows payments to be made to vendors via credit cards.

The Clerk of the Circuit Court will issue a unique credit card number to vendor after goods are delivered or services rendered, vendors submit invoices to the remit to address on the purchase order. When payments are authorized, an email notification is sent to the vendor. The email notification includes the invoice number(s), invoice date(s), and amount of payment. There is no cost for vendors to participate in this program; however, there may be a charge by the company that processes your credit card transactions.

If Bidder is interested in participating in this program, complete the ePayables Application attached herein and return the completed form via email to lori.bryan@manateeclerk.com.

A.43 BASIS OF AWARD

County will not make award to a Bidder who is delinquent in payment of any taxes, fees, fines, contractual debts, judgments, or any other debts due and owed to the County, or is in default on any contractual or regulatory obligation to the County. By submitting this solicitation response, Bidder attests that it is not delinquent in payment of any such debts due and owed to the County, nor is it in default on any contractual or regulatory obligation to the County. In the event the Bidder's statement is discovered to be false, bidder will be subject to suspension and/or debarment and the County may terminate any award it has with bidder.

Award shall be to the lowest, responsive, responsible bidder(s) meeting specifications which includes delivery time requirements, qualification requirements, and having the lowest total offer for requirements listed on the Bid Form for the Work as set forth in this IFBC. Bid prices shall include costs for furnishing all labor, equipment and/or materials for the completion of the Work to the County's satisfaction, in accordance with and in the manner set forth and described in the IFBC documents and within the prescribed time.

Only one (1) completion schedule for 90 calendar days shall be submitted and considered.

In evaluating Bids, County shall consider the qualifications of the Bidders; and if required, may also consider the qualifications of the subcontractors, suppliers, and other persons and organizations proposed. County may also consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work.

Whenever two or more responsive, responsible bids which are equal with respect to price and all other evaluation factors are received, the bid from the local business shall be given preference in award.

Whenever two or more responsive, responsible bids which are equal with respect to price are received, and both or neither of these bids are from a local business, the award shall be determined by a chance drawing, coin toss, or similar tie-breaking method conducted by the Procurement Division and open to the public.

Bidder acknowledges that County has, or may hire, others to perform work similar to or the same as that which is within the scope of work of this IFBC. In the event that the successful Bidder cannot meet the delivery time or availability requirements of materials, the County, at its sole discretion can obtain the goods and services from other sources.

A.44 SCOPE OF WORK

The successful Bidder shall furnish and install all materials, equipment and labor which is reasonably inferable and necessary for the proper completion of the Work specified in this IFBC, whether specifically indicated in the IFBC or not.

The successful Bidder shall furnish all shop drawings, work drawings, labor, materials, equipment, tools, services and incidentals necessary to complete all Work required by these Specifications.

The successful Bidder shall perform the Work complete, in place and ready for continuous service and shall include any repairs, replacements, and / or restoration required as a result of damages caused prior to acceptance by the County.

The Scope of Work consist of the hydraulic placement of 74,805 cubic yards of fill on Coquina Beach, located immediately north of Longboat Pass on the southern end of Anna Maria Island in Manatee County. The project area extends approximately 7,747 feet from beach monument number R-33 southward to R-41 as shown on the Plans.

A.45 COMPLETION OF WORK

The Work will be completed and ready for final inspection within the specified calendar days from the date the Contract Time commences to run. Completion time shall be based on 90 calendar days.

A.46 LIQUIDATED DAMAGES

If the successful Bidder fails to achieve substantial completion of the Work within the contract time and as otherwise required by the Agreement (to include not only the entire Work but any portion of the Work as set forth therein), the County shall be entitled to retain or recover from the successful Bidder, as liquidated damages and not as a penalty, the sum of $2,300.00 per calendar day, commencing upon the first day following expiration of the contract time and continuing until the actual date of substantial completion.

Such liquidated damages are hereby agreed to be a reasonable estimate of damages the County will incur because of delayed completion of the Work. The County may deduct liquidated damages as described in this paragraph from any unpaid amounts then or thereafter due the successful bidder under this Agreement. Any liquidated damages not so deducted from any unpaid amounts due the successful bidder shall be payable to the County at the demand of the County, together with interest from the date of the demand at the maximum allowable rate.

A.47 CONTRACT CONTINGENCY WORK

Contract contingency is a monetary allowance used solely at County's discretion to handle unexpected conditions as required to satisfactorily complete the Work in accordance with the IFBC documents. A Field Directive must be issued by an authorized County representative to authorize use of contract contingency funds.

The percentage for contract contingency is listed on the Bid Form. Bidder shall enter the dollar amount for contract contingency based on the percentage of the total base bid. The total contract award will include contract contingency.

Appropriate uses of contract contingency include increases to existing bid item quantities that do not change the initial scope of Work, which may be directed by County staff; modification items not originally bid which were unforeseen yet necessary during the Work to provide a safe, complete Project and that do not change the initial scope of Work; and unanticipated conflicts and/or design changes required during construction which are necessary to provide a safe, complete Project and that do not change the initial Scope of Work.

Inappropriate uses of contract contingency include anything that changes the initial scope of Work, including the Contract Sum and Contract Time, and adding bid items not previously contemplated that change the initial scope of Work.

A.48 LICENSES AND PERMITS

The successful Bidder shall be solely responsible for obtaining all necessary license and permit fees, including, but not limited to, all license fees, permit fees, impact fees, or inspection fees, and responsible for the costs of such fees. Successful Bidder is solely responsible for ensuring all work complies with all Federal, State, local, and Manatee County ordinances, orders, codes, laws, rules, regulations, directives, and guidelines.

A.49 PROTEST

Any actual bidder, proposer, or contractor who is aggrieved in connection with the notice of intent to award of a contract with a value greater than $250,000 where such grievance is asserted to be the result of a violation of the requirements of the Manatee County Procurement Code or any applicable provision of law by the officers, agents, or employees of the County, may file a protest to the Procurement Official.

Protest must be in writing and delivered via email at purchasing@mymanatee.org or by hand delivery to the Procurement Division at 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205 by 5:00 p.m. on the fifth business day following the date of posting of the Notice of Intent to Award on the County website. There is no stay of the procurement process during a protest. The Procurement Official shall have the authority to settle and resolve a protest concerning the intended award of a contract.

For additional information regarding the County protest process, visit the Procurement Division webpage on the County website.

A.50 ACCESSIBILITY

The County is committed to making its documents and information technologies accessible to individuals with disabilities by meeting the requirements of Section 504 of the Rehabilitation Act and best practices (w3C WCAG 2). **For assistance with accessibility regarding this solicitation, contact the Manatee County Procurement Division via email at purchasing@mymanatee.org or by phone at 941-748-4501 X3014.**

Successful Bidder shall ensure all its electronic information, documents, applications, reports, and deliverables required under this Agreement are in a format that meets the requirements of Section 504 of the Rehabilitation Act and best practices (w3C WCAG 2).

Where not fully compliant with these requirements and best practices, Successful Bidder shall provide clear points of contact for each document and information technology to direct users in how to obtain alternate formats. Further, successful Bidder shall develop accommodation strategies for those non-compliant resources and implement strategies to resolve the discrepancies.

A.51 SOLICITATION SCHEDULE

The following schedule has been established for this Solicitation process. Refer to the County's website (www.mymanatee.org > Business > *Bids & Proposals*) for meeting locations and updated information pertaining to any revisions to this schedule.

Scheduled Item	Scheduled Date
Non-Mandatory Solicitation Information Conference via ZOOM	December 21, 2020 at 10:00 AM
Question and Clarification Deadline	December 31, 2020
Final Addendum Posted	January 5, 2021
Bid Response Due Date and Time	January 13, 2021, 3:00 PM, ET
Due Diligence Review Completed	January 15, 2021
Projected Award	Fenruary 2021

NOTE: Any statements contained in the Scope of Work, Bid Summary, Construction Agreement, General Conditions of the Construction Agreement and/or Exhibits which vary from the information in Section A, Information for Bidders, shall have precedence over the Information for Bidders.

END OF SECTION A

SECTION B, BID FORMS

(To be completed and returned with Bid)

APPENDIX A, MINIMUM QUALIFICATIONS

APPENDIX A, MINIMUM QUALIFICATIONS

IFBC No. 21-R075936CD

Bidders must submit the information and documentation requested in this Attachment that confirms Bidder meets the following minimum qualification requirement(s):

1. Must have been registered with the State of Florida, Division of Corporations to do business in Florida.

   No documentation is required. The County will verify registration.

2. Bidder, or its representative(s), has made an inspection of the construction site for work specified in this IFBC on or after the date of advertisement of this IFBC and prior to the Due Date and Time.

   Bidder must submit a statement on company letterhead and signed by an authorized official of Bidder that Bidder, or its representative(s), has made an inspection of the construction site, listing the date of the inspection and the individuals, by name, who conducted the inspection.

3. Must have possessed a General Contractor's license issued by the Florida Department of Business and Professional Regulation for a period of at least three consecutive years since November 30, 2017. License must be current and valid through the Due Date for submission of bids for this IFBC.

   Provide a copy of Bidder's General Contractor's license issued by the Florida Department of Business and Professional Regulation and documentation confirming Bidder has been licensed and/or certified for the period of November 30, 2017 through the date of submission of the Bid.

4. Bidder has provided beach nourishment for at least three projects since November 30, 2015, in which at least one project included inlet dredging in the open Gulf of Mexico (channel and/or ebb shoal).

   Provide the following information for the three qualifying projects.

   a) Name of client
   b) Project name
   c) Location (City/State)
   d) Client contact name
   e) Contact phone
   f) Contact email
   g) Service dates (Start/End)

5. Bidder, on the day the bid is submitted, has a certified or registered Qualifying Agent, as required by Section 489.119, Florida Statutes, and that Qualifying Agent has been the same Qualifying Agent of Bidder for a period of at least three consecutive years, since November 30, 2017.

   Submit a copy of Bidder's Qualifying Agent's registration or certification along with supporting documentation confirming Qualifying Agent has been the Qualifying Agent for Bidder for three years, since November 30, 2017.

6. Bidder must submit all documentation required on page TS-28 of the Technical Specifications, Part 2- Technical Provisions, Section 2. Contractor Qualifications.

   Submit all documentation required for the nine (9) items in this section under the heading of "Bidder Qualifications".

7. Bidder is not on the Florida Department of Management Services Suspended, Debarred, Convicted Vendor Lists.

   No documentation is required. The County will verify

8. If Bidder is submitting as a joint venture must file the required documents with the Florida Department of Business and Professional Regulation as required by Florida Statute Section 489.119, prior to the Due Date and Time.

   If Bidder is not a joint venture, provide a statement to that effect. If Bidder is a joint venture, provide a copy of Bidder's approved filing with the Florida Department of Business and Professional Regulation.

9. Bidder has no reported conflict of interests in relation to this IFBC.

   Submit a fully completed copy of Appendix J. If applicable, on a separate page disclose the name of any officer, director or agent who is also an employee of the County. Disclose the name of any County employee who owns, directly or indirectly, any interest in the Bidder's firm or any of its branches. If no conflicts of interests are present, Bidder must submit a statement to that affect.

   END OF APPENDIX A

APPENDIX B, BIDDER'S QUESTIONNAIRE

Bidder must fully complete and return this form with its Bid. Bidder warrants the truth and accuracy of all statements and answers herein contained. (Attach additional pages if necessary.)

THIS QUESTIONNAIRE MUST BE COMPLETED AND SUBMITTED WITH YOUR BID

1. Contact Information:

FEIN #: ______________________________

License #: ______________________________
License Issued to: ______________________________
Date License Issued (MM/DD/YR): ______________________________
Company Name: ______________________________
Physical Address: ______________________________
City: ____________ State of Incorporation: ________ Zip Code: ________
Phone Number: ( ) ____________ Fax Number: ( ) ____________
Email address: ______________________________

2. Bidding as: an individual __; a partnership __; a corporation __; a joint venture __

3. If a partnership, list names and addresses of partners; if a corporation, list names of officers, directors, shareholders, and state of incorporation; if joint venture, list names and address of ventures' and the same if any venture are a corporation for each such corporation, partnership, or joint venture:

____
____
____
____

4. Bidder is authorized to do business in the State of Florida: ☐ Yes ☐ No

For how many years? ______

5. Your organization has been in business (under this firm's name) as a

____

Is this firm in bankruptcy? ______

6. Attach a list of projects where this specific type of Work was performed.

BIDDER: ______________________________

7. Is this firm currently contemplating or in litigation? Provide summary details.

____

____

____

8. Have you ever been assessed liquidated damages under a contract during the past five (5) years? If so, state when, where (contact name, address and phone number) and why.

____

____

____

9. Have you ever failed to complete Work awarded to you? Or failed to complete projects within contract time? If so, state when, where (contact name, address, phone number) and why.

____

____

____

10. Have you ever been debarred or prohibited from providing a bid to a governmental entity? If yes, name the entity and describe the circumstances.

____

____

____

11. Will you subcontract any part of this Work? If so, describe which portion(s) and to whom.

____

____

____

12. If any part of work will be subcontracted, list MBE/DBE/WBE/VETERAN to be utilized. Include the estimated dollar amount of the portion of Work each will perform.

____

____

____

BIDDER: ____________________________________

13. What equipment do you own to accomplish this Work? (A listing may be attached)

____

____

____

14. What equipment will you purchase/rent for the Work? (Specify which)

____

____

____

15. If applicable to the Work for this IFBC, Drilling Supervisor Qualifications: Contractor shall provide a boring specialist who shall remain on the project site during the entirety of the directional boring operation. This includes, but is not limited to, drilling fluid preparation, seaming, boring and pulling. The boring specialist shall have a minimum of five (5) years' experience in supervising directional bores of similar nature, diameter, materials and lengths. (Reference: Specification Section 02619, Horizontal Directional Drilling).

Provide the contact information for a minimum of three (3) projects wherein the boring specialist has performed this type of work, diameter, materials and lengths.

Boring specialist's name: ____
Boring specialist's years of experience in supervising directional bores ____________________
Provide contact name, and contact number for projects:

____

____

____

16. If applicable to the Work for this IFBC, Pipe Fusion Qualifications: All boring and fusing equipment shall be certified for operation. The Contractor responsible for thermal butt fusing pipe and fittings shall have manufacturer certification for performing such work or a minimum of five (5) years of experience performing this type of work.

Thermal butt fusing pipe and fittings contractor or subcontractor's name: __________________
Attach a copy of contractor's/subcontractor's manufacturer certification to this Questionnaire
OR
Provide contractor's/subcontractor's years of experience in thermal butt fusing pipe and fittings _______
If manufacturer certification is not provided, include contact name, and contact number for projects that confirms five years of experience:

____

____

____

BIDDER: ___________________________________

17. If applicable to the Work for this IFB, Pipe Bursting Qualifications: The Contractor shall be certified by the manufacturer of the pipe bursting system that they are fully trained licensed installer of the manufacturer's pipe bursting system. Contractor shall provide a letter to the County documenting this requirement. (Reference: Specification Section 02619A, Pipe Bursting (PB) of Existing Mains).

18. List the following regarding the surety which is providing the bond(s):

Surety's Name: ______________________________
Address: ______________________________
____

Name, address, phone number and email of surety's resident agent for service of process in Florida:

Agent's Name: ______________________________
Address: ______________________________
____
Phone: ______________________________
Email: ______________________________

19. Is Bidder a local business as defined in Section A.38, Local Preference?

☐ Yes ☐ No

If yes, by signing below Bidder certifies that for at least six months prior to the advertisement date of this IFB it has maintained a physical place of business in Manatee, Desoto, Hardee, Hillsborough, Pinellas or Sarasota counties with at least one full-time employee at that location.

BIDDER: ______________________________

BY: ______________________________

PRINTED NAME: ______________________________

TITLE/DATE: ______________________________

PHYSICAL ADDRESS OF QUALIFYING LOCAL LOCATION: ______________________________

____

NAME OF QUALIFYING EMPLOYEE AT LOCAL LOCATION: ______________________________

BIDDER: ______________________________

20. Confirm if Bidder has an environmental sustainability initiative as defined in Section A.41.

☐ Yes ☐ No

If yes, submit a brief summary (2-3 paragraphs) of the environmental sustainability initiative.

BIDDER: ___________________________________

APPENDIX C, ENVIRONMENTAL CRIMES CERTIFICATION

SWORN STATEMENT PURSUANT TO ARTICLE V, MANATEE COUNTY PROCUREMENT CODE

Bidder must fully complete and return this form with its Bid. This form must be signed and sworn to in the presence of a notary public or other official authorized to administer oaths.

This sworn statement is submitted to the Manatee County Board of County Commissioners by

____

[Print individual's name and title]

for ____ [Print name of entity submitting sworn statement]

whose business address is ____

and (if applicable) its Federal Employer Identification Number (FEIN) is ________________. If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement: _____________________.

I understand that no person or entity shall be awarded or receive an Owner's Agreement for public improvements, procurement of goods or services (including professional services) or an Owner's lease, franchise, concession or management agreement, or shall receive a grant of Owner's monies unless such person or entity has submitted a written certification to Owner that it has not:

> (1) been convicted of bribery or attempting to bribe a public officer or employee of Manatee County, the State of Florida, or any other public entity, including, but not limited to the Government of the United States, any state, or any local government authority in the United States, in that officer's or employee's official capacity; or
>
> (2) been convicted of an agreement or collusion among bidders or prospective bidders in restraint of freedom of competition, by agreement to bid a fixed price, or otherwise; or
>
> (3) been convicted of a violation of an environmental law that, in the sole opinion of Owner's Purchasing Official, reflects negatively upon the ability of the person or entity to conduct business in a responsible manner; or
>
> (4) made an admission of guilt of such conduct described in items (1), (2) or (3) above, which is a matter of record, but has not been prosecuted for such conduct, or has made an admission of guilt of such conduct, which is a matter of record, pursuant to formal prosecution. An admission of guilt shall be construed to include a plea of nolo contendere; or
>
> (5) where an officer, official, agent or employee of a business entity has been convicted of or has admitted guilt to any of the crimes set forth above on behalf of such an entity and pursuant to the direction or authorization of an official thereof (including the person committing the offense, if he is an official of the business entity), the business shall be chargeable with the conduct herein above set forth. A business entity shall be chargeable with the conduct of an affiliated entity, whether wholly owned, partially owned, or one which has common ownership or a common Board of Directors. For purposes of this Form, business entities are affiliated if, directly or indirectly, one business entity controls or has the power to control another business entity, or if an individual or group of individuals controls or has the power to control both entities. Indicia of control shall include, without limitation, interlocking management or ownership, identity of interests among family members, shared organization of a business entity following the ineligibility of a business entity under this

Article, or using substantially the same management, ownership or principles as the ineligible entity.
(Continued)

Any person or entity who claims that this Article is inapplicable to him/her/it because a conviction or judgment has been reversed by a court of competent jurisdiction shall prove the same with documentation satisfactory to Owner's Purchasing Official. Upon presentation of such satisfactory proof, the person or entity shall be allowed to contract with Owner.

I UNDERSTAND THAT THE SUBMISSION OF THIS FORM TO THE CONTRACTING OFFICER FOR MANATEE COUNTY IS VALID THROUGH DECEMBER 31 OF THE CALENDAR YEAR IN WHICH IT IS FILED. I ALSO UNDERSTAND THAT ANY AGREEMENT OR BUSINESS TRANSACTION SHALL PROVIDE FOR SUSPENSION OF PAYMENTS, OR TERMINATION, OR BOTH, IF THE CONTRACTING OFFICER OR COUNTY ADMINISTRATOR DETERMINES THAT **SUCH** PERSON OR ENTITY HAS MADE FALSE CERTIFICATION.

____
[Signature]

STATE OF ________________________________
COUNTY OF ______________________________

Sworn to and subscribed before me this _____ day of _________________, 20_____ by _________________

Who is personally known / has produced ____ as identification
[Type of identification]

My commission expires ____________________________

____
Notary Public Signature

____
[Print, type or stamp Commissioned name of Notary Public]

Signatory Requirement - In the case of a business entity other than a partnership or a corporation, this affidavit shall be executed by an authorized agent of the entity. In the case of a partnership, this affidavit shall be executed by the general partner(s). In the case of a corporation, this affidavit shall be executed by the corporate president.

APPENDIX D, FLORIDA TRENCH SAFETY ACT

Bidder must fully complete and return this form with its Bid. This form must be singed in the presence of a notary public or by an officer authorized to administer oaths.

1. This Sworn Statement is submitted with **IFBC NO. 21-R075936CD**
2. This Sworn Statement is submitted by____ whose business address is____ and, if applicable, its Federal Employer Identification Number (FEIN) is________________. If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement _________________.
3. Name of individual signing this Sworn Statement is: _____________________________________,
Whose relationship to the above entity is: ____.
4. The Trench Safety Standards that will be in effect during the construction of this project shall include, but are not limited to: Laws of Florida, Chapters 90-96, TRENCH SAFETY ACT, and OSHA RULES AND REGULATIONS 29 CFR 1926.650 Subpart P, effective October 1, 1990.
5. The undersigned assures that the entity will comply with the applicable Trench Safety Standards and agrees to indemnify and hold harmless the County and Engineer of Record, and any of their agents or employees from any claims arising from the failure to comply with said standard.
6. The undersigned has appropriated the following costs for compliance with the applicable standards:

Trench Safety Measure (Description)	Units of MeasureUnit (LF, SY)	Quantity	Unit Cost	Extended Cost
a. _____________	_________	__________	$___________	____________
b. _____________	_________	___________	$___________	_____________
c. _____________	_________	___________	$___________	_____________
d. _____________	_________	___________	$___________	_____________

7. The undersigned intends to comply with these standards by instituting the following procedures:
____
____
____

THE UNDERSIGNED, in submitting this bid, represents that they have reviewed and considered all available geotechnical information and made such other investigations and tests as they may deem necessary to adequately design the trench safety system(s) to be utilized on this project.

____
(Authorized signature / Title)

SWORN to and subscribed before me this __________ day of _____________, 20_____.
(Impress official seal)

Notary Public, State of Florida: ____

My commission expires: ____

Angelina M. Colonneso
CLERK OF THE CIRCUIT COURT AND COMPTROLLER OF MANATEE COUNTY

1115 Manatee Avenue West, Bradenton, Florida 34205 - Phone (941) 749-1800 Fax (941) 741-4082, P.O. Box 25400, Bradenton, Florida 34206 - www.manateeclerk.com

Bidder must fully complete and return this form with its Bid.

APPENDIX E: ePAYABLES APPLICATION

Company name____

Contact person____

Phone number____

Email Address____

FINANCE USE ONLY

Open orders: YES or NO

PEID ____

CREATE DATE ____

CONFIRMED WITH

____
Name and phone number

IFAS ______________________

BANK ______________________

INITIALS_____________________

Return completed form to:
Via email to: lori.bryan@manateeclerk.com
Via fax to: (941) 741-4011
Via mail:
PO Box 1000
Bradenton, Fl 34206

Revised: September 30, 2015

"Pride in Service with a Vision to the Future"
Clerk of the Circuit Court – Clerk of Board of County Commissioners – County Comptroller – Auditor and Recorder

APPENDIX F, SCRUTINIZED COMPANY CERTIFICATION

This certification is required pursuant to Florida State Statute Section 287.135.

As of July 1, 2011, a company that, at the time of bidding or submitting a proposal for a new contract or renewal of an existing contract, is on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List is ineligible for, and may not bid on, submit a proposal for, or enter into or renew a contract with an agency or local governmental entity for goods or services of $1 million or more.

Bidder must fully complete and return this form with its Bid.

Company ___________________________________ FID or EIN No. __________________________

Address ____

City _______________________________________ State ________________ Zip _____________

I, ____, as a representative of __________________________ certify and affirm that this company is not on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List.

____ ____
Signature Title

____ ____
Printed Name Date

APPENDIX G
MANATEE COUNTY, A POLITICAL SUBDIVISION OF THE STATE OF FLORIDA
INDEMNITY AND HOLD HARMLESS
IFBC No. 21-R075963CD

Bidder must fully complete and return this form with its Bid.

Bidder shall defend, indemnify and hold harmless the County and all of the County's officers, agents, employees, and volunteers from and against all claims, liability, loss and expense, including reasonable costs, collection expenses, attorneys' fees, and court costs which may arise because of the negligence (whether active or passive), misconduct, or other fault, in whole or in part (whether joint, concurrent, or contributing), of Respondent, its officers, employees, representatives and agents in performance or non-performance of its obligations under the Contract/Agreement. Bidder recognizes the broad nature of this indemnification and hold harmless clause, as well as the provision of a legal defense to the County when necessary, and voluntarily makes this covenant and expressly acknowledges the receipt of such good and valuable consideration provided by the County in support of these indemnification, legal defense and hold harmless contractual obligations in accordance with the laws of the State of Florida. This clause shall survive the termination of this Contract/Agreement. Compliance with any insurance requirements required elsewhere within this Contract/Agreement shall not relieve Bidder of its liability and obligation to defend, hold harmless and indemnify the County as set forth in this article of the Contract/Agreement.

Nothing herein shall be construed to extend the County's liability beyond that provided in section 768.28, Florida Statutes.

PROJECT NUMBER AND/OR NAME	
INSURANCE AGENT	
RESPONDENT SIGNATURE	**DATE**

Acknowledgement:

STATE OF ___________________________ COUNTY OF ________________________

The foregoing instrument was acknowledged before me this _____ day of _________________,

20____ by ____ [FULL LEGAL NAME], who is

personally known to me / has produced ____ as identification.

Notary Signature ____

Print Name ____

APPENDIX H, INSURANCE STATEMENT

Bidder must fully complete and return this form with its Bid.

THE UNDERSIGNED has read and understands the insurance requirements of this IFBC applicable to any contract resulting from this solicitation and shall provide the insurances required by this Appendix within ten (10) days from the date of Notice of Intent to Award.

Bidder Name: ______________________ Date: ______________

Signature (Authorized Official): ______________________________

Printed Name/Title: ______________________________

Insurance Agency: ______________________________

Agent Name: ______________________ Agent Phone: ______________

APPENDIX I, ACKNOWLEDGMENT OF ADDENDA

The undersigned acknowledges receipt of the following addenda:

Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:

Print or type Bidder's information below:

Name of Bidder
Telephone Number

Street Address
City/State/Zip

Email Address

Print Name & Title of Authorized Officer
Signature of Authorized Official Date

APPENDIX J, AFFIDAVIT OF NO CONFLICT

COUNTY OF ________________________
STATE OF __________________________

BEFORE ME, the undersigned authority, this _____ day of ________________, 20____ personally appeared, ____, a principal with full authority to bind ____ (hereinafter the "Affiant"), who being first duly sworn, deposes and says:

(a) is not currently engaged or will not become engaged in any obligations, undertakings or contracts that will require the Affiant to maintain an adversarial role against the County or that will impair or influence the advice, recommendations or quality of work provided to the County; and

(b) has provided full disclosure of all potentially conflicting contractual relationships and full disclosure of contractual relationships deemed to raise a question of conflict(s); and

(c) has provided full disclosure of prior work history and qualifications that may be deemed to raise possible question of conflict(s).

Affiant makes this affidavit for the purpose of inducing Manatee County, a political subdivision of the State of Florida, to enter into an Agreement for Coquina Beach Strom Damage Restoration Proejct.

If applicable, on a separate page Bidder shall disclose the name of any officer, director or agent of Bidder who is also an employee of the County and the name of any County employee who owns, directly or indirectly, any interest in the Bidder's firm or any of its branches. If no conflicts of interest are present, submit a statement to that affect.

____
Signature

____
Print Name

SUBSCRIBED to and sworn before me this ____ day of ________________, 20___.

[Notary Seal]

Notary Public

My commission expires: _____________

____
Notary Signature

____
Print Name

Personally known OR produced identification. Type of identification produced ______________________________

____________________________.

Appendix K,

FORM 1, CLEAN AIR AND FEDERAL WATER POLLUTION CONTROL ACTS

Clean Air Act (42 U.S.C. 7401–7671q.) and the Federal Water Pollution Control Act (33U.S.C. 1251–1387), as amended - If awarded, Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401–7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C.1251–1387). Contractor shall report all violations of such Acts to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

Acknowledged by:

____
Firm Name (print)

____
Signature

____
Printed Name and Title

Appendix L,

FORM 2, DEBARMENT AND SUSPENSION

By signing below, Contractor confirms that it **is not** listed on the government wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), ‘‘Debarment and Suspension.’’

____
Firm Name (print)

____
Signature

____
Printed Name and Title

Appendix M,

FORM 3, BYRD ANTI-LOBBYING AMENDMENT

By signing below, Contractor confirms that it has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352

____

Firm Name (print)

____

Signature

____

Printed Name and Title

Appendix N,

FORM 4, MINORITY/WOMEN-OWNED/LABOR SURPLUS FIRMS' PARTICIPATION

Pursuant to C.F.R. 200.321 Contractor, agrees to take the affirmative steps listed in items 1 through 5 below:

1. Place qualified small and minority businesses and women-owned business enterprises on its solicitation lists;
2. Assure that small and minority businesses, and women-owned business enterprises are solicited whenever they are potential sources;
3. Divide total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small, minority, and women-owned business enterprises;
4. Establish delivery schedules, where the requirement permits, which encourage participation by small, minority, and women-owned business enterprises;
5. Use the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.

____
Firm Name (print)

____
Address

____
City/State/Zip

____
Signature

____
Printed Name and Title

APPENDIX O, BID PRICING FORM

IFBC No. 21-R075936CD: COQUINA BEACH STORM DAMAGE RESTORATION PROJECT

Total Bid Price/Offer for Bid: $_________________________ Complete. Based on a

completion time of 90 calendar days.

We, the undersigned, hereby declare that we have carefully reviewed the IFB Documents in their entirety and with full knowledge and understanding of the Bid information and all its requirements, submit this Bid, which is complete in meeting each specification, term, and condition contained therein.

As Bidder, we understand that the IFB documents, including but not limited to, all specifications, terms, and conditions shall be made a part of any resulting Agreement between County and the successful Bidder. Failure by successful Bidder to comply with such specifications, terms and conditions shall result in Agreement default, whereupon, the defaulting successful Bidder shall be required to pay for all re-procurement costs, damages, and attorney fees as incurred by County, and agrees to forfeit its bid bond.

Authorized Signature(s): ____

Name and Title of Above Signer(s):

____

Date: ____

BID FORM

CORTEZ BEACH STORM DAMAGE RESTORATION PROJECT
Bid Based on Completion Time of 90 Calendar Days

ITEM NO.	DESCRIPTION	EST. QTY.	U/M	UNIT PRICE	EXTENDED PRICE
1	**MOBILIZATION/ DEMOBILIZATION**	1	LS	$	$
2	**Beach Fill Placement (Maximum Quantity)**	74,805	Cubic Yards	$	$
3	**Beach Tilling**	5	Acres	$	$
4	**Remediation of Non-Compliant Material (See Note 2 below)**	1	Acres	$	$
5	**Screening to remove Unacceptable Material (See Note 2 below)**	800	Cubic Yards	$	$
6	**Hauling and Removal of Unacceptable Screened Matieral (See Note 2 Below)**	80	Cubic Yards	$	$
7	**Turbidity Monitoring**	1	LS	$	$
	TOTAL BASE BID - Based on Completion Time of 90 Calendar Days				$
8	**CONTRACT CONTINGENCY WORK (USED ONLY WITH COUNTY APPROVAL)**		**10% OF TOTAL BASE BID**		$
	TOTAL OFFER FOR BID with Contract Contingency - Based on Completion Time of 90 Calendar Days				$

Note:

1. Unit based prices are based on estimated quantities. Actual quantities will vary.
2. Remediation, screening, hauling and removal of unacceptable material is included as an optional item of the Contract to be utilized per the specifications and only at request of the COUNTY.

Bidder Name: ___________________________________

Authorized Signature: ___________________________________

SECTION C, BID ATTACHMENTS

Bid Attachment 1, INSURANCE AND BOND REQUIREMENTS

The CONTRACTOR will not commence work under the resulting Agreement until all insurance coverages indicated by an "X" herein have been obtained. The CONTRACTOR shall obtain and submit to the Procurement Division within ten (10) calendar days from the date of notice of intent to award, at its expense, the following minimum amounts of insurance (inclusive of any amounts provided by an umbrella or excess policy): Work under this Agreement cannot commence until all insurance coverages indicated herein have been obtained on a standard ACORD form (inclusive of any amounts provided by an umbrella or excess policy):

☒ **Automobile Liability Insurance Required Limits**

Coverage must be afforded under a per occurrence policy form including coverage for all owned, hired and non-owned vehicles for bodily injury and property damage of not less than:

- $1,000,000 Combined Single Limit; OR
- $ 500,000 Bodily Injury and $500,000 Property Damage
- $10,000 Personal Injury Protection (No Fault)
- $500,000 Hired, Non-Owned Liability
- $10,000 Medical Payments

This policy shall contain severability of interests' provisions.

☒ **Commercial General Liability Insurance Required Limits (per Occurrence form only; claims-made form is not acceptable)**

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County, a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- $1,000,000 Single Limit Per Occurrence
- $2,000,000 Aggregate
- $1,000,000 Products/Completed Operations Aggregate
- $1,000,000 Personal and Advertising Injury Liability
- $50,000 Fire Damage Liability
- $10,000 Medical Expense, and
- $1,000,000, Third Party Property Damage
- $ Project Specific Aggregate (Required on projects valued at over $10,000,000)

This policy shall contain severability of interests' provisions.

☒ **Employer's Liability Insurance**

Coverage limits of not less than:

- $100,000 Each Accident
- $500,000 Disease Each Employee
- $500,000 Disease Policy Limit

☒ **Worker's Compensation Insurance**

☒ **US Longshoremen & Harbor Workers Act**

☒ **Jones Act Coverage**

Coverage limits of not less than:

- Statutory workers' compensation coverage shall apply for all employees in compliance with the laws and statutes of the State of Florida and the federal government.
- If any operations are to be undertaken on or about navigable waters, coverage must be included for the US Longshoremen & Harbor Workers Act and Jones Act.

Should 'leased employees' be retained for any part of the project or service, the employee leasing agency shall provide evidence of Workers' Compensation coverage and Employer's Liability coverage for all personnel on the worksite and in compliance with the above Workers' Compensation requirements. NOTE: Workers' Compensation coverage is a firm requirement. Elective exemptions are considered on a case-by-case basis and are approved in a very limited number of instances.

☐ **Aircraft Liability Insurance Required Limits**

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- $ Each Occurrence Property and Bodily Injury with no less than $100,000 per passenger each occurrence or a 'smooth' limit.
- $ General Aggregate.

☐ **Un-Manned Aircraft Liability Insurance (Drone)**

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- $ Each Occurrence Property and Bodily Injury; Coverage shall specifically include operation of Unmanned Aircraft Systems (UAS), including liability and property damage.
- $ General Aggregate

☐ **Installation Floater Insurance**

When the contract or agreement **does not** include construction of, or additions to, above ground building or structures, but does involve the installation of machinery or equipment, Installation Floater Insurance shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- 100% of the completed value of such addition(s), building(s), or structure(s)

☐ **Professional Liability and/or Errors and Omissions (E&O) Liability Insurances**
Coverage shall be afforded under either an occurrence policy form or a claims-made policy form. If the coverage form is on a claims-made basis, then coverage must be maintained for a minimum of three years from termination of date of the contract. Limits must not be less than:

- $ 1,000,000 Bodily Injury and Property Damage Each Occurrence
- $ 2,000,000 General Aggregate

☒ **Builder's Risk Insurance**
When the contract or agreement includes the construction of roadways and/or the addition of a permanent structure or building, including the installation of machinery and/or equipment, Builder's Risk Insurance shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- An amount equal to 100% of the completed value of the project, or the value of the equipment to be installed
- The policy shall not carry a self-insured retention/deductible greater than $10,000

Coverage shall be for all risks and include, but not be limited to, storage and transport of materials, equipment, supplies of any kind whatsoever to be used on or incidental to the project, theft coverage, and Waiver of Occupancy Clause Endorsement, where applicable.

☐ **Cyber Liability Insurance**
Coverage shall comply with Florida Statute 501.171, shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County, a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- $ Security Breach Liability
- $ Security Breach Expense Each Occurrence
- $ Security Breach Expense Aggregate
- $ Replacement or Restoration of Electronic Data
- $ Extortion Threats
- $ Business Income and Extra Expense
- $ Public Relations Expense

NOTE: Policy must not carry a self-insured retention/deductible greater than $25,000.

☐ **Hazardous Materials Insurance (As Noted Below)**
Hazardous materials include all materials and substances that are currently designated or defined as hazardous by the law or rules of regulation by the State of Florida or federal government.

All coverage shall be afforded under either an occurrence policy form or a claims-made policy form, and the policy shall be endorsed and name 'Manatee County, a political subdivision of the State of Florida' as an Additional Insured. If the coverage form is on a claims-made basis, then coverage must be maintained for a minimum of three years from termination of date of the contract. Limits must not be less than:

☐ ***Pollution Liability***
Amount equal to the value of the contract, subject to a $1,000,000 minimum, for Bodily Injury and Property Damage to include sudden and gradual release, each claim and aggregate.

☐ ***Asbestos Liability (If handling within scope of Contract)***
Amount equal to the value of the contract, subject to a $1,000,000 minimum, for Bodily Injury and Property Damage to include sudden and gradual release, each claim and aggregate.

☐ ***Disposal***
When applicable, CONTRACTOR shall designate the disposal site and furnish a Certificate of Insurance from the disposal facility for Environmental Impairment Liability Insurance covering liability.

- Amount equal to the value of the contract, subject to a $1,000,000 minimum, for Liability for Sudden and Accidental Occurrences, each claim and an aggregate.
- Amount equal to the value of the contract, subject to a $1,000,000 minimum, for Liability for Non-Sudden and Accidental Occurrences, each claim and an aggregate.

☐ **Hazardous Waste Transportation Insurance**
CONTRACTOR shall designate the hauler and have the hauler furnish a Certificate of Insurance for Automobile Liability insurance with Endorsement MCS-90 for liability arising out of the transportation of hazardous materials. EPA identification number shall be provided.

All coverage shall be afforded under either an occurrence policy form or a claims-made policy form and the policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured. If the coverage form is on a claims-made basis, then coverage must be maintained for a minimum of three years from termination of date of the contract. Limits must not be less than:

- Amount equal to the value of the contract, subject to a $1,000,000 minimum, per accident.

☐ **Liquor Liability Insurance**
Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- $1,000,000 Each Occurrence and Aggregate

☐ **Garage Keeper's Liability Insurance**

Coverage shall be required if the maintenance, servicing, cleaning or repairing of any County motor vehicles is inherent or implied within the provision of the contract.

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- Property and asset coverage in the full replacement value of the lot or garage.

☐ **Bailee's Customer Liability Insurance**

Coverage shall be required for damage and/or destruction when County property is temporarily under the care or custody of a person or organization, including property that is on, or in transit to and from the person or organization's premises. Perils covered should include fire, lightning, theft, burglary, robbery, explosion, collision, flood, earthquake and damage or destruction during transportation by a carrier.

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- Property and asset coverage in the full replacement value of the County asset(s) in the CONTRACTOR'S care, custody and control.

☐ **Hull and Watercraft Liability Insurance**

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- $ Each Occurrence
- $ General Aggregate
- $ Fire Damage Liability
- $10,000 Medical Expense, and
- $ Third Party Property Damage
- $ Project Specific Aggregate (Required on projects valued at over $10,000,000)

☐ **Other [Specify]**

BOND REQUIREMENTS

☒ **Bid Bond**

A Bid Bond in the amount of 5% of the total offer. Bid bond shall be submitted with the sealed response and shall include project name, location, and / or address and project number. In lieu of the bond, the bidder may file an alternative form of security in the amount of 5% of the total offer. in the form of a money order, a certified check, a cashier's check, or an irrevocable letter of credit issued to Manatee County. NOTE: A construction project over $200,000 requires a Bid Bond in the amount of 5% of the total bid offer.

☒ **Payment and Performance Bond**

A Payment and Performance Bond shall be submitted by Successful Bidder for 100% of the award amount and shall be presented to Manatee County within ten (10) calendar days of issuance of the notice of intent to award. NOTE: A construction project over $200,000 requires a Payment and Performance Bond.

INSURANCE REQUIREMENTS

I. THE POLICIES BELOW ARE TO CONTAIN, OR BE ENDORSED TO CONTAIN, THE FOLLOWING PROVISIONS:

1. **Commercial General Liability and Automobile Liability Coverages**

    a. **"Manatee County, a Political Subdivision of the State of Florida," is to be named as an Additional Insured in respect to:** Liability arising out of activities performed by or on behalf of the successful Bidder, his agents, representatives, and employees; products and completed operations of the successful Bidder; or automobiles owned, leased, hired or borrowed by the successful Bidder. The coverage shall contain no special limitation(s) on the scope of protection afforded to the County, its officials, employees or volunteers.

    In addition to furnishing a Certificate of Insurance, the successful Bidder shall provide the endorsement that evidences Manatee County being listed as an Additional Insured. This can be done in one of two ways: (1) an endorsement can be issued that specifically lists "Manatee County, a Political Subdivision of the State of Florida," as Additional Insured; or, (2) an endorsement can be issued that states that all Certificate Holders are Additional Insured with respect to the policy.

    b. The successful Bidder's insurance coverage shall be primary insurance with respect to the County, its officials, employees and volunteers. Any insurance or self-insurance maintained by the County, its officials, employees or volunteers shall be excess of successful Bidder's insurance and shall be non-contributory.

    c. The insurance policies must be on an occurrence form.

2. **Workers' Compensation and Employers' Liability Coverages**

The insurer shall agree to waive all rights of subrogation against the County, its officials, employees and volunteers for losses arising from work performed by the successful Bidder for the County.

II. GENERAL INSURANCE PROVISIONS APPLICABLE TO ALL POLICIES:

1. Prior to the execution of contract, or issuance of a Purchase Order, and then annually upon the anniversary date(s) of the insurance policy's renewal date(s) for as long as this contract remains in effect, successful Bidder shall furnish the County with a Certificate(s) of Insurance (using an industry accepted certificate form, signed by the Issuer, with applicable endorsements, and containing the solicitation or contract number, and title or description) evidencing the coverage set forth above and naming "Manatee County, a Political Subdivision of the State of Florida" as an Additional Insured on the applicable coverage(s) set forth above.

2. If the policy contains an aggregate limit, confirmation is needed in writing (letter, email, etc.) that the aggregate limit has not been eroded to procurement representative when supplying Certificate of Insurance.

In addition, when requested in writing from the County, successful Bidder will provide the County with a certified copy of all applicable policies. The address where such certificates and certified policies shall be sent or delivered is as follows:

Manatee County, a Political Subdivision of the State of Florida
Attn: Risk Management Division
1112 Manatee Avenue West, Suite 969
Bradenton, FL 34205

3. The project's solicitation number and title shall be listed on each certificate.

4. successful Bidder shall provide thirty (30) days written notice to the Risk Manager of any cancellation, non-renewal, termination, material change, or reduction in coverage of any insurance policies to procurement representative including solicitation number and title with all notices.

5. successful Bidder agrees that should at any time successful Bidder fail to meet or maintain the required insurance coverage(s) as set forth herein, the County may terminate this contract.

6. The successful Bidder waives all subrogation rights against Manatee County, a Political Subdivision of the State of Florida, for all losses or damages which occur during the contract and for any events occurring during the contract period, whether the suit is brought during the contract period or not.

7. The successful Bidder has sole responsibility for all insurance premiums and policy deductibles.

8. It is the successful Bidder's responsibility to ensure that his agents, representatives and subcontractors comply with the insurance requirements set forth herein. successful Bidder shall include his agents, representatives, and subcontractors working on the project or at the worksite as insured under its policies, or successful Bidder shall furnish separate certificates and endorsements for each agent, representative, and subcontractor working on the project or at the worksite. All coverages for agents, representatives, and subcontractors shall be subject to all of the requirements set forth to the procurement representative.

9. All required insurance policies must be written with a carrier having a minimum A.M. Best rating of A- FSC VII or better. In addition, the County has the right to review the successful Bidder's deductible or self-insured retention and to require that it be reduced or eliminated.

III. Successful Bidder understands and agrees that the stipulated limits of coverage listed herein in this insurance section shall not be construed as a limitation of any potential liability to the County, or to others, and the County's failure to request evidence of this insurance coverage shall not be construed as a waiver of successful Bidder's obligation to provide and maintain the insurance coverage specified.

IV. The enclosed Hold Harmless Agreement shall be signed by the successful Bidder and shall become a part of the contract.

V. Successful Bidder understands and agrees that the County does not waive its immunity, and nothing herein shall be interpreted as a waiver of the County's rights, including the limitation of waiver of immunity, as set forth in Florida Statutes 768.28, or any other statutes, and the County expressly reserves these rights to the full extent allowed by law.

VI. No award shall be made until the Procurement Division has received the Certificate of Insurance and Hold Harmless Agreement in accordance with this section.

[Remainder of page intentionally left blank]

Bid Attachment 2, Special Provisions - Federal Grants

SPECIAL PROVISIONS –FEDERAL GRANTS

CONTRACT PROVISIONS FOR NON-FEDERAL ENTITY CONTRACTS UNDER FEDERAL AWARDS

In addition to other provisions required, all contracts made by the County that are funded in whole, or in part, by a Federal grant the following provisions will apply:

A. Equal Opportunity Employment

In accordance with 41 C.F.R. §60-1.4(b), the Subrecipient hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan, insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the following equal opportunity clause:

During the performance of this contract, the contractor agrees as follows:

The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:

i. Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

ii. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

iii. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

iv. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

v. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

vi. The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

vii. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

viii. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

B. Contract Work Hours and Safety Standards Act (40 U.S.C. 3701–3708)

Where applicable, Contractors for Federal grant funded contracts awarded by the County in excess of $100,000 that involve the employment of mechanics or laborers must comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act. The Contractor must compute the wages of every mechanic and laborer based on a standard work week of 40 hours.

Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the workweek. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or underworking conditions which are unsanitary, hazardous or dangerous.

NOTE: These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

C. Clean Air Act (42 U.S.C. 7401–7671q.) and the Federal Water Pollution Control Act (33U.S.C. 1251–1387), as amended

Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401–7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C.1251–1387). Contractor shall report all violations of such Acts to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

D. Suspension and Debarment (Executive Orders 12549 and 12689)

Any Contractor listed on the government-wide exclusions in the System for Award Management (SAM), will not be eligible for award in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), ‘‘Debarment and Suspension.’’ SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

E. Byrd Anti-Lobbying Amendment (31U.S.C. 1352)

Contractors for an award exceeding $100,000 must file the required anti-lobbying certification. Each tier must certify to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award. See § 200.322 Procurement of recovered materials.

F. Minority/Women-owned/Labor Surplus Firms' Participation

The County, in accordance with the requirements as stated in C.F.R. 200.321 encourages the active participation of minority businesses, women-owned business enterprises and labor surplus area firms as a part of any subsequent agreement whenever possible. If subcontracts are to be let, by the Contractor, Contractor shall be required to take the affirmative steps listed in items 1 through 5 below:

1. Place qualified small and minority businesses and women-owned business enterprises on its solicitation lists;
2. Assure that small and minority businesses, and women-owned business enterprises are solicited whenever they are potential sources;
3. Divide total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small, minority, and women-owned business enterprises;
4. Establish delivery schedules, where the requirement permits, which encourage participation by small, minority, and women-owned business enterprises;
5. Use the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.

Bid Attachment 3, TECHNICAL SPECIFICATIONS

MANATEE COUNTY
COQUINA BEACH STORM DAMAGE RESTORATION PROJECT
TECHNICAL SPECIFICATIONS

MICHELLE REES PFEIFFER
LICENSE
No 76209
STATE OF FLORIDA
PROFESSIONAL ENGINEER

Michelle Pfeiffer

MICHELLE REES PFEIFFER, P.E. NO. 76209

12/7/20

DATE

MANATEE COUNTY
COQUINA BEACH STORM DAMAGE RESTORATION PROJECT
TECHNICAL SPECIFICATIONS

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MANATEE COUNTY
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MANATEE COUNTY
COQUINA BEACH STORM DAMAGE RESTORATION PROJECT
TECHNICAL SPECIFICATIONS

PART 1 – SUPPLEMENTAL GENERAL CONDITIONS

Please refer to the COUNTY's front end documents in addition to the following Part 1 – Supplemental General Conditions.

1. COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK.

1.1 The CONTRACTOR shall be required to commence Work as stipulated by the Contract Documents and the Notice to Proceed (NTP) issued by Manatee County (COUNTY). As a requirement of the Contract Documents, the CONTRACTOR shall commence dredging and prosecute said Work diligently, and shall complete the entire Work ready for use no later than May 15, 2021. The time stated for completion shall include removal of pipe from the beach, grading, leveling of escarpments in the beach, tilling of the beach (if required), final clean-up of the premises and all repairs or restorations of facilities, structures, vegetation control documentation, or any other item disturbed or damaged by the CONTRACTOR or their subcontractor(s) as a result of project construction activities.

1.2 The total number of days to complete the specified Work will be 90 consecutive calendar days from Contract NTP to final completion, which includes lead time for mobilization of all resources (dredge, equipment, personnel and materials, etc.) necessary to complete the work and demobilization of said resources evidenced by the complete removal of all equipment and materials from the beach and project work sites on Coquina Beach as further described herein.

2. CONTRACT DOCUMENTS.

2.1 The Contract Documents may be altered, amended, added to, or deleted from only by a written modification agreed upon by the COUNTY and CONTRACTOR. The Contract Documents will be constructed in accordance with the laws and ordinances of the State of Florida and Manatee County.

2.2 The Contract Documents are complementary; what is called for by one Contract Document is binding as if called for by all Contract Documents. Before undertaking the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. The CONTRACTOR shall promptly report, in writing, to the ENGINEER, any conflict, error, or discrepancy that the CONTRACTOR may discover. If, during the performance of the Work, the CONTRACTOR finds a conflict, error, or discrepancy in the Contract Documents, the CONTRACTOR shall report it to the ENGINEER, in writing, at once and before proceeding with the Work affected thereby. If any party discovers a conflict or discrepancy, the ENGINEER will determine which Contract requirement is appropriate.

The CONTRACTOR shall not be liable to the COUNTY or ENGINEER for failure to report any conflict, error, or discrepancy in the Contract Documents the CONTRACTOR does not find unless CONTRACTOR had actual knowledge thereof or has demonstrated this by their action or should reasonably have known thereof.

2.3 One (1) set of Contract Documents (Contract) will be furnished to the CONTRACTOR by the COUNTY without charge at the CONTRACTOR's request, except for applicable publications incorporated into the Contract Documents by reference. The Work shall conform to the Contract Plans entitled "Coquina Beach Storm Damage Restoration Project," all of which form a part of these specifications and are available from Manatee County, Purchasing Department at 1112 Manatee Ave W, Bradenton, FL 34205.

2.4 It is the intent of the Contract Documents to describe a complete project to be constructed in accordance with the Contract Documents. Any work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied whether or not it is specifically identified. Any technical questions concerning the Contract Documents or work that may reasonably be inferred shall be provided, in writing, to the ENGINEER. Clarifications or interpretations of the technical portions of the Contract Documents shall be issued by the ENGINEER after receipt of written request for clarifications or interpretations from the CONTRACTOR. When words that have a well-known technical or trade meaning to describe work, materials, or equipment, such words shall be interpreted in accordance with such meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the law or code of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual or code in effect at the time of opening bids, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of the COUNTY, CONTRACTOR or ENGINEER, or any of their agents or employees from those set forth in the Contract Documents.

2.5 Omissions from the Contract Documents or the misdescription of details of work, which are manifestly necessary to carry out the intent of the Contract Documents, or which are customarily performed, shall not relieve the CONTRACTOR from performing such omitted or misdescribed details of the Work but they shall be performed as if fully and correctly set forth and described in the Contract Documents. It is the responsibility of the CONTRACTOR to seek clarifications or interpretations from the ENGINEER, in writing, prior to initiating the Work if the CONTRACTOR has any doubt or question concerning the Work. If requests for clarification or interpretations are not submitted in writing, there will be no obligation on the part of the COUNTY or ENGINEER to respond to the CONTRACTOR.

2.6 Figures marked on the Drawings or Plans shall, in general, be followed in preference to scale measurements. Large scale Plans shall, in general, govern over small scale drawings. The CONTRACTOR shall compare all drawings and verify the figures before laying out the Work and will be responsible for any errors that might have been avoided thereby.

2.7 Neither CONTRACTOR nor any subcontractor, manufacturer, fabricator, supplier or distributor shall have, or acquire any title to, or ownership rights in, any of the Plans (drawings), Specifications or other documents of the Contract Documents (or copies of any thereof) prepared by the ENGINEER. The CONTRACTOR shall not reuse any of the Contract Documents on extensions of the project or any other project without written consent of the ENGINEER and specific written verification or adaptation by the ENGINEER.

3. DELAYS AND EXTENSIONS OF TIME.

3.1 **No Damage for Delay.** No payment, compensation or adjustment of any kind, other than the extension of time provided for below, shall be made to the CONTRACTOR for damages because of hindrances or delays from any cause in the commencement, prosecution or completion of the Work resulting from the CONTRACTOR's or its agents negligence or non-compliance with the Contract Documents, or including but not limited to:

(a) Acts of God, such as storms, wave events, hurricanes, tropical storms, tornadoes, earthquakes, floods, or extreme weather;
(b) Changes in project sequence;
(c) Project de-acceleration;
(d) Lack of right-of-way or easement not within the direct control of the COUNTY;
(e) Lack of approvals;
(f) Site conditions;
(g) Presence and operation of other contractors;
(h) Strikes, lockouts, labor or material shortages;
(i) Fire;
(j) Delay in transportation;
(k) Omissions or errors in the Plans or Specifications;

wherein the CONTRACTOR can conclusively demonstrate that the act or omission clearly caused the delay.

Whether such hindrances or delays be avoidable or unavoidable, the CONTRACTOR agrees that it shall make no claim for, nor be entitled to, compensatory, acceleration, disruption damages or mitigation of liquidated damages, if any, or any other damages of any kind or nature for any such delays or hindrances and will accept in full satisfaction for such delays the extension of time set forth below as project permits allow. The No Damage for Delay provision of this paragraph shall include, but shall not be limited to, increase in time-related costs, escalation in material costs, reduction in material volume, escalation in labor costs, additional equipment requirements, effect on other contracts, increased premiums, lower labor productivity, lost alternative income, additional labor head count, additional premium time labor, additional supervision, and demobilization and remobilization costs.

3.2 Avoidable Delays by the Contractor. Avoidable delays or hindrances in the commencement, prosecution or completion of the Work shall include all delays from any cause whatsoever that could have been avoided in the exercise of appropriate planning, care, prudence, foresight, or diligence on the part of the CONTRACTOR or their subcontractors. Delays in the prosecution of parts of the Work that may in themselves be unavoidable but do not necessarily prevent or delay the prosecution of other parts of the Work nor the completion of the whole Work within the time herein specified, reasonable loss of time resulting from the necessity of submitting reports, plans or surveys to the ENGINEER for review, from conducting surveys, measurements and inspections, and from such interruptions as may occur in the prosecution of the Work on account of the reasonable interference of other contractors employed by the COUNTY which do not necessarily prevent the completion of the Work within the time herein specified shall be deemed avoidable delays within the meaning of this Contract.

3.3 Unavoidable Delays. Unavoidable delays in the commencement, prosecution or completion of the Work under this Contract shall include delays that may result through causes beyond the control of the CONTRACTOR and that the CONTRACTOR could not have provided against by the exercise of care, prudence, foresight or diligence. Orders issued by the COUNTY increasing the total amount of work to be done by 25% or more, increasing the quantity of beach fill material to be furnished by 25% or more, lack of rights-of-way, and unforeseen delays in the completion of the Work of other contractors under contract with the COUNTY may be considered unavoidable delays, so far as they necessarily extend the time for completion of the whole Work.

3.4 Notice of Delays. Whenever the CONTRACTOR experiences any delay in the prosecution of the Work, the CONTRACTOR shall, immediately upon the occurrence of any event giving rise to a delay, and in any event no later than 72 hours after the onset of the delay, notify the ENGINEER in writing of the occurrence of such delay and its cause and probable length in order that the ENGINEER may determine whether the delay is to be considered avoidable or unavoidable, how long it continues, and to what extent the prosecution and completion of the Work are to be delayed thereby. The notice must also demonstrate that CONTRACTOR will or has used all reasonable means to minimize the delay and contain an estimate of the probable effect that such delay will have on the progress and final completion of the Work. Notification of occurrence of delay will not be considered unless submitted IN WRITING. Delays due to ocean conditions shall not apply to land based work.

3.5 Extensions of Time for Unavoidable Delays. For delays that are unavoidable, as determined by the COUNTY and ENGINEER, the CONTRACTOR will be allowed, if it applies for the same in the notice, an extension of time beyond the time specified for completion in the Contract and as specified in an approved change order, proportionate to such unavoidable delay or delays, within which to complete the Contract and within time limitations contained in project permits; and the CONTRACTOR will not be charged, because of an extension of time for such unavoidable delay, any liquidated damages and engineering and construction observation costs as may be charged at the discretion of the COUNTY in the case of avoidable delays. Due to the requirements of the work being funded through agreements with the Federal Emergency Management Agency (FEMA), no extensions of time will be granted beyond May 31, 2021.

3.6 Remedies for Avoidable Delays. If (a) the Work called for under this Contract is not finished and completed by the CONTRACTOR in accordance with all requirements, and within the time specified for completion in the Contract Documents, including authorized Change Orders or suspensions of Work not due to the CONTRACTOR's failure to perform according to the Contract Documents; or, (b) if at any time prior to the expiration of said time it should appear to the COUNTY that the CONTRACTOR will be unable to finish and complete said Work as aforesaid within said time, then in that event the COUNTY may terminate this Contract as provided in the COUNTY's Standard Terms and Conditions; or in the exercise of its sole and absolute discretion, allow the CONTRACTOR to complete the Work, providing permits and approvals may be modified to extend the work period, but charge to CONTRACTOR and deduct from the final payment due to the Work, engineering, construction observation, legal and/or administrative expenses computed on the basis equal to the amount of Liquidated Damages specified herein per day until completion of the Work. Any remobilization/demobilization necessary to complete the Work will be done at the CONTRACTOR's expense. Notwithstanding an election made pursuant to this paragraph, the COUNTY may thereafter terminate the Contract, as provided in the COUNTY's Standard Terms and Conditions, if the COUNTY is not adequately assured of prompt completion.

3.7 Time Extension for Delays for Weather or Sea State which Prevent Work From Being Accomplished. The CONTRACTOR shall become familiar with the weather and sea conditions for the project site prior to submitting a bid for the Work and shall include appropriate downtime based on the equipment being proposed to execute the Work within the contractual time for completion. Time extension for delays for unusual weather or sea state which prevent work from being accomplished by the CONTRACTOR will be granted if:

a) Project permits and FEMA grants allow the work to continue, or time extension to be granted;
b) A request is made in writing within 72 hours of the delay.
c) The delay is substantiated, in writing and with wave or weather data, within 72 hours of the onset of the delay.
d) The wave or weather data indicates that the dredge had to be removed from the project area for safety reasons.
e) If steps (b), (c) and (d) are not addressed or could not be proven, the COUNTY may not grant an extension of time to complete the project.

3.8 Permit and Grant Time Extensions. If construction is not completed within the time frame of the state and federal permits or grants, the COUNTY may seek modification to allow construction past the deadline for construction completion. If the COUNTY attempted to extend the deadlines and is unsuccessful in obtaining an extension of time to complete construction, or if the time extension granted to the COUNTY is not sufficient to complete construction, then the COUNTY may take one of the following actions:

a) Terminate the Contract and compensate the CONTRACTOR for fill placed within the construction template(s) and for demobilization from the project site in accordance with Contract Documents.
b) Negotiate with the CONTRACTOR to seek an acceptable agreement allowing for project completion when (if) permits and agencies allow for the resumption of project construction activities at a later date.
c) Require the CONTRACTOR to remobilize, at the CONTRACTOR's own expense, to complete the project as permit conditions and time frames allow if it is determined by the COUNTY that the CONTRACTOR failed to complete the project by the end of the construction period as identified in the Contract Documents, FEMA grants, or the permits due to the negligence of the CONTRACTOR.

4. PERFORMANCE OF WORK BY CONTRACTOR.

4.1 <u>Contractor Participation and Use of Subcontractors</u>. The CONTRACTOR shall perform on the site, and with their own organization, excluding subcontractors, beach renourishment (beach fill) work equivalent to at least seventy percent (70%) of the total amount of beach nourishment work to be performed under the Contract, based on dollar amount of the Work. If during the progress of work hereunder, the CONTRACTOR requests, in writing, a reduction in such percentage, the percentage of the beach nourishment work required to be performed by the CONTRACTOR may be reduced, provided written approval of such reduction is provided by the COUNTY. Nevertheless, the CONTRACTOR shall remain responsible for construction of the project as provided for by the Contract Documents, including all work performed by subcontractors.

4.2 <u>Continuous Construction</u>. The CONTRACTOR and their subcontractors shall continuously maintain at the project site and on the job, the dredge, materials, equipment and adequate personnel required to continuously construct the project. Under no circumstances will the CONTRACTOR remove the dredge, equipment, materials, subcontractors, and adequate numbers of personnel from the project site without the written consent of the COUNTY unless one or more of the following occurs: the project is determined by the COUNTY to be complete; weather or sea state conditions require movement from the project site; a condition exists which threatens the safety and welfare of personnel or threatens equipment; or the time frame provided for project construction in the Contract Documents, the State of Florida or Federal permits has expired. Removal of equipment, personnel, materials, or subcontractors from the project site which interrupts work progress, without valid reason, prior to the completion of the project, will result in the imposition of liquidated damages.

5. SUBCONTRACTORS.

5.1 Subcontractor Qualifications. The CONTRACTOR shall furnish within the bid documents the names of subcontractors proposed for any portion of the Work and provide appropriate information in the bid, such as company experience, personnel experience, equipment, and references to verify the qualifications of the subcontractor to complete the assigned portion of the Work. The CONTRACTOR may use the subcontractors listed in the bid to conduct the Work, and shall identify the Work to be performed by the subcontractor.

5.2 Subcontractor Acceptance. The CONTRACTOR shall not employ any subcontractor or other person or organization (including those who are to furnish the principal items of materials or equipment), whether initially or as a substitute, against whom the ENGINEER or COUNTY may have a concern or objection. If the ENGINEER or COUNTY has a concern or objection to any subcontractor, other person or organization proposed by the CONTRACTOR before, or after, execution of the Contract Documents, the CONTRACTOR shall submit an acceptable substitute as soon as possible without increase in project cost, or delay in project construction.

5.3 Subcontractor Work. The divisions and sections of the Contract Documents and the identifications of any plans shall not control CONTRACTOR in dividing the Work among subcontractors or delineating the Work to be performed by any specific trade.

5.4 Statues, Laws and Regulations. The CONTRACTOR hereby agrees and shall be solely responsible for ensuring that the CONTRACTOR and any subcontractors, fully comply with the requirements of any applicable ordinances, statutes, laws or regulations which may affect this project or the CONTRACTOR's/subcontractor's work under this project. The CONTRACTOR further agrees that neither the COUNTY nor its ENGINEER shall be responsible for ensuring compliance or notification on any changes or modifications to any such applicable ordinances, laws, statutes, rules or regulations.

6. SIMULTANEOUS WORK BY OTHERS.

6.1 By COUNTY. The COUNTY shall have the right to perform or have performed by its forces, or by other contractors, in, about or near the work site or sites during the performance of work by the CONTRACTOR, such other work as COUNTY may desire.

6.2 Coordination. The CONTRACTOR shall make every reasonable effort to perform its Work hereunder in such manner as to enable both the Work under this Contract and such other work by such other contractors to be completed without hindrance or interference from each other. The CONTRACTOR shall afford other contractors reasonable opportunity for the execution of their work and shall properly connect and coordinate its Work with the work of other contractors; shall keep itself informed of the progress and the detail of the work of the other contractors; and shall notify the ENGINEER immediately of interference with the CONTRACTOR’s work, lack of progress or defective workmanship on the part of other contractors, where such interference, delay or such defective workmanship will impact with CONTRACTOR's own operations or the operations of its subcontractors or effect or delay the CONTRACTOR's Work. Whenever there is interference with work under contracts with the COUNTY, the COUNTY shall decide the manner in which work shall proceed under each Contract in an attempt to reduce or eliminate the interference to the greatest extent practicable. The CONTRACTOR shall proceed at its own risk in the event the CONTRACTOR fails to obtain such prior direction or assistance from the COUNTY. Failure of the CONTRACTOR to keep informed of the work progressing at any other work site or sites and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by the CONTRACTOR of the status of other work as being satisfactory for proper coordination with the CONTRACTOR's own Work.

6.3 Parking Lot Improvement Work by the COUNTY. The COUNTY will be performing parking lot improvements, converting dirt and shell to porous pavement, at Coquina Beach during the winter and spring of 2021. While the areas identified for staging and access in these Contract Documents and Plans are not part of the upcoming parking lot project, the CONTRACTOR shall be aware of and cooperate with the other contractors in the area.

7. SUPERINTENDENT.

7.1 The COUNTY and/or ENGINEER may reject the superintendent proposed by the CONTRACTOR. If the proposed superintendent is rejected, the CONTRACTOR will propose an alternate superintendent as soon as possible and without additional cost to the COUNTY.

7.2 A superintendent(s) of the CONTRACTOR shall be a land based employee and shall be at the beach work site at all times, or otherwise make herself or himself available to the COUNTY and/or ENGINEER at all times during project construction. Under no circumstances will project construction occur without the presence of a superintendent at the beach project site. The CONTRACTOR shall provide to the ENGINEER and COUNTY a mobile phone number which shall be for a phone, which is in the possession of the superintendent at all times. The COUNTY may request a new superintendent(s) if the existing superintendent is not available to the COUNTY or ENGINEER during the project construction period. In that event, the CONTRACTOR shall provide a new superintendent(s).

8. ENGINEER.

8.1 **<u>Technical Issues</u>.** The ENGINEER shall decide all technical issues of whatever nature may arise relative to the interpretation of the technical portions of the Contract Documents, the Plans, surveys and beach fill volume measurement, and prosecution and fulfillment of this Contract, and as to the character, quality, amount, and value of any work done and materials furnished under this Contract.

8.2 Engineer Access to the Dredge and Work Site. The ENGINEER shall have unlimited access to the dredge, beach nourishment construction site, and all CONTRACTOR vessels. The CONTRACTOR shall furnish, at the request of the ENGINEER, safe and suitable transportation from the shore to and from the various pieces of equipment, including the dredge, barges, to and from the spoil site (beach fill area), or as required to administer the Contract Documents. The presence or absence of the ENGINEER shall not relieve the CONTRACTOR of the responsibility for the proper execution of the Work in accordance with the Contract Documents.

9. TECHNICAL DISPUTE RESOLUTION.

The CONTRACTOR shall perform the Work as specified by the Contract Documents. The ENGINEER will interpret the requirements of the technical portion of the Work, as specified in the Technical Specifications and Plans of the Contract Documents. If the CONTRACTOR objects to the ENGINEER's decision, the CONTRACTOR shall, within 48 hours of receiving the ENGINEER’s decision, notify the ENGINEER in writing of the CONTRACTOR's objection thereto. The CONTRACTOR and ENGINEER will mutually attempt to resolve the issue; nevertheless, the ENGINEER’s decision will be binding upon the CONTRACTOR.

10. PAYMENT FOR MOBILIZATION AND DEMOBILIZATION.

10.1 Payment for Mobilization and Demobilization for Hydraulic Beach Fill Placement. All costs connected with the mobilization and demobilization of all the CONTRACTOR's equipment, material and personnel directly related to beach fill placement, including dredge and all other equipment, will be paid for at the Contract lump sum price for this item. Sixty percent (60%) of the lump sum price will be paid to the CONTRACTOR after meeting Before Dredge beach survey requirements described in these Technical Specifications and after commencement of dredging and placement of a quantity of, at minimum, one thousand (1,000) cubic yards of material on the beach and within the beach fill template within a continuous twenty-four (24) hour period, as verified by survey. The remaining forty percent (40%) will be included in the final payment for Work under this Contract. Payment for mobilization (and all payments except the final payment) will be subject to a retainage until final acceptance of the project by the COUNTY per the COUNTY’s Standard Terms and Conditions.

11. PAYMENT FOR HYDRAULIC FILL PLACEMENT.

12.1. Hydraulic Beach Fill Payment. Other than costs for mobilization, demobilization, and beach tilling, all other costs associated with the beach nourishment project including but not limited to, beach and hydrographic surveying and reporting, water quality monitoring, debris removal clean-up, excavating, transporting, escarpment leveling, site restoration, and repairs, and constructing the hydraulic beach fill shall be included in the Contract Unit Price per cubic yard on the Bid Form. The Unit Price shall also include all other items of overhead, profit, labor, material and any other costs incidental to performing the Work.

12.2 Basis of Volume Computation Measurement. The basis of the volume computation for payment purposes will be the comparison of the post-beach dressing surveyed as-filled after dredge (AD) pay profiles to the before dredge (BD) pay profiles, and the volume within the templates. The quantity (volume) of fill material lying within the construction template, addressed in the Contract Documents and shown in the Plans, will be the basis for payment. The CONTRACTOR shall conduct the BD and AD surveys, and prepare computations of volume within the templates as are necessary and as indicated in the Contract Documents in order to determine the quantities placed within the fill acceptance sections between payment profile lines.

12.3 Requests for Payment. As further described in the COUNTY's front end documents, the CONTRACTOR may request payment for hydraulic fill placement on a monthly basis, and at completion of the project, upon final acceptance by the ENGINEER of the completed beach nourishment sections. The CONTRACTOR will be eligible for progress payments when fill sections have been filled to a minimum of 95% of the total beach fill section volume. The beach fill volume for a section is the volume to completely fill the minimum 100 foot section along the project baseline to the construction template requirements shown on the Plans. The CONTRACTOR may conduct surveys for payment purposes after completion and dressing of five (5) adjacent fill sections; however, after the initial payment, future payment will be based on a minimum of twenty-five (25) filled and dressed adjacent acceptance sections. For all payments following the initial payment shall occur when at least twenty-five (25) additional adjacent sections have been filled, dressed and approved for payment by the ENGINEER. The CONTRACTOR shall submit to the COUNTY and ENGINEER for review on a monthly basis, an Application for Progress Payment filled out and signed by CONTRACTOR covering the Work completed as is required by the Contract Documents and accompanied by such supporting documentation as is required by the Contract Documents and also as the ENGINEER may reasonably require. All payments will be subject to retainage per the COUNTY's Standard Terms and Conditions until final acceptance of the project.

12.4 Fill Tolerances. Payment shall be for hydraulic fill placed within the construction template with a minimum construction berm elevation of +4.0 feet (NAVD) as shown on the Plans. Payment shall also be provided for fill placed in the upper 1.0 foot berm tolerance, to a maximum of +5.0 feet (NAVD) as shown in the Plans. The berm elevation shall be achieved everywhere within areas filled and for which payment has been requested, must at least meet the minimum berm elevation everywhere on the constructed beach berm from the north project limit to the south project limit shown on the Plans, and the minimum requirement of 95% of the upper tolerance fill volume for each acceptance section must be met. The CONTRACTOR shall fill any deficient section of beach to, at minimum, meet the minimum berm elevation everywhere on the constructed beach berm, and to a minimum of 95% of the upper tolerance fill volume calculated up to the +5.0 ft (NAVD) elevation for the acceptance section. The COUNTY will withhold payment for acceptance sections that do not meet the minimum required hydraulic fill requirements until the required hydraulic fill placement and dressing has been completed by the CONTRACTOR.

12.5 Computation of Payment Volumes. Quantities of beach fill satisfactorily placed and meeting beach fill design template requirements and volumes will be computed for payment by use of the average end-area method. The distance between each profile line to be used for fill computation is the perpendicular distance between each profile line along the project baseline shown on the Plans. The CONTRACTOR shall account for this method of fill volume calculation when estimating the bid prices. Payment will be provided for fill contained within the payment profile construction templates plus the upper beach (+1.0 foot) berm tolerance, as shown in the Plans. No payment will be provided for fill placed above the +5.0 foot (NAVD) upper tolerance. The CONTRACTOR's bid shall account for any costs associated with the payment profile requirement, the azimuth of profile lines, the profile measurement technique, survey requirements, potential loss of sand before section survey and acceptance, and the payment volume calculation methodology.

12.6 Compensatory Slope Adjustment. During placement of fill, wave conditions may adjust the slope of the placed fill beyond the fill template. In recognition of this natural phenomena, fill located seaward of the fill template slope may qualify for payment where such placed fill is (a) within the limits of the fill project area shown in the Plans, (b) below the mean high water line, (c) contiguous to the fill template, (d) above the BD profile survey, and (e) measured within the AD profile survey. Compensatory slope volumes will be applied only to compensate for lost volume from the template slope below the mean high water line. This volume will not be used to compensate for volume deficiencies within the fill template on the beach berm located landward of the mean high water elevation on the template slope, or along other fill profiles identified on the Plans. This clause does not relieve the CONTRACTOR from grading the beach berm and slope as shown on the Plans. Compensatory fill volume shall not qualify for payment other than that portion of the volume that was relocated by natural forces seaward beyond the template slope shown in the Plans.

12. PAYMENT FOR BEACH TILLING.

Payment for travel, mobilization, demobilization, labor, materials, equipment, fuel, oil, and all other appropriate costs in connection with tilling of the nourished beach shall be included in the Lump Sum price for beach tilling. No partial payments will be issued for this work item.

13. RIGHT TO REFUSE RECOMMENDATION FOR PAYMENT.

The ENGINEER may refuse to recommend the whole or any part of any payment if, in their opinion, such representations to the COUNTY would be false. The ENGINEER may also refuse to recommend any payment to protect the COUNTY from loss in the event that:

(a) The Work is defective or completed Work not accepted by the ENGINEER has been damaged requiring correction or replacement;

(b) Written claims have been made against COUNTY or liens have been filed in connection with the Work;

(c) The Contract Price has been reduced because of modification(s) to the project;

(d) The COUNTY has been required to correct defective Work or complete the Work;

(e) The CONTRACTOR has not performed the Work in accordance with the Contract Documents;

(f) The COUNTY has been notified or advised that the CONTRACTOR has failed to make payment to subcontractors, or for labor, materials, or equipment.

(g) The CONTRACTOR is claiming additional placement of fill volume for placement beyond that measured and calculated using the procedures established in the Contract Documents for computation of quantities for payment purposes.

(h) The CONTRACTOR is claiming additional payment for any reason not previously agreed to by the COUNTY;

(i) The CONTRACTOR has not repaired damages caused by the CONTRACTOR's operation to the satisfaction of the COUNTY and/or affected private property owner.

14. COMPLETION OF WORK AND FINAL PAYMENT.

14.1 Beach Escarpment Elimination Before Final Payment. At the completion of the entire fill placement and beach tilling, and prior to final payment, the CONTRACTOR shall inspect the beach project area for the formation of sand escarpments. Any escarpments in the project area, independent of the escarpment height or the length, shall be leveled or smoothed by the CONTRACTOR to eliminate the escarpment. The ENGINEER, upon request by the CONTRACTOR, will observe the beach after leveling of escarpments by the CONTRACTOR.

14.2 Completion of All Work. Upon written notice from CONTRACTOR that the Work is complete, the ENGINEER will observe the Work within five (5) days of receipt of the written notice from the CONTRACTOR and, if required, will notify the CONTRACTOR in writing of all particulars in which this observation reveals that the Work is incomplete or defective. The CONTRACTOR shall immediately take such measures as are necessary to remedy such deficiencies.

14.3 Application for Final Payment. After the CONTRACTOR has completed all such corrections to the satisfaction of the ENGINEER and COUNTY and delivered all required quality control reports, all water quality reports, all technical or cost data requested by the ENGINEER, guarantees, bonds, certificates of inspection, marked-up record documents, and all other documents as required by the Contract Documents or ENGINEER, and after the ENGINEER has indicated that the Work is acceptable to the COUNTY, the CONTRACTOR may make application for final payment, including all retainage. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents and such other data, reports and schedules as ENGINEER may reasonably require, together with complete and legally effective releases or waivers (satisfactory to COUNTY) of all Liens arising out of, or filed in connection with the Work. In lieu thereof and as approved by the COUNTY, the CONTRACTOR may furnish receipts or releases in full; an affidavit of the CONTRACTOR providing warranties, covenants, and representation that the releases and receipts include all labor, services, material and equipment bills, and other indebtedness connected with the Work for which the COUNTY or the COUNTY's property might in any way be responsible, that all changes have been paid or otherwise satisfied; and consent of the surety to final payment. If any subcontractor, manufacturer, fabricator, supplier or distributor fails to furnish a release or receipt in full, the CONTRACTOR may furnish a bond or other collateral satisfactory to the COUNTY to indemnify the COUNTY against any lien.

14.4 Recommendation for Final Payment. If, on the basis of the ENGINEER's observation of the Work during construction and post-construction, before and after dredge survey data, appropriate site cleanup and completion of all repairs and the ENGINEER's review of the final Application for Payment and accompanying documentation the ENGINEER is satisfied that the Work has been completed and the CONTRACTOR has fulfilled all of their obligations under the Contract Documents, the ENGINEER will, within fifteen (15) days after receipt of the final Application for Payment, indicate in writing their recommendation of payment and present the application to the COUNTY. Otherwise, the ENGINEER will return the application to the CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case the CONTRACTOR shall make the necessary corrections and resubmit the application.

14.5 Contractor's Obligation to Complete Work. The CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents, and within time limitations, shall be absolute. Neither recommendation of any payment by the ENGINEER, nor the issuance of a certificate of substantial completion, nor any payment by the COUNTY to the CONTRACTOR under the Contract Documents, nor any use or occupancy of the Work of any part thereof by the COUNTY, nor any act of acceptance by the COUNTY nor any failure to do so, nor the issuance of a notice of acceptability by the ENGINEER, nor any correction of defective Work by the COUNTY shall constitute an acceptance of Work not in accordance with the Contract Documents or a release of the CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents.

14.6 CONTRACTOR Access to the Work. The COUNTY shall have the right to exclude the CONTRACTOR from the Work after the date of completion, but the COUNTY shall allow the CONTRACTOR reasonable access to complete the Work or correct items as allowed by project permits.

14.7 Making and Acceptance of Final Payment. The making and acceptance of final payment shall constitute:

(a) A waiver of all claims by the COUNTY against the CONTRACTOR, except claims arising from unsettled liens, from defective Work appearing after project completion or from failure to comply with the Contract Documents or the terms of any guarantees specified therein; however, it shall not constitute a waiver by the COUNTY of any rights in respect to the CONTRACTOR's continuing obligations under the Contract Documents; and,

(b) A waiver of all claims by the CONTRACTOR against the COUNTY other than those previously made in writing and still unsettled.

14.8 Defective Work.

14.8.1 General. If within one (1) year after the date of completion or such longer period of time as may be prescribed by law or by the terms of any applicable guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, the CONTRACTOR shall promptly, without cost to the COUNTY and in accordance with the COUNTY's written instructions, either correct such defective Work, or, if it has been rejected by the COUNTY, remove it from the site and replace it with non-defective Work. If the CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, the COUNTY may have the defective Work corrected or the rejected Work removed and replaced. All costs associated with correction of defective Work including compensation for additional professional services, shall be paid by the CONTRACTOR. The CONTRACTOR will not be held responsible for erosion of the beach fill after acceptance of completed fill segments by the ENGINEER. However, if unsuitable material including but not limited to rocks, debris or construction materials placed as a result of the CONTRACTOR’s operations are found within one (1) year of the project completion, the CONTRACTOR will be held responsible to correct this at no further cost to the COUNTY.

14.8.2 Beach Erosion. The CONTRACTOR will not be responsible for erosion of the accepted beach fill sections after final acceptance of fill sections by the ENGINEER. The CONTRACTOR shall remain responsible for beach fill sections until they are accepted for payment by the ENGINEER. The CONTRACTOR shall be responsible for the placement of material that is not beach compatible or does not meet State of Florida standards for beach material.

15. USE OF COMPLETED PORTIONS.

The COUNTY shall have the right to take possession of, and use, any completed or partially completed portions of the Work, prior to the completion of the entire Work. Such taking possession and use shall not be deemed an acceptance of any Work not completed in accordance with the Contract Documents.

16. CHANGES AND EXTRAS.

16.1 Changes in the Work. Please refer to the COUNTY's front end documents in addition to the following: The COUNTY shall have the right, within the general scope of the Work and without notice to any surety or sureties of the CONTRACTOR, to make changes in the Work, including but not limited to changes in the Plans, General Conditions, Technical Provisions, and Environmental Provisions pertaining to beach width, beach elevation, beach volume, beach length, environmental protection, Contract time, Contract price, in or to the method or manner of performance of the Work, in or to equipment, materials, service or site, in or to the mode or manner of payment for the Work, or directing a change in the rate of performance of the Work. All changes shall, except in the case of emergencies endangering the safety of personnel or property, be made by modification of the Contract Documents or by written Change Order duly executed by the COUNTY, ENGINEER and CONTRACTOR. Work necessary in connection with emergency changes in the Work shall be strictly limited to the minimum necessary to alleviate the immediate emergency; Work beyond such minimum shall be undertaken only pursuant to a properly issued change order received from the COUNTY. The CONTRACTOR shall promptly comply with any and all written change orders issued by the COUNTY, notwithstanding any disputes. No such change order shall be deemed to invalidate the Contract.

16.2 No Adjustment of Unit Price. The volume of material to be placed on the beach is based on beach surveys conducted prior to the construction of the project. It is almost a certainty that the forces of wind and waves have altered the beach since development of the fill templates for the project. No adjustment shall be made in any Unit Price of the Contract for changes ordered by the COUNTY that cause an increase or decrease equal to, or less than twenty-five percent (25%) in the amount of the Work, or by the estimated volume provided in the bid documents of dredged material that is to be placed within fill templates whether individually or in total. It is further provided, however, that no adjustments shall be made in the Contract price or time of performance for either lump sum or unit price work if the change is expressly or reasonably implied by the Contract Drawings and Specifications or is incidental thereto, or if the Work becomes more difficult than the bid price and Contract Documents would reflect, or if CONTRACTOR failed to protest, negotiate, comment or otherwise call to the COUNTY's attention, in writing, any omissions, ambiguities or conflicts in the Contract Documents that CONTRACTOR could have discovered prior to the submission of its bid or execution of the Contract.

17. CHANGE OF CONTRACT PRICE

The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR shall be at their expense without change in the Contract Price.

The Contract Price may only be changed by Change Order, Work Directive Change, Admin Contract Adjustment or by a written amendment. Any claim for an increase or decrease in the Contract Price shall be based on written notice delivered by CONTRACTOR making the claim to OWNER. Notice of the amount of the change order request with supporting data shall be delivered within five (5) calendar days from the beginning of such occurrence and shall be accompanied by CONTRACTOR's written statement that the amount covers all known amounts (direct, indirect and consequential) to which the claimant is entitled as a result of the occurrence of said event.

18. PHYSICAL DATA.

Information and data furnished or referred to in the Contract Documents are furnished, or referred to, for the CONTRACTOR's benefit. However, it is expressly understood that the COUNTY and ENGINEER will not be responsible for any interpretation or conclusion of the CONTRACTOR. Likewise, the COUNTY and ENGINEER will not be responsible for any information provided to the CONTRACTOR by any information agency or other party.

19. WEATHER.

The project area may be affected by tropical storms and hurricanes primarily from June through November, and by high wave conditions, stormy and/or rainy weather, including severe thunderstorms, during any time of the year. Wave activity can occur at any time and may be frequent during the winter months. The CONTRACTOR shall be responsible for obtaining information concerning rain, wind, tide and wave conditions that could influence safety, schedule, dredging and disposal operations. Accordingly, the CONTRACTOR shall become familiar with the local weather patterns prior to making a bid for the Work, and account for typical weather activity that can reasonably be expected to occur during the prosecution of said Work.

20. BOAT TRAFFIC AND LONGBOAT PASS.

Longboat Pass, located in Manatee County, is a dynamic, tidal inlet that provides access to the Gulf of Mexico from Sarasota Bay. The Work includes dredging the navigation channel through a portion of the inlet and ebb shoal. Boat traffic in the vicinity of the project areas consists primarily of pleasure craft and fishing boats. By submittal of a bid for the Work, the CONTRACTOR acknowledges the challenges and accepts the risks associated with performing operations in this inlet environment and shoal complex adjacent to the open Gulf of Mexico, which is subject to daily tidal currents and frequent wave activity.

21. LOCAL PORT.

Tampa Bay, located north of the project areas, is a deep draft maintained port. All inlets and ports are used at the CONTRACTOR's own risk.

22. STATE AND FEDERAL PERMITS, EASEMENTS AND LICENSES.

The CONTRACTOR shall comply with all requirements set out in all permits applicable to the Work. Copies of project permits and relevant project attachments are provided as appendices to these Technical Specifications are part of the Contract Documents. Specifically, the CONTRACTOR will familiarize himself/herself with general and specific conditions contained in the Florida Department of Environmental Protection (FDEP) Permit No. 0298107-004-JC, and the U.S. Army Corps of Engineers (USACE) Permit No. SAJ-2014-00606 (SP-CSH) and other State and Federal approvals for the project, including public easements, use of sovereign submerged lands and referenced attachments. The CONTRACTOR shall follow the applicable Terms and Conditions in the following Biological Opinions (BO) that are incorporated by reference in the USACE permit: U.S. Fish and Wildlife Service (USFWS) BO for red knots, dated September 24, 2015; USFWS Statewide Programmatic Biological Opinion (SPBO) for sea turtles, dated February 27, 2015; USFWS Programmatic Piping Plover Biological Opinion (P^3BO) for piping plovers, dated May 22, 2013; and the National Marine Fisheries Service (NMFS) Gulf Regional Biological Opinion (GRBO). Any other licenses or approvals required for the prosecution of the Work shall be secured and paid for by the CONTRACTOR.

23. LAYOUT OF WORK FOR HYDRAULIC FILL PLACEMENT.

23.1 Survey Control. Florida Department of Environmental Protection (FDEP) (formerly Department of Natural Resources) second order “A” monuments shall be used for control, once the CONTRACTOR has independently verified the location and elevation of each monument. The FDEP “A” monument location coordinates and elevations for the work site are provided on the Plans, and shall be independently verified by the CONTRACTOR and their surveyor. The CONTRACTOR shall contact the ENGINEER if any discrepancies are discovered in any of the information presented concerning control monumentation. FDEP beach R-monuments or T-monuments shall not to be used as primary control for this project. If the ENGINEER is not contacted by the CONTRACTOR, it is understood that the CONTRACTOR agrees with all information presented in the Plans related to beach monumentation elevation and control information.

23.2 Surveyor. The CONTRACTOR shall complete the layout of the Work and shall be responsible for all measurements that may be required for the execution of the layout of the Work, subject to such modifications as the ENGINEER may require to meet changed conditions or as a result of necessary modifications to the Contract Work. The CONTRACTOR will use a surveyor registered in the State of Florida. The licensed surveyor used by the CONTRACTOR will be responsible for all survey work and layout work and shall certify (sign and seal) all survey deliverables.

23.3 Work Layout. All temporary marking stakes (including grade stakes) placed by the CONTRACTOR must be recorded on a tracking sheet (available to the ENGINEER upon request) and shall be completely removed upon completion of the project. If grade stakes are used in the performance of the Work, the CONTRACTOR shall provide a signed copy of the tracking sheet upon the completion of fill placement activities to demonstrate the complete retrieval and removal of all grade stakes prior to making a final Application for Payment.

23.4 Protection of Survey Monuments. All permanent markers or survey monuments will not be disturbed, damaged or destroyed by the CONTRACTOR. Disturbed, damaged or destroyed monuments will be replaced by the ENGINEER, at their discretion, and the expense of replacement will be deducted from any amounts due, or to become due to the CONTRACTOR.

24. CONTRACTOR QUALITY CONTROL.

24.1 The CONTRACTOR is responsible for quality control and shall provide and maintain an effective quality control plan that is received by the COUNTY and ENGINEER seven (7) days prior to the pre-construction conference. For dredging and fill placement operations, the CONTRACTOR shall follow the FDEP approved Sediment QA/QC Plan provided in the appendices.

24.2 **Daily Quality Control Reports.** The CONTRACTOR is required to prepare a Daily Quality Control Report (QCR), and copies shall be furnished to the ENGINEER on a daily basis without exception, by 2:00 p.m. of the following day of each day's report. Electronic submittal of the Daily QCR is acceptable. Daily QCRs will be provided from the Notice to Proceed issuance to the last day of demobilization, including site clean-up. Reports shall be required for each and every day, regardless of whether work is accomplished. An example copy of the Daily QCR is appended to these Technical Specifications. Likewise, the CONTRACTOR's Water Quality Monitoring reports must be prepared in a format acceptable to the regulatory agencies according permit requirements and submitted daily along with the QCR; the COUNTY or ENGINEER will assemble and submit the Water Quality Monitoring reports to the regulatory agencies as required by the project permits. The CONTRACTOR may substitute their own Daily QCR format if: (1) it contains, at minimum, all of the information required by the format example in the Technical Specifications and (2) the CONTRACTOR'S quality control report format is approved by the ENGINEER.

24.3 The CONTRACTOR shall establish a quality control system to perform sufficient inspections and tests of all items of Work, including that of their subcontractors, and to ensure conformance to applicable provisions of the Contract Documents and Plans with respect to the materials, workmanship, construction, finish, and functional performance. This control will be established for all construction except where the Contract provides for specific COUNTY or ENGINEER control by observation, tests or other means. The CONTRACTOR's control system will specifically include the surveillance and tests required in the Technical Specifications.

24.4 The CONTRACTOR's quality control system is the means by which the CONTRACTOR is assured that the construction complies with the requirements of the Contract Documents, including all project permits. The controls shall be adequate to cover all construction operations and shall be keyed to the proposed construction sequence.

24.5 The CONTRACTOR's job supervisory staff may be used for quality control, supplemented as necessary by additional personnel for surveillance, by special technicians, or by testing facilities with the expertise to provide for the controls required by the Technical Specifications.

24.6 All compliance inspections will be recorded on the Daily QCR, including, but not limited to, the specific items required in each technical section of the specifications. This form shall include records of corrective action taken.

24.7 If reoccurring deficiencies in an item or items indicate that the quality control system is not adequate, or reports are not being provided in a timely manner, the CONTRACTOR shall undertake such corrective actions as necessary to meet all Contract requirements.

24.8 No separate payment will be made for CONTRACTOR quality control or Daily QCR.

24.9 Delay of Payment. Failure to provide Daily QCR to the ENGINEER may result in delay in payments to the CONTRACTOR until all due Daily QCR are received and are acceptable to the ENGINEER.

24.10 The CONTRACTOR shall be responsible for making such inspections, surveys and tests as may be necessary to assure compliance with all the requirements of the Contract Documents and applicable permits. Reports of all inspections, surveys and tests and remedial actions shall be submitted to the ENGINEER in writing.

24.11 The ENGINEER reserves the right to utilize the CONTRACTOR's control testing laboratory, survey and other equipment to make random tests and surveys, and to check the CONTRACTOR's testing and survey procedures, techniques, and results (where applicable).

25. PERMIT AGENCY PRE-CONSTRUCTION CONFERENCE.

A pre-construction meeting will be held at the COUNTY's office, or via teleconference, webinar, or other virtual means at the COUNTY's discretion, with the ENGINEER, COUNTY, CONTRACTOR, marine turtle license holder, shorebird monitor, appropriate State and Federal agencies, and any other individuals as required in compliance with project permit requirements, to discuss permit conditions. Following this meeting, the CONTRACTOR will be required to provide a written affirmative statement that they have read the General and Specific Conditions of the FDEP permit and understands them (per FDEP General Condition 9). This meeting is separate from the Contract pre-construction conference described below, which will also be held by the COUNTY. These two meetings may be coordinated to occur at the same location, and/or on the same day, pending agency availability and the COUNTY's Standard Terms and Conditions.

26. CONTRACT PRE-CONSTRUCTION CONFERENCE.

Please refer to the COUNTY's Standard Terms and Conditions for specific requirements for the Contract pre-construction conference (Project Meeting). After the Contract is awarded and before construction operations are started, the CONTRACTOR shall meet with the ENGINEER and COUNTY at the COUNTY's office, or virtually at the COUNTY's discretion, to discuss the quality control requirements, the permits, and the project. This shall be referred to as a Contract pre-construction conference. The meeting shall develop mutual understanding relative to details of the system, including the forms to be used for recording the quality control operations, inspections, daily reports, applications for payment, administration of the system, and the interrelationship of the CONTRACTOR, ENGINEER, and COUNTY and their respective personnel.

27. WATER QUALITY MONITORING BY THE CONTRACTOR.

27.1 The CONTRACTOR shall be bound and obligated to maintain the quality of the State's waters as stipulated in project permits and in the Florida Administrative Code, Rule 62-3.121, as they pertain to the Class III waters of this Contract. The CONTRACTOR will be required to make inspections, measurements and observations required by those regulations and the FDEP permit in the vicinity of the dredge, and the spoil site (beach). This includes, but is not limited to, daily turbidity sampling with reports to the ENGINEER, following procedures stated in Florida Department of Environmental Protection (FDEP) permit appended to the Technical Specifications. If it is determined that the quality of the State's waters is not being maintained, the CONTRACTOR will, without delay, follow the procedures provided in the FDEP permit. The water quality monitoring measurements, procedures to maintain water quality and reporting costs will be incorporated into the unit cost for fill in the bid documents.

27.2 Construction at the project site shall be monitored closely by an experienced, qualified, and independent third party hired by the CONTRACTOR to assure that turbidity levels do not exceed the compliance standards established in the state permit. An individual familiar with beach construction techniques and turbidity monitoring shall be present at all times when fill material is discharged on the beach. This individual shall have authority to alter construction techniques or shut down the dredging or beach construction operations if turbidity levels exceed the compliance standards established in this permit. The names and qualifications of those individuals performing these functions shall be submitted with the CONTRACTOR's bid as required in the Technical Provisions.

28. DREDGE REQUIREMENTS.

28.1 **<u>Dredge Capacity</u>.** The CONTRACTOR shall keep on the job a dredge of sufficient capacity to construct the project in a timely manner, with beach fill placement completed no later than stipulated in these Contract Documents. The CONTRACTOR shall also retain, at the project site, all related dredge equipment of sufficient capacity to meet the requirements of the Work. The dredge shall be in satisfactory operating condition, shall be reliable in its performance, and capable of safely and efficiently performing the Work as set forth in the Contract Documents, including the ability to move a mixture of sandy soils with shell from the furthest extent of the borrow area to the beach project area limits shown on the Plans. The dredge shall be of sufficient size and capacity to complete the Work in a timely manner, meeting or exceeding Contract Document requirements for the construction time period. At a minimum, the dredge shall be suitable for hydraulic dredging in exposed areas such as an inlet channel and ebb shoal in the Gulf of Mexico as shown in the Plans. If the CONTRACTOR elects to use a larger dredge, the CONTRACTOR shall consider the existing depths in the areas to be dredged when selecting the physical plant used to execute the project. The CONTRACTOR and CONTRACTOR's employees shall have experience with the dredge being proposed, or similarly used for hydraulic dredging in exposed areas such as in the Gulf of Mexico. The CONTRACTOR may be required to demonstrate and certify the production capacity of the dredge, demonstrating its capability to construct the project within the time limitations, recognizing there will be periods of inactivity due to weather, sea state, etc. If the dredge, in the ENGINEER's opinion, is not of sufficient capacity to complete the Work in the Contract time period, the ENGINEER may direct the CONTRACTOR to replace the dredge with a greater production capacity dredge. Periods of inactivity shall be factored into the CONTRACTOR's consideration of dredge capability to construct the project within Contract time limits. No reduction in the capacity of the dredge employed on the Work shall be made except by written permission of the COUNTY.

28.2 American Bureau of Shipping Certification for Open Ocean Operation. It is the CONTRACTOR's responsibility to obtain any and all American Bureau of Shipping (A.B.S.) and U.S. Coast Guard dredge certifications and/or approvals required for the project described herein, to allow for the open ocean operation of the dredge that will be used to complete the Work. A copy of the applicable legal certifications and associated approvals must be provided to the COUNTY and ENGINEER at the time of bid, demonstrating that the plant (dredge) proposed for use on the project is licensed and certified to conduct open water (Gulf of Mexico) work.

28.3 Pipelines. Pipe and pipelines utilized for the project will be in good working order, free of defects. All pipelines, both above and below water, must be kept in good condition at all times. All pipelines shall be maintained free of leaks and deposition of sediment or creation of turbidity. Any leaks or breaks along their length must be promptly and properly repaired. The CONTRACTOR shall cease operations and promptly repair the pipeline to the satisfaction of the ENGINEER in the event of leaks or pipeline breaks. All pipelines from the borrow area to the fill placement area will be placed in accordance with the Plans and permits, and shall avoid all vegetation and established shorebird protection areas. Use of the pipelines on the beach shall not result in the deposition of rust pieces or deposits that may discolor the beach or present a potential hazard to beach visitors. The CONTRACTOR shall clean the beach of any rust pieces or rust color deposits, and clean the beach of all materials used to seal seams between the connected pipeline segments.

28.4 Booster Pumps. Booster pumps are not expected to be used on this project. If the CONTRACTOR anticipates a need for booster pumps to complete the Work, the CONTRACTOR shall indicate the type, size, placement location, anticipated duration, and other particulars of use with the bid as part of the dredge and equipment submittal requirements. Unless requested by the CONTRACTOR in this manner, and subsequently granted by the COUNTY in writing, or by virtue of Contract Award, booster pump use will not be permitted.

29. MISPLACED MATERIAL, PLANT MACHINERY, EQUIPMENT OR APPLIANCE.

Should the CONTRACTOR, during the progress of the Work, lose, discard, throw overboard, sink, or misplace any material, plant, machinery, equipment, or appliance, the CONTRACTOR shall recover and remove the same with the utmost dispatch. The CONTRACTOR shall also give immediate notice to the ENGINEER, with description and location of such material, plant, machinery, equipment, or appliance. Should the ENGINEER discover such material, plant, machinery, equipment, or appliance, the ENGINEER will locate through electronic means or buoy the material, plant, machinery, equipment, or appliance, and notify the CONTRACTOR of its location. Removal of the material, plant, machinery, equipment, or appliance, shall be the responsibility of the CONTRACTOR and cost of the removal will be paid for by the CONTRACTOR. Should the CONTRACTOR refuse, neglect, or delay compliance with the above requirements, such material, plant, machinery, equipment, or appliance may be removed by the COUNTY, and the cost of such removal may be deducted from any money due or to become due to the CONTRACTOR or may be recovered under their bond.

30. FINAL CLEAN-UP.

Final clean-up shall include the removal of the CONTRACTOR's plant and all equipment and materials, and all debris, either for disposal or reuse. Unless otherwise approved in writing by the COUNTY, the CONTRACTOR will not be permitted to abandon stakes, pipelines, cables, pipeline supports, pontoons, or other equipment or materials in the disposal area, pipeline access areas, water areas, underwater in the Gulf of Mexico, passes or inlets, on the beach or other areas adjacent to the work site. Any stakes or other markers placed by the CONTRACTOR must be removed as a part of the final clean-up. All stakes, including grade stakes, placed during the fill operation shall be completely removed and shall not be left buried in the fill. All debris shall be removed from the beach. Final payment will be delayed until all grade stakes are removed from the beach area.

31. SIGNAL LIGHTS.

The CONTRACTOR shall display signal lights and conduct their operations in accordance with the most recent and current General Regulations of the Department of the Army and of the U.S. Coast Guard governing lights and day signals to be displayed by towing vessels with tows on which no signals can be displayed, vessels working on wrecks, dredges and vessels engaged in laying cables or pipes or in submarine or bank protection operations, lights to be displayed on dredge pipeline and day signals to be displayed by vessels moored or anchored in a fairway or channel and the passing by other vessels or floating plant working navigable channels, as approved by the Secretary of the Army and Commandant, U.S. Coast Guard (33 C.F.R. 80.18 - 8-31a: 33 C.F.R. 95.51 - 95.66; 33 C.F.R. 9.22 - 90.36; 33 C.F.R. 82 and C.G. Pub. 169, Navigation Rules, International-Inland dated May 1 1977) (DAR 7-603.33), or more recently prescribed by applicable regulations.

32. NOTICE TO MARINERS.

The CONTRACTOR shall issue a Notice to Mariners regarding the dredging and disposal operation immediately after the Notice to Proceed has been received and prior to the movement of floating equipment into the project area. A copy of the Notice to Mariners shall be provided to the ENGINEER prior to the commencement of Work, including mobilization of equipment to the project site.

Should the CONTRACTOR, during dredging operations, encounter any objects on the ocean bottom that could be a hazard to navigation, he/she will notify the U.S. Coast Guard, any other pertinent agencies, and the ENGINEER immediately as to the location of said object and any other pertinent information necessary for the CONTRACTOR to put out a Notice to Mariners.

33. UNDERWATER CABLES, PIPELINES, OUTFALL LINES, ETC.

The CONTRACTOR shall be responsible for verifying the locations and depths of all underwater cables, pipelines, outfall lines, etc. and take precautions against damage which might result from their operations, including without limitation, the placement of dredge spuds and/or anchors which may damage the underwater facilities. If any damage occurs as a result of the CONTRACTOR’s operations, the CONTRACTOR will be required to suspend dredging until the damage is repaired and approved by the ENGINEER. Costs of such repairs and downtime of the dredge and attendant plan shall be at the CONTRACTOR’s expense.

34. LEGAL RESTRICTIONS AND TRAFFIC PROVISIONS.

The CONTRACTOR shall conform to all applicable laws, regulations, or ordinances with regard to labor equipment certification, laws, hours of work and their general operations. The CONTRACTOR shall conduct their operations so that navigation shall not be blocked or closed through Longboat Pass, any thoroughfare nor interfere in any way with traffic on railway, highways, or on water, without the consent of the proper authorities. The regulations the CONTRACTOR shall adhere to are those established by, but not necessarily limited to, the Department of the Navy, U.S. Coast Guard, Department of the Army, American Bureau of Shipping, all environmental agencies, Florida Department of Environmental Protection, Florida Department of Transportation, and the COUNTY.

35. ELECTRICITY AND OTHER UTILITIES.

All electric current and other utilities required by the CONTRACTOR shall be furnished at the CONTRACTOR's own expense.

36. ASSIGNMENT.

Neither party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other nor shall the CONTRACTOR assign any monies due or to become due to him hereunder, without the previous written consent of the COUNTY.

37. PROTECTION OF PROPERTY AND WORK.

37.1 Protection of Property. The CONTRACTOR shall, at the CONTRACTOR’s own cost and expense, support and protect all public and private property that may be encountered or endangered in the prosecution of the Work herein contemplated. The CONTRACTOR shall repair to its original condition and make good any damage caused to any such property by reason of its operation, to the satisfaction of the COUNTY, and any owner, before final payment is provided to the CONTRACTOR by the COUNTY.

37.2 CONTRACTOR Responsibility. The CONTRACTOR shall at all times guard the work site or sites and adjacent properties from any damage whatsoever in connection with this Contract whether arising from direct operations under this Contract, theft, vandalism or any cause whatsoever. The CONTRACTOR shall at all times protect its own Work from damage; nevertheless, the CONTRACTOR is not responsible for natural erosion of beach sections previously accepted by the ENGINEER for payment. The CONTRACTOR shall make good any and all loss, damage or injury to the Work, whether arising from direct operations under this Contract, weather or sea conditions, theft, vandalism or any cause whatsoever. The CONTRACTOR will not be responsible for maintenance of beach sections previously accepted by the ENGINEER, unless the beach is eroded or damaged due to the activities of the CONTRACTOR.

37.3 Risk of Loss. The Work and everything pertaining thereto shall be performed at the sole risk and cost of the CONTRACTOR from commencement until final payment by the COUNTY. Any specific references contained in the Contract Documents, that the CONTRACTOR shall be responsible at its sole risk and cost for the Work or any part thereof are not intended to be, nor shall they be construed to be, an exclusive listing of the circumstances in which the CONTRACTOR bears the risk of loss, but rather they are intended only to be examples.

37.4 Risk of Weather Events. All loss or damage arising out of the nature of the Work, or from the action of the elements, or from weather events, hurricanes, tropical storms, winter storms, adverse sea state, or from any unusual obstruction or difficulty, or any other natural or existing circumstances either known or unforeseen, that may be encountered in the prosecution of the Work, shall be sustained and borne by the CONTRACTOR at its own cost and expense, including all fill placement that has not been accepted by the ENGINEER for payment.

37.5 No Claims Against COUNTY or ENGINEER. The CONTRACTOR shall have no claim against the COUNTY or ENGINEER because of any damage or loss to the Work for any reason, or CONTRACTOR's materials, equipment or supplies, including no claim for loss or damage due to simultaneous work by others, and the CONTRACTOR shall be responsible for the complete restoration of damaged Work to its original condition complying with the Contract Documents. Notwithstanding any other provision of this Contract, this obligation shall exist without regard to the availability of any insurance, either of the COUNTY, ENGINEER, or the CONTRACTOR, to indemnify, hold harmless or reimburse the CONTRACTOR for the cost incurred in making such restoration.

37.6 Beach Erosion. The CONTRACTOR shall be aware of the dynamic nature of the project site and account for the likelihood of changing site conditions including, but not limited to, beach erosion and accretion, sediment migration and shoaling, and changes to the volume available in the borrow area and/or required by the project fill templates, whether individually or in total. Based on the CONTRACTOR's before dredge surveys (BD), the ENGINEER reserves the right to evaluate the conditions and make a determination regarding adjustments to the Work as prescribed in these Contact

Documents. The CONTRACTOR is not responsible for naturally-occurring erosion of any section of the beach fill after it has been accepted for payment by the ENGINEER; however, the CONTRACTOR is responsible for maintaining the beach fill until it is accepted by the ENGINEER and to avoid preventable damage to sections that have been accepted by the ENGINEER. The CONTRACTOR is also responsible to grade and eliminate all beach scarps or cliffs in either of the project fill areas regardless of ENGINEER acceptance, prior to being considered complete and eligible for final payment.

38. SAFETY.

38.1 Contractor Responsibility for Safety. The CONTRACTOR is responsible for all safety associated with the project. The CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work, including, but not limited to, exclusion of the public from active work sites, protection of beachgoers and watercraft, establishing appropriate safety zones, and use of safety personnel such as spotters and flagmen, with an abundance of caution. The CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to, the following at a minimum:

(a) All persons;

(b) All the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site; and,

(c) Other property at the site or adjacent thereto, including trees, shrubs, lawns, natural vegetation, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

38.2 The CONTRACTOR shall notify owners of adjacent property and utilities when prosecution of the Work may affect them. All damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the CONTRACTOR, any subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall be remedied by the CONTRACTOR. The CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed, the CONTRACTOR has entirely demobilized from the COUNTY, and the ENGINEER has issued a notice to the COUNTY and CONTRACTOR that the Work is acceptable.

39. OTHER INSURANCE

Insurance required to be maintained by the CONTRACTOR is specified in the COUNTY’s Standard Terms and Conditions. In addition, unless more specifically required by the COUNTY, Maritime Coverage (Jones Act) and Longshore and Harbor Workers’ Compensation Act (LHWCA) coverage shall be maintained where applicable to the completion of the work.

40. DEFINITIONS.

40.1 **Acceptance Sections.** Acceptance sections are defined as the segment of beach lying between two immediately adjacent pay profile lines, which are located a perpendicular distance approximately 100 foot apart as indicated in the Plans.

40.2 **Addenda or Addendums.** Written or graphic instruments, explanations, interpretations, changes, corrections, additions, deletions or modifications of the Contract Documents issued prior to the opening of Bids which clarify, correct or change the bidding documents or the Contract Documents.

40.3 **Bid.** The offer or proposal of the bidder submitted on the prescribed form, providing all required information, setting forth the prices for the Work to be performed, properly signed or guaranteed.

40.4 **Bonds.** Bid, Performance, and Payment bonds and other instruments that protect against loss due to inability, failure or refusal of the CONTRACTOR to perform the Work specified in the Contract Documents.

40.5 **COUNTY.** Manatee County, Florida and its authorized and legal representatives, the public entity with whom the CONTRACTOR has entered into the agreement and for whom the Work is to be provided.

40.6 **CONTRACTOR.** The person, firm, or corporation with whom the COUNTY has executed the Agreement to furnish the Work called for in the Contract Documents.

40.7 **Date of Completion.** Calendar date when all Work shall be completed in compliance with Contract Documents, the CONTRACTOR has repaired all damage or injury to the work site, cleaned up the work site, and demobilized all equipment and personnel from the project area.

40.8 **Lump Sum Price Work.** Work to be paid for on the basis of a single payment to accomplish a Work task.

40.9 **Permits.** State and Federal approvals to conduct the Work, including conditions and requirements stated therein and incorporated by reference, that are to be adhered to by the CONTRACTOR.

40.10 **Plans (drawings).** The drawings, plans, maps, profiles, diagrams, and other graphic representations which show character, location, nature, extent and scope of the Work, which have been prepared or approved by ENGINEER and which are considered part of the Contract Documents.

40.11 **Specifications.** Those portions of the Contract Documents consisting of the general requirements and written technical descriptions of products and execution of the Work.

40.12 Surety. Any person, firm or corporation which is bound by bid or Contract bond with and for the CONTRACTOR.

40.13 Written Amendment. A written amendment of the Contract Documents, signed by the COUNTY and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the non-engineering or nontechnical rather than strictly Work-related aspects of the Contract Documents.

MANATEE COUNTY
COQUINA BEACH STORM DAMAGE RESTORATION PROJECT
TECHNICAL SPECIFICATIONS

PART 2 - TECHNICAL PROVISIONS

Please refer to the COUNTY's front end documents in addition to the following Part 2 – Technical Provisions.

1. COQUINA BEACH RESTORATION PROJECT.

The beach nourishment project consists of the hydraulic placement of 74,805 cubic yards of fill on Coquina Beach, located immediately north of Longboat Pass on the southern end of Anna Maria Island in Manatee County. The project area extends approximately 7,747 feet from beach monument number R-33 southward to R-41 as shown on the Plans. The elevation of the construction berm is +4.0 ft (NAVD) plus a 1.0 ft allowable vertical tolerance above the construction template only to a maximum elevation of +5.0 ft (NAVD). The seaward slope of the fill template is 1 vertical to 15 horizontal from the constructed berm crest to the intersection with the existing seafloor. Payment will be for the not-to-exceed bid quantity of 74,805 cubic yards placed within the beach fill template. The CONTRACTOR will not be paid for any fill in excess of the bid quantity (cy) or any fill placed outside the templates and tolerances. Estimated target fill densities per beach fill cross-section are shown on the Plans. The COUNTY reserves the right to recalculate the target fill densities and distribution based on an updated survey.

Sediment for the project will be obtained by cutter suction dredging within the permitted navigation channel of Longboat Pass, located at the southern project limit, and transported hydraulically to the beach fill site. The navigation channel was most recently dredged in 2016 and has since refilled with material as a result of natural processes. Based on September 2020 conditions, the borrow area is estimated to contain approximately 202,600 cubic yards of material to -15.6 ft (NAVD), which includes the authorized overdepth allowance.

2. CONTRACTOR QUALIFICATION.

The CONTRACTOR shall provide the dredge and all support vessels, labor, equipment, supplies, and materials to perform all operations in connection with excavating, transporting, placing, grading and tilling the beach fill, debris removal, and returning the project site to its pre-construction condition as required by the Contract Documents. In order for the CONTRACTOR to be deemed qualified and responsive, the following must be provided with the bid under cover labeled "BIDDER QUALIFICATIONS" or similar title:

a) Bidder's proposed method of construction and overall schedule to demonstrate understanding of the Work and completion within the Contract time.
b) The size and type of the cutterhead dredge proposed for the Work that meets the minimum requirements provided in the Supplemental General Conditions.
c) The additional equipment proposed to complete this project, to include barges, scows, boosters, cranes, bulldozers, loaders, excavators, etc.
d) Qualifications and prior experience of bidder's key personnel, to include proposed project manager, superintendent, dredge operator, site engineer, etc.

e) Experience with open Gulf of Mexico inlet (channel and ebb shoal) dredging.
f) Description of last inlet dredging project of this nature that the bidder completed.
g) References for at least three (3) similar beach nourishment works within the previous five (5) years.
h) Turbidity monitoring experience and qualifications for compliance with project permits.
i) Scope of Work and resumes for the independent third party turbidity monitoring to demonstrate that the staff and equipment is available to conduct the monitoring correctly.

3. ORDER OF WORK, PROJECT SCHEDULE, AND ACCEPTANCE SECTIONS.

3.1 Order of Work and Project Schedule. The CONTRACTOR shall provide an order of Work outline and project schedule to the ENGINEER and COUNTY within 10 days after being awarded the agreement for discussion and concurrence. The project schedule shall indicate mobilization, start of sediment discharge onto the beach, estimated construction period, hydraulic fill placement completion date, beach tilling, demobilization and completion of all work. The CONTRACTOR shall describe the order in which the Work will be performed, including the anticipated progression of fill placement along the beach and dredge progression through the borrow area. The borrow area shall be dredged from west to east in a continuous fashion, commencing at the western terminus of the borrow area as shown on the Plans.

The CONTRACTOR shall also forward to COUNTY, as soon as practicable after the first day of each month, a summary report of the progress of the various parts of the Work under the Contract stating the existing status, estimated time of completion and cause of delay, if any. Together with the summary report, CONTRACTOR shall submit any necessary revisions to the original schedule for COUNTY's review and approval.

3.2 Acceptance Section. Acceptance sections are defined as the portion of the nourished beach lying between two immediately adjacent pay profile lines, which are identified in the project Plans. Once fill placement begins in an acceptance section, it must be completed before moving to the adjacent acceptance section, unless the ENGINEER approves moving to another acceptance section. Pay profile lines will be established by the CONTRACTOR according to the Plans and shall be spaced at the perpendicular distance apart as shown on the Project Baseline, and at the locations provided in the Plans.

3.3 Work Hours and Holidays. Work may occur 24 hours a day on any day during the performance period except Good Friday and Easter weekend, which includes April 2, 3, and 4 in 2021.

3.4 Progress Maps. The CONTRACTOR shall maintain and submit progress maps for project performance and completion tracking by acceptance section with correlation to the placed material removal from the borrow area. The Progress Maps may be submitted in digital (i.e. Adobe PDF) format and transmitted by email to the ENGINEER as an attachment to the Daily QCR.

4. DREDGE CUTTERHEAD LOCATION CONTROL.

4.1 Continuous Electronic Positioning on the Dredge Cutterhead. The CONTRACTOR is required to have in continuous operation on the dredge electronic positioning equipment that will accurately compute and plot the position of the cutterhead of the dredge. The CONTRACTOR shall adhere to the applicable sections of the FDEP Sediment QA/QC Plan provided in the appendices. Differential Global Positioning System (DGPS), or equivalent, shall be used to maintain precise positioning of the dredge cutterhead. Whenever excavation is underway, the location of the dredge cutterhead shall be continuously monitored and its position recorded in Florida State Plane Coordinates. The dredge cutterhead location shall be recorded at intervals not to exceed two (2) minutes while the dredge is working. Plotters shall also continuously record the deviation (with respect to the datum on the Plans) of the cutterhead and cut elevation as well as the cutterhead horizontal location. The CONTRACTOR shall also continuously record the elevation (with respect to NAVD) of the cutterhead location. Such fixes, and the accompanying plots, shall be furnished to the ENGINEER upon request of the ENGINEER, but no later than daily as part of the Quality Control Reports. The electronic positioning equipment for the dredge cutterhead shall be installed on the dredge prior to the start of excavation so as to monitor, as closely as possible, the actual location of the bottom of the dredge cutterhead while it is excavating sediment. All vertical measurements shall be tide corrected and reported in NAVD88. The operator shall have visual controls that depict the location and depth of the cutterhead within the specified borrow area. The electronic positioning equipment shall be calibrated, maintained and operated so that the maximum error for the fixes recorded does not exceed tolerances in the horizontal position (±3 feet) or vertical position (±0.1 foot). The location on the dredge of the master antenna and the distance and direction from the master antenna to the cutterhead shall be reported in the Quality Control Report.

4.2 Daily Quality Control Report and Dredge Cutterhead Location. Daily Quality Control Reports provided to the ENGINEER shall include northing, easting and elevation data and plan view and cross-section plots of the previous day's dredge cutterhead locations and show the borrow area limits. The format of the plot may be subject to approval by the ENGINEER. All payments to the CONTRACTOR may be withheld by the COUNTY until all of the required information is provided to the ENGINEER.

5. BORROW AREA EXCAVATION.

5.1 Sediment QA/QC Plan. The CONTRACTOR shall follow the FDEP approved Sediment QA/QC Plan provided in the appendices.

5.2 Borrow Area Sediment Removal Limitations. All sediment removal shall be within the horizontal and vertical limits of the borrow area shown in the Plans. Under no circumstances shall sediment removal occur below the permitted overdepth elevation as shown in the Plans or permits for the project, referenced to NAVD88. If sediment removal occurs outside of the permitted borrow area, or below the elevation of the borrow area as shown in the Plans, the CONTRACTOR will pay any and all permit fines for the permit violation and shall be responsible for removal of material from the nourished beach which is not acceptable to the State of Florida. The CONTRACTOR will be required to pay for any costs, fines, or other expenses related to excavating outside of or below the permitted borrow area limits and/or permit violations resulting from CONTRACTOR negligence in complying with permits for the project, and may be required by the State of Florida to remove unacceptable material from the beach fill. Removal of unacceptable material from the beach fill will be at the CONTRACTOR's expense. If the CONTRACTOR does not pay any costs, fines, or other expenses related to excavating too deep or outside of the borrow area limits and/or for permit violations, the COUNTY will have the option to deduct from payments due to the CONTRACTOR from the COUNTY, or may be recovered from the CONTRACTOR's bond to cover all costs, fines, or expenses related to excavating outside of borrow area limits and/or removing sediment deeper than allowed within the borrow area. Beach fill that is obtained from unauthorized areas will not be paid for under this Contract. If it is determined that direct mechanical sediment removal has been performed beyond the borrow area(s) limits, the quantity of the material dredged from these areas will be computed and subtracted directly from the pay quantity of material placed on the beach.

5.3 Sediment Excavation Limits. The CONTRACTOR shall be allowed to remove material to the maximum elevation of -15.6 feet NAVD within the borrow area boundaries, which is based on the permitted design depth of -13.6 feet NAVD, plus 2 foot of allowable overdepth.

5.4 Continuous Excavation. All excavation shall be performed in a continuous manner to the greatest extent practicable to avoid loss of material which could have been excavated from each section of the borrow area. Excavation of sediment shall occur to the horizontal and vertical limits of the borrow area in those borrow area sections excavated by the CONTRACTOR.

5.5 Uniform Excavation. All excavation shall be performed in a uniform manner to the greatest extent practicable, so as to avoid creating significant holes, valleys, or ridges within the borrow areas. The borrow area shall be dredged to maximize the removal of sediment from each section of the borrow area, while avoiding excavation outside of the allowable borrow area before moving to the next section of the borrow area. The CONTRACTOR shall demonstrate to the ENGINEER that all sediment resources have been exhausted from each section of the borrow area before moving to the next borrow area section.

5.6 Borrow Area Check Surveys. The CONTRACTOR shall provide surveys as part of the Daily Quality Control Report that demonstrates the limits of sediment removal that occurs each day. The surveys are required as part of the normal course of work as additional assurance of compliance with the project permits, Plans and Specifications. The surveys shall be tide corrected and provided as raw digital data (i.e. X, Y, Z), and in cross-section and plan view plots or other graphical format proposed by the CONTRACTOR that is acceptable to the ENGINEER. The surveys shall be collected at a spacing sufficient to demonstrate compliance with project permits.

5.7 Compliance Criteria for Beach Fill Material. The CONTRACTOR shall continuously visually monitor the material being placed on the beach. Beach fill material shall meet the requirements of the FDEP approved project Sediment QA/QC Plan and shall conform to the compliance values presented on the plan for the respective project area. Any unacceptable material remaining in the fill shall be removed and disposed of by the CONTRACTOR as approved by the ENGINEER.

5.8 Unsuitable Material. If amounts of rock that exceed the FDEP approved Sediment QA/QC Plan, clay, or other debris are encountered in the borrow areas, the CONTRACTOR shall immediately cease dredging and elevate the equipment excavation depth within borrow area limits, or the location of the dredge cutterhead within the borrow area in order to avoid the inclusion of unacceptable amounts of rock, clay, or other debris in the beach fill while staying within the defined area. The location of unsuitable material encountered within the borrow areas shall be noted on the Contractor's Daily Quality Control Reports.

5.9 Encountering Rock, Rubble or Debris in the Borrow Areas. During beach fill operations, the CONTRACTOR shall continuously monitor the placement of fill material for the presence of rocks, rubble or debris in the material. If rock in excess of what is permissible by the FDEP approved Sediment QA/QC Plan is encountered during dredging, the CONTRACTOR shall adjust the construction operations to eliminate rock placement on the beach that exceeds permit requirements. The CONTRACTOR shall immediately notify the ENGINEER verbally, and report the encounter with excessive amounts of rock, rubble or debris on the Quality Control Report, providing location in State Plane Coordinates of the area of rock, rubble or debris. Rock, rubble or any other debris larger than three-fourths (3/4) inch in diameter that is excavated and placed on the beach may be required by the COUNTY or the State of Florida to be removed from the beach fill by the CONTRACTOR, at the costs provided in the Bid Form. If the CONTRACTOR fails to remove the rock, rubble or debris from the beach fill to the satisfaction of the COUNTY or State of Florida, such material may be removed by the COUNTY and the cost of such removal may be deducted from any money due, or to become due, to the CONTRACTOR or may be recovered under their bond. The State of Florida has the authority to determine if the quality of material being placed on the beach is acceptable; nevertheless, this does not relieve the CONTRACTOR of responsibility for all placed material, including rock and debris. If the State of Florida makes a specific determination that material being placed is unacceptable quality, the CONTRACTOR will adjust their operations to avoid the unacceptable material and to place material which is acceptable to the State of Florida.

5.10 Preservation of Historical, Archeological, and Cultural Resources. The borrow area is a navigation channel that has been excavated on numerous occasions and most recently in 2016. Nevertheless, if during construction activities, the CONTRACTOR observes items that may have historical or archeological value, the CONTRACTOR shall immediately cease all activities that may result in the destruction of these resources and shall prevent employees and subcontractors from trespassing on, removing, or otherwise damaging such resources. The CONTRACTOR will immediately relocate to another position in the borrow area and resume construction of the beach nourishment project, and not return to the site in question until State authorities have rendered judgment concerning the potential resources. Such observation shall be reported immediately to the ENGINEER so that the appropriate authorities may be notified and a determination made as to the significance and what, if any, special disposition of the finds shall be made. The

CONTRACTOR shall report any observed unauthorized removal or destruction of such resources by any person to the ENGINEER and appropriate State of Florida authorities.

5.11 Borrow Area Geotechnical Data. The borrow area is a navigation channel that has been excavated on numerous occasions and most recently in 2016. Prior to this most recent dredging event, vibracores (sediment cores) were collected in the Longboat Pass navigation channel in 2007 and 2014, which are depicted on the Plans in the borrow area plan view and cross-section sheets. The resulting geotechnical report and sediment logs are provided as an appendix to these Technical Specifications. Although the material within the permitted limits of the borrow area depicted in the 2007 and 2014 cores is assumed to have been predominantly removed during the 2016 dredging event, the channel has infilled as a result of coastal processes. Based on past dredging events, repetitive coastal processes associated with the Longboat Pass channel and previous geotechnical characteristics, the material in the borrow area is expected to have been deposited from the adjacent beaches as a mix of sandy soils with shell. At the CONTRACTOR's own discretion, the CONTRACTOR shall make an independent assessment prior to bidding.

5.12 Noncompliant Material Remediation and Removal. Screening at the beach disposal site is not a requirement of the Work. Nevertheless, remediation and removal of noncompliant material is included as an optional item of the Contract to be utilized only at the ENGINEER's direction to address the potential of noncompliant material occurring within the borrow area. If noncompliant material is placed on the beach from within the approved borrow area limits, screening for remediation and removal may be required by the COUNTY. If screening is required for remediation purposes, the method by which the CONTRACTOR removes oversized material shall be of their own design and shall be submitted to the ENGINEER for information purposes prior to commencement of work. All noncompliant material must be disposed of at a legal location at the CONTRACTOR's own discretion per the costs established in the Bid Form. This provision does not exclude the CONTRACTOR from meeting the sediment quality requirements specified herein and established in the project permits. Likewise, the bid prices for implementing this provision shall not apply to any noncompliant material dredged from outside the approved borrow area limits, for which the CONTRACTOR will be held responsible to remediate, remove, and dispose of at a legal location at the CONTRACTOR's own cost. Crushing or burial of rock or shell and dispersing in the fill material shall not be allowed in any circumstance.

5.12.1 Beach Fill Quality Control. The CONTRACTOR shall continuously ensure beach fill material is in compliance with the FDEP Sand Rule, Florida Administrative Code 62B- 41.007(2)(j), contract requirements and permit conditions. The CONTRACTOR shall characterize the nature of the sediments dredged from the borrow area and placed along the project shoreline in the Daily QCR. If directed by the ENGINEER, the CONTRACTOR shall acquire the equipment and personnel necessary to remediate the beach fill area.

5.12.2 Compliance Criteria for Beach Fill Material. Beach fill material shall meet the requirements of the FDEP approved project Sediment QC/QA Plan and shall conform to the compliance values presented on the plan for the respective project area. Beach fill material shall be clean sediment from the permitted source and free of unacceptable materials, such as debris, asphalt, rocks greater than ¾ inch in diameter, clay balls, and other organics, oil, pollutants and any other foreign materials. Any unacceptable material remaining in the fill shall be removed and disposed of by the CONTRACTOR as approved by the ENGINEER.

5.12.3 Beach Fill Observation and Sampling. Beach fill observation shall be performed by the CONTRACTOR at all times during which beach fill material is being placed. The CONTRACTOR shall have on-site personnel to visually monitor the material being placed on the beach and capable of identifying deviations in sediment quality as specified in the Sediment QC/QA Plan, at the active placement location. The selected individual shall have training or experience in beach renourishment, construction inspection and testing and be knowledgeable of the contract requirements and permit conditions. The observer shall remain in constant radio contact with the dredge and shall report encounters with noncompliant materials to the dredge operator. Should any beach fill material not comply with the compliance criteria stated above, the CONTRACTOR shall collect samples of said material at an interval of no greater than 100 feet throughout the noncompliant area and notify the ENGINEER immediately. If the expanse of noncompliant material exceeds the compliance criteria as stated in the Sediment QC/QA Plan, the ENGINEER shall be notified immediately and the CONTRACTOR shall cease borrow area excavation operations and take necessary actions to avoid further discharge of noncompliant material with possible remediation. If requested by the ENGINEER, the collected samples of noncompliant beach sediments shall be analyzed by the CONTRACTOR for grain size distribution, silt content, Munsell Color, carbonate content, and percent visual shell by a certified laboratory at no cost to the COUNTY using the methods outlined in the Sediment QC/QA Plan.

5.12.4 Determination of Aerial Extent of Noncompliant Beach Fill. In the event of encountering noncompliant beach fill, the CONTRACTOR shall follow procedures to determine aerial extent and remediation specified in the Sediment QC/QA Plan and implement the Beach Fill Observation and Sampling provision above. The total square footage and volume of the noncompliant material shall be determined and a site map shall be prepared depicting the location of all samples and the boundaries of all areas of noncompliant fill. Once the CONTRACTOR has the results of the sediment investigation, the ENGINEER shall be notified immediately and provided the information. Notification shall include the map with the aerial extent and volume of all areas of noncompliant beach fill material.

5.12.5 Remediation and Removal of Noncompliant Beach Fill. If the ENGINEER determines remediation is required, the CONTRACTOR shall remediate. The method by which the CONTRACTOR remediates shall be of their own design and shall be conducted so as to ensure compliance of the material placed. The ENGINEER shall be notified of the CONTRACTOR’s remediation method before the CONTRACTOR proceeds with remediation. All noncompliant material must be disposed of at a legal location at the CONTRACTOR’s own discretion. Compensation for Remediation and Removal of Noncompliant Beach Fill will be paid at the unit rates established in the Bid Form for work directed by the ENGINEER as follows:

a. Remediation of Noncompliant Material - Remediation through the actions of blending, grading, pushing, and mixing as further specified in the Sediment QC/QA Plan will be paid per surface area (square foot or acre) of beach remediated as directed by the ENGINEER.

b. Screening to Remove Unacceptable Material – Should material screening be required to remove unacceptable material from the beach fill, the work will be paid by cubic yard of material processed by screening operations as directed by the ENGINEER.

c. Hauling and Disposal of Unacceptable Material – Should screening operations result in unacceptable material that must be hauled away and disposed as directed by the ENGINEER, the quantity will be paid by cubic yard of unacceptable material removed and evidenced by certified documentation (haul tickets, waste disposal records, etc.).

Any costs for remediation and removal actions performed by the CONTRACTOR without the ENGINEER's explicit direction will borne solely by the CONTRACTOR. The CONTRACTOR shall provide to the ENGINEER all plots, data, and information required by the Sediment QC/QA plan for reporting.

6. PIPELINES.

6.1 Pipeline Placement. The CONTRACTOR shall avoid areas of the beach outside the fill placement area used by shorebirds. No construction activity, including pipeline placement, shall occur in any vegetated areas because of the potential presence of shorebirds, which are to be protected and avoided.

6.2 Pipeline Leaks. The CONTRACTOR shall maintain a tight discharge pipeline at all times. The joints shall be so constructed as to preclude spillage and leakage above and below water. All leaks shall be promptly repaired. Failure to repair leaks or change the method of operation which is resulting in leakage that exceeds turbidity and water quality standards during transport to discharge site will result in suspension of dredging operations and require prompt repair or change of operation to prevent leakage as a prerequisite to the resumption of dredging. Materials used to plug leaks or to seal pipeline joints shall be entirely removed from the beach when the pipeline is removed.

6.3 Sand Ramps. The CONTRACTOR is required to build sand ramps a minimum of 15 feet wide over the shore pipe at a maximum of 200 foot intervals to allow pedestrian access to the water. Sand ramps will also be required at the beach access points for each existing public access from the upland throughout the project area. Additional ramps shall be constructed in front of all lifeguard towers, stairways down to the beach, and dune overwalks. After construction, the pipe will be removed and the beach in the area of the ramps leveled and dressed.

6.4 Booster Pumps and Trucking. Booster pumps will not be permitted without the written consent of the COUNTY and as described in the Supplemental General Conditions. The CONTRACTOR shall use a dredge of sufficient capability to maintain a sufficient sediment transfer rate to meet or exceed time limitations for project construction. Trucking of sediment will also be prohibited unless approved by the COUNTY in writing upon written request of the CONTRACTOR due to extenuating circumstances.

6.5 Pipeline Transportation. A pipeline dredge shall be used to transport material to the project placement site. The Contractor shall maintain a tight discharge pipeline at all times. The joints shall be so constructed as to preclude spillage and leakage.

6.6 Submerged Pipeline. In the event the Contractor elects to submerge their pipeline, the pipeline shall rest on the bottom, and the top of the submerged pipeline and any anchor securing the submerged pipeline shall be no higher than the project depth for any navigation channel in which the submerged pipeline is placed. Should the Contractor elect to use a pipeline material which is buoyant or semi-buoyant, such as PVC pipe, plastic, or similar low density materials, the Contractor shall securely anchor the pipeline to prevent the pipeline from lifting off the bottom under any conditions. The Contractor shall make daily inspections of the submerged pipeline to ensure buoyancy has not loosened the anchors. The Contractor shall retrieve all anchors when the submerged pipeline is removed. The location of the entire length of submerged pipeline shall be marked with signs, buoys, lights and flags conforming to U.S. Coast Guard regulations. No pipelines shall be placed on artificial reefs or within any identified buffer zones.

6.7 Floating Pipeline. Should the Contractor's pipeline not rest on the bottom, it will be considered a floating pipeline and shall be visible on the surface and clearly marked. In no case will the Contractor's pipeline be allowed to fluctuate between the surface and the bottom, or lie partly submerged except where the pipeline descends from the dredge to a submerged pipeline. Lights shall be installed on the floating pipeline in compliance with U.S. Coast Guard requirements and for safety. The lights shall be supported either by buoys or by temporary piling, provided by the Contractor. Where the pipeline does not cross a navigable channel, the flashing yellow all around lights shall not be spaced more than 200 feet apart. Closer spacing and specific markings or colors may be required by the U.S. Coast Guard, in which case the requirements of the U.S. Coast Guard shall govern, at no additional cost to the County.

6.8 Pipeline Landing Barricade Requirements. Installation of a barricade is required on all pipelines that encounter land on Anna Maria Island. The purpose of the barricade is to prevent public access onto the pipeline landing.

7. HYDRAULIC PLACEMENT OF BEACH FILL.

7.1 General. All sediment excavated from the borrow area shall be transported to, and hydraulically deposited on, the beach within the lines, grades and cross sections shown in the Plans except as may be modified by the ENGINEER. The CONTRACTOR shall maintain and protect the fill in a satisfactory condition at all times until final completion and acceptance of the work. The CONTRACTOR will receive no payment for any fill (sediment) that is not contained within the limits of the hydraulic fill template, with the exception of fill placed in the beach berm tolerance, which is +1.0 feet. The CONTRACTOR must place a minimum of 95% of the upper tolerance volume between pay profile lines and achieve the minimum beach berm fill elevation of +4.0 feet (NAVD) everywhere in order to be considered for payment of that section, unless otherwise indicated by the ENGINEER in writing.

7.2 **Debris Removal.** Prior to placement of fill, the CONTRACTOR shall remove from the site of the work all loose or partially buried material lying within the foundation limits of the beach fill sections. All material removed shall be disposed of in an appropriate and legal manner and at the expense of the CONTRACTOR.

7.3 **Debris and Rock Disposal.** The CONTRACTOR shall not bury rock or debris within the beach fill. The CONTRACTOR shall remove any rock or debris which is required to be eliminated from the fill, from the beach area and disposed of it in a legal manner.

7.4 Fill Placement.

7.4.1 **Construction Beach Berm Elevation and Beach Slope.** The elevation of the construction berm is +4.0 ft (NAVD) with a 1.0 ft allowable vertical tolerance above the construction template only. The seaward beach slope shall be 1 foot vertical to 15 feet horizontal until intersection with the existing beach profile.

7.4.2 **Fill Placement Limits.** The excavated material shall be placed and brought to rest on the beach to the lines, grades, and cross-sections indicated on the Plans, unless otherwise provided for herein or directed by the ENGINEER. The beach is subject to change. Existing beach profile cross-sections at the time the Work is done will likely vary from those shown in the Plans. As a result, the fill volumes by profile will also likely vary from the estimated densities shown on the Plans, dependent upon the availability of capacity within the permitted fill template. The CONTRACTOR shall place the hydraulic fill on the beach in such a manner as to establish a uniform beach between adjacent pay profile lines. Segments of beach located between pay profiles will not be underfilled.

7.4.3 **Fill Placement Control.** The CONTRACTOR shall make every effort to retain placed fill within the beach fill template. Temporary longitudinal dikes, and spreader and pocket pipe shall be used as necessary to prevent gullying and erosion of the beach and hydraulic fill, to retain the hydraulic fill on the beach within the limits of the hydraulic fill template cross-section, and to control water turbidity. The pipeline discharge will be located in such a position or location as determined by the CONTRACTOR to avoid potential undermining of any structure, or at a distance that will avoid undermining or any structural damage. Dikes or mounds shall be constructed parallel to the waterline to direct the pipeline discharge longitudinally along the beach to avoid transverse gullying direct from the discharge point to the ocean and to control water turbidity. The ENGINEER may direct the CONTRACTOR to extend dikes, if necessary, to control turbidity and beach erosion. No undrained pockets shall be left on the renourished beach upon completion of the work. The CONTRACTOR shall not permit spoil water to flow landward of the fill section, or water to pond between the hydraulic fill and upland. The CONTRACTOR shall protect existing drainage and operations. Any material permitted to flow into or restrict the flow of an existing ditch, canal, or drain pipe, shall be promptly removed. All structures within the fill section shall be protected by the CONTRACTOR to prevent damage by the CONTRACTOR's operations.

7.4.4 Area of No Fill Placement. The fill shall extend landward to the existing elevation contour that matches the berm crest elevation of +4.0 ft NAVD, plus 1.0 ft upper tolerance, unless features such as dunes or vegetation, or any structures such as concrete decks, buildings, revetments, or bulkheads inhibit fill placement on, or landward of, those features. If a bulkhead or revetment extends to the design berm elevation or above, the fill shall terminate at the bulkhead or revetment. If the top of a structure is below the design berm crest elevation of +4.0 ft (NAVD), then the fill shall taper landward (using a 3H to 1V slope) intersecting one (1) foot below the top of the structure to prevent burial or overtopping with sediment. If a dune vegetation line is below the design berm crest of +4.0 ft (NAVD), then the fill shall taper landward (using a 3H to 1V slope) to the edge of the vegetation.

7.4.5 Right to Vary Beach Dimensions. The ENGINEER reserves the right to vary the width, volume, slope or grade of the berm from the lines and grades shown on the Plans or observed at the project site in order to establish a uniform beach between adjacent pay profile lines or for the entire length of each project, as shown in the Plans. The hydraulic beach fill cross-sections shown in the Plans are for the purpose of estimating the amount of hydraulic fill needed and will be used by the ENGINEER in making any change in the lines and grades. The CONTRACTOR will not be required to dress the hydraulic fill below mean high water, but will be required to dress the beach as specified herein.

7.5 Pay Profiles.

7.5.1 Pay Profile Lines. Based on the pay profile lines presented in the Plans, the CONTRACTOR shall establish beach profiles at the identified locations for purposes of pay volume computations. Pay profile lines are generally spaced at 100 feet apart but may vary for alignment with the design survey profiles collected at FDEP R-Monument locations.

7.5.2 Fill Placement Tolerance. The maximum vertical tolerance for fill placement above the design template is 1.0 feet to a maximum of +5.0 ft NAVD. Payment will be for hydraulic fill placed within the construction template only, plus the upper beach berm tolerance of 1.0 feet, as shown in the Plans. Any material placed above the upper template tolerance may be left in place at the discretion of the ENGINEER; however, this material will not be included in the quantities or volume of material eligible for payment. The CONTRACTOR shall fill any deficient section of beach to be at the minimum elevation of +4.0 feet NAVD everywhere in the project fill area, and shall meet the minimum fill volume requirement of 95% of the fill volume to the +5.0 ft NAVD elevation for the acceptance segment. The COUNTY will withhold payment for those sections of beach (segments between pay profiles) that do not meet the minimum hydraulic fill requirement (tolerance and volume) until the appropriate hydraulic fill placement and grading has been completed by the CONTRACTOR. The CONTRACTOR is encouraged to minimize fill placement above the upper tolerance elevation, which will be considered “non-pay” fill placement. If the CONTRACTOR does fill above the tolerance, that material may be left in place at the ENGINEER’s direction and may require the CONTRACTOR to perform additional surveying and grading at no cost to the COUNTY.

7.5.3 Maximum Pay Volume. The maximum pay volume is 74,805 cubic yards or as otherwise authorized by Change Order. The pay volume will not exceed this value, even though the fill template may have capacity for a larger volume at the time of construction.

7.5.4 Uniform Beach. The filled beach between the pay profiles will be graded, dressed and uniform in dimension. The constructed beach contour lines between pay profiles including the beach berm break, will be approximately shore parallel and straight line, indicating that the CONTRACTOR constructed a uniform (non-cuspate) beach between the profile lines to the appropriate elevation and width, as shown in the Plans or as directed by the ENGINEER.

7.5.5 Underfilling Between Pay Profile Lines. If the ENGINEER or COUNTY believe they have observed underfilling of the beach between pay profile lines, the ENGINEER or COUNTY may request a survey be conducted by the CONTRACTOR at the CONTRACTOR's expense to document the elevation of the placed material. If found to be deficient, the CONTRACTOR will place additional hydraulic fill from the borrow area until the beach is uniform in appearance and dimensions between pay profile lines, provides a straight beach berm break between pay profile lines, provides a minimum of 95% of the upper tolerance fill volume and meets the minimum elevation of +4.0 feet NAVD everywhere on the constructed berm in order to qualify for payment of that section. Fill should be obtained from adjacent areas of the beach that have been overfilled exceeding the design template if fill cannot be obtained from the borrow area. This will include fill contained between the elevations of +4.0 feet NAVD and +5.0 feet NAVD.

8. DRESSING THE NOURISHED BEACH.

8.1 Dressing Before Payment Survey. Upon completion of all filling operations within an acceptance section, and prior to surveying for payment, the fill shall be graded and dressed with a dragged pipe so as to eliminate any undrained pockets, ridges, and depressions in the hydraulic beach fill surfaces. The beach surface shall be level after dressing is completed. The CONTRACTOR is to grade and dress the hydraulic fill on the beach in such a manner as to establish a uniform berm width and slope between adjacent pay profile lines. The beach slope shall be graded down to a slope not steeper than one (1) foot vertical to fifteen (15) feet horizontal to the water's edge. The CONTRACTOR is responsible to grade down any and all beach escarpments or sand cliffs in the entire restored beach until the CONTRACTOR has demobilized from the project site. The project site will not be considered complete, nor the CONTRACTOR eligible for final payment until all beach scarps/sand cliffs in the project areas are graded.

8.2 Misplaced Materials. If any material is deposited other than in places designated or approved, the CONTRACTOR may be required to remove such misplaced material and redeposit it where directed by the ENGINEER or COUNTY, at the CONTRACTOR's expense. This will include materials within the borrow area, on the seafloor in the Gulf of Mexico, in Longboat Pass, or within inland waterbodies.

8.3 Removal of Grade Stakes. If the CONTRACTOR uses grade stakes, the CONTRACTOR shall remove all grade stakes from each completed section prior to dressing the beach. Upon completion of fill placement, the CONTRACTOR shall conduct a search to find each and every stake placed by the CONTRACTOR in the area. Any grade stakes left in the beach will be the sole responsibility and liability of the CONTRACTOR. If the CONTRACTOR fails to remove grade stakes in a timely manner, the COUNTY may have the visible stakes removed and deduct the cost from the CONTRACTOR's final payment.

9. BEFORE AND AFTER DREDGE SURVEYS.

9.1 General. Payments will be based on the comparison of before dredge (BD) and after dredge (AD) surveys conducted on the dressed beach certified by the CONTRACTOR's surveyor. The ENGINEER will verify the pay quantities provided by the CONTRACTOR, based on comparison of BD and AD surveys conducted by the CONTRACTOR's surveyor and accepted by the ENGINEER. Surveys will be performed by a surveyor employed by, or a subcontractor of, the CONTRACTOR. The CONTRACTOR shall notify the ENGINEER as to when the surveys will be conducted so that the ENGINEER may observe the survey as it is conducted. The CONTRACTOR's surveyor shall certify all surveys and the ENGINEER must agree, based on submissions provided by the CONTRACTOR's surveyor, that the survey may be used for payment purposes. All survey work conducted by the CONTRACTOR for payment is subject to acceptance by the ENGINEER. Acceptance sections are defined as the segment of beach lying between two immediately adjacent pay profile lines defined on the Plans. The ENGINEER, at their discretion, may conduct surveys to verify surveys performed by the CONTRACTOR for payment purposes.

9.2 Surveyor. The surveyor used by the CONTRACTOR must be a registered land surveyor in the State of Florida, and shall certify (sign and seal) all survey deliverables.

9.3 Payment Surveys. Payments will be based on the result of the comparison of before dredge (BD) and after dredge (AD) surveys conducted on the dressed beach at pay profiles from Station 10+00 to Station 85+00. The ENGINEER will verify the pay quantities provided by the CONTRACTOR based on BD and AD surveys conducted by the CONTRACTOR and accepted by the ENGINEER. Payment (BD and AD) surveys shall be performed and certified by a registered land surveyor employed by the CONTRACTOR. The CONTRACTOR shall notify the COUNTY and the ENGINEER in advance when the payment surveys will be conducted to provide sufficient time for the survey work to be observed by the ENIGNEER’s representative at the option of the ENGINEER.

9.3.1 Before Dredge Survey. Before dredge (BD) surveys will be conducted by the CONTRACTOR at the spacing and location of pay profile lines as identified in the Plans, which are generally 100 feet apart. BD surveys will be conducted to a minimum distance of 100 feet beyond or seaward of the construction toe of fill. The BD survey will be used as the baseline for volumetric payment for the beach nourishment project. The CONTRACTOR shall not commence construction until the ENGINEER has received the certified (signed and sealed) BD survey and has reviewed the survey for use as the BD survey. The fill template may be revised at the ENGINEER's discretion using the BD survey results.

9.3.2 After Dredge Survey. After dredge (AD) surveys shall not be conducted until the beach has been dressed to provide a level and uniform beach surface, removing all depressions, gullies, or other features in the beach which may affect the accuracy of the survey and the volume computation. The AD pay survey shall be conducted prior to tilling the beach.

9.4 Survey Field Notes Submittal. The CONTRACTOR shall submit survey field notes to the ENGINEER upon completion of each BD or AD survey to expedite review of each survey. All field notes, survey and volume computations, and the records used by the CONTRACTOR to compute the payment fill quantity shall be furnished to the ENGINEER with the Application for Progress or Final Payment. Failure to provide the specified information will delay recommendation and payment.

9.5 Survey Error or Volume Computation Discrepancy. If there is an error or discrepancy in the survey conducted by the CONTRACTOR which affects the payment volume, the CONTRACTOR and the ENGINEER's surveyors will attempt to resolve the survey discrepancy or error. If the discrepancy or error cannot be resolved, the ENGINEER will compute the fill volume for payment purposes. Likewise, if there is an error or discrepancy concerning the payment volume computation, the ENGINEER and CONTRACTOR will attempt to resolve the issue. Nevertheless, the volume determined to be correct by the ENGINEER shall be the volume used for payment purposes.

9.6 Fill Section Rejection. The notification of rejection of a fill section will be based on notification to the CONTRACTOR from the ENGINEER. After the survey data has been received by the ENGINEER, the ENGINEER will have five (5) days to review the data and prepare a written response if a section has been rejected, and the reason for rejection.

9.7 Beach Fill Pay Profile Lines. The BD and AD surveys shall be conducted at the intervals and locations as indicated in the Plans, to include Station 10+00 through Station 85+00 plus at least one additional R-monument profile line in each direction, and shall extend offshore a minimum distance of 100 feet seaward of the termination of the construction toe of fill. Profiles to be used for payment purposes are strictly limited to profiles specifically defined by the project baseline on the Plans. For example, FDEP R-monument profile line R-33 (Station 10+00) will be the first payment station, with payment profile lines spaced generally at 100 foot intervals to the south except at the location of the FDEP monuments where the spacing varies to include the FDEP profile location. Pay quantity calculations will utilize the distance between adjacent pay profile lines as shown on the Plans.

9.8 Survey Requirements. All beach profile surveys shall be conducted by either differential leveling techniques or with RTK GPS technology to a minimum distance of 100 feet seaward of the termination of the construction toe of fill. The CONTRACTOR shall close all level loops; the closure shall be less than 0.04 feet. All onshore points shall be within ±1 foot of the established profile line.

9.9 Profile Line Azimuth and Measurements. Profile line surveys shall be conducted along the azimuth indicated in the Plans. A sufficient number of points will be taken along each line to ensure adequate measurements of the entire profile line including topographic features, and major breaks in slope, beach berms, foreshore, and intersection of the fill with the bottom, with a maximum elevation difference of approximately 1 foot between adjacent points. Data points shall be taken at a spacing of not more than 10 feet. The product shall be a continuous line representing the entire beach fill profile plus 100 feet seaward of the construction toe of fill.

9.10 Beach Survey Deliverables to the Engineer. Deliverables to the ENGINEER shall include processed and tide corrected survey data of easting, northing and elevation from each of the pay stations in ASCII format provided digitally (via email, FTP, flash drive or on a compact disk (CD)) and illustrated in cross-sections on digital or hard copy plots. Cross-section plots shall show the survey, the construction template, the upper tolerance and the mean high water line. Additional information to be provided to the ENGINEER shall include any corrections and field notes.

9.11 Before and After Dredge Borrow Area Survey. A before dredge (BD) survey of the borrow area will be conducted by the CONTRACTOR in accordance with all survey standards established herein. Following collection of the BD survey, and prior to excavation of the fill, the CONTRACTOR's estimate of available material based on the BD survey shall be provided to the ENGINEER along with the survey data. The data shall be collected on uniform (i.e. 100 foot spacing) stations along the baseline shown on the Plans. The borrow area has been established by permit and will not be revised with the BD survey data, although the available volume may vary due to natural processes. The after dredge (AD) survey of the borrow area shall be conducted within 30 days after excavation for the project is complete along the same lines as the BD survey for direct comparison. The CONTRACTOR shall notify the COUNTY and the ENGINEER in advance when the surveys will be conducted to provide sufficient time for the survey work to be observed by the ENGINEER's representative at the option of the ENGINEER.

9.12 Borrow Area Survey Deliverables to the Engineer. Deliverables to the ENGINEER shall include processed tide corrected survey data of easting, northing and elevation in ASCII format provided digitally (via email, FTP, flash drive or on a compact disk (CD)) and illustrated in cross-sections on digital or hard copy plots. Cross-section plots shall show the survey, the permitted after dredge and overdepth elevations shown on the plans. Additional information to be provided the ENGINEER shall include any corrections and field notes.

9.13 Survey Documentation. All survey work shall be documented and copies supplied to the ENGINEER. The surveys may be conducted in the presence of the ENGINEER or their representative, at the option of the ENGINEER. The CONTRACTOR shall provide a minimum of three (3) days advance notice to the ENGINEER prior to conducting surveys for payment.

10. VESSEL USE AT LONGBOAT PASS.

10.1 Vessel-Shore Transfers. A landing site for shore to vessel to shore transfers of personnel, supplies, etc., may be available near Longboat Pass. The CONTRACTOR is responsible for making all arrangements for vessel-shore transfer facilities. The CONTRACTOR shall bear the responsibility for any damage caused by the use of any site for landing and transfers, and shall maintain navigation through all navigable waterways and boat ramps. The CONTRACTOR shall use any landing site, inlet, transfer area, or staging area at their own risk.

10.2 Small CONTRACTOR Vessels. Small CONTRACTOR vessels that can safely navigate through Longboat Pass may be anchored in approved anchorages. The vessels must not block navigation channels leading to Longboat Pass, the interior Waterway, or private docks located along the perimeter of Longboat Pass. The CONTRACTOR shall avoid interference with, or damage to, private or commercial vessels. The CONTRACTOR may use Longboat Pass and local waterways at the CONTRACTOR's own risk.

10.3 Longboat Pass Commercial Dock/Loading Facility. The dock area on the east side of Anna Maria Island, immediately north of Longboat Pass in the City of Bradenton Beach may be available to the CONTRACTOR during the timeframe of this project. It is also possible that this area will be utilized by other COUNTY operations depending on the timing of the project. The CONTRACTOR shall secure permission from Manatee County to use this facility. If the CONTRACTOR decides to use this facility, the Work area will be fenced off by the CONTRACTOR to keep the public from entering the work and/or storage areas used by the CONTRACTOR. However, the CONTRACTOR shall not block and shall maintain open the road that passes the dock facility and passes beneath the Longboat Pass bridge. The CONTRACTOR shall not in any way interfere with the public use of the other facilities (boat ramps, restrooms, etc.) adjacent to the Longboat Pass Commercial Dock/Loading Facility. If the CONTRACTOR wishes to cordon off an area with fencing it must be approved by the ENGINEER in advance.

10.4 Gulf of Mexico Vessel Access. Longboat Pass (south) and Passage Key Inlet (north) provides access to the Gulf of Mexico from Sarasota Bay and Tampa Bay for numerous boaters. The Contractor shall maintain ingress and egress to boaters using Longboat Pass and Passage Key Inlet. Under no circumstances will the Contractor be allowed to block navigational access.

11. WORK AREA.

The construction and borrow area limits available to the CONTRACTOR for accomplishing the Work are shown in the Plans. Construction access to the beach will be as shown in the Plans, as stated in these Technical Specifications. The CONTRACTOR shall accomplish the Work in such a manner so as to minimize disruption to road traffic.

12. CONSTRUCTION ACCESS.

The CONTRACTOR shall limit construction access to the beach at the locations shown in the Plans or as approved by the COUNTY. The CONTRACTOR shall exercise caution when accessing and driving on the beach with vehicles or equipment, particularly with regard to beachgoers and private property. Tracked equipment shall not traverse paved roads, concrete pathways, or paved parking lot. The walking path located between the designated staging area and construction access can be traversed with tracked equipment with caution but must be documented and protected to prevent damage, and restored to pre-construction conditions or better.

In the event that damage is caused by the CONTRACTOR, the CONTRACTOR shall restore all damage to roads, parking lots, sidewalks, walking paths, structures, dune vegetation or any other structure or natural feature to pre-construction conditions or better. The CONTRACTOR will not receive final payment until all damage is restored to the satisfaction of the COUNTY, as stated in these Technical Specifications. All damage will be repaired at the CONTRACTOR's expense.

12.1 <u>Land Access to the Project Site.</u> Land access to the landward project area is by two bridges extending from the mainland to Anna Maria Island, State Roads 64 and 70, and a bridge from Longboat Key. The CONTRACTOR is responsible for adhering to all weight and traffic regulations on all roadways.

13. STAGING AREA.

Beach staging areas are limited to the project fill template and alongshore limits shown on the Plans. Off-beach staging and storage areas are also shown on the Plans. The CONTRACTOR shall cordon off and/or fence the staging areas to keep the public away from equipment. The staging areas must be restored to the pre-construction condition upon project completion at the cost of the CONTRACTOR. If additional staging areas are needed, they shall be procured by and at the expense of the CONTRACTOR, and with the approval of the COUNTY.

14. DAMAGES.

The CONTRACTOR shall collect and provide a pre-construction video to include (1) staging and access areas to be used for the Work and (2) the upland dunes, vegetation and infrastructure along the beach within the project limits as documentation of the pre-construction conditions. The video shall be provided the ENGINEER prior to the commencement of equipment arrival in the staging areas and before any site work occurs on the beach. All damages to natural areas, and private or public property resulting from the CONTRACTOR's operations shall be repaired by the CONTRACTOR at the CONTRACTOR's expense. The COUNTY shall determine if repairs are required and the COUNTY or owner of the damaged property will determine if the property has been repaired to its previous condition before the CONTRACTOR receives approval of repairs. If the CONTRACTOR fails to repair damages, the COUNTY may conduct the repair and deduct from payment due to the CONTRACTOR the amount of money required for the repair, including all administrative and engineering costs.

15. PROTECTION OF COASTAL STRUCTURES.

Multiple shore protection structures are located in the project area and may be partially or completely buried at the time of construction. Regardless of the level of exposure, coastal structures shall not be damaged or destroyed by the CONTRACTOR. All existing structures shall be left in place and undisturbed. Bulldozers shall avoid all contact with coastal structures including the groins on the project beach. The CONTRACTOR 's operations shall not result in the damage or destruction of any coastal structures. The CONTRACTOR is permitted to traverse the landward buried portions of the three-pier type groins between R-33 and R-36 (designated as the Cortez Groins). The CONTRACTOR's means and methods may necessitate creation of a temporary ramp with sand and protective materials over the Cortez Groins to enable passage of equipment without damage. Bulldozers and any other heavy equipment shall not move over the concrete portions of any groin on Coquina Beach south of R-36 (designated as the Coquina Beach groins), even if the Coquina Beach groins have been covered in sand. The CONTRACTOR may place the bulldozer's blade over the concrete portion of the Coquina Beach groins to grade and dress the beach or perform fill related operations, but it must be done in a manner that will not damage the groins. Bulldozers and other heavy equipment are permitted to move over the buried rubble-mound portions of the Coquina Beach groins if they are covered and protected by sand. If requested by the Engineer, the CONTRACTOR shall excavate the placed beach to expose the groin(s) for examination to determine if the groins have been damaged by the CONTRACTOR at no additional cost to the COUNTY. The CONTRACTOR shall repair damage to coastal structures caused by the CONTRACTOR's operations at no additional cost to the COUNTY.

16. BEACH TILLING.

16.1 General. The Contractor may be required to till the beach to reduce fill compaction at the discretion and direction of the Engineer in compliance with the permits and U.S. Fish and Wildlife Service (USFWS) requirements. If the CONTRACTOR is required to till the beach, the CONTRACTOR will be compensated in the lump sum amount indicated on the bid document for beach tilling. If tilling is not conducted by the CONTRACTOR, the amount of monies indicated as the tilling bid amount in the bid document will not be due the CONTRACTOR.

16.2 Tilling and Dressing the Beach. Following the completion of beach filling, dressing, and payment survey, the CONTRACTOR will till the constructed portion of the beach to loosen the compaction of the placed material. Tilling will be to a minimum depth of 24 inches throughout the newly placed beach seaward to the visible high water mark to the landward extent of fill placement. It is acknowledged that the tilling depth listed in the Statewide Programmatic Biological Opinion is 36 inches; however, a depth of 24 inches was verified to be acceptable by personal communication with U.S. Fish and Wildlife Service, which aligns with the 24-inch requirement of the FDEP permit.

The tilling shall be by use of a tracked vehicle (bulldozer, loader, or equivalent) by pulling (rear mount) or pushing (front mount) a rake with the tines of a length appropriate to achieve a tilling depth of 24 inches. Tines will be spaced 15 to 18 inches apart. The CONTRACTOR shall conduct additional tilling as necessary to ensure all of the beach fill above the mean high water line has a compaction of less than 500 cone penetrometer units, as determined by the ENGINEER. Following tilling, the beach shall again be dressed by dragging a pipe (or similar) lengthwise over the beach. The pipe may be positioned immediately behind the tilling tines to allow for a single operation of tilling and dressing.

16.3 **Avoidance of Groins.** Under no circumstances will tilling and dressing occur over the groins in the project area. Tilling and dressing will be conducted between and around the groins only. The location of the groins shall be staked by the CONTRACTOR prior to tilling, and the stakes maintained at all times. Heavy equipment operators shall be briefed by the CONTRACTOR on the importance of avoiding the groins. The CONTRACTOR shall be responsible to repair any groin damage caused by their operations before final payment can be provided to the CONTRACTOR. If the CONTRACTOR obtains pre-construction photo documentation of the condition of the groins, the photos shall be provided to the COUNTY prior to the commencement of construction to document the condition of the groins.

17. NIGHTTIME OPERATIONS.

Nighttime is defined as the period of time from sunset to sunrise. During nighttime beach fill operations, the CONTRACTOR shall utilize the minimum lighting that is necessary to accomplish the Work and comply with all OSHA and COUNTY sea turtle protection requirements, if applicable by permit. The CONTRACTOR shall shield or orient the lights to minimize the amount of light to the work area.

18. CONSTRUCTION PLANS AND CONTRACT DOCUMENTS.

A minimum of one (1) complete set of construction Plans and Contract Documents (with permits) shall be kept in the construction office; one set at the dredge and one set at the on-site portable office (dump shack) at all times during project construction. In addition, the surveyor shall have at least one set. Permit notices shall be prominently displayed at the active work site (e.g. dump shack window, bulletin board, etc.) in accordance with regulatory requirements and remain posted for the entire duration of the Work.

19. BEACH USE FOR SPECIAL EVENTS.

Special events may be conducted on the beach, including weddings and County functions. The CONTRACTOR shall make every effort to accommodate special events including, but not limited to, the burial of shoreline pipe in the vicinity of the special event and avoidance of the special event area with personnel and equipment during the event. The COUNTY or ENGINEER will coordinate with the CONTRACTOR concerning special events. The CONTRACTOR shall address accommodation of special events at no cost to the COUNTY.

20. NOISE CONTROL.

The CONTRACTOR, at times, will be working in close proximately to private residences. As a result, noise control is of paramount importance. The CONTRACTOR shall minimize noise so as not to disturb residents living along or near the beach. All hauling and excavating equipment, including dredges, pumps, boosters, as well as engines and motors used on this Work shall be equipped with satisfactory mufflers or other noise abatement devices. The CONTRACTOR shall conduct their operations so as to comply with all Federal, State, and local laws pertaining to noise.

The use of horns, whistles, signals, and handling of dredge pipelines shall be held to the minimum necessary in order to ensure as quiet an operation as possible on the job site, especially at night, while maintaining safety on the job site.

20.1 Booster Pumps Noise Control. If permitted, booster pumps used on this Work shall be equipped with satisfactory mufflers and/or other sound abatement devices to reduce engine noise. If audible from land, a sound barrier shall be constructed landward of booster pumps in order to reflect noise waterward. The CONTRACTOR shall conduct their operations so as to comply with all Federal, State, and local laws pertaining to noise.

21. RESTRICTION OF PUBLIC ACCESS.

The CONTRACTOR shall be required to erect, maintain, and move as necessary, a restrictive barrier around the discharge of their hydraulic pipeline (or other mechanical off loader). The barrier shall be constructed so as to prevent the public from approaching at an unsafe distance the pipeline discharge, or active bulldozers and equipment. At a minimum, the CONTRACTOR shall post signs in a conspicuous manner stating, **"DANGER - HIGH PRESSURE DISCHARGE FROM DREDGE."** The CONTRACTOR shall be required to prevent any public access to the end of the dredge discharge. If the public does not heed warning signs and/or restrictive barriers, the CONTRACTOR shall contact the COUNTY or local police for assistance in maintaining the public at a safe distance from construction activities.

MANATEE COUNTY
COQUINA BEACH STORM DAMAGE RESTORATION PROJECT
TECHNICAL SPECIFICATIONS

PART 3 - ENVIRONMENTAL PROVISIONS

Please refer to the COUNTY's front end documents in addition to the following Part 3 – Environmental Provisions.

1. SCOPE.

This section addresses compliance with environmental conditions of the permits and the prevention of pollution and other environmental damage as the result of construction operations under this Contract and for those measures set forth in the Technical Specifications. For the purpose of this specification, pollution and other environmental damage are defined as the presence of chemical, physical, or biological elements or agents that adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic, cultural, and/or historical purposes. The control of pollution and damage requires consideration of air, water, land and the marine environment and includes management of construction activities, visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants. The CONTRACTOR shall fulfill these specifications at the CONTRACTOR's expense.

2. QUALITY CONTROL.

The CONTRACTOR shall establish and maintain quality control and environmental protection for all items set forth herein. The CONTRACTOR shall record on Daily Quality Control reports any problems in complying with laws, regulations and ordinances, as well as project permits, and corrective action taken.

3. PERMITS.

The CONTRACTOR shall comply with all requirements under the terms and conditions set out in all permits applicable to the work. Copies of project permits and selected attachments are provided as appendices to the Technical Specifications of the Contract. Specifically, the CONTRACTOR will familiarize himself with specific conditions contained in the Florida Department of Environmental Protection (FDEP) and U.S. Army Corps of Engineers (USACE) permits and other State and Federal approvals for the project, including Biological Opinions. The CONTRACTOR shall follow the applicable Terms and Conditions in the following Biological Opinions (BO) that are incorporated by reference in the USACE permit: U.S. Fish and Wildlife Service (USFWS) BO for red knots, dated September 24, 2015; USFWS Statewide Programmatic Biological Opinion (SPBO) for sea turtles, dated February 27, 2015; USFWS Programmatic Piping Plover Biological Opinion (P^3BO) for piping plovers, dated May 22, 2013; and the National Marine Fisheries Service (NMFS) Gulf Regional Biological Opinion (GRBO). The Terms and Conditions from each BO are provided as appendices to the Technical Specifications of the Contract. Complete copies of Biological Opinions are available upon request (2015 BO for red knots) or on the websites provided in the USACE permit (SPBO, P^3BO, and GRBO). Any other licenses, easements or approvals required, including, but not limited to those which may be required by the COUNTY, shall be secured and paid for by the CONTRACTOR.

4. SUBCONTRACTORS.

Assurance of compliance with all sections of the Contract by subcontractors will be the responsibility of the CONTRACTOR, including compliance with all environmental and permit requirements.

5. NOTIFICATION.

The ENGINEER will notify the CONTRACTOR and the COUNTY of any observed noncompliance with the aforementioned Federal, State, or local laws or regulations, permits and other elements of the CONTRACTOR's Environmental Protection Plan. The COUNTY will determine what action will be taken and such response will be transmitted to the CONTRACTOR by the COUNTY, which may include stopping construction of the project until the CONTRACTOR complies with the environmental protection plan. Nevertheless, it remains the sole responsibility of the CONTRACTOR to comply with all applicable Federal, State or Local laws or regulations, permits and all elements of the Environmental Protection Plan. It will also be the CONTRACTOR's responsibility to advise all subcontractors to comply with all applicable laws, regulations, permit requirements and all elements of the Environmental Protection Plan.

6. TURBIDITY CONTROL.

6.1 General. The CONTRACTOR shall be bound and obligated to maintain the quality of the State's waters as stipulated in Chapter 17-3 of the Florida Administrative Code. Water quality monitoring will be performed by the CONTRACTOR, as specified on page 27 of 32 of the FDEP Permit No. 0298107-004-JC, dated March 19, 2015, under the heading "Water Quality Monitoring” numbered as Specific Condition 30. The permit is provided in the appendices of the Technical Specifications. Water quality monitoring will be included in the project construction bid as a portion of the unit cost of the project fill placement.

6.2 Violations. The CONTRACTOR shall follow all requirements concerning water quality as provided by permits for the project. In the event of a turbidity violation, the CONTRACTOR shall comply with permit conditions and take immediate corrective action indicated in project permits which could include stopping work, changing construction procedures or environmental protection methods, relocation of the dredge in the borrow area or other action. Construction activities shall not resume until water quality has returned to within standards (as provided by the FDEP permit).

6.4 Reporting. Water quality monitoring results will be provided to the ENGINEER, or their representative, on a daily basis. The reports will be sent to the Florida Department of Environmental Protection by the ENGINEER.

7. PROTECTION OF ENVIRONMENTAL RESOURCES.

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this Contract shall be protected during the entire period of this Contract. The CONTRACTOR shall confine their activities to areas defined by the drawings and specifications. Environmental protection shall be as stated in the following subparagraphs.

7.1 Protection of Land Resources

7.1.1 General. Prior to the beginning of any construction, and at the request of the CONTRACTOR, the ENGINEER shall identify land resources to be preserved within the Contractor's work area, which is defined as the beach seaward of the vegetation line. The CONTRACTOR shall not remove, cut, deface, injure, or destroy land resources including sand dune or berm vegetation, trees, shrubs, vines, grasses, top soil, and land forms without direct written permission from the COUNTY. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such special emergency use is allowed, the CONTRACTOR shall provide effective protection for land and vegetation resources at all times as defined in the following paragraphs. The CONTRACTOR shall be responsible for the replacement of any damaged or destroyed vegetation, to the satisfaction of the COUNTY. Failure to replace damaged or destroyed vegetation by the CONTRACTOR will result in replacement by the COUNTY; cost of replacement will be deducted from monies due to the CONTRACTOR, or from monies which will be due to the CONTRACTOR by the COUNTY.

7.1.2 Work Area Limits. In addition to all of the features listed under Section 7.1.1, isolated areas (if any) within the work area which are to be saved and protected may also be identified by the ENGINEER and marked or fenced by the CONTRACTOR. All monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, the marks shall be visible. The CONTRACTOR shall convey to all subcontractors and personnel the purpose of marking and/or protection for all necessary objects.

7.1.3 Protection of Landscape. Trees, shrubs, vines, grasses, land forms, and other landscape features within the beach work area are to be preserved. Unless otherwise approved by the ENGINEER or COUNTY, no trees, shrubs, vines, grasses or other vegetation will be harmed or destroyed by the CONTRACTOR for any purpose.

7.1.4. Fill Placement. To avoid damage, no fill will be hydraulically placed within 25 feet of dunes, seawalls, or vegetation by direct pipeline discharge. Mechanical or manual means shall be used to place material at such locations.

7.1.5. Retardation and Control of Runoff. Runoff from the construction site shall be controlled by construction of diversion ditches, benches, dikes and/or berms to retard and divert runoff to protected drainage courses, and any measures required by area wide plans approved under paragraph 208 of the Clean Water Act. Dikes shall be constructed above the mean high water line and maintained in continuous repair to allow partial settling of fine materials from dredging, or as required by permit documents. The ENGINEER can require the CONTRACTOR to extend dikes up to 500 feet in length if it is deemed necessary for retardation and control of runoff. The extension of dikes, if required, will be provided by the CONTRACTOR at no additional cost.

7.1.6 Temporary Excavations. Embankments for plant and/or work areas shall be controlled to protect adjacent areas from despoilment.

7.1.7 Disposal of Solid Wastes. Solid wastes (including clearing debris) shall be placed in containers which are emptied on a regular schedule. The CONTRACTOR shall empty containers when seven-eighths full and will avoid overflow conditions. All handling and disposal shall be conducted to prevent contamination. No steel, cables, wire, pipe, drums or any other debris shall be permitted to be disposed overboard into the waters of the Gulf of Mexico. Disposal of solid wastes or debris in the Gulf of Mexico is a violation of State and Federal laws. If such debris is found, the debris shall be removed by the CONTRACTOR at their own cost, or the cost of removal deducted from the CONTRACTOR's final payment.

7.1.8 Disposal of Chemical Waste. Chemical waste shall be stored in corrosion resistant containers, removed from the work area and disposed of in accordance with Federal, State, and Local regulations. The CONTRACTOR shall perform all maintenance of equipment, including but not limited to refueling, filter changes, and replacement of hydraulic lines in a manner so as not to contaminate soils, ground or surface waters, or any other natural resources.

7.1.9 Disposal of Discarded Materials. Discarded materials other than those which can be included in the solid waste category will be handled by the CONTRACTOR in the same manner as solid waste.

7.2 Protection of Fish and Wildlife Resources. The CONTRACTOR shall keep construction activities under continued surveillance, management, and control to minimize interference with, disturbance to, and impact to, or damage of fish and wildlife. Species that require specific consideration, as well as measures for their protection, will be addressed in the Contractor’s Environmental Protection Plan prior to the beginning of project construction.

7.2.1 Sea Turtles. If project construction occurs during a portion of the sea turtle nesting season (May 1 to October 31), construction pipes shall be placed parallel to shore whenever possible, and as far landward as possible without impacting the dune system, structures, or access points. In order to minimize adverse effects to sea turtles, nighttime lighting will comply with permit conditions and contract documents for the project and include lowering, screening and shielding lights where possible. All temporary storage of equipment shall be off the beach whenever possible, or as far landward as possible without impacting the dune system, structures or access points. The CONTRACTOR shall comply with all sea turtle protection measures outlined in the permits, Biological Opinions (BO), and "Sea Turtle and Smalltooth Sawfish Construction Conditions" (NMFS, 2006) regarding construction procedures, beach lighting and dates of construction. These documents are provided in the appendices of the Technical Specifications.

7.2.2 Manatee Protection. In order to ensure that manatees are not adversely affected by construction activities, the CONTRACTOR shall comply with all manatee protection measures outlined in the permits, BOs, and "Standard Manatee Conditions for In-Water Work" (FWC, 2011). These documents are provided in the appendices of the Technical Specifications.

7.2.3 Seabird and Shorebird Nesting Season. Breeding season varies by species. Most species have completed the breeding cycle by September 1, but flightless young may be present through September. The following dates are based on the best available information regarding ranges and habitat use by species for this site: February 15 - September 1. The CONTRACTOR shall comply with all seabird and shorebird protection measures outlined in the permits and BOs, which are provided in the appendices of the Technical Specifications.

7.2.4 Smalltooth Sawfish. In order to ensure that smalltooth sawfish are not adversely affected by construction activities, the CONTRACTOR shall comply with all smalltooth sawfish protection measures outlined in the permits, BOs, and "Sea Turtle and Smalltooth Sawfish Construction Conditions" (NMFS, 2006). These documents are provided in the appendices of the Technical Specifications.

7.3 Natural Hardbottom and Artificial Reef Protection. Hardbottom communities, including both natural and artificial reef communities, exist immediately offshore of the Coquina Beach project area. Avoidance of the natural hardbottom communities is encouraged in order to preserve the existing natural environment. Contact with any and all artificial reefs is prohibited. It will be the responsibility of the Contractor to utilize divers and/or any other variable means to ensure that there are no artificial reefs in jeopardy prior to placing pipes, spuds, anchors, cables, drag arms or any other objects on the bottom. It will be solely the responsibility of the Contractor to prohibit contact with all artificial reefs. The Contractor shall take note that the State of Florida has levied significant fines to dredge Contractors who have damaged protected hardbottom communities, which include artificial reefs. The Contractor will be responsible for any and all costs, fines, legal expenses, repairs or mitigation requirements, or any other related expenses, levied by the Local, State or Federal governments with jurisdictional or regulatory authority for damage to hardbottom communities in artificial reefs, other than for covering the hardbottom with beach fill that have been by permit, acknowledged to be covered with fill as part of project construction.

7.3.1 Control of Mobilization and Demobilization of Floating Equipment. Avoidance of damage to hardbottoms is entirely the responsibility of the CONTRACTOR. Mobilization and demobilization of floating equipment to, and from, the project site will be controlled by the CONTRACTOR to avoid contact with any and all hardbottom formations. The most recent hardbottom mapping data are shown on the Plans; however, it is the CONTRACTOR's responsibility to verify the location of resources. The CONTRACTOR shall avoid passing over hardbottom formations with any equipment.

7.3.2 Non-Propelled Floating Equipment. The Contractor shall directly push or tow with polypropylene (floating) lines all floating equipment that is not self-propelled if traversing near hardbottom areas. No cables, equipment or other objects shall sag or hang over the side of the dredge, any barges or tugs, or any other vessels, floating pipelines, pontoons, or floating equipment. These measures are required to avoid hardbottom damage from sagging cables or other objects.

7.3.3 Floating Equipment Location Tracking. The Engineer shall have access upon request to location tracking data for all CONTRACTOR and SUBCONTRACTOR vessels and floating equipment associated with the project.

7.4 Protection of Air Resources. The CONTRACTOR shall keep construction activities under surveillance, management, and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or performed by the CONTRACTOR in accomplishing the specified construction shall be in strict accordance with the applicable air pollution standards of the State of Florida (Florida Statute, Chapter 403 and others) and all Federal emission and performance laws and standards.

7.5 Protection of Sound Intrusions. The CONTRACTOR shall keep construction activities under surveillance, and control to minimize damage to the environment by noise. If booster pumps are used on the beach, the CONTRACTOR shall provide adequate muffler systems and erect a sound barrier to deflect noise in the waterward direction and away from buildings.

7.6 Dispensing of Fuel. Secondary containment, which is capable of holding a minimum of 110% of the tank contents, must be provided by the CONTRACTOR for each fuel storage tank. At a minimum, fuel dispensers shall have a 4-foot square, 16-gauge metal pan with borders banded up and welded at corners right below the bibb. Edges of the pans shall be 8-inch minimum in depth to ascertain that no contamination of the ground takes place. Pans shall be cleaned by an approved method immediately after every dispensing of fuel and wastes disposed of offsite in an approved area. Should any spilling of fuel occur, the CONTRACTOR shall immediately contain the spill and contact the appropriate local authorities. The CONTRACTOR shall be solely responsible for any fines, penalties or other legal activities related to fuel spills.

7.7 Storage of Lubricants. All lubricants and other potential liquid pollutants shall be stored in sealed, non-corrosive containers. Individual containers shall be stored in metal pans with borders banded up and welded at the corners right below the bibb. Pans shall be deep enough to prevent contamination of the ground. Pans shall be kept clean of all spillage or leakage.

7.8 Temporary Sanitary Facility. The CONTRACTOR shall supply and maintain, at minimum, one (1) temporary sanitary facility for the use of land based employees and subcontractors. The facility shall be conveniently located in the vicinity of the beach disposal operation, but away from residential and commercial buildings along the coastline. The facility shall be removed at the end of the project.

8. POST-CONSTRUCTION CLEAN-UP.

The CONTRACTOR shall clean up any area used for construction to the pre-construction condition and to the satisfaction of the COUNTY.

9. RESTORATION OF LANDSCAPE DAMAGE.

The CONTRACTOR shall restore all landscape features damaged or destroyed during construction operations outside the limits of the approved work areas. Such restoration shall be in accordance with a plan submitted for approval by the COUNTY. This work shall be accomplished at the CONTRACTOR's expense. Final payment to the CONTRACTOR shall not occur until the ENGINEER and the COUNTY are satisfied with the CONTRACTOR's effort to restore landscape or any other damage caused by the CONTRACTOR or their subcontractors.

10. OIL AND HAZARDOUS MATERIAL SPILLS AND CONTAINMENT.

The CONTRACTOR shall ensure that all hazardous material spills are immediately reported to the proper authorities and the COUNTY. All hazardous material spills shall be immediately cleaned up in accordance with the most recent version of the U.S. Army Corps of Engineers' Safety and Health Requirements Manual, EM 385-1-1, or latest version and any other applicable laws or regulations, and the plan developed for spill containment.

11. MAINTENANCE OF POLLUTION CONTROL FACILITIES.

The CONTRACTOR shall maintain constructed facilities and portable pollution control devices for the duration of the Contract or for that length of time construction activities create the particular pollutant.

12. TRAINING OF CONTRACTOR PERSONNEL IN POLLUTION CONTROL AND ENVIRONMENTAL PROTECTION.

The CONTRACTOR shall train all subcontractors and personnel in all phases of environmental protection. All personnel and subcontractors will be familiar with permit requirements, and with the necessity of protection of all habitats. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of facilities to ensure adequate and continuous environmental pollution control. Quality Control and supervisory personnel shall be thoroughly trained in the proper use of monitoring devices and abatement equipment, and shall be thoroughly knowledgeable of Federal, State, and local laws, regulations, and permits as listed in the Environmental Protection Plan submitted by the CONTRACTOR. Quality Control personnel will be identified in the plan.

13. FUEL OIL TRANSFER OPERATIONS.

In accordance with the U.S. Coast Guard regulations (33 CFR 156.120), couplings used in fuel oil transfer operations on any vessel with a capacity of 250 or more barrels of oil (or fuel) shall be either a bolted or full-threaded connection; or a quick-connect coupling approved by the Commandant; or an automatic back-pressure shutoff nozzle used to fuel the vessel. An executed fuel oil transfer (Declaration) form signed by the tanker man shall be completed for each refueling operation. The U.S. Coast Guard shall also be notified prior to any refueling.

14. ENVIRONMENTAL PROTECTION PLAN.

At least seven (7) days prior to the first scheduled pre-construction conference, the CONTRACTOR shall submit in writing an Environmental Protection Plan to the ENGINEER. The Environmental Protection Plan shall include but not be limited to the following:

(a) Methods for protection of features and habitats to be preserved within authorized work areas. The CONTRACTOR shall prepare a listing of methods to protect resources needing protection, i.e. all vegetation, trees, shrubs, vines, grasses and ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, archeological and cultural resources, manatees, and the marine habitat.

(b) Procedures to be implemented to provide the required environmental protection and to comply with the applicable permits, laws and regulations. The CONTRACTOR shall provide written assurance that immediate corrective action will be taken to correct pollution of the environment due to accident, natural causes or failure to follow the procedures set out in accordance with the Environmental Protection Plan.

(c) Drawings showing locations of any proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials.

(d) Environmental monitoring plans for the jobsite, including land, water, air and noise monitoring.

(e) Oil spill prevention.

(f) Oil spill contingency plan.

(g) A protection plan for sea turtles, manatees, seabirds and shorebirds, and smalltooth sawfish.

(h) Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas.

(i) A statement that the Project Superintendent will be responsible for implementation of the Environmental Protection Plan. The CONTRACTOR's project superintendent shall report directly to the CONTRACTOR's top management and shall have the authority to act for the CONTRACTOR in all environmental protection matters.

(j) A statement acknowledging that the CONTRACTOR is responsible for environmental protection, including all of the CONTRACTOR's personnel and subcontractors.

(k) The Environmental Protection Plan will be dated and endorsed by the individual of top management in charge of the construction.

APPENDIX A

CONTRACTOR'S DAILY QUALITY CONTROL REPORT FORM

DAILY CONTRACTOR QUALITY CONTROL REPORT

Date: ___________ Report No.___________
(Report is due by 2:00 p.m. of the following day)

PROJECT: 2021 Coquina Beach Storm Damage Restoration Project

WEATHER: (Clear) (P. Cloudy) (Cloudy) TEMP. Min. Max.

Wind Speed _______ mph Direction _____

Wave Height at:
(1) Borrow site _______ feet; Wave Direction _______
(2) Beach disposal site _______ feet; Wave Direction _______

LOCATION OF DISCHARGE: (Station): _________

DRESSING OPERATIONS COMPLETE TO: (Station): ________

CONTRACTOR/SUB-CONTRACTOR and area of responsibility:

1. Work Performed Today: (Indicate location and description of work performed. Provide beach fill advance over last 24 hours. Attach dredge position printouts and plot to this report.)

2. Results of Surveillance: (Include satisfactory work completed or deficiencies with action to be taken.)

3. Water Quality Monitoring: Was water quality monitoring conducted today in compliance with project permit requirements of the Florida Department of Environmental Protection Permit No. ______________________________ and water quality protection laws (Yes/No)?______________

   Were the results provided to the ENGINEER (Yes/No)? ______________
   When were the results provided to the ENGINEER date__________, time __________

4. Remarks: (Address delays and any conflicts in Plans, specifications or instructions.)

5. Equipment Data: (Indicate items of construction equipment other than hand tools at job site and whether or not used and if operable.)

6. Dredge Status: (Is the dredge working, being refueled or maintained, not operating due to weather/sea state, or is it under repair?)

7. Avoidance of Overdredging: Do you certify that the dredge has excavated within the limits of the borrow areas, as shown in the Plans (Yes/No)? ___________. Also, do you certify that the borrow area has not been excavated below the limit as shown in the Plans (Yes/No)? __________

8. Progress Summary:

	This Day	To Date
Worked Hours		
Downtime Hours (Explain Below)		
Length of Discharge Advance on Beach (Ft.)		
Volume Pumped (Estimated c.y.)		
Volume Pay (c.y. accepted sections only)		
Linear % Completed		

Explanation of Downtime:

CONTRACTOR's Verification: The above report is complete and correct and equipment used and work performed during this reporting period are in compliance with the Contract drawings and specifications except as noted above. The CONTRACTOR further certifies that excavation occurred within the limits of the borrow area identified in the Contract Documents.

CONTRACTOR's Approved Authorized Representative

Note: This form must include continuous plots of dredge locations and depths.

APPENDIX B

GEOTECHNICAL INFORMATION

APPENDIX OVERVIEW

Introduction: These appendices contain the geotechnical data collected during the Longboat Pass Maintenance Dredging Project. In 2007, a total of twenty (20) vibracores were collected offshore of Anna Maria Island and Longboat Pass for the 2007 Coquina Beach Nourishment Project on Anna Maria Island. The vibracore data are provided in the form of vibracore logs, vibracore photographs, granularmetric reports, grain size distribution curves/histograms and composite summary tables. In 2014 a total of five (5) vibracores were taken within the investigation area. The vibracore data are provided in the form of vibracore logs, vibracore photographs, granularmetric reports, grain size distribution curves/histograms and composite summary tables. Dredging and sand movement have occurred in this borrow area since vibracore collection.

1. 2007 CPE Vibracore Logs

A total of twenty (20) vibracores collected by Coastal Planning & Engineering, Inc. in 2007 are presented in this appendix. Laboratory and descriptive information for each vibracore is presented on the log sheets. Unified Soils Classification terminology is used in the core layer descriptions and key grain size information (mean grain size, fines content and sorting) for each vibracore sample is presented under the Remarks column. Multiple layer intervals are sometimes represented by a single sample. The Sample Number column is used to identify the specific sample that represents a specific layer.

2. 2007 CPE Individual Vibracore Granularmetric Reports

This appendix contains individual granularmetric reports for each of the 62 vibracore samples.

3. 2007 CPE Individual Vibracore Grain Size Distribution Curves/Histograms

This appendix contains individual grain size distribution curves/histograms for each of the 62 vibracore samples.

4. 2007 CPE Vibracore Photographs

Photographs of the twenty (20) vibracores collected in 2007 are presented in this appendix.

5. 2014 CB&I Vibracore Logs

A total of five (5) vibracores collected by CB&I in 2014 are presented here. Laboratory and descriptive information for each vibracore is presented on the log sheets. Unified Soils Classification terminology is used in the core layer descriptions and key grain size information (mean grain size, fines content and sorting) for each vibracore sample is presented under the Remarks column. Multiple layer intervals are sometimes represented by a single sample. The Sample Number column is used to identify the specific sample that represents a specific layer.

6. 2014 CB&I Vibracore Photographs

Photographs of the five (5) vibracores collected in 2014 are presented in this appendix.

7. 2014 CB&I Individual Vibracore Granularmetric Reports

This appendix contains individual granularmetric reports for the vibracore samples collected in 2014.

8. 2014 CB&I Individual Vibracore Grain Size Distribution Curves/Histograms

This appendix contains individual grain size distribution curves/histograms for the vibracore samples collected in 2014.

9. Channel Composite Summary Tables

A series of summary tables are presented in this appendix. These tables are used to calculate and summarize composite data. Composite statistics were calculated based on the vibracore samples that are representative of the material defined within each area. Composite data provide the average physical characteristics of each borrow area. An average of the representative layers, weighted by effective length, was calculated for each vibracore, producing the vibracore composite. The vibracore composites are averaged and weighted by effective length to calculate the borrow area composite. Three table types were produced to display this data. The Composite Summary table is a summary of key grain size data for all of the composites. The Composite Data table shows the composite data for the borrow area and the supporting composite vibracore data used to calculate the borrow area composite. The Cumulative Percents and Computed Composite Distribution tables show the weighted average percent retained on all sieves for the individual samples used to create vibracore composites.

10. Channel Composite Granularmetric Reports

Composite granularmetric reports, corresponding to data presented in the tables in Appendix 9, are included here. Granularmetric reports are presented for the borrow area and each vibracore.

APPENDIX 1

2007 CPE VIBRACORE LOGS

Coastal Planning & Engineering
2481 N.W. Boca Raton Blvd.
Boca Raton, Florida 33431
Phone # 1-561-391-8102

Legend for Geotechnical Data

(SP), (SM), etc.	Refers to the Army Corps of Engineers Unified Soils Classification System. Class types are defined primarily by grain size, sorting and percent of material passing the 200 sieve. Classification of materials on the core logs is initially based on visual field examinations and are identified on the core logs under the Classification of Materials Description. Final classifications are based on laboratory sieve analyses and are identified on the core logs in the Legend and under Remarks.
Silty, shelly, etc.	The indicated sediment type is present. The estimated percentage indicated by the Unified Soil Classification System descriptive terms selected to describe the sediment.

Definition of descriptive terms

Clean	Free of silt or clay
Very	To a high degree
Slightly	To a small degree
Isolated	Limited occurrence
Occasional	Infrequently present
Tight	Dense compacted

Grain size terms

Cobbles – above 3”
Gravel – 3” sieve to # 4 sieve
    Coarse – 3” sieve to ¾” sieve
    Fine – ¾” sieve to # 4 sieve
Sand – # 4 sieve to # 200 sieve
    Coarse - # 4 sieve to # 10 sieve
    Medium - # 10 sieve to # 40 sieve
    Fine - # 40 sieve to # 200 sieve
Fine – (silt or clay) < # 200 sieve

Proportional definition of descriptive terms

Descriptive Term	Range of Proportions
Sandy, gravelly, etc.	35 % to 50 %
Some	20 % to 35 %
Little	10 % to 20 %
Trace	1 % to 10 %
Coarse to fine	All sizes
Coarse to medium	10 % fine
Medium to fine	10 % coarse
Coarse	10 % medium and fine
Medium	10 % coarse and fine
Fine	10 % coarse and medium

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*

Coastal Planning & Engineering
2481 N.W. Boca Raton Blvd.
Boca Raton, Florida 33431
Phone # 1-561-391-8102

Legend for Geotechnical Data

GW	⁘	Well graded gravels or gravel-sand mixtures, little or no fines
GP	⁘	Poorly graded gravels or gravel-sand mixtures, w/ little or no fines
GM	▥	Silty gravels, gravel-sand-silt mixtures
GC	▨	Clayey gravels, gravel-sand-clay mixtures
SW	⁘	Well graded sands or gravelly sands, little or no fines
SP	░	Poorly graded sands or gravelly sands, little or no fines
SM	▥	Silty sands, sand-silt mixtures
SC	▨	Clayey sands, sand-clay mixtures
SW-SM	⁘▥	Well-graded silty sand
GW-GM	⁘▥	Well-graded silty gravel
GM-GC	▥▨	Clayey silty gravel
ML	▥	Inorganic silts and very fine sands, rock flour, sandy silts or clayey silts with slight plasticity
MH	▥	Inorganic silts, micaceous or diatomaceous fine sandy or silty soild, elastic silts
OL	▥	Organic silts and organic silt-clays of low plasticity
OH	▨	Organic clays of medium to high plasticity, organic silts
CL	▨	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
CH	▨	Inorganic clays of high plasticity, fat clays
PT	▤	Peat and other highly organic soils
SP-SM	░▥	Poorly-graded silty sand
SM-SC	▥▨	Silty clayey sand
ML-CL	▨▥	Inorganic silty lean clay

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*

Coastal Planning & Engineering
2481 N.W. Boca Raton Blvd.
Boca Raton, Florida 33431
Phone # 1-561-391-8102

Legend for Geotechnical Data

The naming convention used by Coastal Planning and Engineering incorporates key information about the item in the title. The naming format uses the following information:

- Abbreviated area name (two letters that will be used throughout the project)
- Abbreviated data type: jet probe (JP), vibracore (VC) or surface sample (SS)
- Collection year (yy)
- Identification number
- Sample identification in the case of jet probes or vibracores
- Composite samples are indicated by COMP or SOBC following the identification number. COMP represents a composite developed to characterize beach compatible material. SOBC represents a composite developed to characterize sandy overburden material to be used in marsh design.

Format examples:
A) AMVC-07-05
B) AMVC-07-08 S#2

Example A is a vibracore number 5, collected in the Anna Maria Island area in the year 2007.

Example B refers to sample number 2 taken from vibracore number 8, which was collected in the Anna Maria Island area in 2007.

No specific format is followed for area name abbreviations, however, the name of the area is always given in the appendix title page where the data is presented.

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*

Boring Designation AMVC-07-01

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-01

LOCATION COORDINATES X = 430,831 Y = 1,143,326

3. DRILLING AGENCY Eckerd College

CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.8 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West | **HORIZONTAL** NAD 1983 | **VERTICAL** NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore
☐ **AUTO HAMMER**
☐ **MANUAL HAMMER**

12. TOTAL SAMPLES | **DISTURBED** | **UNDISTURBED (UD)**

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING | **STARTED** 02-20-07 09:26 | **COMPLETED** 02-20-07 09:27

16. ELEVATION TOP OF BORING -8.0 Ft.

17. TOTAL RECOVERY FOR BORING 14.8 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-8.0	0.0					
-9.1	1.1		SAND, fine grained, little shell hash, trace shell fragments, trace silt, silt distributed in lamina; shell fragments up to 0.5", light gray (5Y-7/2), (SW).		1	Sample #1, Depth = 0.6' Mean (mm): 0.33, Phi Sorting: 1.38 Shell Hash: 3%, Fines (230): 1.74% (SW)
-10.0	2.0		SAND, fine grained, trace shell hash, trace silt, silt distributed in lamina; mottled gray (5Y-6/1) and, light gray (5Y-7/2), (SP).		2	Sample #2, Depth = 1.5' Mean (mm): 0.17, Phi Sorting: 0.68 Shell Hash: 0%, Fines (230): 2.33% (SP)
-13.0	5.0		SAND, fine grained, little shell hash, trace shell fragments, trace silt, silt distributed in lamina; shell fragments up to 0.5", light gray (5Y-7/2), (SW).		1	
-15.2	7.2		SAND, fine grained, little shell hash, trace silt, silt distributed in lamina; 1.0" wood layer @ 6.9'; 0.5" wood pocket @ 7.1', light gray (5Y-7/2), (SW).		3	Sample #3, Depth = 6.1' Mean (mm): 0.30, Phi Sorting: 1.27 Shell Hash: 2%, Fines (230): 1.88% (SW)
-16.5	8.5		SAND, fine grained, trace shell hash, trace silt, silt distributed in lamina, light gray (5Y-7/2), (SP).		2	
-18.6	10.6		SAND, fine grained, little clay, little silt, (2.0"x 1.0") shell fragment @ 10.5'; (1.25"x 1.25") whole shell @ 10.3'; (0.75"x 0.75") whole shell @ 10.6', gray (5Y-5/1), (SM-SC).			
-22.4	14.4		CLAY, trace shell hash, (0.75"x 0.75") whole shells @ 10.9' and 12.4'; (1.25"x 1.25") whole shells @ 11.4' and 12.4', dark gray (5Y-4/1), (SC).			
-22.8	14.8		SAND, fine grained, trace shell hash, trace silt, silt distributed in lamina, light gray (5Y-7/2), (SP).			
-26.8	18.8		No Recovery.			
			End of Boring			

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Boring Designation AMVC-07-02

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-02

LOCATION COORDINATES X = 431,070 Y = 1,142,410

3. DRILLING AGENCY Eckerd College

CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 10.6 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West

HORIZONTAL NAD 1983

VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore

☐ **AUTO HAMMER**
☐ **MANUAL HAMMER**

12. TOTAL SAMPLES

DISTURBED

UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING

STARTED 02-20-07 10:04

COMPLETED 02-20-07 10:05

16. ELEVATION TOP OF BORING -20.2 Ft.

17. TOTAL RECOVERY FOR BORING 10.1 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-20.2	0.0					Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-21.1	0.9		SAND, fine grained, little clay, little silt, trace shell hash, clay content increases with depth, olive gray (5Y-4/2), (SM-SC).			
-23.9	3.7		CLAY, trace shell fragments, trace shell hash, shell fragments up to (1.0"x 1.0"), very dark greenish gray (10Y-3/1), (SC).			
-25.3	5.1		SAND, fine grained, little shell fragments, trace clay, trace shell hash, trace silt, shell fragment layers from 3.7' to 3.9' and 4.8' to 5.1'; (1.75"x 1.75") shell fragment @ 5.0', light brownish gray (2.5Y-6/2), (GW).			
-30.3	10.1		SAND, fine grained, little organics, trace clay, trace shell fragments, trace shell hash, trace silt, silt distributed in lamina, shell fragments up to 0.5"; some organic lamina from 6.5'-6.8', grayish brown (2.5Y-5/2), (SM).			
-30.8	10.6		No Recovery.			
			End of Boring			

FLORIDA DEP ROSS ANNA MARIA 2007 VIBRACORES.GPJ FL DEP ROSS.GDT 10/30/07

Boring Designation AMVC-07-03

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-03

LOCATION COORDINATES X = 433,627 Y = 1,132,302

3. DRILLING AGENCY Eckerd College

CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 19.1 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West | **HORIZONTAL** NAD 1983 | **VERTICAL** NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore
☐ AUTO HAMMER
☐ MANUAL HAMMER

12. TOTAL SAMPLES | **DISTURBED** | **UNDISTURBED (UD)**

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING | **STARTED** 02-20-07 11:17 | **COMPLETED** 02-20-07 11:20

16. ELEVATION TOP OF BORING -7.0 Ft.

17. TOTAL RECOVERY FOR BORING 16.5 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-7.0	0.0					
-20.5	13.5	⁘	SAND, fine grained, trace shell hash, trace silt, silt distributed in lamina; little shell hash from 10.9' to 11.4' and 13.3' to 13.5'; 1.0" clay pocket @ 1.6'; (1.0"x 0.25") wood fragment @ 7.5'; (0.75"x 0.75") shell fragments @ 12.8' and 13.4' (3), white (5Y-8/1), (SP).		1	Sample #1, Depth = 4.0' Mean (mm): 0.16, Phi Sorting: 0.32 Shell Hash: 0%, Fines (230): 1.14% (SP)
					2	Sample #2, Depth = 8.0' Mean (mm): 0.15, Phi Sorting: 0.33 Shell Hash: 0%, Fines (230): 1.21% (SP)
					3	Sample #3, Depth = 12.0' Mean (mm): 0.20, Phi Sorting: 0.64 Shell Hash: 1%, Fines (230): 1.35% (SP)
-23.5	16.5	▨	SAND, fine grained, some clay, little shell hash, little silt, trace shell fragments, shell fragments up to 0.5"; (1.25"x 0.75") whole shells @ 13.5' and 15.7', olive gray (5Y-5/2), (SM-SC).			
-26.1	19.1		No Recovery.			
			End of Boring			

0
5
10
15
20
25

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Boring Designation AMVC-07-04

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-04

LOCATION COORDINATES X = 433,879 Y = 1,133,137

3. DRILLING AGENCY Eckerd College

CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 10.2 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West

HORIZONTAL NAD 1983

VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore

☐ **AUTO HAMMER**
☐ **MANUAL HAMMER**

12. TOTAL SAMPLES

DISTURBED

UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING

STARTED 02-20-07 12:31

COMPLETED 02-20-07 12:37

16. ELEVATION TOP OF BORING -11.7 Ft.

17. TOTAL RECOVERY FOR BORING 8.6 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-11.7	0.0					
-20.3	8.6		SAND, fine grained, trace organics, trace shell hash, trace silt, 1.0" some shell hash layer @ 5.3'; (4.5"x 0.5") wood fragment @ 0.5'; silt distributed in lamina; little rock fragments up to (1.25"x 1.0") from 7.3' to 7.6'; trace shell fragments up to (1.25"x 1.25") from 7.3' to 7.6'; (1.0"x 1.0") whole shell @ 7.8', white (5Y-8/1), (SP).		1 2	Sample #1, Depth = 3.0' Mean (mm): 0.17, Phi Sorting: 0.41 Shell Hash: 0%, Fines (230): 1.17% (SP) Sample #2, Depth = 6.0' Mean (mm): 0.16, Phi Sorting: 0.35 Shell Hash: 0%, Fines (230): 1.09% (SP)
-21.9	10.2		No Recovery.			
			End of Boring			

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Boring Designation AMVC-07-05

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION: AMVC-07-05
LOCATION COORDINATES: X = 437,029 Y = 1,128,780

3. DRILLING AGENCY: Eckerd College
CONTRACTOR FILE NO.:

4. NAME OF DRILLER: Gregg Brooks

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: 19.0 Ft.

9. SIZE AND TYPE OF BIT: 3.0 In.

10. COORDINATE SYSTEM/DATUM: Florida State Plane West
HORIZONTAL: NAD 1983
VERTICAL: NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL: Electronic Vibracore
☐ AUTO HAMMER
☐ MANUAL HAMMER

12. TOTAL SAMPLES
DISTURBED:
UNDISTURBED (UD):

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING
STARTED: 02-20-07 13:44
COMPLETED: 02-20-07 13:45

16. ELEVATION TOP OF BORING: -4.7 Ft.

17. TOTAL RECOVERY FOR BORING: 15 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-4.7	0.0					
-7.0	2.3		SAND, fine grained, trace organics, trace shell hash, trace silt, organics less than 1%; (0.75"x 0.5") bone fragment @ 0.8'; mottled light gray (2.5Y-7/2) and, light gray (5Y-7/1), (SP).		1	Sample #1, Depth = 1.1' Mean (mm): 0.15, Phi Sorting: 0.39 Shell Hash: 0%, Fines (230): 1.39% (SP)
-8.1	3.4		Sandy SHELL FRAGMENTS, trace silt, shell fragments up to (1.0"x 1.0"); 0.5" clay pocket @ 2.7', light gray (2.5Y-7/1), (GW).		2	Sample #2, Depth = 2.9' Mean (mm): 0.59, Phi Sorting: 2.34 Shell Hash: 24%, Fines (230): 2.63% (SW)
-8.5	3.8		SAND, fine grained, trace shell hash, trace silt, light olive gray (5Y-6/2), (SP).		3	Sample #3, Depth = 3.6' Mean (mm): 0.13, Phi Sorting: 0.32 Shell Hash: 0%, Fines (230): 3.41% (SP)
-15.7	11.0		SAND, fine grained, trace shell hash, trace silt, silt distributed in lamina. (0.75"x 0.75") shell fragments @ 3.9' and 4.5'; (1.5"x 1.0") shell fragment @ 6.9'; light gray (2.5Y-7/2) grading to, white (5Y-8/1), (SP).		4	Sample #4, Depth = 7.5' Mean (mm): 0.13, Phi Sorting: 0.30 Shell Hash: 0%, Fines (230): 1.59% (SP)
-16.8	12.1		SAND, fine grained, little clay, little silt, trace shell hash, (3) (1.0"x 0.75") shell fragments @ 11.5', olive gray (5Y-4/2), (SM-SC).			
-17.6	12.9		SAND, fine grained, some silt, trace shell hash, olive gray (5Y-4/2), (SM).			
-19.7	15.0		Shelly SAND, trace silt, shell fragments up to (1.5"x 0.75"), gray (2.5Y-5/1), (GW).			
-23.7	19.0		No Recovery.			
			End of Boring			

0 5 10 15 20 25

SAJ FORM 1836 JUN 02 MODIFIED FOR THE FLORIDA DEP JUN 04

Boring Designation AMVC-07-06

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-06

LOCATION COORDINATES X = 436,754 Y = 1,128,828

3. DRILLING AGENCY Eckerd College

CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.8 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West

HORIZONTAL NAD 1983

VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore

☐ AUTO HAMMER
☐ MANUAL HAMMER

12. TOTAL SAMPLES

DISTURBED

UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING **STARTED** 02-20-07 14:18 **COMPLETED** 02-20-07 14:23

16. ELEVATION TOP OF BORING -7.0 Ft.

17. TOTAL RECOVERY FOR BORING 15.7 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-7.0	0.0					
-10.6	3.6		SAND, fine grained, trace organics, trace shell hash, trace silt, organics less than 1%, silt distributed in lamina, (1.0"x 1.0") shell fragments @ 0.1' and 3.4' (2); (2.0"x 1.0") shell fragment @ 3.4'; mottled light gray (2.5Y-7/2) and, light gray (5Y-7/1), (SP).		1	Sample #1, Depth = 1.8' Mean (mm): 0.15, Phi Sorting: 0.40 Shell Hash: 0%, Fines (230): 1.29% (SP)
-11.0	4.0		SAND, fine grained, trace silt, (1.5"x 1.0") shell fragment @ 3.7', light brownish gray (2.5Y-6/2), (SP).		2	Sample #2, Depth = 3.8' Mean (mm): 0.15, Phi Sorting: 0.37 Shell Hash: 0%, Fines (230): 2.99% (SP)
-14.8	7.8		SAND, fine grained, trace silt, (1.0"x 0.75") whole shells @ 6.7' and 6.9'; 1.0" pocket mottled with little clay @ 6.9'; silt distributed in lamina, light gray (2.5Y-7/2), (SP).		3	Sample #3, Depth = 6.0' Mean (mm): 0.15, Phi Sorting: 0.45 Shell Hash: 0%, Fines (230): 1.99% (SP)
-15.4	8.4		SAND, fine grained, little clay, little silt, olive gray (5Y-5/2), (SM-SC).			
-15.9	8.9		SAND, fine grained, little silt, trace clay, trace shell hash, light olive gray (5Y-6/2), (SM).			
-16.5	9.5		SAND, fine grained, little shell fragments, little silt, trace shell hash, shell fragments up to (1.25"x 0.75"), light olive gray (5Y-6/2), (SW-SM).			
-22.7	15.7		SAND, fine grained, little clay, little shell fragments, trace shell hash, trace silt, (1.0"x 1.0") shell fragments @ 9.7', 10.7', 12.0', 12.2', 12.5' and 13.5'; (2.5"x 1.5") shell fragment @ 10.8'; (1.75"x 1.0") shell fragment @ 13.5', (3.0"x 2.0") shell fragment @ 14.5', clay content decreases with depth, light brownish gray (2.5Y-6/2), (SM-SC).			
-25.8	18.8		No Recovery.			
			End of Boring			

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Boring Designation AMVC-07-07

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION: AMVC-07-07
LOCATION COORDINATES: X = 433,503 Y = 1,131,479

3. DRILLING AGENCY: Eckerd College
CONTRACTOR FILE NO.:

4. NAME OF DRILLER: Gregg Brooks

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: 17.2 Ft.

9. SIZE AND TYPE OF BIT: 3.0 In.

10. COORDINATE SYSTEM/DATUM: Florida State Plane West
HORIZONTAL: NAD 1983
VERTICAL: NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL: Electronic Vibracore
☐ AUTO HAMMER
☐ MANUAL HAMMER

12. TOTAL SAMPLES
DISTURBED:
UNDISTURBED (UD):

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING
STARTED: 02-20-07 15:03
COMPLETED: 02-20-07 15:08

16. ELEVATION TOP OF BORING: -11.0 Ft.

17. TOTAL RECOVERY FOR BORING: 14.7 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR: JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-11.0	0.0					
-12.4	1.4		SAND, fine grained, little shell fragments, little shell hash, trace silt, shell fragments up to 0.5", (1.0"x 0.5") shell fragments @ 1.9' and 1.2', (1.25"x 1.0") shell fragments @ 1.1' and 1.2', white (5Y-8/1), (SW).		1	Sample #1, Depth = 0.7' Mean (mm): 0.40, Phi Sorting: 1.78 Shell Hash: 11%, Fines (230): 1.35% (SW)
-14.5	3.5		SAND, medium grained, little shell fragments, little shell hash, trace silt, shell fragments up to (1.5"x 1.0"), light gray (5Y-7/2), (SW).		2	Sample #2, Depth = 2.5' Mean (mm): 0.75, Phi Sorting: 2.03 Shell Hash: 22%, Fines (230): 1.08% (SW)
-15.2	4.2		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, little shell hash from 4.0' to 4.1'; shell fragments up to 0.5"; (1.25"x 1.0") shell fragment @ 3.9', white (5Y-8/1), (SW).		3	Sample #3, Depth = 3.8' Mean (mm): 0.25, Phi Sorting: 1.38 Shell Hash: 0%, Fines (230): 1.39% (SW)
-15.7	4.7		SAND, medium grained, little shell fragments, little shell hash, trace silt, shell fragments up to (1.25"x 1.0"), light gray (5Y-7/2), (SW).		2	
-16.1	5.1		SAND, fine grained, little shell hash, trace shell fragments, trace silt, shell fragments up to 0.5", white (5Y-8/1), (SW).		1	
-18.5	7.5		SAND, fine grained, trace clay, trace shell hash, trace silt, silt distributed in lamina; clay distributed in lamina; (1.25"x 0.5") whole shell @ 7.3', olive gray (5Y-5/2), (SW-SM).		4	Sample #4, Depth = 6.3' Mean (mm): 0.14, Phi Sorting: 0.93 Shell Hash: 2%, Fines (230): 6.76% (SW-SM)
-23.2	12.2		SAND, fine grained, little clay, little shell fragments, little silt, trace shell hash, shell fragments up to (2.5"x 1.5"), gray (5Y-5/1), (SM-SC).			
-25.7	14.7		CLAY, trace sand, trace shell fragments, trace shell hash, shell fragments up to 0.5"; (2) (1.5"x 1.0") shell fragments @ 12.6'; (3.0"x 2.0") shell fragment @ 12.8', dark gray (5Y-4/1), (SC).			
-28.2	17.2		No Recovery.			
			End of Boring			

FLORIDA DEP ROSS ANNA MARIA 2007 VIBRACORES.GPJ FL DEP ROSS.GDT 10/30/07

SAJ FORM 1836 JUN 02 MODIFIED FOR THE FLORIDA DEP JUN 04

Boring Designation AMVC-07-08

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-08

LOCATION COORDINATES X = 433,653 Y = 1,130,845

3. DRILLING AGENCY Eckerd College

CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 16.9 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West | **HORIZONTAL** NAD 1983 | **VERTICAL** NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore
☐ AUTO HAMMER
☐ MANUAL HAMMER

12. TOTAL SAMPLES | **DISTURBED** | **UNDISTURBED (UD)**

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING | **STARTED** 02-20-07 16:43 | **COMPLETED** 02-20-07 16:45

16. ELEVATION TOP OF BORING -5.6 Ft.

17. TOTAL RECOVERY FOR BORING 8.5 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-5.6	0.0					
-6.9	1.3		SHELL HASH, some shell fragments, little sand, trace silt, shell fragments up to (1.75"x 1.25"); (1.5"x 0.75") rock fragment @ 0.7', light gray (5Y-7/1), (SW).		1	Sample #1, Depth = 0.7' Mean (mm): 1.52, Phi Sorting: 2.07 Shell Hash: 33%, Fines (230): 2.06% (SW)
-7.4	1.8		SAND, medium grained, little shell fragments, little shell hash, trace silt, shell fragments up to (1.25"x 1.0"), white (5Y-8/1), (SW).		2	Sample #2, Depth = 1.5' Mean (mm): 0.48, Phi Sorting: 1.61 Shell Hash: 9%, Fines (230): 1.35% (SW)
-8.1	2.5		SHELL HASH, some shell fragments, little sand, trace silt, shell fragments up to (2.25"x 1.5"), light gray (5Y-7/1), (SW).		1	
-8.6	3.0		SAND, medium grained, little shell fragments, little shell hash, trace silt, shell fragments up to (1.5"x 0.75"), white (5Y-8/1), (SW).		2	
-10.1	4.5		SHELL HASH, some shell fragments, little sand, trace silt, shell fragments up to (1.25"x 1.25"), light gray (5Y-7/1), (SW).		1	
-11.9	6.3		SHELL HASH, some sand, little shell fragments, trace silt, shell fragments up to (1.0"x 1.0"), light gray (5Y-7/1), (SW).		3	Sample #3, Depth = 5.4' Mean (mm): 0.75, Phi Sorting: 1.70 Shell Hash: 14%, Fines (230): 2.44% (SW)
-13.1	7.5		SAND, medium grained, some shell hash, trace shell fragments, trace silt, shell fragments up to 0.5"; (1.0"x 0.5") shell fragment @ 7.5', white (5Y-8/1), (SW).		4	Sample #4, Depth = 6.9' Mean (mm): 0.44, Phi Sorting: 1.03 Shell Hash: 0%, Fines (230): 1.20% (SW)
-14.1	8.5		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, silt distributed in lamina; shell fragments up to 0.5", white (5Y-8/1), (SP).			
-22.5	16.9		No Recovery.			
			End of Boring			

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Boring Designation AMVC-07-09

DRILLING LOG	**DIVISION**	**INSTALLATION**	**SHEET** 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-09
LOCATION COORDINATES X = 429,126 Y = 1,128,661

3. DRILLING AGENCY Eckerd College
CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.8 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West
HORIZONTAL NAD 1983
VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore
☐ **AUTO HAMMER**
☐ **MANUAL HAMMER**

12. TOTAL SAMPLES
DISTURBED
UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING
STARTED 02-21-07 09:14
COMPLETED 02-21-07 09:16

16. ELEVATION TOP OF BORING -12.7 Ft.

17. TOTAL RECOVERY FOR BORING 16.8 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
JF

ELEV. (ft)	**DEPTH (ft)**	**LEGEND**	**CLASSIFICATION OF MATERIALS** Depths and elevations based on measured values	**% REC.**	**BOX OR SAMPLE**	**REMARKS**
-12.7	0.0					Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-23.7	11.0		SAND, fine grained, trace shell hash, trace silt, 1.0" little shell hash pocket @ 0.7'; little shell hash layer from 2.1' to 2.3'; (1.0"x 1.0") whole shell @ 2.0'; (0.5"x 0.5") shell fragment @ 7.0', white (5Y-8/1), (SP).		1	Sample #1, Depth = 3.0' Mean (mm): 0.19, Phi Sorting: 0.52 Shell Hash: 0%, Fines (230): 1.89% (SP)
					2	Sample #2, Depth = 6.0' Mean (mm): 0.16, Phi Sorting: 0.37 Shell Hash: 0%, Fines (230): 1.25% (SP)
					3	Sample #3, Depth = 9.0' Mean (mm): 0.17, Phi Sorting: 0.52 Shell Hash: 0%, Fines (230): 1.14% (SP)
-25.2	12.5		SAND, medium grained, little shell fragments, little shell hash, trace silt, shell fragments up to (1.5"x 0.75"); shell fragments increase with depth; (3.0"x 2.5") shell fragment @ 11.9', light gray (5Y-7/1), (SW).		4	Sample #4, Depth = 11.6' Mean (mm): 0.55, Phi Sorting: 2.11 Shell Hash: 18%, Fines (230): 0.83% (SW)
-29.5	16.8		SAND, fine grained, trace shell hash, trace silt, silt distributed in lamina; little shell hash from 16.0' to 16.1' and 16.4' to 16.6'; trace shell fragments up to 0.5" from 16.4' to 16.6'; (2.0"x 0.75") wood fragment @ 16.6', light gray (5Y-7/1), (SP).		5	Sample #5, Depth = 13.7' Mean (mm): 0.18, Phi Sorting: 0.57 Shell Hash: 0%, Fines (230): 1.96% (SP)
-31.5	18.8		No Recovery.			
			End of Boring			

0 5 10 15 20 25

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Boring Designation AMVC-07-10

DRILLING LOG	**DIVISION**	**INSTALLATION**	**SHEET** 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-10
LOCATION COORDINATES X = 429,717 Y = 1,129,373

3. DRILLING AGENCY Eckerd College
CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.8 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West
HORIZONTAL NAD 1983
VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore
☐ **AUTO HAMMER**
☐ **MANUAL HAMMER**

12. TOTAL SAMPLES
DISTURBED
UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING
STARTED 02-21-07 09:55
COMPLETED 02-21-07 09:58

16. ELEVATION TOP OF BORING -9.2 Ft.

17. TOTAL RECOVERY FOR BORING 17 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-9.2	0.0					Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-12.6	3.4		SAND, fine grained, little shell hash, trace shell fragments, trace silt, shell fragments up to 0.5"; some shell hash from 2.9' to 3.2'; trace whole shell up to (1.0"x 1.0") from 2.8' to 3.3', light gray (5Y-7/1), (SW).		1	Sample #1, Depth = 1.7' Mean (mm): 0.26, Phi Sorting: 1.32 Shell Hash: 4%, Fines (230): 1.20% (SW)
-14.1	4.9		SHELL HASH, little sand, little shell fragments, trace silt, (1.0"x 0.75") whole shell @ 3.9', 4.3' and 4.4'; shell fragments up to (1.0"x 1.0"); (1.0"x 0.75") rock fragment @ 3.5', gray (5Y-6/1), (SW).		2	Sample #2, Depth = 4.2' Mean (mm): 0.64, Phi Sorting: 1.98 Shell Hash: 19%, Fines (230): 1.30% (SW)
-16.0	6.8		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, silt distributed in lamina; 1.0" some shell hash pocket @ 5.4'; shell fragments up to 0.5"; (1.5"x 1.0") shell fragment @ 6.8'; (1.0"x 0.75") whole shells @ 5.1', 5.3', 5.4' and 6.0', white (5Y-8/1), (SW).		3	Sample #3, Depth = 6.0' Mean (mm): 0.17, Phi Sorting: 0.87 Shell Hash: 1%, Fines (230): 1.16% (SW)
-21.1	11.9		SAND, fine grained, trace clay, trace shell hash, trace silt, silt distributed in lamina; some shell hash from 11.7' to 11.9'; (0.75"x 0.75") whole shells @ 8.8' and 11.5'; (0.75"x 0.5") shell fragments @ 9.3' and 9.6'; (1.75"x 1.0") shell fragment @ 11.8', light gray (5Y-7/1), (SP).		4	Sample #4, Depth = 9.0' Mean (mm): 0.15, Phi Sorting: 0.42 Shell Hash: 0%, Fines (230): 1.42% (SP)
-22.9	13.7		SAND, fine grained, trace clay, trace shell fragments, trace shell hash, trace silt, silt distributed in lamina; 1.0" clay pocket @ 13.7'; shell fragments up to 0.5"; (2) (1.0"x 1.0") whole shells @ 12.5'; (1.0"x 1.0") shell fragment @ 13.5', gray (5Y-6/1), (SW).		5	Sample #5, Depth = 12.8' Mean (mm): 0.17, Phi Sorting: 1.02 Shell Hash: 2%, Fines (230): 3.30% (SW)
-23.1	13.9		SAND, fine grained, trace clay, trace shell hash, trace silt, silt distributed in lamina, light gray (5Y-7/1), (SP).		4	
-23.5	14.3		SHELL HASH, some shell fragments, trace sand, shell fragments up to 0.5"; (1.5"x 1.0") rock fragment @ 14.0'; 1.0" clay pockets @ 14.2' and 14.3', olive gray (5Y-5/2), (SW).			
-26.2	17.0		SAND, fine grained, trace clay, trace shell fragments, trace shell hash, trace silt, silt distributed in lamina; some shell hash from 16.6' to 16.8'; shell fragments up to 0.5"; (1.5"x 0.75") shell fragment @ 14.9'; (1.0"x 1.0") whole shell @ 15.1', light gray (5Y-7/1), (SP).		4	
-28.0	18.8		No Recovery.			
			End of Boring			

Boring Designation AMVC-07-11

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-11

LOCATION COORDINATES X = 430,620 Y = 1,129,814

3. DRILLING AGENCY Eckerd College

CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.4 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West

HORIZONTAL NAD 1983

VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore

☐ **AUTO HAMMER**
☐ **MANUAL HAMMER**

12. TOTAL SAMPLES

DISTURBED

UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING

STARTED 02-21-07 10:36

COMPLETED 02-21-07 10:39

16. ELEVATION TOP OF BORING -7.2 Ft.

17. TOTAL RECOVERY FOR BORING 11.6 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-7.2	0.0					
-11.3	4.1		SAND, fine grained, little shell hash, trace shell fragments, trace silt, shell fragments up to 0.5"; (2.75"x 1.75") shell fragment @ 3.0'; trace organics from 3.3' to 3.5' and @ 3.9'; (1.0"x 0.75") whole shells @ 2.2', 3.5' and 4.1'; increased shell hash from 3.2' to 4.1', light gray (5Y-7/1), (SW).		1	Sample #1, Depth = 2.0' Mean (mm): 0.27, Phi Sorting: 1.22 Shell Hash: 2%, Fines (230): 1.03% (SW)
-12.6	5.4		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, shell fragments up to 0.5"; (1.0"x 0.75") whole shells @ 4.4' and 5.2' (2); 0.5" some hash shell pocket @ 5.2'; mottled gray (5Y-6/1) and, pale yellow (5Y-8/2), (SP).		2	Sample #2, Depth = 4.7' Mean (mm): 0.19, Phi Sorting: 0.85 Shell Hash: 2%, Fines (230): 1.28% (SP)
-13.5	6.3		SHELL HASH, some shell fragments, trace sand, trace silt, shell fragments up to (2.5"x 1.0"); 1.0" sand pocket @ 6.2'; (1.0"x 1.0") rock fragment @ 6.0'; (1.0"x 1.0") whole shells @ 5.6' and 5.9', light olive gray (5Y-6/2), (SW).		3	Sample #3, Depth = 5.8' Mean (mm): 0.87, Phi Sorting: 2.02 Shell Hash: 25%, Fines (230): 1.29% (SW)
-15.0	7.8		SAND, fine grained, trace silt, (2.25"x 1.25") shell fragments @ 7.0' and 7.4'; (1.0"x 1.0") whole shells @ 7.2' and 7.3' (2); mottled gray (5Y-8/1) and, white (5Y-8/1), (SP).		4	Sample #4, Depth = 6.8' Mean (mm): 0.26, Phi Sorting: 0.59 Shell Hash: 1%, Fines (230): 1.08% (SP)
-17.5	10.3		SHELL HASH, some shell fragments, trace sand, trace silt, trace whole shell, shell fragments up to (1.0"x 1.0"); (3.0"x 2.0") shell fragment @ 8.0'; (2.0"x 2.0") shell fragment @ 7.9'; whole shells up to (1.0"x 1.0"), light olive gray (5Y-6/2), (SW).		3	
-18.2	11.0		SAND, fine grained, little shell hash, trace shell fragments, trace silt, shell fragments up to 0.5", light gray (5Y-7/1), (SW).		1	
-18.8	11.6		SHELL HASH, some shell fragments, trace sand, trace silt, shell fragments up to (1.0"x 1.0"); (1.5"x 1.0") shell fragments @ 11.2' and 11.4', light olive gray (5Y-6/2), (SW).		3	
-25.6	18.4		No Recovery.			
			End of Boring			

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Boring Designation AMVC-07-12

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-12

LOCATION COORDINATES X = 430,389 Y = 1,130,139

3. DRILLING AGENCY Eckerd College

CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.8 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West

HORIZONTAL NAD 1983

VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore
☐ AUTO HAMMER
☐ MANUAL HAMMER

12. TOTAL SAMPLES

DISTURBED

UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING

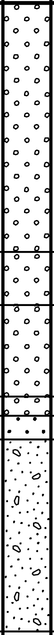
STARTED 02-21-07 11:28

COMPLETED 02-21-07 11:31

16. ELEVATION TOP OF BORING -7.5 Ft.

17. TOTAL RECOVERY FOR BORING 13.1 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
JF



ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.	
-7.5	0.0						0
-12.7	5.2		SAND, fine grained, trace shell fragments, trace silt, shell fragments up to 0.5"; (0.75"x 0.75") shell fragment @ 2.6'; (1.0"x 0.5") shell fragments @ 2.7' and 3.4'; (1.75"x 1.0") shell fragment @ 4.7'; 1.0" some shell hash pocket @ 1.3'; (1.5"x 1.0") rock fragment @ 3.1', white (5Y-8/1), (SW).		1	Sample #1, Depth = 2.6' Mean (mm): 0.26, Phi Sorting: 1.35 Shell Hash: 5%, Fines (230): 1.05% (SW)	5
-13.8	6.3		SHELL HASH, some shell fragments, little sand, trace silt, shell fragments up to (1.5"x 1.25"), light gray (5Y-7/1), (SW).		2	Sample #2, Depth = 5.7' Mean (mm): 0.70, Phi Sorting: 1.92 Shell Hash: 19%, Fines (230): 1.40% (SW)	
-15.7	8.2		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, some shell hash from 6.7' to 6.9'; (1.0"x 1.0") shell fragments @ 7.3' and 8.1'; (1.25"x 1.25") shell fragments @ 7.8' and 7.9'; (1.5"x 1.25") shell fragments @ 7.4' and 7.5', white (5Y-8/1), (SW).		3	Sample #3, Depth = 7.2' Mean (mm): 0.30, Phi Sorting: 1.24 Shell Hash: 4%, Fines (230): 1.15% (SW)	
-16.1	8.6		SHELL HASH, some shell fragments, little sand, trace silt, shell fragments up to (0.75"x 0.5"), light gray (5Y-7/1), (SW).				
-16.6	9.1		SAND, fine grained, trace shell hash, trace silt, silt distributed in lamina, white (5Y-8/1), (SP).				10
-20.6	13.1		SHELL FRAGMENTS, some shell hash, little sand, trace silt, shell fragments up to (2.5"x 1.5"); (2.5"x 1.5") rock fragment @ 9.5'; 0.5" clay pockets @ 9.8' and 10.2', light gray (5Y-7/1), (GW).				15
-26.3	18.8		No Recovery.				
			End of Boring				20
							25

FLORIDA DEP ROSS ANNA MARIA 2007 VIBRACORES.GPJ FL DEP ROSS.GDT 10/30/07

Boring Designation AMVC-07-13

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-13

LOCATION COORDINATES X = 430,866 Y = 1,130,639

3. DRILLING AGENCY Eckerd College

CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.5 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West

HORIZONTAL NAD 1983

VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore
☐ AUTO HAMMER
☐ MANUAL HAMMER

12. TOTAL SAMPLES

DISTURBED

UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING

STARTED 02-21-07 12:53

COMPLETED 02-21-07 12:56

16. ELEVATION TOP OF BORING -5.0 Ft.

17. TOTAL RECOVERY FOR BORING 15.5 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-5.0	0.0					
-5.8	0.8		SAND, fine grained, little shell hash, trace shell fragments, trace silt, shell fragments up to 0.5"; (1.0"x 0.75") shell fragment @ 0.5', white (5Y-8/1), (SW).		2	
-6.9	1.9		SHELL FRAGMENTS, some shell hash, little sand, trace silt, shell fragments up to (1.0"x 1.0"), light gray (5Y-7/2), (GW).		1	Sample #1, Depth = 1.4' Mean (mm): 1.69, Phi Sorting: 2.11 Shell Hash: 42%, Fines (230): 0.85% (SW)
-9.3	4.3		SAND, fine grained, little shell hash, trace shell fragments, trace silt, shell fragments up to 0.5"; little shell fragments up to (1.25"x 1.25") from 2.8' to 3.3'; (2.5"x 1.0") whole shell @ 3.4', white (5Y-8/1), (SW).		2	Sample #2, Depth = 2.5' Mean (mm): 0.24, Phi Sorting: 1.05 Shell Hash: 2%, Fines (230): 1.06% (SW)
-15.2	10.2		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, shell fragments up to 0.5"; (1.0"x 1.0") whole shell @ 5.0'; (1.0"x 0.75") shell fragments @ 5.3' (3) and 5.9'; (1.25"x 0.75") shell fragment @ 8.9'; 0.5" clay pocket @ 9.7', white (5Y-8/1), (SP).		3	Sample #3, Depth = 7.5' Mean (mm): 0.17, Phi Sorting: 0.40 Shell Hash: 0%, Fines (230): 1.01% (SP)
-17.5	12.5		SHELL HASH, some shell fragments, trace silt, shell fragments up to (1.75"x 1.0"); (3.0"x 2.0") shell fragment @ 10.3'; (1.75"x 1.5") shell fragments @ 12.2' and 12.4', light gray (5Y-7/2), (SW).		4	Sample #4, Depth = 11.4' Mean (mm): 1.24, Phi Sorting: 1.72 Shell Hash: 25%, Fines (230): 2.32% (SW)
-18.7	13.7		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, shell fragments up to 0.5"; (1.0"x 0.5") shell fragment @ 12.9', light yellowish brown (2.5Y-6/3), (SP).			
-20.5	15.5		SAND, fine grained, some shell hash, little shell fragments, trace silt, shell fragments up to (1.5"x 1.0"); (2.0"x 2.0") shell fragment @ 14.4'; 0.25" clay pocket from 14.4' to 14.6', light yellowish brown (2.5Y-6/3), (SW).			
-23.5	18.5		No Recovery.			
			End of Boring			

0
5
10
15
20
25

FLORIDA DEP ROSS ANNA MARIA 2007 VIBRACORES.GPJ FL DEP ROSS.GDT 10/30/07

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Boring Designation AMVC-07-14

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-14

LOCATION COORDINATES X = 431,287 Y = 1,130,625

3. DRILLING AGENCY Eckerd College

CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.8 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West

HORIZONTAL NAD 1983

VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore

☐ AUTO HAMMER
☐ MANUAL HAMMER

12. TOTAL SAMPLES

DISTURBED

UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING

STARTED 02-21-07 13:37

COMPLETED 02-21-07 13:41

16. ELEVATION TOP OF BORING -6.4 Ft.

17. TOTAL RECOVERY FOR BORING 16 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR JF

ELEV. (ft) -6.4	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-7.4	1.0		SAND, fine grained, little shell hash, trace shell fragments, trace silt, shell fragments up to 0.5", light gray (5Y-7/2), (SW).		1	Sample #1, Depth = 0.5' Mean (mm): 0.28, Phi Sorting: 1.25 Shell Hash: 3%, Fines (230): 1.05% (SW)
-8.2	1.8		SHELL HASH, some shell fragments, trace sand, trace silt, shell fragments up to (1.0"x 0.75"); (2.75"x 1.25") rock fragment @ 1.5', pale olive (5Y-6/3), (SW).		2	Sample #2, Depth = 1.4' Mean (mm): 1.19, Phi Sorting: 2.00 Shell Hash: 31%, Fines (230): 0.88% (SW)
-11.9	5.5		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, shell hash and shell fragment layer from 2.1' to 2.3'; 1.0" some shell hash pocket from 2.6' to 3.1'; shell fragments up to 0.5"; (1.25"x 0.75") shell fragments @ 2.0', 3.0' and 4.7'; (1.0"x 0.5") shell fragments @ 2.8', 3.4', 4.3' and 4.7', white (5Y-8/1), (SP).		3	Sample #3, Depth = 4.0' Mean (mm): 0.19, Phi Sorting: 0.84 Shell Hash: 1%, Fines (230): 0.83% (SP)
-15.7	9.3		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, shell fragments up to 0.5"; (1.25"x 1.25") rock fragment @ 7.6', white (5Y-8/1), (SW).		4	Sample #4, Depth = 7.0' Mean (mm): 0.26, Phi Sorting: 1.12 Shell Hash: 3%, Fines (230): 2.13% (SW)
-18.0	11.6		SHELL HASH, some shell fragments, trace sand, trace silt, shell fragments up to (1.5"x 1.0"); (2.0"x 1.0") rock fragments @ 10.3' and 10.7'; (1.25"x 1.0") rock fragment @ 11.5', pale olive (5Y-6/3), (SW).		2	
-19.2	12.8		SAND, fine grained, little shell fragments, trace shell hash, trace silt, shell fragments up to (1.5"x 0.75"), light gray (5Y-7/1), (SW).		5	Sample #5, Depth = 12.2' Mean (mm): 0.40, Phi Sorting: 1.83 Shell Hash: 11%, Fines (230): 1.78% (SW)
-22.4	16.0		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, silt distributed in lamina, 0.5" clay pockets @ 12.9', 13.0' and 13.4'; shell fragments up to 0.5"; some shell fragments up to (1.5"x 1.0") from 14.0' to 14.7'; (3.0"x 2.0") whole shells @ 12.8', 14.1' and 14.3'; (1.0"x 1.0") whole shells @ 13.4' and 13.6'; (3.5"x 1.5") rock fragment @ 14.8', olive (5Y-5/3), (SW).			
-25.2	18.8		No Recovery.			
			End of Boring			

0
5
10
15
20
25

FLORIDA DEP ROSS ANNA MARIA 2007 VIBRACORES.GPJ FL DEP ROSS.GDT 10/30/07

SAJ FORM 1836
JUN 02

MODIFIED FOR THE FLORIDA DEP
JUN 04

Boring Designation AMVC-07-15

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-15
LOCATION COORDINATES X = 432,201 Y = 1,130,972

3. DRILLING AGENCY Eckerd College
CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.4 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West
HORIZONTAL NAD 1983
VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore
☐ AUTO HAMMER
☐ MANUAL HAMMER

12. TOTAL SAMPLES
DISTURBED
UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING
STARTED 02-21-07 15:05
COMPLETED 02-21-07 15:07

16. ELEVATION TOP OF BORING -10.7 Ft.

17. TOTAL RECOVERY FOR BORING 10.6 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-10.7	0.0					Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-11.3	0.6		SAND, fine grained, little shell hash, trace shell fragments, trace silt, shell fragments up to 0.5", light gray (5Y-7/1), (SW).		2	
-15.2	4.5		SHELL HASH, some shell fragments, trace organics, trace sand, trace silt, shell fragments up to (2.5"x 1.25"); (3.5"x 2.5") rock fragment @ 1.6'; (3.0"x 2.0") whole shell @ 2.3', gray (5Y-6/1), (SW).		1	Sample #1, Depth = 2.0' Mean (mm): 0.95, Phi Sorting: 1.77 Shell Hash: 20%, Fines (230): 1.93% (SW)
-15.9	5.2		SAND, fine grained, little shell hash, trace shell fragments, trace silt, shell fragments up to 0.5", light gray (5Y-7/1), (SW).		2	Sample #2, Depth = 4.9' Mean (mm): 0.37, Phi Sorting: 1.40 Shell Hash: 4%, Fines (230): 2.11% (SW)
-18.2	7.5		SHELL HASH, some shell fragments, trace sand, trace silt, sand layer from 5.6' to 5.8'; shell fragments up to (1.5"x 1.0"), gray (5Y-6/1), (SW).		1	
-20.3	9.6		SAND, fine grained, trace shell hash, trace silt, shelly layers from 8.1' to 8.3' and 9.1' to 9.3'; (2.5"x 1.5") coral fragment @ 7.9', white (5Y-8/1), (SP).		3	Sample #3, Depth = 8.5' Mean (mm): 0.21, Phi Sorting: 0.74 Shell Hash: 0%, Fines (230): 1.88% (SP)
-20.6	9.9		SHELL HASH, some shell fragments, trace sand, trace silt, shell fragments up to (1.0"x 1.0"); (1.75"x 1.75") whole shell @ 9.6', gray (5Y-6/1), (SW).		1	
-21.3	10.6		CLAY, little shell fragments, little shell hash, shell fragments up to (1.0"x 1.0"), dark gray (5Y-4/1), (SC).			
-29.1	18.4		No Recovery.			
			End of Boring			

Boring Designation AMVC-07-16

DRILLING LOG	**DIVISION**	**INSTALLATION**	**SHEET** 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-16
LOCATION COORDINATES X = 433,544 Y = 1,130,795

3. DRILLING AGENCY Eckerd College
CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.0 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West
HORIZONTAL NAD 1983
VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore
☐ **AUTO HAMMER**
☐ **MANUAL HAMMER**

12. TOTAL SAMPLES **DISTURBED** **UNDISTURBED (UD)**

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING **STARTED** 02-21-07 16:21 **COMPLETED** 02-21-07 16:24

16. ELEVATION TOP OF BORING -7.1 Ft.

17. TOTAL RECOVERY FOR BORING 9.3 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.	
-7.1	0.0						0
			SHELL FRAGMENTS, some shell hash, trace sand, trace silt, shell fragments up to (2.5"x 1.5"), light gray (2.5Y-7/1), (GW).				5
-15.8	8.7		SAND, fine grained, some shell hash, trace silt, white (5Y-8/1), (SP).				
-16.4	9.3		No Recovery.				10 15
-25.1	18.0		End of Boring				20 25

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Boring Designation AMVC-07-17

DRILLING LOG	**DIVISION**	**INSTALLATION**	**SHEET** 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-17
LOCATION COORDINATES X = 430,589 Y = 1,144,145

3. DRILLING AGENCY Eckerd College
CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.8 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West
HORIZONTAL NAD 1983
VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore
☐ **AUTO HAMMER**
☐ **MANUAL HAMMER**

12. TOTAL SAMPLES
DISTURBED
UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING
STARTED 02-22-07 08:58
COMPLETED 02-22-07 09:00

16. ELEVATION TOP OF BORING -8.0 Ft.

17. TOTAL RECOVERY FOR BORING 11.7 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-8.0	0.0					
-9.6	1.6	⁘	SAND, fine grained, trace shell hash, trace silt, silt distributed in lamina; 0.5" clay pockets @ 0.5' and 1.5', light gray (5Y-7/2), (SP).		1	Sample #1, Depth = 0.9' Mean (mm): 0.16, Phi Sorting: 0.45 Shell Hash: 0%, Fines (230): 1.39% (SP)
-12.6	4.6	▨	Sandy CLAY, little shell fragments, trace shell hash, shell fragments up to (1.0"x 1.0"), olive gray (5Y-4/2), (SC).			
-19.7	11.7	⁘	SAND, fine grained, little silt, trace clay, trace organics, trace shell hash, silt distributed in lamina; clay distributed in lamina, light gray (5Y-7/2), (SP).			
-26.8	18.8		No Recovery.			
			End of Boring			

0 5 10 15 20 25

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Boring Designation AMVC-07-18

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-18

LOCATION COORDINATES X = 430,955 Y = 1,144,486

3. DRILLING AGENCY Eckerd College

CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.8 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West

HORIZONTAL NAD 1983

VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore
☐ **AUTO HAMMER**
☐ **MANUAL HAMMER**

12. TOTAL SAMPLES

DISTURBED

UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING

STARTED 02-22-07 09:42

COMPLETED 02-22-07 09:42

16. ELEVATION TOP OF BORING -4.8 Ft.

17. TOTAL RECOVERY FOR BORING 16.5 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-4.8	0.0					
-6.2	1.4		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, silt distributed in lamina; 0.5" clay pockets @ 0.7', 0.9' and 1.1'; shell fragments up to 0.5", light gray (5Y-7/2), (SP).		1	Sample #1, Depth = 0.7' Mean (mm): 0.20, Phi Sorting: 0.66 Shell Hash: 0%, Fines (230): 1.66% (SP) Sample #2, Depth = 2.0' Mean (mm): 0.35, Phi Sorting: 1.45 Shell Hash: 3%, Fines (230): 1.75% (SW) Sample #3, Depth = 3.4' Mean (mm): 1.04, Phi Sorting: 1.66 Shell Hash: 16%, Fines (230): 2.68% (SW)
-7.4	2.6		SAND, fine grained, little shell hash, trace shell fragments, trace silt, silt distributed in lamina; shell fragments up to 0.5"; (1.0"x 0.75") shell fragments @ 1.5', 1.7' and 2.0', light gray (5Y-7/2), (SW).		2	
-9.1	4.3		SHELL HASH, little shell fragments, trace sand, trace silt, shell fragments up to (1.0"x 0.75"); 0.5" clay pocket @ 4.2', light olive gray (5Y-6/2), (SW).		3	
-10.4	5.6		SAND, fine grained, little shell hash, trace shell fragments, trace silt, silt distributed in lamina; shell fragments up to 0.5", light gray (5Y-7/2), (SW).		2	
-21.3	16.5		Clayey SAND, fine grained, trace shell fragments, trace shell hash, trace silt, silt distributed in lamina; shell fragments up to 0.5"; (1.0"x 1.0") whole shells @ 6.2', 6.5' and 12.5'; (1.0"x 0.75") shell fragments @ 7.7' and 11.4'; (1.75"x 1.0") shell fragment @ 9.2'; some shell fragments up to (2.5"x 1.25") from 14.6' to 15.1', olive gray (5Y-4/2), (SC).			
-23.6	18.8		No Recovery.			
			End of Boring			

0
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15
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25

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Boring Designation AMVC-07-19

DRILLING LOG	**DIVISION**	**INSTALLATION**	**SHEET** 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-19
LOCATION COORDINATES X = 431,156 Y = 1,144,258

3. DRILLING AGENCY Eckerd College
CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.8 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West
HORIZONTAL NAD 1983
VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore
☐ **AUTO HAMMER**
☐ **MANUAL HAMMER**

12. TOTAL SAMPLES
DISTURBED
UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING
STARTED 02-22-07 10:20
COMPLETED 02-22-07 10:21

16. ELEVATION TOP OF BORING -5.1 Ft.

17. TOTAL RECOVERY FOR BORING 16.8 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-5.1	0.0					
-7.0	1.9		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, silt distributed in lamina; shell fragments up to 0.5"; mottled gray (5Y-6/1) and, light gray (5Y-7/2), (SW).		1	Sample #1, Depth = 1.0' Mean (mm): 0.23, Phi Sorting: 1.00 Shell Hash: 2%, Fines (230): 1.86% (SW)
-9.7	4.6		SHELL FRAGMENTS, some shell hash, little sand, trace silt, 0.25" organic pocket @ 2.8' shell fragments up to (1.0"x 1.0"), light gray (2.5Y-7/2), (GW).		2	Sample #2, Depth = 3.3' Mean (mm): 0.59, Phi Sorting: 1.89 Shell Hash: 14%, Fines (230): 2.76% (SW)
-10.3	5.2		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, silt distributed in lamina; shell fragments up to 0.5", light gray (5Y-7/2), (SW).		1	
-10.8	5.7		SHELL FRAGMENTS, some shell hash, little sand, trace silt, light gray (2.5Y-7/2), (GW).		2	
-12.1	7.0		SAND, fine grained, trace clay, trace shell hash, trace silt, trace wood fragments, silt distributed in lamina; (1.0"x 0.25") wood fragment @ 6.3', light olive gray (5Y-6/2), (SP).		3	Sample #3, Depth = 6.4' Mean (mm): 0.17, Phi Sorting: 0.36 Shell Hash: 0%, Fines (230): 2.27% (SP)
-18.2	13.1		SAND, fine grained, some clay, little silt, trace shell hash, 1.0" clay pocket @ 7.1'; (1.25"x 1.0") shell fragments @ 7.7' (3) and 8.8'; (2.0"x 2.0") shell fragments @ 8.0', 8.8', 10.8' and 12.6'; (1.0"x 1.0") shell fragments @ 10.7' (2), 11.2' (2), 11.9' and 12.9', dark gray (5Y-4/1), (SM-SC).			
-21.9	16.8		SAND, fine grained, little clay, little silt, trace organics, trace shell hash, silt distributed in lamina, olive gray (5Y-4/2), (SM-SC).			
-23.9	18.8		No Recovery.			
			End of Boring			

FLORIDA DEP ROSS ANNA MARIA 2007 VIBRACORES.GPJ FL DEP ROSS.GDT 10/30/07

SAJ FORM 1836 **MODIFIED FOR THE FLORIDA DEP**
JUN 02 JUN 04

Boring Designation AMVC-07-20

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
Anna Maria 2007 Sand Search
Manatee County, FL

2. BORING DESIGNATION AMVC-07-20

LOCATION COORDINATES X = 430,935 Y = 1,143,913

3. DRILLING AGENCY Eckerd College

CONTRACTOR FILE NO.

4. NAME OF DRILLER Gregg Brooks

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 18.8 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West

HORIZONTAL NAD 1983

VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electronic Vibracore

☐ **AUTO HAMMER**
☐ **MANUAL HAMMER**

12. TOTAL SAMPLES

DISTURBED

UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING

STARTED 02-20-07 11:25

COMPLETED 02-20-07 11:27

16. ELEVATION TOP OF BORING -4.3 Ft.

17. TOTAL RECOVERY FOR BORING 14 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
JF

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.
-4.3	0.0					
-8.4	4.1		SAND, fine grained, trace shell fragments, trace shell hash, trace silt, silt distributed in lamina; shell fragments up to 0.5"; little shell fragments from 2.6' to 2.8'; (1.0"x 1.0") shell fragment @ 3.9', white (5Y-8/1), (SP).		1	Sample #1, Depth = 2.0' Mean (mm): 0.21, Phi Sorting: 0.82 Shell Hash: 1%, Fines (230): 1.15% (SP)
-10.5	6.2		SAND, fine grained, some clay, trace shell fragments, trace shell hash, trace silt, silt distributed in lamina; shell fragments up to 0.5"; little shell fragments from 5.1' to 5.4'; (1.0"x 1.0") shell fragments @ 4.8' (2), 5.2' (2) and 5.3' (3), light olive gray (5Y-6/2), (SW).		2	Sample #2, Depth = 5.4' Mean (mm): 0.21, Phi Sorting: 1.10 Shell Hash: 3%, Fines (230): 2.30% (SW)
-11.3	7.0		SHELL HASH, some sand, some shell fragments, trace clay, trace silt, shell fragments up to (1.0"x 1.0"), olive gray (5Y-5/2), (SW).		3	Sample #3, Depth = 6.6' Mean (mm): 0.81, Phi Sorting: 2.05 Shell Hash: 16%, Fines (230): 2.83% (SW)
-16.4	12.1		Clayey SAND, trace shell fragments, trace shell hash, trace silt, silt distributed in lamina; shell fragments up to 0.5"; (1.75"x 1.5") shell fragment @ 8.1', (1.0"x 1.0") whole shells @ 8.1' and 11.4', olive gray (5Y-4/2), (SC).			
-18.3	14.0		SAND, fine grained, little clay, trace shell hash, trace silt, silt distributed in lamina, light yellowish brown (2.5Y-6/3), (SC).			
-23.1	18.8		No Recovery.			
			End of Boring			

0
5
10
15
20
25

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

APPENDIX 2

2007 CPE INDIVIDUAL VIBRACORE GRANULARMETRIC REPORTS

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-01 #1

Analysis Date: 03-08-07

Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,831	1,143,326	Florida State Plane West	-8.6 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/2 Dry - 5Y-7/1 Washed - 5Y-7/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
78.74	77.43	0.01	0.05	#200 - 1.75 #230 - 1.74			3

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.26	0.33	0.26	0.33
4	-2.25	4.76	0.29	0.37	0.55	0.70
5	-2.00	4.00	0.53	0.67	1.08	1.37
7	-1.50	2.83	1.58	2.01	2.66	3.38
10	-1.00	2.00	3.41	4.33	6.07	7.71
14	-0.50	1.41	3.94	5.00	10.01	12.71
18	0.00	1.00	2.99	3.80	13.00	16.51
25	0.50	0.71	3.35	4.25	16.35	20.76
35	1.00	0.50	3.62	4.60	19.97	25.36
45	1.50	0.35	3.71	4.71	23.68	30.07
60	2.00	0.25	7.22	9.17	30.90	39.24
80	2.50	0.18	22.17	28.16	53.07	67.40
120	3.00	0.13	22.35	28.38	75.42	95.78
170	3.50	0.09	1.90	2.41	77.32	98.19
200	3.75	0.07	0.05	0.06	77.37	98.25
230	4.00	0.06	0.01	0.01	77.38	98.26

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.99	2.79	2.63	2.19	0.96	-0.07	-1.31

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	1.62	0.33	1.38	-1.2	3.31

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-01 #2
Analysis Date: 03-08-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,831	1,143,326	Florida State Plane West	-9.5 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-7/2 Dry - 5Y-7/1 Washed - 5Y-7/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
78.62	76.92	0.01	0.17	#200 - 2.42 #230 - 2.33			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.13	0.17	0.13	0.17
5	-2.00	4.00	0.01	0.01	0.14	0.18
7	-1.50	2.83	0.09	0.11	0.23	0.29
10	-1.00	2.00	0.27	0.34	0.50	0.63
14	-0.50	1.41	0.48	0.61	0.98	1.24
18	0.00	1.00	0.46	0.59	1.44	1.83
25	0.50	0.71	0.63	0.80	2.07	2.63
35	1.00	0.50	0.80	1.02	2.87	3.65
45	1.50	0.35	1.05	1.34	3.92	4.99
60	2.00	0.25	2.65	3.37	6.57	8.36
80	2.50	0.18	17.89	22.76	24.46	31.12
120	3.00	0.13	43.52	55.35	67.98	86.47
170	3.50	0.09	8.45	10.75	76.43	97.22
200	3.75	0.07	0.28	0.36	76.71	97.58
230	4.00	0.06	0.07	0.09	76.78	97.67

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.40	2.98	2.90	2.67	2.37	2.17	1.50

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.53	0.17	0.68	-3.22	17.46

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-01 #3
Analysis Date: 03-08-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,831	1,143,326	Florida State Plane West	-14.1 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/2 Dry - 5Y-7/1 Washed - 5Y-7/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
74.80	73.48	0.02	0.08	#200 - 1.96 #230 - 1.88			2

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.04	0.05	0.04	0.05
5	-2.00	4.00	0.20	0.27	0.24	0.32
7	-1.50	2.83	0.88	1.18	1.12	1.50
10	-1.00	2.00	2.34	3.13	3.46	4.63
14	-0.50	1.41	3.59	4.80	7.05	9.43
18	0.00	1.00	3.41	4.56	10.46	13.99
25	0.50	0.71	3.69	4.93	14.15	18.92
35	1.00	0.50	3.68	4.92	17.83	23.84
45	1.50	0.35	3.42	4.57	21.25	28.41
60	2.00	0.25	5.80	7.75	27.05	36.16
80	2.50	0.18	20.52	27.43	47.57	63.59
120	3.00	0.13	24.00	32.09	71.57	95.68
170	3.50	0.09	1.70	2.27	73.27	97.95
200	3.75	0.07	0.07	0.09	73.34	98.04
230	4.00	0.06	0.06	0.08	73.40	98.12

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.99	2.82	2.68	2.25	1.13	0.20	-0.96

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	1.74	0.30	1.27	-1.2	3.3

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-03 #1

Analysis Date: 03-08-07

Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
433,627	1,132,302	Florida State Plane West	-11.0 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
81.94	81.03	0.01	0.00	#200 - 1.18 #230 - 1.14			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.00	0.00	0.00	0.00
10	-1.00	2.00	0.01	0.01	0.01	0.01
14	-0.50	1.41	0.02	0.02	0.03	0.03
18	0.00	1.00	0.01	0.01	0.04	0.04
25	0.50	0.71	0.02	0.02	0.06	0.06
35	1.00	0.50	0.02	0.02	0.08	0.08
45	1.50	0.35	0.06	0.07	0.14	0.15
60	2.00	0.25	0.28	0.34	0.42	0.49
80	2.50	0.18	21.77	26.57	22.19	27.06
120	3.00	0.13	50.00	61.02	72.19	88.08
170	3.50	0.09	8.56	10.45	80.75	98.53
200	3.75	0.07	0.24	0.29	80.99	98.82
230	4.00	0.06	0.03	0.04	81.02	98.86

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.33	2.97	2.89	2.69	2.46	2.29	2.08

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.66	0.16	0.32	-0.74	10.64

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-03 #2

Analysis Date: 03-08-07

Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
433,627	1,132,302	Florida State Plane West	-15.0 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
77.64	76.70	0.01	0.00	#200 - 1.25 #230 - 1.21			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.00	0.00	0.00	0.00
10	-1.00	2.00	0.01	0.01	0.01	0.01
14	-0.50	1.41	0.02	0.03	0.03	0.04
18	0.00	1.00	0.02	0.03	0.05	0.07
25	0.50	0.71	0.02	0.03	0.07	0.10
35	1.00	0.50	0.06	0.08	0.13	0.18
45	1.50	0.35	0.10	0.13	0.23	0.31
60	2.00	0.25	0.49	0.63	0.72	0.94
80	2.50	0.18	16.59	21.37	17.31	22.31
120	3.00	0.13	49.74	64.06	67.05	86.37
170	3.50	0.09	9.37	12.07	76.42	98.44
200	3.75	0.07	0.24	0.31	76.66	98.75
230	4.00	0.06	0.03	0.04	76.69	98.79

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.36	2.98	2.91	2.72	2.52	2.35	2.09

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.69	0.15	0.33	-1.12	12.65

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-03 #3
Analysis Date: 03-08-07
Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
433,627	1,132,302	Florida State Plane West	-19.0 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
83.49	82.37	0.01	0.00	#200 - 1.36 #230 - 1.35			1

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.29	0.35	0.29	0.35
5	-2.00	4.00	0.00	0.00	0.29	0.35
7	-1.50	2.83	0.14	0.17	0.43	0.52
10	-1.00	2.00	0.24	0.29	0.67	0.81
14	-0.50	1.41	0.33	0.40	1.00	1.21
18	0.00	1.00	0.34	0.41	1.34	1.62
25	0.50	0.71	0.49	0.59	1.83	2.21
35	1.00	0.50	0.78	0.93	2.61	3.14
45	1.50	0.35	1.94	2.32	4.55	5.46
60	2.00	0.25	7.39	8.85	11.94	14.31
80	2.50	0.18	40.60	48.63	52.54	62.94
120	3.00	0.13	27.28	32.67	79.82	95.61
170	3.50	0.09	2.48	2.97	82.30	98.58
200	3.75	0.07	0.05	0.06	82.35	98.64
230	4.00	0.06	0.01	0.01	82.36	98.65

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.99	2.82	2.68	2.37	2.11	2.02	1.40

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.3	0.20	0.64	-3.33	20.58

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-04 #1

Analysis Date: 03-07-07

Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
433,879	1,133,137	Florida State Plane West	-14.7 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
88.45	87.44	0.01	0.00	#200 - 1.19 #230 - 1.17			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.01	0.01	0.01	0.01
10	-1.00	2.00	0.03	0.03	0.04	0.04
14	-0.50	1.41	0.07	0.08	0.11	0.12
18	0.00	1.00	0.11	0.12	0.22	0.24
25	0.50	0.71	0.21	0.24	0.43	0.48
35	1.00	0.50	0.24	0.27	0.67	0.75
45	1.50	0.35	0.38	0.43	1.05	1.18
60	2.00	0.25	2.01	2.27	3.06	3.45
80	2.50	0.18	29.39	33.23	32.45	36.68
120	3.00	0.13	46.98	53.11	79.43	89.79
170	3.50	0.09	7.65	8.65	87.08	98.44
200	3.75	0.07	0.33	0.37	87.41	98.81
230	4.00	0.06	0.02	0.02	87.43	98.83

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.30	2.95	2.86	2.63	2.32	2.19	2.02

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.58	0.17	0.41	-1.97	15.85

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-04 #2

Analysis Date: 03-07-07

Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
433,879	1,133,137	Florida State Plane West	-17.7 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
91.20	90.21	0.00	0.00	#200 - 1.10 #230 - 1.09			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.00	0.00	0.00	0.00
10	-1.00	2.00	0.00	0.00	0.00	0.00
14	-0.50	1.41	0.05	0.05	0.05	0.05
18	0.00	1.00	0.05	0.05	0.10	0.10
25	0.50	0.71	0.10	0.11	0.20	0.21
35	1.00	0.50	0.18	0.20	0.38	0.41
45	1.50	0.35	0.24	0.26	0.62	0.67
60	2.00	0.25	1.10	1.21	1.72	1.88
80	2.50	0.18	26.54	29.10	28.26	30.98
120	3.00	0.13	53.93	59.13	82.19	90.11
170	3.50	0.09	7.83	8.59	90.02	98.70
200	3.75	0.07	0.18	0.20	90.20	98.90
230	4.00	0.06	0.01	0.01	90.21	98.91

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.28	2.95	2.87	2.66	2.40	2.24	2.05

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.62	0.16	0.35	-1.52	13.18

Granularmetric Report
Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-05 #1
Analysis Date: 03-07-07
Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
437,029	1,128,780	Florida State Plane West	-5.8 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-7/1 Dry - 5Y-7/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
84.19	83.03	0.01	0.00	#200 - 1.41 #230 - 1.39			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.04	0.05	0.04	0.05
10	-1.00	2.00	0.11	0.13	0.15	0.18
14	-0.50	1.41	0.13	0.15	0.28	0.33
18	0.00	1.00	0.07	0.08	0.35	0.41
25	0.50	0.71	0.08	0.10	0.43	0.51
35	1.00	0.50	0.08	0.10	0.51	0.61
45	1.50	0.35	0.08	0.10	0.59	0.71
60	2.00	0.25	0.23	0.27	0.82	0.98
80	2.50	0.18	11.49	13.65	12.31	14.63
120	3.00	0.13	56.56	67.18	68.87	81.81
170	3.50	0.09	14.07	16.71	82.94	98.52
200	3.75	0.07	0.06	0.07	83.00	98.59
230	4.00	0.06	0.02	0.02	83.02	98.61

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.39	3.07	2.95	2.76	2.58	2.51	2.15

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.74	0.15	0.39	-4.11	40.43

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-05 #2
Analysis Date: 03-07-07
Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
437,029	1,128,780	Florida State Plane West	-7.6 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 2.5Y-7/1 Dry - 2.5Y-7/1 Washed - 2.5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
83.51	81.39	0.04	0.05	#200 - 2.77 #230 - 2.63			24

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	2.65	3.17	2.65	3.17
5/16"	-3.00	8.00	1.38	1.65	4.03	4.82
3.5	-2.50	5.66	3.63	4.35	7.66	9.17
4	-2.25	4.76	2.04	2.44	9.70	11.61
5	-2.00	4.00	3.52	4.22	13.22	15.83
7	-1.50	2.83	6.69	8.01	19.91	23.84
10	-1.00	2.00	6.87	8.23	26.78	32.07
14	-0.50	1.41	5.07	6.07	31.85	38.14
18	0.00	1.00	2.89	3.46	34.74	41.60
25	0.50	0.71	2.41	2.89	37.15	44.49
35	1.00	0.50	1.40	1.68	38.55	46.17
45	1.50	0.35	0.83	0.99	39.38	47.16
60	2.00	0.25	0.82	0.98	40.20	48.14
80	2.50	0.18	2.83	3.39	43.03	51.53
120	3.00	0.13	25.36	30.37	68.39	81.90
170	3.50	0.09	12.10	14.49	80.49	96.39
200	3.75	0.07	0.70	0.84	81.19	97.23
230	4.00	0.06	0.12	0.14	81.31	97.37

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.45	3.07	2.89	2.27	-1.43	-1.99	-2.98

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	0.75	0.59	2.34	-0.37	1.55

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-05 #3

Analysis Date: 03-07-07

Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
437,029	1,128,780	Florida State Plane West	-8.3 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-6/2 Dry - 5Y-6/2 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
78.07	75.51	0.07	0.04	#200 - 3.70 #230 - 3.41			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.02	0.03	0.02	0.03
10	-1.00	2.00	0.01	0.01	0.03	0.04
14	-0.50	1.41	0.02	0.03	0.05	0.07
18	0.00	1.00	0.02	0.03	0.07	0.10
25	0.50	0.71	0.06	0.08	0.13	0.18
35	1.00	0.50	0.03	0.04	0.16	0.22
45	1.50	0.35	0.07	0.09	0.23	0.31
60	2.00	0.25	0.15	0.19	0.38	0.50
80	2.50	0.18	1.65	2.11	2.03	2.61
120	3.00	0.13	48.81	62.52	50.84	65.13
170	3.50	0.09	22.37	28.65	73.21	93.78
200	3.75	0.07	1.97	2.52	75.18	96.30
230	4.00	0.06	0.23	0.29	75.41	96.59

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.62	3.33	3.17	2.88	2.68	2.61	2.52

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.9	0.13	0.32	-2.02	29.33

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-05 #4

Analysis Date: 03-08-07

Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
437,029	1,128,780	Florida State Plane West	-12.2 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 2.5Y-7/2 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
75.64	74.51	0.03	0.08	#200 - 1.70 #230 - 1.59			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.00	0.00	0.00	0.00
10	-1.00	2.00	0.00	0.00	0.00	0.00
14	-0.50	1.41	0.02	0.03	0.02	0.03
18	0.00	1.00	0.02	0.03	0.04	0.06
25	0.50	0.71	0.02	0.03	0.06	0.09
35	1.00	0.50	0.02	0.03	0.08	0.12
45	1.50	0.35	0.02	0.03	0.10	0.15
60	2.00	0.25	0.09	0.12	0.19	0.27
80	2.50	0.18	2.13	2.82	2.32	3.09
120	3.00	0.13	40.38	53.38	42.70	56.47
170	3.50	0.09	30.91	40.86	73.61	97.33
200	3.75	0.07	0.73	0.97	74.34	98.30
230	4.00	0.06	0.08	0.11	74.42	98.41

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.47	3.34	3.23	2.94	2.71	2.62	2.52

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.95	0.13	0.3	-1.2	14.3

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-06 #1

Analysis Date: 03-08-07

Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
436,754	1,128,828	Florida State Plane West	-8.8 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-7/1 Dry - 5Y-7/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
72.70	71.76	0.00	0.00	#200 - 1.33 #230 - 1.29			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.06	0.08	0.06	0.08
10	-1.00	2.00	0.07	0.10	0.13	0.18
14	-0.50	1.41	0.09	0.12	0.22	0.30
18	0.00	1.00	0.12	0.17	0.34	0.47
25	0.50	0.71	0.08	0.11	0.42	0.58
35	1.00	0.50	0.07	0.10	0.49	0.68
45	1.50	0.35	0.09	0.12	0.58	0.80
60	2.00	0.25	0.24	0.33	0.82	1.13
80	2.50	0.18	8.67	11.93	9.49	13.06
120	3.00	0.13	48.74	67.04	58.23	80.10
170	3.50	0.09	13.26	18.24	71.49	98.34
200	3.75	0.07	0.24	0.33	71.73	98.67
230	4.00	0.06	0.03	0.04	71.76	98.71

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.41	3.11	2.96	2.78	2.59	2.52	2.16

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.76	0.15	0.4	-4.14	39.96

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-06 #2

Analysis Date: 03-08-07

Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
436,754	1,128,828	Florida State Plane West	-10.8 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 2.5Y-6/2 Dry - 2.5Y-6/1 Washed - 2.5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
78.80	76.45	0.01	0.00	#200 - 3.14 #230 - 2.99			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.00	0.00	0.00	0.00
10	-1.00	2.00	0.03	0.04	0.03	0.04
14	-0.50	1.41	0.04	0.05	0.07	0.09
18	0.00	1.00	0.06	0.08	0.13	0.17
25	0.50	0.71	0.08	0.10	0.21	0.27
35	1.00	0.50	0.06	0.08	0.27	0.35
45	1.50	0.35	0.10	0.13	0.37	0.48
60	2.00	0.25	0.25	0.32	0.62	0.80
80	2.50	0.18	17.78	22.56	18.40	23.36
120	3.00	0.13	46.55	59.07	64.95	82.43
170	3.50	0.09	10.75	13.64	75.70	96.07
200	3.75	0.07	0.62	0.79	76.32	96.86
230	4.00	0.06	0.12	0.15	76.44	97.01

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.46	3.06	2.94	2.73	2.51	2.34	2.09

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.7	0.15	0.37	-1.66	17.56

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-06 #3

Analysis Date: 03-08-07

Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
436,754	1,128,828	Florida State Plane West	-13.0 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 2.5Y-7/2 Dry - 2.5Y-7/1 Washed - 2.5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
79.86	78.27	0.01	0.00	#200 - 2.08 #230 - 1.99			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.21	0.26	0.21	0.26
5	-2.00	4.00	0.12	0.15	0.33	0.41
7	-1.50	2.83	0.02	0.03	0.35	0.44
10	-1.00	2.00	0.02	0.03	0.37	0.47
14	-0.50	1.41	0.04	0.05	0.41	0.52
18	0.00	1.00	0.08	0.10	0.49	0.62
25	0.50	0.71	0.04	0.05	0.53	0.67
35	1.00	0.50	0.06	0.08	0.59	0.75
45	1.50	0.35	0.06	0.08	0.65	0.83
60	2.00	0.25	0.15	0.19	0.80	1.02
80	2.50	0.18	4.54	5.68	5.34	6.70
120	3.00	0.13	58.81	73.64	64.15	80.34
170	3.50	0.09	13.40	16.78	77.55	97.12
200	3.75	0.07	0.64	0.80	78.19	97.92
230	4.00	0.06	0.07	0.09	78.26	98.01

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.44	3.11	2.96	2.79	2.62	2.56	2.35

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.78	0.15	0.45	-6.93	75.52

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-07 #1
Analysis Date: 03-06-07
Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
433,503	1,131,479	Florida State Plane West	-11.7 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
88.60	87.43	0.02	0.00	#200 - 1.41 #230 - 1.35			11

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	2.77	3.13	2.77	3.13
3.5	-2.50	5.66	2.19	2.47	4.96	5.60
4	-2.25	4.76	0.77	0.87	5.73	6.47
5	-2.00	4.00	0.50	0.56	6.23	7.03
7	-1.50	2.83	3.75	4.23	9.98	11.26
10	-1.00	2.00	3.52	3.97	13.50	15.23
14	-0.50	1.41	3.47	3.92	16.97	19.15
18	0.00	1.00	2.89	3.26	19.86	22.41
25	0.50	0.71	2.93	3.31	22.79	25.72
35	1.00	0.50	2.99	3.37	25.78	29.09
45	1.50	0.35	3.71	4.19	29.49	33.28
60	2.00	0.25	9.71	10.96	39.20	44.24
80	2.50	0.18	23.42	26.43	62.62	70.67
120	3.00	0.13	19.59	22.11	82.21	92.78
170	3.50	0.09	4.84	5.46	87.05	98.24
200	3.75	0.07	0.31	0.35	87.36	98.59
230	4.00	0.06	0.05	0.06	87.41	98.65

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.20	2.80	2.60	2.11	0.39	-0.90	-2.62

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.33	0.40	1.78	-1.16	3.16

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-07 #2

Analysis Date: 03-06-07

Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
433,503	1,131,479	Florida State Plane West	-13.5 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/2 Dry - 5Y-7/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
92.77	91.79	0.01	0.00	#200 - 1.11 #230 - 1.08			22

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	1.83	1.97	1.83	1.97
5/16"	-3.00	8.00	2.71	2.92	4.54	4.89
3.5	-2.50	5.66	4.75	5.12	9.29	10.01
4	-2.25	4.76	2.17	2.34	11.46	12.35
5	-2.00	4.00	3.57	3.85	15.03	16.20
7	-1.50	2.83	6.59	7.10	21.62	23.30
10	-1.00	2.00	6.35	6.84	27.97	30.14
14	-0.50	1.41	6.35	6.84	34.32	36.98
18	0.00	1.00	4.58	4.94	38.90	41.92
25	0.50	0.71	4.00	4.31	42.90	46.23
35	1.00	0.50	3.80	4.10	46.70	50.33
45	1.50	0.35	4.23	4.56	50.93	54.89
60	2.00	0.25	9.05	9.76	59.98	64.65
80	2.50	0.18	17.43	18.79	77.41	83.44
120	3.00	0.13	11.74	12.65	89.15	96.09
170	3.50	0.09	2.42	2.61	91.57	98.70
200	3.75	0.07	0.18	0.19	91.75	98.89
230	4.00	0.06	0.03	0.03	91.78	98.92

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.96	2.52	2.28	0.96	-1.38	-2.01	-2.99

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	0.42	0.75	2.03	-0.37	1.77

Granularmetric Report
Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-07 #3
Analysis Date: 03-06-07
Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
433,503	1,131,479	Florida State Plane West	-14.8 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
90.04	88.80	0.01	0.01	#200 - 1.45 #230 - 1.39			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.99	1.10	0.99	1.10
5/16"	-3.00	8.00	0.70	0.78	1.69	1.88
3.5	-2.50	5.66	0.94	1.04	2.63	2.92
4	-2.25	4.76	0.47	0.52	3.10	3.44
5	-2.00	4.00	0.17	0.19	3.27	3.63
7	-1.50	2.83	1.51	1.68	4.78	5.31
10	-1.00	2.00	1.39	1.54	6.17	6.85
14	-0.50	1.41	1.25	1.39	7.42	8.24
18	0.00	1.00	0.95	1.06	8.37	9.30
25	0.50	0.71	1.04	1.16	9.41	10.46
35	1.00	0.50	1.18	1.31	10.59	11.77
45	1.50	0.35	1.76	1.95	12.35	13.72
60	2.00	0.25	5.77	6.41	18.12	20.13
80	2.50	0.18	37.00	41.09	55.12	61.22
120	3.00	0.13	27.23	30.24	82.35	91.46
170	3.50	0.09	6.02	6.69	88.37	98.15
200	3.75	0.07	0.36	0.40	88.73	98.55
230	4.00	0.06	0.05	0.06	88.78	98.61

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.26	2.88	2.73	2.36	2.06	1.68	-1.59

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.99	0.25	1.38	-2.49	8.89

Granularmetric Report
Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-07 #4
Analysis Date: 03-07-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
433,503	1,131,479	Florida State Plane West	-17.3 NAVD 88

USCS:	Munsell:	Comments:
SW-SM	Wet - 5Y-5/2 Dry - 5Y-6/2 Washed - 5Y-6/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
90.21	84.66	0.46	0.10	#200 - 7.27 #230 - 6.76			2

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.51	0.57	0.51	0.57
4	-2.25	4.76	0.30	0.33	0.81	0.90
5	-2.00	4.00	0.25	0.28	1.06	1.18
7	-1.50	2.83	0.45	0.50	1.51	1.68
10	-1.00	2.00	0.37	0.41	1.88	2.09
14	-0.50	1.41	0.45	0.50	2.33	2.59
18	0.00	1.00	0.30	0.33	2.63	2.92
25	0.50	0.71	0.47	0.52	3.10	3.44
35	1.00	0.50	0.40	0.44	3.50	3.88
45	1.50	0.35	0.45	0.50	3.95	4.38
60	2.00	0.25	0.87	0.96	4.82	5.34
80	2.50	0.18	5.61	6.22	10.43	11.56
120	3.00	0.13	34.83	38.61	45.26	50.17
170	3.50	0.09	35.08	38.89	80.34	89.06
200	3.75	0.07	3.31	3.67	83.65	92.73
230	4.00	0.06	0.46	0.51	84.11	93.24

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
	3.43	3.32	3.00	2.67	2.56	1.82

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.79	0.14	0.93	-3.9	20.34

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-08 #1
Analysis Date: 03-09-07
Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
433,653	1,130,845	Florida State Plane West	-6.3 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-7/1 Washed - 5Y-7/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
97.24	95.37	0.02	0.10	#200 - 2.12 #230 - 2.06			33

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	5.65	5.81	5.65	5.81
5/16"	-3.00	8.00	8.26	8.49	13.91	14.30
3.5	-2.50	5.66	10.13	10.42	24.04	24.72
4	-2.25	4.76	4.21	4.33	28.25	29.05
5	-2.00	4.00	3.05	3.14	31.30	32.19
7	-1.50	2.83	6.85	7.04	38.15	39.23
10	-1.00	2.00	7.04	7.24	45.19	46.47
14	-0.50	1.41	6.85	7.04	52.04	53.51
18	0.00	1.00	5.08	5.22	57.12	58.73
25	0.50	0.71	5.51	5.67	62.63	64.40
35	1.00	0.50	4.69	4.82	67.32	69.22
45	1.50	0.35	4.84	4.98	72.16	74.20
60	2.00	0.25	8.01	8.24	80.17	82.44
80	2.50	0.18	10.13	10.42	90.30	92.86
120	3.00	0.13	4.00	4.11	94.30	96.97
170	3.50	0.09	0.73	0.75	95.03	97.72
200	3.75	0.07	0.16	0.16	95.19	97.88
230	4.00	0.06	0.06	0.06	95.25	97.94

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.76	2.07	1.55	-0.75	-2.48	-2.92	-3.60

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	-0.6	1.52	2.07	0.14	1.69

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-08 #2
Analysis Date: 03-09-07
Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
433,653	1,130,845	Florida State Plane West	-7.1 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
94.86	93.68	0.00	0.09	#200 - 1.36 #230 - 1.35			9

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	1.22	1.29	1.22	1.29
3.5	-2.50	5.66	1.10	1.16	2.32	2.45
4	-2.25	4.76	1.56	1.64	3.88	4.09
5	-2.00	4.00	1.31	1.38	5.19	5.47
7	-1.50	2.83	3.97	4.19	9.16	9.66
10	-1.00	2.00	4.52	4.76	13.68	14.42
14	-0.50	1.41	5.91	6.23	19.59	20.65
18	0.00	1.00	4.49	4.73	24.08	25.38
25	0.50	0.71	6.11	6.44	30.19	31.82
35	1.00	0.50	6.08	6.41	36.27	38.23
45	1.50	0.35	6.69	7.05	42.96	45.28
60	2.00	0.25	12.36	13.03	55.32	58.31
80	2.50	0.18	22.69	23.92	78.01	82.23
120	3.00	0.13	13.94	14.70	91.95	96.93
170	3.50	0.09	1.56	1.64	93.51	98.57
200	3.75	0.07	0.07	0.07	93.58	98.64
230	4.00	0.06	0.01	0.01	93.59	98.65

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.93	2.56	2.35	1.68	-0.04	-0.87	-2.09

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	1.06	0.48	1.61	-0.84	2.62

Granularmetric Report
Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-08 #3
Analysis Date: 03-09-07
Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
433,653	1,130,845	Florida State Plane West	-11.0 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-7/1 Washed - 5Y-7/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
95.13	92.96	0.02	0.14	#200 - 2.48 #230 - 2.44			14

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	1.81	1.90	1.81	1.90
5/16"	-3.00	8.00	1.96	2.06	3.77	3.96
3.5	-2.50	5.66	2.07	2.18	5.84	6.14
4	-2.25	4.76	1.44	1.51	7.28	7.65
5	-2.00	4.00	1.39	1.46	8.67	9.11
7	-1.50	2.83	4.52	4.75	13.19	13.86
10	-1.00	2.00	6.40	6.73	19.59	20.59
14	-0.50	1.41	9.38	9.86	28.97	30.45
18	0.00	1.00	6.13	6.44	35.10	36.89
25	0.50	0.71	9.56	10.05	44.66	46.94
35	1.00	0.50	9.59	10.08	54.25	57.02
45	1.50	0.35	8.93	9.39	63.18	66.41
60	2.00	0.25	9.79	10.29	72.97	76.70
80	2.50	0.18	10.26	10.79	83.23	87.49
120	3.00	0.13	7.97	8.38	91.20	95.87
170	3.50	0.09	1.50	1.58	92.70	97.45
200	3.75	0.07	0.07	0.07	92.77	97.52
230	4.00	0.06	0.04	0.04	92.81	97.56

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.95	2.34	1.92	0.65	-0.78	-1.34	-2.76

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	0.41	0.75	1.7	-0.45	2.45

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-08 #4

Analysis Date: 03-09-07

Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
433,653	1,130,845	Florida State Plane West	-12.5 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
97.08	95.96	0.04	0.00	#200 - 1.20 #230 - 1.20			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.44	0.45	0.44	0.45
4	-2.25	4.76	0.31	0.32	0.75	0.77
5	-2.00	4.00	0.37	0.38	1.12	1.15
7	-1.50	2.83	1.00	1.03	2.12	2.18
10	-1.00	2.00	1.35	1.39	3.47	3.57
14	-0.50	1.41	2.98	3.07	6.45	6.64
18	0.00	1.00	4.57	4.71	11.02	11.35
25	0.50	0.71	9.30	9.58	20.32	20.93
35	1.00	0.50	13.59	14.00	33.91	34.93
45	1.50	0.35	21.05	21.68	54.96	56.61
60	2.00	0.25	22.59	23.27	77.55	79.88
80	2.50	0.18	11.53	11.88	89.08	91.76
120	3.00	0.13	6.02	6.20	95.10	97.96
170	3.50	0.09	0.78	0.80	95.88	98.76
200	3.75	0.07	0.04	0.04	95.92	98.80
230	4.00	0.06	0.00	0.00	95.92	98.80

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.76	2.17	1.90	1.35	0.65	0.24	-0.77

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.19	0.44	1.03	-0.91	4.3

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-09 #1

Analysis Date: 03-06-07

Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,126	1,128,661	Florida State Plane West	-15.7 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
90.38	88.75	0.01	0.07	#200 - 1.89 #230 - 1.89			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.27	0.30	0.27	0.30
7	-1.50	2.83	0.06	0.07	0.33	0.37
10	-1.00	2.00	0.13	0.14	0.46	0.51
14	-0.50	1.41	0.21	0.23	0.67	0.74
18	0.00	1.00	0.16	0.18	0.83	0.92
25	0.50	0.71	0.29	0.32	1.12	1.24
35	1.00	0.50	0.42	0.46	1.54	1.70
45	1.50	0.35	0.89	0.98	2.43	2.68
60	2.00	0.25	4.74	5.24	7.17	7.92
80	2.50	0.18	41.88	46.34	49.05	54.26
120	3.00	0.13	37.74	41.76	86.79	96.02
170	3.50	0.09	1.87	2.07	88.66	98.09
200	3.75	0.07	0.02	0.02	88.68	98.11
230	4.00	0.06	0.00	0.00	88.68	98.11

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.99	2.86	2.75	2.45	2.18	2.09	1.72

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.4	0.19	0.52	-3.98	29.92

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-09 #2
Analysis Date: 03-06-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,126	1,128,661	Florida State Plane West	-18.7 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
89.77	88.64	0.00	0.00	#200 - 1.28 #230 - 1.25			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.06	0.07	0.06	0.07
10	-1.00	2.00	0.05	0.06	0.11	0.13
14	-0.50	1.41	0.07	0.08	0.18	0.21
18	0.00	1.00	0.04	0.04	0.22	0.25
25	0.50	0.71	0.07	0.08	0.29	0.33
35	1.00	0.50	0.07	0.08	0.36	0.41
45	1.50	0.35	0.13	0.14	0.49	0.55
60	2.00	0.25	0.41	0.46	0.90	1.01
80	2.50	0.18	22.87	25.48	23.77	26.49
120	3.00	0.13	55.62	61.96	79.39	88.45
170	3.50	0.09	8.80	9.80	88.19	98.25
200	3.75	0.07	0.42	0.47	88.61	98.72
230	4.00	0.06	0.03	0.03	88.64	98.75

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.33	2.96	2.89	2.69	2.47	2.29	2.08

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.66	0.16	0.37	-2.93	31.72

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-09 #3
Analysis Date: 03-06-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,126	1,128,661	Florida State Plane West	-21.7 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
95.82	94.72	0.00	0.01	#200 - 1.15 #230 - 1.14			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.14	0.15	0.14	0.15
10	-1.00	2.00	0.15	0.16	0.29	0.31
14	-0.50	1.41	0.24	0.25	0.53	0.56
18	0.00	1.00	0.30	0.31	0.83	0.87
25	0.50	0.71	0.46	0.48	1.29	1.35
35	1.00	0.50	0.68	0.71	1.97	2.06
45	1.50	0.35	1.04	1.09	3.01	3.15
60	2.00	0.25	3.16	3.30	6.17	6.45
80	2.50	0.18	28.57	29.82	34.74	36.27
120	3.00	0.13	53.34	55.67	88.08	91.94
170	3.50	0.09	6.55	6.84	94.63	98.78
200	3.75	0.07	0.07	0.07	94.70	98.85
230	4.00	0.06	0.01	0.01	94.71	98.86

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.22	2.93	2.85	2.62	2.31	2.16	1.78

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.53	0.17	0.52	-3.23	20.6

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-09 #4
Analysis Date: 03-06-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,126	1,128,661	Florida State Plane West	-24.3 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-7/1 Washed - 5Y-7/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
100.85	100.02	0.00	0.00	#200 - 0.84 #230 - 0.83			18

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	1.46	1.45	1.46	1.45
5/16"	-3.00	8.00	3.04	3.01	4.50	4.46
3.5	-2.50	5.66	3.43	3.40	7.93	7.86
4	-2.25	4.76	1.21	1.20	9.14	9.06
5	-2.00	4.00	2.40	2.38	11.54	11.44
7	-1.50	2.83	7.62	7.56	19.16	19.00
10	-1.00	2.00	6.99	6.93	26.15	25.93
14	-0.50	1.41	6.98	6.92	33.13	32.85
18	0.00	1.00	4.36	4.32	37.49	37.17
25	0.50	0.71	3.40	3.37	40.89	40.54
35	1.00	0.50	2.30	2.28	43.19	42.82
45	1.50	0.35	1.98	1.96	45.17	44.78
60	2.00	0.25	3.39	3.36	48.56	48.14
80	2.50	0.18	14.65	14.53	63.21	62.67
120	3.00	0.13	31.27	31.01	94.48	93.68
170	3.50	0.09	5.40	5.35	99.88	99.03
200	3.75	0.07	0.13	0.13	100.01	99.16
230	4.00	0.06	0.01	0.01	100.02	99.17

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.12	2.84	2.70	2.06	-1.07	-1.70	-2.92

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	0.87	0.55	2.11	-0.58	1.85

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-09 #5

Analysis Date: 03-06-07

Analyzed By: AU

CPE®
Coastal Planning & Engineering
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FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,126	1,128,661	Florida State Plane West	-26.4 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-7/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
91.00	89.35	0.03	0.10	#200 - 2.07 #230 - 1.96			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.08	0.09	0.08	0.09
10	-1.00	2.00	0.19	0.21	0.27	0.30
14	-0.50	1.41	0.24	0.26	0.51	0.56
18	0.00	1.00	0.34	0.37	0.85	0.93
25	0.50	0.71	0.59	0.65	1.44	1.58
35	1.00	0.50	0.83	0.91	2.27	2.49
45	1.50	0.35	1.14	1.25	3.41	3.74
60	2.00	0.25	2.65	2.91	6.06	6.65
80	2.50	0.18	32.06	35.23	38.12	41.88
120	3.00	0.13	41.07	45.13	79.19	87.01
170	3.50	0.09	9.13	10.03	88.32	97.04
200	3.75	0.07	0.81	0.89	89.13	97.93
230	4.00	0.06	0.10	0.11	89.23	98.04

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.40	2.97	2.87	2.59	2.26	2.13	1.72

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.51	0.18	0.57	-2.53	15.29

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-10 #1
Analysis Date: 03-09-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,717	1,129,373	Florida State Plane West	-10.9 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-7/1 Washed - 5Y-7/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
90.89	89.85	-0.01	0.08	#200 - 1.22 #230 - 1.20			4

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.30	0.33	0.30	0.33
3.5	-2.50	5.66	0.75	0.83	1.05	1.16
4	-2.25	4.76	0.62	0.68	1.67	1.84
5	-2.00	4.00	0.56	0.62	2.23	2.46
7	-1.50	2.83	1.44	1.58	3.67	4.04
10	-1.00	2.00	1.71	1.88	5.38	5.92
14	-0.50	1.41	1.87	2.06	7.25	7.98
18	0.00	1.00	1.93	2.12	9.18	10.10
25	0.50	0.71	2.43	2.67	11.61	12.77
35	1.00	0.50	3.17	3.49	14.78	16.26
45	1.50	0.35	3.96	4.36	18.74	20.62
60	2.00	0.25	6.67	7.34	25.41	27.96
80	2.50	0.18	20.56	22.62	45.97	50.58
120	3.00	0.13	37.70	41.48	83.67	92.06
170	3.50	0.09	6.04	6.65	89.71	98.71
200	3.75	0.07	0.06	0.07	89.77	98.78
230	4.00	0.06	0.02	0.02	89.79	98.80

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.22	2.90	2.79	2.49	1.80	0.96	-1.24

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.97	0.26	1.32	-1.9	6.09

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-10 #2

Analysis Date: 03-09-07

Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,717	1,129,373	Florida State Plane West	-13.4 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-6/1 Dry - 5Y-6/1 Washed - 5Y-6/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
93.00	91.86	0.01	0.06	#200 - 1.31 #230 - 1.30			19

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.78	0.84	0.78	0.84
5/16"	-3.00	8.00	1.05	1.13	1.83	1.97
3.5	-2.50	5.66	4.09	4.40	5.92	6.37
4	-2.25	4.76	1.56	1.68	7.48	8.05
5	-2.00	4.00	3.12	3.35	10.60	11.40
7	-1.50	2.83	7.72	8.30	18.32	19.70
10	-1.00	2.00	6.35	6.83	24.67	26.53
14	-0.50	1.41	7.13	7.67	31.80	34.20
18	0.00	1.00	5.74	6.17	37.54	40.37
25	0.50	0.71	4.48	4.82	42.02	45.19
35	1.00	0.50	3.90	4.19	45.92	49.38
45	1.50	0.35	3.18	3.42	49.10	52.80
60	2.00	0.25	4.15	4.46	53.25	57.26
80	2.50	0.18	13.49	14.51	66.74	71.77
120	3.00	0.13	22.34	24.02	89.08	95.79
170	3.50	0.09	2.64	2.84	91.72	98.63
200	3.75	0.07	0.06	0.06	91.78	98.69
230	4.00	0.06	0.01	0.01	91.79	98.70

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.98	2.75	2.57	1.09	-1.11	-1.72	-2.66

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	0.65	0.64	1.98	-0.36	1.71

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-10 #3

Analysis Date: 03-09-07

Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
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fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,717	1,129,373	Florida State Plane West	-15.2 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
93.37	92.31	0.01	0.01	#200 - 1.20 #230 - 1.16			1

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.07	0.07	0.07	0.07
7/16"	-3.50	11.31	0.14	0.15	0.21	0.22
5/16"	-3.00	8.00	0.25	0.27	0.46	0.49
3.5	-2.50	5.66	0.00	0.00	0.46	0.49
4	-2.25	4.76	0.00	0.00	0.46	0.49
5	-2.00	4.00	0.00	0.00	0.46	0.49
7	-1.50	2.83	0.44	0.47	0.90	0.96
10	-1.00	2.00	0.65	0.70	1.55	1.66
14	-0.50	1.41	0.85	0.91	2.40	2.57
18	0.00	1.00	0.71	0.76	3.11	3.33
25	0.50	0.71	0.87	0.93	3.98	4.26
35	1.00	0.50	0.93	1.00	4.91	5.26
45	1.50	0.35	1.29	1.38	6.20	6.64
60	2.00	0.25	2.48	2.66	8.68	9.30
80	2.50	0.18	12.82	13.73	21.50	23.03
120	3.00	0.13	58.55	62.71	80.05	85.74
170	3.50	0.09	11.99	12.84	92.04	98.58
200	3.75	0.07	0.21	0.22	92.25	98.80
230	4.00	0.06	0.04	0.04	92.29	98.84

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.36	2.99	2.91	2.72	2.52	2.24	0.87

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.52	0.17	0.87	-3.75	20.24

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-10 #4
Analysis Date: 03-09-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,717	1,129,373	Florida State Plane West	-18.2 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-7/1 Dry - 5Y-7/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
93.13	91.81	0.01	0.00	#200 - 1.48 #230 - 1.42			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.10	0.11	0.10	0.11
7	-1.50	2.83	0.03	0.03	0.13	0.14
10	-1.00	2.00	0.13	0.14	0.26	0.28
14	-0.50	1.41	0.10	0.11	0.36	0.39
18	0.00	1.00	0.09	0.10	0.45	0.49
25	0.50	0.71	0.12	0.13	0.57	0.62
35	1.00	0.50	0.11	0.12	0.68	0.74
45	1.50	0.35	0.16	0.17	0.84	0.91
60	2.00	0.25	0.37	0.40	1.21	1.31
80	2.50	0.18	10.87	11.67	12.08	12.98
120	3.00	0.13	63.28	67.95	75.36	80.93
170	3.50	0.09	15.42	16.56	90.78	97.49
200	3.75	0.07	0.96	1.03	91.74	98.52
230	4.00	0.06	0.06	0.06	91.80	98.58

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.42	3.09	2.96	2.77	2.59	2.52	2.16

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.75	0.15	0.42	-4.6	45.96

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-10 #5
Analysis Date: 03-09-07
Analyzed By: AU

Coastal Planning & Engineering
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Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,717	1,129,373	Florida State Plane West	-22.0 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-6/1 Dry - 5Y-6/1 Washed - 5Y-7/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
93.59	90.61	0.10	0.00	#200 - 3.89 #230 - 3.30			2

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.36	0.38	0.36	0.38
3.5	-2.50	5.66	0.40	0.43	0.76	0.81
4	-2.25	4.76	0.05	0.05	0.81	0.86
5	-2.00	4.00	0.12	0.13	0.93	0.99
7	-1.50	2.83	0.54	0.58	1.47	1.57
10	-1.00	2.00	0.61	0.65	2.08	2.22
14	-0.50	1.41	0.71	0.76	2.79	2.98
18	0.00	1.00	0.65	0.69	3.44	3.67
25	0.50	0.71	0.94	1.00	4.38	4.67
35	1.00	0.50	1.06	1.13	5.44	5.80
45	1.50	0.35	1.25	1.34	6.69	7.14
60	2.00	0.25	4.08	4.36	10.77	11.50
80	2.50	0.18	16.21	17.32	26.98	28.82
120	3.00	0.13	32.60	34.83	59.58	63.65
170	3.50	0.09	26.05	27.83	85.63	91.48
200	3.75	0.07	4.33	4.63	89.96	96.11
230	4.00	0.06	0.55	0.59	90.51	96.70

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.69	3.37	3.20	2.80	2.39	2.13	0.65

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.58	0.17	1.02	-2.94	13.84

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-11 #1
Analysis Date: 03-09-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,620	1,129,814	Florida State Plane West	-9.2 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-7/1 Washed - 5Y-7/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
88.63	87.81	0.00	0.11	#200 - 1.06 #230 - 1.03			2

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.36	0.41	0.36	0.41
5	-2.00	4.00	0.28	0.32	0.64	0.73
7	-1.50	2.83	1.42	1.60	2.06	2.33
10	-1.00	2.00	2.29	2.58	4.35	4.91
14	-0.50	1.41	2.82	3.18	7.17	8.09
18	0.00	1.00	2.59	2.92	9.76	11.01
25	0.50	0.71	2.87	3.24	12.63	14.25
35	1.00	0.50	3.19	3.60	15.82	17.85
45	1.50	0.35	3.77	4.25	19.59	22.10
60	2.00	0.25	7.77	8.77	27.36	30.87
80	2.50	0.18	24.78	27.96	52.14	58.83
120	3.00	0.13	32.08	36.20	84.22	95.03
170	3.50	0.09	3.41	3.85	87.63	98.88
200	3.75	0.07	0.05	0.06	87.68	98.94
230	4.00	0.06	0.03	0.03	87.71	98.97

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.00	2.85	2.72	2.34	1.67	0.74	-0.99

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	1.91	0.27	1.22	-1.6	4.75

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-11 #2
Analysis Date: 03-09-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,620	1,129,814	Florida State Plane West	-11.9 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/2 Dry - 5Y-8/2 Washed - 5Y-8/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
86.17	85.17	0.01	0.10	#200 - 1.31 #230 - 1.28			2

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.21	0.24	0.21	0.24
3.5	-2.50	5.66	0.16	0.19	0.37	0.43
4	-2.25	4.76	0.48	0.56	0.85	0.99
5	-2.00	4.00	0.19	0.22	1.04	1.21
7	-1.50	2.83	0.25	0.29	1.29	1.50
10	-1.00	2.00	0.42	0.49	1.71	1.99
14	-0.50	1.41	0.41	0.48	2.12	2.47
18	0.00	1.00	0.41	0.48	2.53	2.95
25	0.50	0.71	0.56	0.65	3.09	3.60
35	1.00	0.50	0.89	1.03	3.98	4.63
45	1.50	0.35	1.63	1.89	5.61	6.52
60	2.00	0.25	5.26	6.10	10.87	12.62
80	2.50	0.18	25.92	30.08	36.79	42.70
120	3.00	0.13	43.13	50.05	79.92	92.75
170	3.50	0.09	5.03	5.84	84.95	98.59
200	3.75	0.07	0.09	0.10	85.04	98.69
230	4.00	0.06	0.03	0.03	85.07	98.72

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.19	2.91	2.82	2.57	2.21	2.06	1.10

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.37	0.19	0.85	-3.65	19.44

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-11 #3
Analysis Date: 03-09-07
Analyzed By: AU

Coastal Planning & Engineering
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FL 33431
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fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,620	1,129,814	Florida State Plane West	-13.0 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-6/2 Dry - 5Y-7/2 Washed - 5Y-8/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
90.28	89.20	0.01	0.08	#200 - 1.32 #230 - 1.29			25

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	1.84	2.04	1.84	2.04
5/16"	-3.00	8.00	2.89	3.20	4.73	5.24
3.5	-2.50	5.66	6.36	7.04	11.09	12.28
4	-2.25	4.76	2.16	2.39	13.25	14.67
5	-2.00	4.00	2.93	3.25	16.18	17.92
7	-1.50	2.83	6.20	6.87	22.38	24.79
10	-1.00	2.00	6.52	7.22	28.90	32.01
14	-0.50	1.41	7.27	8.05	36.17	40.06
18	0.00	1.00	5.90	6.54	42.07	46.60
25	0.50	0.71	5.05	5.59	47.12	52.19
35	1.00	0.50	4.78	5.29	51.90	57.48
45	1.50	0.35	4.45	4.93	56.35	62.41
60	2.00	0.25	6.83	7.57	63.18	69.98
80	2.50	0.18	11.23	12.44	74.41	82.42
120	3.00	0.13	13.17	14.59	87.58	97.01
170	3.50	0.09	1.47	1.63	89.05	98.64
200	3.75	0.07	0.04	0.04	89.09	98.68
230	4.00	0.06	0.03	0.03	89.12	98.71

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.93	2.55	2.20	0.30	-1.49	-2.15	-3.04

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	0.2	0.87	2.02	-0.2	1.74

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-11 #4
Analysis Date: 03-09-07
Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
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fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,620	1,129,814	Florida State Plane West	-14.0 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
85.38	84.48	0.00	0.01	#200 - 1.08 #230 - 1.08			1

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.20	0.23	0.20	0.23
4	-2.25	4.76	0.00	0.00	0.20	0.23
5	-2.00	4.00	0.13	0.15	0.33	0.38
7	-1.50	2.83	0.16	0.19	0.49	0.57
10	-1.00	2.00	0.35	0.41	0.84	0.98
14	-0.50	1.41	0.47	0.55	1.31	1.53
18	0.00	1.00	0.63	0.74	1.94	2.27
25	0.50	0.71	0.47	0.55	2.41	2.82
35	1.00	0.50	0.77	0.90	3.18	3.72
45	1.50	0.35	2.64	3.09	5.82	6.81
60	2.00	0.25	35.23	41.26	41.05	48.07
80	2.50	0.18	39.93	46.77	80.98	94.84
120	3.00	0.13	3.46	4.05	84.44	98.89
170	3.50	0.09	0.02	0.02	84.46	98.91
200	3.75	0.07	0.01	0.01	84.47	98.92
230	4.00	0.06	0.00	0.00	84.47	98.92

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.52	2.38	2.29	2.02	1.72	1.61	1.21

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	1.93	0.26	0.59	-3.68	23.04

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-12 #1
Analysis Date: 03-08-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,389	1,130,139	Florida State Plane West	-10.1 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
78.27	77.48	0.00	0.05	#200 - 1.06 #230 - 1.05			5

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.89	1.14	0.89	1.14
5/16"	-3.00	8.00	0.96	1.23	1.85	2.37
3.5	-2.50	5.66	0.42	0.54	2.27	2.91
4	-2.25	4.76	0.48	0.61	2.75	3.52
5	-2.00	4.00	0.28	0.36	3.03	3.88
7	-1.50	2.83	0.83	1.06	3.86	4.94
10	-1.00	2.00	1.07	1.37	4.93	6.31
14	-0.50	1.41	1.17	1.49	6.10	7.80
18	0.00	1.00	0.83	1.06	6.93	8.86
25	0.50	0.71	1.04	1.33	7.97	10.19
35	1.00	0.50	1.36	1.74	9.33	11.93
45	1.50	0.35	1.88	2.40	11.21	14.33
60	2.00	0.25	5.77	7.37	16.98	21.70
80	2.50	0.18	33.06	42.24	50.04	63.94
120	3.00	0.13	25.86	33.04	75.90	96.98
170	3.50	0.09	1.51	1.93	77.41	98.91
200	3.75	0.07	0.02	0.03	77.43	98.94
230	4.00	0.06	0.01	0.01	77.44	98.95

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.97	2.80	2.67	2.33	2.04	1.61	-1.48

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.95	0.26	1.35	-2.63	9.63

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-12 #2
Analysis Date: 03-08-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,389	1,130,139	Florida State Plane West	-13.2 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-7/1 Washed - 5Y-7/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
81.66	80.56	0.02	0.01	#200 - 1.44 #230 - 1.40			19

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	1.70	2.08	1.70	2.08
5/16"	-3.00	8.00	1.00	1.22	2.70	3.30
3.5	-2.50	5.66	4.64	5.68	7.34	8.98
4	-2.25	4.76	1.83	2.24	9.17	11.22
5	-2.00	4.00	2.00	2.45	11.17	13.67
7	-1.50	2.83	4.30	5.27	15.47	18.94
10	-1.00	2.00	4.83	5.91	20.30	24.85
14	-0.50	1.41	5.95	7.29	26.25	32.14
18	0.00	1.00	5.11	6.26	31.36	38.40
25	0.50	0.71	5.04	6.17	36.40	44.57
35	1.00	0.50	4.92	6.02	41.32	50.59
45	1.50	0.35	5.00	6.12	46.32	56.71
60	2.00	0.25	8.05	9.86	54.37	66.57
80	2.50	0.18	12.82	15.70	67.19	82.27
120	3.00	0.13	12.12	14.84	79.31	97.11
170	3.50	0.09	1.13	1.38	80.44	98.49
200	3.75	0.07	0.06	0.07	80.50	98.56
230	4.00	0.06	0.03	0.04	80.53	98.60

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.93	2.56	2.27	0.95	-0.99	-1.78	-2.85

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	0.51	0.70	1.92	-0.47	2

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-12 #3
Analysis Date: 03-08-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
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fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,389	1,130,139	Florida State Plane West	-14.7 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
76.96	76.18	0.01	0.13	#200 - 1.15 #230 - 1.15			4

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.59	0.77	0.59	0.77
4	-2.25	4.76	0.31	0.40	0.90	1.17
5	-2.00	4.00	0.44	0.57	1.34	1.74
7	-1.50	2.83	1.86	2.42	3.20	4.16
10	-1.00	2.00	1.55	2.01	4.75	6.17
14	-0.50	1.41	1.79	2.33	6.54	8.50
18	0.00	1.00	1.76	2.29	8.30	10.79
25	0.50	0.71	2.68	3.48	10.98	14.27
35	1.00	0.50	3.69	4.79	14.67	19.06
45	1.50	0.35	5.58	7.25	20.25	26.31
60	2.00	0.25	9.91	12.88	30.16	39.19
80	2.50	0.18	27.42	35.63	57.58	74.82
120	3.00	0.13	17.46	22.69	75.04	97.51
170	3.50	0.09	1.00	1.30	76.04	98.81
200	3.75	0.07	0.03	0.04	76.07	98.85
230	4.00	0.06	0.00	0.00	76.07	98.85

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.94	2.70	2.50	2.15	1.41	0.68	-1.29

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.72	0.30	1.24	-1.68	5.28

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-13 #1

Analysis Date: 03-09-07

Analyzed By: MC

Coastal Planning & Engineering
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FL 33431
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fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,866	1,130,639	Florida State Plane West	-6.4 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/2 Dry - 5Y-7/2 Washed - 5Y-7/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
97.65	96.95	0.00	0.12	#200 - 0.86 #230 - 0.85			42

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	8.08	8.27	8.08	8.27
5/16"	-3.00	8.00	9.52	9.75	17.60	18.02
3.5	-2.50	5.66	8.89	9.10	26.49	27.12
4	-2.25	4.76	2.77	2.84	29.26	29.96
5	-2.00	4.00	4.23	4.33	33.49	34.29
7	-1.50	2.83	9.16	9.38	42.65	43.67
10	-1.00	2.00	6.82	6.98	49.47	50.65
14	-0.50	1.41	7.28	7.46	56.75	58.11
18	0.00	1.00	5.43	5.56	62.18	63.67
25	0.50	0.71	5.35	5.48	67.53	69.15
35	1.00	0.50	4.24	4.34	71.77	73.49
45	1.50	0.35	3.79	3.88	75.56	77.37
60	2.00	0.25	4.48	4.59	80.04	81.96
80	2.50	0.18	9.25	9.47	89.29	91.43
120	3.00	0.13	6.81	6.97	96.10	98.40
170	3.50	0.09	0.69	0.71	96.79	99.11
200	3.75	0.07	0.03	0.03	96.82	99.14
230	4.00	0.06	0.01	0.01	96.83	99.15

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.76	2.11	1.19	-1.05	-2.62	-3.10	-3.80

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	-0.76	1.69	2.11	0.28	1.79

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-13 #2
Analysis Date: 03-09-07
Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,866	1,130,639	Florida State Plane West	-7.5 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
91.84	90.87	0.00	0.00	#200 - 1.07 #230 - 1.06			2

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.58	0.63	0.58	0.63
4	-2.25	4.76	0.41	0.45	0.99	1.08
5	-2.00	4.00	0.26	0.28	1.25	1.36
7	-1.50	2.83	0.88	0.96	2.13	2.32
10	-1.00	2.00	1.30	1.42	3.43	3.74
14	-0.50	1.41	1.51	1.64	4.94	5.38
18	0.00	1.00	1.36	1.48	6.30	6.86
25	0.50	0.71	1.52	1.66	7.82	8.52
35	1.00	0.50	1.77	1.93	9.59	10.45
45	1.50	0.35	2.45	2.67	12.04	13.12
60	2.00	0.25	5.99	6.52	18.03	19.64
80	2.50	0.18	41.20	44.86	59.23	64.50
120	3.00	0.13	29.75	32.39	88.98	96.89
170	3.50	0.09	1.84	2.00	90.82	98.89
200	3.75	0.07	0.04	0.04	90.86	98.93
230	4.00	0.06	0.01	0.01	90.87	98.94

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.97	2.80	2.66	2.34	2.06	1.72	-0.62

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.07	0.24	1.05	-2.54	9.55

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-13 #3
Analysis Date: 03-09-07
Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,866	1,130,639	Florida State Plane West	-12.5 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
88.55	87.67	0.00	0.01	#200 - 1.01 #230 - 1.01			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.06	0.07	0.06	0.07
5	-2.00	4.00	0.00	0.00	0.06	0.07
7	-1.50	2.83	0.02	0.02	0.08	0.09
10	-1.00	2.00	0.09	0.10	0.17	0.19
14	-0.50	1.41	0.11	0.12	0.28	0.31
18	0.00	1.00	0.06	0.07	0.34	0.38
25	0.50	0.71	0.08	0.09	0.42	0.47
35	1.00	0.50	0.14	0.16	0.56	0.63
45	1.50	0.35	0.28	0.32	0.84	0.95
60	2.00	0.25	1.33	1.50	2.17	2.45
80	2.50	0.18	28.95	32.69	31.12	35.14
120	3.00	0.13	51.98	58.70	83.10	93.84
170	3.50	0.09	4.55	5.14	87.65	98.98
200	3.75	0.07	0.01	0.01	87.66	98.99
230	4.00	0.06	0.00	0.00	87.66	98.99

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.11	2.92	2.84	2.63	2.34	2.21	2.04

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.57	0.17	0.4	-3.93	39.04

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-13 #4
Analysis Date: 03-09-07
Analyzed By: MC

Coastal Planning & Engineering
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FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,866	1,130,639	Florida State Plane West	-16.4 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/2 Dry - 5Y-7/2 Washed - 5Y-7/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
99.42	97.30	0.03	0.16	#200 - 2.34 #230 - 2.32			25

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.87	0.88	0.87	0.88
5/16"	-3.00	8.00	5.71	5.74	6.58	6.62
3.5	-2.50	5.66	4.96	4.99	11.54	11.61
4	-2.25	4.76	2.82	2.84	14.36	14.45
5	-2.00	4.00	4.63	4.66	18.99	19.11
7	-1.50	2.83	9.17	9.22	28.16	28.33
10	-1.00	2.00	8.42	8.47	36.58	36.80
14	-0.50	1.41	10.02	10.08	46.60	46.88
18	0.00	1.00	7.02	7.06	53.62	53.94
25	0.50	0.71	8.38	8.43	62.00	62.37
35	1.00	0.50	7.73	7.78	69.73	70.15
45	1.50	0.35	9.42	9.47	79.15	79.62
60	2.00	0.25	9.28	9.33	88.43	88.95
80	2.50	0.18	4.94	4.97	93.37	93.92
120	3.00	0.13	3.00	3.02	96.37	96.94
170	3.50	0.09	0.65	0.65	97.02	97.59
200	3.75	0.07	0.07	0.07	97.09	97.66
230	4.00	0.06	0.02	0.02	97.11	97.68

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.68	1.73	1.26	-0.28	-1.68	-2.17	-3.14

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	-0.31	1.24	1.72	-0.02	1.99

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-14 #1

Analysis Date: 03-09-07

Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
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fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,287	1,130,625	Florida State Plane West	-6.9 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/2 Dry - 5Y-8/2 Washed - 5Y-8/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
87.54	86.73	0.00	0.13	#200 - 1.05 #230 - 1.05			3

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.22	0.25	0.22	0.25
4	-2.25	4.76	0.05	0.06	0.27	0.31
5	-2.00	4.00	0.46	0.53	0.73	0.84
7	-1.50	2.83	1.62	1.85	2.35	2.69
10	-1.00	2.00	1.51	1.72	3.86	4.41
14	-0.50	1.41	2.53	2.89	6.39	7.30
18	0.00	1.00	2.88	3.29	9.27	10.59
25	0.50	0.71	3.78	4.32	13.05	14.91
35	1.00	0.50	4.72	5.39	17.77	20.30
45	1.50	0.35	6.14	7.01	23.91	27.31
60	2.00	0.25	9.39	10.73	33.30	38.04
80	2.50	0.18	15.03	17.17	48.33	55.21
120	3.00	0.13	33.84	38.66	82.17	93.87
170	3.50	0.09	4.38	5.00	86.55	98.87
200	3.75	0.07	0.07	0.08	86.62	98.95
230	4.00	0.06	0.00	0.00	86.62	98.95

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.11	2.87	2.76	2.35	1.34	0.60	-0.90

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	1.86	0.28	1.25	-1.4	4.28

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-14 #2
Analysis Date: 03-09-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,287	1,130,625	Florida State Plane West	-7.8 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-6/3 Dry - 5Y-8/2 Washed - 5Y-8/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
96.89	96.14	0.01	0.08	#200 - 0.89 #230 - 0.88			31

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	3.70	3.82	3.70	3.82
5/16"	-3.00	8.00	4.63	4.78	8.33	8.60
3.5	-2.50	5.66	8.32	8.59	16.65	17.19
4	-2.25	4.76	2.44	2.52	19.09	19.71
5	-2.00	4.00	3.66	3.78	22.75	23.49
7	-1.50	2.83	7.42	7.66	30.17	31.15
10	-1.00	2.00	7.12	7.35	37.29	38.50
14	-0.50	1.41	8.51	8.78	45.80	47.28
18	0.00	1.00	7.28	7.51	53.08	54.79
25	0.50	0.71	6.58	6.79	59.66	61.58
35	1.00	0.50	6.18	6.38	65.84	67.96
45	1.50	0.35	6.04	6.23	71.88	74.19
60	2.00	0.25	6.36	6.56	78.24	80.75
80	2.50	0.18	6.36	6.56	84.60	87.31
120	3.00	0.13	9.43	9.73	94.03	97.04
170	3.50	0.09	1.96	2.02	95.99	99.06
200	3.75	0.07	0.05	0.05	96.04	99.11
230	4.00	0.06	0.01	0.01	96.05	99.12

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.90	2.25	1.56	-0.32	-1.90	-2.57	-3.38

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	-0.25	1.19	2	0.03	1.85

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-14 #3
Analysis Date: 03-09-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,287	1,130,625	Florida State Plane West	-10.4 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
86.91	86.36	0.01	0.21	#200 - 0.86 #230 - 0.83			1

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.35	0.40	0.35	0.40
4	-2.25	4.76	0.25	0.29	0.60	0.69
5	-2.00	4.00	0.20	0.23	0.80	0.92
7	-1.50	2.83	0.37	0.43	1.17	1.35
10	-1.00	2.00	0.52	0.60	1.69	1.95
14	-0.50	1.41	0.58	0.67	2.27	2.62
18	0.00	1.00	0.50	0.58	2.77	3.20
25	0.50	0.71	0.66	0.76	3.43	3.96
35	1.00	0.50	0.98	1.13	4.41	5.09
45	1.50	0.35	1.63	1.88	6.04	6.97
60	2.00	0.25	4.88	5.62	10.92	12.59
80	2.50	0.18	27.88	32.08	38.80	44.67
120	3.00	0.13	42.23	48.59	81.03	93.26
170	3.50	0.09	5.02	5.78	86.05	99.04
200	3.75	0.07	0.09	0.10	86.14	99.14
230	4.00	0.06	0.03	0.03	86.17	99.17

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.15	2.90	2.81	2.55	2.19	2.05	0.96

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.36	0.19	0.84	-3.4	17.17

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-14 #4

Analysis Date: 03-09-07

Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft): 431,287	Northing (ft): 1,130,625	Coordinate System: Florida State Plane West	Elevation (ft): -13.4 NAVD 88

USCS: SW	Munsell: Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	Comments:

Dry Weight (g): 86.59	Wash Weight (g): 84.76	Pan Retained (g): 0.01	Sieve Loss (%): 0.01	Fines (%): #200 - 2.14 #230 - 2.13	Organics (%):	Carbonates (%):	Shell Hash (%): 3

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.11	0.13	0.11	0.13
4	-2.25	4.76	0.39	0.45	0.50	0.58
5	-2.00	4.00	0.78	0.90	1.28	1.48
7	-1.50	2.83	1.27	1.47	2.55	2.95
10	-1.00	2.00	1.74	2.01	4.29	4.96
14	-0.50	1.41	1.64	1.89	5.93	6.85
18	0.00	1.00	1.21	1.40	7.14	8.25
25	0.50	0.71	1.54	1.78	8.68	10.03
35	1.00	0.50	2.00	2.31	10.68	12.34
45	1.50	0.35	2.63	3.04	13.31	15.38
60	2.00	0.25	7.74	8.94	21.05	24.32
80	2.50	0.18	38.36	44.30	59.41	68.62
120	3.00	0.13	22.69	26.20	82.10	94.82
170	3.50	0.09	2.56	2.96	84.66	97.78
200	3.75	0.07	0.07	0.08	84.73	97.86
230	4.00	0.06	0.01	0.01	84.74	97.87

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.03	2.79	2.62	2.29	2.01	1.53	-0.99

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.97	0.26	1.12	-2.18	7.39

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-14 #5
Analysis Date: 03-09-07
Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
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fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,287	1,130,625	Florida State Plane West	-18.6 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
89.93	88.44	0.02	0.10	#200 - 1.91 #230 - 1.78			11

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.67	0.75	0.67	0.75
3.5	-2.50	5.66	3.76	4.18	4.43	4.93
4	-2.25	4.76	0.62	0.69	5.05	5.62
5	-2.00	4.00	1.91	2.12	6.96	7.74
7	-1.50	2.83	4.07	4.53	11.03	12.27
10	-1.00	2.00	3.96	4.40	14.99	16.67
14	-0.50	1.41	4.63	5.15	19.62	21.82
18	0.00	1.00	2.80	3.11	22.42	24.93
25	0.50	0.71	2.73	3.04	25.15	27.97
35	1.00	0.50	2.28	2.54	27.43	30.51
45	1.50	0.35	2.21	2.46	29.64	32.97
60	2.00	0.25	4.20	4.67	33.84	37.64
80	2.50	0.18	23.43	26.05	57.27	63.69
120	3.00	0.13	26.83	29.83	84.10	93.52
170	3.50	0.09	4.01	4.46	88.11	97.98
200	3.75	0.07	0.10	0.11	88.21	98.09
230	4.00	0.06	0.12	0.13	88.33	98.22

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.17	2.84	2.69	2.24	0.01	-1.08	-2.47

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.34	0.40	1.83	-1.04	2.64

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-15 #1
Analysis Date: 03-08-07
Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
432,201	1,130,972	Florida State Plane West	-12.7 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-6/1 Dry - 5Y-6/1 Washed - 5Y-6/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
89.75	88.15	0.01	0.13	#200 - 2.00 #230 - 1.93			20

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	1.30	1.45	1.30	1.45
5/16"	-3.00	8.00	3.35	3.73	4.65	5.18
3.5	-2.50	5.66	3.50	3.90	8.15	9.08
4	-2.25	4.76	1.41	1.57	9.56	10.65
5	-2.00	4.00	2.98	3.32	12.54	13.97
7	-1.50	2.83	5.78	6.44	18.32	20.41
10	-1.00	2.00	7.01	7.81	25.33	28.22
14	-0.50	1.41	8.73	9.73	34.06	37.95
18	0.00	1.00	8.31	9.26	42.37	47.21
25	0.50	0.71	8.44	9.40	50.81	56.61
35	1.00	0.50	8.13	9.06	58.94	65.67
45	1.50	0.35	6.77	7.54	65.71	73.21
60	2.00	0.25	6.58	7.33	72.29	80.54
80	2.50	0.18	6.97	7.77	79.26	88.31
120	3.00	0.13	7.48	8.33	86.74	96.64
170	3.50	0.09	1.17	1.30	87.91	97.94
200	3.75	0.07	0.05	0.06	87.96	98.00
230	4.00	0.06	0.06	0.07	88.02	98.07

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.90	2.22	1.62	0.15	-1.21	-1.84	-3.02

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	0.07	0.95	1.77	-0.16	2.14

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-15 #2

Analysis Date: 03-08-07

Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
432,201	1,130,972	Florida State Plane West	-15.6 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-7/1 Washed - 5Y-7/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
98.49	96.48	0.01	0.03	#200 - 2.13 #230 - 2.11			4

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.60	0.61	0.60	0.61
4	-2.25	4.76	0.38	0.39	0.98	1.00
5	-2.00	4.00	0.87	0.88	1.85	1.88
7	-1.50	2.83	2.07	2.10	3.92	3.98
10	-1.00	2.00	3.41	3.46	7.33	7.44
14	-0.50	1.41	4.91	4.99	12.24	12.43
18	0.00	1.00	5.46	5.54	17.70	17.97
25	0.50	0.71	6.16	6.25	23.86	24.22
35	1.00	0.50	6.68	6.78	30.54	31.00
45	1.50	0.35	7.37	7.48	37.91	38.48
60	2.00	0.25	10.76	10.92	48.67	49.40
80	2.50	0.18	21.78	22.11	70.45	71.51
120	3.00	0.13	23.13	23.48	93.58	94.99
170	3.50	0.09	2.77	2.81	96.35	97.80
200	3.75	0.07	0.07	0.07	96.42	97.87
230	4.00	0.06	0.02	0.02	96.44	97.89

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.00	2.77	2.57	2.01	0.56	-0.18	-1.35

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.44	0.37	1.4	-0.94	2.93

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-15 #3

Analysis Date: 03-08-07

Analyzed By: AU

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
432,201	1,130,972	Florida State Plane West	-19.2 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
92.72	91.14	0.02	0.16	#200 - 1.89 #230 - 1.88			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.07	0.08	0.07	0.08
5	-2.00	4.00	0.00	0.00	0.07	0.08
7	-1.50	2.83	0.30	0.32	0.37	0.40
10	-1.00	2.00	0.47	0.51	0.84	0.91
14	-0.50	1.41	0.53	0.57	1.37	1.48
18	0.00	1.00	0.74	0.80	2.11	2.28
25	0.50	0.71	1.26	1.36	3.37	3.64
35	1.00	0.50	2.26	2.44	5.63	6.08
45	1.50	0.35	3.81	4.11	9.44	10.19
60	2.00	0.25	11.34	12.23	20.78	22.42
80	2.50	0.18	34.03	36.70	54.81	59.12
120	3.00	0.13	33.08	35.68	87.89	94.80
170	3.50	0.09	3.02	3.26	90.91	98.06
200	3.75	0.07	0.05	0.05	90.96	98.11
230	4.00	0.06	0.01	0.01	90.97	98.12

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.03	2.85	2.72	2.38	2.04	1.74	0.78

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.22	0.21	0.74	-2.29	10.51

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-17 #1
Analysis Date: 03-09-07
Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,589	1,144,145	Florida State Plane West	-8.9 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-7/2 Dry - 5Y-7/2 Washed - 5Y-7/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
95.29	94.00	0.02	0.00	#200 - 1.44 #230 - 1.39			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.02	0.02	0.02	0.02
10	-1.00	2.00	0.06	0.06	0.08	0.08
14	-0.50	1.41	0.10	0.10	0.18	0.18
18	0.00	1.00	0.14	0.15	0.32	0.33
25	0.50	0.71	0.29	0.30	0.61	0.63
35	1.00	0.50	0.49	0.51	1.10	1.14
45	1.50	0.35	0.81	0.85	1.91	1.99
60	2.00	0.25	1.92	2.01	3.83	4.00
80	2.50	0.18	25.63	26.90	29.46	30.90
120	3.00	0.13	54.33	57.02	83.79	87.92
170	3.50	0.09	9.44	9.91	93.23	97.83
200	3.75	0.07	0.70	0.73	93.93	98.56
230	4.00	0.06	0.05	0.05	93.98	98.61

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.36	2.97	2.89	2.67	2.39	2.22	2.02

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.61	0.16	0.45	-2.37	16.98

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-18 #1
Analysis Date: 03-08-07
Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,955	1,144,486	Florida State Plane West	-5.5 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-7/2 Dry - 5Y-7/2 Washed - 5Y-7/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
90.41	88.94	0.03	0.00	#200 - 1.69 #230 - 1.66			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.03	0.03	0.03	0.03
7	-1.50	2.83	0.12	0.13	0.15	0.16
10	-1.00	2.00	0.16	0.18	0.31	0.34
14	-0.50	1.41	0.41	0.45	0.72	0.79
18	0.00	1.00	0.54	0.60	1.26	1.39
25	0.50	0.71	1.25	1.38	2.51	2.77
35	1.00	0.50	1.96	2.17	4.47	4.94
45	1.50	0.35	3.08	3.41	7.55	8.35
60	2.00	0.25	6.46	7.15	14.01	15.50
80	2.50	0.18	33.85	37.44	47.86	52.94
120	3.00	0.13	36.62	40.50	84.48	93.44
170	3.50	0.09	4.24	4.69	88.72	98.13
200	3.75	0.07	0.16	0.18	88.88	98.31
230	4.00	0.06	0.03	0.03	88.91	98.34

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.17	2.88	2.77	2.46	2.13	2.01	1.01

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.33	0.20	0.66	-2.24	10.52

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-18 #2
Analysis Date: 03-08-07
Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,955	1,144,486	Florida State Plane West	-6.8 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/2 Dry - 5Y-7/2 Washed - 5Y-7/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
94.52	93.02	0.03	0.14	#200 - 1.79 #230 - 1.75			3

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.24	0.25	0.24	0.25
4	-2.25	4.76	0.40	0.42	0.64	0.67
5	-2.00	4.00	0.69	0.73	1.33	1.40
7	-1.50	2.83	1.95	2.06	3.28	3.46
10	-1.00	2.00	4.30	4.55	7.58	8.01
14	-0.50	1.41	6.66	7.05	14.24	15.06
18	0.00	1.00	4.41	4.67	18.65	19.73
25	0.50	0.71	5.04	5.33	23.69	25.06
35	1.00	0.50	4.42	4.68	28.11	29.74
45	1.50	0.35	4.93	5.22	33.04	34.96
60	2.00	0.25	7.72	8.17	40.76	43.13
80	2.50	0.18	23.04	24.38	63.80	67.51
120	3.00	0.13	25.35	26.82	89.15	94.33
170	3.50	0.09	3.45	3.65	92.60	97.98
200	3.75	0.07	0.22	0.23	92.82	98.21
230	4.00	0.06	0.04	0.04	92.86	98.25

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.09	2.81	2.64	2.14	0.49	-0.40	-1.33

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	1.51	0.35	1.45	-0.94	2.66

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-18 #3

Analysis Date: 03-08-07

Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,955	1,144,486	Florida State Plane West	-8.2 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-6/2 Dry - 5Y-6/2 Washed - 5Y-6/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
93.42	91.08	0.03	0.12	#200 - 2.73 #230 - 2.68			16

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	1.00	1.07	1.00	1.07
3.5	-2.50	5.66	2.17	2.32	3.17	3.39
4	-2.25	4.76	1.00	1.07	4.17	4.46
5	-2.00	4.00	2.01	2.15	6.18	6.61
7	-1.50	2.83	9.68	10.36	15.86	16.97
10	-1.00	2.00	16.07	17.20	31.93	34.17
14	-0.50	1.41	15.22	16.29	47.15	50.46
18	0.00	1.00	7.96	8.52	55.11	58.98
25	0.50	0.71	7.24	7.75	62.35	66.73
35	1.00	0.50	4.09	4.38	66.44	71.11
45	1.50	0.35	2.98	3.19	69.42	74.30
60	2.00	0.25	3.02	3.23	72.44	77.53
80	2.50	0.18	7.44	7.96	79.88	85.49
120	3.00	0.13	9.13	9.77	89.01	95.26
170	3.50	0.09	1.73	1.85	90.74	97.11
200	3.75	0.07	0.15	0.16	90.89	97.27
230	4.00	0.06	0.05	0.05	90.94	97.32

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.99	2.41	1.61	-0.51	-1.27	-1.55	-2.19

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	-0.05	1.04	1.66	0.48	2.13

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-19 #1

Analysis Date: 03-07-07

Analyzed By: JF

Coastal Planning & Engineering
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FL 33431
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fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,156	1,144,258	Florida State Plane West	-6.1 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/2 Dry - 5Y-7/2 Washed - 5Y-7/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
83.92	82.42	0.01	0.06	#200 - 1.90 #230 - 1.86			2

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.23	0.27	0.23	0.27
4	-2.25	4.76	0.04	0.05	0.27	0.32
5	-2.00	4.00	0.33	0.39	0.60	0.71
7	-1.50	2.83	0.69	0.82	1.29	1.53
10	-1.00	2.00	1.05	1.25	2.34	2.78
14	-0.50	1.41	1.39	1.66	3.73	4.44
18	0.00	1.00	1.27	1.51	5.00	5.95
25	0.50	0.71	1.44	1.72	6.44	7.67
35	1.00	0.50	1.73	2.06	8.17	9.73
45	1.50	0.35	2.83	3.37	11.00	13.10
60	2.00	0.25	6.03	7.19	17.03	20.29
80	2.50	0.18	29.32	34.94	46.35	55.23
120	3.00	0.13	32.34	38.54	78.69	93.77
170	3.50	0.09	3.47	4.13	82.16	97.90
200	3.75	0.07	0.17	0.20	82.33	98.10
230	4.00	0.06	0.03	0.04	82.36	98.14

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.15	2.87	2.76	2.43	2.07	1.70	-0.31

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.15	0.23	1	-2.37	8.97

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-19 #2

Analysis Date: 03-07-07

Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,156	1,144,258	Florida State Plane West	-8.4 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 2.5Y-7/2 Dry - 2.5Y-7/2 Washed - 2.5Y-7/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
86.43	84.12	0.03	0.06	#200 - 2.88 #230 - 2.76			14

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.71	0.82	0.71	0.82
3.5	-2.50	5.66	1.40	1.62	2.11	2.44
4	-2.25	4.76	1.58	1.83	3.69	4.27
5	-2.00	4.00	1.48	1.71	5.17	5.98
7	-1.50	2.83	6.97	8.06	12.14	14.04
10	-1.00	2.00	9.27	10.73	21.41	24.77
14	-0.50	1.41	8.83	10.22	30.24	34.99
18	0.00	1.00	5.10	5.90	35.34	40.89
25	0.50	0.71	3.44	3.98	38.78	44.87
35	1.00	0.50	2.10	2.43	40.88	47.30
45	1.50	0.35	2.10	2.43	42.98	49.73
60	2.00	0.25	3.44	3.98	46.42	53.71
80	2.50	0.18	15.34	17.75	61.76	71.46
120	3.00	0.13	18.82	21.77	80.58	93.23
170	3.50	0.09	3.10	3.59	83.68	96.82
200	3.75	0.07	0.26	0.30	83.94	97.12
230	4.00	0.06	0.10	0.12	84.04	97.24

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.25	2.79	2.58	1.53	-0.99	-1.41	-2.14

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	0.76	0.59	1.89	-0.27	1.55

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-19 #3
Analysis Date: 03-07-07
Analyzed By: JF

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,156	1,144,258	Florida State Plane West	-11.5 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-6/2 Dry - 5Y-6/2 Washed - 5Y-7/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
84.01	82.12	0.01	0.00	#200 - 2.31 #230 - 2.27			0

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.06	0.07	0.06	0.07
10	-1.00	2.00	0.01	0.01	0.07	0.08
14	-0.50	1.41	0.05	0.06	0.12	0.14
18	0.00	1.00	0.07	0.08	0.19	0.22
25	0.50	0.71	0.06	0.07	0.25	0.29
35	1.00	0.50	0.07	0.08	0.32	0.37
45	1.50	0.35	0.10	0.12	0.42	0.49
60	2.00	0.25	0.49	0.58	0.91	1.07
80	2.50	0.18	34.78	41.40	35.69	42.47
120	3.00	0.13	42.00	49.99	77.69	92.46
170	3.50	0.09	4.14	4.93	81.83	97.39
200	3.75	0.07	0.25	0.30	82.08	97.69
230	4.00	0.06	0.03	0.04	82.11	97.73

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.26	2.92	2.83	2.58	2.29	2.18	2.05

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.55	0.17	0.36	-2.37	27.56

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search

Sample Name: AMVC-07-20 #1

Analysis Date: 03-08-07

Analyzed By: JF

Coastal Planning & Engineering
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FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,935	1,143,913	Florida State Plane West	-6.3 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-8/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
88.49	87.50	0.01	0.03	#200 - 1.17 #230 - 1.15			1

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.13	0.15	0.13	0.15
5	-2.00	4.00	0.06	0.07	0.19	0.22
7	-1.50	2.83	0.33	0.37	0.52	0.59
10	-1.00	2.00	0.75	0.85	1.27	1.44
14	-0.50	1.41	1.30	1.47	2.57	2.91
18	0.00	1.00	1.14	1.29	3.71	4.20
25	0.50	0.71	1.13	1.28	4.84	5.48
35	1.00	0.50	1.04	1.18	5.88	6.66
45	1.50	0.35	1.26	1.42	7.14	8.08
60	2.00	0.25	3.10	3.50	10.24	11.58
80	2.50	0.18	39.79	44.97	50.03	56.55
120	3.00	0.13	33.44	37.79	83.47	94.34
170	3.50	0.09	3.83	4.33	87.30	98.67
200	3.75	0.07	0.14	0.16	87.44	98.83
230	4.00	0.06	0.02	0.02	87.46	98.85

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.08	2.86	2.74	2.43	2.15	2.05	0.31

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.28	0.21	0.82	-2.82	12.13

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-20 #2
Analysis Date: 03-08-07
Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,935	1,143,913	Florida State Plane West	-9.7 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-6/2 Dry - 5Y-6/2 Washed - 5Y-6/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
89.50	87.64	0.08	0.13	#200 - 2.37 #230 - 2.30			3

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.10	0.11	0.10	0.11
4	-2.25	4.76	0.64	0.72	0.74	0.83
5	-2.00	4.00	0.93	1.04	1.67	1.87
7	-1.50	2.83	1.20	1.34	2.87	3.21
10	-1.00	2.00	1.41	1.58	4.28	4.79
14	-0.50	1.41	1.37	1.53	5.65	6.32
18	0.00	1.00	0.53	0.59	6.18	6.91
25	0.50	0.71	0.54	0.60	6.72	7.51
35	1.00	0.50	0.45	0.50	7.17	8.01
45	1.50	0.35	0.59	0.66	7.76	8.67
60	2.00	0.25	1.77	1.98	9.53	10.65
80	2.50	0.18	29.08	32.49	38.61	43.14
120	3.00	0.13	44.27	49.46	82.88	92.60
170	3.50	0.09	4.25	4.75	87.13	97.35
200	3.75	0.07	0.25	0.28	87.38	97.63
230	4.00	0.06	0.06	0.07	87.44	97.70

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.25	2.91	2.82	2.57	2.22	2.08	-0.93

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.26	0.21	1.1	-2.86	10.69

Granularmetric Report

Depths and elevations based on measured values

Project Name: Anna Maria 2007 Sand Search
Sample Name: AMVC-07-20 #3
Analysis Date: 03-08-07
Analyzed By: MC

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
ph (561) 391-8102
fax (561) 391-9116

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,935	1,143,913	Florida State Plane West	-10.9 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-5/2 Dry - 5Y-6/2 Washed - 5Y-6/2	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
91.31	89.08	0.14	0.22	#200 - 2.88 #230 - 2.83			16

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	2.99	3.27	2.99	3.27
5/16"	-3.00	8.00	2.12	2.32	5.11	5.59
3.5	-2.50	5.66	3.68	4.03	8.79	9.62
4	-2.25	4.76	1.47	1.61	10.26	11.23
5	-2.00	4.00	2.07	2.27	12.33	13.50
7	-1.50	2.83	6.56	7.18	18.89	20.68
10	-1.00	2.00	8.76	9.59	27.65	30.27
14	-0.50	1.41	9.68	10.60	37.33	40.87
18	0.00	1.00	5.43	5.95	42.76	46.82
25	0.50	0.71	4.93	5.40	47.69	52.22
35	1.00	0.50	3.34	3.66	51.03	55.88
45	1.50	0.35	3.13	3.43	54.16	59.31
60	2.00	0.25	4.51	4.94	58.67	64.25
80	2.50	0.18	10.87	11.90	69.54	76.15
120	3.00	0.13	16.48	18.05	86.02	94.20
170	3.50	0.09	2.45	2.68	88.47	96.88
200	3.75	0.07	0.22	0.24	88.69	97.12
230	4.00	0.06	0.05	0.05	88.74	97.17

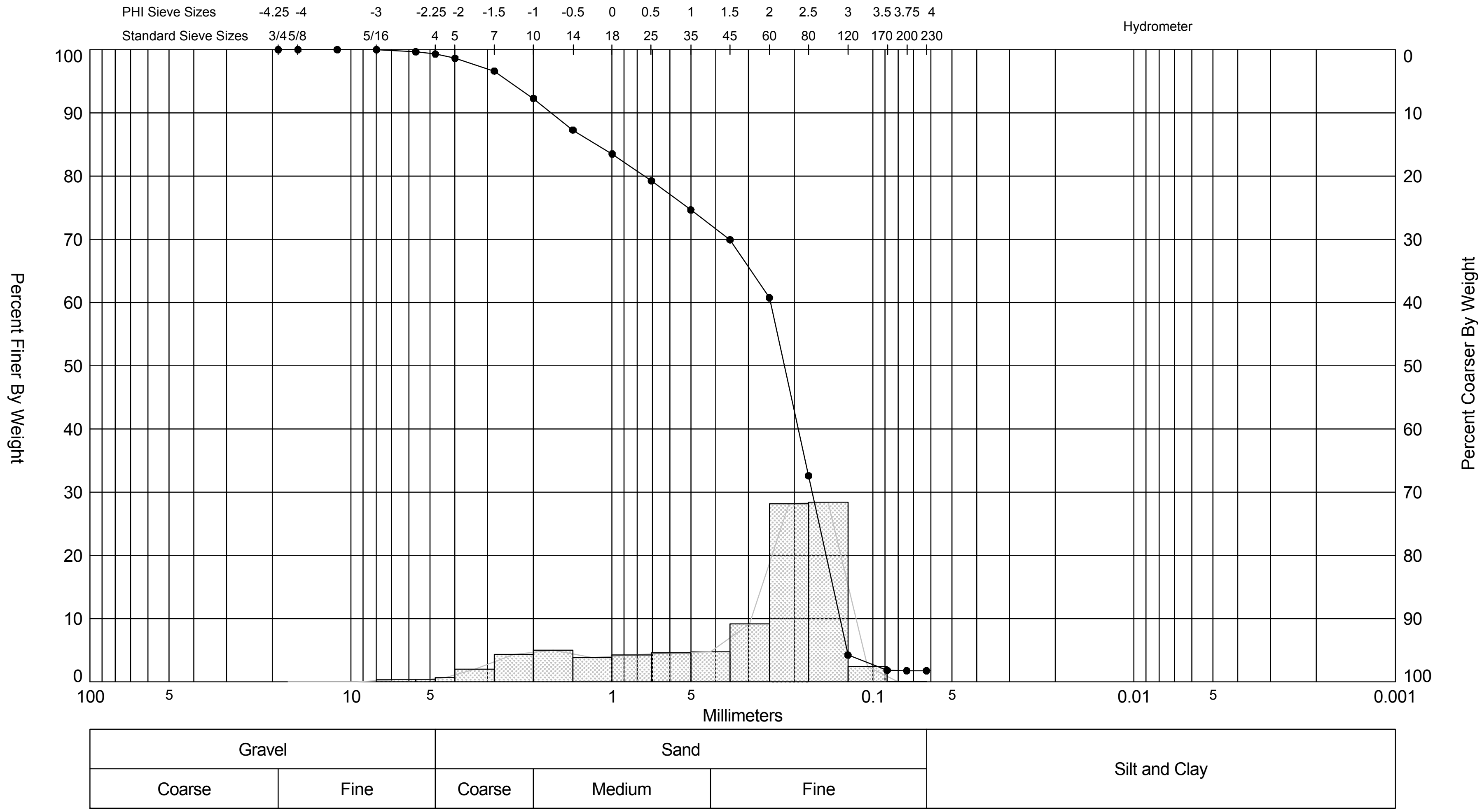
Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.15	2.72	2.45	0.29	-1.27	-1.83	-3.13

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	0.31	0.81	2.05	-0.2	1.79

APPENDIX 3

2007 CPE INDIVIDUAL VIBRACORE GRAIN SIZE DISTRIBUTION CURVES/HISTOGRAMS



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-01 #1	—●—	-8.6	SW	#200 - 1.75 #230 - 1.74			2.19	1.62	-1.2	3.31	1.38

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	AU
Easting (X, ft):	430,831
Northing (Y, ft):	1,143,326
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

Coastal Planning & Engineering
2481 NW Boca Raton Blvd, Boca Raton
FL 33431
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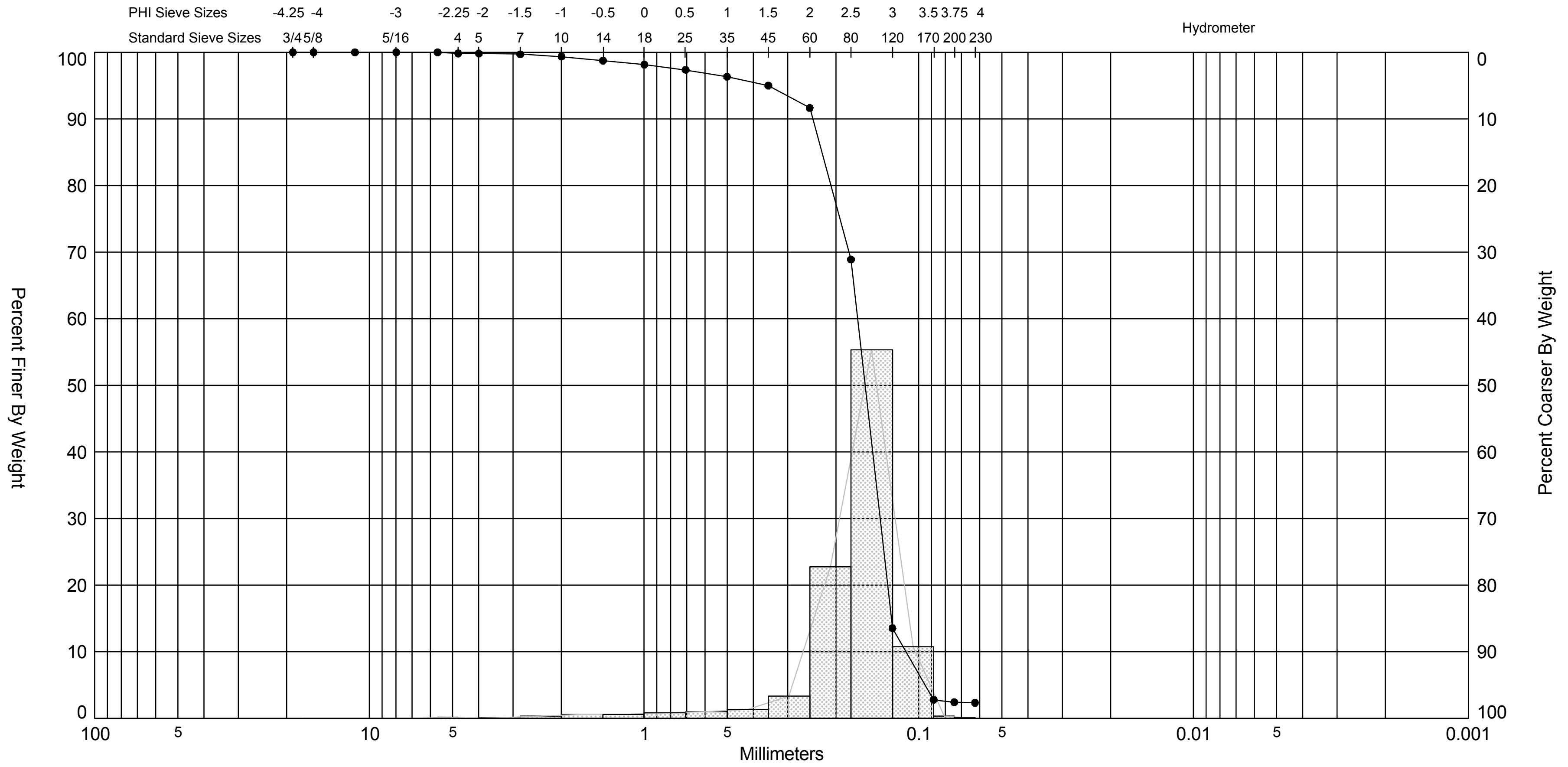
fax (561) 391-9116

SIEVE ANALYSIS ANNA MARIA 2007 VIBRACORES.GPJ FL DEP ROSS.GDT 10/26/07



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-01 #2	—●—	-9.5	SP	#200 - 2.42 #230 - 2.33			2.67	2.53	-3.22	17.46	0.68

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	AU
Easting (X, ft):	430,831
Northing (Y, ft):	1,143,326
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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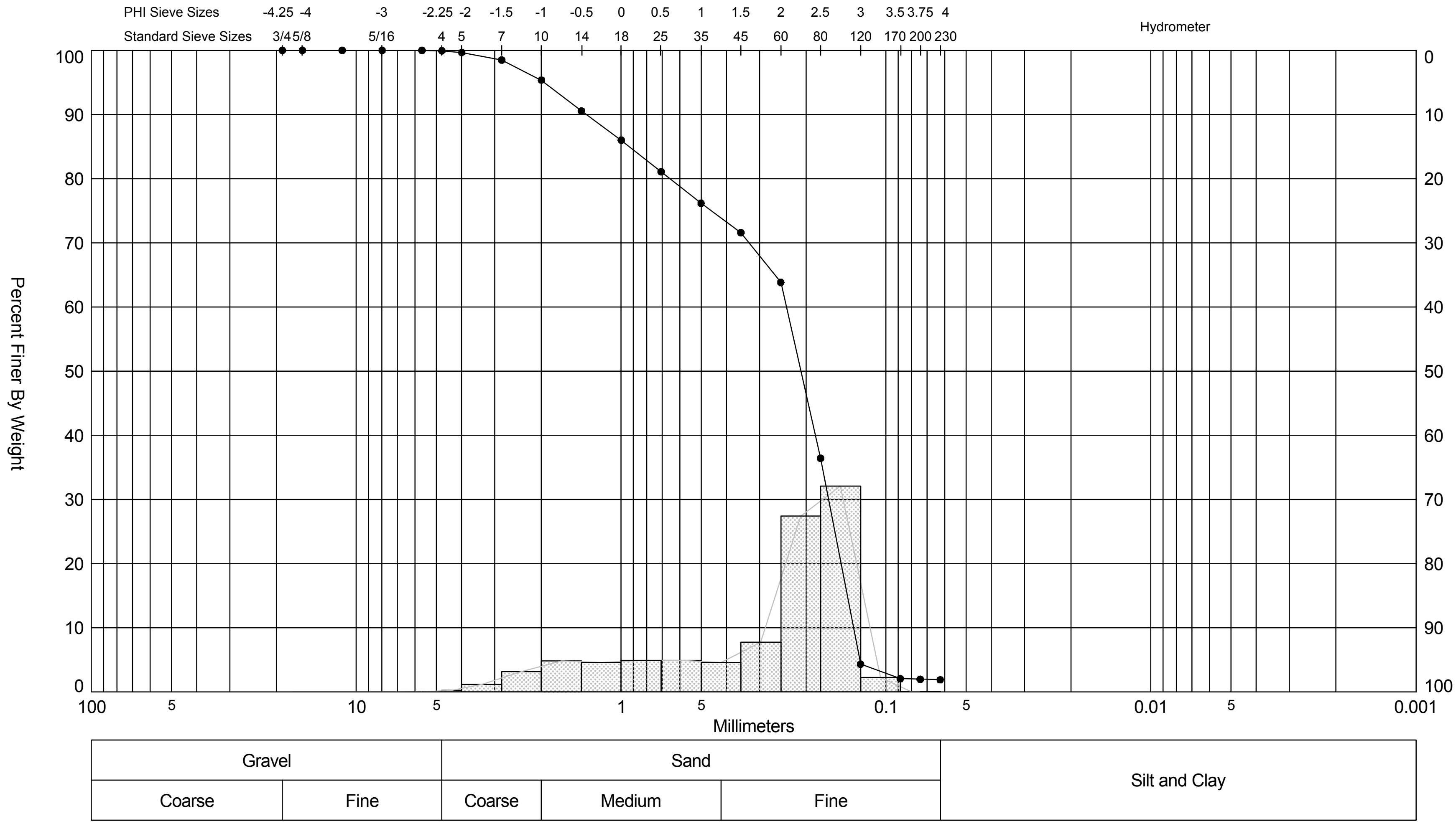

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-01 #3	—●—	-14.1	SW	#200 - 1.96 #230 - 1.88			2.25	1.74	-1.2	3.3	1.27

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	AU
Easting (X, ft):	430,831
Northing (Y, ft):	1,143,326
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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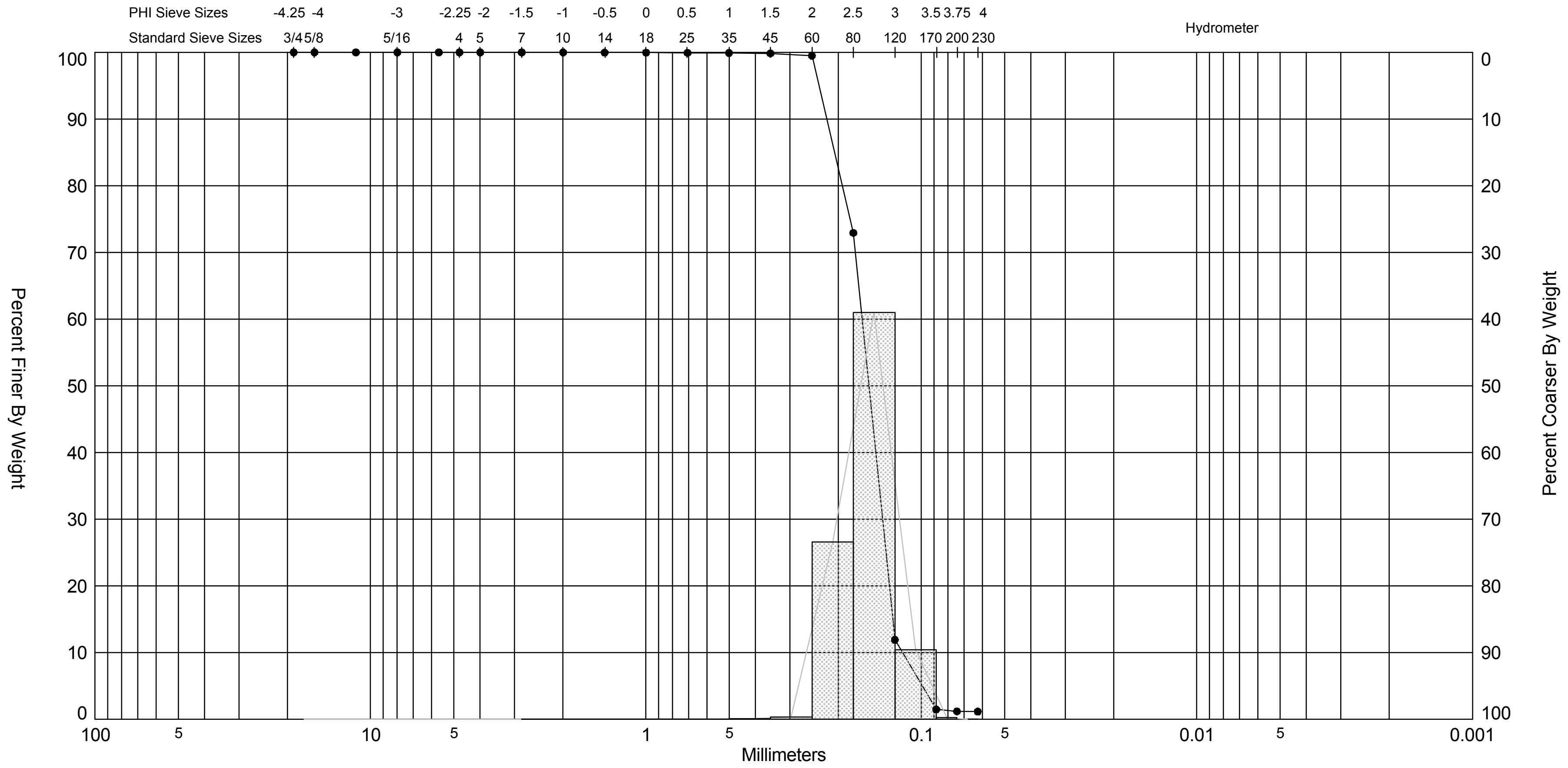
fax (561) 391-9116



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-03 #1	—●—	-11.0	SP	#200 - 1.18 #230 - 1.14			2.69	2.66	-0.74	10.64	0.32

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	JF
Easting (X, ft):	433,627
Northing (Y, ft):	1,132,302
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

Coastal Planning & Engineering
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FL 33431
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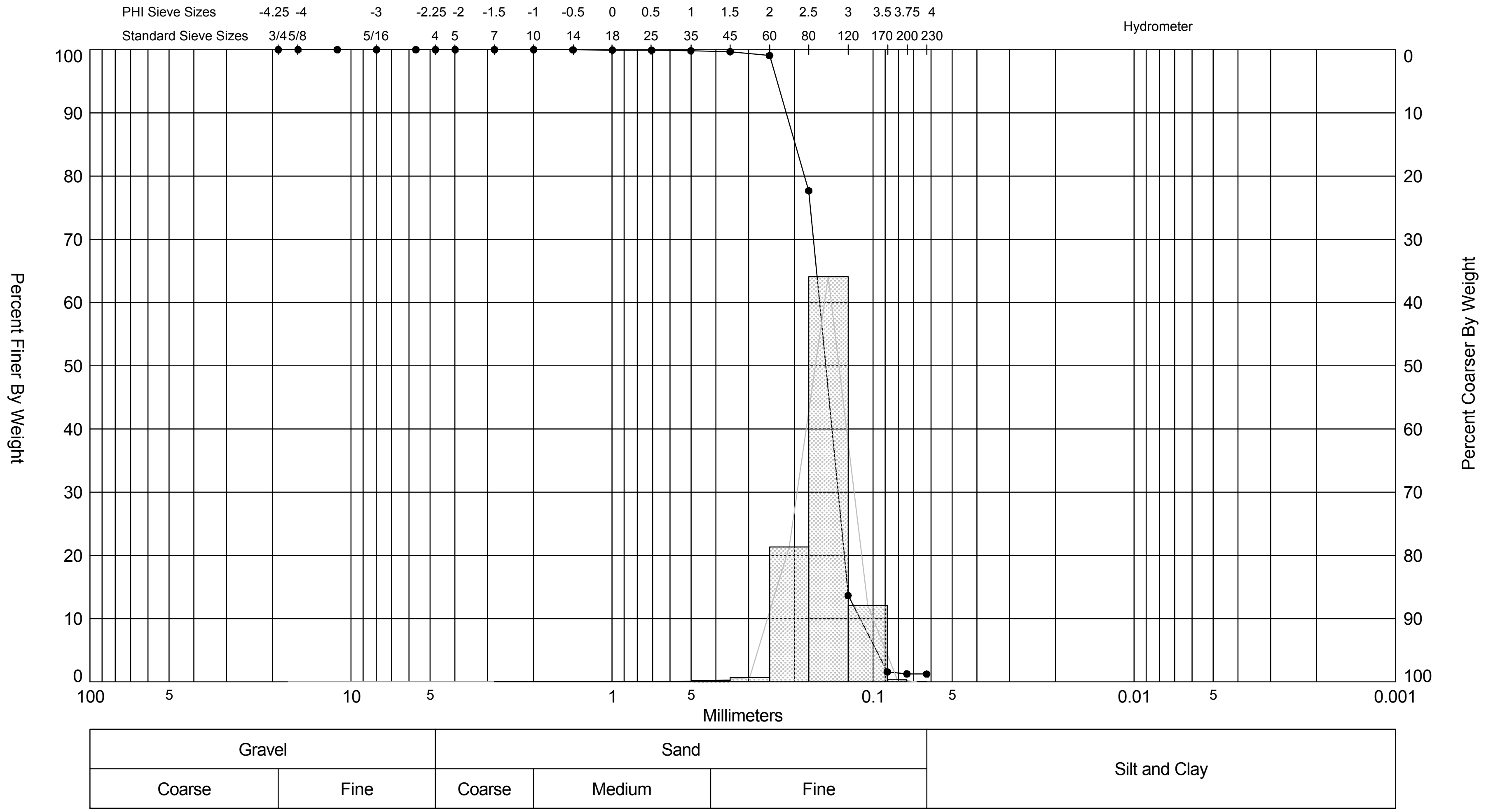

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-03 #2	—●—	-15.0	SP	#200 - 1.25 #230 - 1.21			2.72	2.69	-1.12	12.65	0.33

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	JF
Easting (X, ft):	433,627
Northing (Y, ft):	1,132,302
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

Coastal Planning & Engineering
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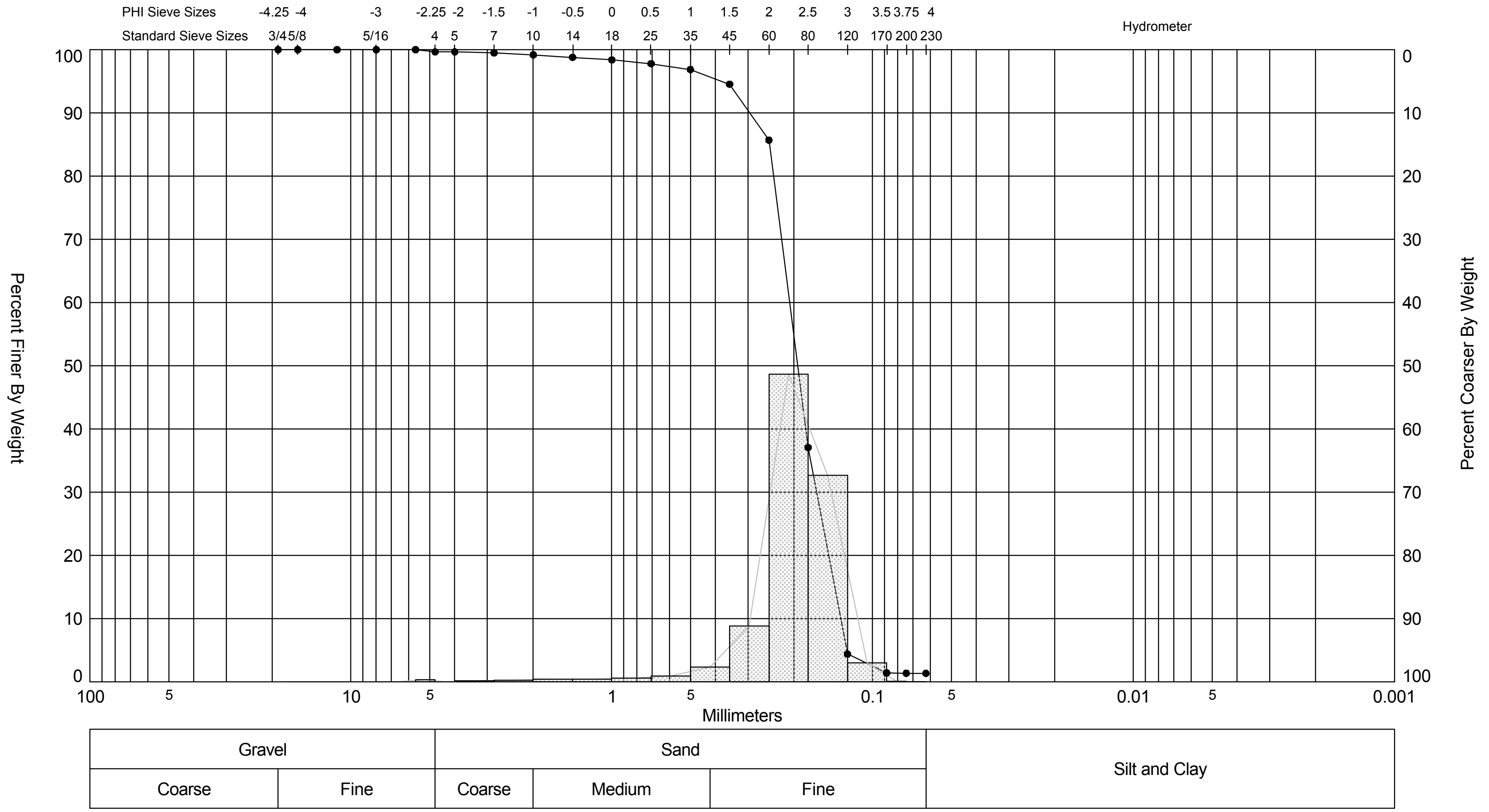

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-03 #3	—●—	-19.0	SP	#200 - 1.36 #230 - 1.35			2.37	2.3	-3.33	20.58	0.64

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	JF
Easting (X, ft):	433,627
Northing (Y, ft):	1,132,302
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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ph (561) 391-8102
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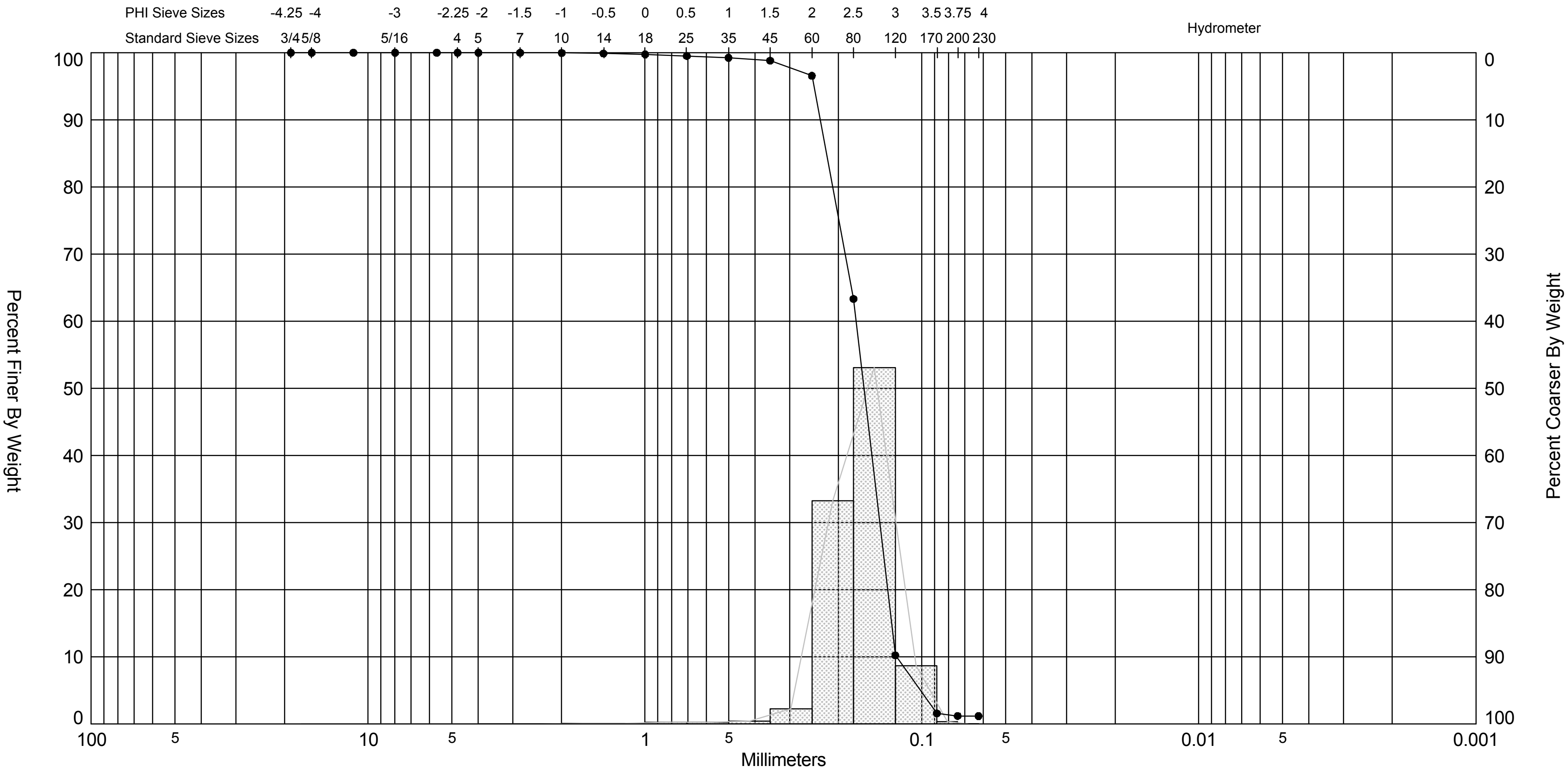

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-04 #1	—●—	-14.7	SP	#200 - 1.19 #230 - 1.17			2.63	2.58	-1.97	15.85	0.41

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-07-07
Analyzed By:	JF
Easting (X, ft):	433,879
Northing (Y, ft):	1,133,137
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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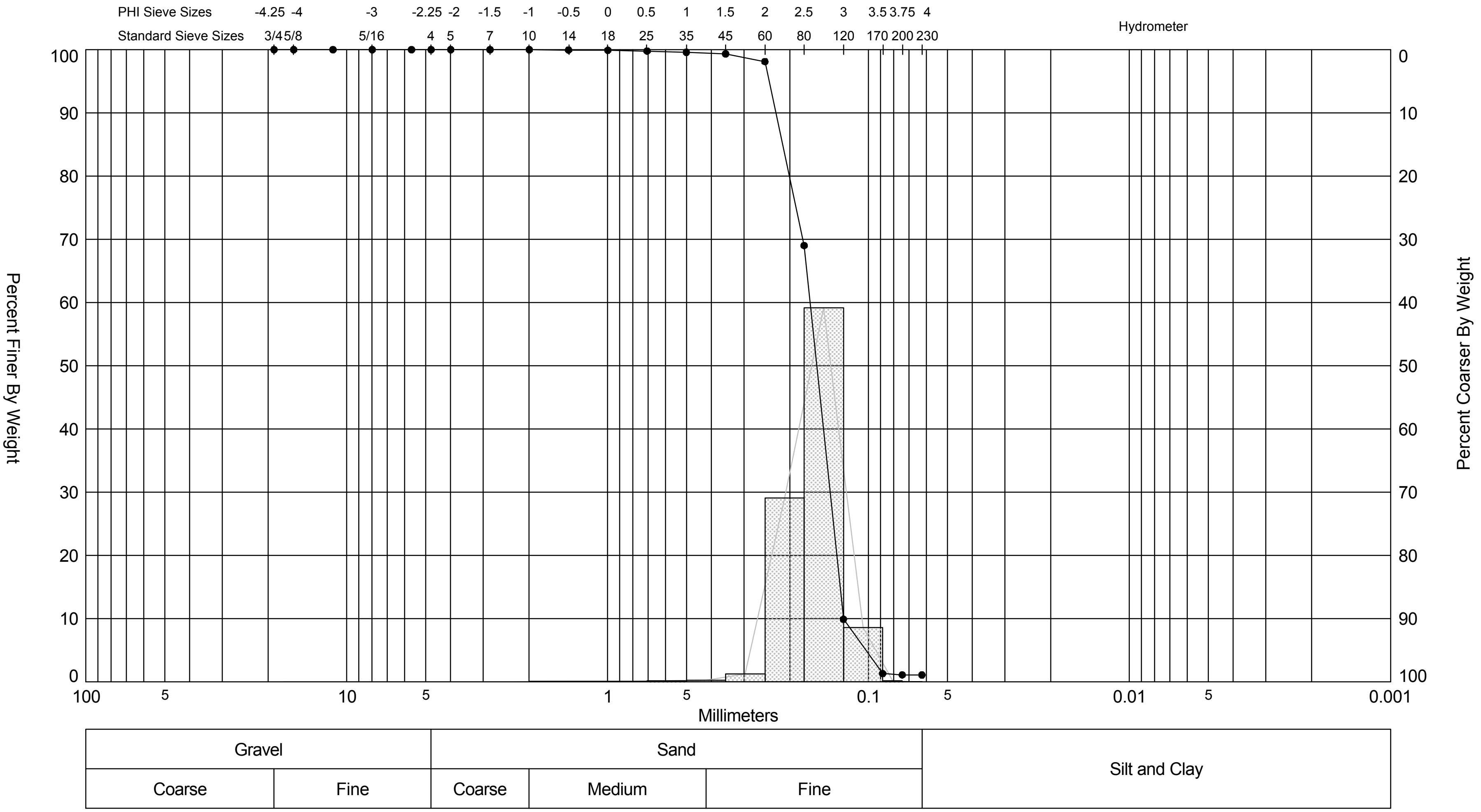

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-04 #2	—●—	-17.7	SP	#200 - 1.10 #230 - 1.09			2.66	2.62	-1.52	13.18	0.35

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-07-07
Analyzed By:	JF
Easting (X, ft):	433,879
Northing (Y, ft):	1,133,137
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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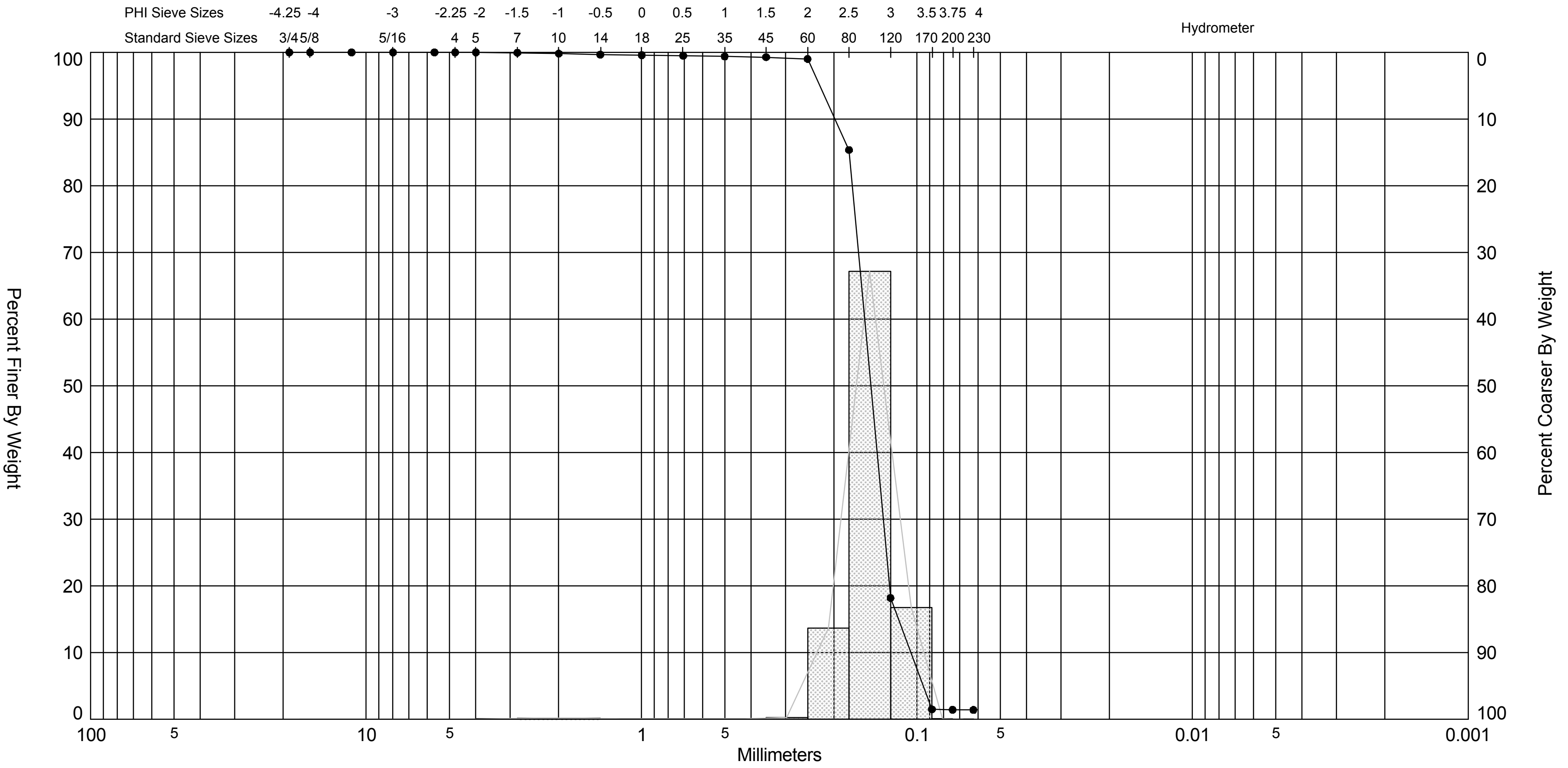

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-05 #1	—●—	-5.8	SP	#200 - 1.41 #230 - 1.39			2.76	2.74	-4.11	40.43	0.39

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-07-07
Analyzed By:	JF
Easting (X, ft):	437,029
Northing (Y, ft):	1,128,780
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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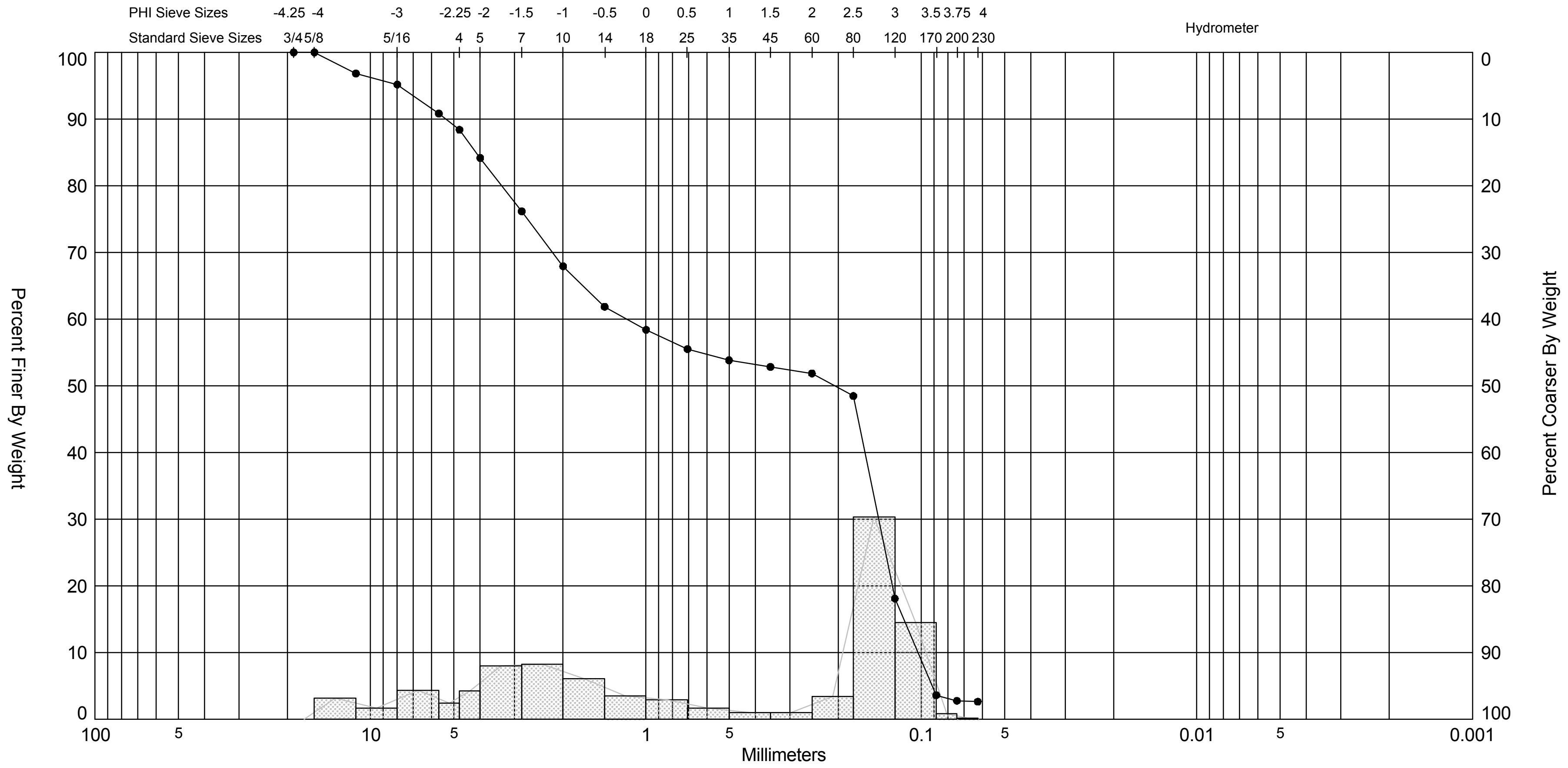

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-05 #2	—●—	-7.6	SW	#200 - 2.77 #230 - 2.63			2.27	0.75	-0.37	1.55	2.34

Comments:

Depths and elevations based on measured values

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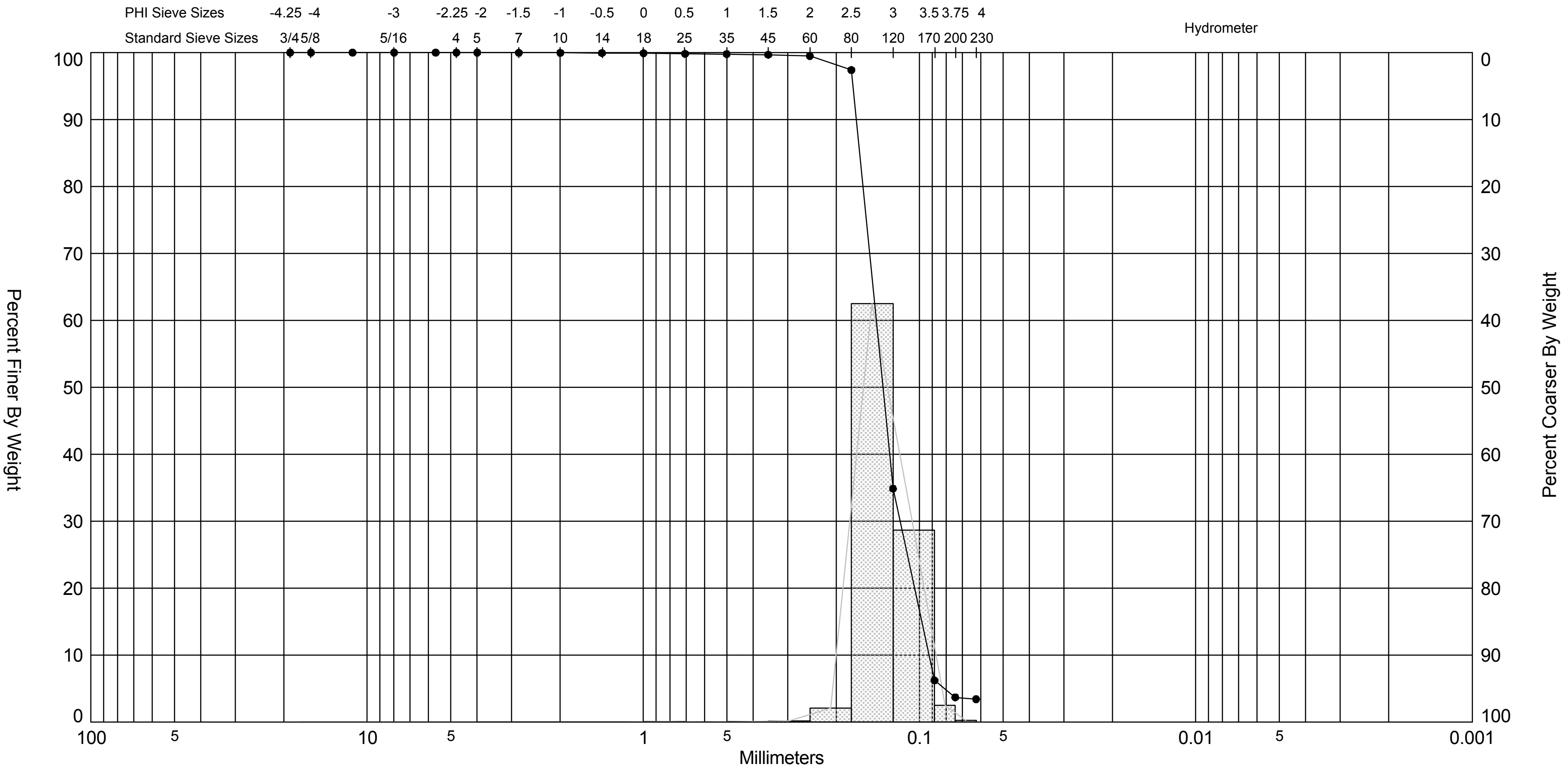
Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-07-07
Analyzed By:	JF
Easting (X, ft):	437,029
Northing (Y, ft):	1,128,780
Horizontal System:	NAD 1983
Vertical System:	NAVD 88



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-05 #3	—●—	-8.3	SP	#200 - 3.70 #230 - 3.41			2.88	2.9	-2.02	29.33	0.32

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-07-07
Analyzed By:	JF
Easting (X, ft):	437,029
Northing (Y, ft):	1,128,780
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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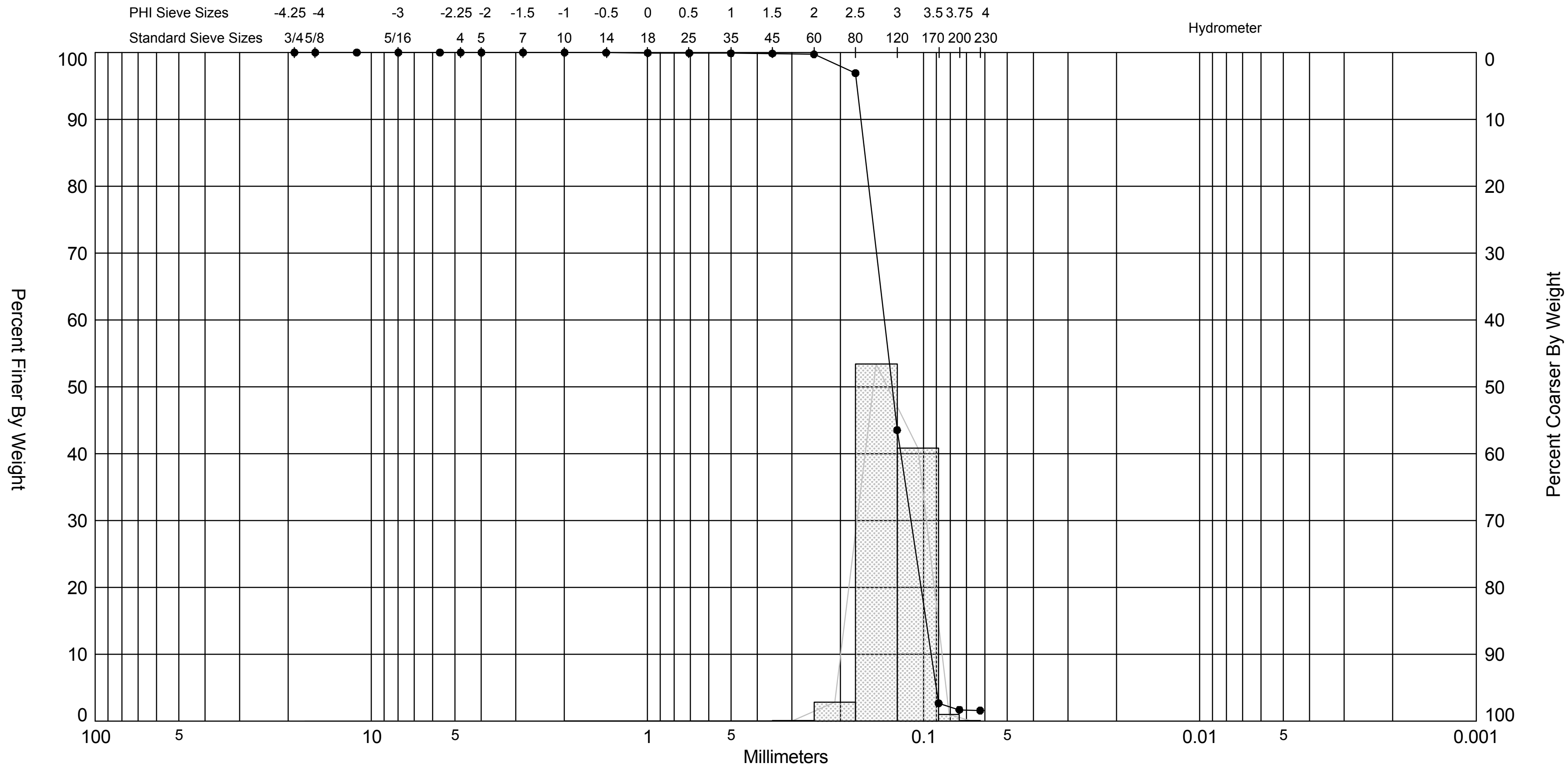

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<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
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Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-05 #4	—●—	-12.2	SP	#200 - 1.70 #230 - 1.59			2.94	2.95	-1.2	14.3	0.3

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	AU
Easting (X, ft):	437,029
Northing (Y, ft):	1,128,780
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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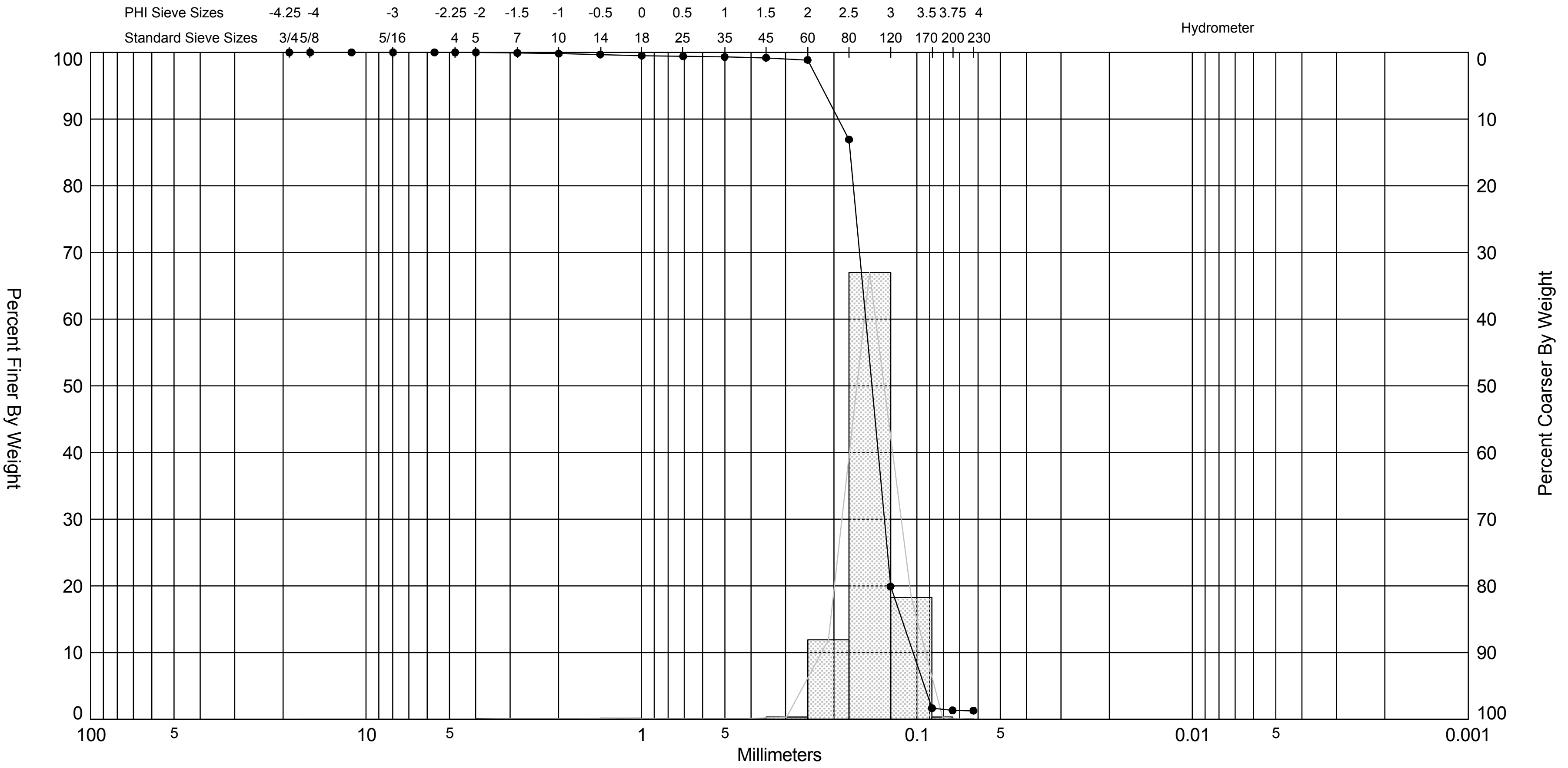

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-06 #1	—●—	-8.8	SP	#200 - 1.33 #230 - 1.29			2.78	2.76	-4.14	39.96	0.4

Comments:

Depths and elevations based on measured values

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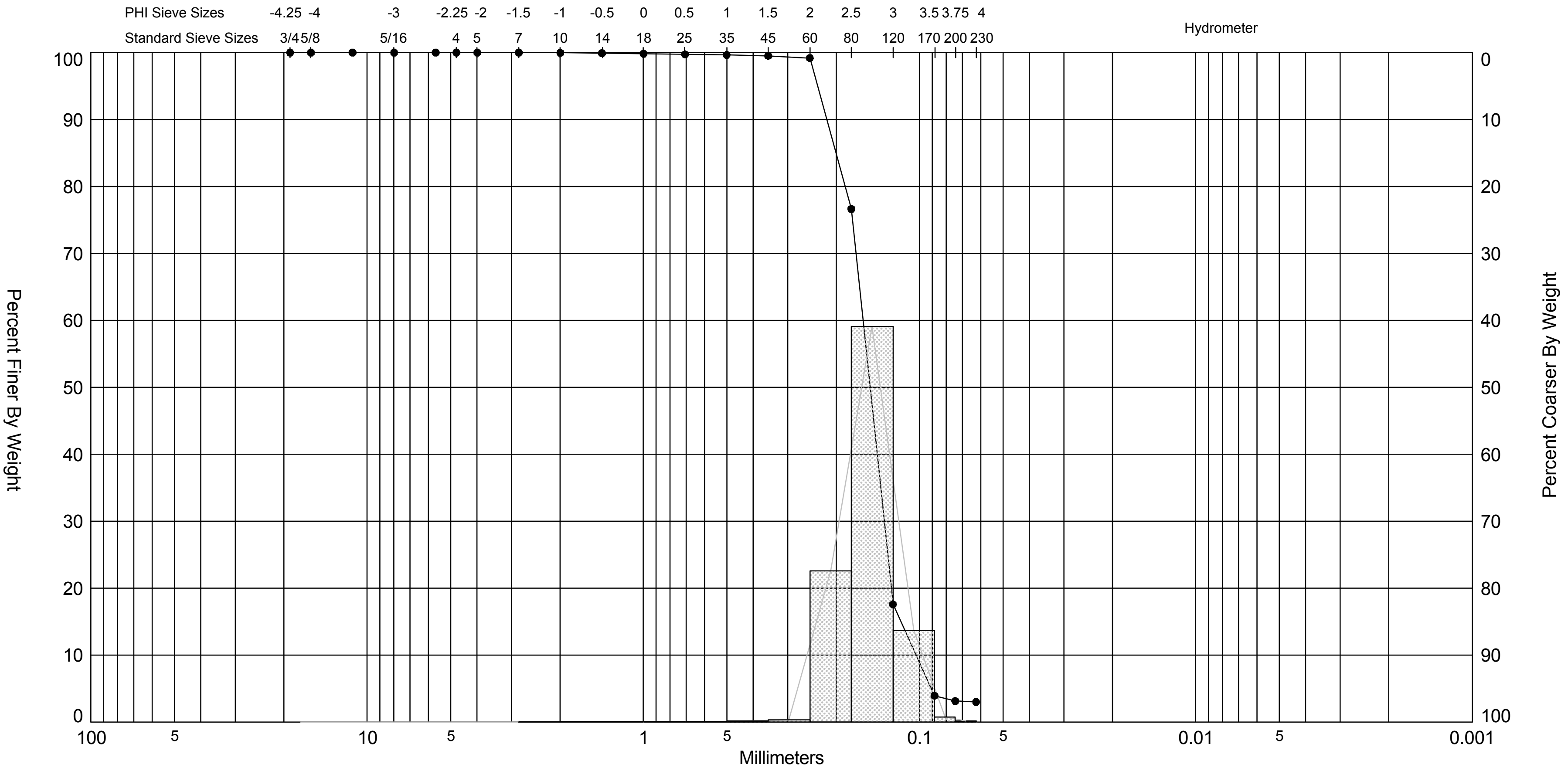
Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	JF
Easting (X, ft):	436,754
Northing (Y, ft):	1,128,828
Horizontal System:	NAD 1983
Vertical System:	NAVD 88



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-06 #2	─●─	-10.8	SP	#200 - 3.14 #230 - 2.99			2.73	2.7	-1.66	17.56	0.37

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	JF
Easting (X, ft):	436,754
Northing (Y, ft):	1,128,828
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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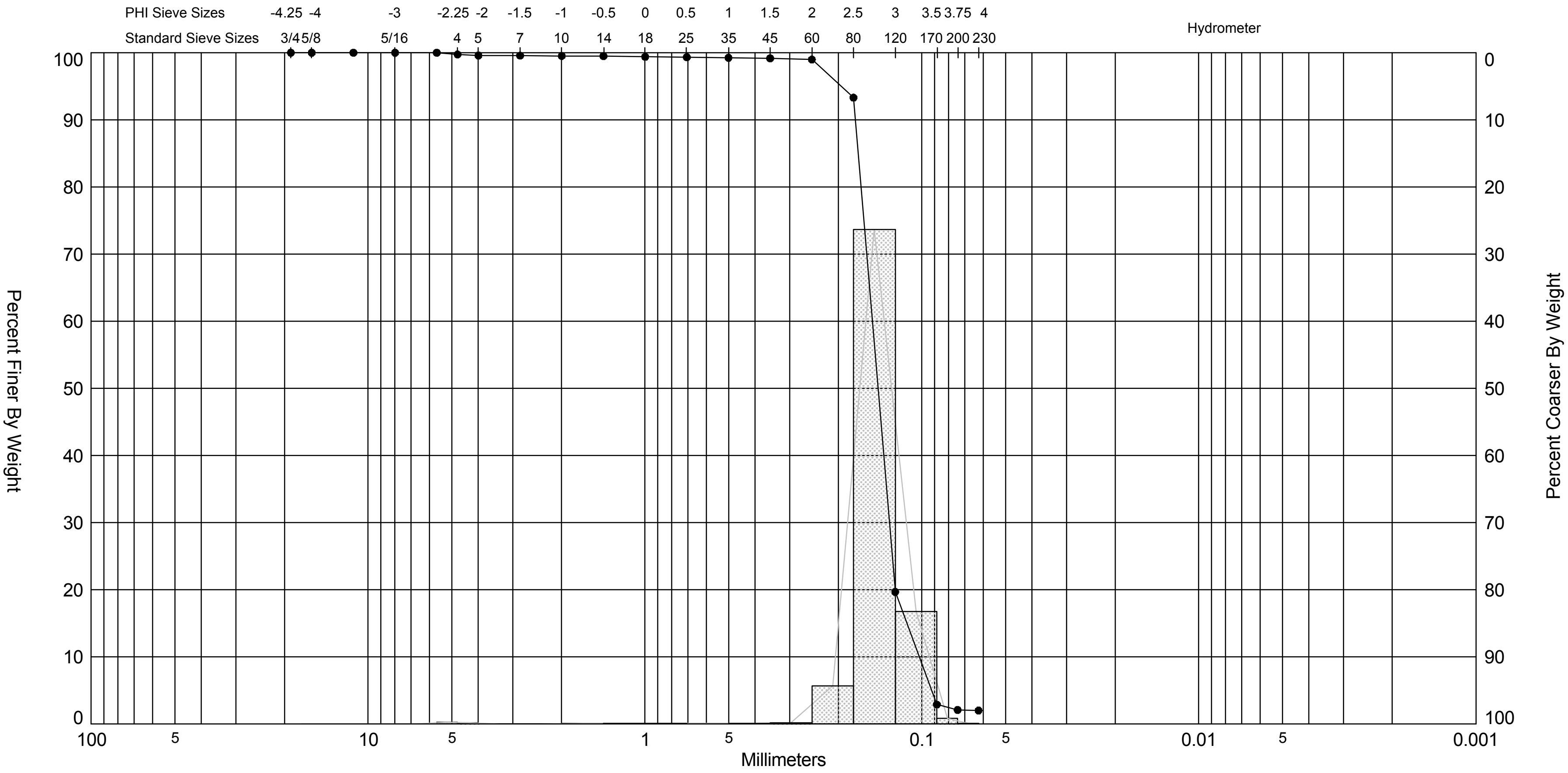

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-06 #3	—●—	-13.0	SP	#200 - 2.08 #230 - 1.99			2.79	2.78	-6.93	75.52	0.45

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	JF
Easting (X, ft):	436,754
Northing (Y, ft):	1,128,828
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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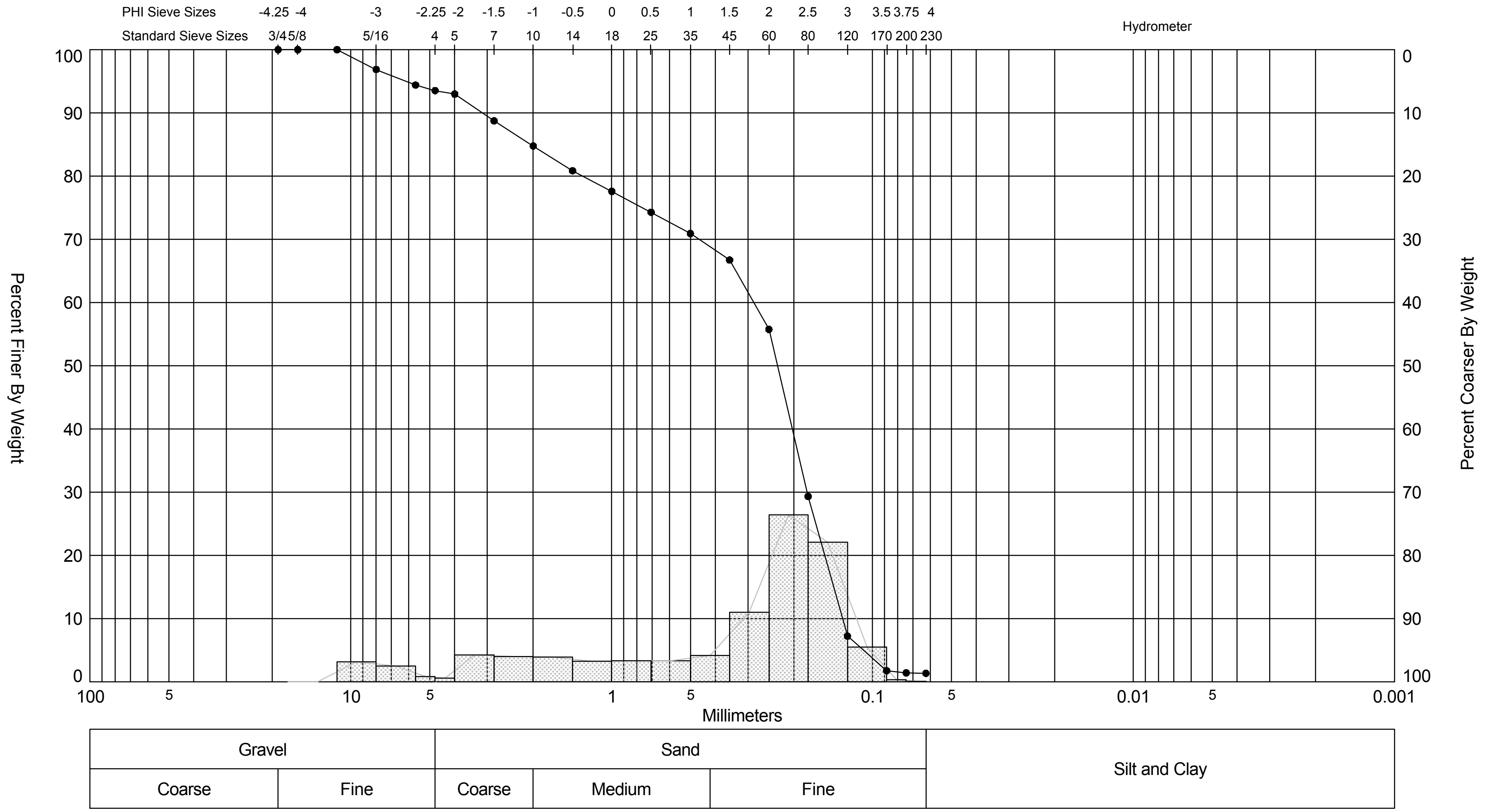

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-07 #1	—●—	-11.7	SW	#200 - 1.41 #230 - 1.35			2.11	1.33	-1.16	3.16	1.78

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-06-07
Analyzed By:	JF
Easting (X, ft):	433,503
Northing (Y, ft):	1,131,479
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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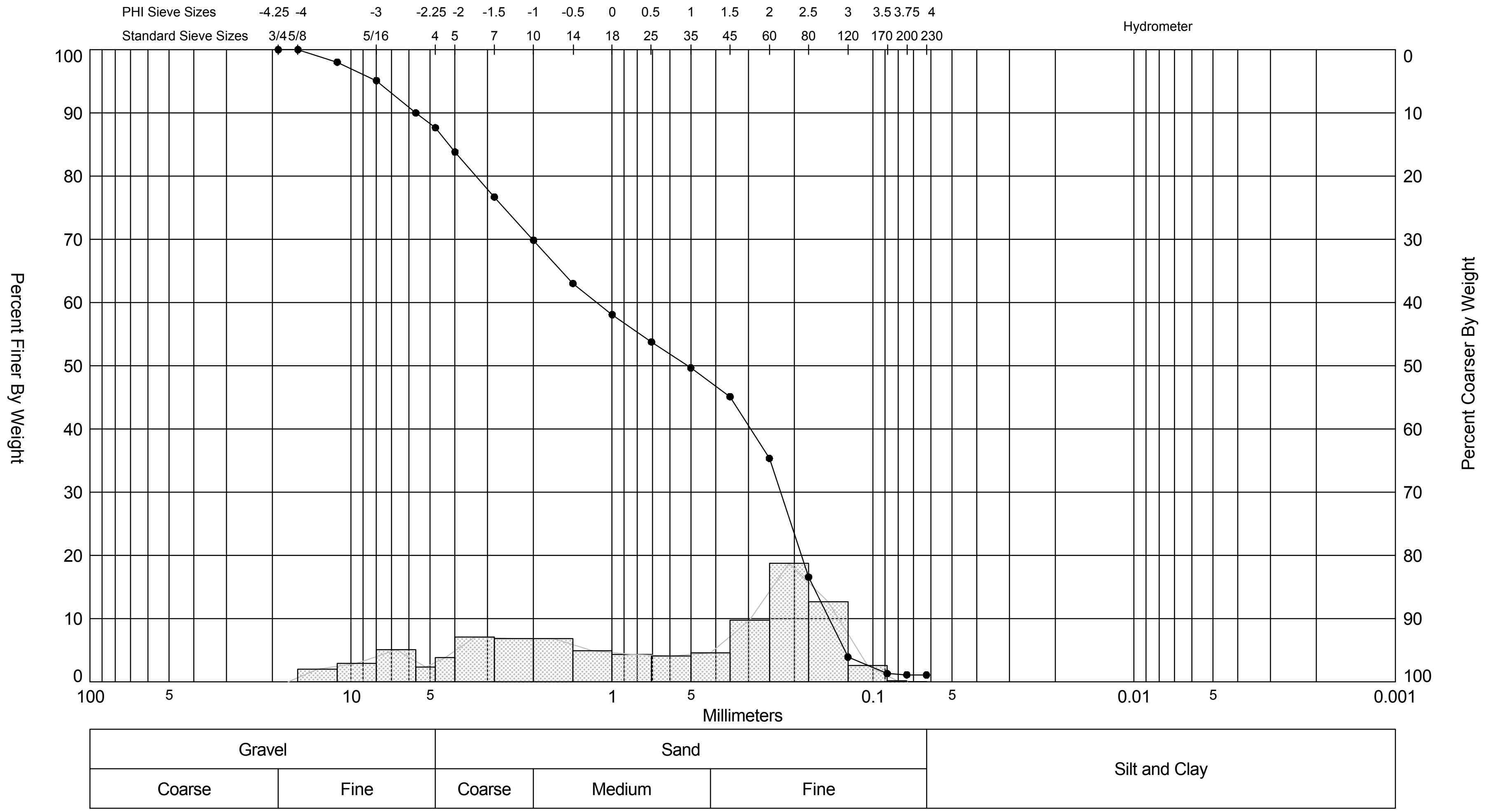

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-07 #2	—●—	-13.5	SW	#200 - 1.11 #230 - 1.08			0.96	0.42	-0.37	1.77	2.03

Comments:

Depths and elevations based on measured values

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Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-06-07
Analyzed By:	JF
Easting (X, ft):	433,503
Northing (Y, ft):	1,131,479
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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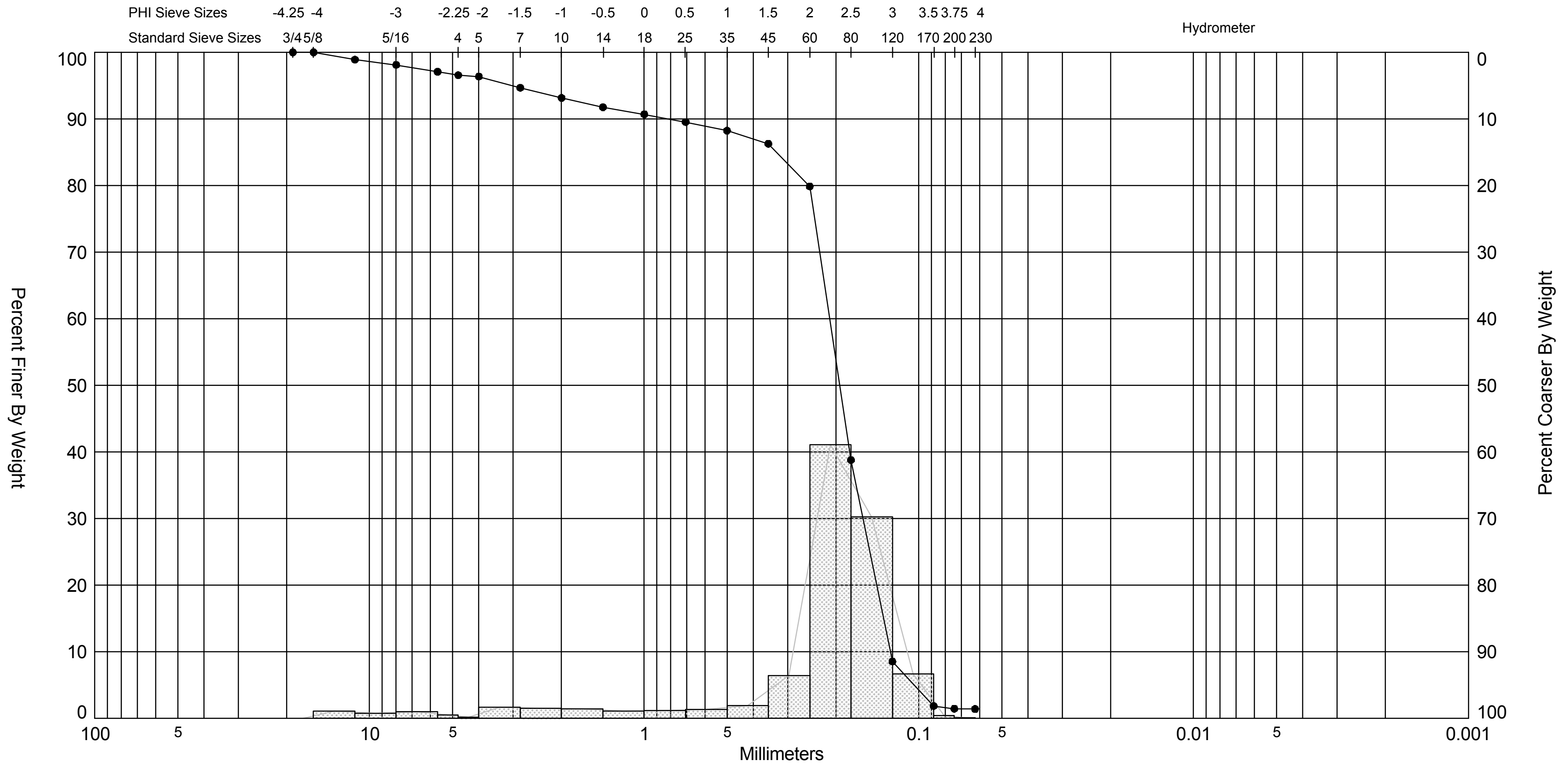

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-07 #3	—●—	-14.8	SW	#200 - 1.45 #230 - 1.39			2.36	1.99	-2.49	8.89	1.38

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-06-07
Analyzed By:	JF
Easting (X, ft):	433,503
Northing (Y, ft):	1,131,479
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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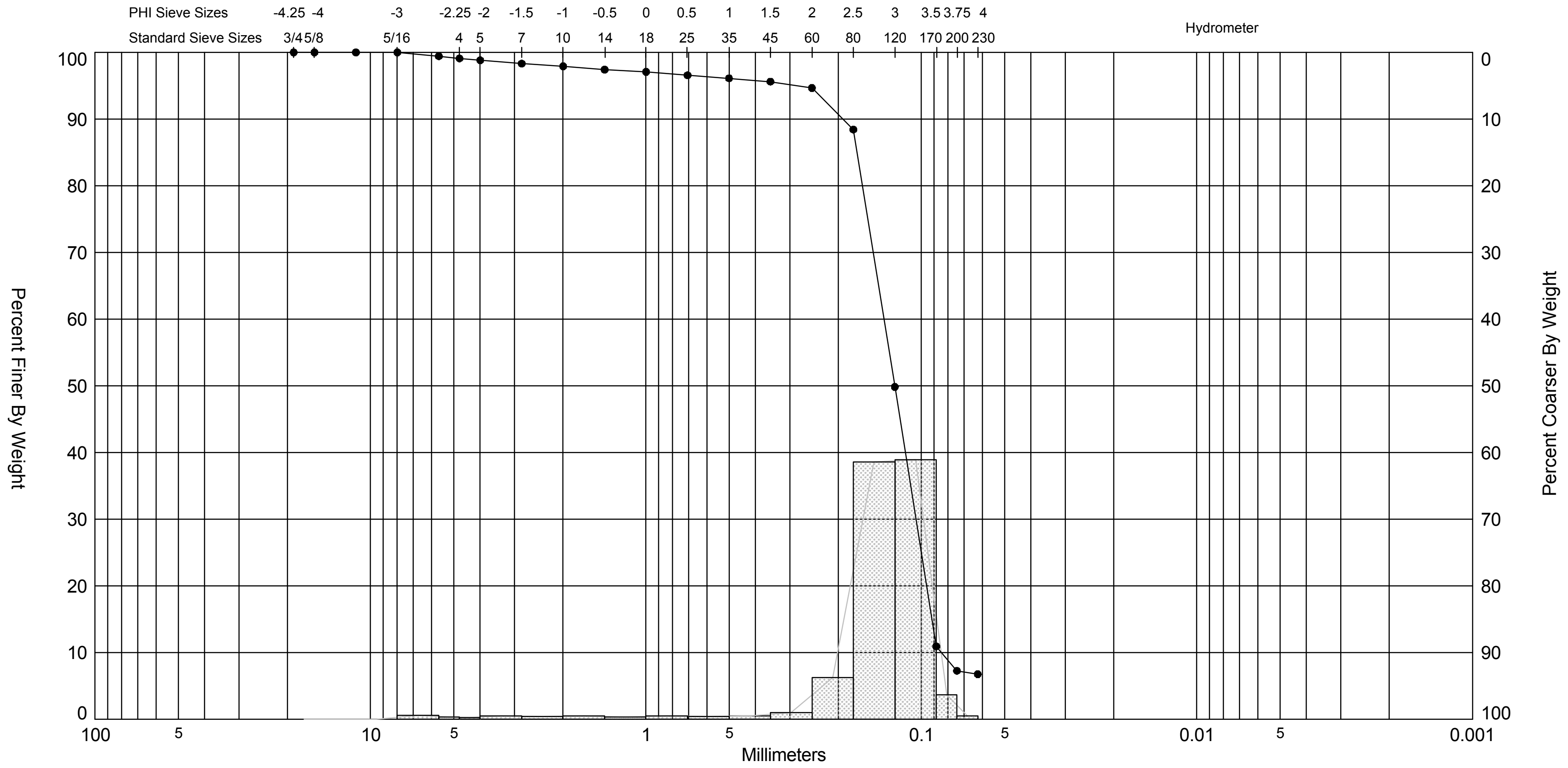

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-07 #4	—●—	-17.3	SW-SM	#200 - 7.27 #230 - 6.76			3	2.79	-3.9	20.34	0.93

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-07-07
Analyzed By:	AU
Easting (X, ft):	433,503
Northing (Y, ft):	1,131,479
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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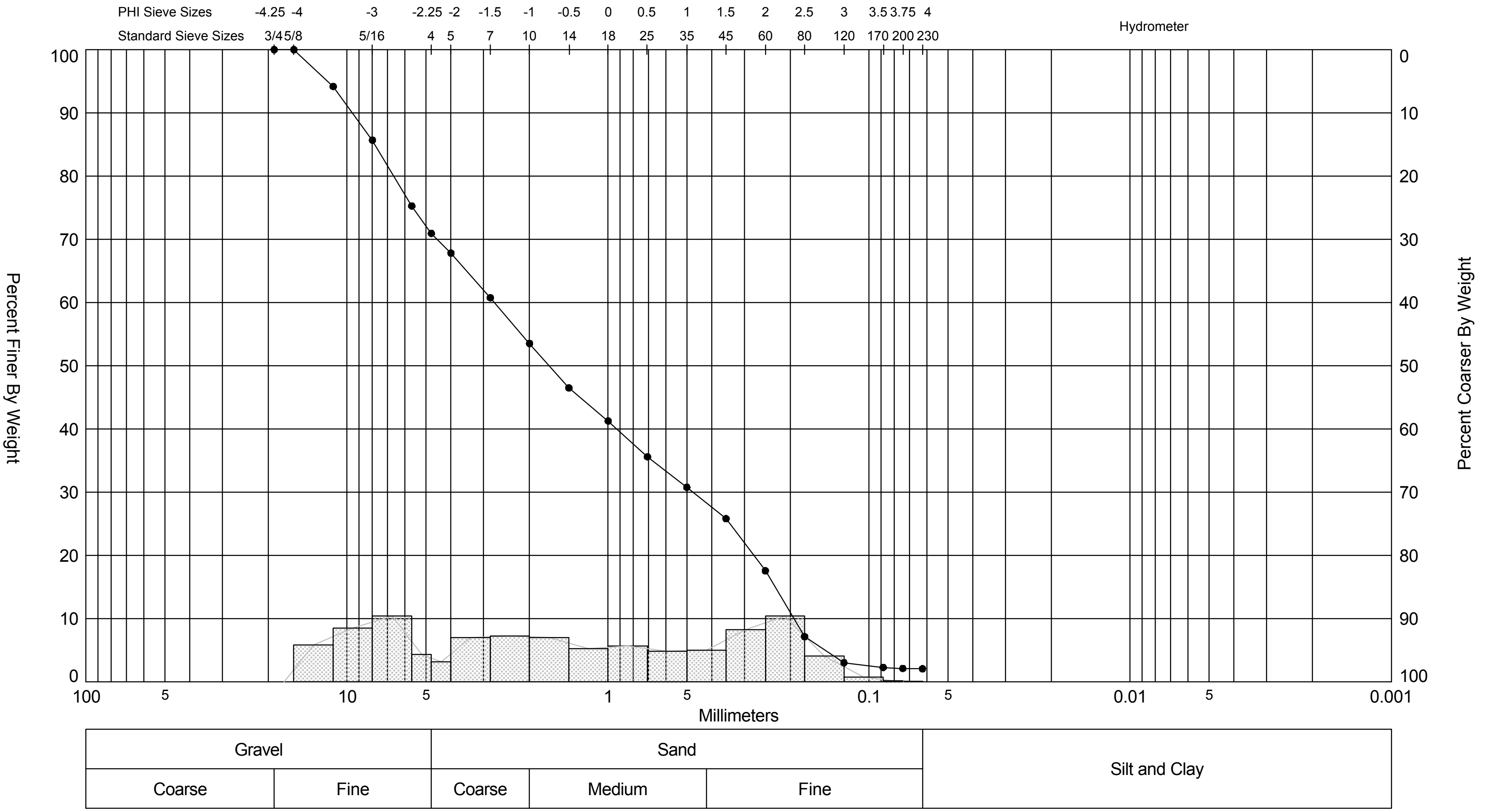

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-08 #1	—●—	-6.3	SW	#200 - 2.12 #230 - 2.06				-0.6	0.14	1.69	2.07

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	MC
Easting (X, ft):	433,653
Northing (Y, ft):	1,130,845
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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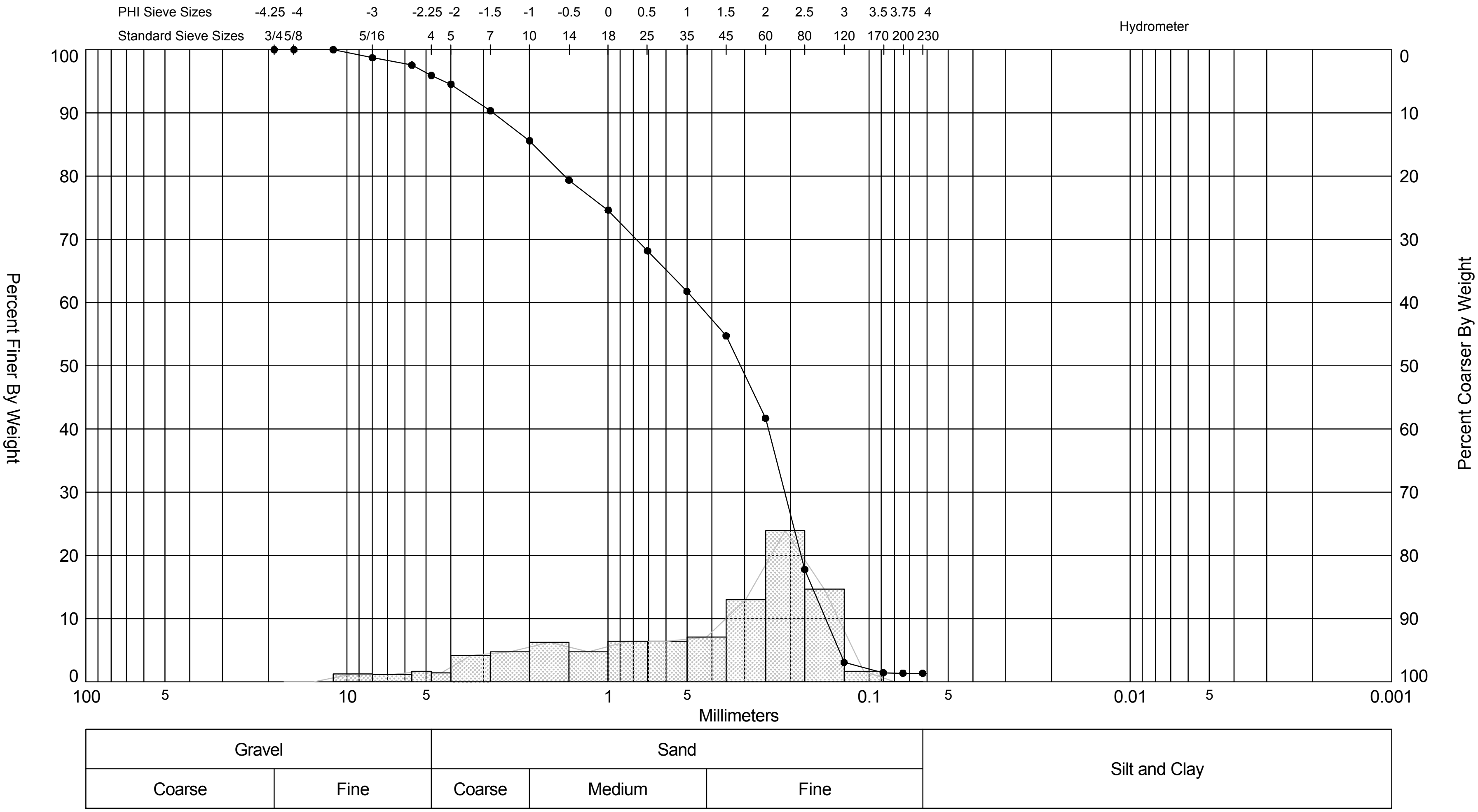

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-08 #2	—●—	-7.1	SW	#200 - 1.36 #230 - 1.35			1.68	1.06	-0.84	2.62	1.61

Comments:

Depths and elevations based on measured values

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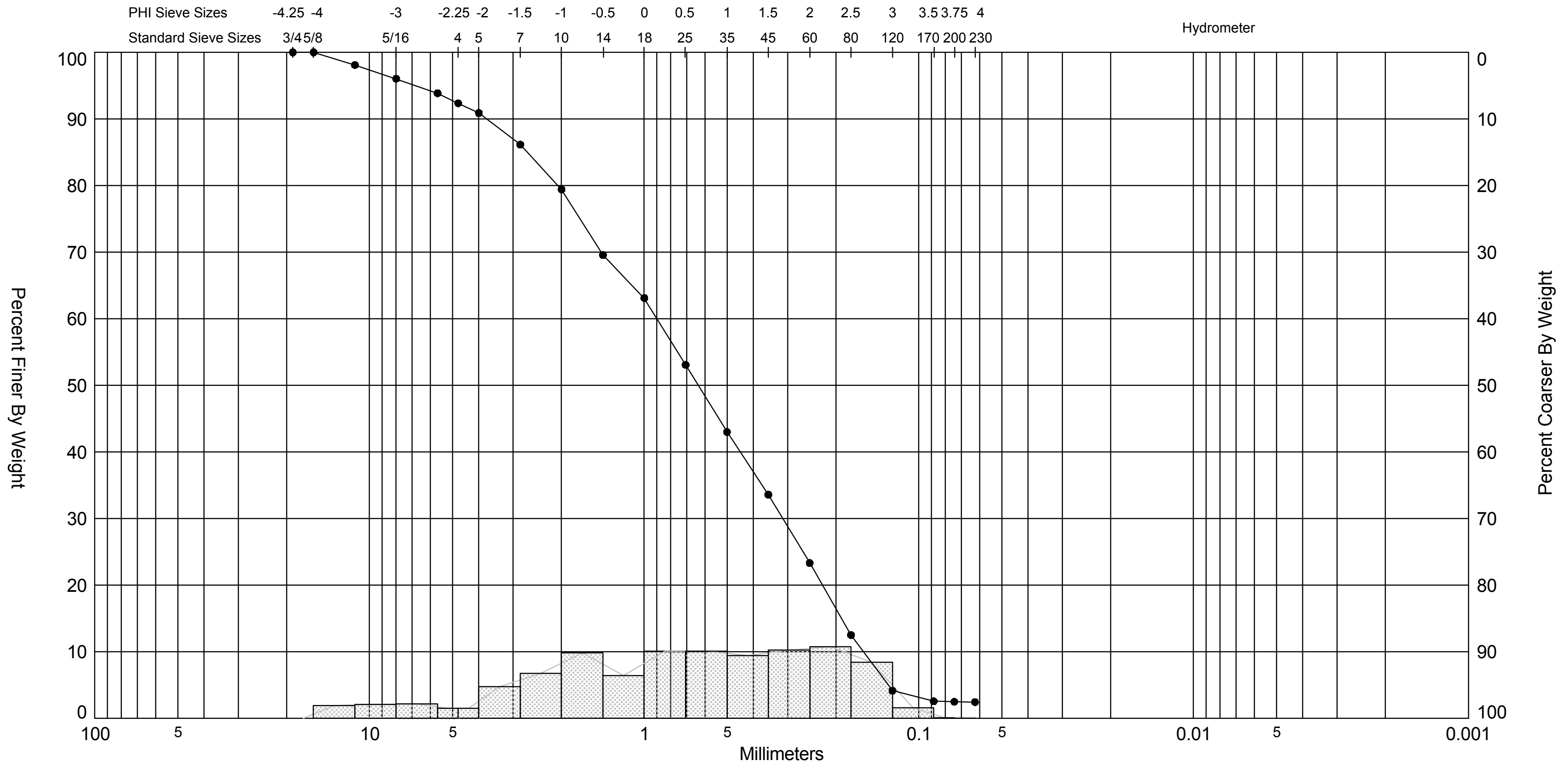
Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	MC
Easting (X, ft):	433,653
Northing (Y, ft):	1,130,845
Horizontal System:	NAD 1983
Vertical System:	NAVD 88



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-08 #3	—●—	-11.0	SW	#200 - 2.48 #230 - 2.44			0.65	0.41	-0.45	2.45	1.7

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	MC
Easting (X, ft):	433,653
Northing (Y, ft):	1,130,845
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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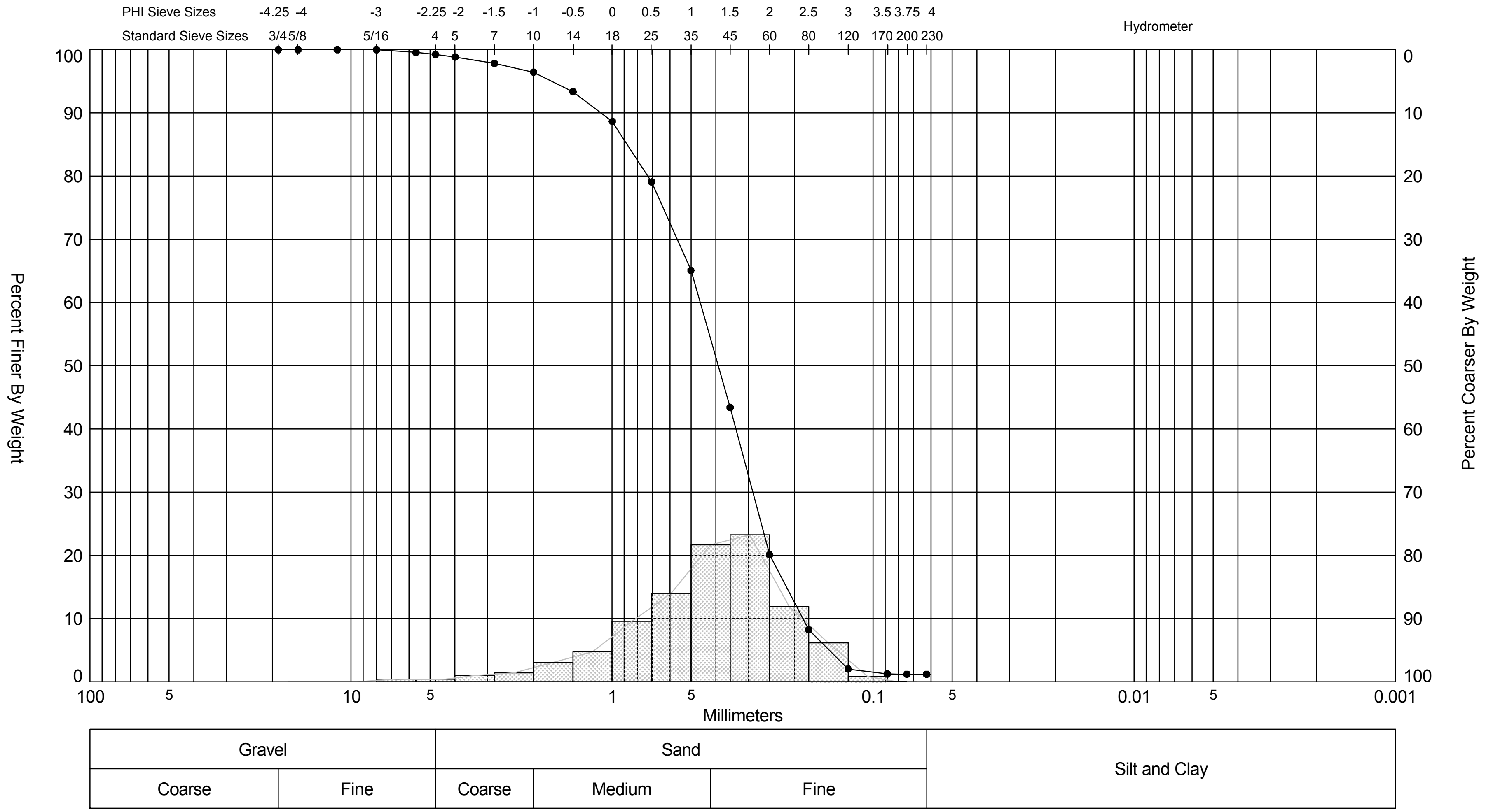

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-08 #4	—●—	-12.5	SW	#200 - 1.20 #230 - 1.20			1.35	1.19	-0.91	4.3	1.03

Comments:

Depths and elevations based on measured values

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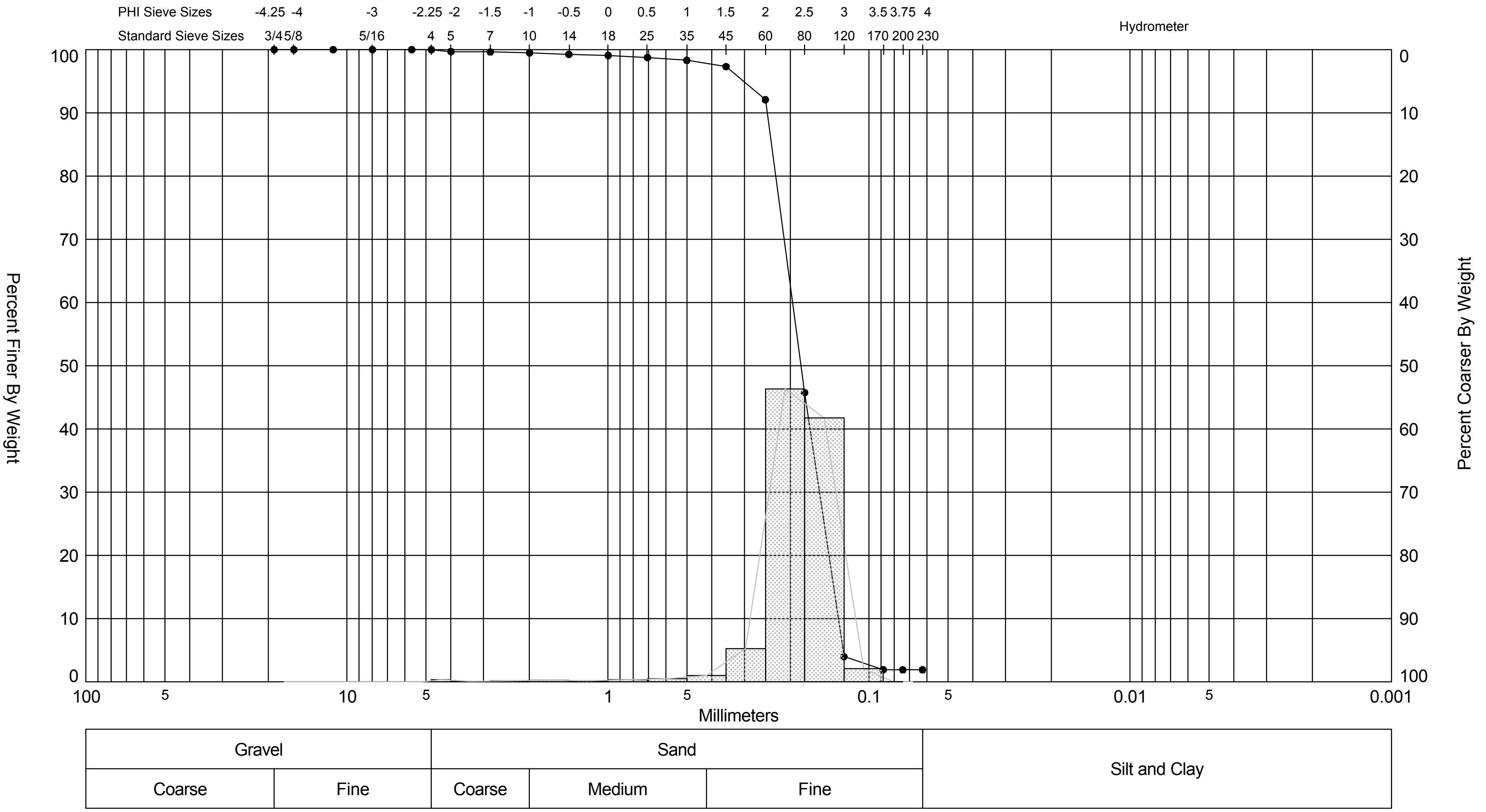
Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	MC
Easting (X, ft):	433,653
Northing (Y, ft):	1,130,845
Horizontal System:	NAD 1983
Vertical System:	NAVD 88



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-09 #1	—●—	-15.7	SP	#200 - 1.89 #230 - 1.89			2.45	2.4	-3.98	29.92	0.52

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-06-07
Analyzed By:	AU
Easting (X, ft):	429,126
Northing (Y, ft):	1,128,661
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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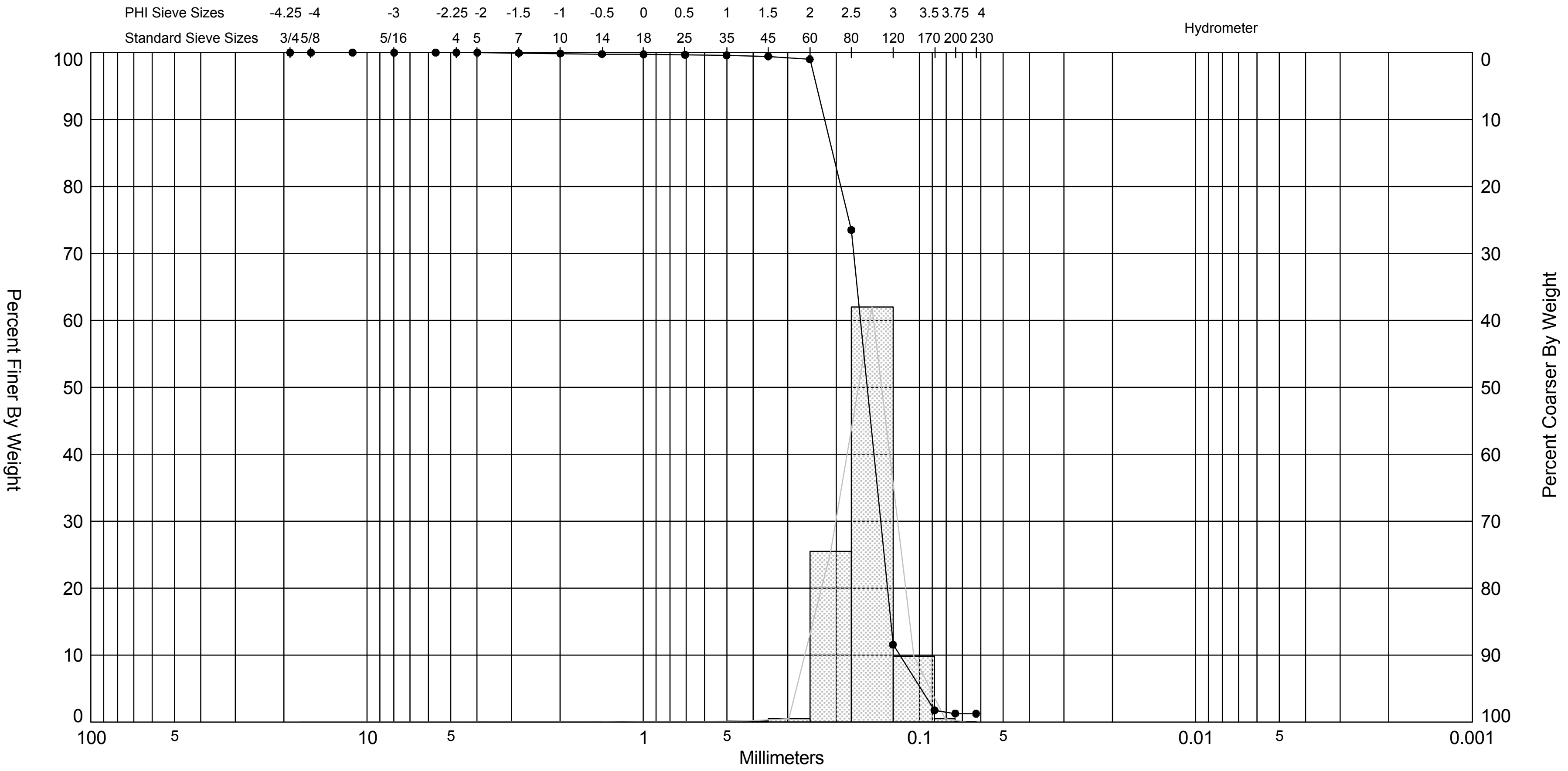

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-09 #2	—●—	-18.7	SP	#200 - 1.28 #230 - 1.25			2.69	2.66	-2.93	31.72	0.37

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-06-07
Analyzed By:	AU
Easting (X, ft):	429,126
Northing (Y, ft):	1,128,661
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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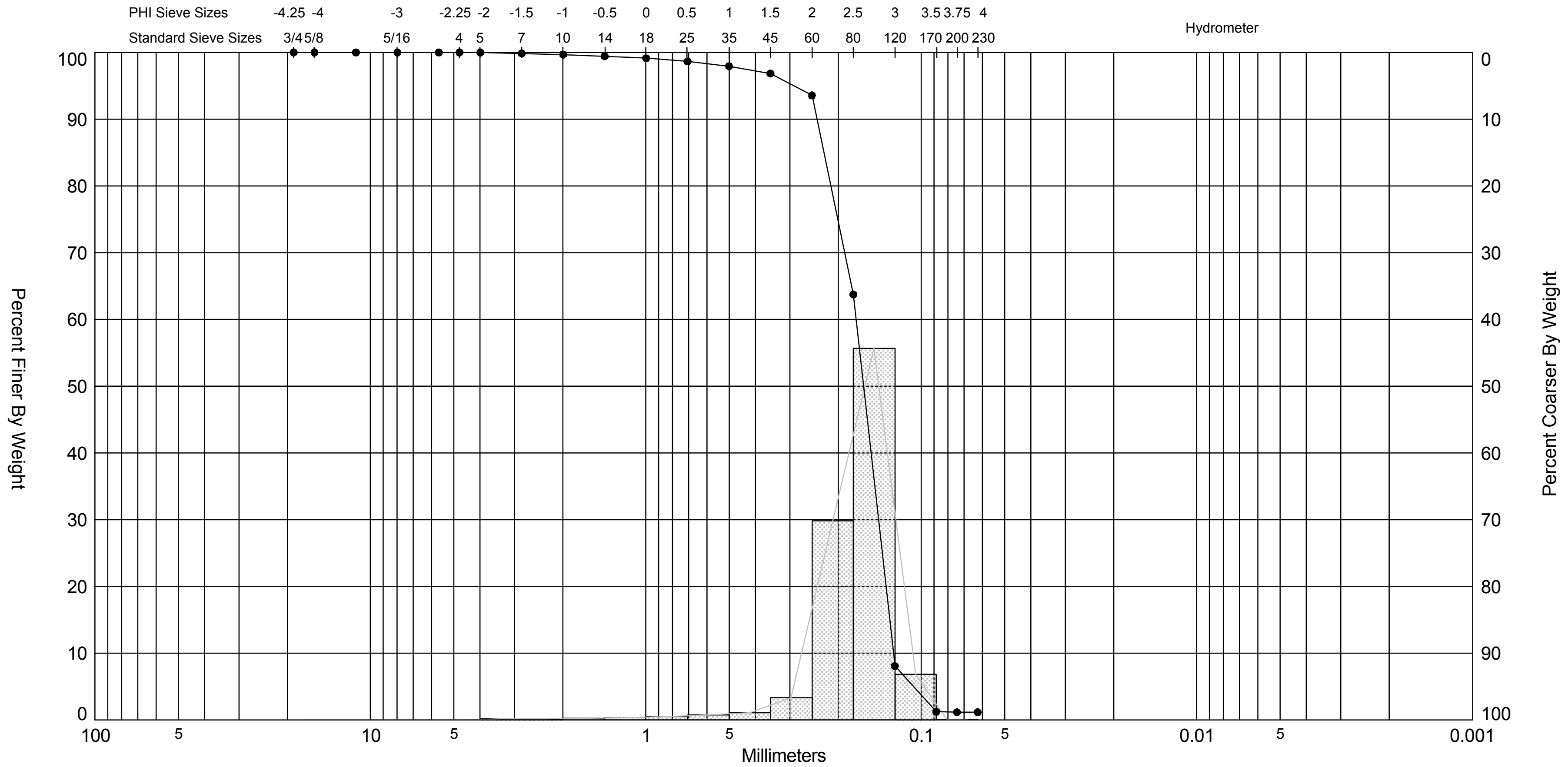

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-09 #3	—●—	-21.7	SP	#200 - 1.15 #230 - 1.14			2.62	2.53	-3.23	20.6	0.52

Comments:

Depths and elevations based on measured values

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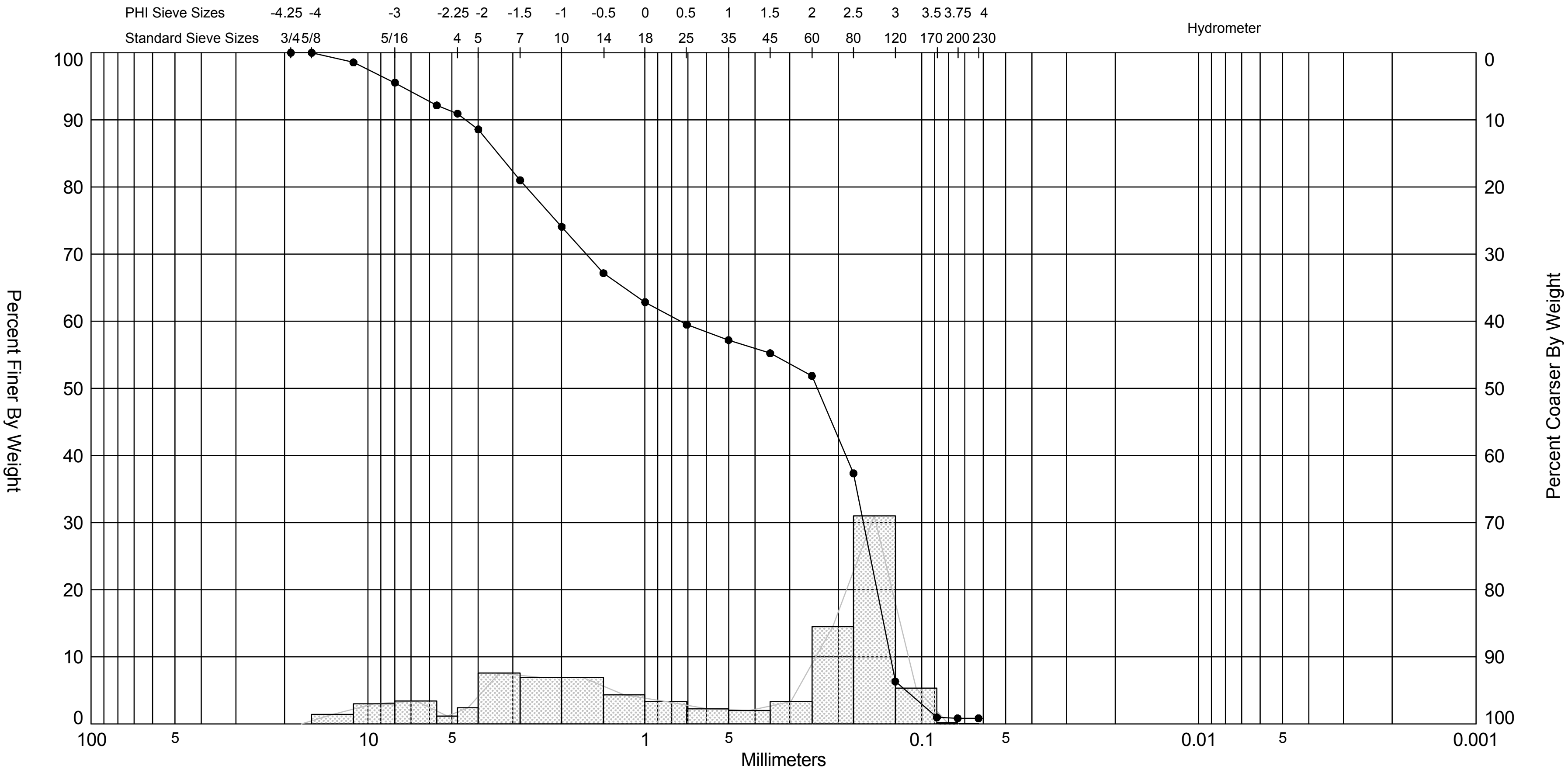
Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-06-07
Analyzed By:	AU
Easting (X, ft):	429,126
Northing (Y, ft):	1,128,661
Horizontal System:	NAD 1983
Vertical System:	NAVD 88



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-09 #4	—●—	-24.3	SW	#200 - 0.84 #230 - 0.83			2.06	0.87	-0.58	1.85	2.11

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-06-07
Analyzed By:	AU
Easting (X, ft):	429,126
Northing (Y, ft):	1,128,661
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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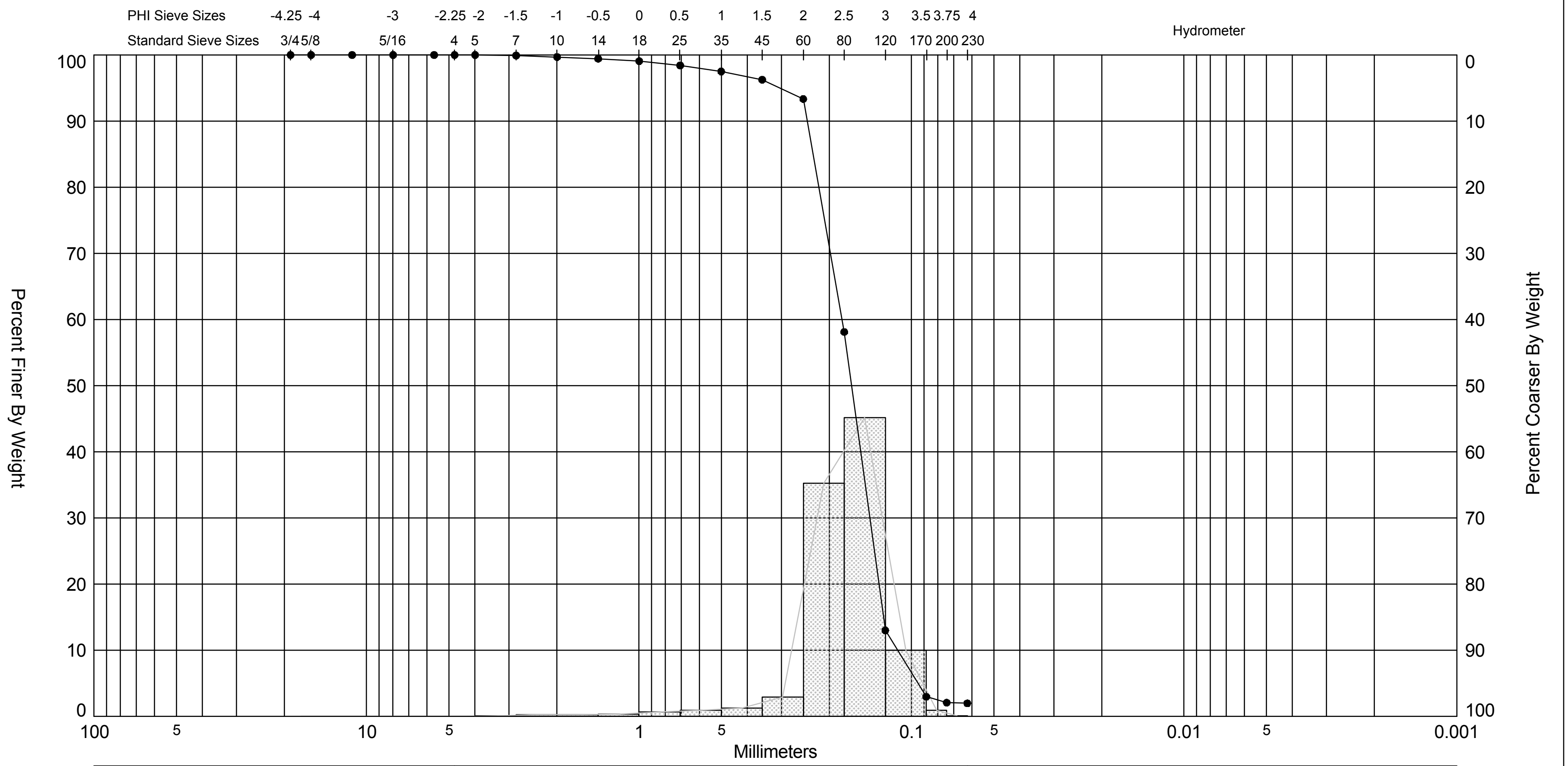

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-09 #5	—●—	-26.4	SP	#200 - 2.07 #230 - 1.96			2.59	2.51	-2.53	15.29	0.57

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-06-07
Analyzed By:	AU
Easting (X, ft):	429,126
Northing (Y, ft):	1,128,661
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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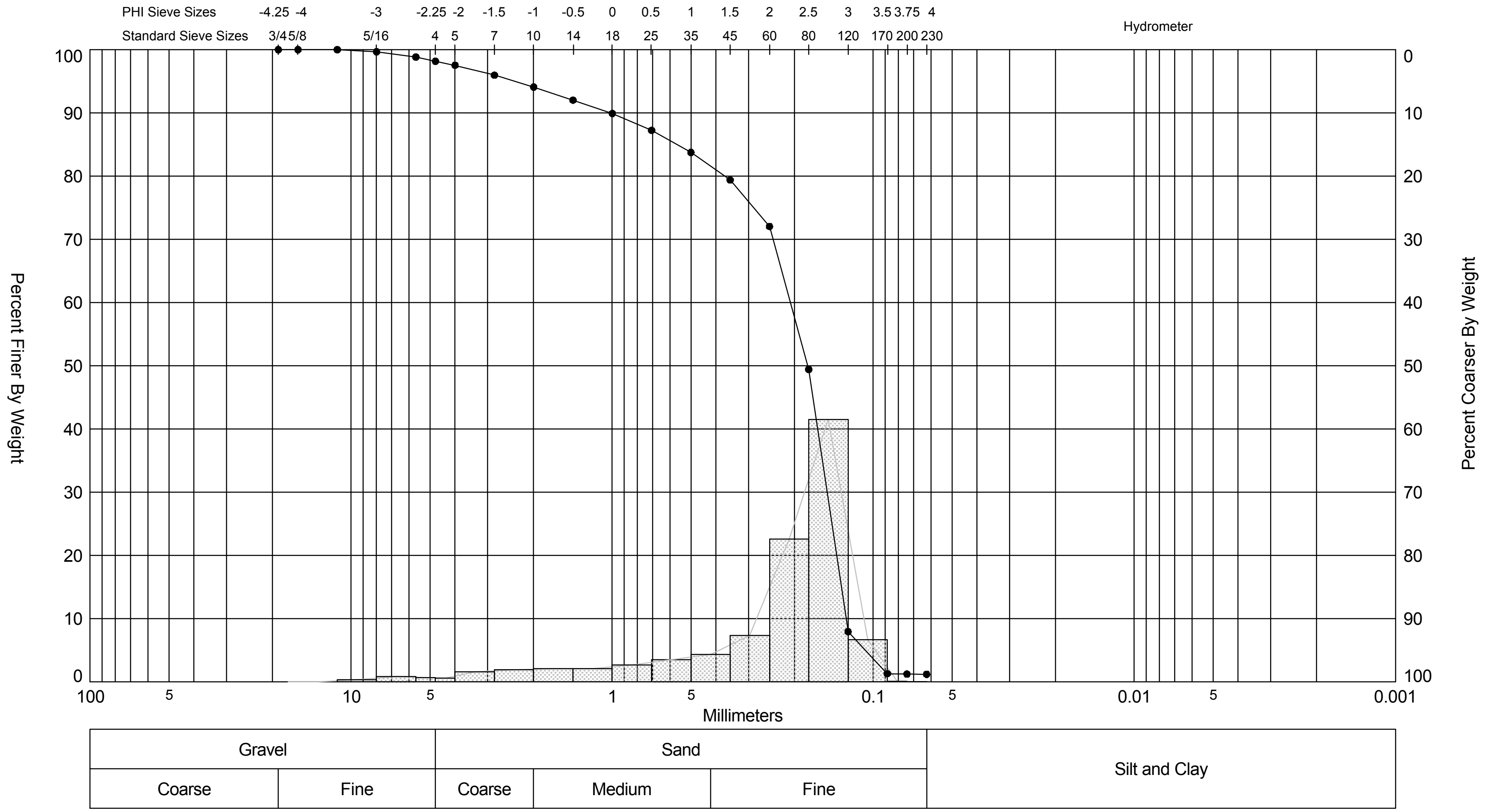

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-10 #1	—●—	-10.9	SW	#200 - 1.22 #230 - 1.20			2.49	1.97	-1.9	6.09	1.32

Comments:

Depths and elevations based on measured values

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Sample Information

Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	AU
Easting (X, ft):	429,717
Northing (Y, ft):	1,129,373
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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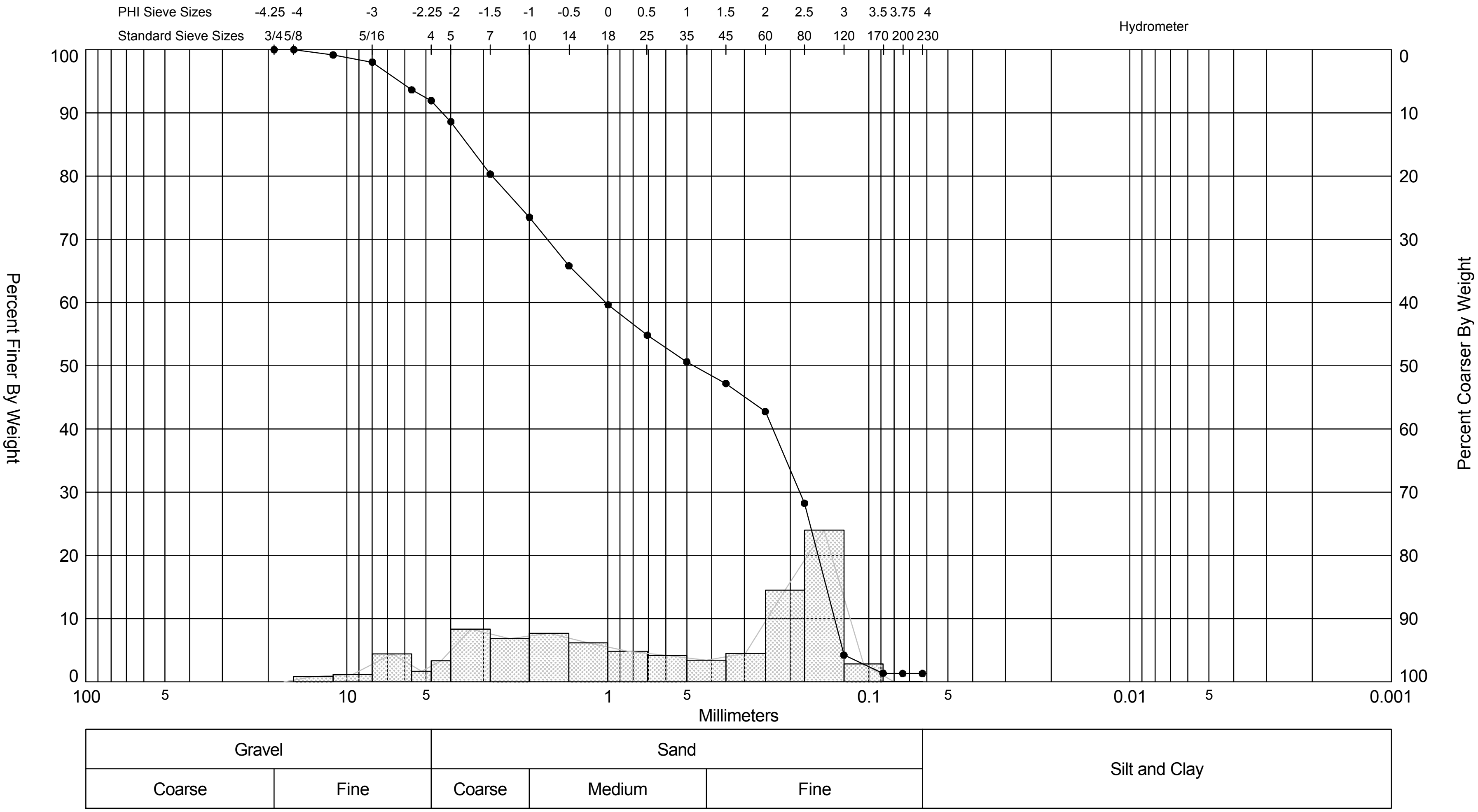

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-10 #2	—●—	-13.4	SW	#200 - 1.31 #230 - 1.30			1.09	0.65	-0.36	1.71	1.98

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	AU
Easting (X, ft):	429,717
Northing (Y, ft):	1,129,373
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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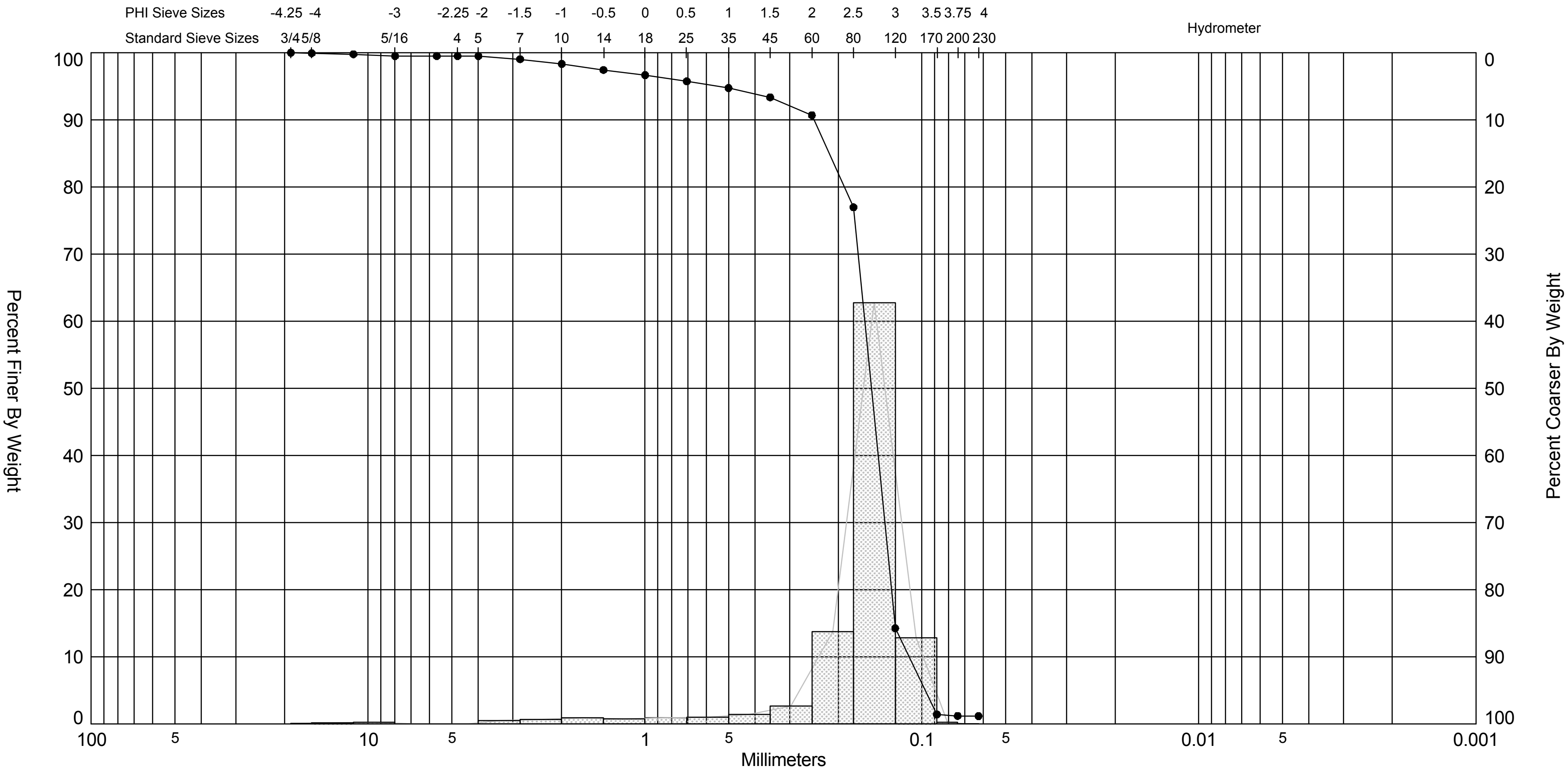

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-10 #3	—●—	-15.2	SW	#200 - 1.20 #230 - 1.16			2.72	2.52	-3.75	20.24	0.87

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	AU
Easting (X, ft):	429,717
Northing (Y, ft):	1,129,373
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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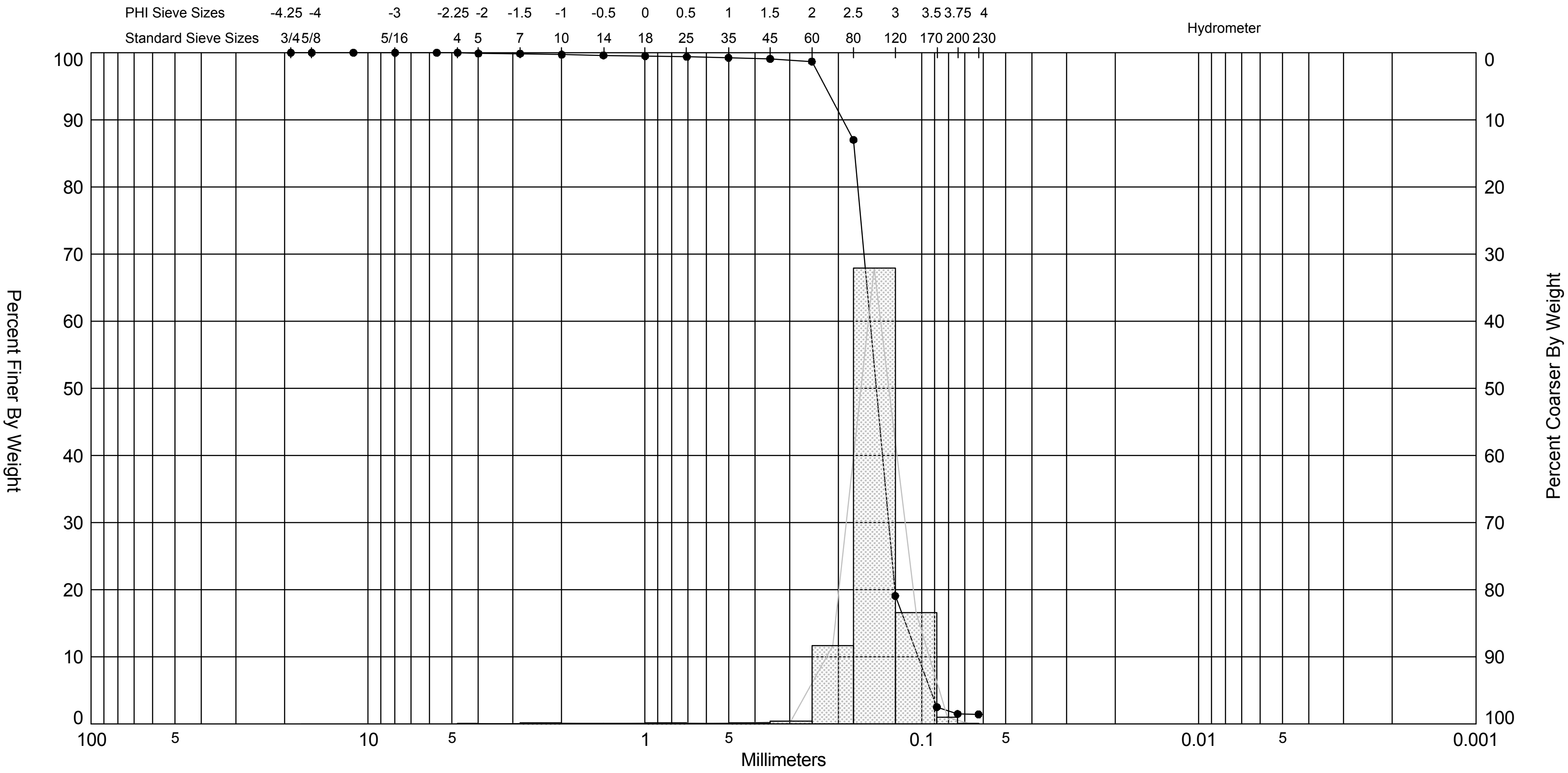

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-10 #4	—●—	-18.2	SP	#200 - 1.48 #230 - 1.42			2.77	2.75	-4.6	45.96	0.42

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	AU
Easting (X, ft):	429,717
Northing (Y, ft):	1,129,373
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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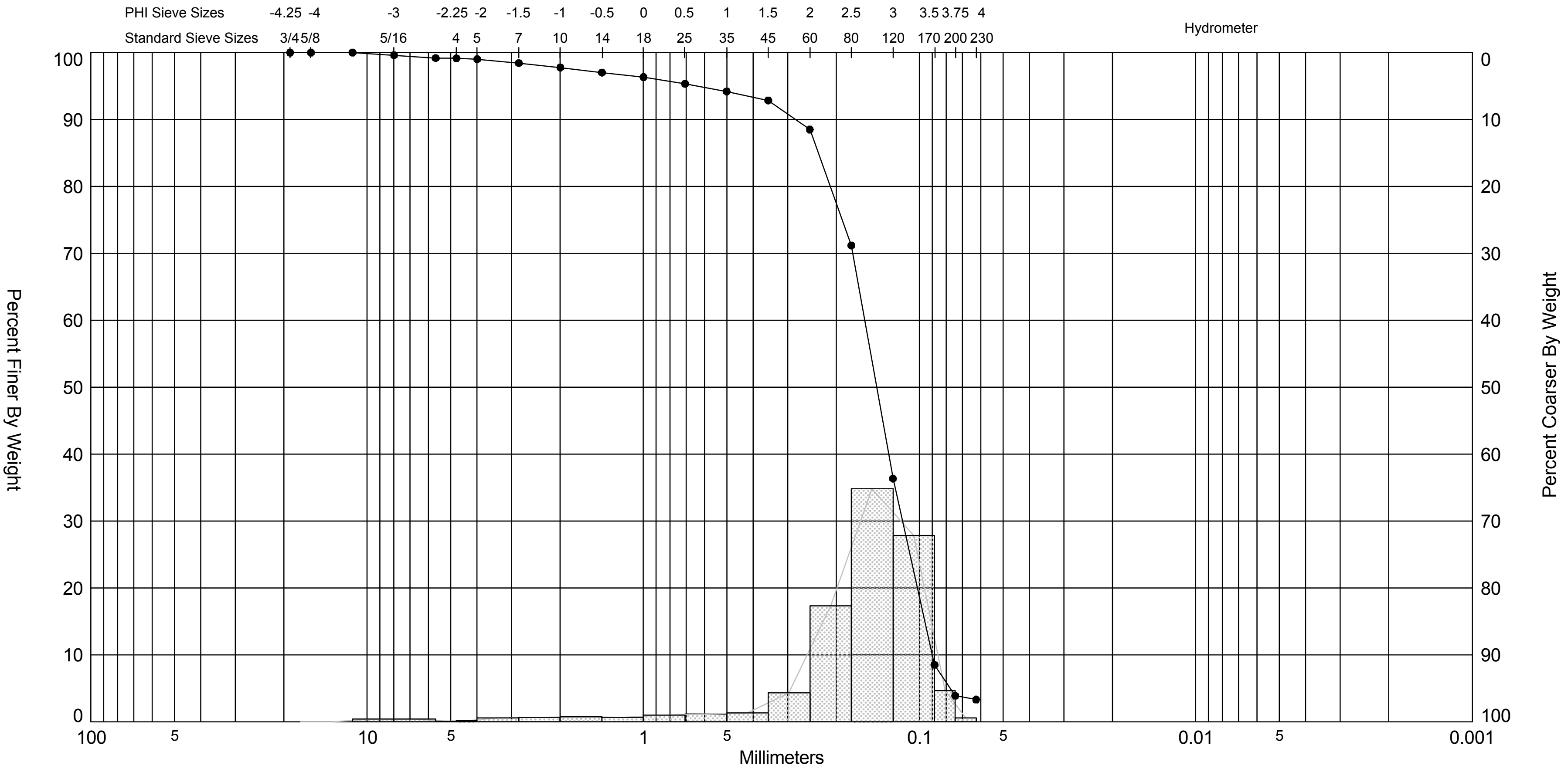

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-10 #5	—●—	-22.0	SW	#200 - 3.89 #230 - 3.30			2.8	2.58	-2.94	13.84	1.02

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	AU
Easting (X, ft):	429,717
Northing (Y, ft):	1,129,373
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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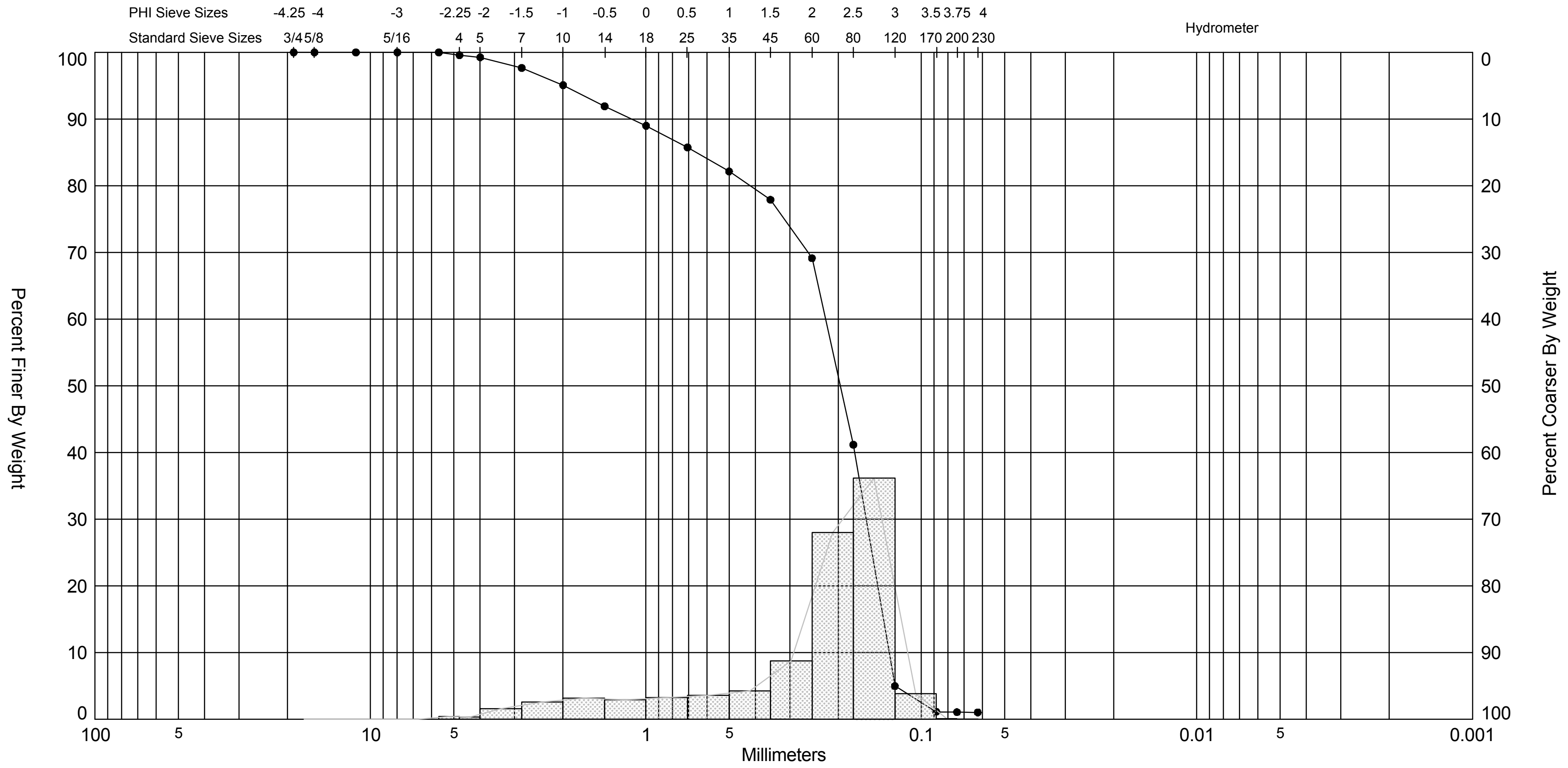

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-11 #1	—●—	-9.2	SW	#200 - 1.06 #230 - 1.03			2.34	1.91	-1.6	4.75	1.22

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	AU
Easting (X, ft):	430,620
Northing (Y, ft):	1,129,814
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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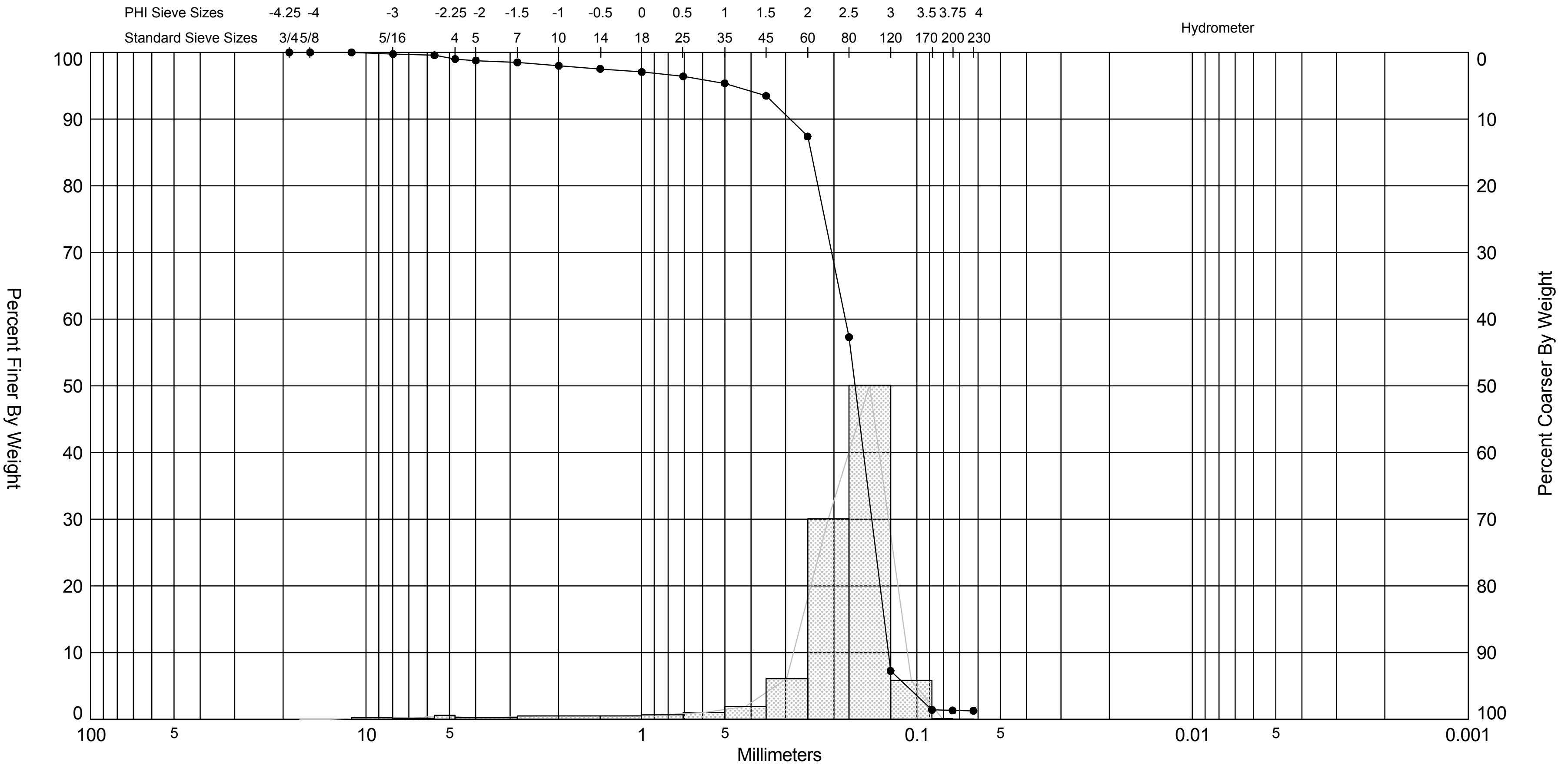

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-11 #2	—●—	-11.9	SP	#200 - 1.31 #230 - 1.28			2.57	2.37	-3.65	19.44	0.85

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	AU
Easting (X, ft):	430,620
Northing (Y, ft):	1,129,814
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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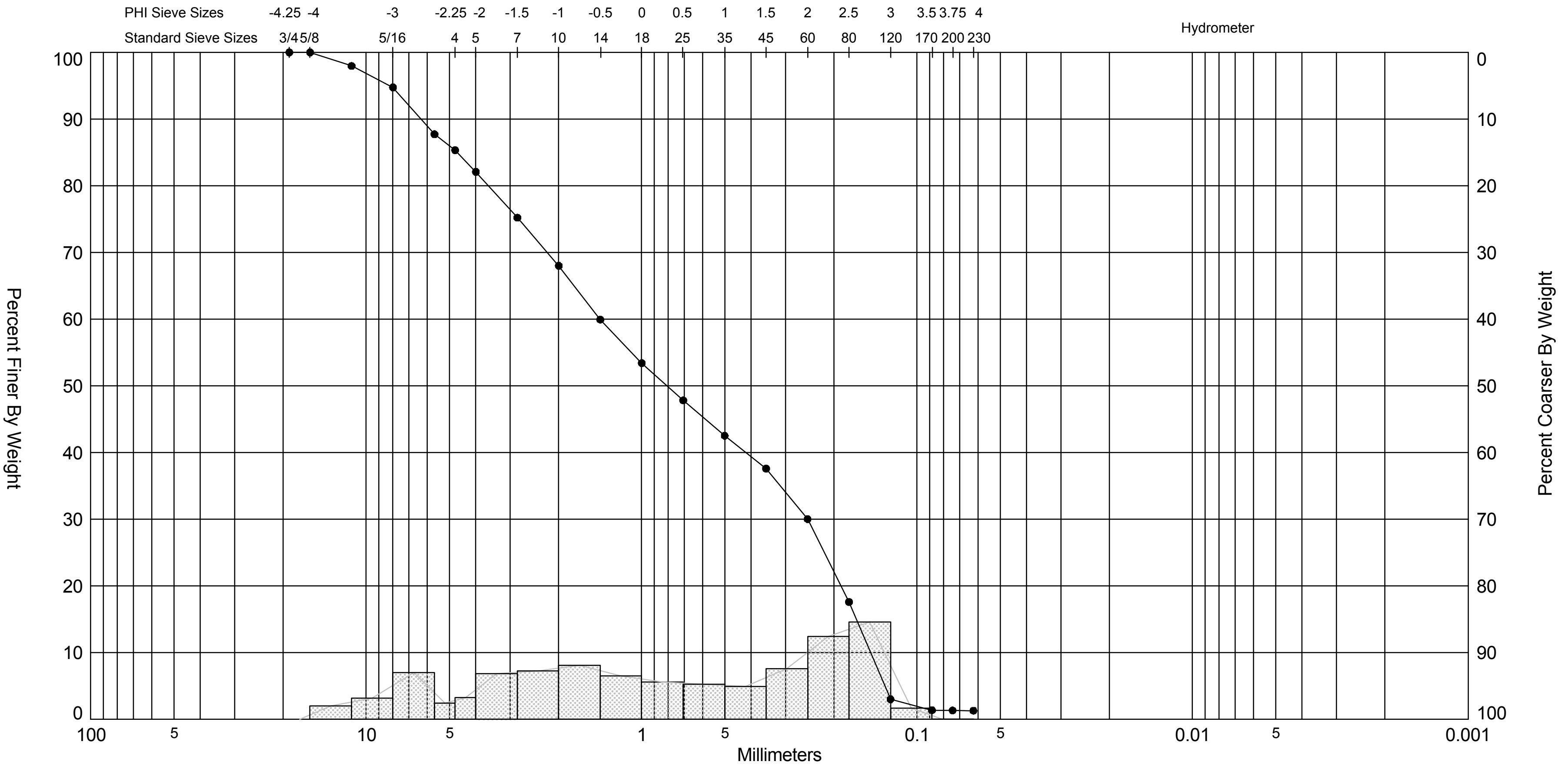

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-11 #3	—●—	-13.0	SW	#200 - 1.32 #230 - 1.29			0.3	0.2	-0.2	1.74	2.02

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	AU
Easting (X, ft):	430,620
Northing (Y, ft):	1,129,814
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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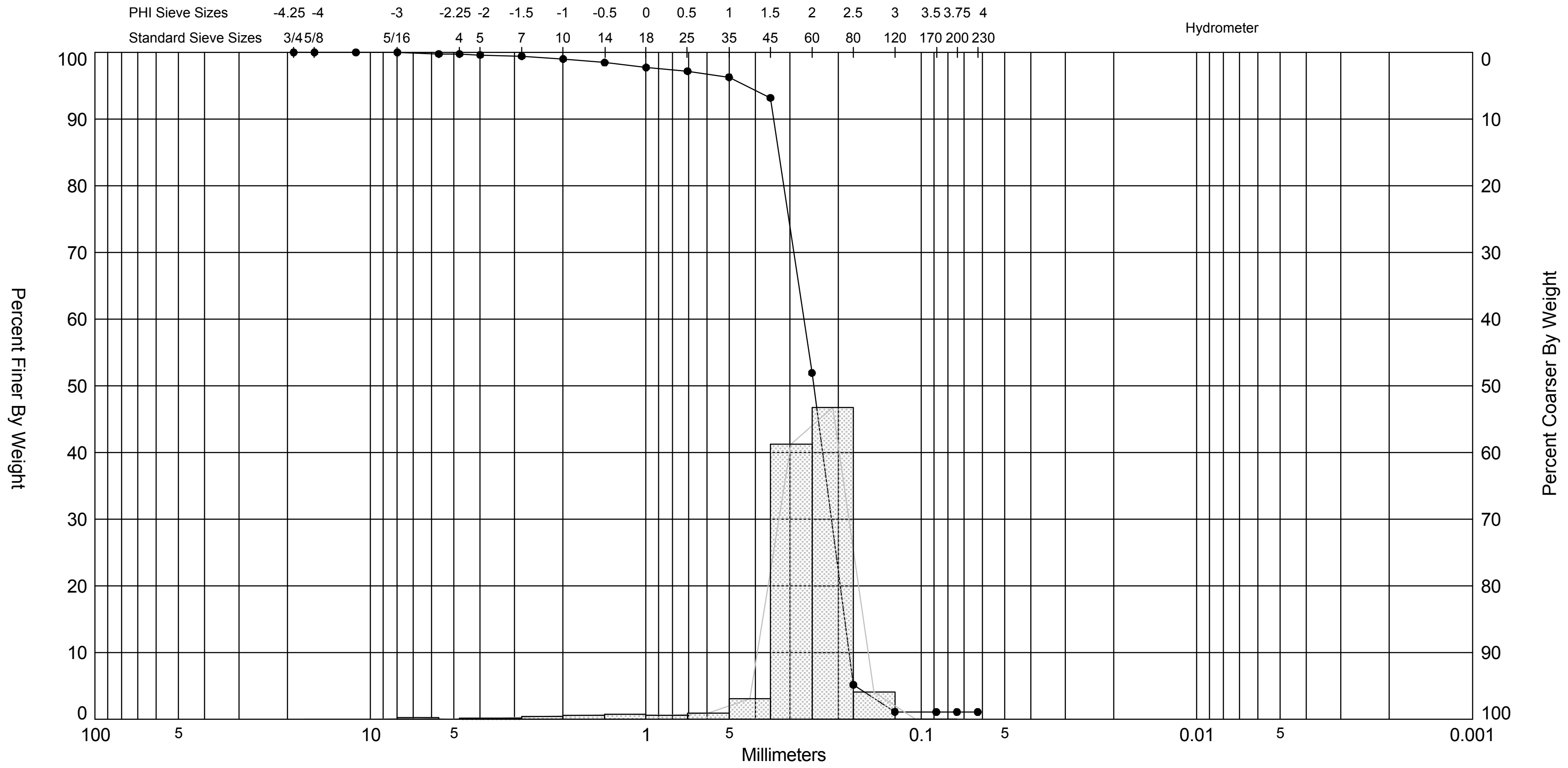

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-11 #4	—●—	-14.0	SP	#200 - 1.08 #230 - 1.08			2.02	1.93	-3.68	23.04	0.59

Comments:

Depths and elevations based on measured values

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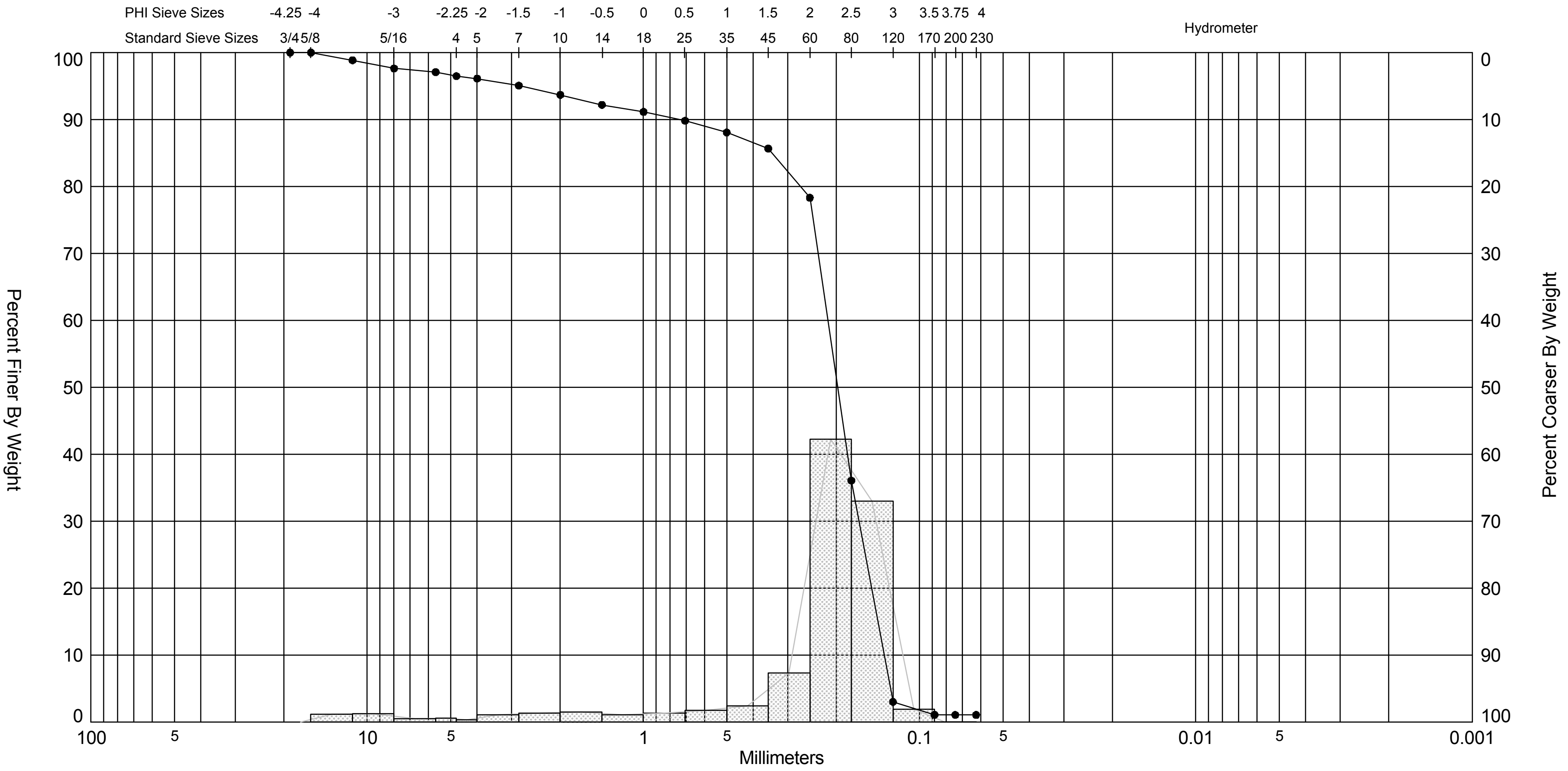
Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	MC
Easting (X, ft):	430,620
Northing (Y, ft):	1,129,814
Horizontal System:	NAD 1983
Vertical System:	NAVD 88



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-12 #1	—●—	-10.1	SW	#200 - 1.06 #230 - 1.05			2.33	1.95	-2.63	9.63	1.35

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	AU
Easting (X, ft):	430,389
Northing (Y, ft):	1,130,139
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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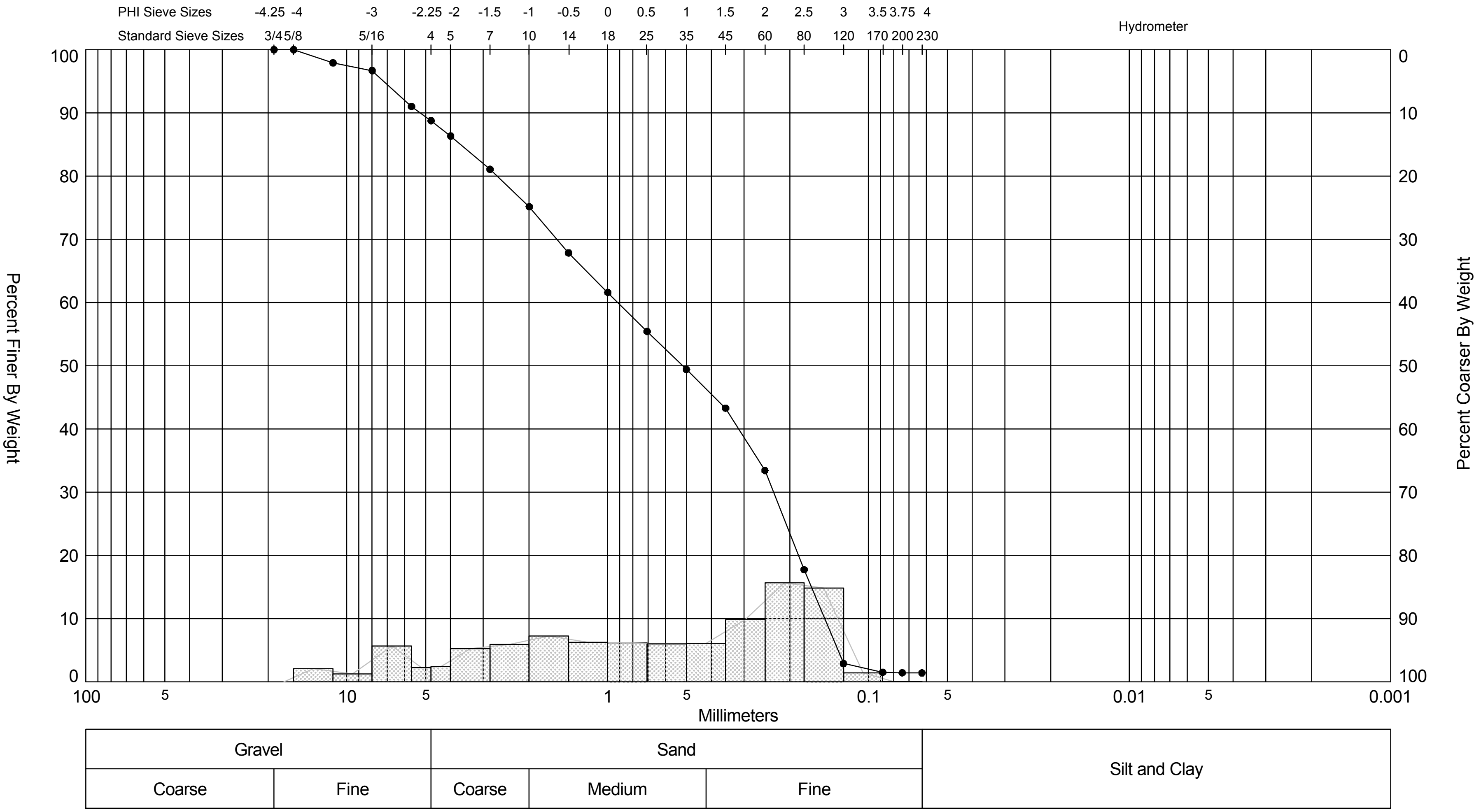

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-12 #2	─●─	-13.2	SW	#200 - 1.44 #230 - 1.40			0.95	0.51	-0.47	2	1.92

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	AU
Easting (X, ft):	430,389
Northing (Y, ft):	1,130,139
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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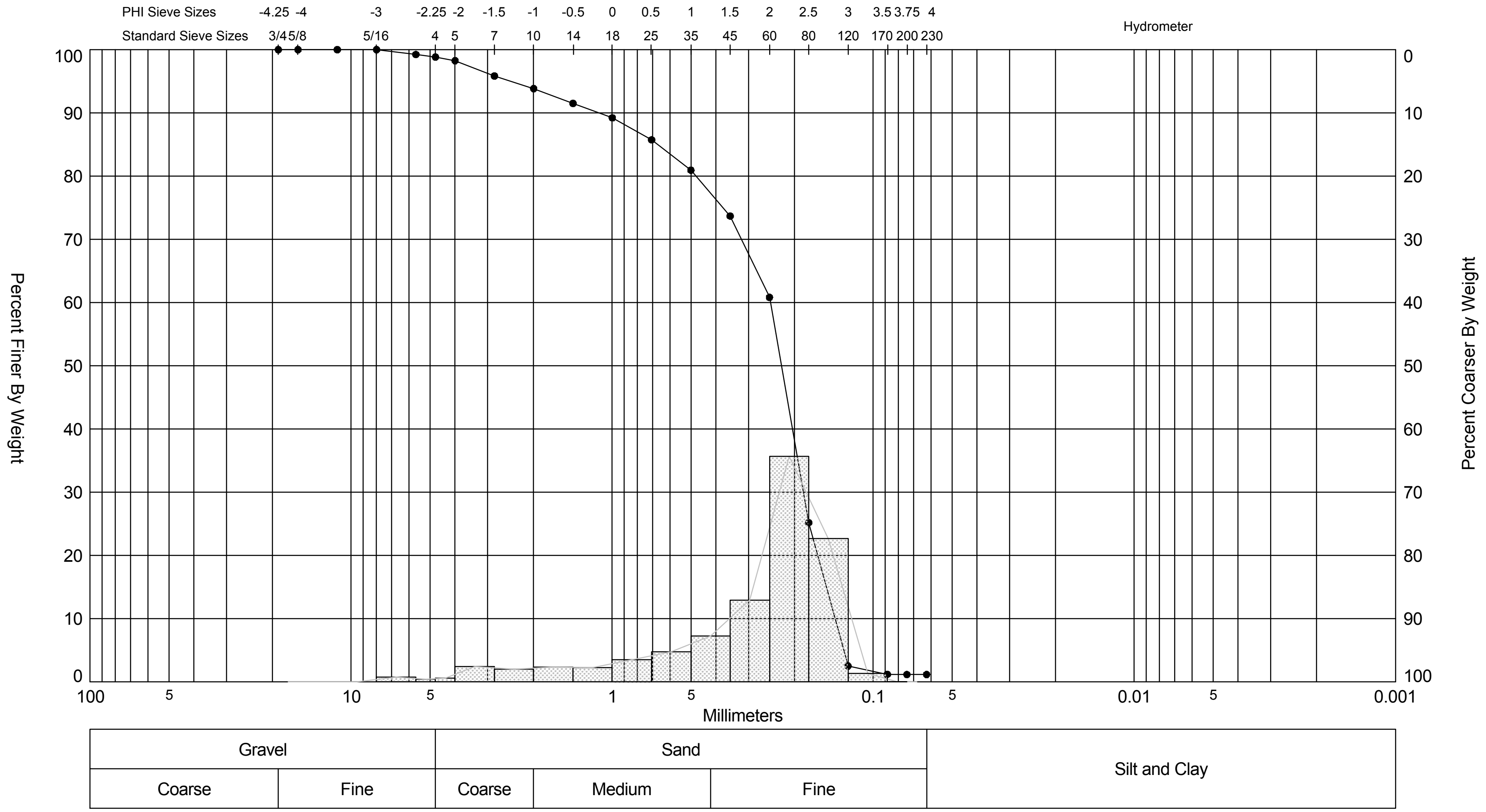

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-12 #3	—●—	-14.7	SW	#200 - 1.15 #230 - 1.15			2.15	1.72	-1.68	5.28	1.24

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	AU
Easting (X, ft):	430,389
Northing (Y, ft):	1,130,139
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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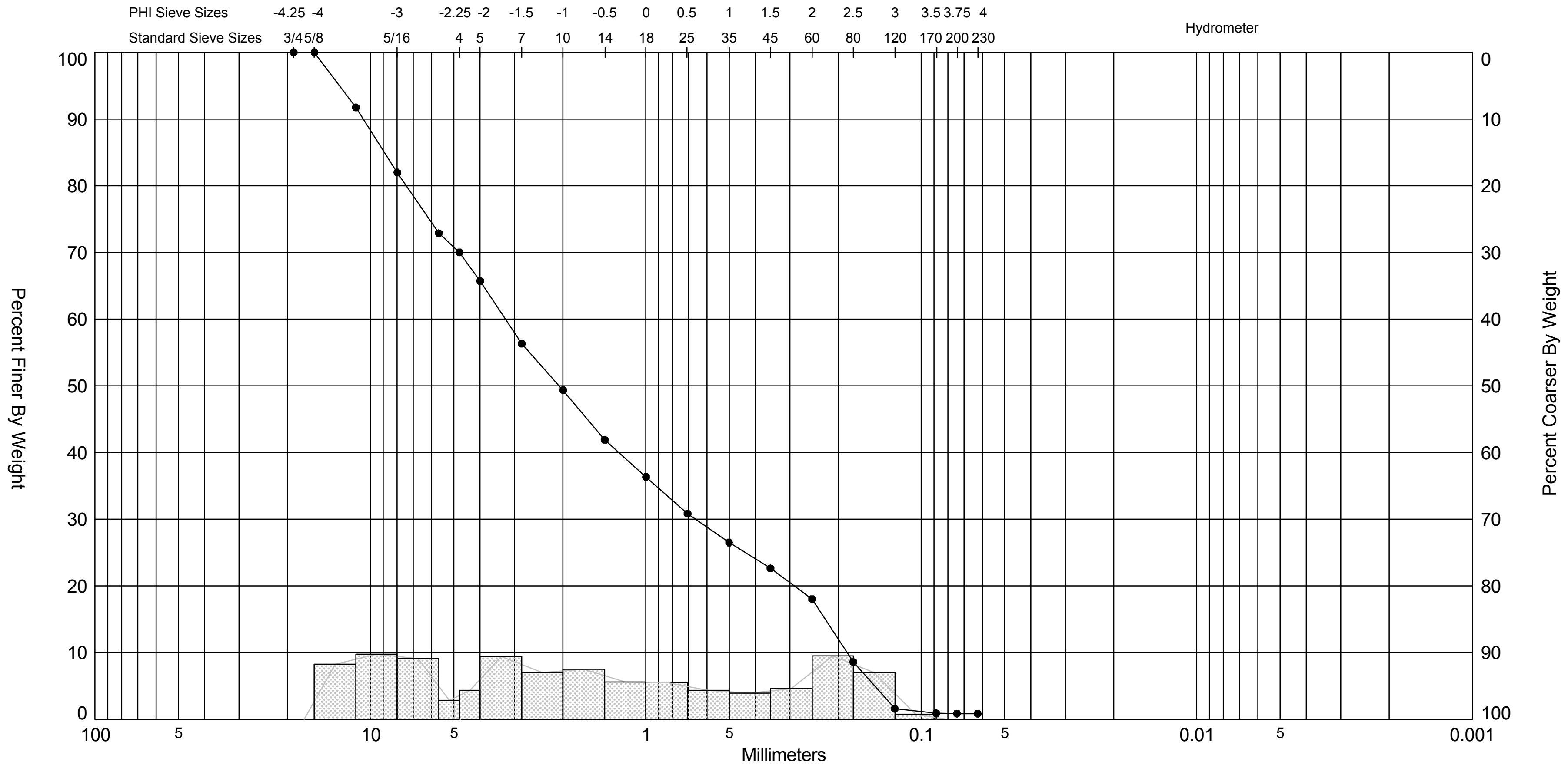

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-13 #1	—●—	-6.4	SW	#200 - 0.86 #230 - 0.85				-0.76	0.28	1.79	2.11

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	MC
Easting (X, ft):	430,866
Northing (Y, ft):	1,130,639
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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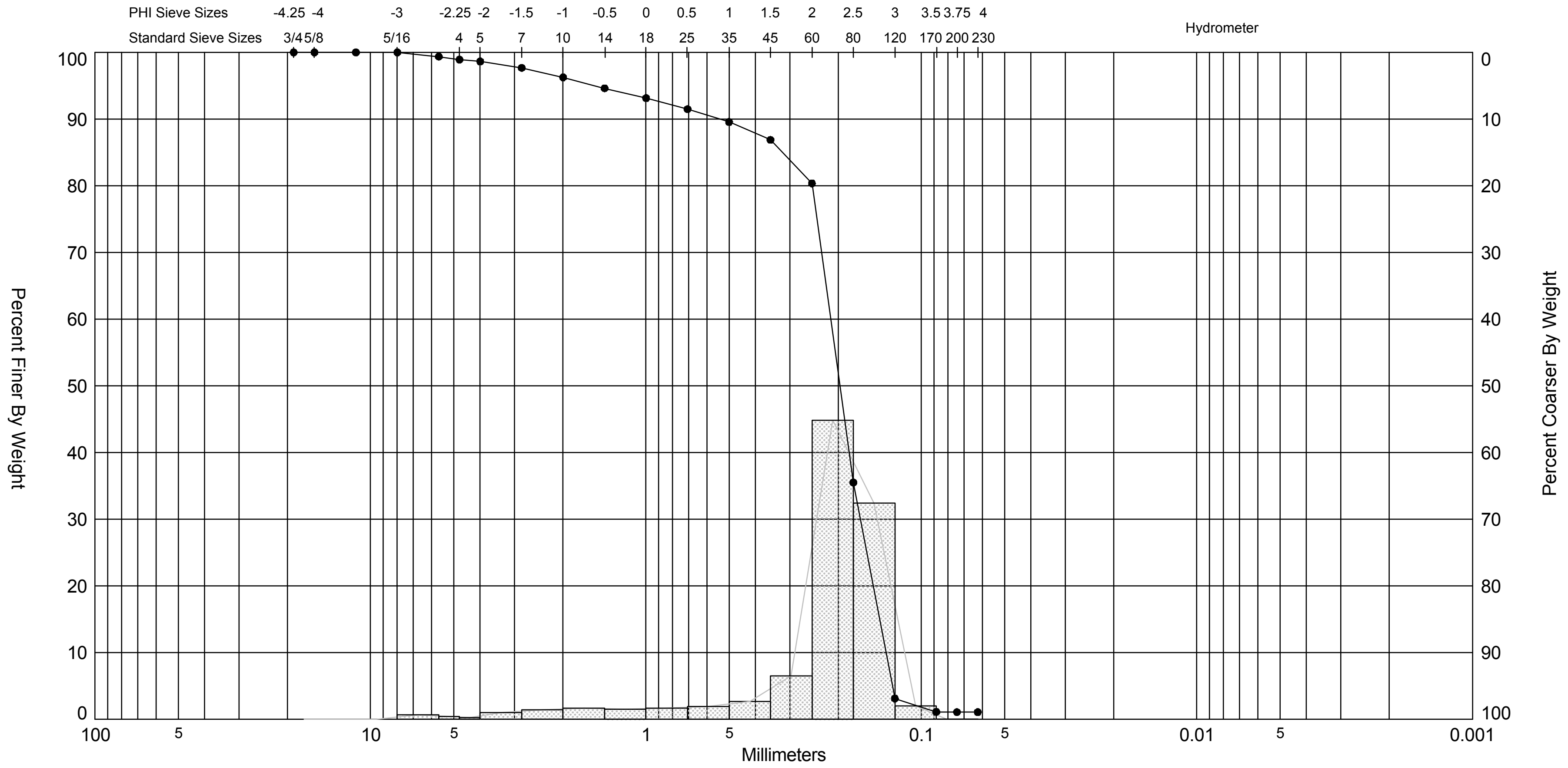

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-13 #2	●	-7.5	SW	#200 - 1.07 #230 - 1.06			2.34	2.07	-2.54	9.55	1.05

Comments:

Depths and elevations based on measured values

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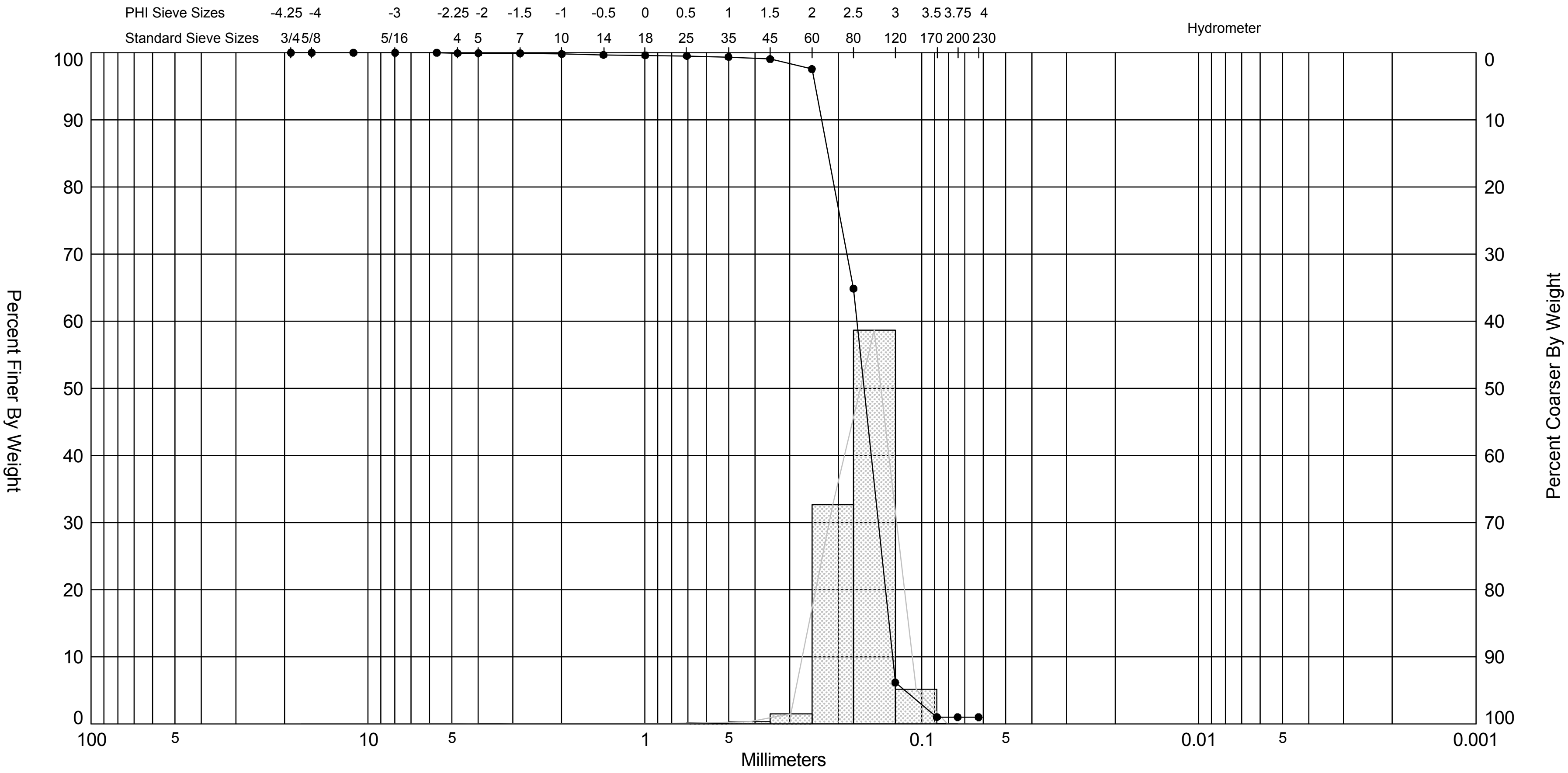
Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	MC
Easting (X, ft):	430,866
Northing (Y, ft):	1,130,639
Horizontal System:	NAD 1983
Vertical System:	NAVD 88



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-13 #3	—●—	-12.5	SP	#200 - 1.01 #230 - 1.01			2.63	2.57	-3.93	39.04	0.4

Comments:

Depths and elevations based on measured values

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Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	MC
Easting (X, ft):	430,866
Northing (Y, ft):	1,130,639
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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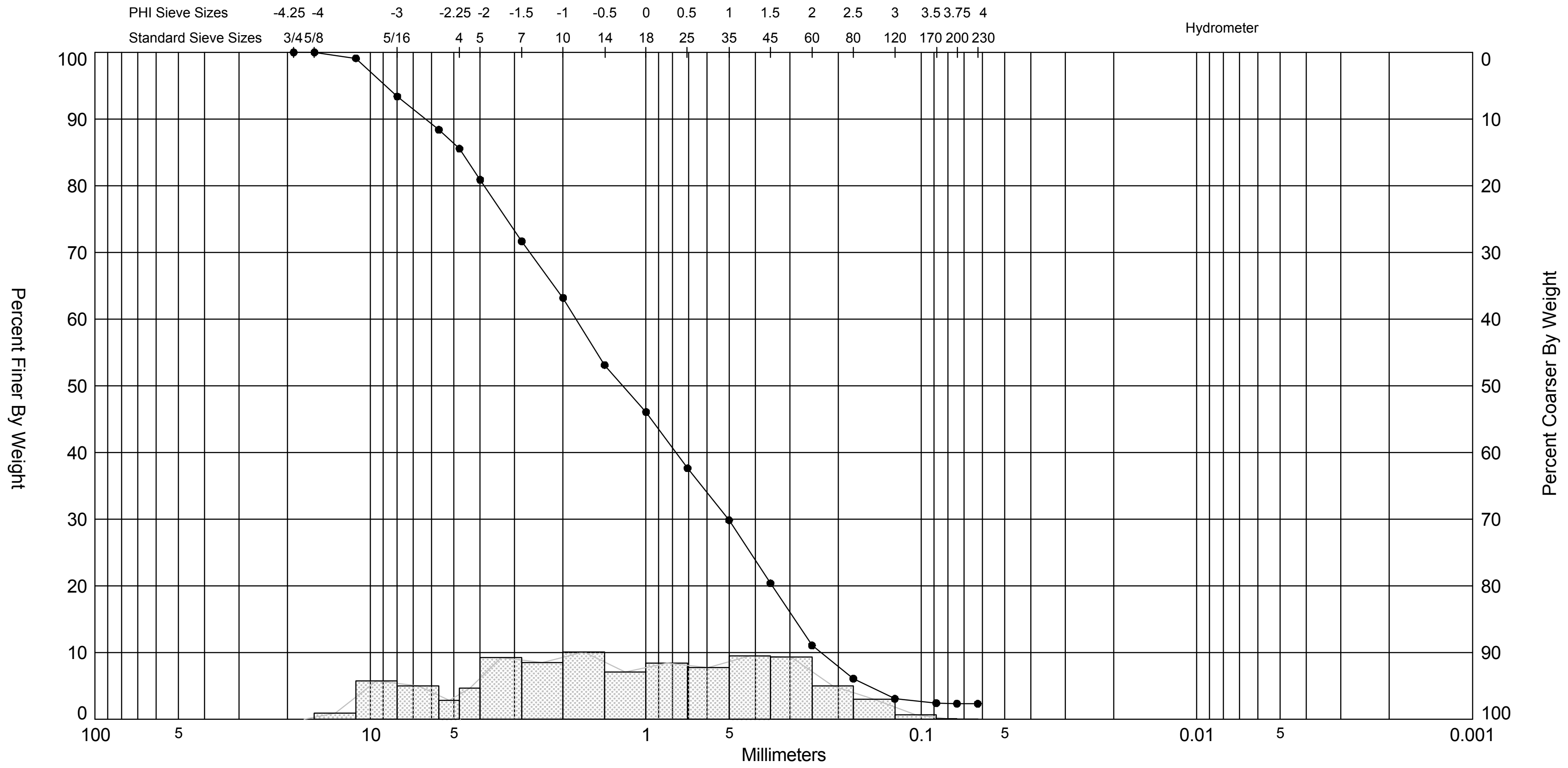

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-13 #4	—●—	-16.4	SW	#200 - 2.34 #230 - 2.32				-0.31	-0.02	1.99	1.72

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	MC
Easting (X, ft):	430,866
Northing (Y, ft):	1,130,639
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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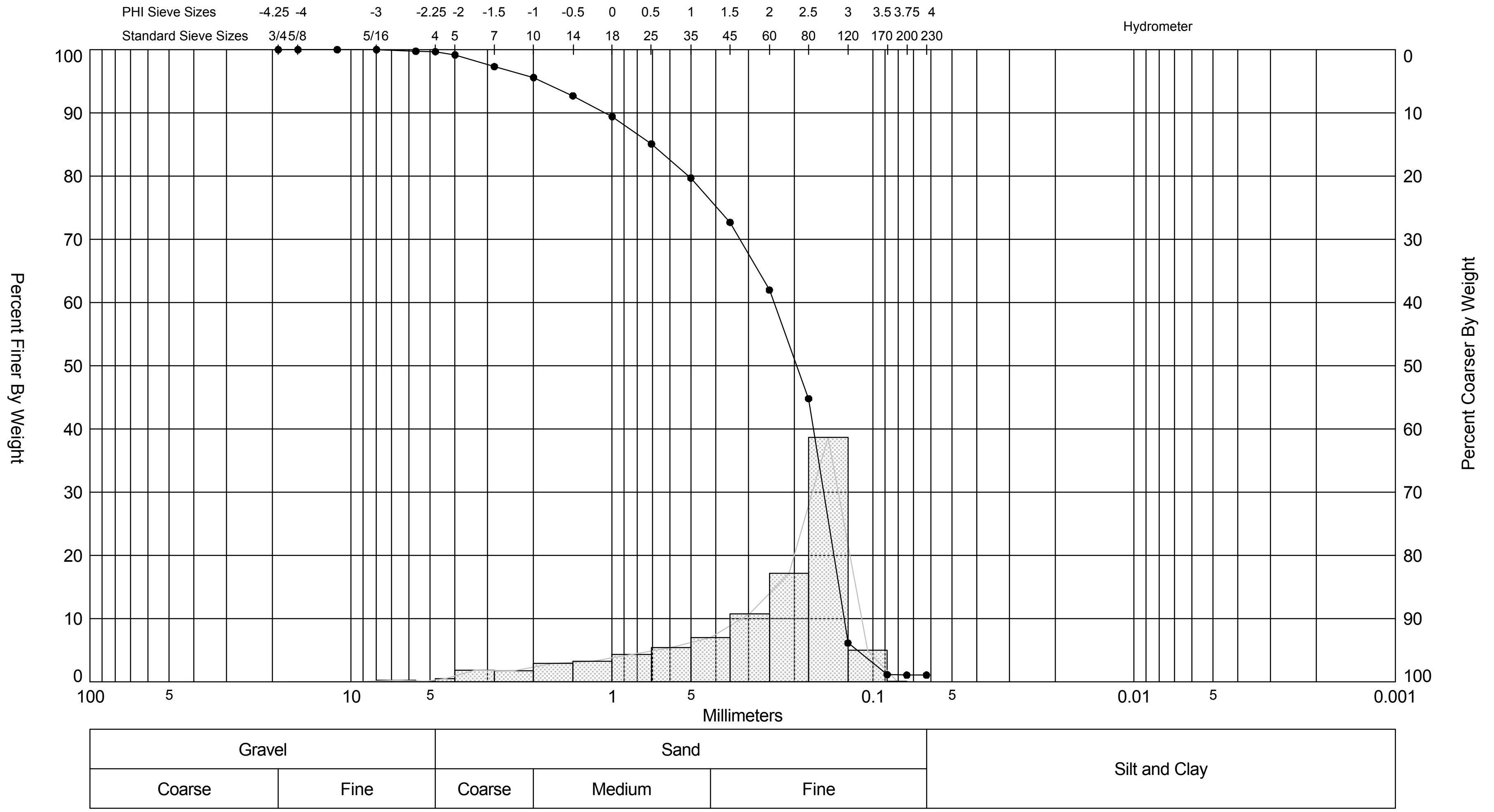

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-14 #1	—●—	-6.9	SW	#200 - 1.05 #230 - 1.05			2.35	1.86	-1.4	4.28	1.25

Comments:

Depths and elevations based on measured values

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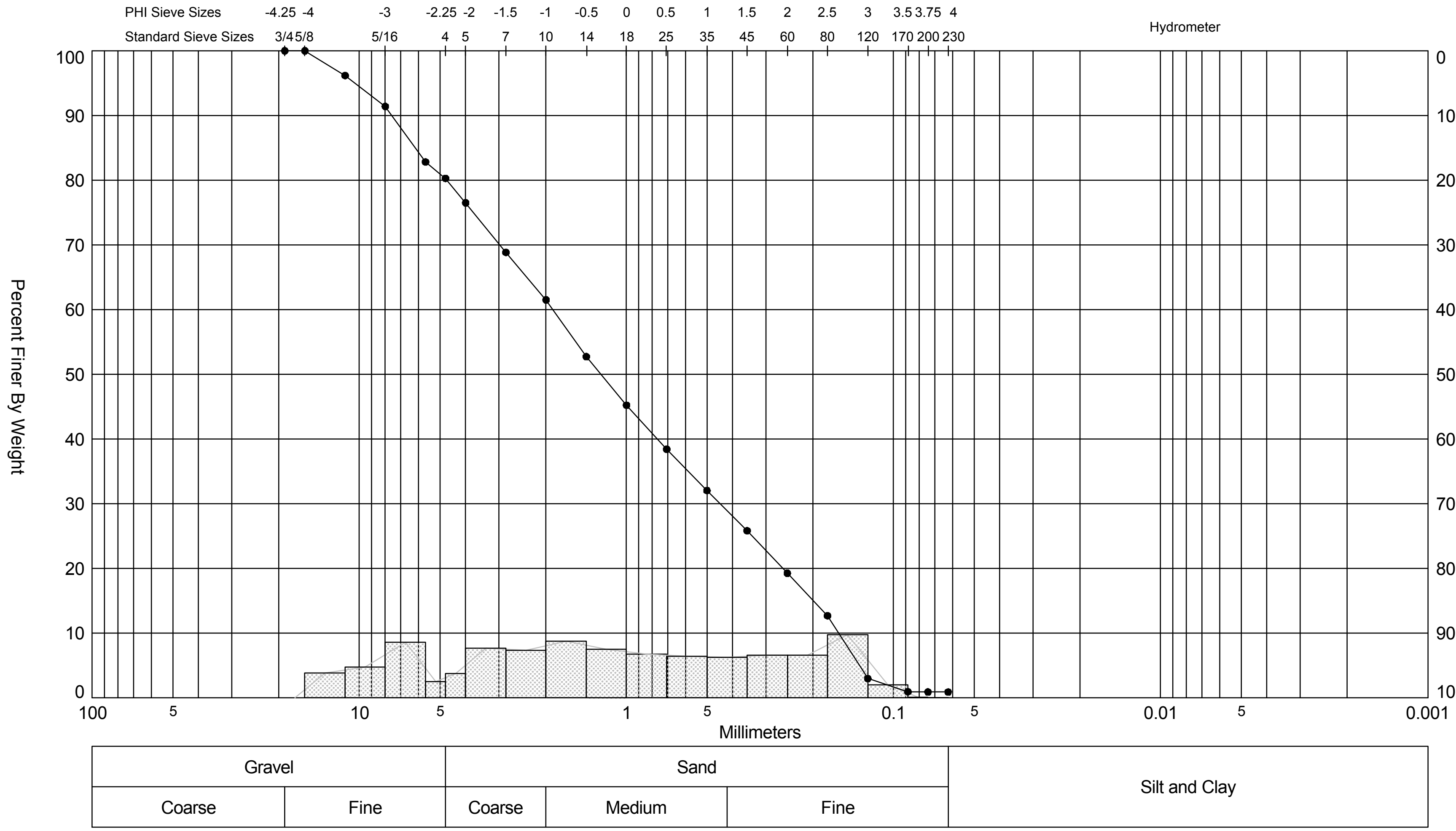
Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	AU
Easting (X, ft):	431,287
Northing (Y, ft):	1,130,625
Horizontal System:	NAD 1983
Vertical System:	NAVD 88



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-14 #2	—●—	-7.8	SW	#200 - 0.89 #230 - 0.88				-0.25	0.03	1.85	2

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	AU
Easting (X, ft):	431,287
Northing (Y, ft):	1,130,625
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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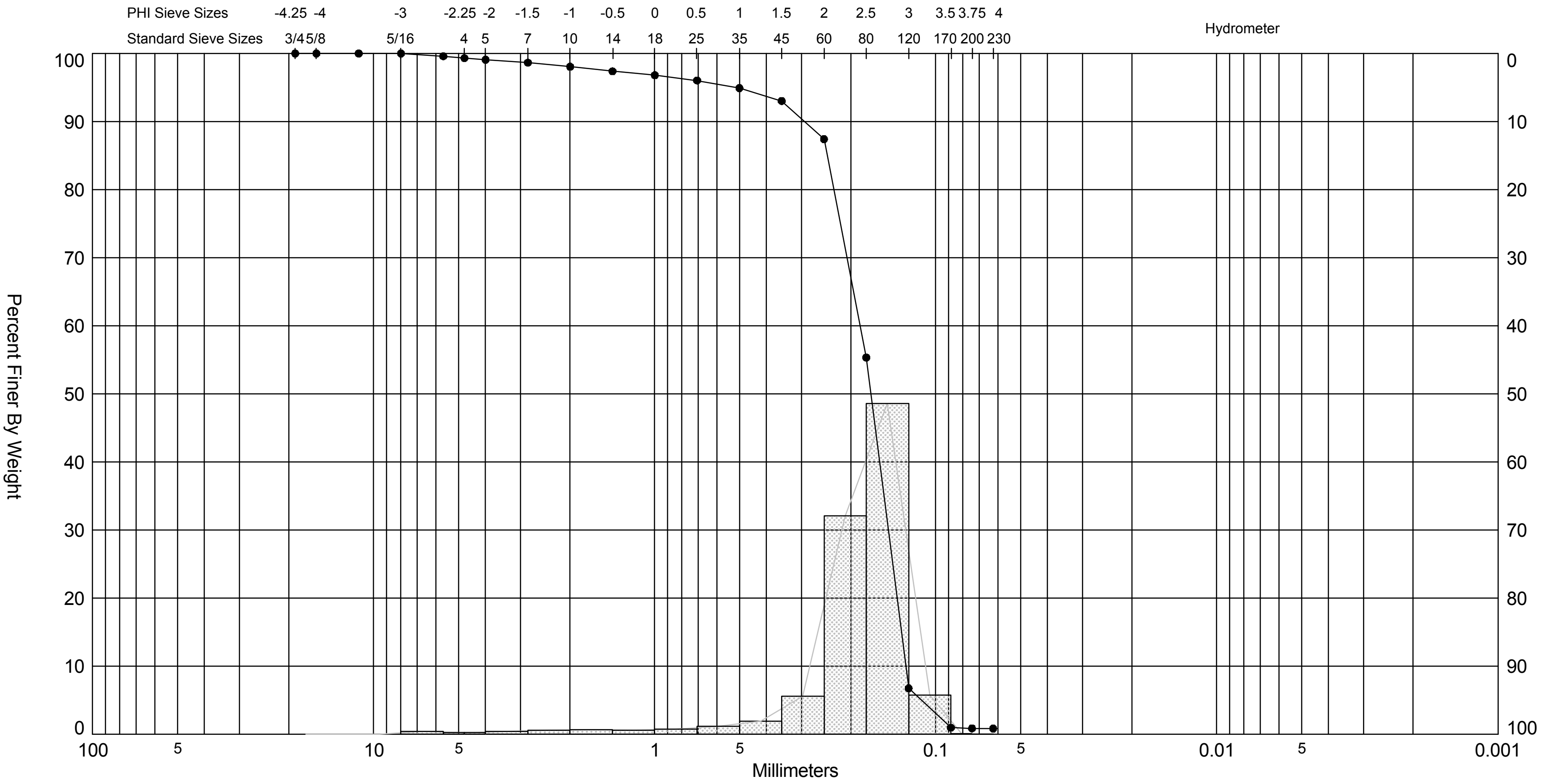

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-14 #3	—●—	-10.4	SP	#200 - 0.86 #230 - 0.83			2.55	2.36	-3.4	17.17	0.84

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	AU
Easting (X, ft):	431,287
Northing (Y, ft):	1,130,625
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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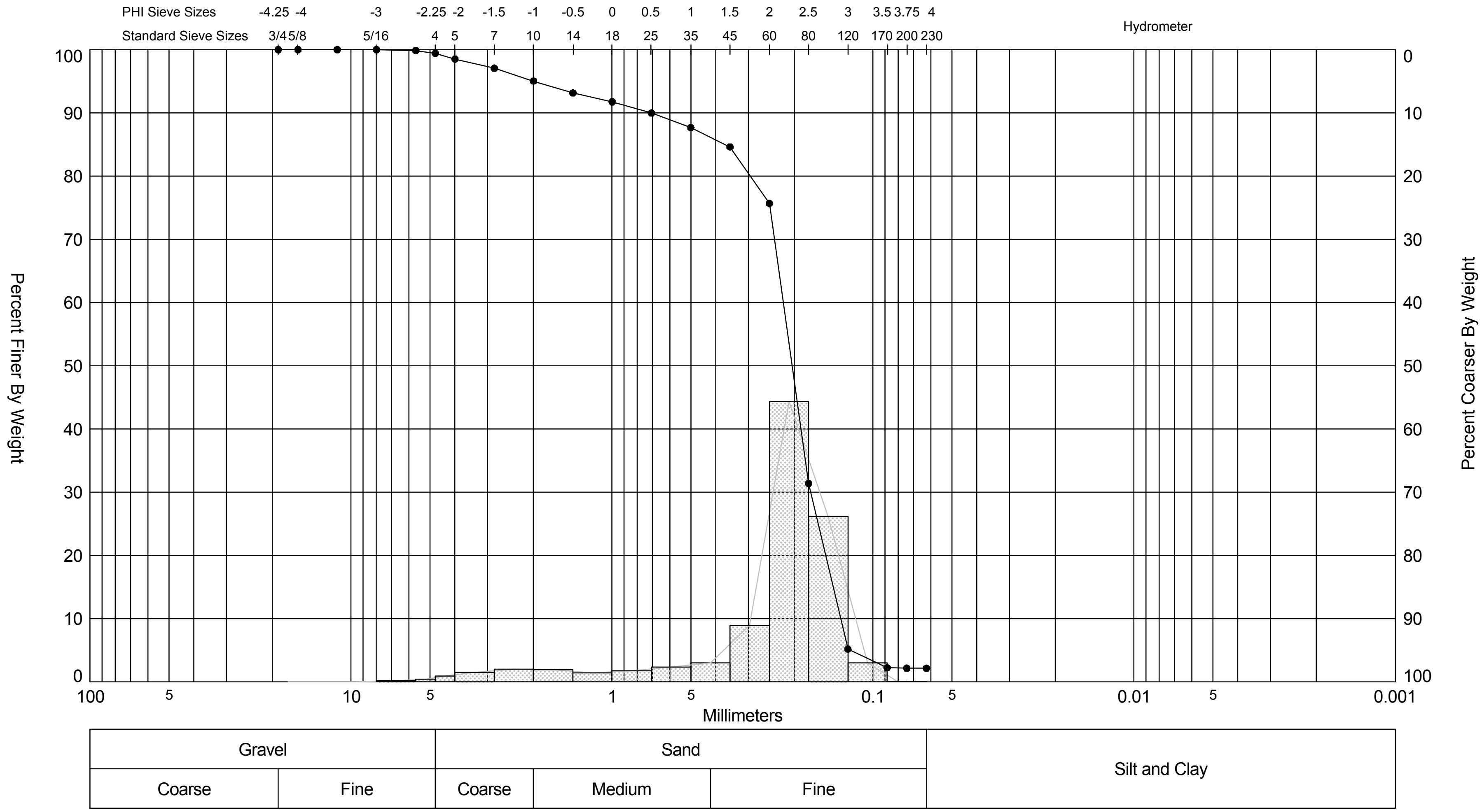

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-14 #4	—●—	-13.4	SW	#200 - 2.14 #230 - 2.13			2.29	1.97	-2.18	7.39	1.12

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	MC
Easting (X, ft):	431,287
Northing (Y, ft):	1,130,625
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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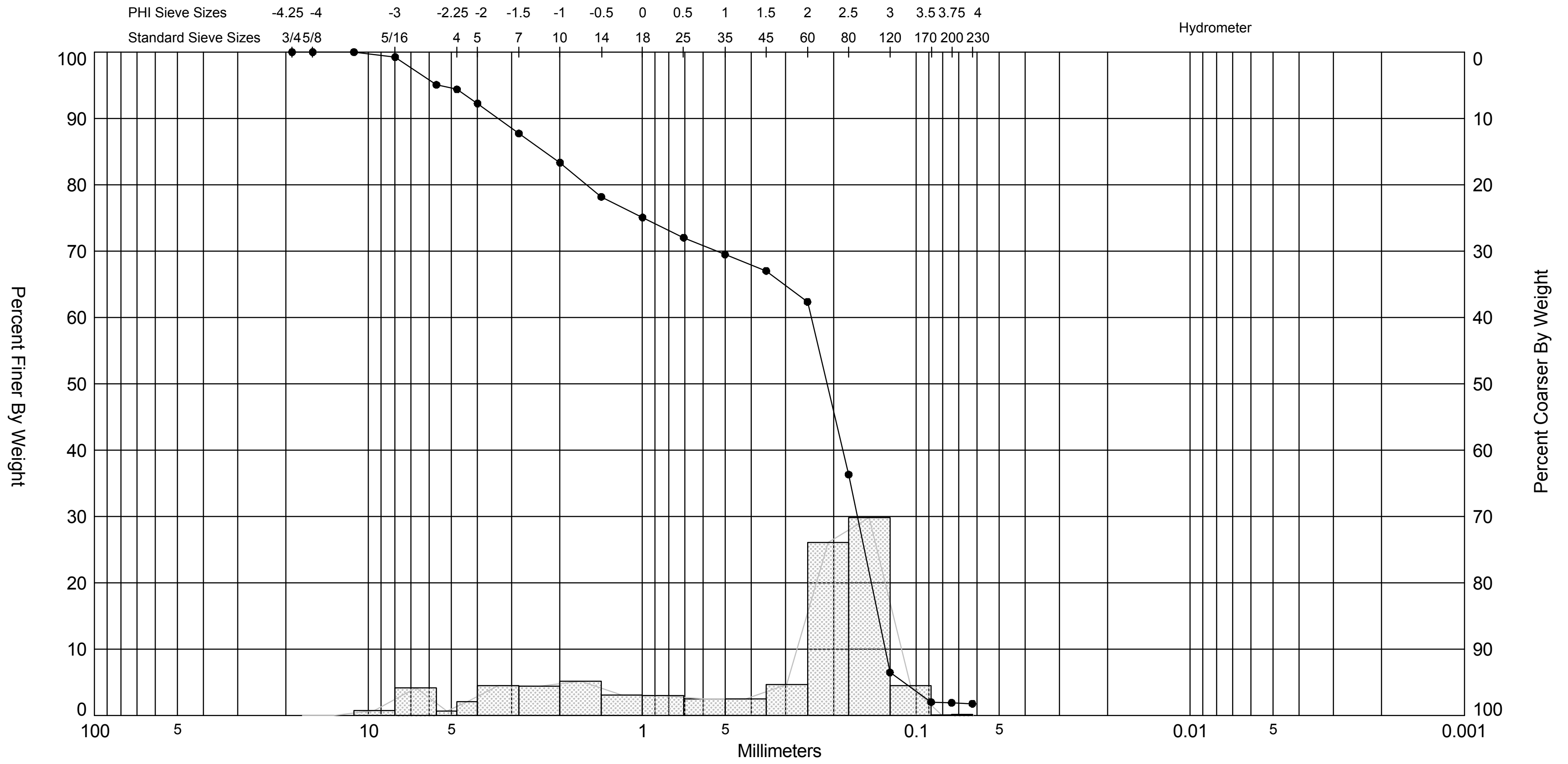

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-14 #5	—●—	-18.6	SW	#200 - 1.91 #230 - 1.78			2.24	1.34	-1.04	2.64	1.83

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	MC
Easting (X, ft):	431,287
Northing (Y, ft):	1,130,625
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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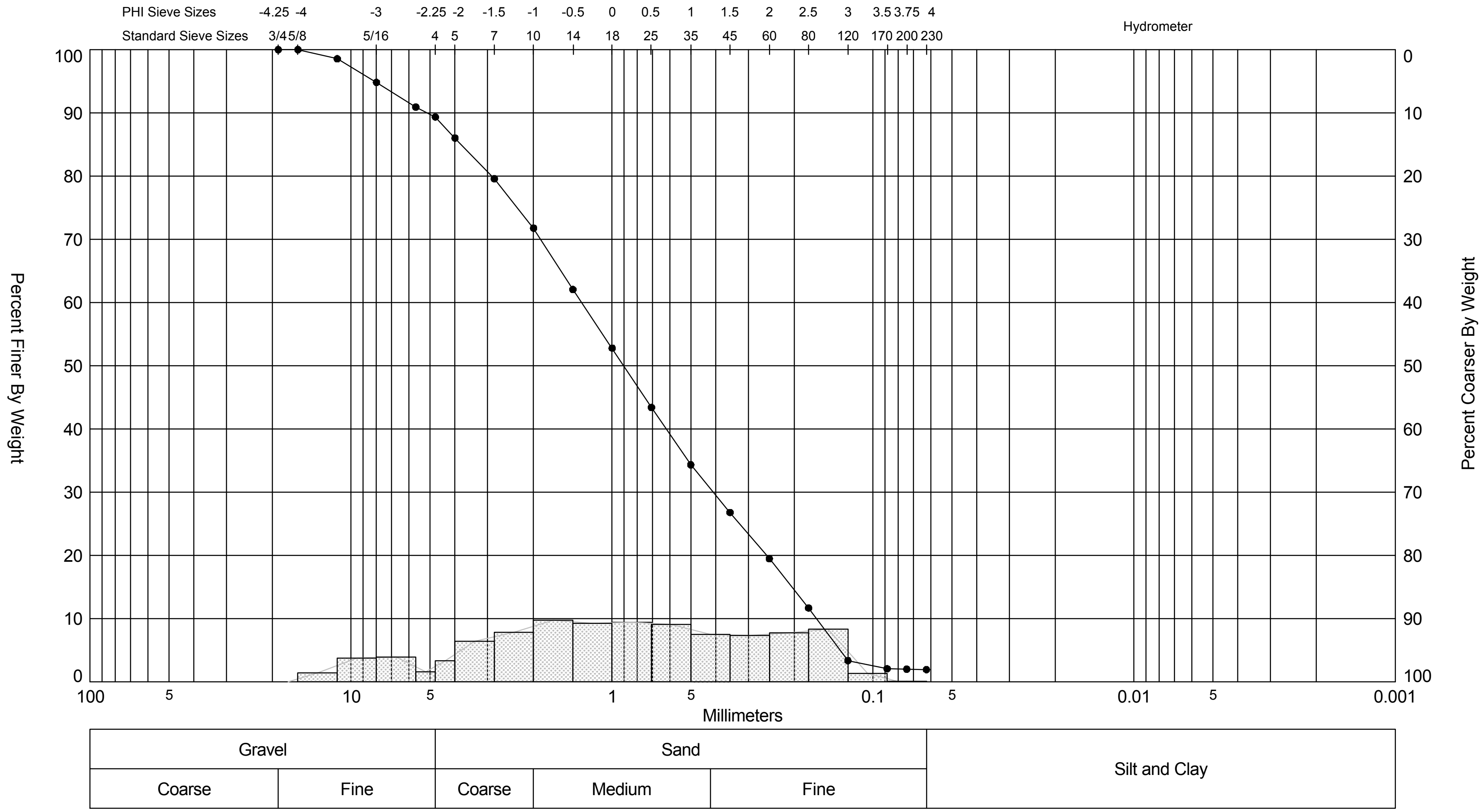

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-15 #1	—●—	-12.7	SW	#200 - 2.00 #230 - 1.93			0.15	0.07	-0.16	2.14	1.77

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	AU
Easting (X, ft):	432,201
Northing (Y, ft):	1,130,972
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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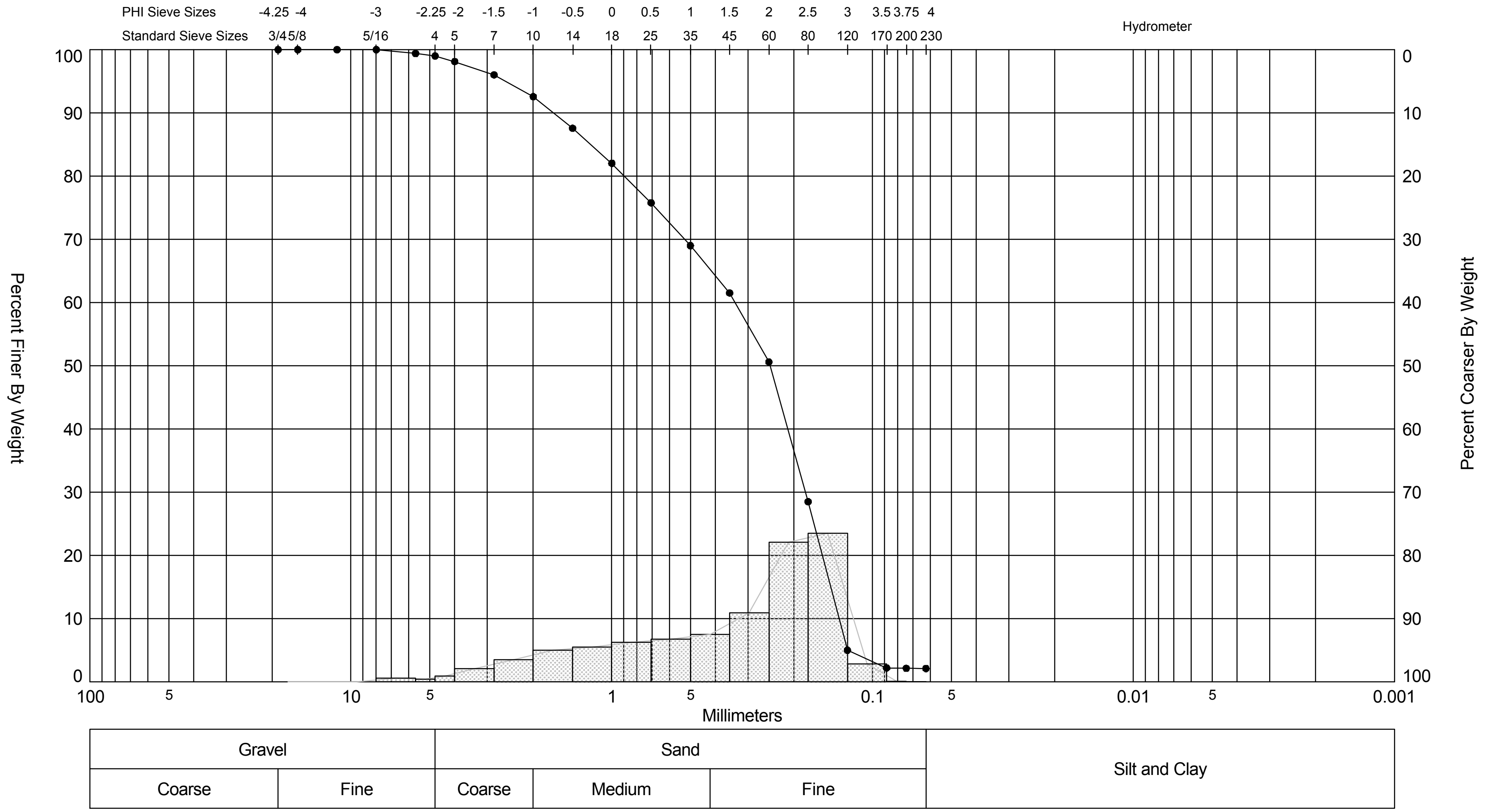

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-15 #2	—●—	-15.6	SW	#200 - 2.13 #230 - 2.11			2.01	1.44	-0.94	2.93	1.4

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	AU
Easting (X, ft):	432,201
Northing (Y, ft):	1,130,972
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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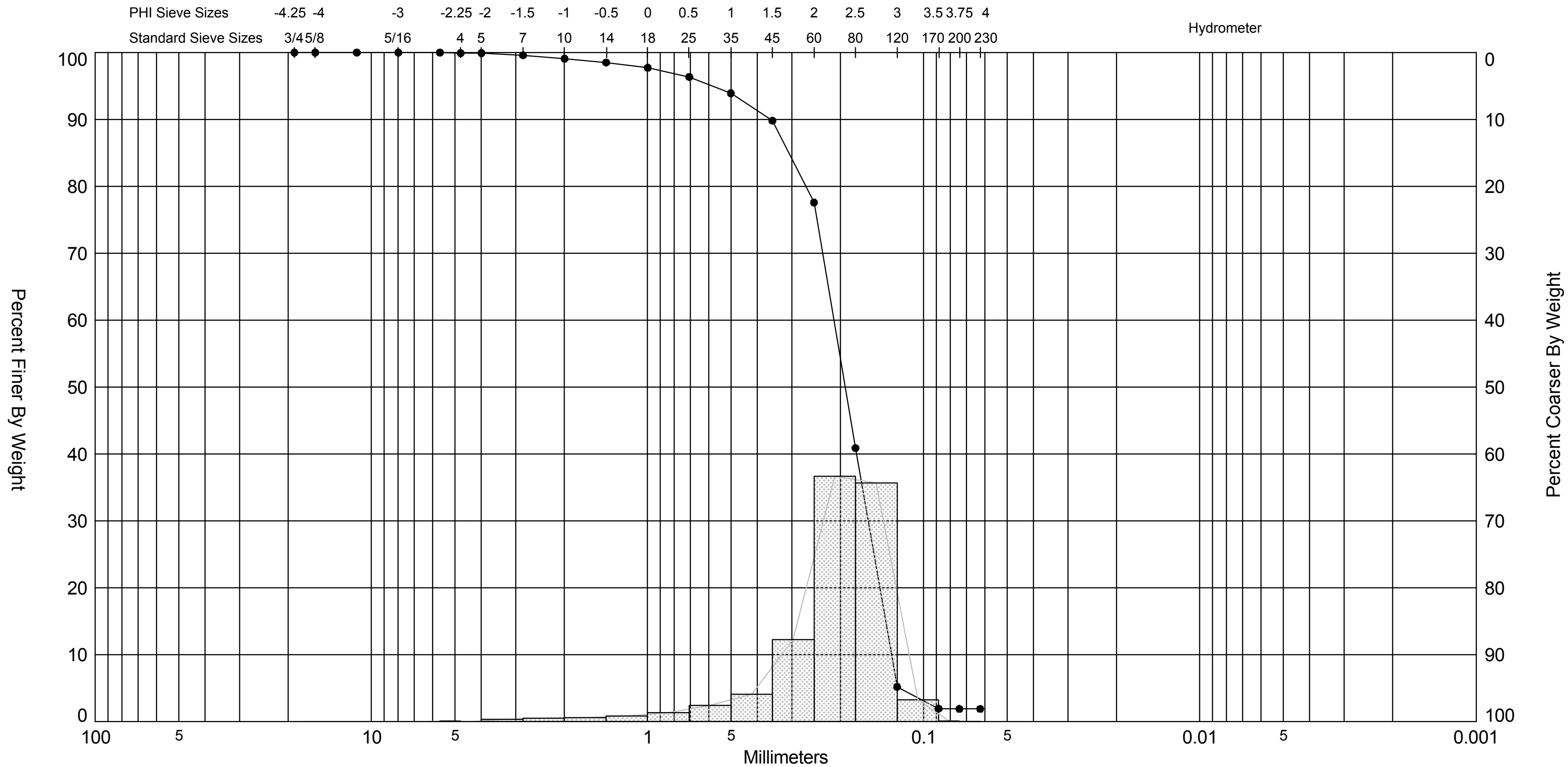

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-15 #3	—●—	-19.2	SP	#200 - 1.89 #230 - 1.88			2.38	2.22	-2.29	10.51	0.74

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	AU
Easting (X, ft):	432,201
Northing (Y, ft):	1,130,972
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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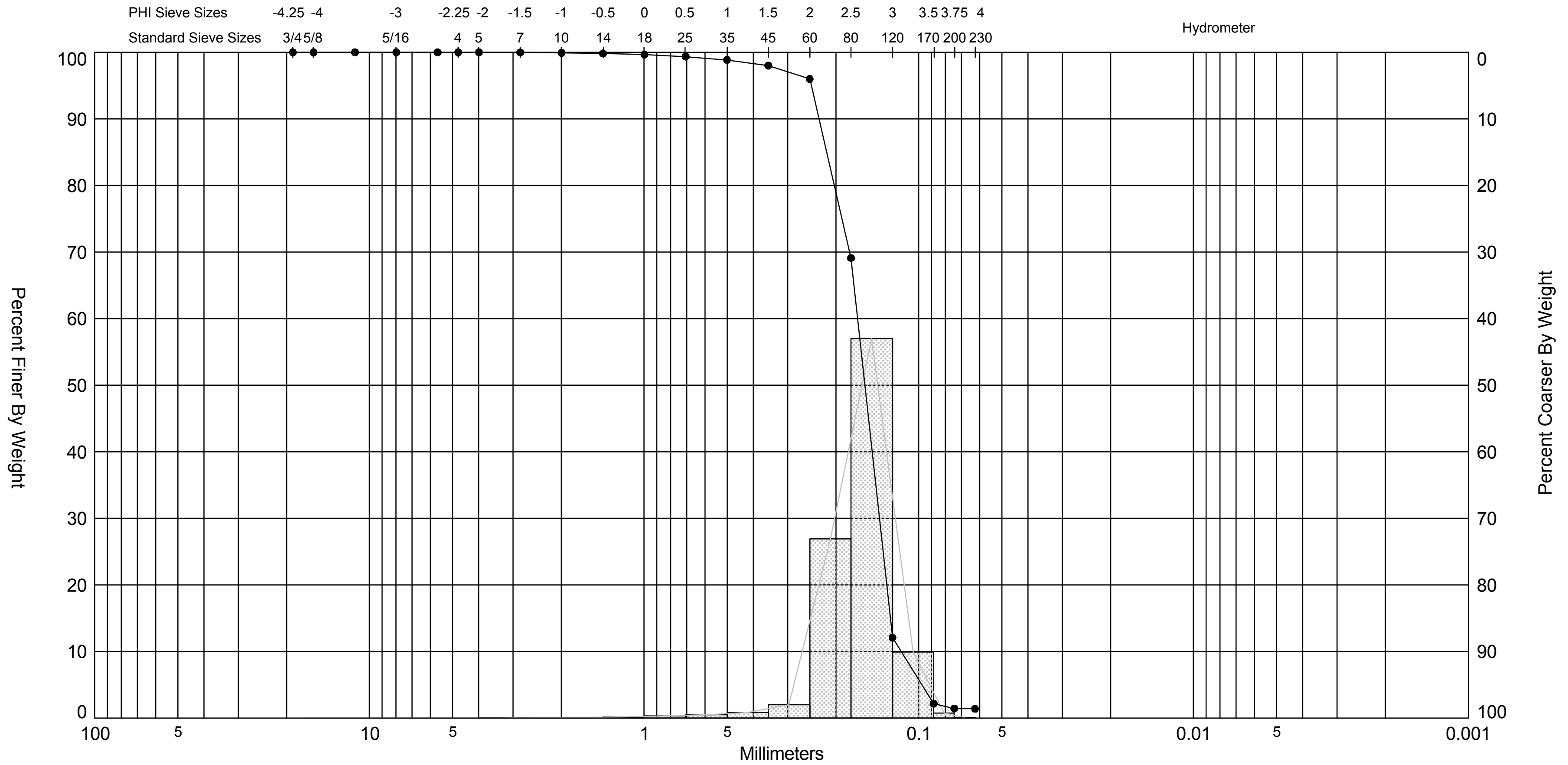

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-17 #1	—●—	-8.9	SP	#200 - 1.44 #230 - 1.39			2.67	2.61	-2.37	16.98	0.45

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-09-07
Analyzed By:	MC
Easting (X, ft):	430,589
Northing (Y, ft):	1,144,145
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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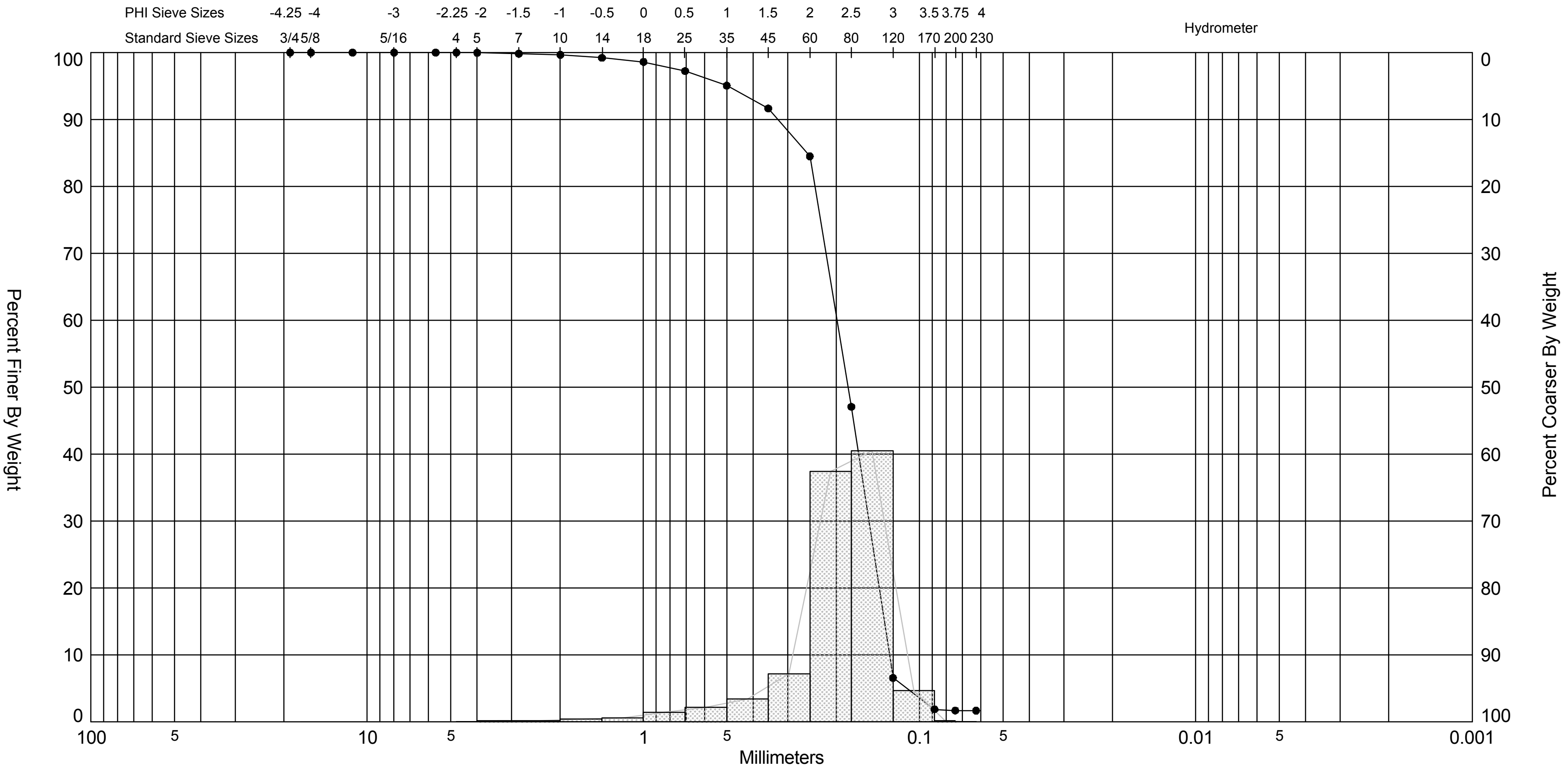

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-18 #1	—●—	-5.5	SP	#200 - 1.69 #230 - 1.66			2.46	2.33	-2.24	10.52	0.66

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	MC
Easting (X, ft):	430,955
Northing (Y, ft):	1,144,486
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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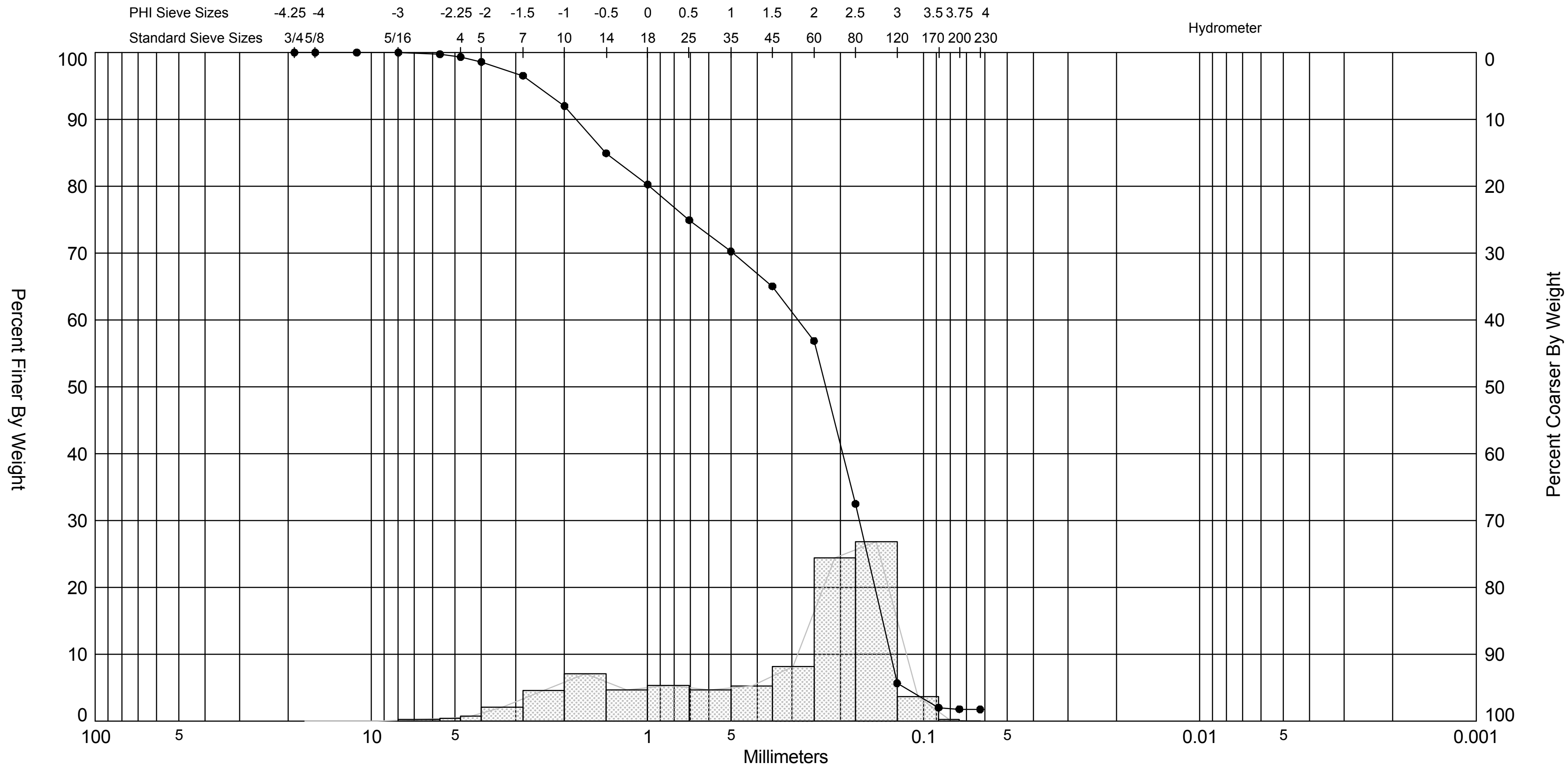

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-18 #2	—●—	-6.8	SW	#200 - 1.79 #230 - 1.75			2.14	1.51	-0.94	2.66	1.45

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	MC
Easting (X, ft):	430,955
Northing (Y, ft):	1,144,486
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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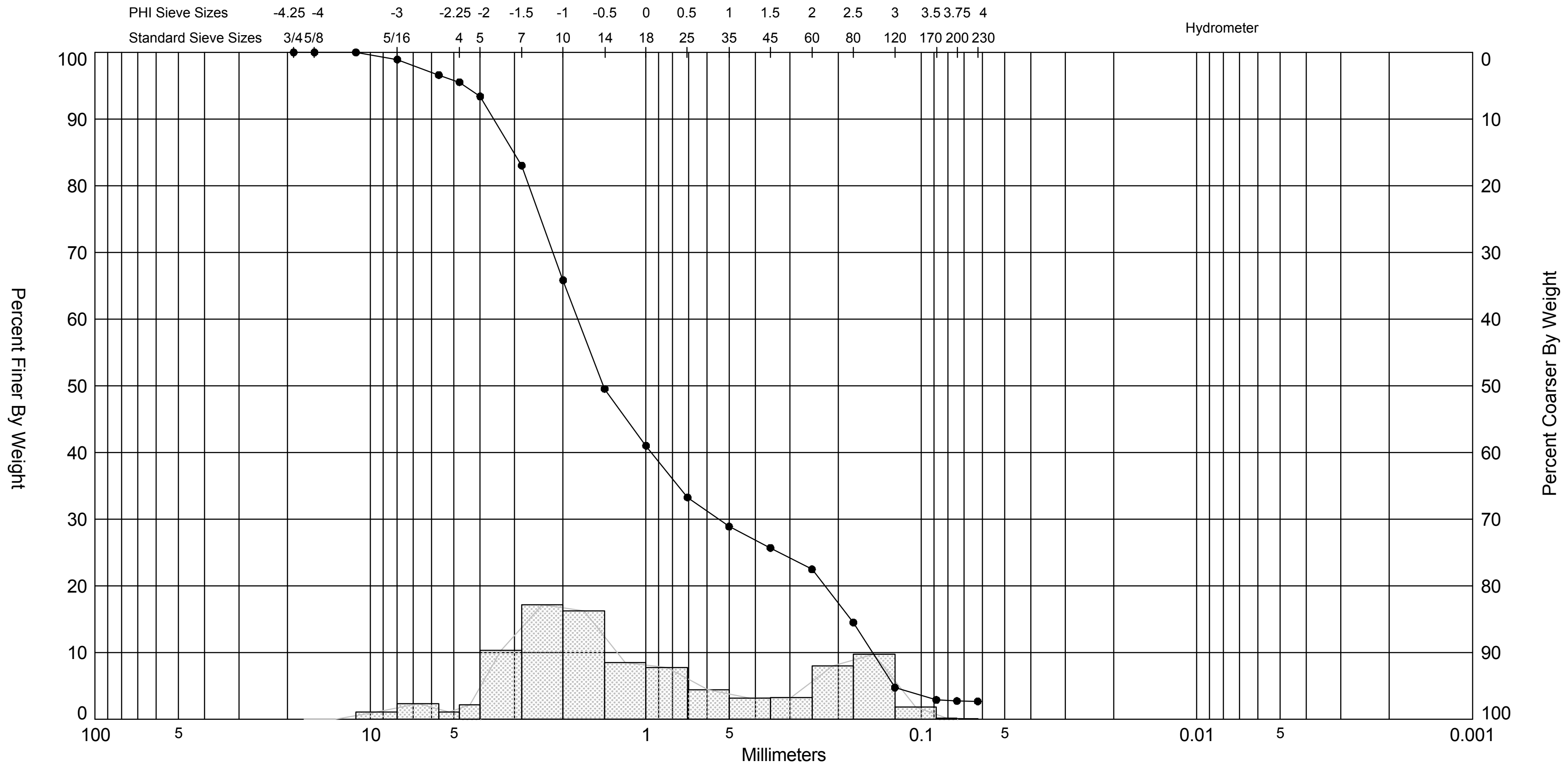

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-18 #3	—●—	-8.2	SW	#200 - 2.73 #230 - 2.68				-0.05	0.48	2.13	1.66

Comments:

Depths and elevations based on measured values

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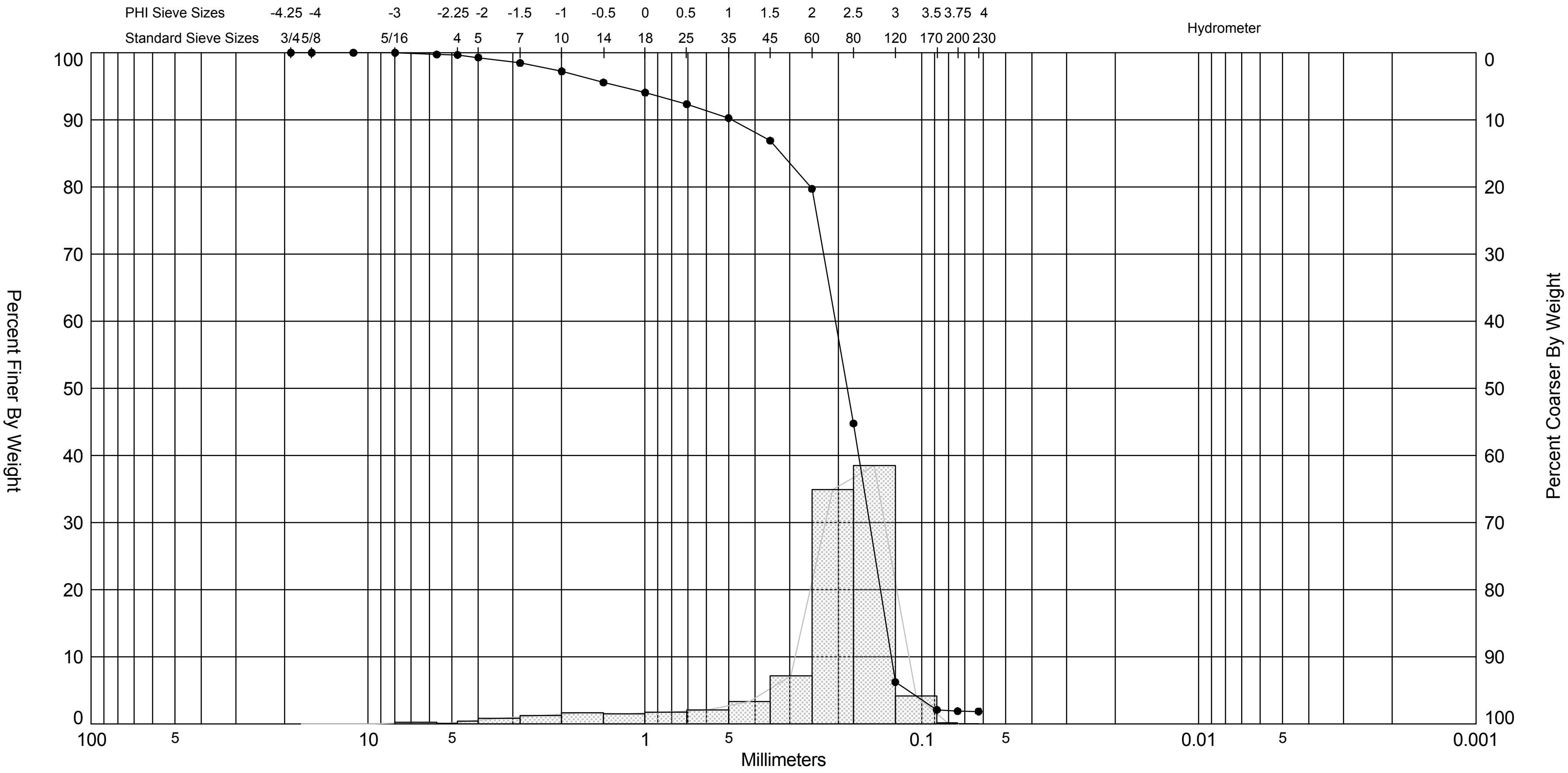
Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	MC
Easting (X, ft):	430,955
Northing (Y, ft):	1,144,486
Horizontal System:	NAD 1983
Vertical System:	NAVD 88



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-19 #1	—●—	-6.1	SW	#200 - 1.90 #230 - 1.86			2.43	2.15	-2.37	8.97	1

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-07-07
Analyzed By:	JF
Easting (X, ft):	431,156
Northing (Y, ft):	1,144,258
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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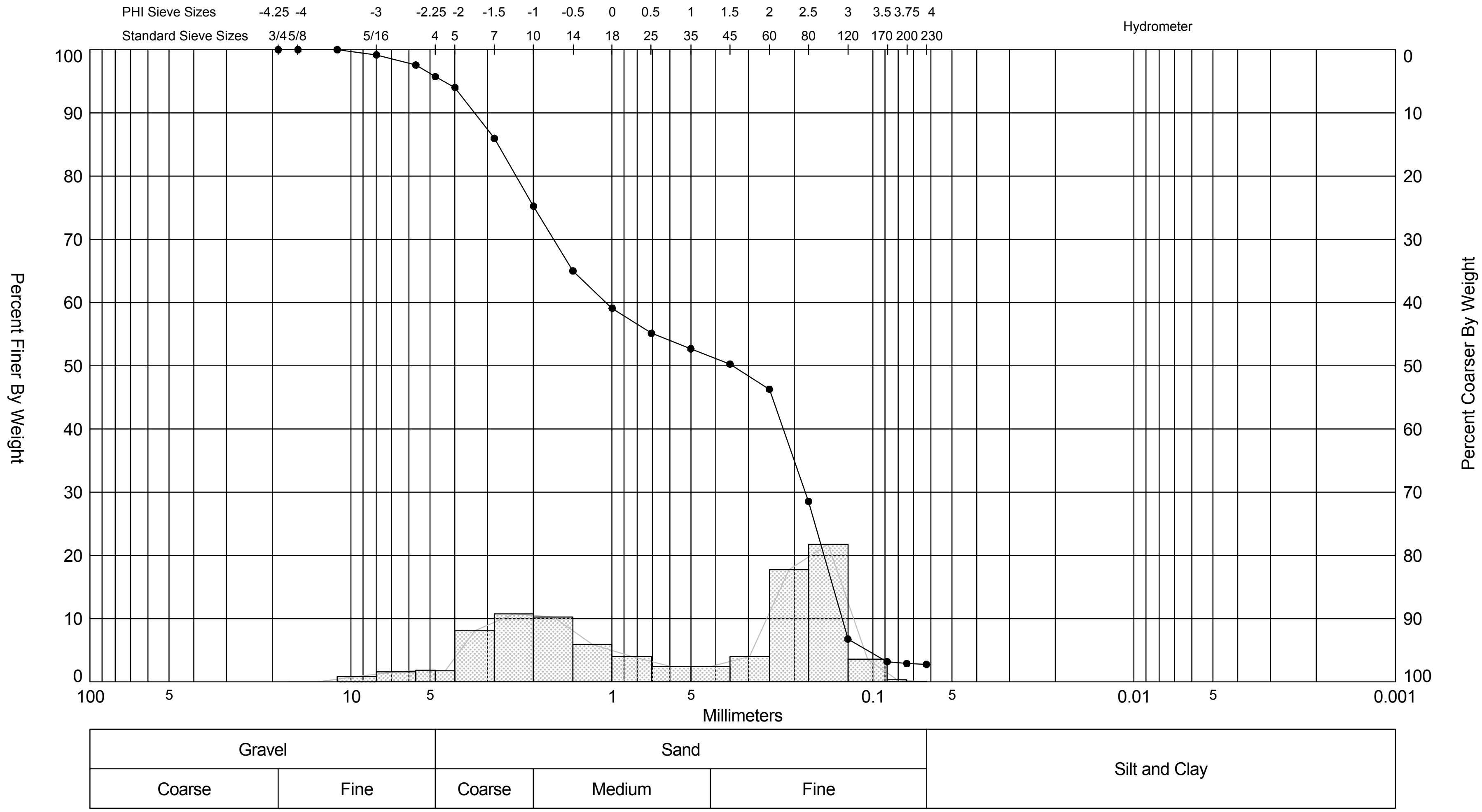

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-19 #2	—●—	-8.4	SW	#200 - 2.88 #230 - 2.76			1.53	0.76	-0.27	1.55	1.89

Comments:

Depths and elevations based on measured values

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Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-07-07
Analyzed By:	JF
Easting (X, ft):	431,156
Northing (Y, ft):	1,144,258
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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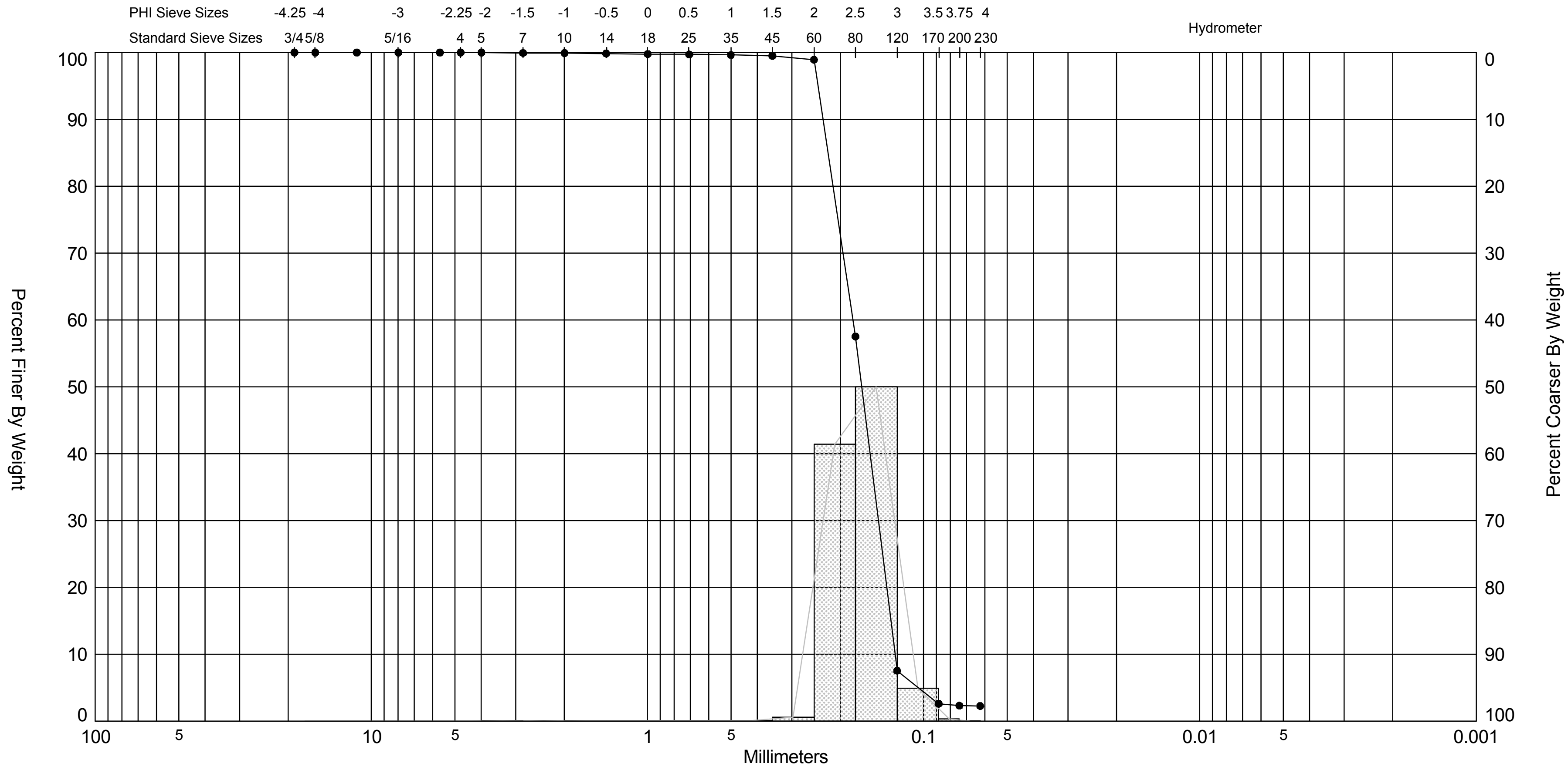

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-19 #3	—●—	-11.5	SP	#200 - 2.31 #230 - 2.27			2.58	2.55	-2.37	27.56	0.36

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-07-07
Analyzed By:	JF
Easting (X, ft):	431,156
Northing (Y, ft):	1,144,258
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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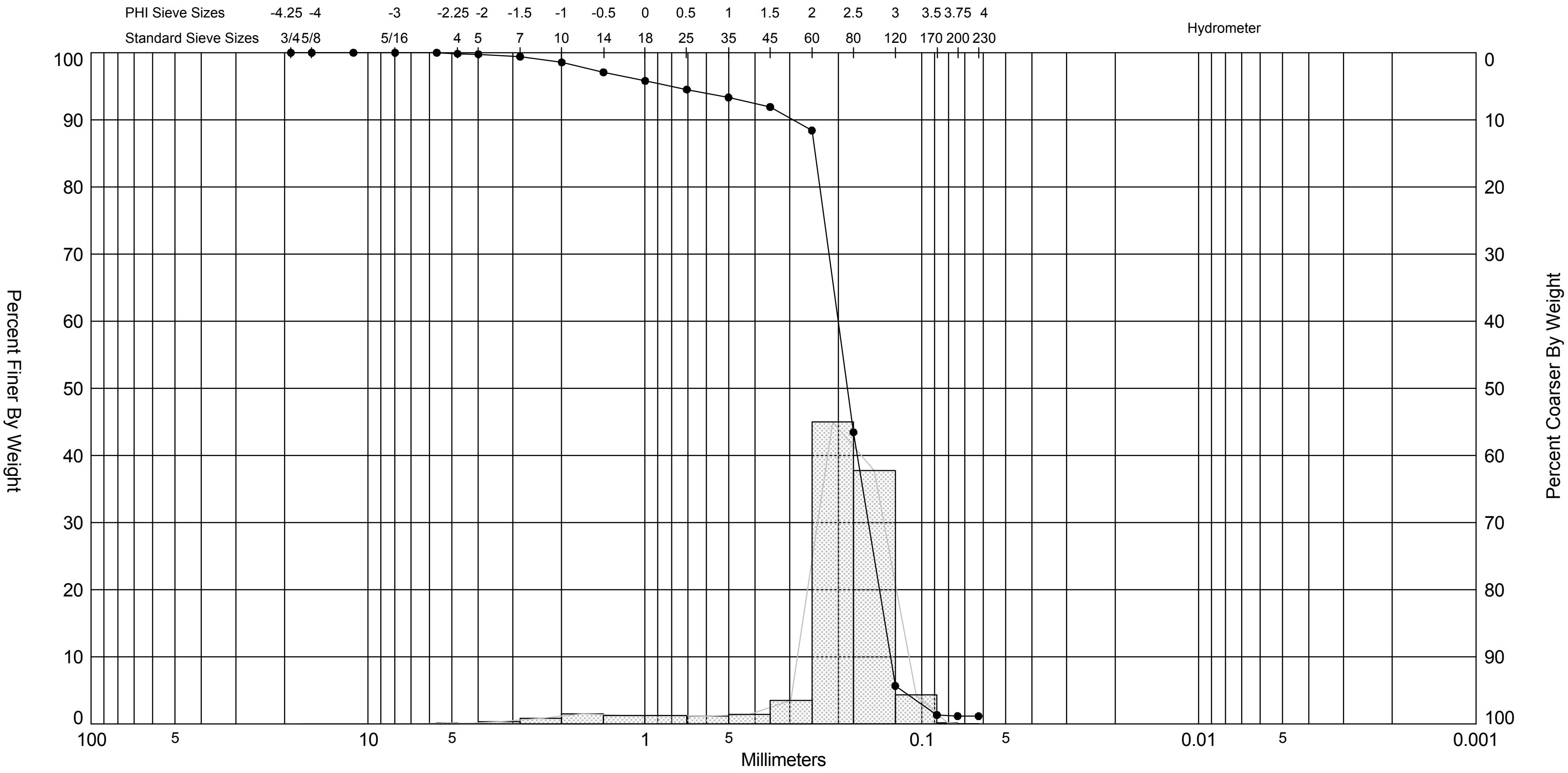

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-20 #1	—●—	-6.3	SP	#200 - 1.17 #230 - 1.15			2.43	2.28	-2.82	12.13	0.82

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	JF
Easting (X, ft):	430,935
Northing (Y, ft):	1,143,913
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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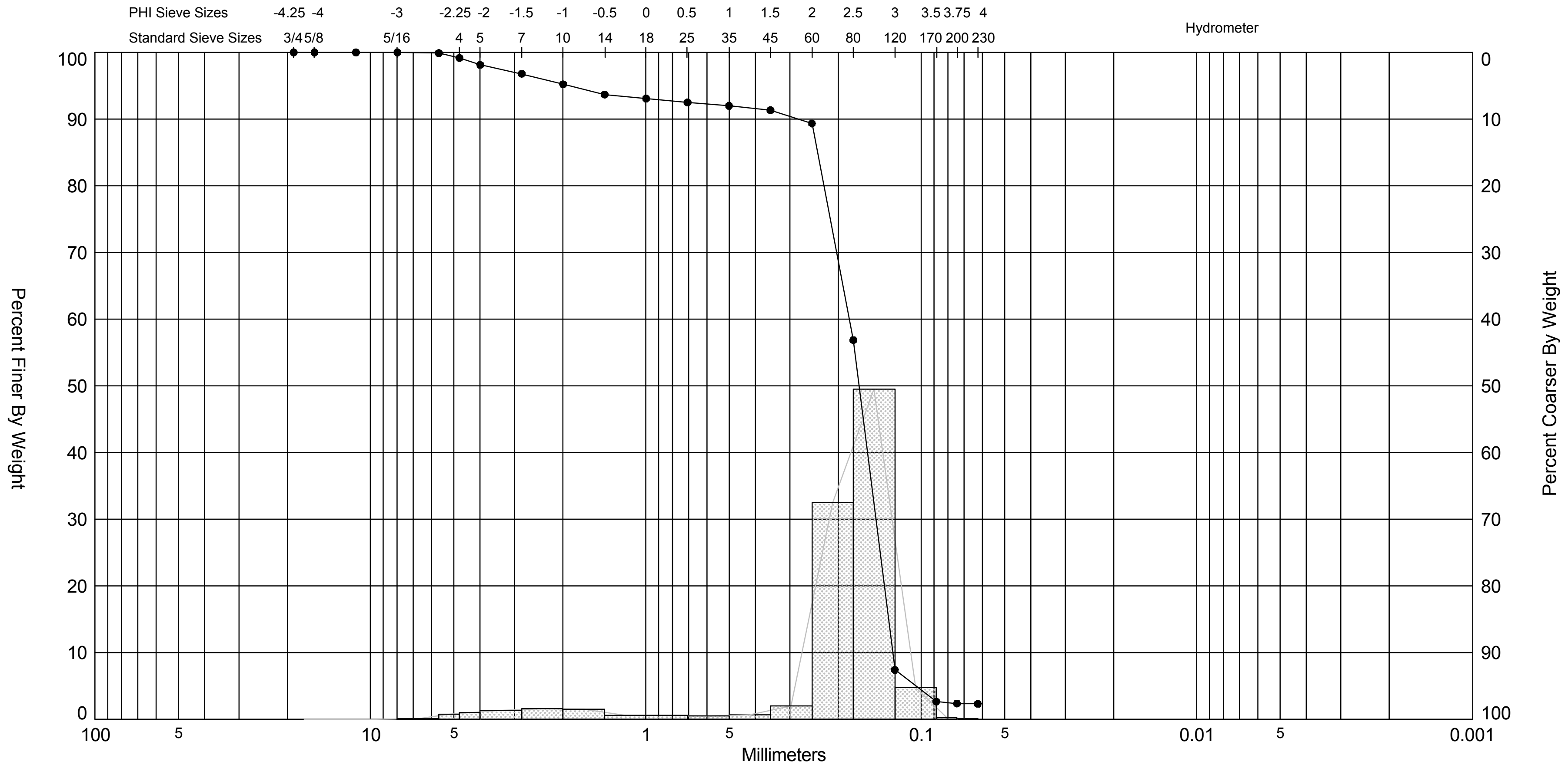

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-20 #2	—●—	-9.7	SW	#200 - 2.37 #230 - 2.30			2.57	2.26	-2.86	10.69	1.1

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	MC
Easting (X, ft):	430,935
Northing (Y, ft):	1,143,913
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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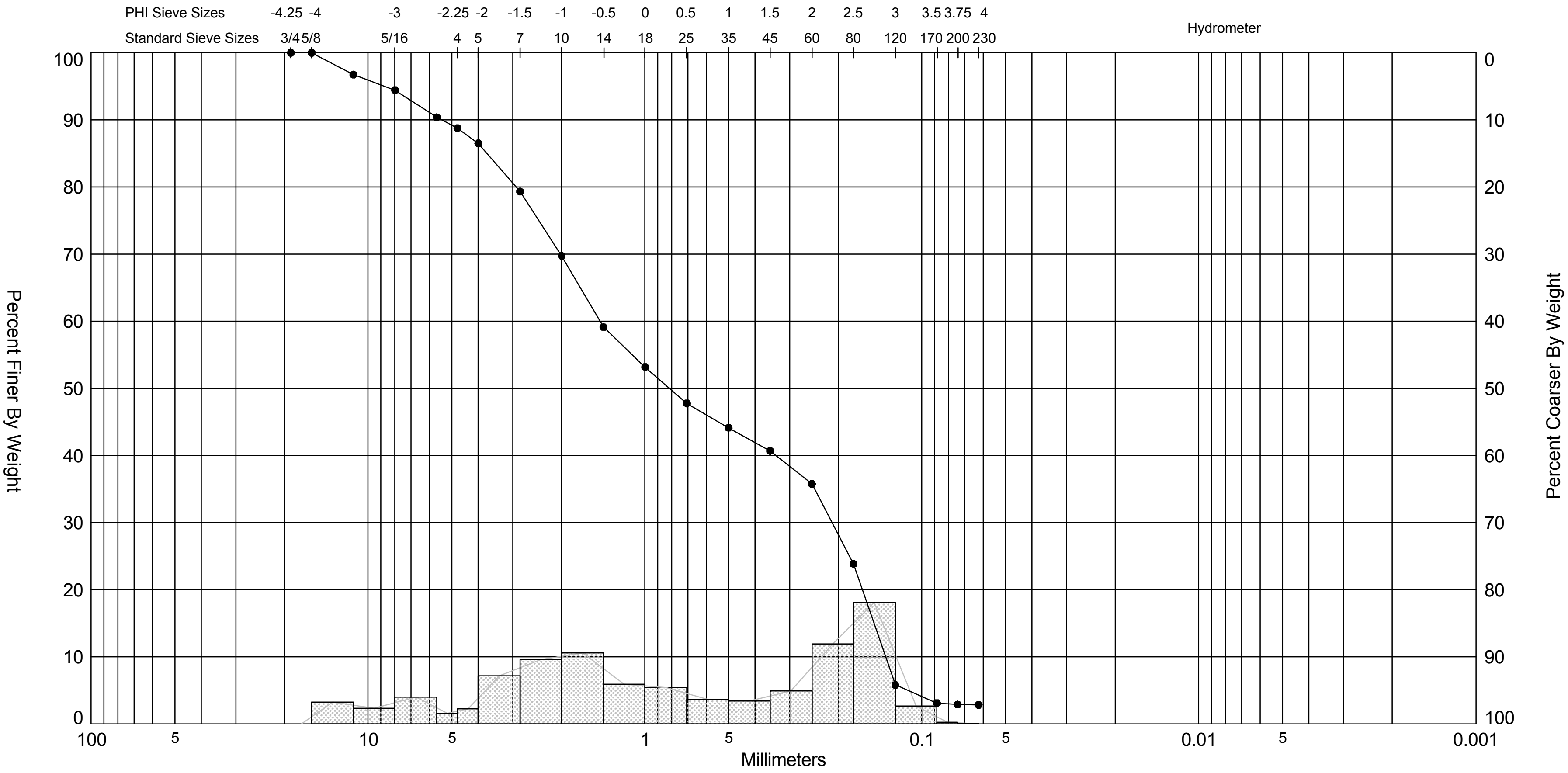

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
AMVC-07-20 #3	—●—	-10.9	SW	#200 - 2.88 #230 - 2.83			0.29	0.31	-0.2	1.79	2.05

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	Anna Maria 2007 Sand Search
Analysis Date:	03-08-07
Analyzed By:	MC
Easting (X, ft):	430,935
Northing (Y, ft):	1,143,913
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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APPENDIX 4

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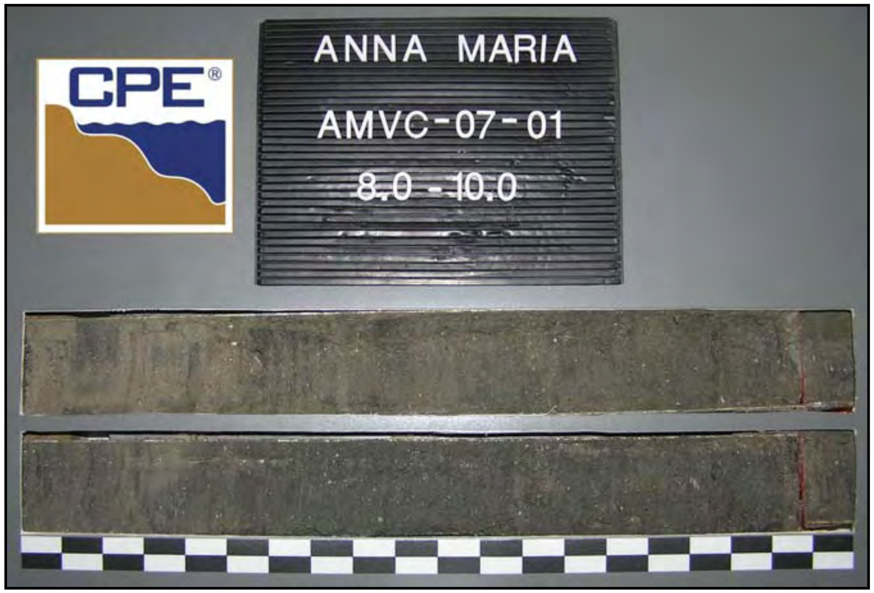
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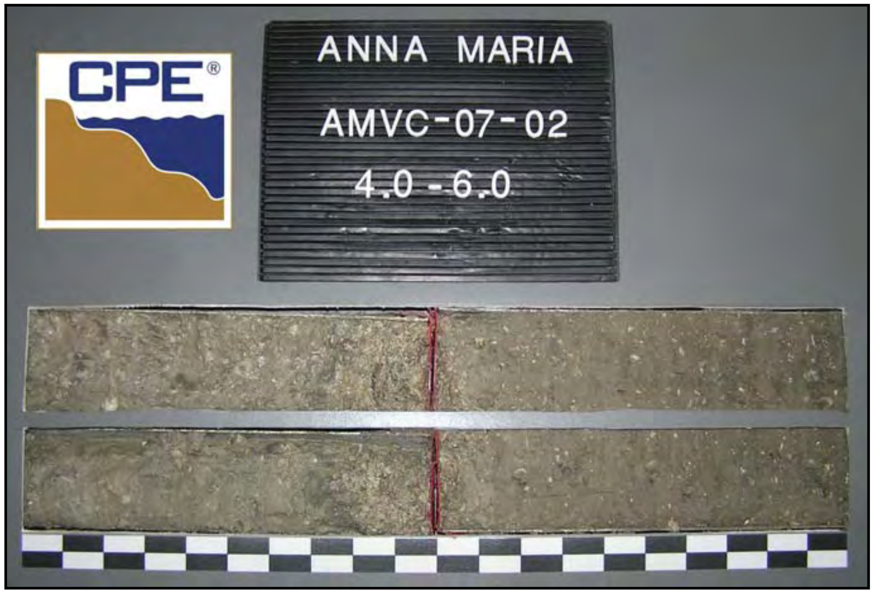
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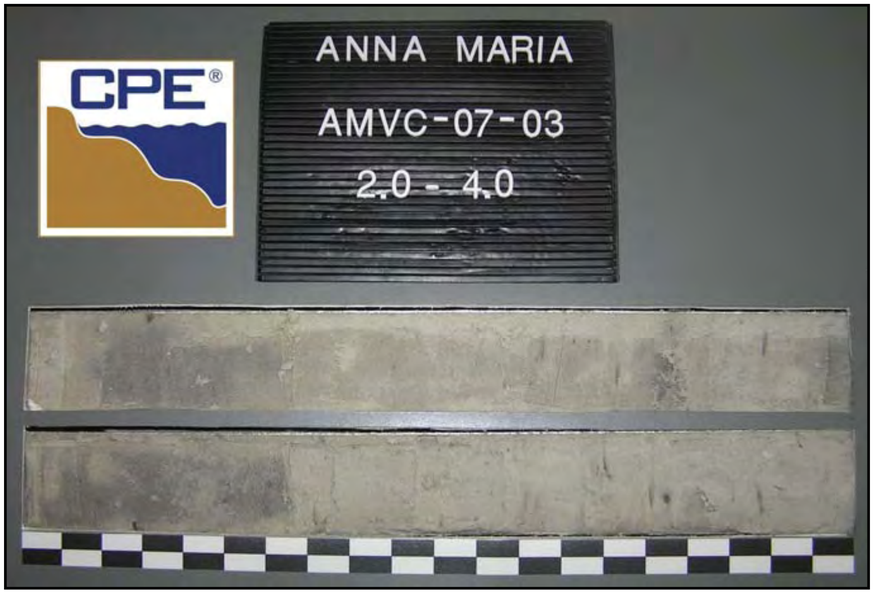
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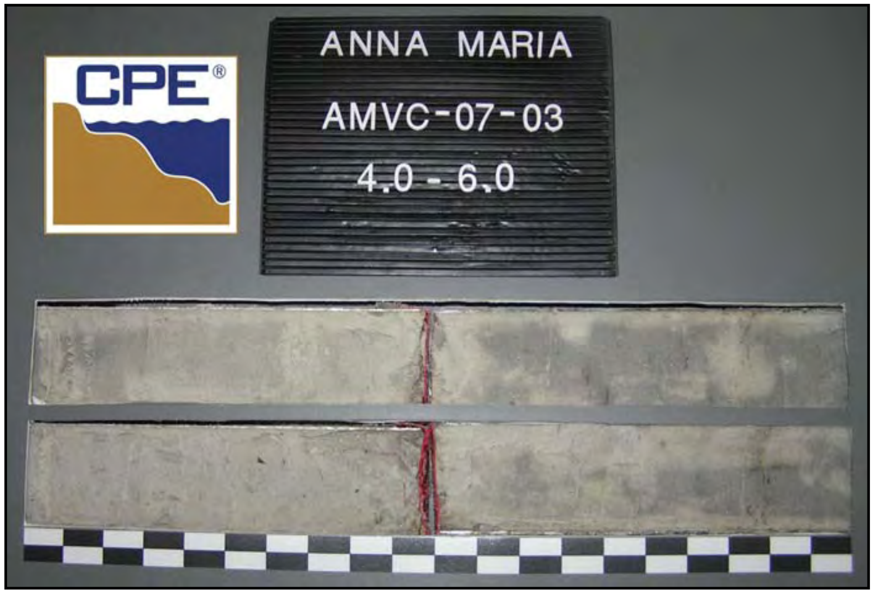
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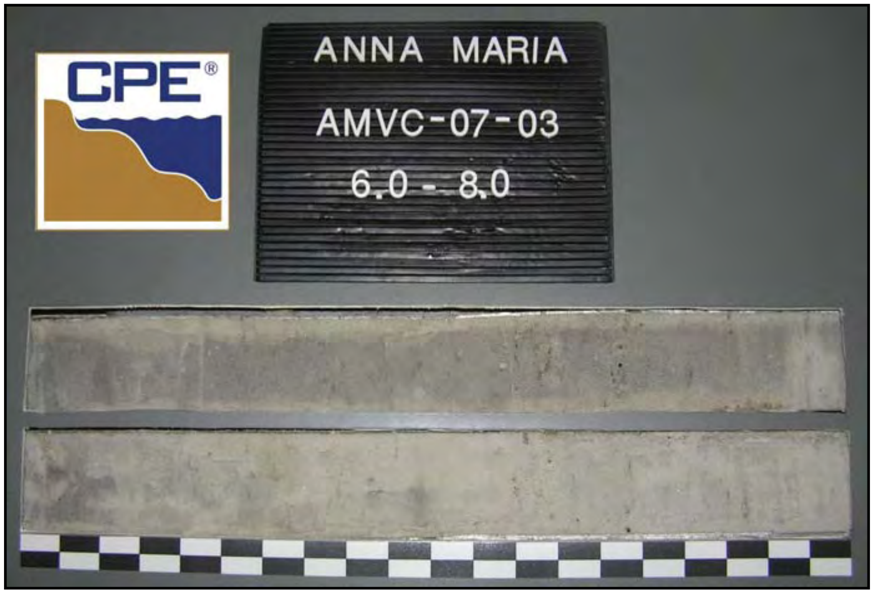
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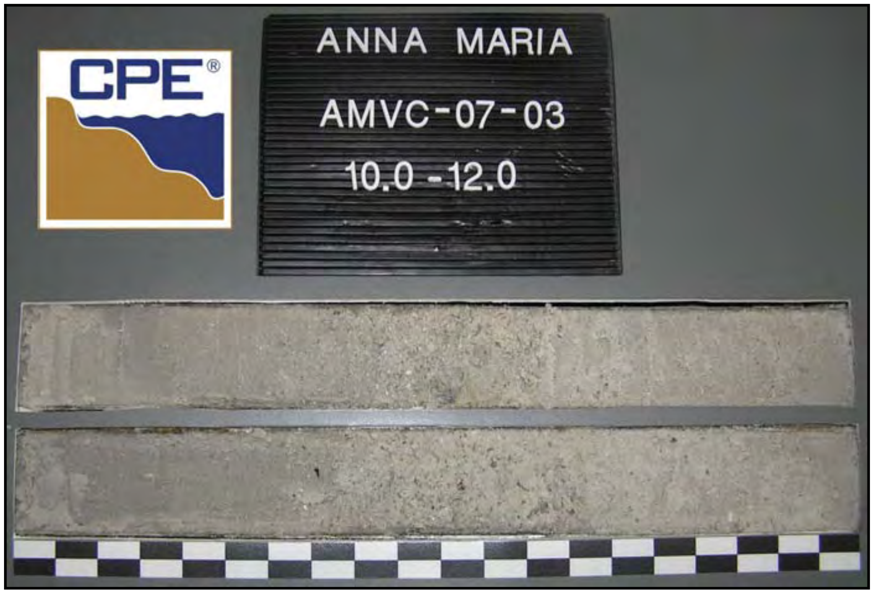
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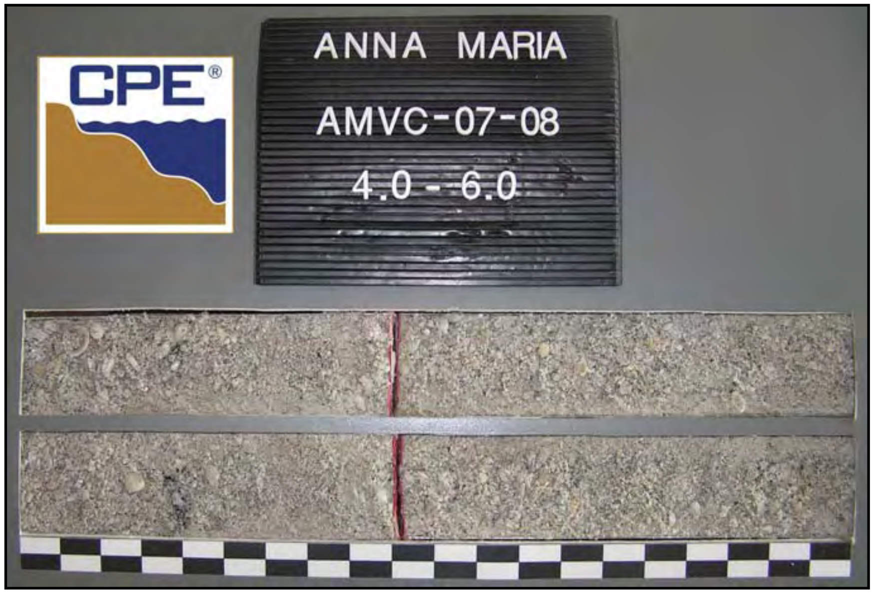
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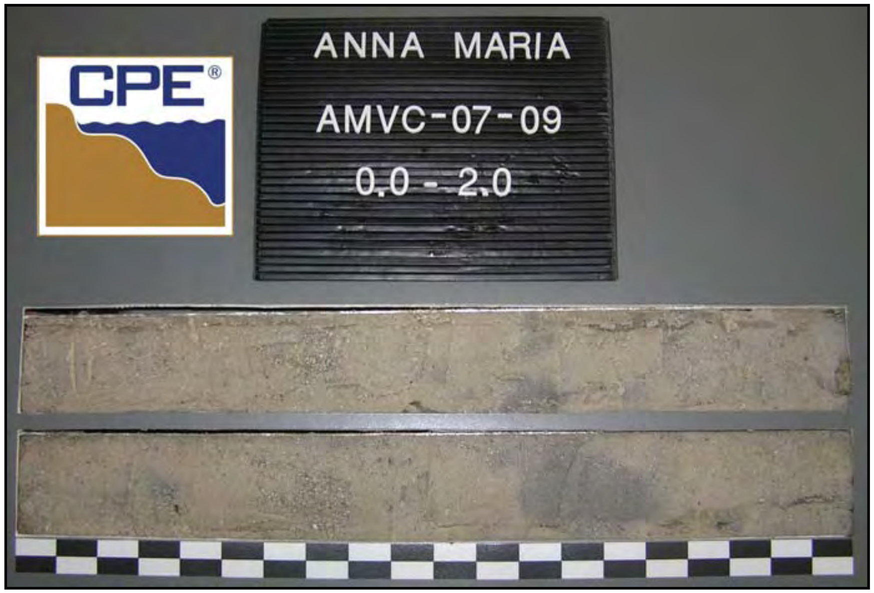
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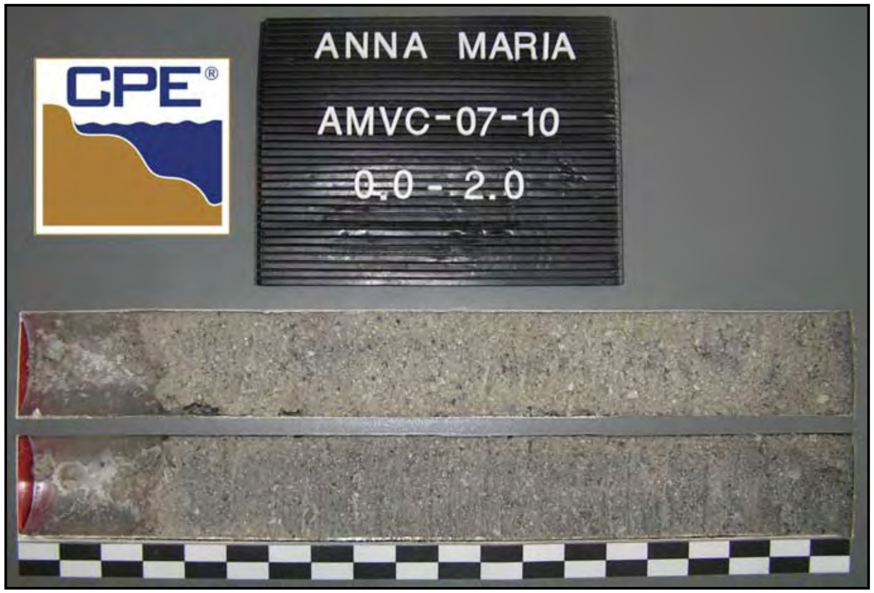
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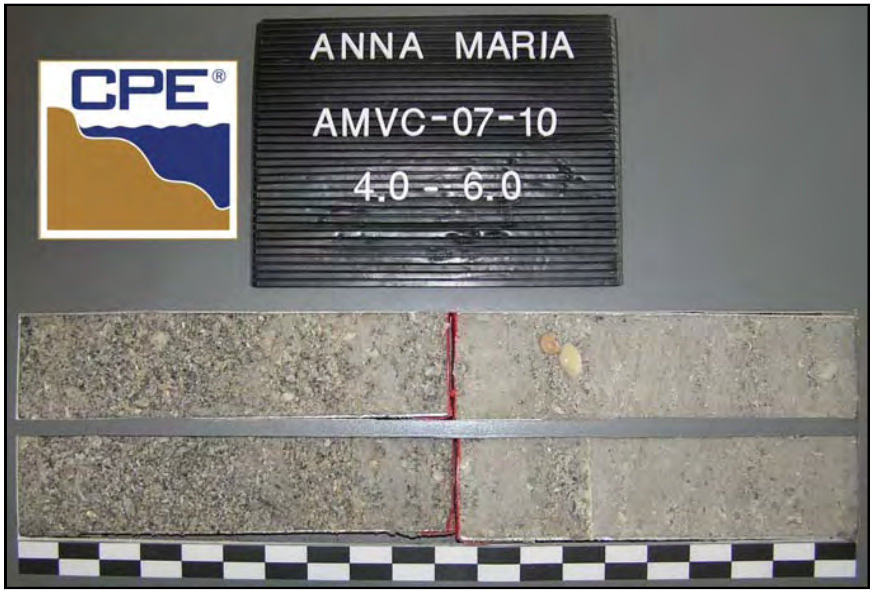
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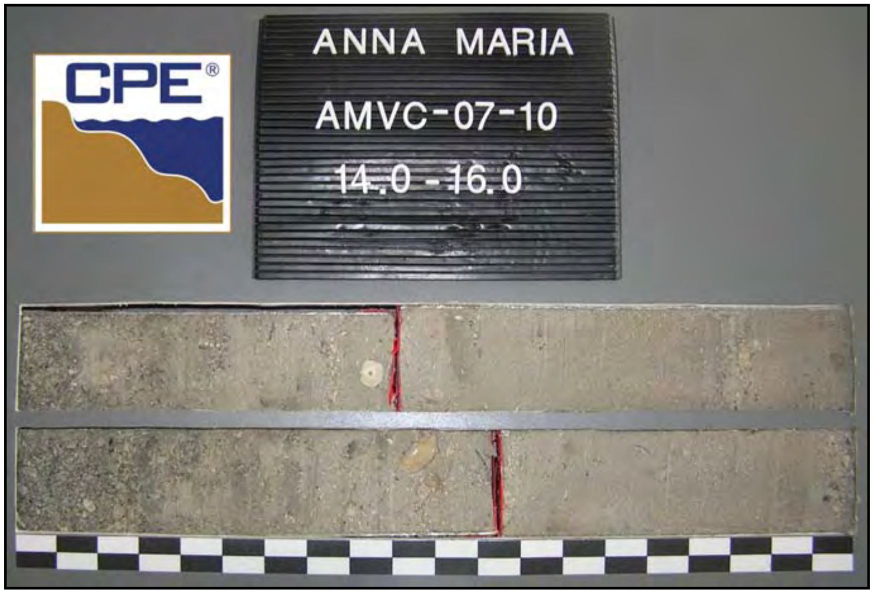
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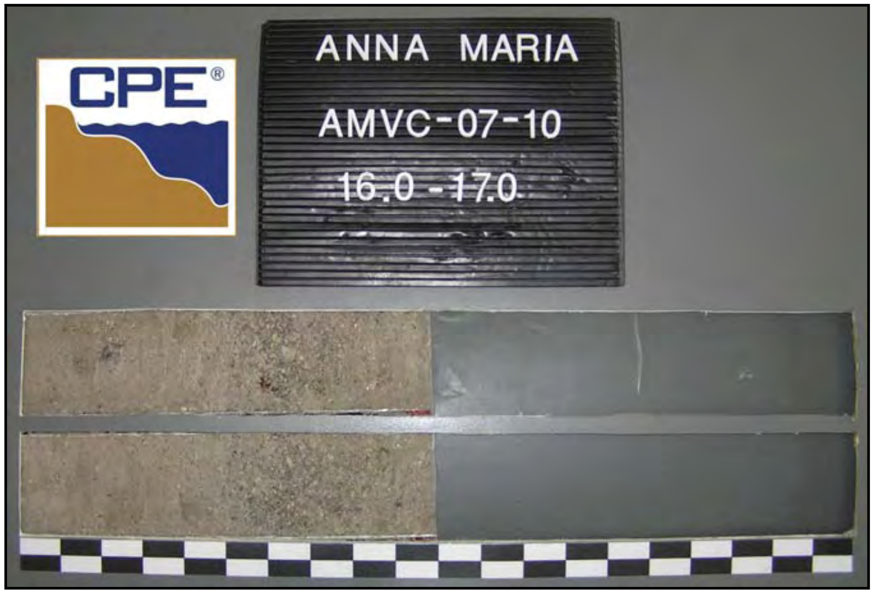
AMVC-07-10
14.0 - 16.0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AMVC-07-10
16.0 - 17.0
CPE®


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AMVC-07-11
0.0 - -2.0


CPE®
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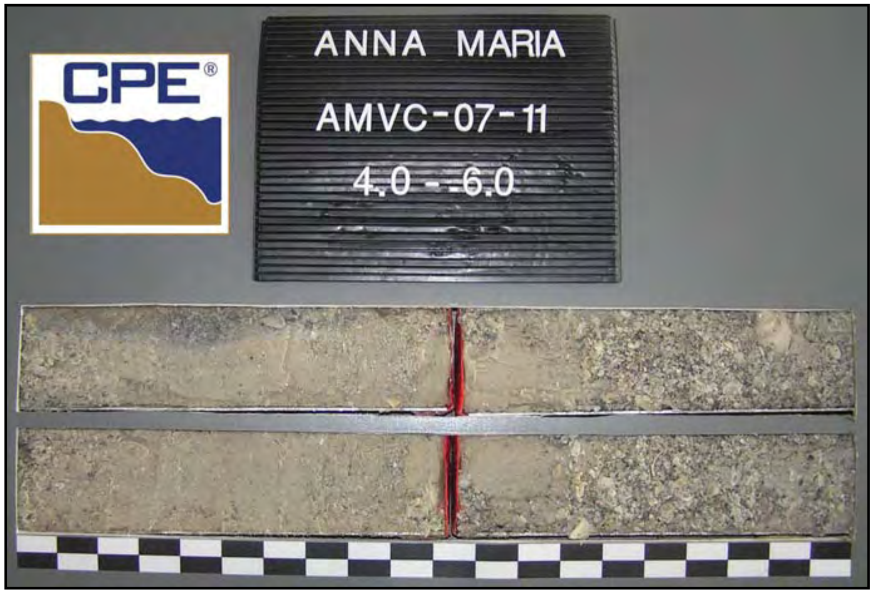
AMVC-07-11
2.0 - -4.0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AMVC-07-11
4.0 - -6.0


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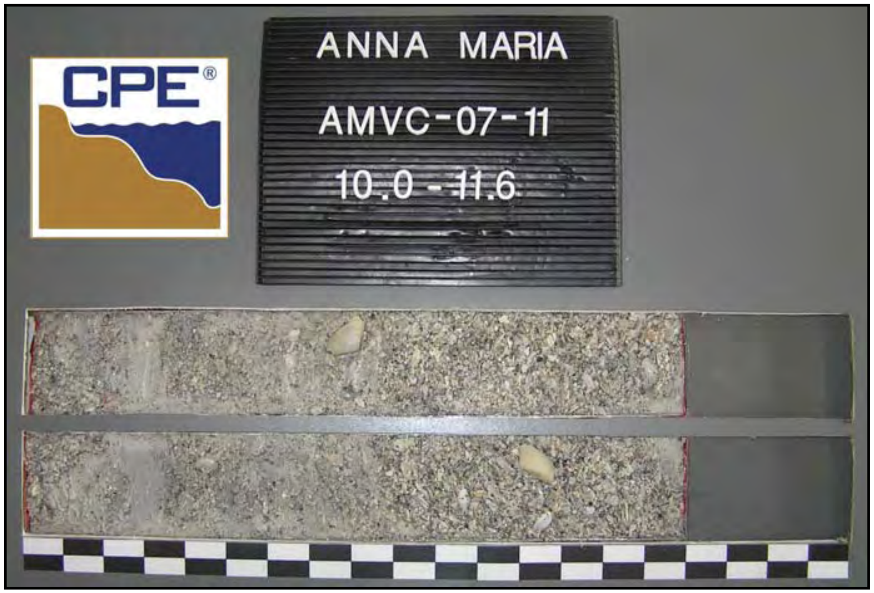
AMVC-07-11
6.0 - -8.0


CPE®
ANNA MARIA
AMVC-07-11
8.0 - 10.0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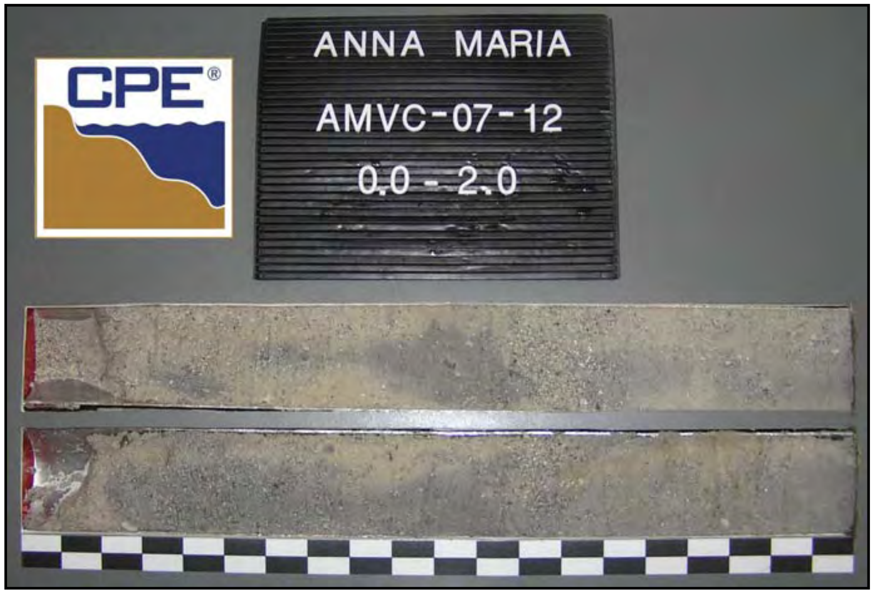
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0.0 - 2.0


CPE
ANNA MARIA
AMVC-07-12
2.0 - 4.0


CPE
ANNA MARIA
AMVC-07-12
4.0 - 6.0


CPE
ANNA MARIA
AMVC-07-12
6.0 - 8.0


CPE®
ANNA MARIA
AMVC-07-12
8.0 - 10.0


CPE®
ANNA MARIA
AMVC-07-12
10.0 - 12.0


CPE®
ANNA MARIA
AMVC-07-12
12.0 - 13.1


CPE®
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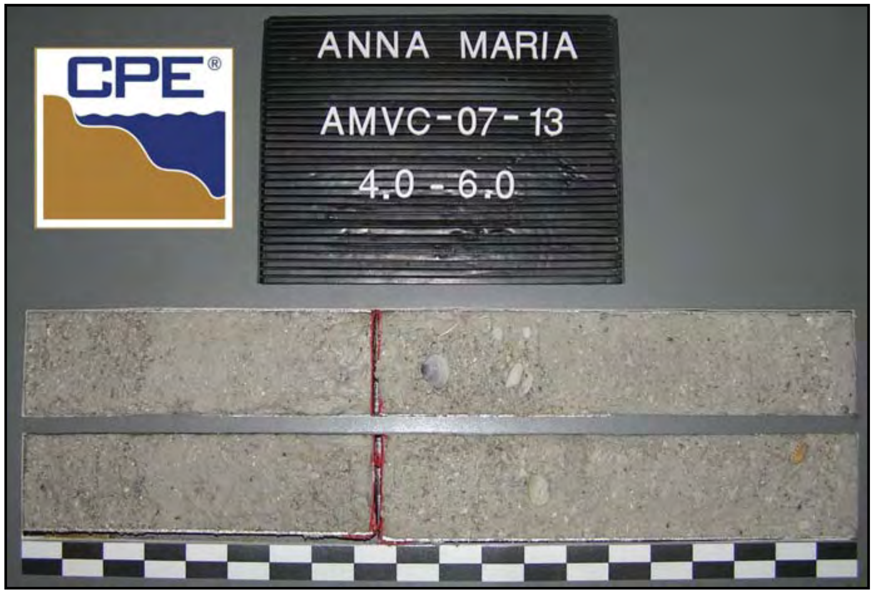
AMVC-07-13
0.0 - 2.0


CPE®
ANNA MARIA
AMVC-07-13
2.0 - 4.0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ANNA MARIA
AMVC-07-13
4.0 - 6.0

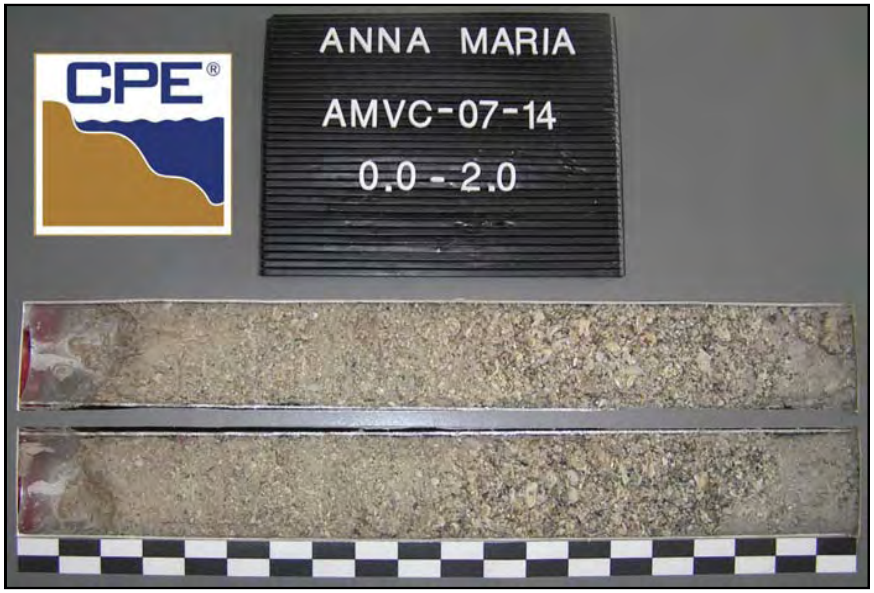

CPE®
ANNA MARIA
AMVC-07-13
6.0 - 8.0


CPE®
ANNA MARIA
AMVC-07-13
8.0 -10.0


CPE®
ANNA MARIA
AMVC-07-13
10.0 -12.0


CPE®
ANNA MARIA
AMVC-07-13
12.0 -14.0


CPE®
ANNA MARIA
AMVC-07-13
14.0 -15.5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CPE®
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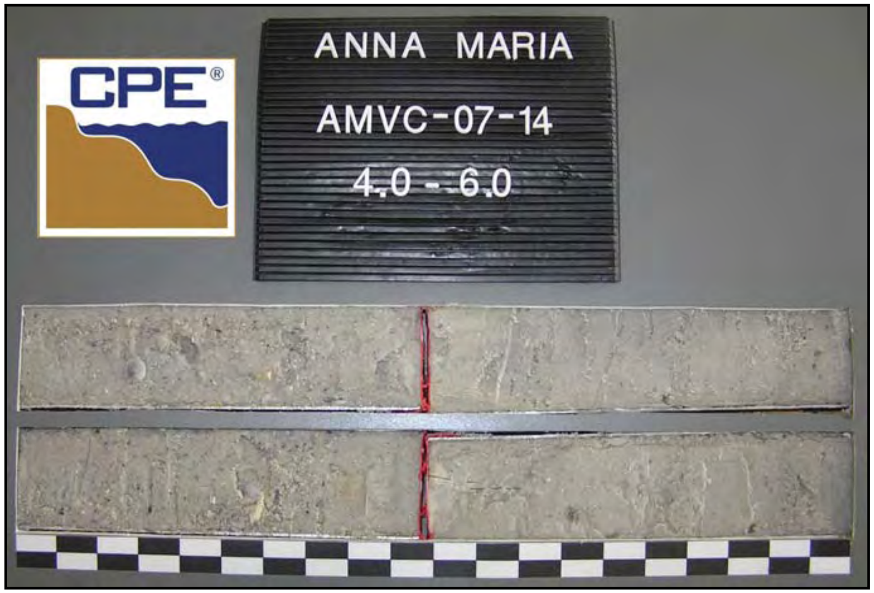
AMVC-07-14
2.0 - -4.0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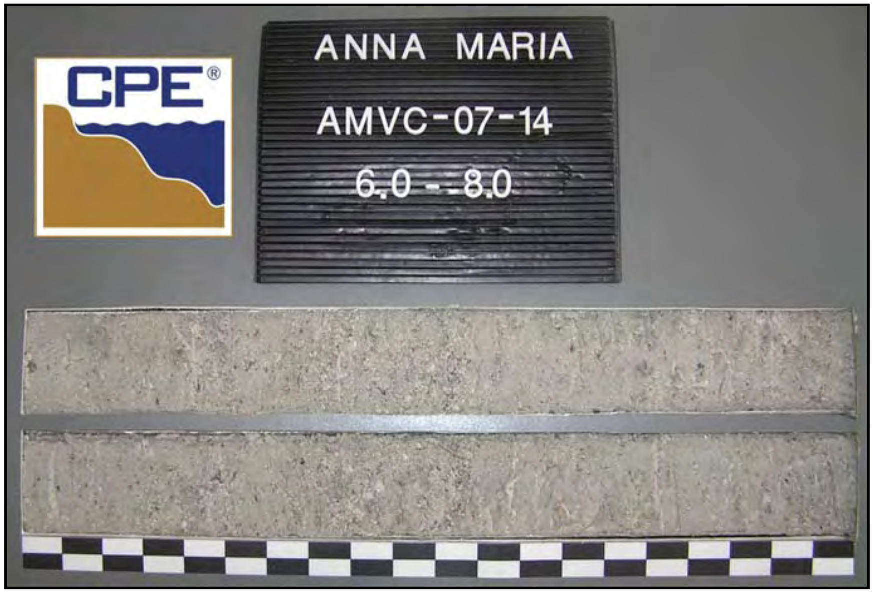
ANNA MARIA
AMVC-07-14
4.0 - -6.0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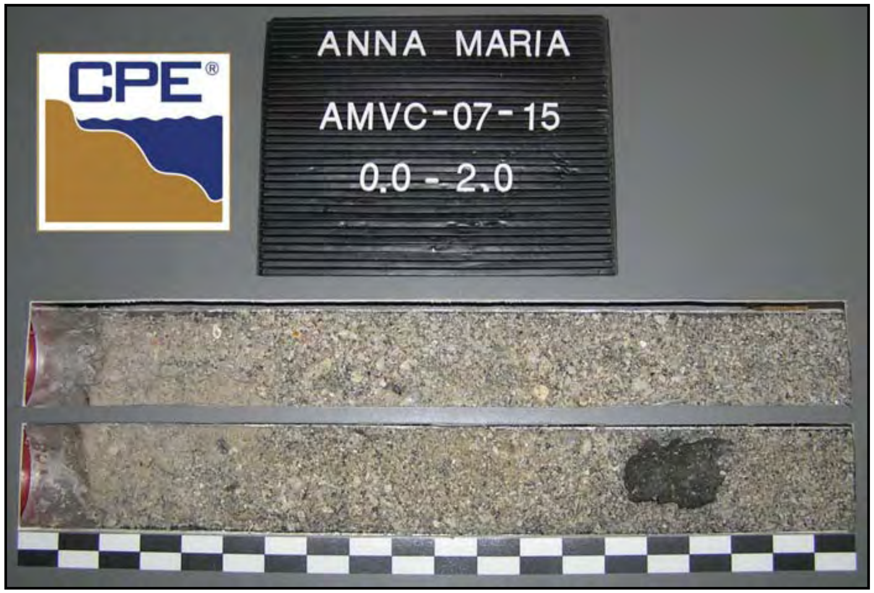
AMVC-07-14
6.0 - -8.0


CPE®
ANNA MARIA
AMVC-07-14
8.0 - 10.0


CPE®
ANNA MARIA
AMVC-07-14
10.0 - 12.0


CPE®
ANNA MARIA
AMVC-07-14
12.0 - 14.0


CPE®
ANNA MARIA
AMVC-07-14
14.0 - 16.0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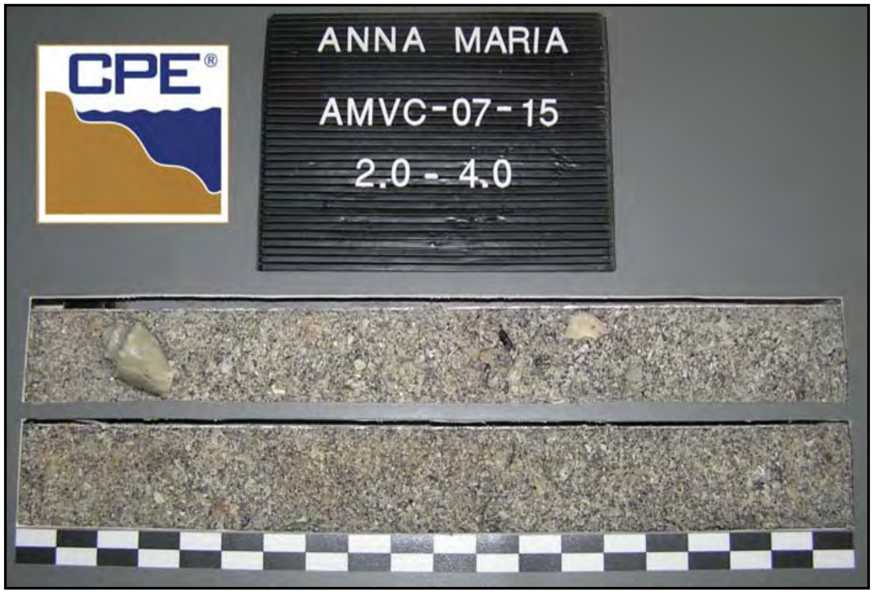
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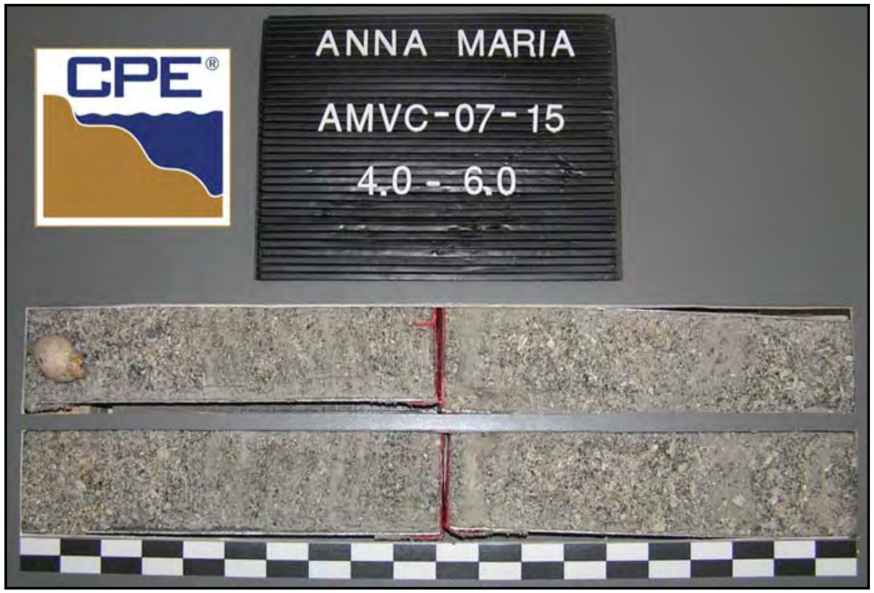
ANNA MARIA
AMVC-07-15
2.0 - 4.0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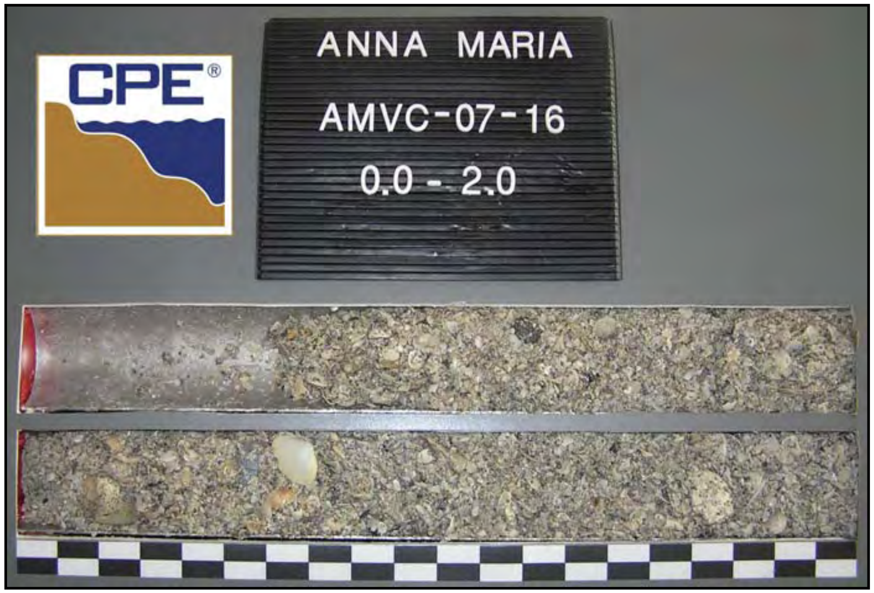
ANNA MARIA
AMVC-07-15
4.0 - 6.0


CPE®
ANNA MARIA
AMVC-07-15
6.0 - 8.0


CPE®
ANNA MARIA
AMVC-07-15
8.0 - 10.0


CPE®
ANNA MARIA
AMVC-07-15
10.0 - 10.6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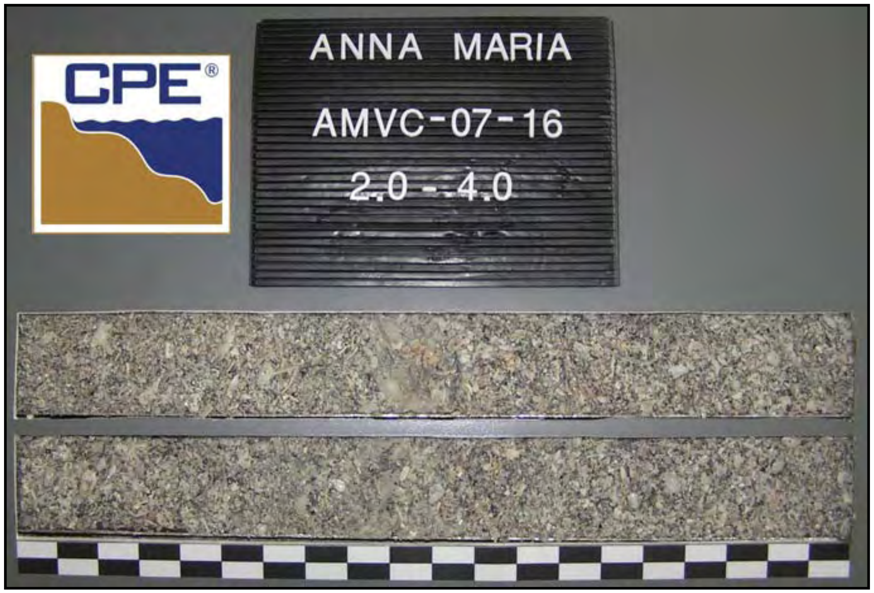
ANNA MARIA
AMVC-07-16
0.0 - 2.0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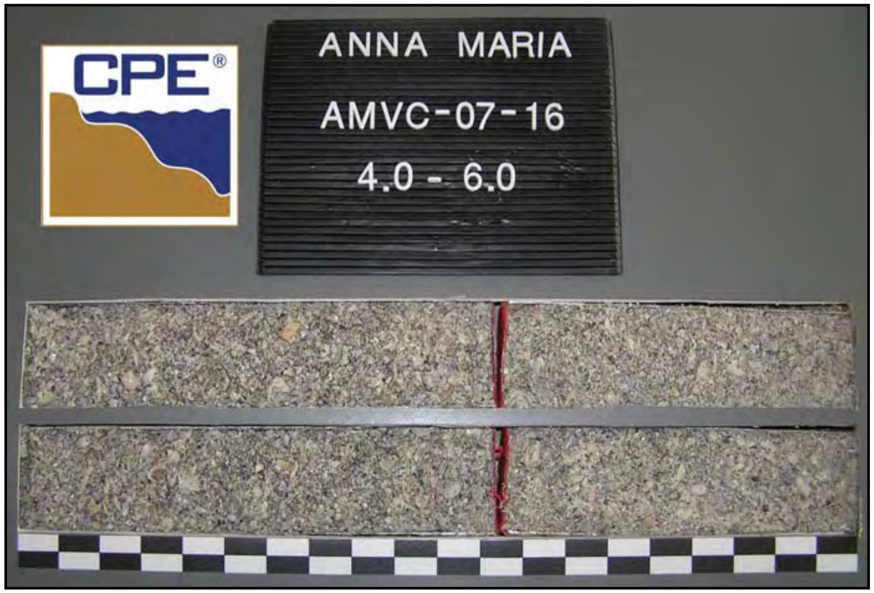
AMVC-07-16
2.0 - 4.0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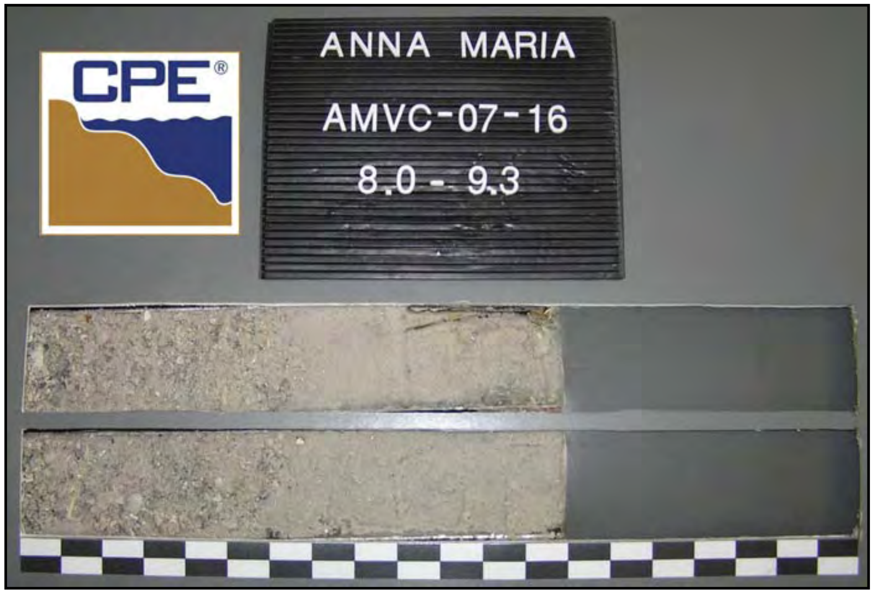
4.0 - 6.0


CPE®
ANNA MARIA
AMVC-07-16
6.0 - 8.0


CPE®
ANNA MARIA
AMVC-07-16
8.0 - 9.3


CPE®
ANNA MARIA
AMVC-07-17
0.0 - 2.0


CPE®
ANNA MARIA
AMVC-07-17
2.0 - 4.0


CPE®
ANNA MARIA
AMVC-07-17
4.0 - 6.0


CPE®
ANNA MARIA
AMVC-07-17
6.0 - 8.0


CPE®
ANNA MARIA
AMVC-07-17
8.0 - 10.0


CPE®
ANNA MARIA
AMVC-07-17
10.0 - 11.7


CPE®
ANNA MARIA
AMVC-07-18
0.0 - -2.0


CPE®
ANNA MARIA
AMVC-07-18
2.0 - -4.0


CPE®
ANNA MARIA
AMVC-07-18
4.0 - -6.0


CPE®
ANNA MARIA
AMVC-07-18
6.0 - -8.0


ANNA MARIA
AMVC-07-18
8.0 - 10.0


ANNA MARIA
AMVC-07-18
10.0 - 12.0


ANNA MARIA
AMVC-07-18
12.0 - 14.0


ANNA MARIA
AMVC-07-18
14.0 - 16.0


CPE®
ANNA MARIA
AMVC-07-18
16.0 - 16.5

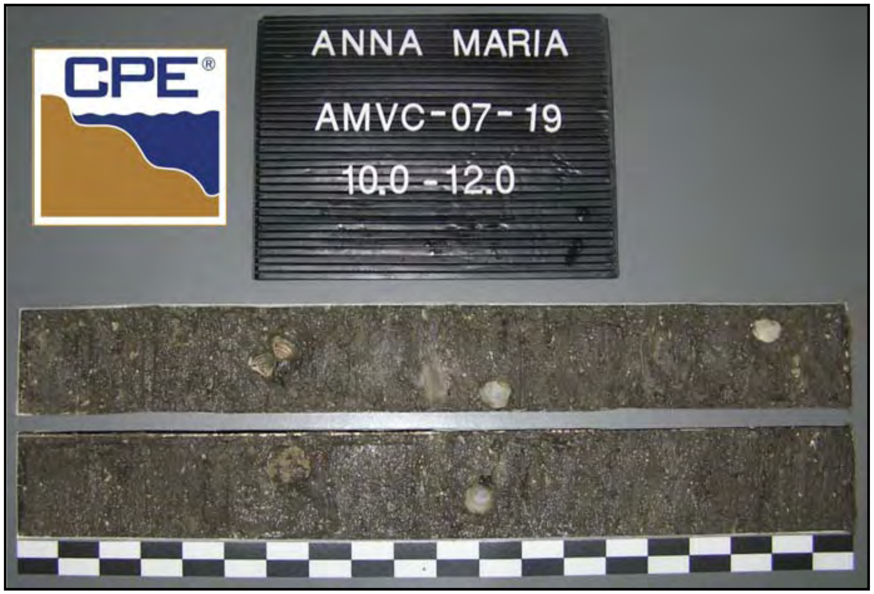

CPE®
ANNA MARIA
AMVC-07-19
0.0 - 2.0


CPE®
ANNA MARIA
AMVC-07-19
2.0 - 4.0


CPE®
ANNA MARIA
AMVC-07-19
4.0 - 6.0


CPE®
ANNA MARIA
AMVC-07-19
6.0 - 8.0


ANNA MARIA
AMVC-07-19
8.0 - 10.0

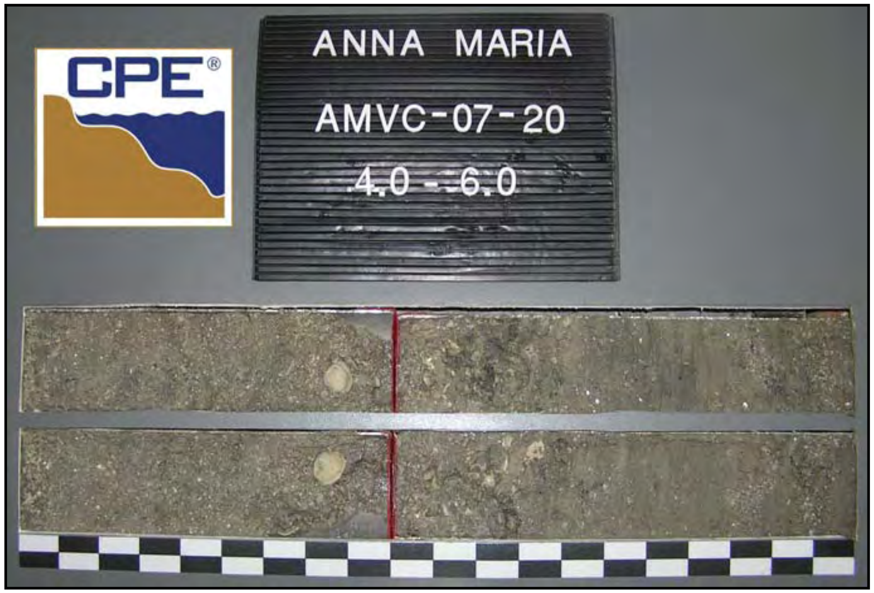

ANNA MARIA
AMVC-07-19
10.0 - 12.0


ANNA MARIA
AMVC-07-19
12.0 - 14.0


ANNA MARIA
AMVC-07-19
14.0 - 15.8


CPE®
ANNA MARIA
AMVC-07-20
0.0 - -2.0


CPE®
ANNA MARIA
AMVC-07-20
2.0 - -4.0


CPE®
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AMVC-07-20
4.0 - -6.0


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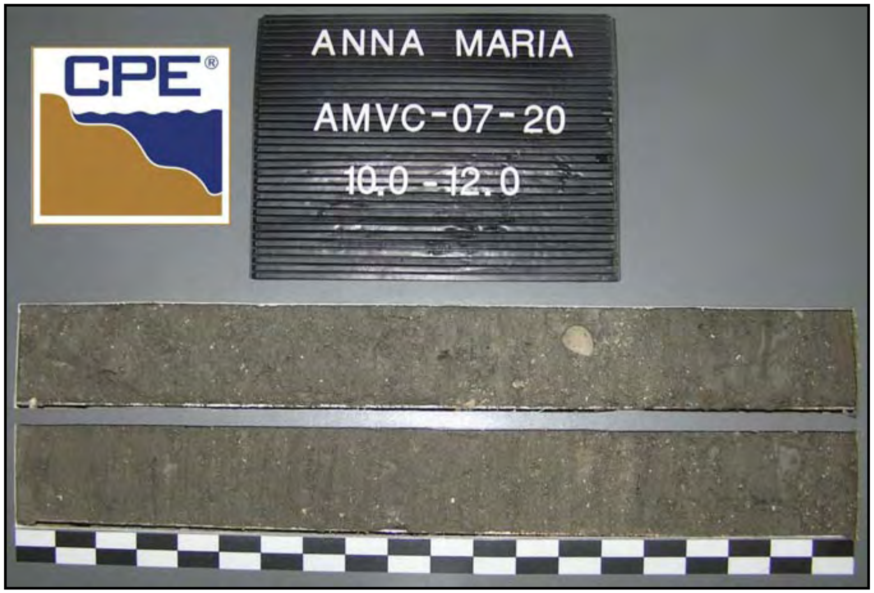
ANNA MARIA
AMVC-07-20
6.0 - -8.0


CPE®
ANNA MARIA
AMVC-07-20
8.0 - 10.0


CPE®
ANNA MARIA
AMVC-07-20
10.0 - 12.0


CPE®
ANNA MARIA
AMVC-07-20
12.0 - 14.0

APPENDIX 5
2014 CB&I VIBRACORE LOGS

CB&I
Coastal Planning & Engineering, Inc.
2481 N.W. Boca Raton Blvd.
Boca Raton, Florida 33431
Phone # 1 (561) 391-8102

Legend for Geotechnical Data

(SP), (SM), etc. Refers to the Army Corps of Engineers Unified Soils Classification System. Class types are defined primarily by grain size, sorting and percent of material passing the 200 sieve. Classification of materials on the core logs based on visual field examinations are identified on the core logs under the Classification of Materials Description. Classifications based on laboratory sieve analyses are identified on the core logs in the Legend and under Remarks.

Grain Size Terms

Cobble – retained on the 3.0” sieve
Gravel – greater than the #4 sieve and less than the 3.0” sieve
    Coarse: greater than the ¾” sieve and less than the 3.0” sieve
    Fine – greater than the #4 sieve and less than the ¾” sieve
Sand - greater than the #200 sieve and less than the #4 sieve
    Coarse - greater than the #10 sieve and less than the #4 sieve
    Medium - greater than the #40 sieve and less than the #10 sieve
    Fine - greater than the #230 sieve and less than the #40 sieve
Fines – (silt or clay) passing the #230 sieve

Proportional definition of descriptive terms

Descriptive Term	Range of Proportions
Sandy, gravelly, etc.	35 % to 50 %
Some	20 % to 35 %
Little	10 % to 20 %
Trace	1 % to 10 %

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*

CB&I
Coastal Planning & Engineering, Inc.
2481 N.W. Boca Raton Blvd.
Boca Raton, Florida 33431
Phone # 1 (561) 391-8102

Legend for Geotechnical Data

GW	░	Well graded gravels or gravel-sand mixtures, little or no fines
GP	░	Poorly graded gravels or gravel-sand mixtures, w/ little or no fines
GM	▥	Silty gravels, gravel-sand-silt mixtures
GC	▨	Clayey gravels, gravel-sand-clay mixtures
SW	░	Well graded sands or gravelly sands, little or no fines
SP	░	Poorly graded sands or gravelly sands, little or no fines
SM	▥	Silty sands, sand-silt mixtures
SC	▨	Clayey sands, sand-clay mixtures
SW-SM	░▥	Well-graded silty sand
GW-GM	░▥	Well-graded silty gravel
GM-GC	▥▨	Clayey silty gravel
ML	▥	Inorganic silts and very fine sands, rock flour, sandy silts or clayey silts with slight plasticity
MH	▥	Inorganic silts, micaceous or diatomaceous fine sandy or silty soild, elastic silts
OL	▥	Organic silts and organic silt-clays of low plasticity
OH	▨	Organic clays of medium to high plasticity, organic silts
CL	▨	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
CH	▨	Inorganic clays of high plasticity, fat clays
PT	≋	Peat and other highly organic soils
SP-SM	░▥	Poorly-graded silty sand
SM-SC	▥▨	Silty clayey sand
ML-CL	▥▨	Inorganic silty lean clay

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*

CB&I
Coastal Planning & Engineering, Inc.
2481 N.W. Boca Raton Blvd.
Boca Raton, Florida 33431
Phone # 1 (561) 391-8102

Legend for Geotechnical Data

The naming convention used by CB&I incorporates key information about the item in the title. The naming format uses the following information:

- Abbreviated area name (two letters that will be used throughout the project)
- Abbreviated data type: jet probe (JP), vibracore (VC) or surface sample (SS)
- Collection year (YY)
- Identification number
- Sample or composite identification in the case of jet probes or vibracores. Composite samples are indicated by COMP following the identification number. COMP represents a composite developed to characterize beach compatible material.

Format examples:
A) LBVC-14-01
B) LBVC-14-03 S#1

Example A is vibracore number 01, collected in the Longboat Pass area in the year 2014.

Example B refers to sample number 1 taken from vibracore number 03, which was collected in the Longboat Pass area in 2014.

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*

Boring Designation LBVC-14-01

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
2014 Longboat Pass Maintenance
Manatee County, FL

2. BORING DESIGNATION LBVC-14-01
LOCATION COORDINATES X = 431,382 Y = 1,130,426

3. DRILLING AGENCY Athena Technologies, Inc.
CONTRACTOR FILE NO.

4. NAME OF DRILLER Palmer McLellan

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 20.0 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West
HORIZONTAL NAD 1983
VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electric
☐ **AUTO HAMMER**
☐ **MANUAL HAMMER**

12. TOTAL SAMPLES
DISTURBED
UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING
STARTED 07-10-14 08:00
COMPLETED 07-10-14

16. ELEVATION TOP OF BORING -7.1 Ft.

17. TOTAL RECOVERY FOR BORING 16.2 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR LC

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-7.1	0.0					
-11.1	4.0		SAND, fine grained, quartz, little shell fragments, little shell hash, trace silt, shell frag up to 0.25", light gray (5Y-7/1), (SW).		1	Sample #1, Depth = 2.0' Mean (mm): 0.24, Phi Sorting: 1.12 Fines (230): 1.10% (SW)
-12.9	5.8		SAND, fine grained, quartz, little shell hash, trace silt, (2"x1") shell frag @ 4.1', (1"x3") shell hash pocket @ 5.2', 2.5" shell frag @ 5.4', 2.5" whole shell and 0.75" shell frag @ 4.4', light gray (5Y-7/1), (SW).		2	Sample #2, Depth = 4.6' Mean (mm): 0.21, Phi Sorting: 1.40 Fines (230): 0.96% (SW)
-13.6	6.5		Sandy SHELL HASH, some shell fragments, trace silt, shell frag up to 0.5", 0.25" organic pocket @ 6.1', light gray (2.5Y-7/1), (SW).		3	Sample #3, Depth = 6.1' Mean (mm): 0.90, Phi Sorting: 1.82 Fines (230): 1.53% (SW)
-14.7	7.6		SAND, fine grained, quartz, little shell fragments, little shell hash, trace silt, shell frag up to 0.5", light gray (5Y-7/1), (SW).		2	
-16.4	9.3		Sandy SHELL HASH, some shell fragments, trace silt, shell frag up to 1", (2"x3") sand pocket @ 7.9', 3" sand pocket @ 8.1', 3" whole shell @ 8.9', light gray (2.5Y-7/1), (SW).		5	
-17.9	10.8		SAND, fine grained, quartz, some shell hash, little shell fragments, trace silt, shell frag up to 1", 1" whole shell @ 9.6', 0.5" whole shell @ 9.7', 1.5" whole shell @ 10.2', (1.5"x3") shell hash pocket @ 10.3', light gray (5Y-7/1), (SW).		4	Sample #4, Depth = 9.7' Mean (mm): 0.25, Phi Sorting: 1.35 Fines (230): 1.03% (SW)
-18.8	11.7		SHELL HASH, some sand, trace silt, 2.5" shell frag @ 10.9', light gray (2.5Y-7/1), (SW).		5	Sample #5, Depth = 11.3' Mean (mm): 2.22, Phi Sorting: 1.69 Fines (230): 1.57% (SW)
-21.3	14.2		SAND, fine grained, quartz, little shell hash, trace shell fragments, trace silt, shell frag up to 0.25", silt increases with depth, (3"x3.5") rock frag @ 11.9', gray (5Y-6/1), (SW-SM).		6	Sample #6, Depth = 12.8' Mean (mm): 0.25, Phi Sorting: 1.24 Fines (230): 5.01% (SW-SM)
-23.3	16.2		SAND, some clay, some shell hash, little shell fragments, trace silt, shell frag up to 0.5", shell hash increases with depth, 0.5" whole shell @ 14.8', 1.5" shell frag @ 16.1', gray (5Y-5/1), (SM).			
-27.1	20.0		No Recovery.			
			End of Boring			

FLORIDA DEP ROSS LONG BOAT PASS 2014.GPJ FL DEP ROSS.GDT 8/5/14

SAJ FORM 1836
JUN 02

MODIFIED FOR THE FLORIDA DEP
JUN 04

Boring Designation LBVC-14-02

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
2014 Longboat Pass Maintenance
Manatee County, FL

2. BORING DESIGNATION LBVC-14-02
LOCATION COORDINATES X = 430,164 Y = 1,129,502

3. DRILLING AGENCY Athena Technologies, Inc.
CONTRACTOR FILE NO.

4. NAME OF DRILLER Palmer McLellan

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 20.0 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West
HORIZONTAL NAD 1983
VERTICAL NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electric
☐ **AUTO HAMMER**
☐ **MANUAL HAMMER**

12. TOTAL SAMPLES
DISTURBED
UNDISTURBED (UD)

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING
STARTED 07-10-14 09:05
COMPLETED 07-10-14

16. ELEVATION TOP OF BORING -5.4 Ft.

17. TOTAL RECOVERY FOR BORING 14.6 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR
LC

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-5.4	0.0					
-10.8	5.4		SAND, fine grained, quartz, little shell fragments, little shell hash, trace silt, shell frag up to 0.5", (2) 1" whole shells @ 4.8', 1" whole shell @ 5.4', 2.5" shell hash pocket @ 4.5', 1" shell frag @ 5.3', light gray (5Y-7/1), (SW).		VC1 S#1	
-11.5	6.1		Shelly SAND, fine grained, quartz, trace silt, shell comp is shell frag up to 0.5", 1.25" whole shell @ 5.6', (1"x3") shell hash pocket @ 5.9', light gray (2.5Y-7/1), (SW).		1	Sample #1, Depth = 5.7' Mean (mm): 0.51, Phi Sorting: 1.58 Fines (230): 0.75% (SW)
-12.8	7.4		SAND, fine grained, quartz, trace shell hash, trace silt, (0.5"x3") shell frag pocket @ 7', 1" shell frag @ 7.2', light gray (5Y-7/1), (SP).		2	Sample #2, Depth = 6.5' Mean (mm): 0.17, Phi Sorting: 0.67 Fines (230): 1.17% (SP)
-14.0	8.6		Sandy SHELL HASH, some shell fragments, trace silt, shell frag up to 0.75", light gray (2.5Y-7/1), (SW).		VC1 S#3	
-14.4	9.0		SAND, fine grained, quartz, little shell hash, trace silt, 0.5" shell frag @ 8.8', 1.25" whole shell @ 8.8', light gray (5Y-7/1), (SW).		3	Sample #3, Depth = 8.8' Mean (mm): 0.28, Phi Sorting: 1.26 Fines (230): 1.21% (SW)
-15.0	9.6		Shelly SAND, fine grained, quartz, trace silt, shell comp is shell hash, shell decreases with depth, 1" shell frag @ 9.3', light gray (2.5Y-7/1), (SW).		1	
-16.8	11.4		SAND, fine grained, quartz, trace shell hash, trace silt, 0.75" shell frag @ 10.3', 0.75" whole shell @ 10.4', (0.5"x3") sea urchin pocket @ 10.8', 3.5" shell hash pocket @ 11.1', light gray (5Y-7/1), (SP).		2	
-17.6	12.2		Sandy SHELL HASH, some shell fragments, trace silt, shell frag up to 0.5", 0.5" whole shell @ 12.2', 0.5" sand pockets @ 11.6' and 11.8', light gray (2.5Y-7/1), (SW).		VC1 S#3	
-19.0	13.6		Shelly SAND, fine grained, quartz, trace silt, shell comp is shell hash, 3" shell hash pocket @ 12.2', 1" silty pocket @ 13.2', 2.5" silty pocket @ 13.3', light gray (2.5Y-7/1), (SW).		4	Sample #4, Depth = 12.8' Mean (mm): 0.67, Phi Sorting: 1.95 Fines (230): 0.84% (SW)
-19.7	14.3		Shelly SAND, fine grained, quartz, trace shell fragments, trace silt, shell comp is shell hash, shell frag up to 0.5", 1.25" shell frag @ 14.3', gray (5Y-5/1), (SW).		5	Sample #5, Depth = 13.9' Mean (mm): 0.58, Phi Sorting: 1.76 Fines (230): 3.08% (SW)
-20.0	14.6		SAND, fine grained, quartz, trace shell hash, trace silt, gray (5Y-6/1), (SP).			
-25.4	20.0		No Recovery.			
			End of Boring			

SAJ FORM 1836
JUN 02

MODIFIED FOR THE FLORIDA DEP
JUN 04

Boring Designation LBVC-14-03

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 **OF** 1 **SHEETS**

1. PROJECT
2014 Longboat Pass Maintenance
Manatee County, FL

2. BORING DESIGNATION LBVC-14-03

LOCATION COORDINATES X = 429,817 Y = 1,128,586

3. DRILLING AGENCY Athena Technologies, Inc.

CONTRACTOR FILE NO.

4. NAME OF DRILLER Palmer McLellan

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 20.0 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West **HORIZONTAL** NAD 1983 **VERTICAL** NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electric ☐ AUTO HAMMER ☐ MANUAL HAMMER

12. TOTAL SAMPLES **DISTURBED** **UNDISTURBED (UD)**

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING **STARTED** 07-10-14 10:49 **COMPLETED** 07-10-14

16. ELEVATION TOP OF BORING -5.5 Ft.

17. TOTAL RECOVERY FOR BORING 20 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR LC

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-5.5	0.0					
-7.8	2.3		SAND, fine grained, quartz, some shell hash, trace shell fragments, trace silt, shell frag up to 0.25", 1" whole shell @ 2.1', light gray (5Y-7/1), (SW).		1	Sample #1, Depth = 1.2' Mean (mm): 0.25, Phi Sorting: 0.93 Fines (230): 1.06% (SW)
-8.5	3.0		Sandy SHELL HASH, little shell fragments, trace silt, shell frag up to 0.5", light gray (2.5Y-7/1), (SW).		VC1 S#3	
-10.1	4.6		SAND, fine grained, quartz, little shell hash, trace shell fragments, trace silt, shell frag up to 0.25", light gray (5Y-7/1), (SP).		6	Sample #6, Depth = 4.0' Mean (mm): 0.19, Phi Sorting: 0.78 Fines (230): 0.93% (SP)
-11.6	6.1		Sandy SHELL HASH, some shell fragments, trace silt, shell frag up to 1", (1.75"x3") sand pocket @ 5.3', 2" sand pocket @ 5.7', light gray (2.5Y-7/1), (SW).		2	Sample #2, Depth = 5.8' Mean (mm): 1.02, Phi Sorting: 2.05 Fines (230): 0.79% (SW)
-12.4	6.9		SAND, fine grained, quartz, trace shell hash, trace silt, 0.75" shell hash pocket @ 6.2', light gray (5Y-7/1), (SP).		VC2 S#2	
-12.8	7.3		Sandy SHELL HASH, little shell fragments, trace silt, shell frag up to 0.5", light gray (2.5Y-7/1), (SW).		VC1 S#3	
-15.9	10.4		SAND, fine grained, quartz, little shell hash, trace shell fragments, trace silt, trace whole shell, shell frag up to 0.5", whole shells up to 0.75", (1.5"x3") shell hash pocket @ 8', 1.5" shell frag pocket @ 9.3', 0.75" shell hash pocket @ 10.2', light gray (5Y-7/1), (SW).		3	Sample #3, Depth = 9.0' Mean (mm): 0.26, Phi Sorting: 1.49 Fines (230): 0.92% (SW)
-18.1	12.6		SAND, fine grained, quartz, trace shell hash, trace silt, 0.5" silt pockets @ 10.5' and 10.6', light gray (5Y-7/1), (SP).		VC2 S#2	
-18.8	13.3		Shelly SAND, fine grained, quartz, little shell fragments, trace silt, shell comp is shell hash, shell frag up to 0.5", light gray (2.5Y-7/1), (SW).		VC2 S#4	
-19.3	13.8		SAND, fine grained, quartz, little shell hash, trace silt, 0.25" clay pocket @ 13.4', gray (5Y-6/1), (SW).		4	Sample #4, Depth = 13.5' Mean (mm): 0.19, Phi Sorting: 1.28 Fines (230): 2.68% (SW)
-19.8	14.3		Shelly SAND, fine grained, quartz, trace silt, shell comp is shell hash, gray (2.5Y-6/1), (SW).		VC2 S#4	
-23.2	17.7		SAND, fine grained, quartz, trace shell fragments, trace shell hash, trace silt, shell frag up to 0.5", (0.75"x3") shell frag pocket @ 15.2', 1.25" rock frag @ 15.2', (1"x3") silty pocket @ 15.5', 0.5" whole shell @ 16.2', 1.5" silty pocket @ 17', gray (5Y-6/1), (SW-SM).		5	Sample #5, Depth = 16.6' Mean (mm): 0.15, Phi Sorting: 0.92 Fines (230): 9.48% (SW-SM)
-24.2	18.7		Shelly SAND, fine grained, quartz, trace shell fragments, trace silt, shell comp is shell hash, shell frag up to 0.5", gray (5Y-5/1), (SW).		VC2 S#5	
-24.7	19.2		SAND, fine grained, quartz, trace shell fragments, trace shell hash, trace silt, shell frag up to 0.5", 1" shell hash pocket @ 19.1', gray (5Y-6/1), (SW-SM).		5	
-25.5	20.0		SAND, fine grained, quartz, some shell fragments, trace silt, shell frag up to 0.75", gray (5Y-6/1), (SW-SM).			
			End of Boring			

FLORIDA DEP ROSS LONG BOAT PASS 2014.GPJ FL DEP ROSS.GDT 8/5/14

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Boring Designation LBVC-14-04

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. **PROJECT**
2014 Longboat Pass Maintenance
Manatee County, FL

2. **BORING DESIGNATION** LBVC-14-04
LOCATION COORDINATES X = 429,577 Y = 1,127,616

3. **DRILLING AGENCY** Athena Technologies, Inc.
CONTRACTOR FILE NO.

4. **NAME OF DRILLER** Palmer McLellan

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** 12.5 Ft.

9. **SIZE AND TYPE OF BIT** 3.0 In.

10. **COORDINATE SYSTEM/DATUM** Florida State Plane West
HORIZONTAL NAD 1983
VERTICAL NAVD 88

11. **MANUFACTURER'S DESIGNATION OF DRILL** Electric
☐ AUTO HAMMER
☐ MANUAL HAMMER

12. **TOTAL SAMPLES**
DISTURBED
UNDISTURBED (UD)

13. **TOTAL NUMBER CORE BOXES**

14. **ELEVATION GROUND WATER**

15. **DATE BORING**
STARTED 07-10-14 12:12
COMPLETED 07-10-14

16. **ELEVATION TOP OF BORING** -5.4 Ft.

17. **TOTAL RECOVERY FOR BORING** 12.1 Ft.

18. **SIGNATURE AND TITLE OF INSPECTOR**
LC

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-5.4	0.0					
					VC2 S#2	
			SAND, fine grained, quartz, trace shell hash, trace silt, (2"x3") shell hash pocket @ 3.1', (1"x3") shell hash pocket @ 7.1', 0.25" organic pocket @ 9' and 11.1', 1" shell hash pocket @ 4.7', light gray (5Y-7/1), (SP).		1	Sample #1, Depth = 6.0' Mean (mm): 0.17, Phi Sorting: 0.42 Fines (230): 0.95% (SP)
					VC2 S#2	
-17.5	12.1					
-17.9	12.5		No Recovery.			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS LONG BOAT PASS 2014.GPJ FL DEP ROSS.GDT 8/5/14

Boring Designation LBVC-14-05

DRILLING LOG	**DIVISION**	**INSTALLATION**	**SHEET** 1 **OF** 1 **SHEETS**

1. PROJECT
2014 Longboat Pass Maintenance
Manatee County, FL

2. BORING DESIGNATION LBVC-14-05 | **LOCATION COORDINATES** X = 429,371 Y = 1,128,156

3. DRILLING AGENCY Athena Technologies, Inc. | **CONTRACTOR FILE NO.**

4. NAME OF DRILLER Palmer McLellan

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 20.0 Ft.

9. SIZE AND TYPE OF BIT 3.0 In.

10. COORDINATE SYSTEM/DATUM Florida State Plane West | **HORIZONTAL** NAD 1983 | **VERTICAL** NAVD 88

11. MANUFACTURER'S DESIGNATION OF DRILL Electric ☐ AUTO HAMMER ☐ MANUAL HAMMER

12. TOTAL SAMPLES | **DISTURBED** | **UNDISTURBED (UD)**

13. TOTAL NUMBER CORE BOXES

14. ELEVATION GROUND WATER

15. DATE BORING | **STARTED** 07-10-14 11:18 | **COMPLETED** 07-10-14

16. ELEVATION TOP OF BORING -10.8 Ft.

17. TOTAL RECOVERY FOR BORING 19.8 Ft.

18. SIGNATURE AND TITLE OF INSPECTOR LC

ELEV. (ft)	DEPTH (ft)	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-10.8	0.0				
-12.3	1.5	SAND, fine grained, quartz, little shell hash, trace silt, light gray (5Y-7/1), (SP).		3	Sample #3, Depth = 0.6' Mean (mm): 0.18, Phi Sorting: 0.75 Fines (230): 0.91% (SP)
-21.7	10.9	SAND, fine grained, quartz, trace shell fragments, trace shell hash, trace silt, shell frag up to 0.25", (2"x3") shell hash pocket @ 3', 1" whole shell @ 3.6', (1.5"x3") shell hash pocket @ 4.1', 3" shell hash pocket @ 5.9', (0.5"x3") silty pocket @ 8.5', 1.5" whole shell @ 6.1', light gray (5Y-7/1), (SP).		1	Sample #1, Depth = 4.7' Mean (mm): 0.18, Phi Sorting: 0.74 Fines (230): 0.87% (SP)
-22.5	11.7	Shelly SAND, fine grained, quartz, trace shell fragments, trace silt, shell comp is shell hash, shell frag up to 0.5", gray (5Y-5/1), (SW).		VC2 S#5	
-23.0	12.2	SAND, fine grained, quartz, trace shell hash, trace silt, gray (5Y-6/1), (SW-SM).		VC3 S#5	
-23.6	12.8	Shelly SAND, fine grained, quartz, trace shell fragments, trace silt, shell comp is shell hash, shell frag up to 0.5", 2.5" shell frag @ 12.4', (1.5"x3") shell hash pocket @ 12.6', gray (2.5Y-6/1), (SW).		VC2 S#5	
-24.7	13.9	SAND, fine grained, quartz, some organics, little shell hash, trace silt, (1"x3") clayey pocket @ 12.8' & wood frag pocket @ 13.6', dark gray (2.5Y-4/1), (SW-SM).		VC1 S#6	
-26.0	15.2	SAND, fine grained, quartz, trace shell hash, trace silt, 1" silty pocket @ 14.1', light gray (5Y-7/1), (SW).		2	Sample #2, Depth = 14.5' Mean (mm): 0.18, Phi Sorting: 0.90 Fines (230): 3.43% (SW)
-26.8	16.0	Shelly SAND, fine grained, quartz, trace silt, shell comp is shell hash, silt in pockets up to 0.75", gray (2.5Y-6/1), (SW).			
-29.2	18.4	SAND, fine grained, quartz, trace shell fragments, trace shell hash, trace silt, (1"x3") shell hash pocket @ 16.5', 3" shell hash pocket at 17.3', light gray (2.5Y-7/1), (SW-SM).			
-29.9	19.1	SHELL FRAGMENTS, some sand, little shell hash, little silt, shell frag up to 1", gray (5Y-6/1), (SW-SM).			
-30.6	19.8	Clayey SAND, fine grained, quartz, some shell fragments, little shell hash, trace whole shell, shell frag and whole shells up to 1", gray (2.5Y-6/1), (SC).			
-30.8	20.0	No Recovery.			
		End of Boring			

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

APPENDIX 6
2014 CB&I VIBRACORE PHOTOGRAPHS


LONGBOAT PASS
LBVC - 14 - 01
0.0 - 2.0


LONGBOAT PASS
LBVC - 14 - 01
2.0 - 4.0


LONGBOAT PASS
LBVC - 14 - 01
4.0 - 6.0


LONGBOAT PASS
LBVC - 14 - 01
6.0 - 8.0


CB&I
LONGBOAT PASS
LBVC - 14 - 01
8.0 - 10.0


CB&I
LONGBOAT PASS
LBVC - 14 - 01
10.0 - 12.0


CB&I
LONGBOAT PASS
LBVC - 14 - 01
12.0 - 14.0


CB&I
LONGBOAT PASS
LBVC - 14 - 01
14.0 - 16.0


LONGBOAT PASS
LBVC - 14 - 01
16.0 - 16.2


CB&I
LONGBOAT PASS
LBVC - 14 - 02
0.0 - 2.0


CB&I
LONGBOAT PASS
LBVC - 14 - 02
2.0 - 4.0


CB&I
LONGBOAT PASS
LBVC - 14 - 02
4.0 - 6.0


CB&I
LONGBOAT PASS
LBVC - 14 - 02
6.0 - 8.0


CB&I
LONGBOAT PASS
LBVC - 14 - 02
8.0 - 10.0


CB&I
LONGBOAT PASS
LBVC - 14 - 02
10.0 - 12.0


CB&I
LONGBOAT PASS
LBVC - 14 - 02
12.0 - 14.0


CB&I
LONGBOAT PASS
LBVC - 14 - 02
14.0 - 14.6


LONGBOAT PASS
LBVC - 14 - 03
0.0 - 2.0


LONGBOAT PASS
LBVC - 14 - 03
2.0 - 4.0


LONGBOAT PASS
LBVC - 14 - 03
4.0 - 6.0


LONGBOAT PASS
LBVC - 14 - 03
6.0 - 8.0


CB&I
LONGBOAT PASS
LBVC - 14 - 03
8.0 - 10.0


CB&I
LONGBOAT PASS
LBVC - 14 - 03
10.0 - 12.0


CB&I
LONGBOAT PASS
LBVC - 14 - 03
12.0 - 14.0


CB&I
LONGBOAT PASS
LBVC - 14 - 03
14.0 - 16.0


LONGBOAT PASS
LBVC - 14 - 03
16.0 - 18.0


LONGBOAT PASS
LBVC - 14 - 03
18.0 - 20.0


LONGBOAT PASS
LBVC - 14 - 04
0.0 - 2.0


LONGBOAT PASS
LBVC - 14 - 04
2.0 - 4.0


LONGBOAT PASS
LBVC - 14 - 04
4.0 - 6.0


LONGBOAT PASS
LBVC - 14 - 04
6.0 - 8.0


CB&I
LONGBOAT PASS
LBVC - 14 - 04
8.0 - 10.0


CB&I
LONGBOAT PASS
LBVC - 14 - 04
10.0 - 12.0


CB&I
LONGBOAT PASS
LBVC - 14 - 04
12.0 - 12.1


CB&I
LONGBOAT PASS
LBVC - 14 - 05
0.0 - 2.0


CB&I
LONGBOAT PASS
LBVC - 14 - 05
2.0 - 4.0


CB&I
LONGBOAT PASS
LBVC - 14 - 05
4.0 - 6.0


CB&I
LONGBOAT PASS
LBVC - 14 - 05
6.0 - 8.0


LONGBOAT PASS
LBVC - 14 - 05
8.0 - 10.0


LONGBOAT PASS
LBVC - 14 - 05
10.0 - 12.0


LONGBOAT PASS
LBVC - 14 - 05
12.0 - 14.0


LONGBOAT PASS
LBVC - 14 - 05
14.0 - 16.0


CB&I
LONGBOAT PASS
LBVC - 14 - 05
16.0 - 18.0


CB&I
LONGBOAT PASS
LBVC - 14 - 05
18.0 - 19.8

APPENDIX 7
2014 CB&I INDIVIDUAL VIBRACORE GRANULARMETRIC REPORTS

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance

Sample Name: LBVC-14-01 #1

Analysis Date: 07-24-14

Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,382	1,130,426	Florida State Plane West	-9.1 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
94.01	93.05	0.00	0.07	#200 - 1.11 #230 - 1.10		18	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.12	0.13	0.12	0.13
4	-2.25	4.76	0.42	0.45	0.54	0.58
5	-2.00	4.00	0.38	0.40	0.92	0.98
7	-1.50	2.83	1.28	1.36	2.20	2.34
10	-1.00	2.00	1.70	1.81	3.90	4.15
14	-0.50	1.41	1.76	1.87	5.66	6.02
18	0.00	1.00	1.66	1.77	7.32	7.79
25	0.50	0.71	1.86	1.98	9.18	9.77
35	1.00	0.50	2.54	2.70	11.72	12.47
45	1.50	0.35	3.27	3.48	14.99	15.95
60	2.00	0.25	7.42	7.89	22.41	23.84
80	2.50	0.18	28.44	30.25	50.85	54.09
120	3.00	0.13	37.76	40.17	88.61	94.26
170	3.50	0.09	4.30	4.57	92.91	98.83
200	3.75	0.07	0.06	0.06	92.97	98.89
230	4.00	0.06	0.01	0.01	92.98	98.90

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.08	2.87	2.76	2.43	2.02	1.50	-0.77

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.08	0.24	1.12	-2.12	7.17

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-01 #2
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,382	1,130,426	Florida State Plane West	-11.7 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
88.58	87.72	0.00	0.00	#200 - 0.98 #230 - 0.96		12	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	2.43	2.74	2.43	2.74
3.5	-2.50	5.66	1.02	1.15	3.45	3.89
4	-2.25	4.76	0.08	0.09	3.53	3.98
5	-2.00	4.00	0.39	0.44	3.92	4.42
7	-1.50	2.83	1.03	1.16	4.95	5.58
10	-1.00	2.00	0.82	0.93	5.77	6.51
14	-0.50	1.41	0.85	0.96	6.62	7.47
18	0.00	1.00	0.62	0.70	7.24	8.17
25	0.50	0.71	0.55	0.62	7.79	8.79
35	1.00	0.50	0.67	0.76	8.46	9.55
45	1.50	0.35	0.84	0.95	9.30	10.50
60	2.00	0.25	1.67	1.89	10.97	12.39
80	2.50	0.18	11.93	13.47	22.90	25.86
120	3.00	0.13	58.08	65.57	80.98	91.43
170	3.50	0.09	6.60	7.45	87.58	98.88
200	3.75	0.07	0.12	0.14	87.70	99.02
230	4.00	0.06	0.02	0.02	87.72	99.04

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.24	2.94	2.87	2.68	2.47	2.13	-1.75

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.25	0.21	1.4	-2.9	10.48

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance

Sample Name: LBVC-14-01 #3

Analysis Date: 07-24-14

Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,382	1,130,426	Florida State Plane West	-13.2 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 2.5Y-7/1 Dry - 2.5Y-8/1 Washed - 2.5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
105.91	104.32	0.03	0.00	#200 - 1.56 #230 - 1.53		67	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	2.15	2.03	2.15	2.03
5/16"	-3.00	8.00	2.67	2.52	4.82	4.55
3.5	-2.50	5.66	5.17	4.88	9.99	9.43
4	-2.25	4.76	2.80	2.64	12.79	12.07
5	-2.00	4.00	2.22	2.10	15.01	14.17
7	-1.50	2.83	7.96	7.52	22.97	21.69
10	-1.00	2.00	7.57	7.15	30.54	28.84
14	-0.50	1.41	8.48	8.01	39.02	36.85
18	0.00	1.00	8.65	8.17	47.67	45.02
25	0.50	0.71	7.86	7.42	55.53	52.44
35	1.00	0.50	7.98	7.53	63.51	59.97
45	1.50	0.35	8.28	7.82	71.79	67.79
60	2.00	0.25	11.59	10.94	83.38	78.73
80	2.50	0.18	12.16	11.48	95.54	90.21
120	3.00	0.13	8.00	7.55	103.54	97.76
170	3.50	0.09	0.66	0.62	104.20	98.38
200	3.75	0.07	0.06	0.06	104.26	98.44
230	4.00	0.06	0.03	0.03	104.29	98.47

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.82	2.23	1.83	0.34	-1.27	-1.88	-2.95

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	0.16	0.90	1.82	-0.29	2

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance

Sample Name: LBVC-14-01 #4

Analysis Date: 07-24-14

Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,382	1,130,426	Florida State Plane West	-16.8 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
90.07	89.16	0.01	0.00	#200 - 1.05 #230 - 1.03			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.16	0.18	0.16	0.18
5/16"	-3.00	8.00	0.31	0.34	0.47	0.52
3.5	-2.50	5.66	1.40	1.55	1.87	2.07
4	-2.25	4.76	0.70	0.78	2.57	2.85
5	-2.00	4.00	0.79	0.88	3.36	3.73
7	-1.50	2.83	1.22	1.35	4.58	5.08
10	-1.00	2.00	1.78	1.98	6.36	7.06
14	-0.50	1.41	1.73	1.92	8.09	8.98
18	0.00	1.00	1.27	1.41	9.36	10.39
25	0.50	0.71	1.13	1.25	10.49	11.64
35	1.00	0.50	1.09	1.21	11.58	12.85
45	1.50	0.35	1.59	1.77	13.17	14.62
60	2.00	0.25	4.62	5.13	17.79	19.75
80	2.50	0.18	29.38	32.62	47.17	52.37
120	3.00	0.13	39.29	43.62	86.46	95.99
170	3.50	0.09	2.63	2.92	89.09	98.91
200	3.75	0.07	0.04	0.04	89.13	98.95
230	4.00	0.06	0.02	0.02	89.15	98.97

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.99	2.86	2.76	2.46	2.08	1.63	-1.53

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.01	0.25	1.35	-2.32	7.57

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance

Sample Name: LBVC-14-01 #5

Analysis Date: 07-24-14

Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,382	1,130,426	Florida State Plane West	-18.4 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 2.5Y-7/1 Dry - 2.5Y-8/1 Washed - 2.5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
101.22	99.66	0.02	0.00	#200 - 1.62 #230 - 1.57			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	9.12	9.01	9.12	9.01
5/16"	-3.00	8.00	6.12	6.05	15.24	15.06
3.5	-2.50	5.66	7.80	7.71	23.04	22.77
4	-2.25	4.76	4.09	4.04	27.13	26.81
5	-2.00	4.00	6.53	6.45	33.66	33.26
7	-1.50	2.83	12.22	12.07	45.88	45.33
10	-1.00	2.00	10.54	10.41	56.42	55.74
14	-0.50	1.41	10.93	10.80	67.35	66.54
18	0.00	1.00	8.25	8.15	75.60	74.69
25	0.50	0.71	6.48	6.40	82.08	81.09
35	1.00	0.50	5.51	5.44	87.59	86.53
45	1.50	0.35	3.86	3.81	91.45	90.34
60	2.00	0.25	3.06	3.02	94.51	93.36
80	2.50	0.18	2.52	2.49	97.03	95.85
120	3.00	0.13	2.07	2.05	99.10	97.90
170	3.50	0.09	0.43	0.42	99.53	98.32
200	3.75	0.07	0.06	0.06	99.59	98.38
230	4.00	0.06	0.05	0.05	99.64	98.43

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.33	0.77	0.02	-1.28	-2.36	-2.94	-3.83

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	-1.15	2.22	1.69	0.41	2.55

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-01 #6
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,382	1,130,426	Florida State Plane West	-19.9 NAVD 88

USCS:	Munsell:	Comments:
SW-SM	Wet - 5Y-6/1 Dry - 5Y-7/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
93.42	88.91	0.14	0.03	#200 - 5.21 #230 - 5.01			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.07	0.07	0.07	0.07
5	-2.00	4.00	0.13	0.14	0.20	0.21
7	-1.50	2.83	0.95	1.02	1.15	1.23
10	-1.00	2.00	2.31	2.47	3.46	3.70
14	-0.50	1.41	3.34	3.58	6.80	7.28
18	0.00	1.00	3.45	3.69	10.25	10.97
25	0.50	0.71	3.50	3.75	13.75	14.72
35	1.00	0.50	3.69	3.95	17.44	18.67
45	1.50	0.35	2.81	3.01	20.25	21.68
60	2.00	0.25	3.79	4.06	24.04	25.74
80	2.50	0.18	18.04	19.31	42.08	45.05
120	3.00	0.13	41.42	44.34	83.50	89.39
170	3.50	0.09	4.71	5.04	88.21	94.43
200	3.75	0.07	0.34	0.36	88.55	94.79
230	4.00	0.06	0.19	0.20	88.74	94.99

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
	2.94	2.84	2.56	1.91	0.66	-0.82

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2	0.25	1.24	-1.49	4.13

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance

Sample Name: LBVC-14-02 #1

Analysis Date: 07-24-14

Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,164	1,129,502	Florida State Plane West	-11.1 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 2.5Y-7/1 Dry - 2.5Y-8/1 Washed - 2.5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
97.72	97.07	0.00	0.08	#200 - 0.75 #230 - 0.75		47	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	1.75	1.79	1.75	1.79
3.5	-2.50	5.66	2.12	2.17	3.87	3.96
4	-2.25	4.76	0.89	0.91	4.76	4.87
5	-2.00	4.00	0.81	0.83	5.57	5.70
7	-1.50	2.83	4.02	4.11	9.59	9.81
10	-1.00	2.00	4.26	4.36	13.85	14.17
14	-0.50	1.41	5.22	5.34	19.07	19.51
18	0.00	1.00	6.08	6.22	25.15	25.73
25	0.50	0.71	5.90	6.04	31.05	31.77
35	1.00	0.50	7.00	7.16	38.05	38.93
45	1.50	0.35	9.68	9.91	47.73	48.84
60	2.00	0.25	16.69	17.08	64.42	65.92
80	2.50	0.18	19.97	20.44	84.39	86.36
120	3.00	0.13	12.00	12.28	96.39	98.64
170	3.50	0.09	0.58	0.59	96.97	99.23
200	3.75	0.07	0.02	0.02	96.99	99.25
230	4.00	0.06	0.00	0.00	96.99	99.25

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.85	2.44	2.22	1.53	-0.06	-0.83	-2.21

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	0.98	0.51	1.58	-0.91	2.89

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-02 #2
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft): 430,164
Northing (ft): 1,129,502
Coordinate System: Florida State Plane West
Elevation (ft): -11.9 NAVD 88

USCS: SP
Munsell: Wet - 5Y-7/1
Dry - 5Y-8/1
Washed - 5Y-8/1
Comments:

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
99.50	98.37	0.01	0.00	#200 - 1.18 #230 - 1.17		6	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.09	0.09	0.09	0.09
5	-2.00	4.00	0.08	0.08	0.17	0.17
7	-1.50	2.83	0.32	0.32	0.49	0.49
10	-1.00	2.00	0.51	0.51	1.00	1.00
14	-0.50	1.41	0.61	0.61	1.61	1.61
18	0.00	1.00	0.67	0.67	2.28	2.28
25	0.50	0.71	0.69	0.69	2.97	2.97
35	1.00	0.50	0.72	0.72	3.69	3.69
45	1.50	0.35	0.75	0.75	4.44	4.44
60	2.00	0.25	1.25	1.26	5.69	5.70
80	2.50	0.18	13.47	13.54	19.16	19.24
120	3.00	0.13	72.27	72.63	91.43	91.87
170	3.50	0.09	6.80	6.83	98.23	98.70
200	3.75	0.07	0.12	0.12	98.35	98.82
230	4.00	0.06	0.01	0.01	98.36	98.83

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.23	2.95	2.88	2.71	2.54	2.38	1.72

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.57	0.17	0.67	-4.13	22.86

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance

Sample Name: LBVC-14-02 #3

Analysis Date: 07-24-14

Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,164	1,129,502	Florida State Plane West	-14.2 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
96.79	95.75	0.01	0.11	#200 - 1.22 #230 - 1.21			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	1.04	1.07	1.04	1.07
3.5	-2.50	5.66	0.33	0.34	1.37	1.41
4	-2.25	4.76	0.17	0.18	1.54	1.59
5	-2.00	4.00	0.30	0.31	1.84	1.90
7	-1.50	2.83	1.58	1.63	3.42	3.53
10	-1.00	2.00	1.82	1.88	5.24	5.41
14	-0.50	1.41	2.19	2.26	7.43	7.67
18	0.00	1.00	1.26	1.30	8.69	8.97
25	0.50	0.71	4.23	4.37	12.92	13.34
35	1.00	0.50	3.96	4.09	16.88	17.43
45	1.50	0.35	5.14	5.31	22.02	22.74
60	2.00	0.25	10.57	10.92	32.59	33.66
80	2.50	0.18	30.94	31.97	63.53	65.63
120	3.00	0.13	29.95	30.94	93.48	96.57
170	3.50	0.09	2.09	2.16	95.57	98.73
200	3.75	0.07	0.05	0.05	95.62	98.78
230	4.00	0.06	0.01	0.01	95.63	98.79

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.97	2.80	2.65	2.26	1.60	0.83	-1.11

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.84	0.28	1.26	-1.93	6.62

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-02 #4
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,164	1,129,502	Florida State Plane West	-18.2 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 2.5Y-7/1 Dry - 2.5Y-8/1 Washed - 2.5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
98.35	97.58	0.05	0.01	#200 - 0.85 #230 - 0.84			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	2.89	2.94	2.89	2.94
5/16"	-3.00	8.00	3.09	3.14	5.98	6.08
3.5	-2.50	5.66	3.93	4.00	9.91	10.08
4	-2.25	4.76	1.25	1.27	11.16	11.35
5	-2.00	4.00	1.83	1.86	12.99	13.21
7	-1.50	2.83	3.89	3.96	16.88	17.17
10	-1.00	2.00	5.45	5.54	22.33	22.71
14	-0.50	1.41	6.78	6.89	29.11	29.60
18	0.00	1.00	6.46	6.57	35.57	36.17
25	0.50	0.71	6.70	6.81	42.27	42.98
35	1.00	0.50	5.94	6.04	48.21	49.02
45	1.50	0.35	6.17	6.27	54.38	55.29
60	2.00	0.25	8.21	8.35	62.59	63.64
80	2.50	0.18	18.89	19.21	81.48	82.85
120	3.00	0.13	14.80	15.05	96.28	97.90
170	3.50	0.09	1.17	1.19	97.45	99.09
200	3.75	0.07	0.06	0.06	97.51	99.15
230	4.00	0.06	0.01	0.01	97.52	99.16

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.90	2.54	2.30	1.08	-0.83	-1.65	-3.17

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	0.58	0.67	1.95	-0.62	2.23

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-02 #5
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,164	1,129,502	Florida State Plane West	-19.3 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-5/1 Dry - 5Y-7/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
95.97	93.15	0.08	0.06	#200 - 3.29 #230 - 3.08			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	1.76	1.83	1.76	1.83
3.5	-2.50	5.66	0.74	0.77	2.50	2.60
4	-2.25	4.76	1.20	1.25	3.70	3.85
5	-2.00	4.00	1.13	1.18	4.83	5.03
7	-1.50	2.83	3.46	3.61	8.29	8.64
10	-1.00	2.00	6.50	6.77	14.79	15.41
14	-0.50	1.41	12.12	12.63	26.91	28.04
18	0.00	1.00	11.04	11.50	37.95	39.54
25	0.50	0.71	7.08	7.38	45.03	46.92
35	1.00	0.50	3.86	4.02	48.89	50.94
45	1.50	0.35	3.80	3.96	52.69	54.90
60	2.00	0.25	5.25	5.47	57.94	60.37
80	2.50	0.18	11.08	11.55	69.02	71.92
120	3.00	0.13	18.52	19.30	87.54	91.22
170	3.50	0.09	4.63	4.82	92.17	96.04
200	3.75	0.07	0.64	0.67	92.81	96.71
230	4.00	0.06	0.20	0.21	93.01	96.92

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.39	2.81	2.58	0.88	-0.62	-0.98	-2.01

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	0.79	0.58	1.76	-0.23	1.9

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-03 #1
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,817	1,128,586	Florida State Plane West	-6.7 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
91.15	90.23	0.00	0.03	#200 - 1.07 #230 - 1.06		25	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.04	0.04	0.04	0.04
7	-1.50	2.83	0.32	0.35	0.36	0.39
10	-1.00	2.00	0.80	0.88	1.16	1.27
14	-0.50	1.41	1.25	1.37	2.41	2.64
18	0.00	1.00	2.05	2.25	4.46	4.89
25	0.50	0.71	3.14	3.44	7.60	8.33
35	1.00	0.50	5.30	5.81	12.90	14.14
45	1.50	0.35	6.58	7.22	19.48	21.36
60	2.00	0.25	10.66	11.70	30.14	33.06
80	2.50	0.18	27.92	30.63	58.06	63.69
120	3.00	0.13	29.70	32.58	87.76	96.27
170	3.50	0.09	2.40	2.63	90.16	98.90
200	3.75	0.07	0.03	0.03	90.19	98.93
230	4.00	0.06	0.01	0.01	90.20	98.94

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.98	2.81	2.67	2.28	1.66	1.13	0.02

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.01	0.25	0.93	-1.52	5.2

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-03 #6
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,817	1,128,586	Florida State Plane West	-9.5 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-7/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
98.93	98.06	0.01	0.03	#200 - 0.94 #230 - 0.93		11	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.19	0.19	0.19	0.19
4	-2.25	4.76	0.00	0.00	0.19	0.19
5	-2.00	4.00	0.03	0.03	0.22	0.22
7	-1.50	2.83	0.25	0.25	0.47	0.47
10	-1.00	2.00	0.35	0.35	0.82	0.82
14	-0.50	1.41	0.75	0.76	1.57	1.58
18	0.00	1.00	1.36	1.37	2.93	2.95
25	0.50	0.71	1.19	1.20	4.12	4.15
35	1.00	0.50	2.36	2.39	6.48	6.54
45	1.50	0.35	2.09	2.11	8.57	8.65
60	2.00	0.25	5.33	5.39	13.90	14.04
80	2.50	0.18	27.96	28.26	41.86	42.30
120	3.00	0.13	50.41	50.96	92.27	93.26
170	3.50	0.09	5.56	5.62	97.83	98.88
200	3.75	0.07	0.18	0.18	98.01	99.06
230	4.00	0.06	0.01	0.01	98.02	99.07

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.15	2.91	2.82	2.58	2.19	2.03	0.68

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.37	0.19	0.78	-2.75	12.64

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-03 #2
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,817	1,128,586	Florida State Plane West	-11.3 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 2.5Y-7/1 Dry - 2.5Y-8/1 Washed - 2.5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
99.90	99.14	0.01	0.00	#200 - 0.81 #230 - 0.79		66	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	2.52	2.52	2.52	2.52
5/16"	-3.00	8.00	4.35	4.35	6.87	6.87
3.5	-2.50	5.66	4.75	4.75	11.62	11.62
4	-2.25	4.76	3.90	3.90	15.52	15.52
5	-2.00	4.00	4.75	4.75	20.27	20.27
7	-1.50	2.83	8.95	8.96	29.22	29.23
10	-1.00	2.00	9.62	9.63	38.84	38.86
14	-0.50	1.41	8.53	8.54	47.37	47.40
18	0.00	1.00	6.52	6.53	53.89	53.93
25	0.50	0.71	5.22	5.23	59.11	59.16
35	1.00	0.50	4.28	4.28	63.39	63.44
45	1.50	0.35	2.77	2.77	66.16	66.21
60	2.00	0.25	3.86	3.86	70.02	70.07
80	2.50	0.18	13.27	13.28	83.29	83.35
120	3.00	0.13	15.01	15.03	98.30	98.38
170	3.50	0.09	0.78	0.78	99.08	99.16
200	3.75	0.07	0.03	0.03	99.11	99.19
230	4.00	0.06	0.02	0.02	99.13	99.21

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.89	2.52	2.19	-0.30	-1.74	-2.22	-3.21

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	-0.03	1.02	2.05	0.01	1.67

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-03 #3
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,817	1,128,586	Florida State Plane West	-14.5 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
94.02	93.17	0.00	0.00	#200 - 0.95 #230 - 0.92		19	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.68	0.72	0.68	0.72
5/16"	-3.00	8.00	0.94	1.00	1.62	1.72
3.5	-2.50	5.66	1.45	1.54	3.07	3.26
4	-2.25	4.76	0.66	0.70	3.73	3.96
5	-2.00	4.00	0.80	0.85	4.53	4.81
7	-1.50	2.83	1.15	1.22	5.68	6.03
10	-1.00	2.00	1.60	1.70	7.28	7.73
14	-0.50	1.41	2.04	2.17	9.32	9.90
18	0.00	1.00	2.01	2.14	11.33	12.04
25	0.50	0.71	1.58	1.68	12.91	13.72
35	1.00	0.50	1.54	1.64	14.45	15.36
45	1.50	0.35	1.62	1.72	16.07	17.08
60	2.00	0.25	3.26	3.47	19.33	20.55
80	2.50	0.18	23.42	24.91	42.75	45.46
120	3.00	0.13	48.03	51.08	90.78	96.54
170	3.50	0.09	2.30	2.45	93.08	98.99
200	3.75	0.07	0.06	0.06	93.14	99.05
230	4.00	0.06	0.03	0.03	93.17	99.08

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.98	2.88	2.79	2.54	2.09	1.19	-1.92

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.96	0.26	1.49	-2.2	6.95

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-03 #4
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,817	1,128,586	Florida State Plane West	-19.0 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-6/1 Dry - 5Y-7/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
94.84	92.45	0.09	0.04	#200 - 2.96 #230 - 2.68			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.26	0.27	0.26	0.27
3.5	-2.50	5.66	0.62	0.65	0.88	0.92
4	-2.25	4.76	0.17	0.18	1.05	1.10
5	-2.00	4.00	0.66	0.70	1.71	1.80
7	-1.50	2.83	1.01	1.06	2.72	2.86
10	-1.00	2.00	1.13	1.19	3.85	4.05
14	-0.50	1.41	1.91	2.01	5.76	6.06
18	0.00	1.00	2.25	2.37	8.01	8.43
25	0.50	0.71	2.10	2.21	10.11	10.64
35	1.00	0.50	1.99	2.10	12.10	12.74
45	1.50	0.35	1.97	2.08	14.07	14.82
60	2.00	0.25	2.24	2.36	16.31	17.18
80	2.50	0.18	4.36	4.60	20.67	21.78
120	3.00	0.13	49.16	51.83	69.83	73.61
170	3.50	0.09	20.55	21.67	90.38	95.28
200	3.75	0.07	1.67	1.76	92.05	97.04
230	4.00	0.06	0.27	0.28	92.32	97.32

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.49	3.24	3.03	2.77	2.53	1.75	-0.76

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.36	0.19	1.28	-2.24	7.49

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance

Sample Name: LBVC-14-03 #5

Analysis Date: 07-24-14

Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,817	1,128,586	Florida State Plane West	-22.1 NAVD 88

USCS:	Munsell:	Comments:
SW-SM	Wet - 5Y-6/1 Dry - 5Y-7/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
96.83	88.32	0.64	0.02	#200 - 11.35 #230 - 9.48			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.20	0.21	0.20	0.21
5	-2.00	4.00	0.08	0.08	0.28	0.29
7	-1.50	2.83	0.10	0.10	0.38	0.39
10	-1.00	2.00	0.38	0.39	0.76	0.78
14	-0.50	1.41	1.00	1.03	1.76	1.81
18	0.00	1.00	1.37	1.41	3.13	3.22
25	0.50	0.71	1.08	1.12	4.21	4.34
35	1.00	0.50	0.85	0.88	5.06	5.22
45	1.50	0.35	0.64	0.66	5.70	5.88
60	2.00	0.25	6.18	6.38	11.88	12.26
80	2.50	0.18	6.22	6.42	18.10	18.68
120	3.00	0.13	29.51	30.48	47.61	49.16
170	3.50	0.09	31.25	32.27	78.86	81.43
200	3.75	0.07	6.99	7.22	85.85	88.65
230	4.00	0.06	1.81	1.87	87.66	90.52

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
	3.59	3.40	3.01	2.60	2.29	0.88

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.73	0.15	0.92	-2.42	10.13

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-04 #1
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,577	1,127,616	Florida State Plane West	-11.4 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-7/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
95.79	94.91	0.00	0.01	#200 - 0.96 #230 - 0.95		4	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.10	0.10	0.10	0.10
7	-1.50	2.83	0.04	0.04	0.14	0.14
10	-1.00	2.00	0.05	0.05	0.19	0.19
14	-0.50	1.41	0.08	0.08	0.27	0.27
18	0.00	1.00	0.09	0.09	0.36	0.36
25	0.50	0.71	0.19	0.20	0.55	0.56
35	1.00	0.50	0.27	0.28	0.82	0.84
45	1.50	0.35	0.63	0.66	1.45	1.50
60	2.00	0.25	2.58	2.69	4.03	4.19
80	2.50	0.18	24.50	25.58	28.53	29.77
120	3.00	0.13	62.62	65.37	91.15	95.14
170	3.50	0.09	3.67	3.83	94.82	98.97
200	3.75	0.07	0.07	0.07	94.89	99.04
230	4.00	0.06	0.01	0.01	94.90	99.05

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.00	2.91	2.85	2.65	2.41	2.23	2.02

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.58	0.17	0.42	-4.09	36.3

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-05 #3
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,371	1,128,156	Florida State Plane West	-11.4 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-7/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
89.32	88.51	0.01	0.00	#200 - 0.92 #230 - 0.91		10	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.14	0.16	0.14	0.16
7	-1.50	2.83	0.24	0.27	0.38	0.43
10	-1.00	2.00	0.34	0.38	0.72	0.81
14	-0.50	1.41	0.66	0.74	1.38	1.55
18	0.00	1.00	0.88	0.99	2.26	2.54
25	0.50	0.71	1.14	1.28	3.40	3.82
35	1.00	0.50	1.58	1.77	4.98	5.59
45	1.50	0.35	1.82	2.04	6.80	7.63
60	2.00	0.25	4.10	4.59	10.90	12.22
80	2.50	0.18	20.73	23.21	31.63	35.43
120	3.00	0.13	49.61	55.54	81.24	90.97
170	3.50	0.09	7.15	8.00	88.39	98.97
200	3.75	0.07	0.10	0.11	88.49	99.08
230	4.00	0.06	0.01	0.01	88.50	99.09

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.25	2.94	2.86	2.63	2.28	2.08	0.83

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.44	0.18	0.75	-2.82	12.85

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-05 #1
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,371	1,128,156	Florida State Plane West	-15.5 NAVD 88

USCS:	Munsell:	Comments:
SP	Wet - 5Y-7/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
107.30	106.40	0.01	0.00	#200 - 0.88 #230 - 0.87		7	

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.39	0.36	0.39	0.36
10	-1.00	2.00	1.00	0.93	1.39	1.29
14	-0.50	1.41	0.96	0.89	2.35	2.18
18	0.00	1.00	0.95	0.89	3.30	3.07
25	0.50	0.71	0.96	0.89	4.26	3.96
35	1.00	0.50	0.99	0.92	5.25	4.88
45	1.50	0.35	1.11	1.03	6.36	5.91
60	2.00	0.25	2.95	2.75	9.31	8.66
80	2.50	0.18	30.21	28.15	39.52	36.81
120	3.00	0.13	60.85	56.71	100.37	93.52
170	3.50	0.09	5.91	5.51	106.28	99.03
200	3.75	0.07	0.10	0.09	106.38	99.12
230	4.00	0.06	0.01	0.01	106.39	99.13

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.13	2.92	2.84	2.62	2.29	2.13	1.06

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.44	0.18	0.74	-3.26	15.27

Granularmetric Report

Depths and elevations based on measured values

Project Name: 2014 Longboat Pass Maintenance
Sample Name: LBVC-14-05 #2
Analysis Date: 07-24-14
Analyzed By: AA

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,371	1,128,156	Florida State Plane West	-25.3 NAVD 88

USCS:	Munsell:	Comments:
SW	Wet - 5Y-7/1 Dry - 5Y-8/1 Washed - 5Y-8/1	

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
92.90	89.79	0.06	0.00	#200 - 3.69 #230 - 3.43			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.04	0.04	0.04	0.04
4	-2.25	4.76	0.04	0.04	0.08	0.08
5	-2.00	4.00	0.00	0.00	0.08	0.08
7	-1.50	2.83	0.36	0.39	0.44	0.47
10	-1.00	2.00	0.85	0.91	1.29	1.38
14	-0.50	1.41	1.10	1.18	2.39	2.56
18	0.00	1.00	1.21	1.30	3.60	3.86
25	0.50	0.71	1.36	1.46	4.96	5.32
35	1.00	0.50	1.77	1.91	6.73	7.23
45	1.50	0.35	1.82	1.96	8.55	9.19
60	2.00	0.25	3.04	3.27	11.59	12.46
80	2.50	0.18	9.28	9.99	20.87	22.45
120	3.00	0.13	52.99	57.04	73.86	79.49
170	3.50	0.09	14.44	15.54	88.30	95.03
200	3.75	0.07	1.19	1.28	89.49	96.31
230	4.00	0.06	0.24	0.26	89.73	96.57

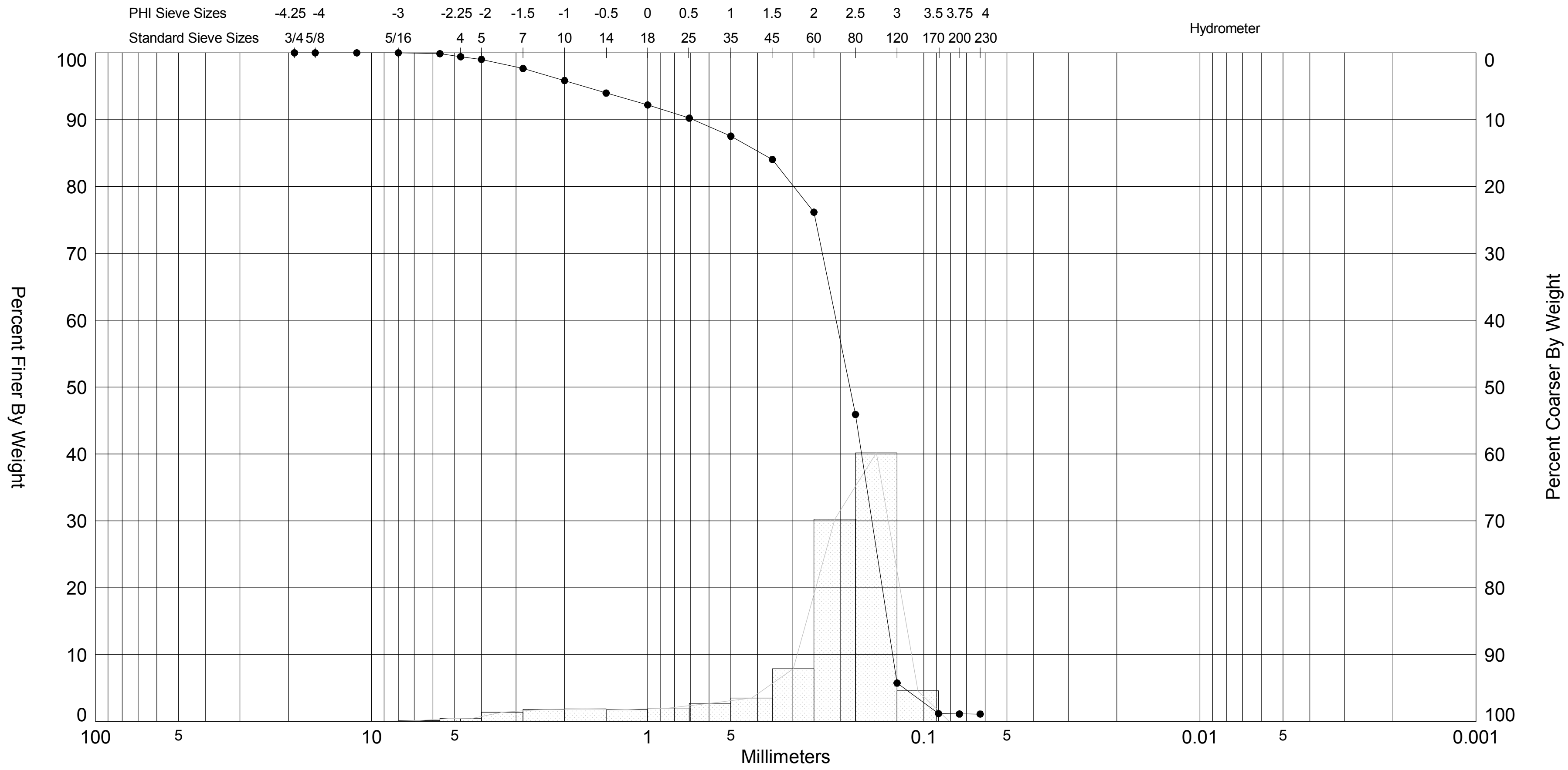
Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.50	3.15	2.96	2.74	2.52	2.18	0.39

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	2.51	0.18	0.9	-2.6	10.36

APPENDIX 8

2014 CB&I INDIVIDUAL VIBRACORE GRAIN SIZE DISTRIBUTION CURVES/HISTOGRAMS



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-01 #1	—●—	-9.1	SW	#200 - 1.11 #230 - 1.10		18	2.43	2.08	-2.12	7.17	1.12

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	431,382
Northing (Y, ft):	1,130,426
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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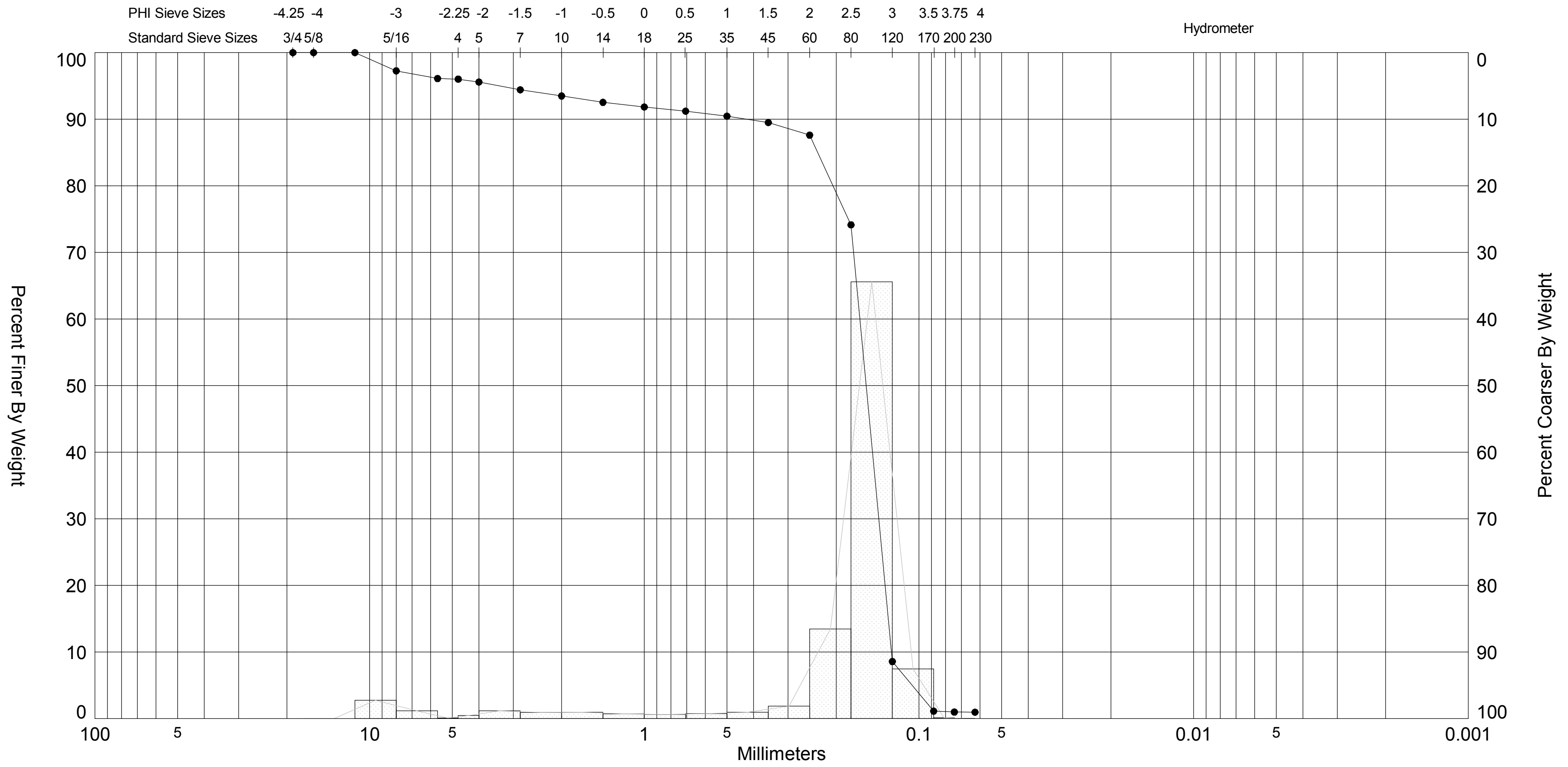

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-01 #2	—●—	-11.7	SW	#200 - 0.98 #230 - 0.96		12	2.68	2.25	-2.9	10.48	1.4

Comments:

Depths and elevations based on measured values

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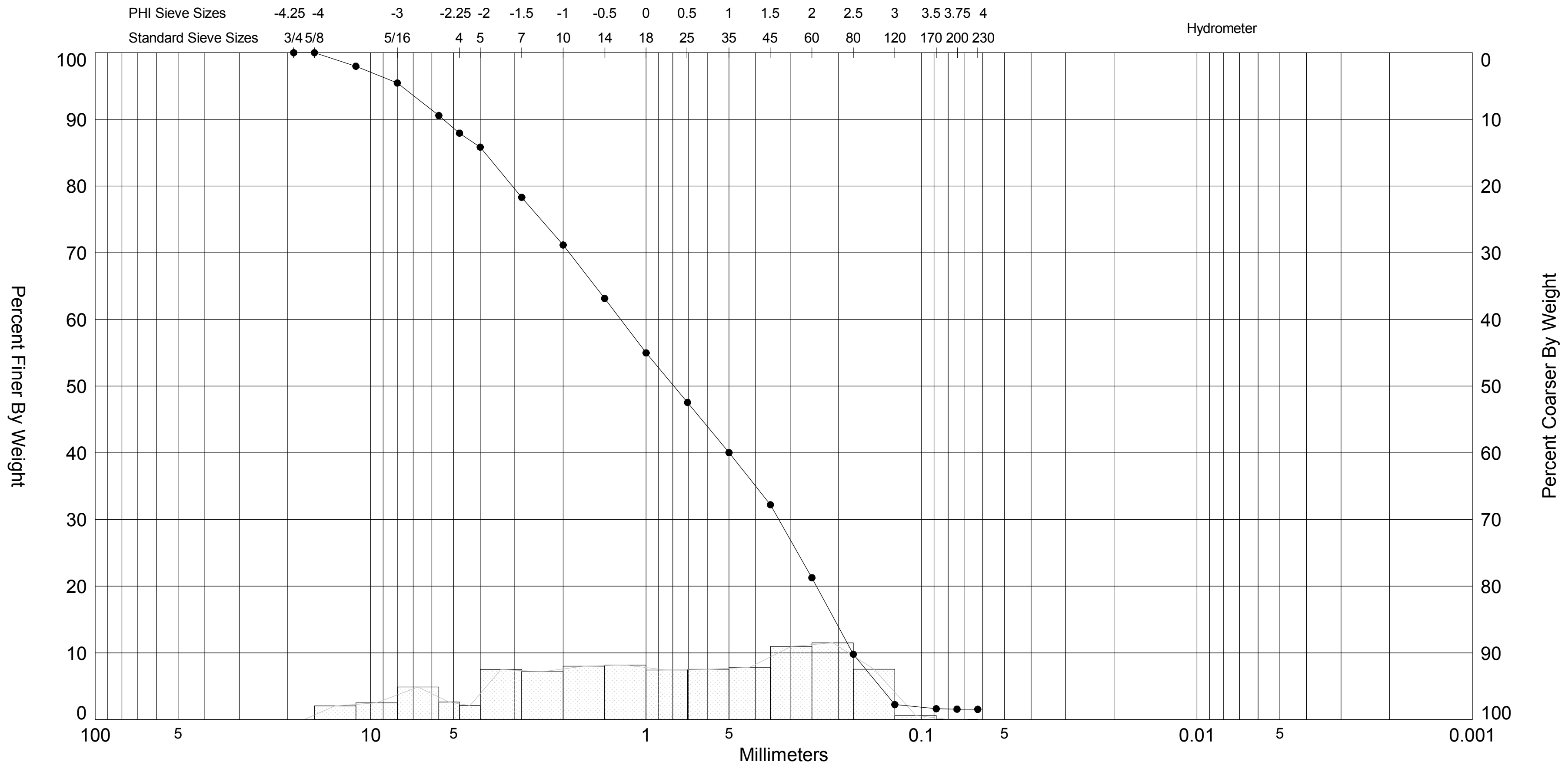
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	431,382
Northing (Y, ft):	1,130,426
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

SIEVE ANALYSIS LONG BOAT PASS 2014.GPJ JPBRAZIL.GDT 8/4/14



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-01 #3	—●—	-13.2	SW	#200 - 1.56 #230 - 1.53		67	0.34	0.16	-0.29	2	1.82

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	431,382
Northing (Y, ft):	1,130,426
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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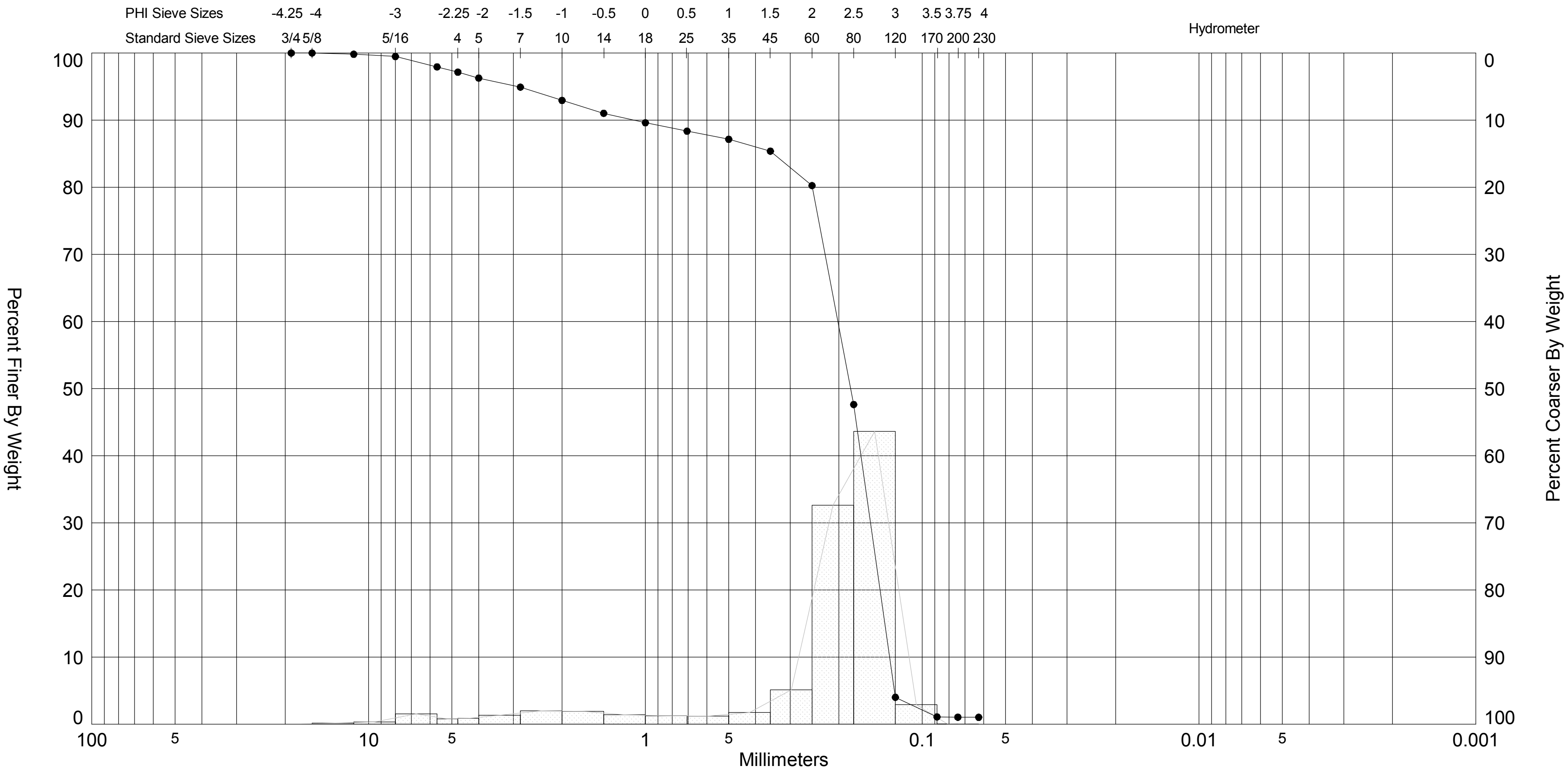

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-01 #4	—●—	-16.8	SW	#200 - 1.05 #230 - 1.03			2.46	2.01	-2.32	7.57	1.35

Comments:

Depths and elevations based on measured values

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Boca Raton, FL 33431
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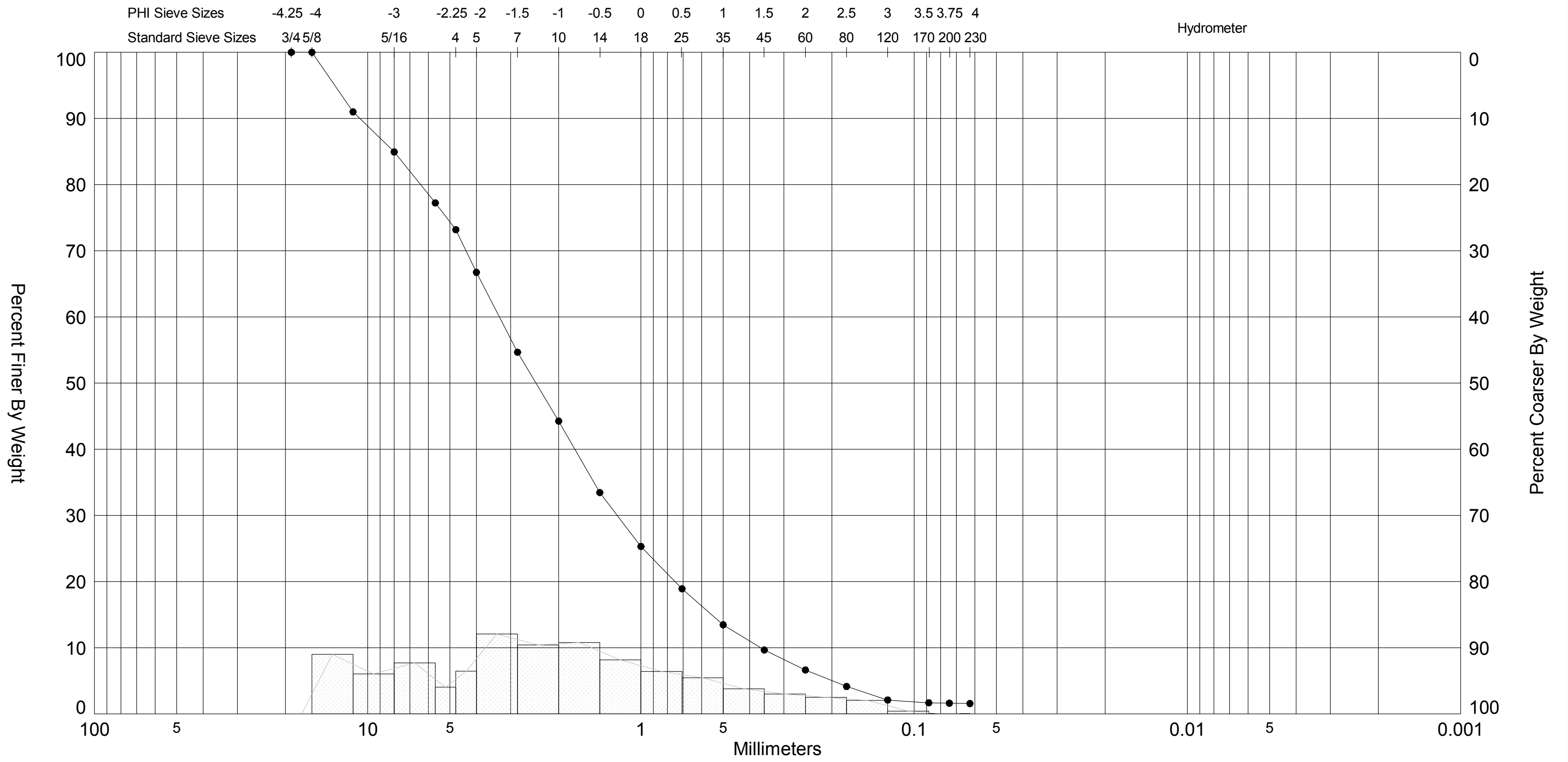
Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	431,382
Northing (Y, ft):	1,130,426
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

SIEVE ANALYSIS LONG BOAT PASS 2014.GPJ JPBRAZIL.GDT 8/4/14



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-01 #5	─●─	-18.4	SW	#200 - 1.62 #230 - 1.57				-1.15	0.41	2.55	1.69

Comments:

Depths and elevations based on measured values

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Boca Raton, FL 33431
ph (561) 391 8102

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	431,382
Northing (Y, ft):	1,130,426
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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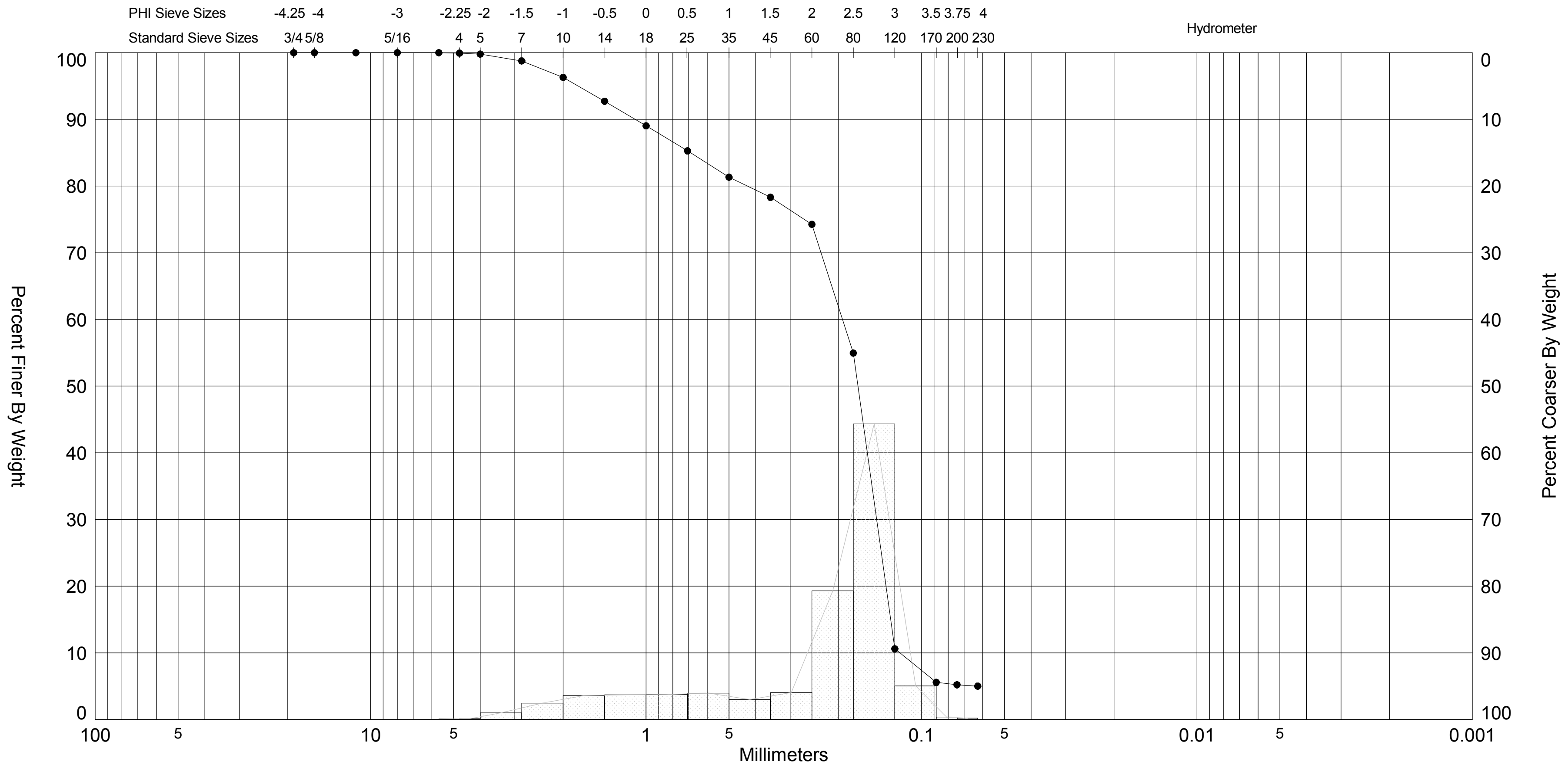

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-01 #6	—●—	-19.9	SW-SM	#200 - 5.21 #230 - 5.01			2.56	2	-1.49	4.13	1.24

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	431,382
Northing (Y, ft):	1,130,426
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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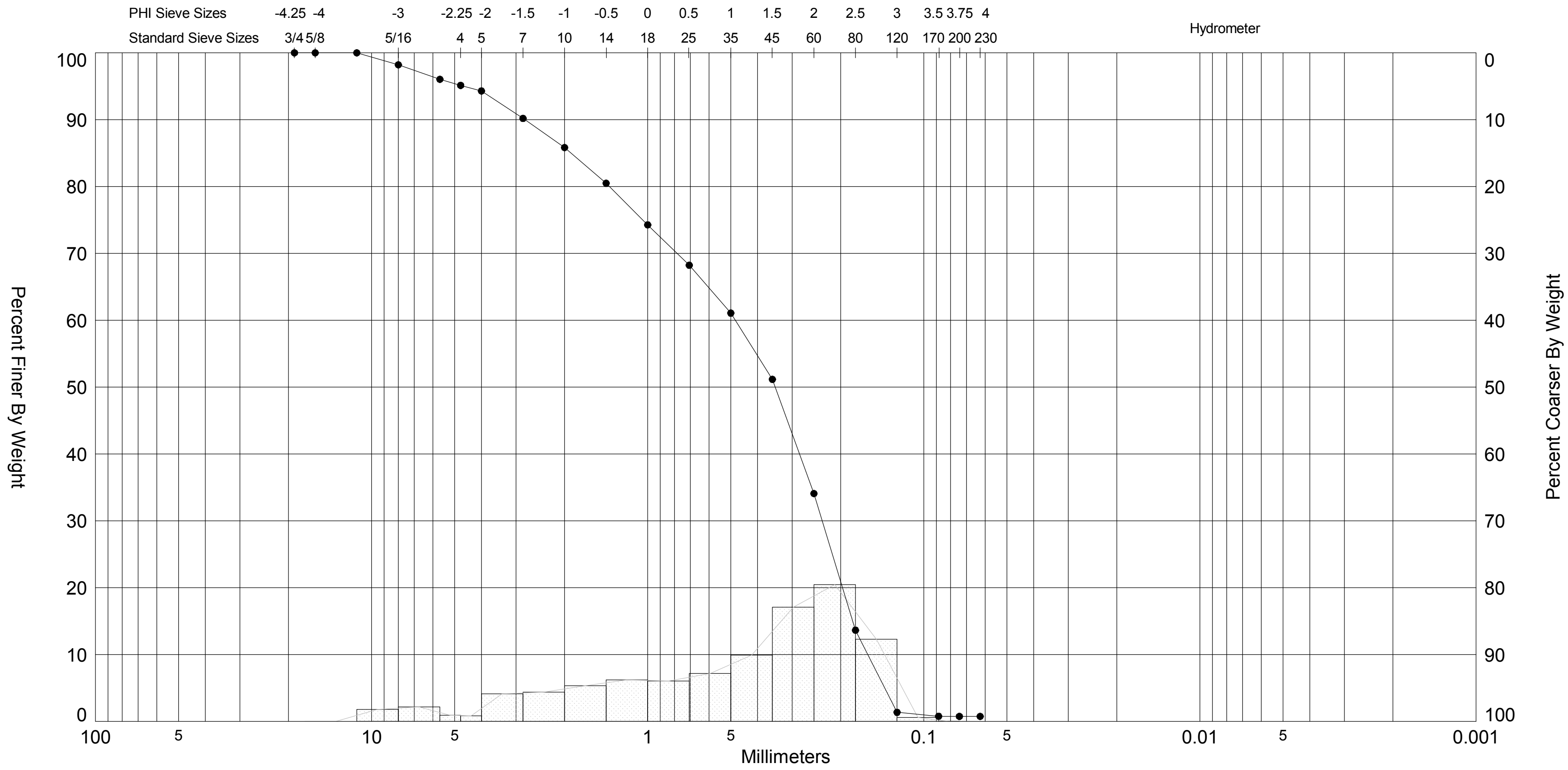

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-02 #1	—●—	-11.1	SW	#200 - 0.75 #230 - 0.75		47	1.53	0.98	-0.91	2.89	1.58

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	430,164
Northing (Y, ft):	1,129,502
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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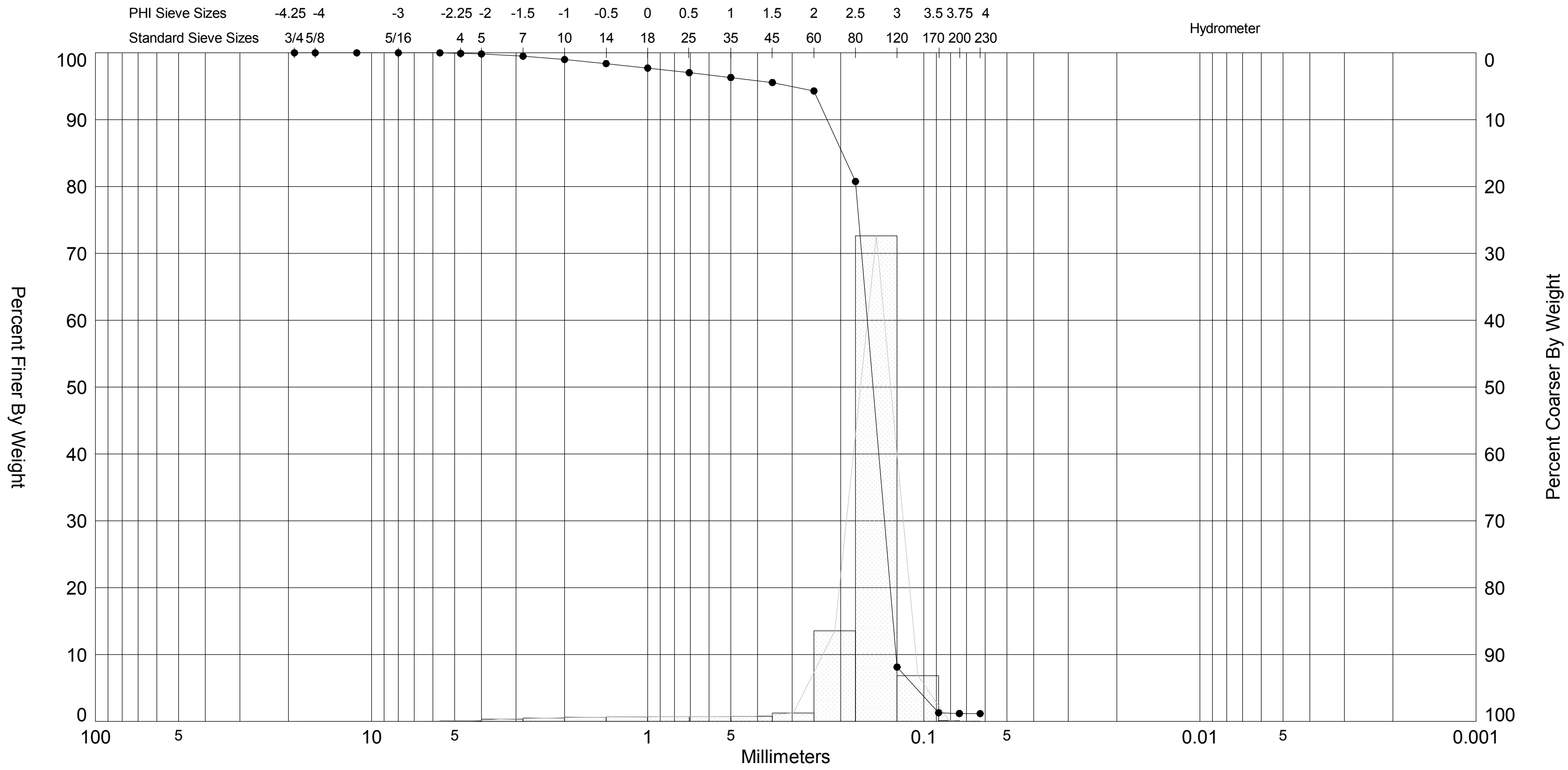

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-02 #2	—●—	-11.9	SP	#200 - 1.18 #230 - 1.17		6	2.71	2.57	-4.13	22.86	0.67

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	430,164
Northing (Y, ft):	1,129,502
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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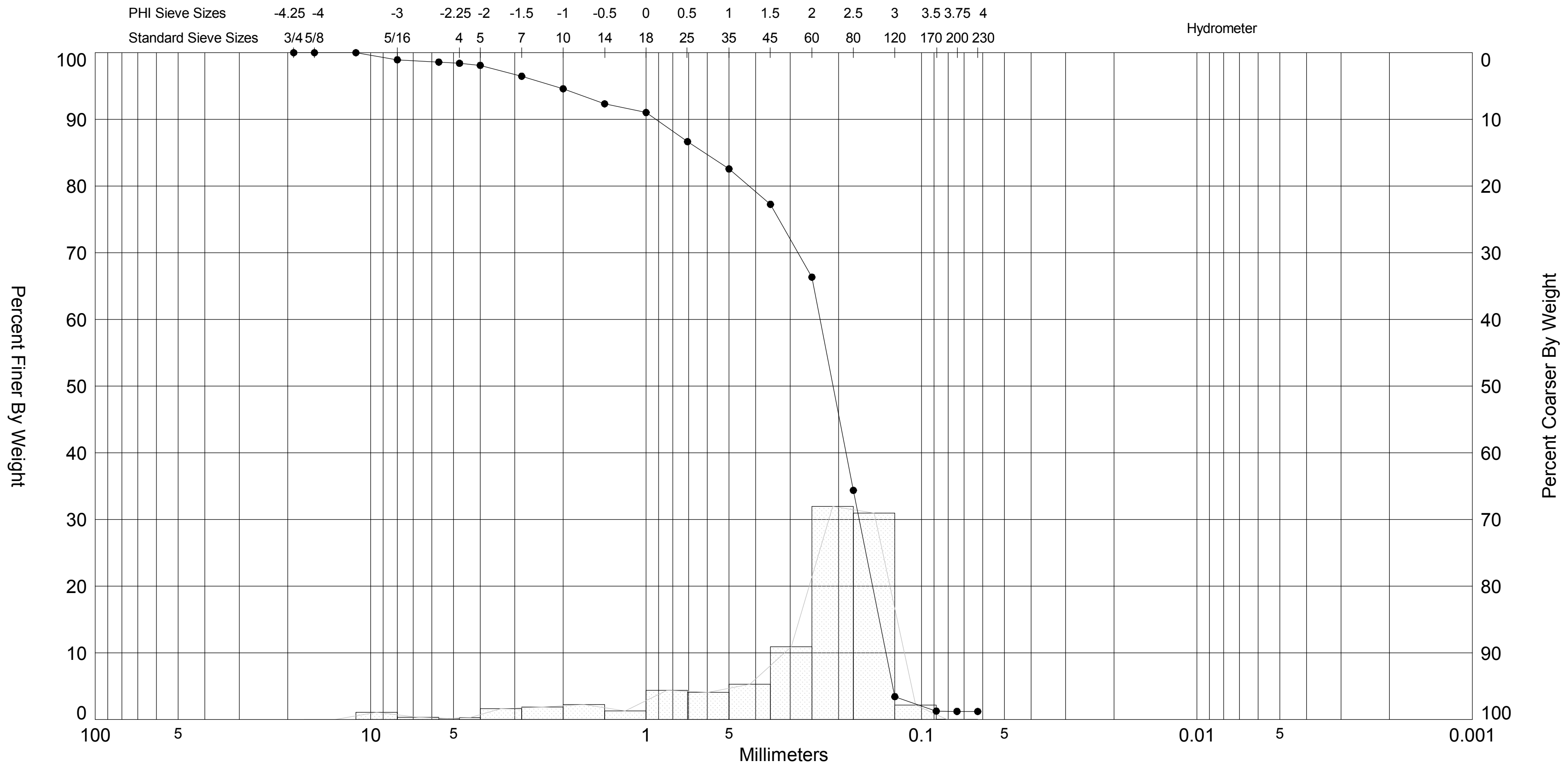

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-02 #3	—●—	-14.2	SW	#200 - 1.22 #230 - 1.21			2.26	1.84	-1.93	6.62	1.26

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	430,164
Northing (Y, ft):	1,129,502
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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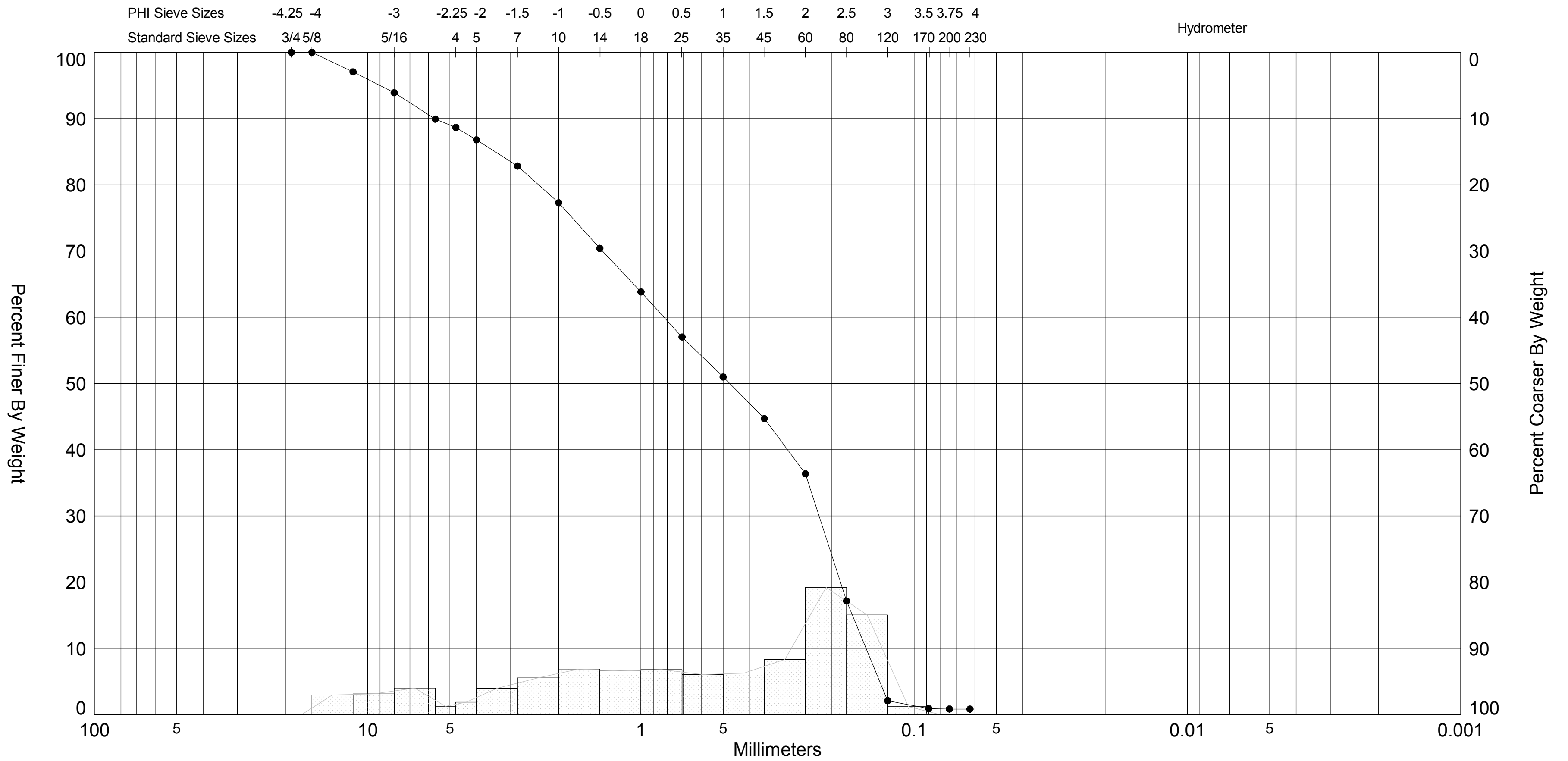

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-02 #4	─●─	-18.2	SW	#200 - 0.85 #230 - 0.84			1.08	0.58	-0.62	2.23	1.95

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	430,164
Northing (Y, ft):	1,129,502
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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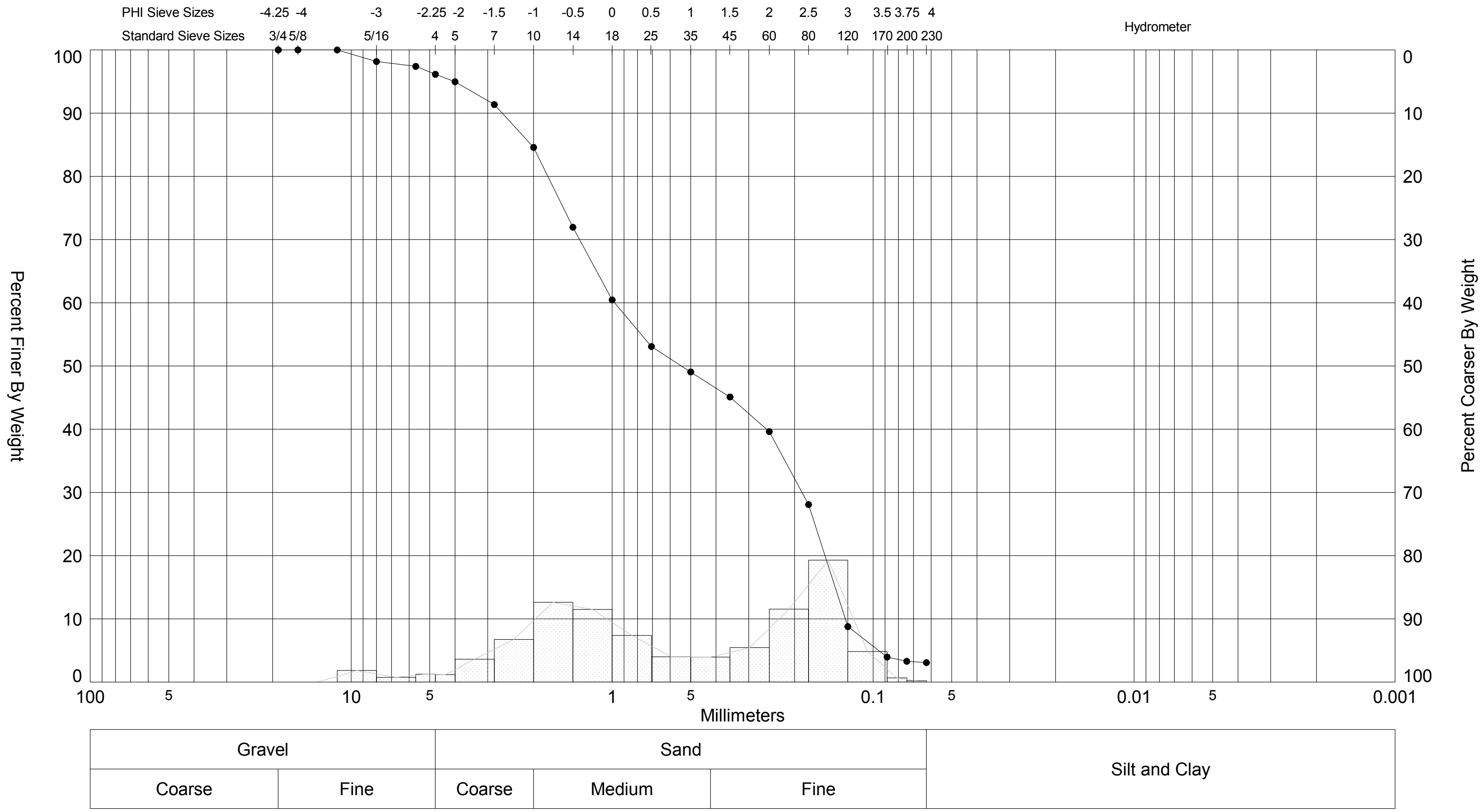

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-02 #5	—●—	-19.3	SW	#200 - 3.29 #230 - 3.08			0.88	0.79	-0.23	1.9	1.76

Comments:

Depths and elevations based on measured values

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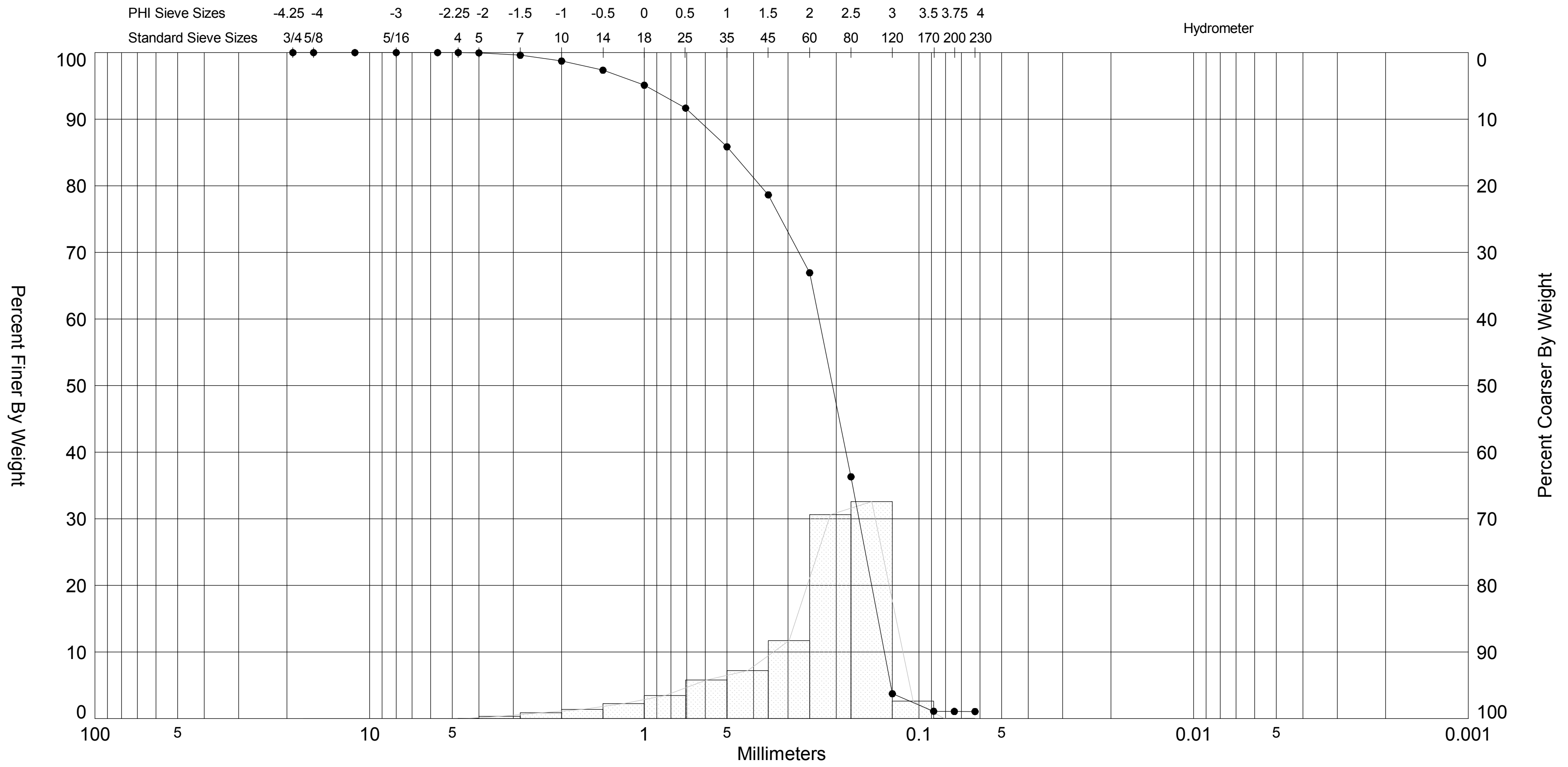
Boca Raton, FL 33431
ph (561) 391 8102

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	430,164
Northing (Y, ft):	1,129,502
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

SIEVE ANALYSIS LONG BOAT PASS 2014.GPJ JPBRAZIL.GDT 8/4/14



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-03 #1	—●—	-6.7	SW	#200 - 1.07 #230 - 1.06		25	2.28	2.01	-1.52	5.2	0.93

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	429,817
Northing (Y, ft):	1,128,586
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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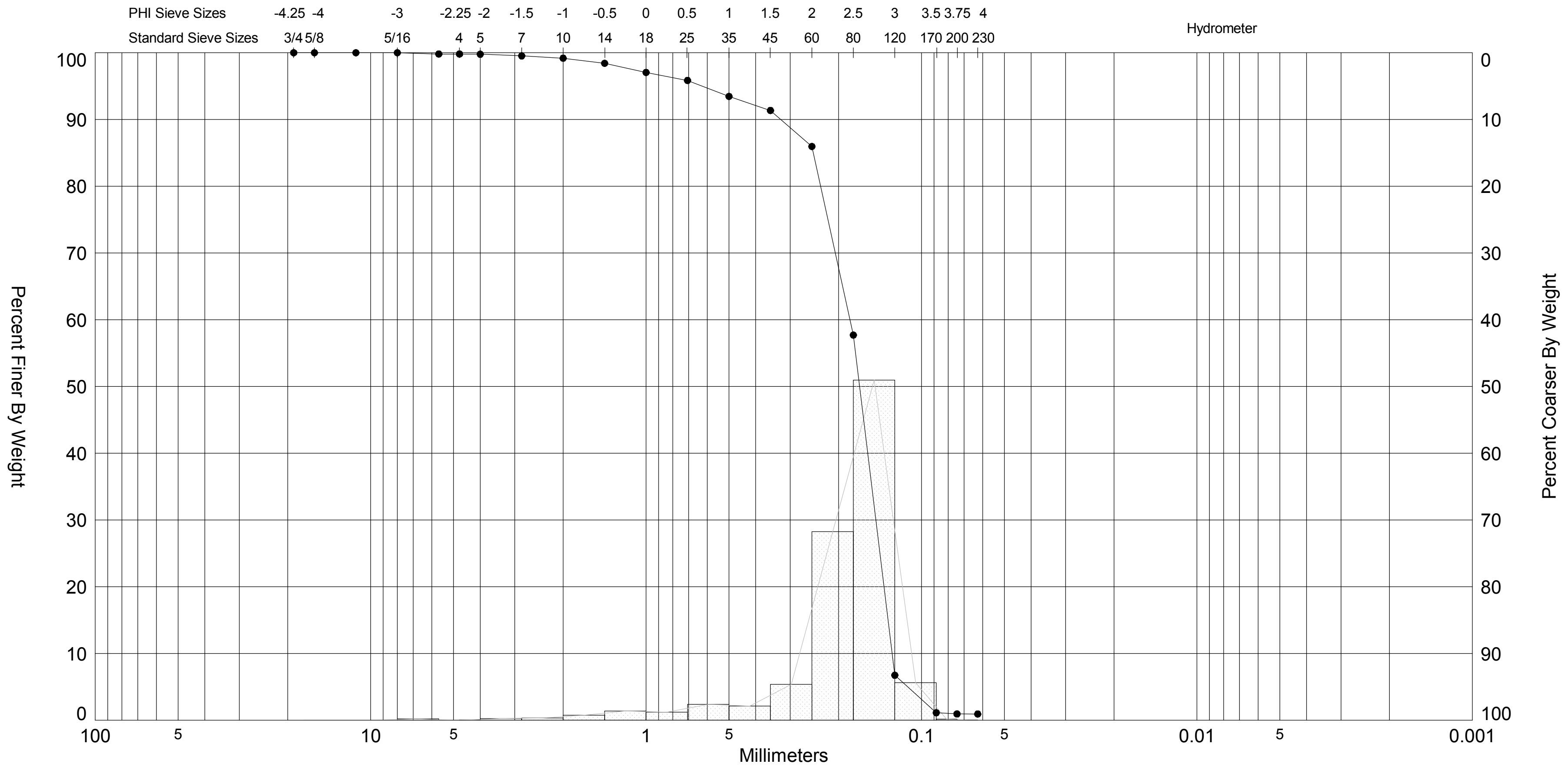

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-03 #6	●	-9.5	SP	#200 - 0.94 #230 - 0.93		11	2.58	2.37	-2.75	12.64	0.78

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	429,817
Northing (Y, ft):	1,128,586
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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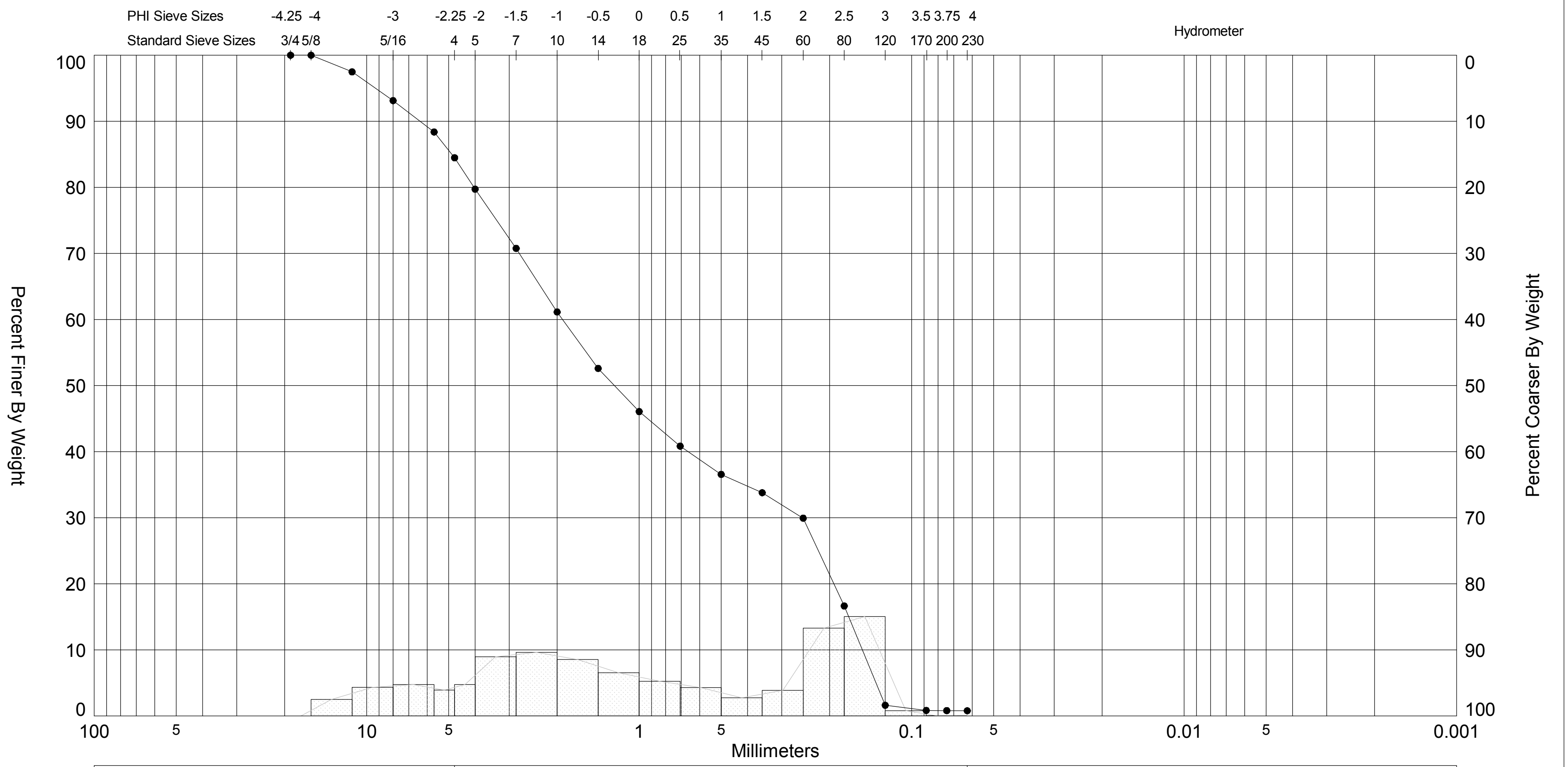

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-03 #2	—●—	-11.3	SW	#200 - 0.81 #230 - 0.79		66		-0.03	0.01	1.67	2.05

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	429,817
Northing (Y, ft):	1,128,586
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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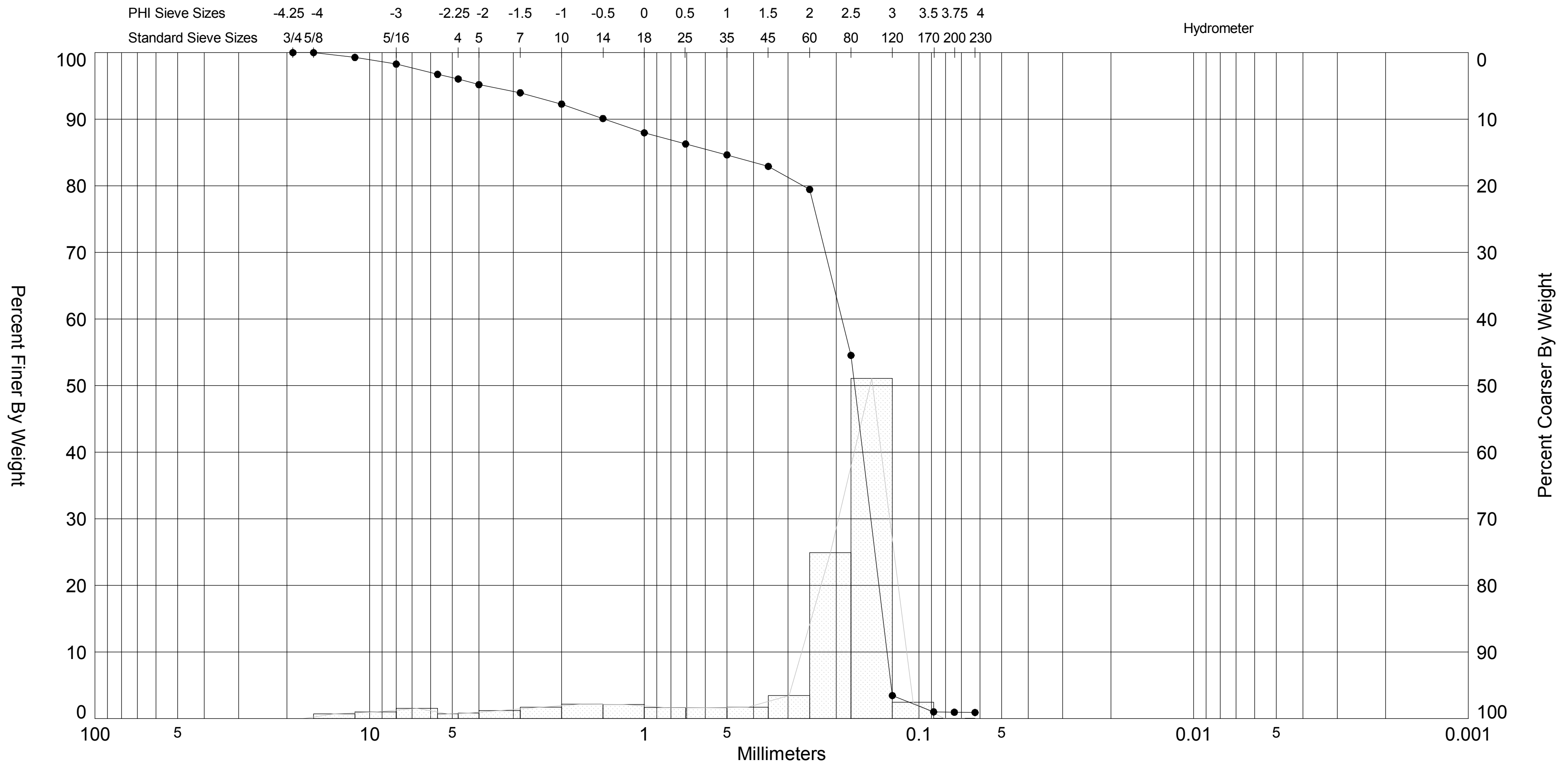

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-03 #3	●	-14.5	SW	#200 - 0.95 #230 - 0.92		19	2.54	1.96	-2.2	6.95	1.49

Comments:

Depths and elevations based on measured values

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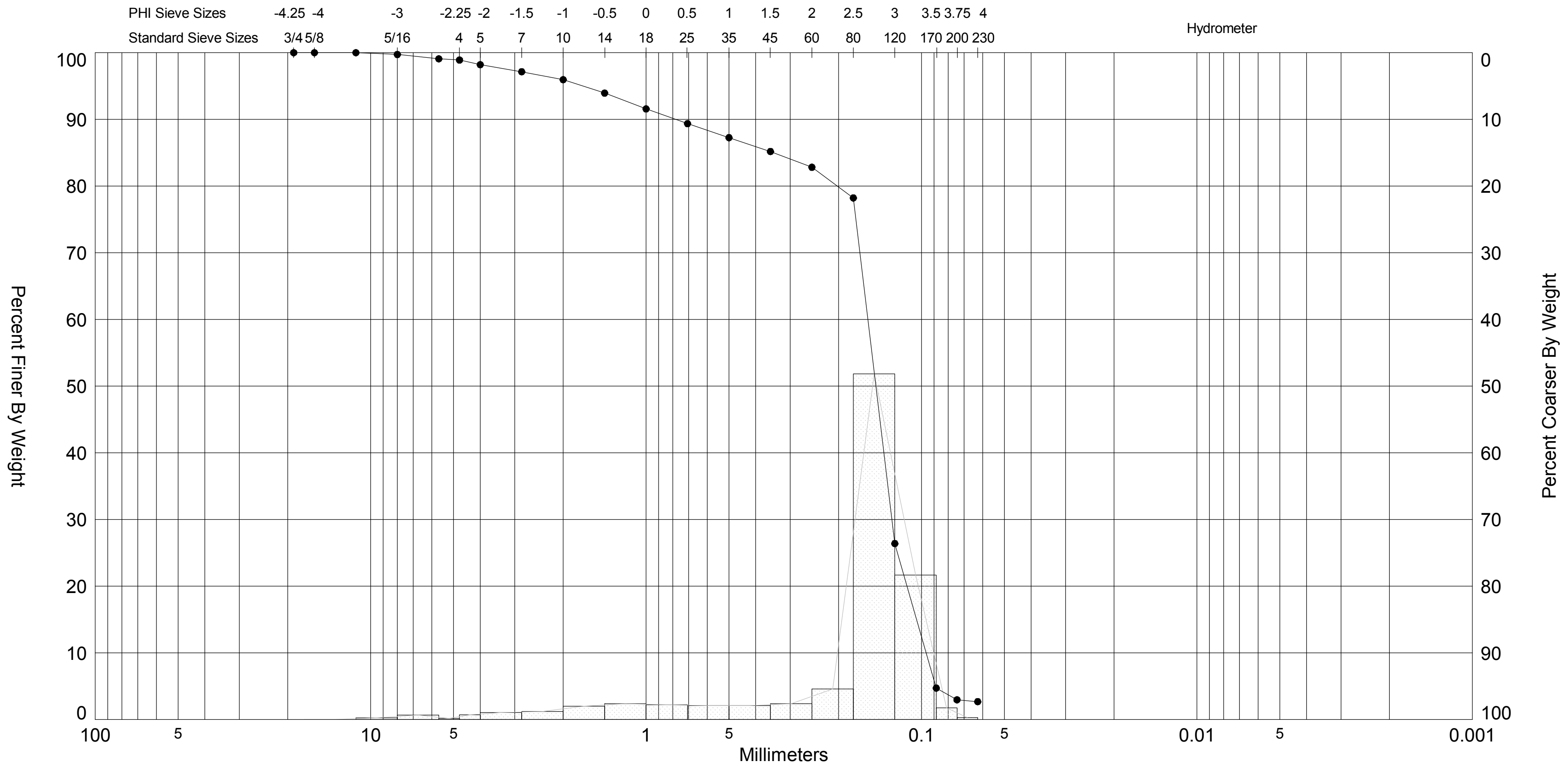
Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	429,817
Northing (Y, ft):	1,128,586
Horizontal System:	NAD 1983
Vertical System:	NAVD 88



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-03 #4	—●—	-19.0	SW	#200 - 2.96 #230 - 2.68			2.77	2.36	-2.24	7.49	1.28

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	429,817
Northing (Y, ft):	1,128,586
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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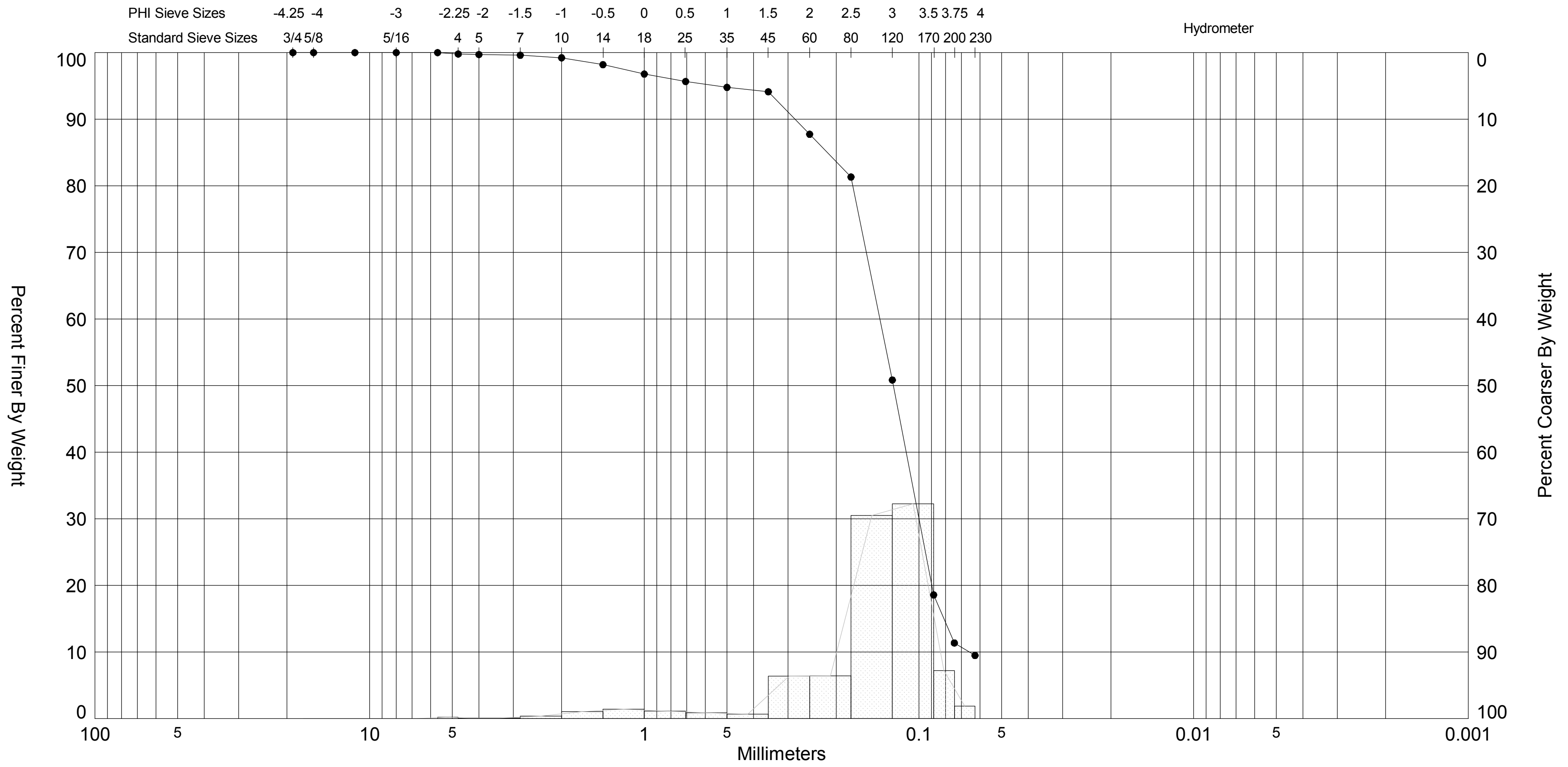

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-03 #5	—●—	-22.1	SW-SM	#200 - 11.35 #230 - 9.48			3.01	2.73	-2.42	10.13	0.92

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	429,817
Northing (Y, ft):	1,128,586
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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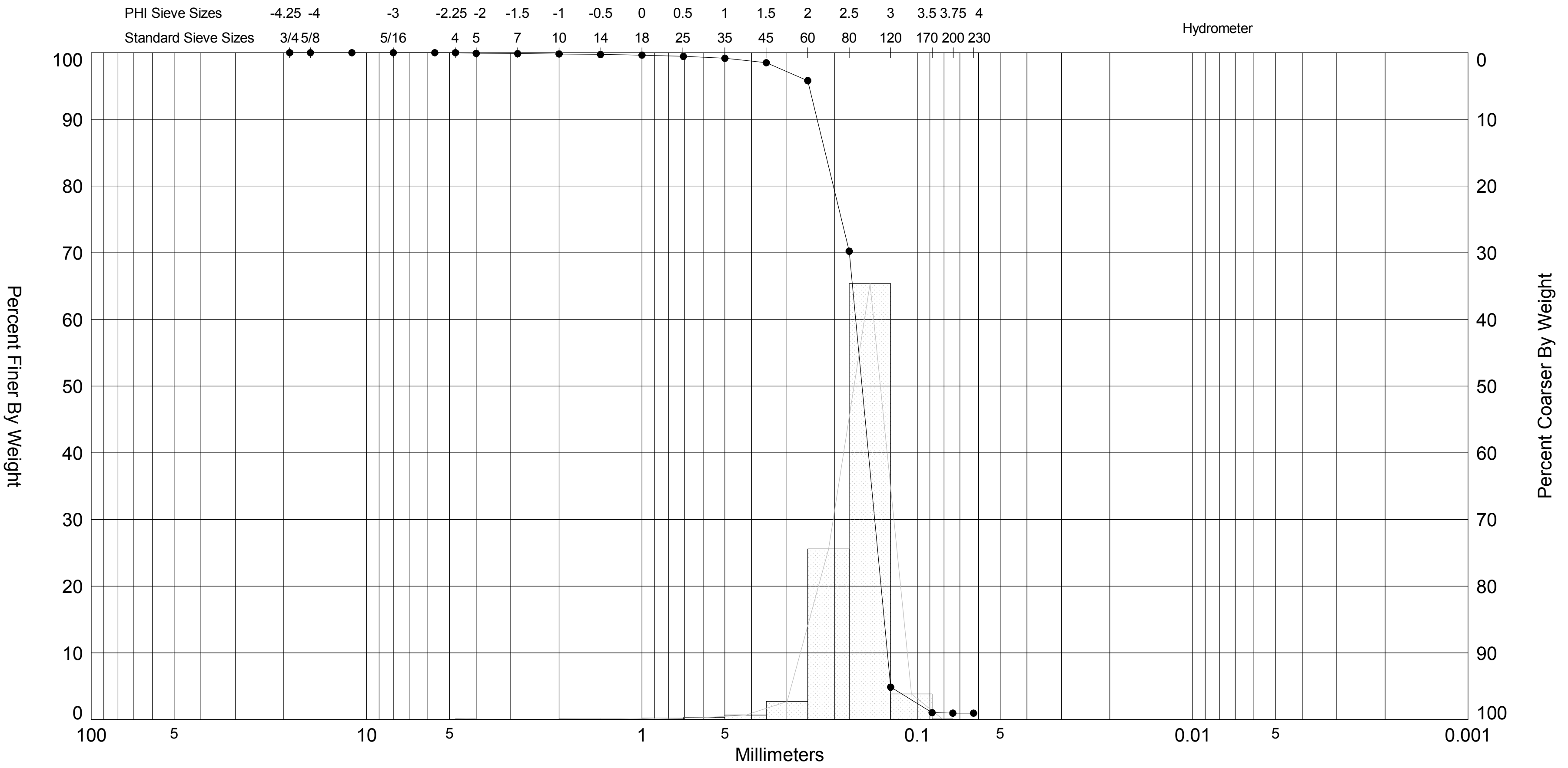

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-04 #1	●	-11.4	SP	#200 - 0.96 #230 - 0.95		4	2.65	2.58	-4.09	36.3	0.42

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	429,577
Northing (Y, ft):	1,127,616
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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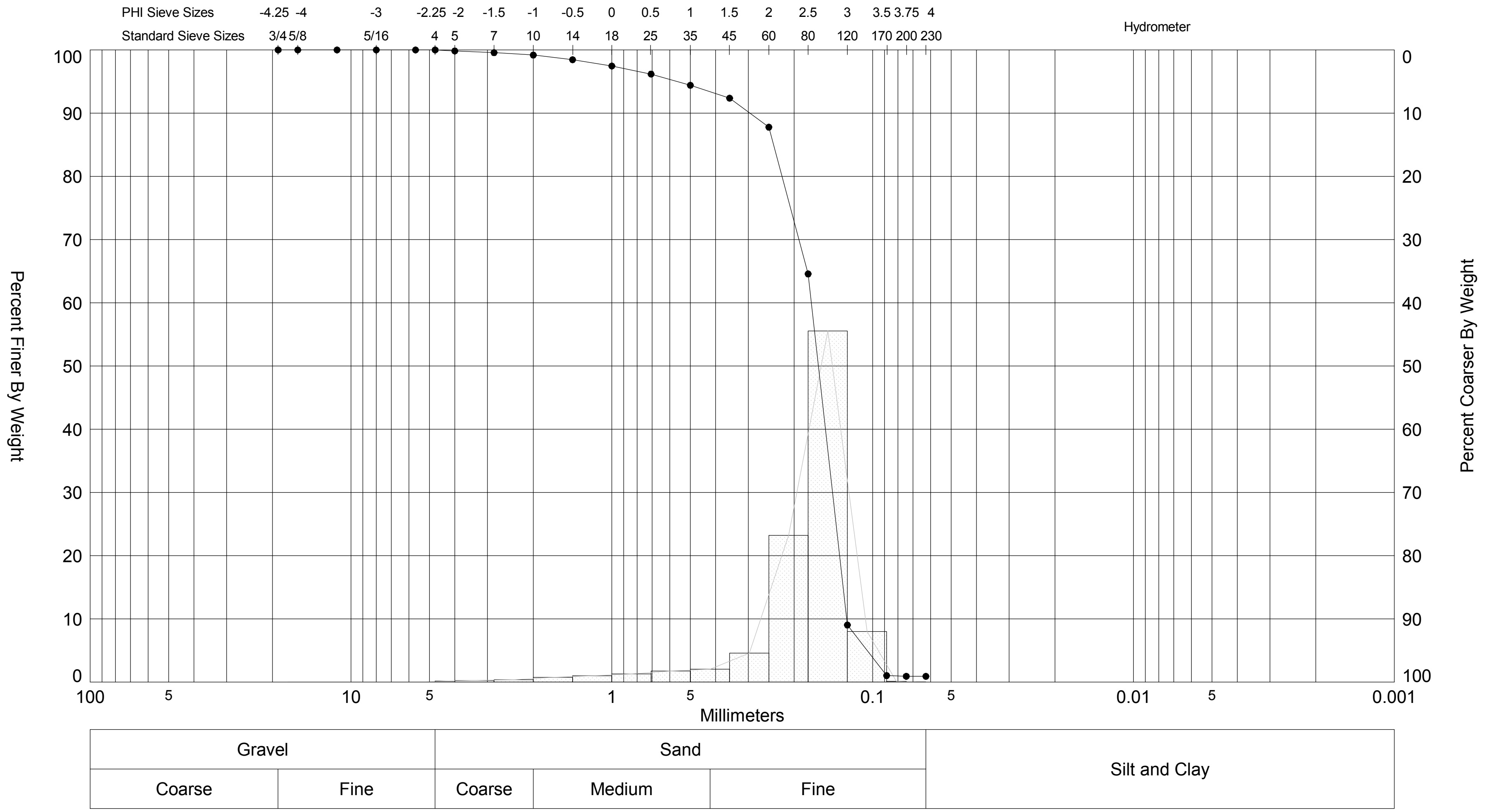

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-05 #3	—●—	-11.4	SP	#200 - 0.92 #230 - 0.91		10	2.63	2.44	-2.82	12.85	0.75

Comments:

Depths and elevations based on measured values

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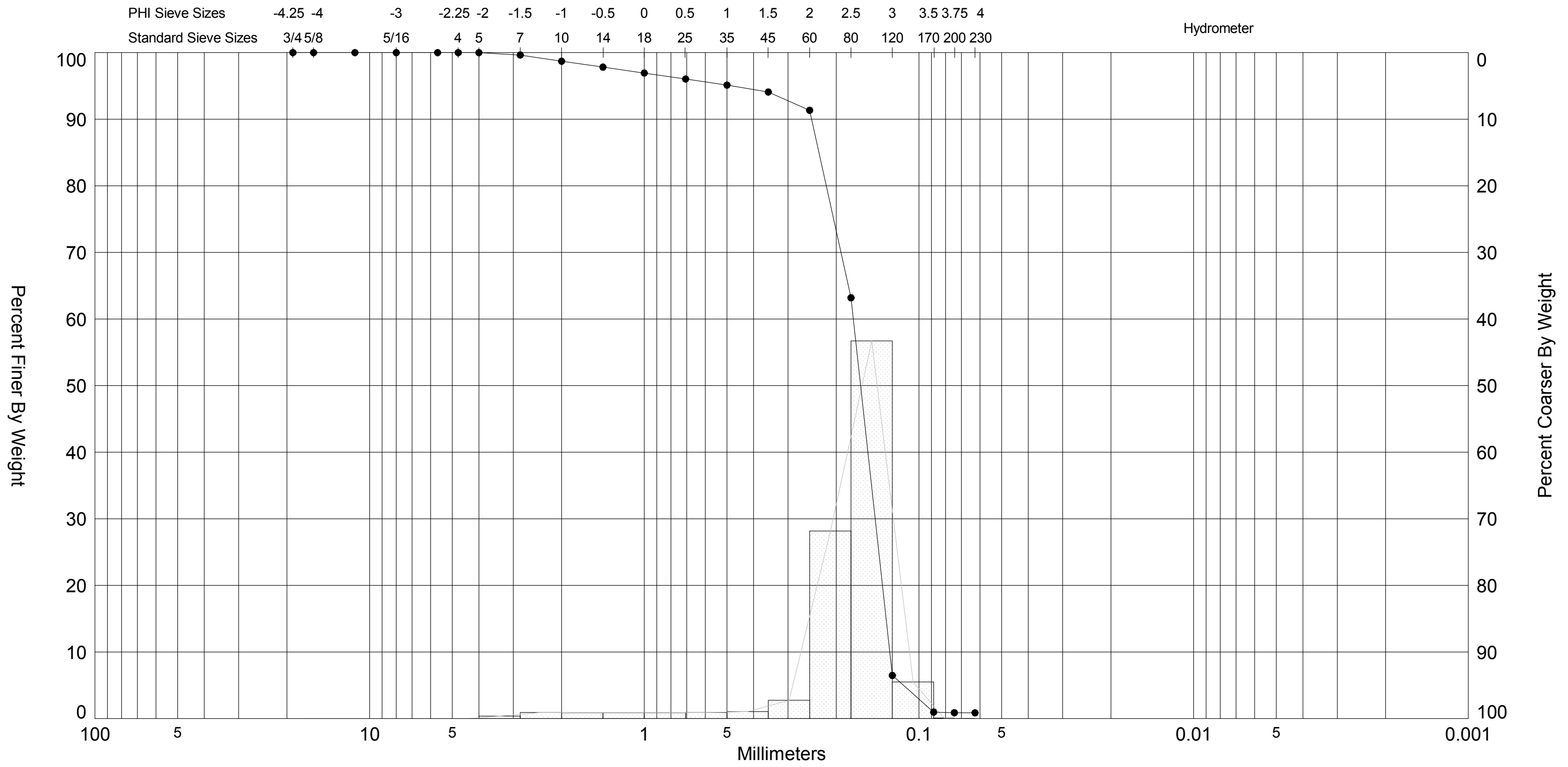
Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	429,371
Northing (Y, ft):	1,128,156
Horizontal System:	NAD 1983
Vertical System:	NAVD 88



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-05 #1	—●—	-15.5	SP	#200 - 0.88 #230 - 0.87		7	2.62	2.44	-3.26	15.27	0.74

Comments:

Depths and elevations based on measured values

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Boca Raton, FL 33431
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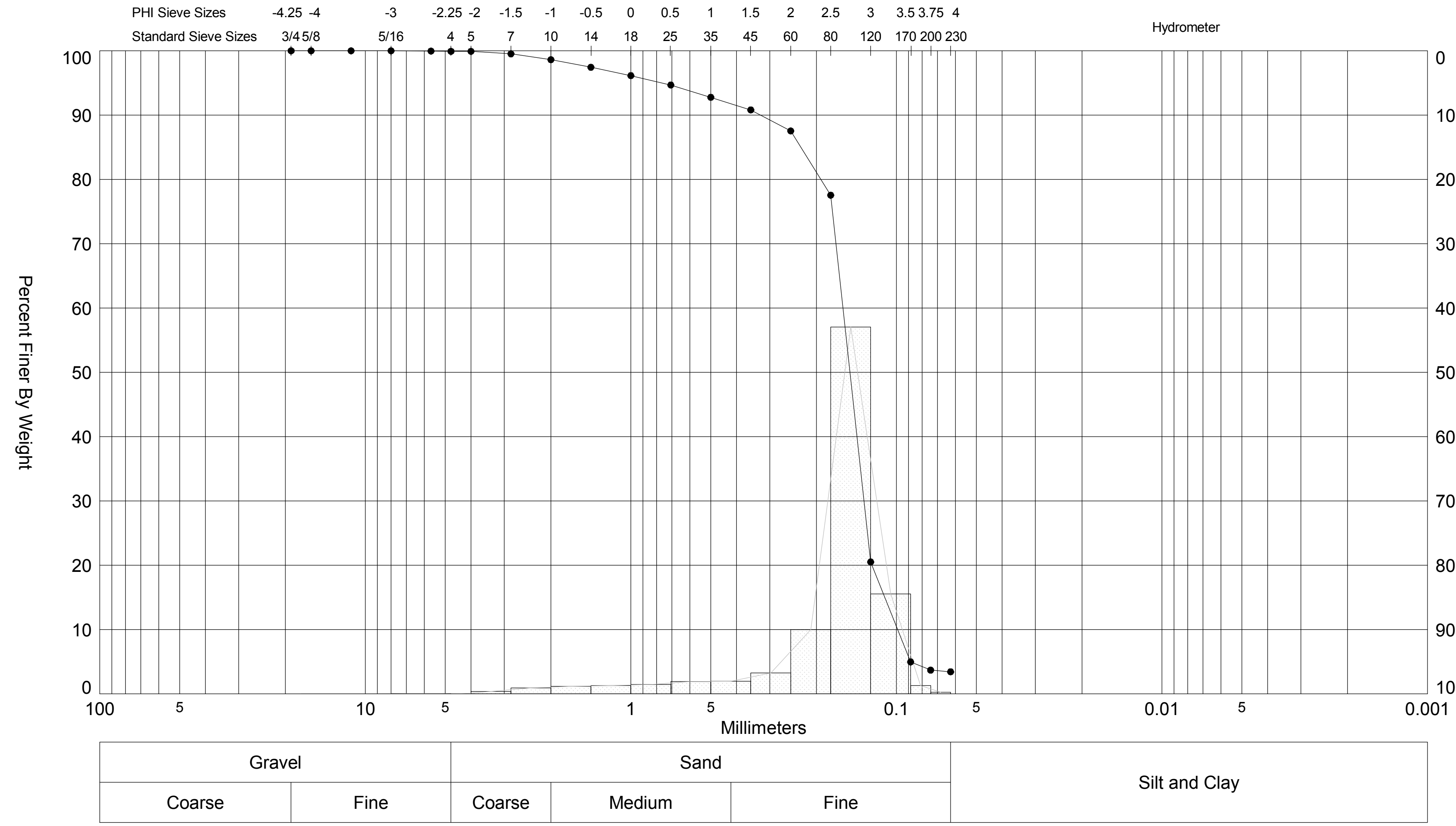
Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	429,371
Northing (Y, ft):	1,128,156
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

SIEVE ANALYSIS LONG BOAT PASS 2014.GPJ JPBRAZIL.GDT 8/4/14



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
LBVC-14-05 #2	—●—	-25.3	SW	#200 - 3.69 #230 - 3.43			2.74	2.51	-2.6	10.36	0.9

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2014 Longboat Pass Maintenance
Analysis Date:	07-24-14
Analyzed By:	AA
Easting (X, ft):	429,371
Northing (Y, ft):	1,128,156
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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APPENDIX 9

CHANNEL COMPOSITE SUMMARY TABLES

COMPOSITE SUMMARY TABLE
LONGBOAT PASS MAINTENANCE DREDGING PROJECT

VIBRACORE I. D.	EFFECTIVE LENGTH (FT)	PHI MEDIAN	MEDIAN (mm)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	% CARBONATE	WET MUNSELL COLOR
LBVC-14-01 Composite	6.5	2.50	0.18	0.26	1.92	1.43	1.12	22	7
LBVC-14-02 Composite	8.2	2.40	0.19	0.27	1.88	1.38	1.12	23	7
LBVC-14-03 Composite	8.1	2.26	0.21	0.35	1.50	1.70	1.05	33	7
LBVC-14-04 Composite	8.2	2.69	0.15	0.17	2.58	0.56	1.04	5	7
LBVC-14-05 Composite	2.8	2.62	0.16	0.18	2.44	0.75	0.89	9	7
AMVC-07-01 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-03 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-04 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-05 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-06 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-07 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-08 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-09 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-10 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-11 Composite	6.2	2.32	0.20	0.30	1.76	1.46	1.12	ND	7
AMVC-07-12 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-13 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-14 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-15 Composite	2.9	0.51	0.70	0.78	0.35	1.79	1.97	ND	6
AMVC-07-17 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-18 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-19 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
AMVC-07-20 Composite	VIBRACORE NOT USED IN CHANNEL COMPOSITES								
ALT. 6F-4 CHANNEL	42.9	2.48	0.18	0.28	1.86	1.46	1.13	16	7

COMPOSITE DATA TABLE
LONGBOAT PASS MAINTENANCE DREDGING PROJECT

VIBRACORE I. D.	EFFECTIVE LENGTH (FT)	PHI MEDIAN	MEDIAN (mm)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	% CARBONATE	WET MUNSELL COLOR								PHI SIZES													
										-4.25	-4.0	-3.50	-3.0	-2.50	-2.25	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	3.75	4.0	PAN
LBVC-14-01 Composite	6.5	2.50	0.18	0.26	1.92	1.43	1.12	22	7	0.00	0.00	0.22	1.25	2.17	2.76	3.35	5.32	7.46	9.74	11.90	14.09	16.78	20.02	26.58	50.16	93.85	98.80	98.88	98.89	99.96
LBVC-14-02 Composite	8.2	2.40	0.19	0.27	1.88	1.38	1.12	23	7	0.00	0.00	0.20	0.60	1.34	1.99	2.54	4.57	6.91	9.48	12.08	14.73	17.97	21.99	29.91	54.84	94.60	98.80	98.87	98.88	99.95
LBVC-14-03 Composite	8.1	2.26	0.21	0.35	1.50	1.70	1.05	33	7	0.00	0.00	0.81	2.06	3.79	4.95	6.22	9.21	12.50	15.98	19.49	22.91	27.08	31.37	38.42	60.52	95.86	98.86	98.94	98.95	99.99
LBVC-14-04 Composite	8.2	2.69	0.15	0.17	2.58	0.56	1.04	5	7	0.00	0.00	0.00	0.00	0.00	0.05	0.14	0.32	0.60	0.96	1.34	1.79	2.30	3.01	4.96	24.38	93.47	98.83	98.93	98.94	100.00
LBVC-14-05 Composite	2.8	2.62	0.16	0.18	2.44	0.75	0.89	9	7	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.40	1.03	1.84	2.79	3.89	5.26	6.83	10.57	36.07	92.15	99.00	99.10	99.11	100.00
AMVC-07-01 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-03 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-04 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-05 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-06 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-07 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-08 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-09 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-10 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-11 Composite	6.2	2.32	0.20	0.30	1.76	1.46	1.12	ND	7	0.00	0.00	0.30	0.81	1.88	2.60	3.32	5.39	8.17	11.45	14.35	17.34	20.60	24.44	33.00	59.45	94.90	98.78	98.85	98.88	99.90
AMVC-07-12 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-13 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-14 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-15 Composite	2.9	0.51	0.70	0.78	0.35	1.79	1.97	ND	6	0.00	0.00	1.15	4.11	7.33	8.65	11.47	17.01	23.92	32.67	41.16	49.91	58.50	66.02	74.10	84.83	96.30	97.91	97.97	98.03	99.89
AMVC-07-17 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-18 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-19 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
AMVC-07-20 Composite													VIBRACORE NOT USED IN CHANNEL COMPOSITES																	
ALT. 6F-4 CHANNEL	42.9	2.48	0.18	0.28	1.86	1.46	1.13	16	7	0.00	0.00	0.35	1.09	2.07	2.70	3.46	5.43	7.79	10.47	13.09	15.75	18.80	22.17	28.42	50.85	94.51	98.77	98.85	98.86	99.96

CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS
LONGBOAT PASS MAINTENANCE DREDGING PROJECT (1 of 3)

SAMPLE	ELEVATION	EFFECTIVE	PHI	MEDIAN	MEAN	PHI	PHI	%	%	WET MUNSELL								PHI SIZES													
I. D.	(NAVD 88 FT)	LENGTH (FT)	MEDIAN	(mm)	(mm)	MEAN	SORTING	SILT	CARBONATE	COLOR	-4.25	-4.0	-3.50	-3.0	-2.50	-2.25	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	3.75	4.00	PAN
LBVC-14-01#1	-9.1	4.0	2.43	0.19	0.24	2.08	1.12	1.10	18	7	0.00	0.00	0.00	0.00	0.13	0.58	0.98	2.34	4.15	6.02	7.79	9.77	12.47	15.95	23.84	54.09	94.26	98.83	98.89	98.90	99.93
LBVC-14-01#2	-11.7	1.8	2.68	0.16	0.21	2.25	1.40	0.96	12	7	0.00	0.00	0.00	2.74	3.89	3.98	4.42	5.58	6.51	7.47	8.17	8.79	9.55	10.50	12.39	25.86	91.43	98.88	99.02	99.04	100.00
LBVC-14-01#3	-13.2	0.7	0.34	0.79	0.90	0.16	1.82	1.53	67	7	0.00	0.00	2.03	4.55	9.43	12.07	14.17	21.69	28.84	36.85	45.02	52.44	59.97	67.79	78.73	90.21	97.76	98.38	98.44	98.47	100.00
LBVC-14-01#4	-16.8	0.0	2.46	0.18	0.25	2.01	1.35	1.03		7	0.00	0.00	0.18	0.52	2.07	2.85	3.73	5.08	7.06	8.98	10.39	11.64	12.85	14.62	19.75	52.37	95.99	98.91	98.95	98.97	100.00
LBVC-14-01#5	-18.4	0.0	-1.28	2.43	2.22	-1.15	1.69	1.57		7	0.00	0.00	9.01	15.06	22.77	26.81	33.26	45.33	55.74	66.54	74.69	81.09	86.53	90.34	93.36	95.85	97.90	98.32	98.38	98.43	100.00
LBVC-14-01#6	-19.9	0.0	2.56	0.17	0.25	2.00	1.24	5.01		6	0.00	0.00	0.00	0.00	0.00	0.07	0.21	1.23	3.70	7.28	10.97	14.72	18.67	21.68	25.74	45.05	89.39	94.43	94.79	94.99	99.97
Cut to -13.6' NAVD88																															
LBVC-14-01 Composite		**6.5**	**2.50**	**0.18**	**0.26**	**1.92**	**1.43**	**1.12**	**22**	**7**	**0.00**	**0.00**	**0.22**	**1.25**	**2.17**	**2.76**	**3.35**	**5.32**	**7.46**	**9.74**	**11.90**	**14.09**	**16.78**	**20.02**	**26.58**	**50.16**	**93.85**	**98.80**	**98.88**	**98.89**	**99.96**
LBVC-14-01 S#1	-8.1	5.4	2.43	0.19	0.24	2.08	1.12	1.10	18	7	0.00	0.00	0.00	0.00	0.13	0.58	0.98	2.34	4.15	6.02	7.79	9.77	12.47	15.95	23.84	54.09	94.26	98.83	98.89	98.90	99.93
LBVC-14-02#1	-11.1	0.7	1.53	0.35	0.51	0.98	1.58	0.75	47	7	0.00	0.00	0.00	1.79	3.96	4.87	5.70	9.81	14.17	19.51	25.73	31.77	38.93	48.84	65.92	86.36	98.64	99.23	99.25	99.25	99.92
LBVC-14-02#2	-11.9	1.3	2.71	0.15	0.17	2.57	0.67	1.17	6	7	0.00	0.00	0.00	0.00	0.00	0.09	0.17	0.49	1.00	1.61	2.28	2.97	3.69	4.44	5.70	19.24	91.87	98.70	98.82	98.83	100.00
LBVC-14-01 S#3	-13.4	0.8	0.34	0.79	0.90	0.16	1.82	1.53	67	7	0.00	0.00	2.03	4.55	9.43	12.07	14.17	21.69	28.84	36.85	45.02	52.44	59.97	67.79	78.73	90.21	97.76	98.38	98.44	98.47	100.00
LBVC-14-02#3	-14.2	0.0	2.26	0.21	0.28	1.84	1.26	1.21		7	0.00	0.00	0.00	1.07	1.41	1.59	1.90	3.53	5.41	7.67	8.97	13.34	17.43	22.74	33.66	65.63	96.57	98.73	98.78	98.79	99.89
LBVC-14-02#4	-18.2	0.0	1.08	0.47	0.67	0.58	1.95	0.84		7	0.00	0.00	2.94	6.08	10.08	11.35	13.21	17.17	22.71	29.60	36.17	42.98	49.02	55.29	63.64	82.85	97.90	99.09	99.15	99.16	99.99
LBVC-14-02#5	-19.3	0.0	0.88	0.54	0.58	0.79	1.76	3.08		5	0.00	0.00	0.00	1.83	2.60	3.85	5.03	8.64	15.41	28.04	39.54	46.92	50.94	54.90	60.37	71.92	91.22	96.04	96.71	96.92	99.94
Cut to -13.6' NAVD88																															
LBVC-14-02 Composite		**8.2**	**2.40**	**0.19**	**0.27**	**1.88**	**1.38**	**1.12**	**23**	**7**	**0.00**	**0.00**	**0.20**	**0.60**	**1.34**	**1.99**	**2.54**	**4.57**	**6.91**	**9.48**	**12.08**	**14.73**	**17.97**	**21.99**	**29.91**	**54.84**	**94.60**	**98.80**	**98.87**	**98.88**	**99.95**
LBVC-14-03#1	-6.7	2.3	2.28	0.21	0.25	2.01	0.93	1.06	25	7	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.39	1.27	2.64	4.89	8.33	14.14	21.36	33.06	63.69	96.27	98.90	98.93	98.94	99.97
LBVC-14-01 S#3	-8.2	1.1	0.34	0.79	0.90	0.16	1.82	1.53	67	7	0.00	0.00	2.03	4.55	9.43	12.07	14.17	21.69	28.84	36.85	45.02	52.44	59.97	67.79	78.73	90.21	97.76	98.38	98.44	98.47	100.00
LBVC-14-03#6	-9.5	1.6	2.58	0.17	0.19	2.37	0.78	0.93	11	7	0.00	0.00	0.00	0.00	0.19	0.19	0.22	0.47	0.82	1.58	2.95	4.15	6.54	8.65	14.04	42.30	93.26	98.88	99.06	99.07	99.97
LBVC-14-03#2	-11.3	1.5	-0.30	1.23	1.02	-0.03	2.05	0.79	66	7	0.00	0.00	2.52	6.87	11.62	15.52	20.27	29.23	38.86	47.40	53.93	59.16	63.44	66.21	70.07	83.35	98.38	99.16	99.19	99.21	100.00
LBVC-14-02 S#2	-12.0	0.8	2.71	0.15	0.17	2.57	0.67	1.17	6	7	0.00	0.00	0.00	0.00	0.00	0.09	0.17	0.49	1.00	1.61	2.28	2.97	3.69	4.44	5.70	19.24	91.87	98.70	98.82	98.83	100.00
LBVC-14-03#3	-14.5	0.8	2.54	0.17	0.26	1.96	1.49	0.92	19	7	0.00	0.00	0.72	1.72	3.26	3.96	4.81	6.03	7.73	9.90	12.04	13.72	15.36	17.08	20.55	45.46	96.54	98.99	99.05	99.08	100.00
LBVC-14-03#4	-19.0	0.0	2.77	0.15	0.19	2.36	1.28	2.68		6	0.00	0.00	0.00	0.27	0.92	1.10	1.80	2.86	4.05	6.06	8.43	10.64	12.74	14.82	17.18	21.78	73.61	95.28	97.04	97.32	99.96
LBVC-14-03#5	-22.1	0.0	3.01	0.12	0.15	2.73	0.92	9.48		6	0.00	0.00	0.00	0.00	0.00	0.21	0.29	0.39	0.78	1.81	3.22	4.34	5.22	5.88	12.26	18.68	49.16	81.43	88.65	90.52	99.98
Cut to -13.6' NAVD88																															
LBVC-14-03 Composite		**8.1**	**2.26**	**0.21**	**0.35**	**1.50**	**1.70**	**1.05**	**33**	**7**	**0.00**	**0.00**	**0.81**	**2.06**	**3.79**	**4.95**	**6.22**	**9.21**	**12.50**	**15.98**	**19.49**	**22.91**	**27.08**	**31.37**	**38.42**	**60.52**	**95.86**	**98.86**	**98.94**	**98.95**	**99.99**
LBVC-14-02 S#2	-7.4	4.2	2.71	0.15	0.17	2.57	0.67	1.17	6	7	0.00	0.00	0.00	0.00	0.00	0.09	0.17	0.49	1.00	1.61	2.28	2.97	3.69	4.44	5.70	19.24	91.87	98.70	98.82	98.83	100.00
LBVC-14-04#1	-11.4	4.0	2.65	0.16	0.17	2.58	0.42	0.95	4	7	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.14	0.19	0.27	0.36	0.56	0.84	1.50	4.19	29.77	95.14	98.97	99.04	99.05	99.99
Cut to -13.6' NAVD88																															
LBVC-14-04 Composite		**8.2**	**2.69**	**0.15**	**0.17**	**2.58**	**0.56**	**1.04**	**5**	**7**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.05**	**0.14**	**0.32**	**0.60**	**0.96**	**1.34**	**1.79**	**2.30**	**3.01**	**4.96**	**24.38**	**93.47**	**98.83**	**98.93**	**98.94**	**100.00**
LBVC-14-05#3	-11.4	1.5	2.63	0.16	0.18	2.44	0.75	0.91	10	7	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.43	0.81	1.55	2.54	3.82	5.59	7.63	12.22	35.43	90.97	98.97	99.08	99.09	100.00
LBVC-14-05#1	-15.5	1.3	2.62	0.16	0.18	2.44	0.74	0.87	7	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	1.29	2.18	3.07	3.96	4.88	5.91	8.66	36.81	93.52	99.03	99.12	99.13	100.00
LBVC-14-05#2	-25.3	0.0	2.74	0.15	0.18	2.51	0.90	3.43		7	0.00	0.00	0.00	0.00	0.04	0.08	0.08	0.47	1.38	2.56	3.86	5.32	7.23	9.19	12.46	22.45	79.49	95.03	96.31	96.57	100.00
Cut to -13.6' NAVD88																															
LBVC-14-05 Composite		**2.8**	**2.62**	**0.16**	**0.18**	**2.44**	**0.75**	**0.89**	**9**	**7**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.09**	**0.40**	**1.03**	**1.84**	**2.79**	**3.89**	**5.26**	**6.83**	**10.57**	**36.07**	**92.15**	**99.00**	**99.10**	**99.11**	**100.00**
AMVC-07-01#1	-8.6	0.0	2.19	0.22	0.33	1.62	1.38	1.74		7	0.00	0.00	0.00	0.00	0.33	0.70	1.37	3.38	7.71	12.71	16.51	20.76	25.36	30.07	39.24	67.40	95.78	98.19	98.25	98.26	99.95
AMVC-07-01#2	-9.5	0.0	2.67	0.16	0.17	2.53	0.68	2.33		7	0.00	0.00	0.00	0.00	0.00	0.17	0.18	0.29	0.63	1.24	1.83	2.63	3.65	4.99	8.36	31.12	86.47	97.22	97.58	97.67	99.83
AMVC-07-01#3	-14.1	0.0	2.25	0.21	0.30	1.74	1.27	1.88		7	0.00	0.00	0.00	0.00	0.00	0.05	0.32	1.50	4.63	9.43	13.99	18.92	23.84	28.41	36.16	63.59	95.68	97.95	98.04	98.12	99.92
AMVC-07-01 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-03#1	-11.0	0.0	2.69	0.15	0.16	2.66	0.32	1.14		8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.04	0.06	0.08	0.15	0.49	27.06	88.08	98.53	98.82	98.86	100.00
AMVC-07-03#2	-15.0	0.0	2.72	0.15	0.15	2.69	0.33	1.21		8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.07	0.10	0.18	0.31	0.94	22.31	86.37	98.44	98.75	98.79	100.00
AMVC-07-03#3	-19.0	0.0	2.37	0.19	0.20	2.30	0.64	1.35		8	0.00	0.00	0.00	0.00	0.00	0.35	0.35	0.52	0.81	1.21	1.62	2.21	3.14	5.46	14.31	62.94	95.61	98.58	98.64	98.65	100.00
AMVC-07-03 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				

CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS
LONGBOAT PASS MAINTENANCE DREDGING PROJECT (2 of 3)

SAMPLE I. D.	ELEVATION (NAVD 88 FT)	EFFECTIVE LENGTH (FT)	PHI MEDIAN	MEDIAN (mm)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	% CARBONATE	WET MUNSELL COLOR								PHI SIZES													
											-4.25	-4.0	-3.50	-3.0	-2.50	-2.25	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	3.75	4.00	PAN
AMVC-07-04#1	-14.7	0.0	2.63	0.16	0.17	2.58	0.41	1.17		8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.12	0.24	0.48	0.75	1.18	3.45	36.68	89.79	98.44	98.81	98.83	100.00
AMVC-07-04#2	-17.7	0.0	2.66	0.16	0.16	2.62	0.35	1.09		8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.21	0.41	0.67	1.88	30.98	90.11	98.70	98.90	98.91	100.00
AMVC-07-04 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-05#1	-5.8	0.0	2.76	0.15	0.15	2.74	0.39	1.39		7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.18	0.33	0.41	0.51	0.61	0.71	0.98	14.63	81.81	98.52	98.59	98.61	100.00
AMVC-07-05#2	-7.6	0.0	2.27	0.21	0.59	0.75	2.34	2.63		7	0.00	0.00	3.17	4.82	9.17	11.61	15.83	23.84	32.07	38.14	41.60	44.49	46.17	47.16	48.14	51.53	81.90	96.39	97.23	97.37	99.95
AMVC-07-05#3	-8.3	0.0	2.88	0.14	0.13	2.90	0.32	3.41		6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.04	0.07	0.10	0.18	0.22	0.31	0.50	2.61	65.13	93.78	96.30	96.59	99.96
AMVC-07-05#4	-12.2	0.0	2.94	0.13	0.13	2.95	0.30	1.59		7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.06	0.09	0.12	0.15	0.27	3.09	56.47	97.33	98.30	98.41	99.92
AMVC-07-05 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-06#1	-8.8	0.0	2.78	0.15	0.15	2.76	0.40	1.29		7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.18	0.30	0.47	0.58	0.68	0.80	1.13	13.06	80.10	98.34	98.67	98.71	100.00
AMVC-07-06#2	-10.8	0.0	2.73	0.15	0.15	2.70	0.37	2.99		6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.09	0.17	0.27	0.35	0.48	0.80	23.36	82.43	96.07	96.86	97.01	100.00
AMVC-07-06#3	-13.0	0.0	2.79	0.14	0.15	2.78	0.45	1.99		7	0.00	0.00	0.00	0.00	0.00	0.26	0.41	0.44	0.47	0.52	0.62	0.67	0.75	0.83	1.02	6.70	80.34	97.12	97.92	98.01	100.00
AMVC-07-06 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-07#1	-11.7	0.0	2.11	0.23	0.40	1.33	1.78	1.35		8	0.00	0.00	0.00	3.13	5.60	6.47	7.03	11.26	15.23	19.15	22.41	25.72	29.09	33.28	44.24	70.67	92.78	98.24	98.59	98.65	100.00
AMVC-07-07#2	-13.5	0.0	0.96	0.51	0.75	0.42	2.03	1.08		7	0.00	0.00	1.97	4.89	10.01	12.35	16.20	23.30	30.14	36.98	41.92	46.23	50.33	54.89	64.65	83.44	96.09	98.70	98.89	98.92	100.00
AMVC-07-07#3	-14.8	0.0	2.36	0.19	0.25	1.99	1.38	1.39		8	0.00	0.00	1.10	1.88	2.92	3.44	3.63	5.31	6.85	8.24	9.30	10.46	11.77	13.72	20.13	61.22	91.46	98.15	98.55	98.61	99.99
AMVC-07-07#4	-17.3	0.0	3.00	0.13	0.14	2.79	0.93	6.76		5	0.00	0.00	0.00	0.00	0.57	0.90	1.18	1.68	2.09	2.59	2.92	3.44	3.88	4.38	5.34	11.56	50.17	89.06	92.73	93.24	99.90
AMVC-07-07 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-08#1	-6.3	0.0			1.52	-0.60	2.07	2.06		7	0.00	0.00	5.81	14.30	24.72	29.05	32.19	39.23	46.47	53.51	58.73	64.40	69.22	74.20	82.44	92.86	96.97	97.72	97.88	97.94	99.90
AMVC-07-08#2	-7.1	0.0	1.68	0.31	0.48	1.06	1.61	1.35		8	0.00	0.00	0.00	1.29	2.45	4.09	5.47	9.66	14.42	20.65	25.38	31.82	38.23	45.28	58.31	82.23	96.93	98.57	98.64	98.65	99.91
AMVC-07-08#3	-11.0	0.0	0.65	0.64	0.75	0.41	1.70	2.44		7	0.00	0.00	1.90	3.96	6.14	7.65	9.11	13.86	20.59	30.45	36.89	46.94	57.02	66.41	76.70	87.49	95.87	97.45	97.52	97.56	99.86
AMVC-07-08#4	-12.5	0.0	1.35	0.39	0.44	1.19	1.03	1.20		8	0.00	0.00	0.00	0.00	0.45	0.77	1.15	2.18	3.57	6.64	11.35	20.93	34.93	56.61	79.88	91.76	97.96	98.76	98.80	98.80	100.00
AMVC-07-08 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-09#1	-15.7	0.0	2.45	0.18	0.19	2.40	0.52	1.89		8	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.37	0.51	0.74	0.92	1.24	1.70	2.68	7.92	54.26	96.02	98.09	98.11	98.11	99.93
AMVC-07-09#2	-18.7	0.0	2.69	0.15	0.16	2.66	0.37	1.25		8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.13	0.21	0.25	0.33	0.41	0.55	1.01	26.49	88.45	98.25	98.72	98.75	100.00
AMVC-07-09#3	-21.7	0.0	2.62	0.16	0.17	2.53	0.52	1.14		8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.31	0.56	0.87	1.35	2.06	3.15	6.45	36.27	91.94	98.78	98.85	98.86	99.99
AMVC-07-09#4	-24.3	0.0	2.06	0.24	0.55	0.87	2.11	0.83		7	0.00	0.00	1.45	4.46	7.86	9.06	11.44	19.00	25.93	32.85	37.17	40.54	42.82	44.78	48.14	62.67	93.68	99.03	99.16	99.17	100.00
AMVC-07-09#5	-26.4	0.0	2.59	0.17	0.18	2.51	0.57	1.96		7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.30	0.56	0.93	1.58	2.49	3.74	6.65	41.88	87.01	97.04	97.93	98.04	99.90
AMVC-07-09 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-10#1	-10.9	0.0	2.49	0.18	0.26	1.97	1.32	1.20		7	0.00	0.00	0.00	0.33	1.16	1.84	2.46	4.04	5.92	7.98	10.10	12.77	16.26	20.62	27.96	50.58	92.06	98.71	98.78	98.80	99.92
AMVC-07-10#2	-13.4	0.0	1.09	0.47	0.64	0.65	1.98	1.30		6	0.00	0.00	0.84	1.97	6.37	8.05	11.40	19.70	26.53	34.20	40.37	45.19	49.38	52.80	57.26	71.77	95.79	98.63	98.69	98.70	99.94
AMVC-07-10#3	-15.2	0.0	2.72	0.15	0.17	2.52	0.87	1.16		8	0.00	0.07	0.22	0.49	0.49	0.49	0.49	0.96	1.66	2.57	3.33	4.26	5.26	6.64	9.30	23.03	85.74	98.58	98.80	98.84	99.99
AMVC-07-10#4	-18.2	0.0	2.77	0.15	0.15	2.75	0.42	1.42		7	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.14	0.28	0.39	0.49	0.62	0.74	0.91	1.31	12.98	80.93	97.49	98.52	98.58	100.00
AMVC-07-10#5	-22.0	0.0	2.80	0.14	0.17	2.58	1.02	3.30		6	0.00	0.00	0.00	0.38	0.81	0.86	0.99	1.57	2.22	2.98	3.67	4.67	5.80	7.14	11.50	28.82	63.65	91.48	96.11	96.70	100.00
AMVC-07-10 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-11#1	-9.2	3.9	2.34	0.20	0.27	1.91	1.22	1.03	ND	7	0.00	0.00	0.00	0.00	0.00	0.41	0.73	2.33	4.91	8.09	11.01	14.25	17.85	22.10	30.87	58.83	95.03	98.88	98.94	98.97	99.89
AMVC-07-11#2	-11.9	1.3	2.57	0.17	0.19	2.37	0.85	1.28	ND	8	0.00	0.00	0.00	0.24	0.43	0.99	1.21	1.50	1.99	2.47	2.95	3.60	4.63	6.52	12.62	42.70	92.75	98.59	98.69	98.72	99.90
AMVC-07-11#3	-13.0	0.9	0.30	0.81	0.87	0.20	2.02	1.29	ND	6	0.00	0.00	2.04	5.24	12.28	14.67	17.92	24.79	32.01	40.06	46.60	52.19	57.48	62.41	69.98	82.42	97.01	98.64	98.68	98.71	99.92
AMVC-07-11#4	-14.0	0.1	2.02	0.25	0.26	1.93	0.59	1.08	ND	8	0.00	0.00	0.00	0.00	0.23	0.23	0.38	0.57	0.98	1.53	2.27	2.82	3.72	6.81	48.07	94.84	98.89	98.91	98.92	98.92	99.99
Cut to -13.6 ft NAVD88																															
AMVC-07-11 Composite		**6.2**	**2.32**	**0.20**	**0.30**	**1.76**	**1.46**	**1.12**	**ND**	**7**	**0.00**	**0.00**	**0.30**	**0.81**	**1.88**	**2.60**	**3.32**	**5.39**	**8.17**	**11.45**	**14.35**	**17.34**	**20.60**	**24.44**	**33.00**	**59.45**	**94.90**	**98.78**	**98.85**	**98.88**	**99.90**

CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS
LONGBOAT PASS MAINTENANCE DREDGING PROJECT (3 of 3)

SAMPLE I. D.	**ELEVATION (NAVD 88 FT)**	**EFFECTIVE LENGTH (FT)**	**PHI MEDIAN**	**MEDIAN (mm)**	**MEAN (mm)**	**PHI MEAN**	**PHI SORTING**	**% SILT**	**% CARBONATE**	**WET MUNSELL COLOR**								**PHI SIZES**													
											-4.25	**-4.0**	**-3.50**	**-3.0**	**-2.50**	**-2.25**	**-2.0**	**-1.5**	**-1.0**	**-0.5**	**0.0**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**3.75**	**4.00**	**PAN**
AMVC-07-12#1	-10.1	0.0	2.33	0.20	0.26	1.95	1.35	1.05		8	0.00	0.00	1.14	2.37	2.91	3.52	3.88	4.94	6.31	7.80	8.86	10.19	11.93	14.33	21.70	63.94	96.98	98.91	98.94	98.95	99.95
AMVC-07-12#2	-13.2	0.0	0.95	0.52	0.70	0.51	1.92	1.40		7	0.00	0.00	2.08	3.30	8.98	11.22	13.67	18.94	24.85	32.14	38.40	44.57	50.59	56.71	66.57	82.27	97.11	98.49	98.56	98.60	99.99
AMVC-07-12#3	-14.7	0.0	2.15	0.23	0.30	1.72	1.24	1.15		8	0.00	0.00	0.00	0.00	0.77	1.17	1.74	4.16	6.17	8.50	10.79	14.27	19.06	26.31	39.19	74.82	97.51	98.81	98.85	98.85	99.87
AMVC-07-12 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-13#1	-6.4	0.0			1.69	-0.76	2.11	0.85		7	0.00	0.00	8.27	18.02	27.12	29.96	34.29	43.67	50.65	58.11	63.67	69.15	73.49	77.37	81.96	91.43	98.40	99.11	99.14	99.15	99.88
AMVC-07-13#2	-7.5	0.0	2.34	0.20	0.24	2.07	1.05	1.06		8	0.00	0.00	0.00	0.00	0.63	1.08	1.36	2.32	3.74	5.38	6.86	8.52	10.45	13.12	19.64	64.50	96.89	98.89	98.93	98.94	100.00
AMVC-07-13#3	-12.5	0.0	2.63	0.16	0.17	2.57	0.40	1.01		8	0.00	0.00	0.00	0.00	0.00	0.07	0.07	0.09	0.19	0.31	0.38	0.47	0.63	0.95	2.45	35.14	93.84	98.98	98.99	98.99	99.99
AMVC-07-13#4	-16.4	0.0			1.24	-0.31	1.72	2.32		7	0.00	0.00	0.88	6.62	11.61	14.45	19.11	28.33	36.80	46.88	53.94	62.37	70.15	79.62	88.95	93.92	96.94	97.59	97.66	97.68	99.84
AMVC-07-13 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-14#1	-6.9	0.0	2.35	0.20	0.28	1.86	1.25	1.05		7	0.00	0.00	0.00	0.00	0.25	0.31	0.84	2.69	4.41	7.30	10.59	14.91	20.30	27.31	38.04	55.21	93.87	98.87	98.95	98.95	99.87
AMVC-07-14#2	-7.8	0.0			1.19	-0.25	2.00	0.88		6	0.00	0.00	3.82	8.60	17.19	19.71	23.49	31.15	38.50	47.28	54.79	61.58	67.96	74.19	80.75	87.31	97.04	99.06	99.11	99.12	99.92
AMVC-07-14#3	-10.4	0.0	2.55	0.17	0.19	2.36	0.84	0.83		8	0.00	0.00	0.00	0.00	0.40	0.69	0.92	1.35	1.95	2.62	3.20	3.96	5.09	6.97	12.59	44.67	93.26	99.04	99.14	99.17	99.79
AMVC-07-14#4	-13.4	0.0	2.29	0.20	0.26	1.97	1.12	2.13		8	0.00	0.00	0.00	0.00	0.13	0.58	1.48	2.95	4.96	6.85	8.25	10.03	12.34	15.38	24.32	68.62	94.82	97.78	97.86	97.87	99.99
AMVC-07-14#5	-18.6	0.0	2.24	0.21	0.40	1.34	1.83	1.78		7	0.00	0.00	0.00	0.75	4.93	5.62	7.74	12.27	16.67	21.82	24.93	27.97	30.51	32.97	37.64	63.69	93.52	97.98	98.09	98.22	99.90
AMVC-07-14 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-15#1	-12.7	2.3	0.15	0.90	0.95	0.07	1.77	1.93	ND	6	0.00	0.00	1.45	5.18	9.08	10.65	13.97	20.41	28.22	37.95	47.21	56.61	65.67	73.21	80.54	88.31	96.64	97.94	98.00	98.07	99.87
AMVC-07-15#2	-15.6	0.6	2.01	0.25	0.37	1.44	1.40	2.11	ND	7	0.00	0.00	0.00	0.00	0.61	1.00	1.88	3.98	7.44	12.43	17.97	24.22	31.00	38.48	49.40	71.51	94.99	97.80	97.87	97.89	99.97
AMVC-07-15#3	-19.2	0.0	2.38	0.19	0.21	2.22	0.74	1.88		8	0.00	0.00	0.00	0.00	0.00	0.08	0.08	0.40	0.91	1.48	2.28	3.64	6.08	10.19	22.42	59.12	94.80	98.06	98.11	98.12	99.84
Cut to -13.6 ft NAVD88																															
AMVC-07-15 Composite		**2.9**	**0.51**	**0.70**	**0.78**	**0.35**	**1.79**	**1.97**	**ND**	**6**	**0.00**	**0.00**	**1.15**	**4.11**	**7.33**	**8.65**	**11.47**	**17.01**	**23.92**	**32.67**	**41.16**	**49.91**	**58.50**	**66.02**	**74.10**	**84.83**	**96.30**	**97.91**	**97.97**	**98.03**	**99.89**
AMVC-07-17#1	-8.9	0.0	2.67	0.16	0.16	2.61	0.45	1.39		7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.08	0.18	0.33	0.63	1.14	1.99	4.00	30.90	87.92	97.83	98.56	98.61	100.00
AMVC-07-17 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-18#1	-5.5	0.0	2.46	0.18	0.20	2.33	0.66	1.66		7	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.16	0.34	0.79	1.39	2.77	4.94	8.35	15.50	52.94	93.44	98.13	98.31	98.34	100.00
AMVC-07-18#2	-6.8	0.0	2.14	0.23	0.35	1.51	1.45	1.75		7	0.00	0.00	0.00	0.00	0.25	0.67	1.40	3.46	8.01	15.06	19.73	25.06	29.74	34.96	43.13	67.51	94.33	97.98	98.21	98.25	99.86
AMVC-07-18#3	-8.2	0.0			1.04	-0.05	1.66	2.68		6	0.00	0.00	0.00	1.07	3.39	4.46	6.61	16.97	34.17	50.46	58.98	66.73	71.11	74.30	77.53	85.49	95.26	97.11	97.27	97.32	99.88
AMVC-07-18 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-19#1	-6.1	0.0	2.43	0.19	0.23	2.15	1.00	1.86		7	0.00	0.00	0.00	0.00	0.27	0.32	0.71	1.53	2.78	4.44	5.95	7.67	9.73	13.10	20.29	55.23	93.77	97.90	98.10	98.14	99.94
AMVC-07-19#2	-8.4	0.0	1.53	0.35	0.59	0.76	1.89	2.76		7	0.00	0.00	0.00	0.82	2.44	4.27	5.98	14.04	24.77	34.99	40.89	44.87	47.30	49.73	53.71	71.46	93.23	96.82	97.12	97.24	99.94
AMVC-07-19#3	-11.5	0.0	2.58	0.17	0.17	2.55	0.36	2.27		6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.08	0.14	0.22	0.29	0.37	0.49	1.07	42.47	92.46	97.39	97.69	97.73	100.00
AMVC-07-19 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				
AMVC-07-20#1	-6.3	0.0	2.43	0.19	0.21	2.28	0.82	1.15		8	0.00	0.00	0.00	0.00	0.00	0.15	0.22	0.59	1.44	2.91	4.20	5.48	6.66	8.08	11.58	56.55	94.34	98.67	98.83	98.85	99.97
AMVC-07-20#2	-9.7	0.0	2.57	0.17	0.21	2.26	1.10	2.30		6	0.00	0.00	0.00	0.00	0.11	0.83	1.87	3.21	4.79	6.32	6.91	7.51	8.01	8.67	10.65	43.14	92.60	97.35	97.63	97.70	99.87
AMVC-07-20#3	-10.9	0.0	0.29	0.82	0.81	0.31	2.05	2.83		5	0.00	0.00	3.27	5.59	9.62	11.23	13.50	20.68	30.27	40.87	46.82	52.22	55.88	59.31	64.25	76.15	94.20	96.88	97.12	97.17	99.78
AMVC-07-20 Composite											**VIBRACORE NOT USED IN CHANNEL COMPOSITES**																				

APPENDIX 10

CHANNEL COMPOSITE GRANULARMETRIC REPORTS

Granularmetric Report

Depths and elevations based on measured values

Project Name: Longboat Pass Alt. 6F-4 Channel
Sample Name: ALT. 6F-4 CHANNEL
Analysis Date: 08-01-14
Analyzed By: LC

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
		Florida State Plane West	

USCS:	Munsell:	Comments:
SW		COMPOSITE

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
100.00	100.00	1.10	0.04	#200 - 1.15 #230 - 1.13			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.35	0.35	0.35	0.35
5/16"	-3.00	8.00	0.74	0.74	1.09	1.09
3.5	-2.50	5.66	0.98	0.98	2.07	2.07
4	-2.25	4.76	0.63	0.63	2.70	2.70
5	-2.00	4.00	0.75	0.75	3.46	3.45
7	-1.50	2.83	1.98	1.98	5.43	5.43
10	-1.00	2.00	2.36	2.36	7.79	7.79
14	-0.50	1.41	2.68	2.68	10.47	10.47
18	0.00	1.00	2.62	2.62	13.09	13.09
25	0.50	0.71	2.67	2.67	15.75	15.76
35	1.00	0.50	3.05	3.05	18.80	18.81
45	1.50	0.35	3.37	3.37	22.17	22.18
60	2.00	0.25	6.24	6.24	28.42	28.42
80	2.50	0.18	22.43	22.43	50.85	50.85
120	3.00	0.13	43.66	43.66	94.51	94.51
170	3.50	0.09	4.26	4.26	98.77	98.77
200	3.75	0.07	0.08	0.08	98.85	98.85
230	4.00	0.06	0.02	0.02	98.86	98.87

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.06	2.88	2.78	2.48	1.73	0.54	-1.61

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.86	0.28	1.46	-1.82	5.51

Granularmetric Report

Depths and elevations based on measured values

Project Name: Longboat Pass Alt. 6F-4 Channel
Sample Name: LBVC-14-01 COMP
Analysis Date: 08-01-14
Analyzed By: LC

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
431,382	1,130,426	Florida State Plane West	

USCS:	Munsell:	Comments:
SW		COMPOSITE

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
100.00	100.00	1.07	0.04	#200 - 1.13 #230 - 1.12			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.22	0.22	0.22	0.22
5/16"	-3.00	8.00	1.03	1.03	1.25	1.25
3.5	-2.50	5.66	0.92	0.92	2.17	2.17
4	-2.25	4.76	0.59	0.59	2.76	2.76
5	-2.00	4.00	0.59	0.59	3.35	3.35
7	-1.50	2.83	1.97	1.97	5.32	5.32
10	-1.00	2.00	2.14	2.14	7.46	7.46
14	-0.50	1.41	2.28	2.28	9.74	9.74
18	0.00	1.00	2.16	2.16	11.90	11.90
25	0.50	0.71	2.19	2.19	14.09	14.09
35	1.00	0.50	2.68	2.68	16.78	16.77
45	1.50	0.35	3.25	3.25	20.02	20.02
60	2.00	0.25	6.56	6.56	26.58	26.58
80	2.50	0.18	23.58	23.58	50.16	50.16
120	3.00	0.13	43.69	43.69	93.85	93.85
170	3.50	0.09	4.94	4.94	98.80	98.79
200	3.75	0.07	0.08	0.08	98.88	98.87
230	4.00	0.06	0.01	0.01	98.89	98.88

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.12	2.89	2.78	2.50	1.88	0.86	-1.58

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	1.92	0.26	1.43	-1.97	6.15

Granularmetric Report

Depths and elevations based on measured values

Project Name: Longboat Pass Alt. 6F-4 Channel
Sample Name: LBVC-14-02 COMP
Analysis Date: 08-01-14
Analyzed By: LC

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
430,164	1,129,502	Florida State Plane West	

USCS:	Munsell:	Comments:
SW		COMPOSITE

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
100.00	100.00	1.07	0.05	#200 - 1.13 #230 - 1.12			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.20	0.20	0.20	0.20
5/16"	-3.00	8.00	0.40	0.40	0.60	0.60
3.5	-2.50	5.66	0.75	0.75	1.34	1.35
4	-2.25	4.76	0.65	0.65	1.99	2.00
5	-2.00	4.00	0.55	0.55	2.54	2.55
7	-1.50	2.83	2.03	2.03	4.57	4.58
10	-1.00	2.00	2.34	2.34	6.91	6.92
14	-0.50	1.41	2.57	2.57	9.48	9.49
18	0.00	1.00	2.60	2.60	12.08	12.09
25	0.50	0.71	2.65	2.65	14.73	14.74
35	1.00	0.50	3.24	3.24	17.97	17.98
45	1.50	0.35	4.02	4.02	21.99	22.00
60	2.00	0.25	7.92	7.92	29.91	29.92
80	2.50	0.18	24.93	24.93	54.84	54.85
120	3.00	0.13	39.75	39.75	94.60	94.60
170	3.50	0.09	4.20	4.20	98.80	98.80
200	3.75	0.07	0.07	0.07	98.87	98.87
230	4.00	0.06	0.01	0.01	98.88	98.88

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.05	2.87	2.75	2.40	1.69	0.69	-1.41

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.88	0.27	1.38	-1.81	5.6

Granularmetric Report

Depths and elevations based on measured values

Project Name: Longboat Pass Alt. 6F-4 Channel
Sample Name: LBVC-14-03 COMP
Analysis Date: 08-01-14
Analyzed By: LC

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,817	1,128,586	Florida State Plane West	

USCS:	Munsell:	Comments:
SW		COMPOSITE

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
100.00	100.00	1.04	0.01	#200 - 1.07 #230 - 1.05			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.81	0.81	0.81	0.81
5/16"	-3.00	8.00	1.25	1.25	2.06	2.06
3.5	-2.50	5.66	1.73	1.73	3.79	3.79
4	-2.25	4.76	1.16	1.16	4.95	4.95
5	-2.00	4.00	1.27	1.27	6.22	6.22
7	-1.50	2.83	2.98	2.98	9.21	9.20
10	-1.00	2.00	3.29	3.29	12.50	12.49
14	-0.50	1.41	3.48	3.48	15.98	15.97
18	0.00	1.00	3.51	3.51	19.49	19.48
25	0.50	0.71	3.42	3.42	22.91	22.90
35	1.00	0.50	4.17	4.17	27.08	27.07
45	1.50	0.35	4.29	4.29	31.37	31.36
60	2.00	0.25	7.05	7.05	38.42	38.41
80	2.50	0.18	22.10	22.10	60.52	60.51
120	3.00	0.13	35.34	35.34	95.86	95.85
170	3.50	0.09	3.00	3.00	98.86	98.85
200	3.75	0.07	0.08	0.08	98.94	98.93
230	4.00	0.06	0.02	0.02	98.95	98.95

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.99	2.83	2.71	2.26	0.75	-0.50	-2.24

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	1.5	0.35	1.7	-1.35	3.71

Granularmetric Report

Depths and elevations based on measured values

Project Name: Longboat Pass Alt. 6F-4 Channel
Sample Name: LBVC-14-04 COMP
Analysis Date: 08-01-14
Analyzed By: LC

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,577	1,127,616	Florida State Plane West	

USCS:	Munsell:	Comments:
SP		COMPOSITE

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
100.00	100.00	1.05	0.01	#200 - 1.05 #230 - 1.04			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.05	0.05	0.05	0.05
5	-2.00	4.00	0.09	0.09	0.14	0.14
7	-1.50	2.83	0.18	0.18	0.32	0.32
10	-1.00	2.00	0.29	0.29	0.60	0.61
14	-0.50	1.41	0.35	0.35	0.96	0.96
18	0.00	1.00	0.39	0.39	1.34	1.35
25	0.50	0.71	0.45	0.45	1.79	1.80
35	1.00	0.50	0.51	0.51	2.30	2.31
45	1.50	0.35	0.71	0.71	3.01	3.02
60	2.00	0.25	1.96	1.96	4.96	4.98
80	2.50	0.18	19.41	19.41	24.38	24.39
120	3.00	0.13	69.09	69.09	93.47	93.48
170	3.50	0.09	5.37	5.37	98.83	98.85
200	3.75	0.07	0.10	0.10	98.93	98.95
230	4.00	0.06	0.01	0.01	98.94	98.96

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.14	2.93	2.87	2.69	2.50	2.28	2.00

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.58	0.17	0.56	-4.44	29.46

Granularmetric Report
Depths and elevations based on measured values

Project Name: Longboat Pass Alt. 6F-4 Channel
Sample Name: LBVC-14-05 COMP
Analysis Date: 08-01-14
Analyzed By: LC

CB&I
Coastal Planning & Engineering, Inc.
2481 NW Boca Raton Blvd.
Boca Raton, FL 33431
ph (561) 391 8102

Easting (ft):	Northing (ft):	Coordinate System:	Elevation (ft):
429,371	1,128,156	Florida State Plane West	

USCS:	Munsell:	Comments:
SP		COMPOSITE

Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
100.00	100.00	0.89	0.00	#200 - 0.90 #230 - 0.89			

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.09	0.09	0.09	0.09
7	-1.50	2.83	0.31	0.31	0.40	0.40
10	-1.00	2.00	0.64	0.64	1.03	1.04
14	-0.50	1.41	0.81	0.81	1.84	1.85
18	0.00	1.00	0.94	0.94	2.79	2.79
25	0.50	0.71	1.10	1.10	3.89	3.89
35	1.00	0.50	1.38	1.38	5.26	5.27
45	1.50	0.35	1.57	1.57	6.83	6.84
60	2.00	0.25	3.74	3.74	10.57	10.58
80	2.50	0.18	25.50	25.50	36.07	36.08
120	3.00	0.13	56.08	56.08	92.15	92.16
170	3.50	0.09	6.84	6.84	99.00	99.00
200	3.75	0.07	0.10	0.10	99.10	99.10
230	4.00	0.06	0.01	0.01	99.11	99.11

Shell Hash calculated from visual estimate of shell <4.75mm and >2.8mm.

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.21	2.93	2.85	2.62	2.28	2.11	0.90

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.44	0.18	0.75	-3.02	13.95

APPENDIX C

SEDIMENT QA/QC PLAN

SEDIMENT QUALITY ASSURANCE/QUALITY CONTROL PLAN
FOR BEACH PLACEMENT OF SEDIMENT FROM MAINTENANCE DREDGING

0298107-004-JC

Manatee County and Town of Longboat Key

Longboat Pass Navigational Maintenance Dredging and Beach Nourishment

October 3, 2014

A. INTRODUCTION

As indicated in the title above, this template plan is for use for beach placement of sediment from maintenance dredging of navigation channels and sediment impoundment basins. A different plan document will be used for beach restoration or nourishment using an offshore borrow area.

Pursuant to Fla. Admin. Code r. 62B-41.008 (1) (k) 4.b., permit applications for inlet excavation, beach restoration, or nourishment shall include a quality assurance/control plan that will ensure that the sediment from the borrow areas to be used in the project will meet the standard in Fla. Admin. Code r. 62B-41.007(2)(j) and (k). To protect the environmental functions of Florida's beaches, only beach compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system.

The Permittee has conducted geotechnical investigations that provide adequate data concerning the character of the sediment and the quantities available within the spatial limits of the permitted dredge cuts. The Permittee has provided an analysis of the existing or native sediment and the sediment within the permitted dredge cuts that demonstrates its compatibility with the naturally occurring beach sediment in accordance with Fla. Admin. Code r. 62B-41.007(2)(j) and (k).

Based upon this information and the design of the maintenance dredge project, the Department of Environmental Protection (Department) has determined that beach placement of the sediment from the dredge area(s) will maintain the general character and functionality of the sediment occurring on the beach and in the adjacent dune and coastal system. However, sediment from some dredge cuts may not be suitable for beach placement; these cuts are indicated in the permit approved plans. Furthermore, this information and the channel design provides sufficient quality assurance/quality control (QA/QC) that the mean grain size and carbonate content of the sediment from the dredge cuts will meet the requirements of Fla. Admin. Code r. 62B-41.007(2)(j) and (k); hence, additional QA/QC procedures are not required for these sediment parameters during construction.

This plan outlines the responsibilities of each stakeholder in the project as they relate to the placement of beach compatible material on the beach. These responsibilities are in response to the possibility that non-beach compatible sediments may exist within the dredge cuts and could be unintentionally placed on the beach. The QC Plan specifies the minimum construction management, inspection, and reporting requirements placed on the Marine Dredging Contractor and enforced by the Permittee, to ensure that the sediment to be placed on the beach from the dredge cuts meet the compliance specifications. The QA Plan specifies the minimum construction oversight, inspection, and reporting requirements to be undertaken by the Permittee or the Permittee's On-Site Representative to observe, sample, and test the placed sediments to verify the sediments are in compliance.

B. SEDIMENT QUALITY SPECIFICATIONS

The sediment from the dredge cut(s) is similar in Munsell color and grain size distribution to the material in the existing coastal system at the beach placement site. The Department and the Permittee acknowledge that it is possible that discrete occurrences of non-beach compatible sediments may exist within the permitted dredge cuts that do not comply with the limiting parameters of Fla. Admin. Code r. 62B-41.007(2)(j) 1. – 5. and (k), or vary in Munsell color from the composite value. Furthermore, the Department and may consider more restrictive values for the sediment parameters to ensure that the sediment from the dredge cuts is similar in color and grain size distribution to the sediment in the existing coastal system at the beach placement site. Specifically, although Fla. Admin. Code r. 62B-41.007(2)(k), deems sediment from maintenance dredging containing up to a 10% fine material passing the #230 sieve to be suitable for beach placement, a compliance value of less than 10% is necessary to meet water quality standards and maintain the general character and environmental functions of the existing beach. Therefore, fill material compliance specifications for the sediment from the borrow area(s) proposed for this project are provided in Table 1.

The compliance specifications take into account the variability of sediment on the native or existing beach, and are values which may reasonably be attained given what is known about the sediment from the dredge cuts. Beach fill material which falls outside of these limits will be considered unacceptable and subject to remediation.

Table 1- Sediment Compliance Specifications

Sediment Parameter	**Parameter Definition**	**Compliance Value**
Max. Silt Content	passing #230 sieve	**10%**
Max. Shell Content*	retained on #4 sieve	**15%**
Munsell Color Value	moist Value (chroma = 1)	**6 or lighter**
The beach fill material shall not contain construction debris, toxic material, or other foreign matter.		

*Shell Content is used as the indicator of fine gravel content for the implementation of quality assurance/quality control procedures.

C. QUALITY CONTROL PLAN

The contract documents shall incorporate the following technical requirements, or equivalent language that addresses the location of dredging, sediment quality monitoring on the beach, and, if necessary, remedial actions. The Permittee will seek to enforce these contract requirements during the execution of work.

1. **Electronic Positioning and Dredge Depth Monitoring Equipment**. The Contractor will continuously operate electronic positioning equipment, approved by the Permittee, to monitor the precise positioning of the excavation device location(s) and depth(s). A Differential Global Positioning System (DGPS) or equivalent system providing equal or better accuracy will be used to determine the horizontal position and will be interfaced with an appropriate depth measuring device to determine the vertical position of the bottom of the excavation device. The horizontal positioning equipment will maintain an accuracy of +/- 3.0 feet. The vertical positioning equipment will maintain a vertical accuracy of +/-0.5 feet with continuous applicable tidal corrections measured at the project site.

2. **Dredge Location Control**. The Contractor is required to have, in continuous operation on the dredge, electronic position recording equipment that will accurately compute and plot the position of the dredge's excavation device. Such fixes, and the accompanying plots, will be furnished to the Permittee's on-site representative daily as part of the QC Reports. A printout of the excavation device positions in State Plane Coordinates, the excavation device depths corrected for tide elevation and referenced to the North American Vertical Datum of 1988 (NAVD 88) and the time, will be maintained using an interval of two (2) minutes for each printed fix. A printed and computer file (in ASCII format) copy of the position data will be provided to the Engineer as part of the daily report. The Contractor will prepare a plot of the data that includes the State Plane Coordinate grid system and the borrow area limits. The format of the plot may be subject to approval by the Permittee. No dredging will take place outside of the dredge cut limits (horizontal and vertical limits) as shown on the drawings.

3. **Dredging Observation.** The Contractor will be responsible for establishing such control as may be necessary to insure that the allowable excavation depths and spatial limits are not exceeded. If the Contractor encounters noncompliant sediment during dredging, the Contractor will immediately cease dredging, relocate the dredge into compliant sediment, and will verbally notify the Permittee's On-site Representative, providing the time, location, and description of the noncompliant sediment. The Contractor will also report any encounters with noncompliant sediment in the Contractor's Daily Report, providing depth and location in State Plane Coordinates of said materials

within the dredge cut(s). The Contractor, in cooperation with the Permittee's Engineer, will use the dredge positioning records, plans, and vibracore descriptions to determine where the Contractor may dredge to avoid additional beach placement of noncompliant sediment. The Contractor will adjust his or her construction operation to implement processing and material handling methods to sequester and remove the noncompliant sediment.

4. **Beach Observation**. The Contractor will continuously visually monitor the sediment being placed on the beach. If noncompliant sediment is placed on the beach, the Contractor will immediately cease dredging, relocate the dredge into compliant sediment, and verbally notify the Permittee's On-site Representative, providing the time, location, and description of the noncompliant sediment. The Contractor will also report any encounters with noncompliant sediment in the Contractor's Daily Report, providing depth and location in State Plane Coordinates of said materials within the dredge cut(s). The Contractor will take the appropriate remediation actions as directed by the Permittee or Permittee's Engineer.

5. **Vibracore Logs and Grain Size Data.** The Contractor will be provided with all descriptions of sediment vibracore borings and/or sediment samples collected within the dredge cut(s), and will acknowledge that he or she is aware of the quality of the sediment as described in the sediment testing. These logs and/or grain size data will be presented in the construction specifications.

6. **Noncompliant Material Handling Provision.** The Contractor shall have plans and equipment available for use to handle any noncompliant material encountered during dredging.

D. QUALITY ASSURANCE PLAN

The Permittee will seek to enforce the construction contract and Department permits related to sediment quality. In order to do so, the following steps shall be followed:

1. **Construction Observation.** Construction observation by the Permittee's On-Site Representative will be performed at least twice per day during periods of active construction. Most observations will be conducted during daylight hours; however, random nighttime observations shall be conducted.

2. **On-Site Representative.** The Permittee will provide on-site observation by individuals with training or experience in beach nourishment and construction observations, and who are knowledgeable of the project design and permit conditions.

3. **Pre-Construction Meeting.** The project QA/QC Plan will be discussed as a matter of importance at the pre-construction meeting. The Contractor will be required to acknowledge the goals and intent of the above described QA/QC Plan, in writing, prior to commencement of construction. The Contractor shall continuously ensure beach fill material is in compliance with this Sediment QA/QC Plan.

4. **Contractor's Daily Reports.** The Engineer will review the Contractor's Daily Reports which characterize the nature of the sediments encountered at the borrow area and placed along the project shoreline with specific reference to moist sand color and the occurrence of rock, rubble, shell, silt or debris that exceeds acceptable limits. The Engineer will review the dredge positions in the Contractor's Daily Report.

5. **On Call.** The Engineer will be continuously on call during the period of construction for the purpose of making decisions regarding issues that involve QA/QC Plan compliance.

6. **Addendums.** Any addendum or change order to the Contract between the Permittee and the Contractor will be evaluated to determine whether or not the change in scope will potentially affect the QA/QC Plan.

7. **During Construction Sampling for Visual Inspection.** To assure that the fill material placed on the beach is in compliance with the permit, the Permittee's Engineer or On-Site Representative will conduct assessments of the beach fill material as follows:

a. During excavation and fill placement activities, the Permittee's On-Site Representative will collect a sediment sample at not less than 200-foot intervals of newly constructed berm to visually assess grain size, Munsell color, shell content, and silt content. The sample shall be a minimum of 1 U.S. pint (approximately 200 grams). This assessment will consist of handling the fill material to ensure that it is predominantly sand, to note the physical characteristics, and to assure the material meets the sediment compliance parameter specified in this Plan. If deemed necessary, quantitative assessments of the sand will be conducted for grain size, silt content, shell content and Munsell color using the methods outlined in section D.8.b. Each sample will be archived with the date, time, and location of the sample. The results of these daily inspections, regardless of the quality of the sediment, will be appended to or notated on the Contractor's Daily Report. All samples will be stored by the Permittee for at least 60 days after project completion.

b. If the Permittee or Engineer determines that the beach fill material does not comply with the sediment compliance specifications in this QA/QC Plan, the Permittee or Engineer will immediately instruct the Contractor to cease material excavation operations and take whatever actions necessary to avoid further beach placement of noncompliant sediment. The Contractor, in cooperation with the Permittee's Engineer, will use the dredge positioning records, plans, and vibracore descriptions to determine where the Contractor may dredge to avoid additional beach placement of noncompliant sediment. The sediment inspection results will be reported to the Department.

8. **Post-Construction Sampling for Laboratory Testing.** To assure that the fill material placed on the beach was adequately assessed by the channel investigation and design, the Project Engineer will conduct assessments of the sediment as follows:

a. Post-construction sampling of each acceptance section and testing of the fill material will be conducted to verify that the sediment placed on the beach meets the expected criteria/characteristics provided from the geotechnical investigation. Upon completion of an acceptance section of constructed beach, the Engineer will collect two (2) duplicate sand samples at each Department reference monument profile line to quantitatively assess the grain size distribution, moist Munsell color, shell content, and silt content for compliance. The Engineer will collect the sediment samples of a minimum of 1 U.S. pint (at least 200 grams) each from the bottom of a test hole a minimum of 18 inches deep within the limits of the constructed berm. The Engineer will visually assess grain size, Munsell color, shell content, and silt content of the material by handling the fill material to ensure that it is predominantly sand, and further to note the physical characteristics. The Engineer will note the existence of any layering or rocks within the test hole. One sample will be sent for laboratory analysis while the other sample will be archived by the Permittee. All samples and laboratory test results will be labeled with the Project name, FDEP Reference Monument Profile Line designation, State Plane (X,Y) Coordinate location, date sample was obtained, and "Construction Berm Sample."

b. All samples will be evaluated for visual attributes (Munsell color and shell content), sieved in accordance with the applicable sections of ASTM D422-63 (Standard Test Method for Particle-Size Analysis of Soils), ASTM D1140 (Standard Test Method for Amount of Material in Soils Finer than No. 200 Sieve), and ASTM D2487 (Classification of Soils for Engineering Purposes), and analyzed for carbonate content. The samples will be sieved using the following U.S. Standard Sieve Numbers: 3/4", 5/8", 7/16", 5/16", 3.5, 4, 5, 7, 10, 14, 18, 25, 35, 45, 60, 80, 120, 170, 200 and 230.

c. A summary table of the sediment samples and test results for the sediment compliance parameters shall accompany the complete set of laboratory testing results. The column headings will include: Sample Number; Mean Grain Size (mm); Sorting Value; Silt Content (%); Shell Content (%); Munsell Color Value; and a column stating whether each sample MET or FAILED the compliance values found in Table 1. The sediment testing results will be certified by a P.E or P.G. The Permittee will submit sediment testing results and analysis report to the Department within 90 days following beach construction.

d. In the event that a section of beach contains fill material that is not in compliance with the sediment compliance specifications, then the Department will be notified. Notification will indicate the volume, aerial extent and location of any unacceptable beach areas and remediation planned.

E. REMEDIATION

1. **Compliance Area.** If a sample does not meet the compliance value for construction debris, toxic material, or other foreign material, the Permittee shall determine the aerial extent and remediate regardless of the extent of the noncompliant material. If a sample is noncompliant for the silt content, shell content, coarse gravel/rock or Munsell color and the aerial extent exceeds 10,000 square feet, the Permittee shall remediate.

2. **Notification.** If an area of newly constructed beach does not meet the sediment compliance specifications, then the Department (JCPCompliance@dep.state.fl.us) will be notified. Notification will indicate the aerial extent and location of any areas of noncompliant beach fill material and remediation planned. As outlined in section E.4. below, the Permittee will immediately undertake remediation actions without additional approvals from the Department. The results of any remediation will be reported to the Department following completion of the remediation activities and shall indicate the volume of noncompliant fill material removed and replaced.

3. **Sampling to determine extent.** In order to determine if an area greater than 10,000 square feet of beach fill is noncompliant, the following procedure will be performed by the Engineer:

a. Upon determination that the first sediment sample is noncompliant, at minimum, five (5) additional sediment samples will be collected at a 25-foot spacing in all directions and assessed. If the additional samples are also noncompliant, then additional samples will be collected at a 25-foot spacing in all directions until the aerial extent is identified.
b. The samples will be visually compared to the acceptable sand criteria. If deemed necessary by the Engineer, quantitative assessments of the sand will be conducted for grain size, silt content, shell content, and Munsell color using the methods outlined in section D.8.b. Samples will be archived by the Permittee.
c. A site map will be prepared depicting the location of all samples and the boundaries of all areas of noncompliant fill.
d. The total square footage will be determined.
e. The site map and analysis will be included in the Contractor's Daily Report.

4. **Actions.** The Permittee or Permittee's Engineer shall have the authority to determine whether the material placed on the beach is compliant or noncompliant. If placement of noncompliant material occurs, the Contractor will be directed by the Permittee or Permittee's Engineer on the necessary corrective actions. Should a situation arise during construction that cannot be corrected by the remediation methods described within this QA/QC Plan, the Department will be notified. The remediation actions for each sediment parameter are as follows:

a. Silt: blending the noncompliant fill material with compliant fill material within the adjacent construction berm sufficiently to meet the compliance value, or removing the noncompliant fill material and replacing it with compliant fill material.
b. Shell: blending the noncompliant fill material with compliant fill material within the adjacent construction berm sufficiently to meet the compliance value or removing the noncompliant fill material and replacing it with compliant fill material.
c. Munsell color: blending the noncompliant fill material with compliant fill material within the adjacent construction berm sufficiently to meet the compliance value or removing the noncompliant fill material and replacing it with compliant fill material.
d. Coarse gravel: screening and removing the noncompliant fill material and replacing it with compliant fill material.
e. Construction debris, toxic material, or other foreign matter: removing the noncompliant fill material and replacing it with compliant fill material.

All noncompliant fill material removed from the beach will be transported to an appropriate upland disposal facility located landward of the Coastal Construction Control Line.

5. **Post-Remediation Testing.** Re-sampling shall be conducted following any remediation actions in accordance with the following protocols:

a. Within the boundaries of the remediation actions, samples will be taken at maximum of 25-foot spacing.

b. The samples will be visually compared to the acceptable sand criteria. If deemed necessary by the Engineer, quantitative assessments of the sand will be conducted for grain size, silt content, and Munsell color using the methods outlined in section D.8.b. Samples will be archived by the Permittee.

c. A site map will be prepared depicting the location of all samples and the boundaries of all areas of remediation actions.

6. **Reporting.** A post-remediation report containing the site map, sediment analysis, and volume of noncompliant fill material removed and replaced will be submitted to the Department within 7 days following completion of remediation activities.

All reports or notices relating to this permit shall be emailed and sent to the Department at the following locations:
DEP Bureau of Beaches & Coastal Systems
JCP Compliance Officer
Mail Station 300
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000
phone: (850) 414-7716
e-mail: JCP Compliance@dep.state.fl.us

End of Plan

FDEP Approved Version dated November 17, 2014

APPENDIX D

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
PERMIT NO. 0298107-004-JC

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
BOB MARTINEZ CENTER
2600 BLAIRSTONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

RICK SCOTT
GOVERNOR

CARLOS LOPEZ-CANTERA
LT. GOVERNOR

JONATHAN P. STEVERSON
SECRETARY

CONSOLIDATED JOINT COASTAL PERMIT AND SOVEREIGN SUBMERGED LANDS AUTHORIZATION

PERMITTEES:
Charlie Hunsicker
Parks and Natural Resources
Manatee County
5502 33rd Avenue Drive West
Bradenton, FL 34209

Juan Florensa
Town of Longboat Key
600 General Harris Street
Longboat Key, FL 34228

AGENT:
Thomas Pierro
Coastal Planning and Engineering, Inc.
2481 NW Boca Raton Boulevard
Boca Raton, FL 33431

PERMIT INFORMATION:

Permit Number: 0298107-004-JC

Project Name: Longboat Pass Navigational Maintenance Dredging and Beach Nourishment

County: Manatee

Issuance Date: March 19, 2015

Expiration Date: March 19, 2030

REGULATORY AUTHORIZATION:

This permit is issued under the authority of Chapter 161 and Part IV of Chapter 373, Florida Statutes (F.S.), and Title 62, Florida Administrative Code (F.A.C.). Pursuant to Operating Agreements executed between the Department of Environmental Protection (Department) and the water management districts, as referenced in Chapter 62-113, F.A.C., the Department is responsible for reviewing and taking final agency action on this activity.

PROJECT DESCRIPTION:

The project is to maintain Longboat Pass at its current specifications, and to place beach-compatible sand from the dredging on the beach north and south of the inlet. Longboat Pass will be maintained at a maximum dredge depth of -13.6 feet North American Vertical Datum (NAVD) using a hydraulic cutterhead dredge. The fill template will have a variable berm width at an elevation of 5 feet NAVD, and a foreshore slope of 1:15 (vertical:horizontal). Following the initial placement, the maintenance schedule and volume of material to be dredged will be determined based on physical monitoring data.

The activity includes consideration of an application for a 15-year sovereign submerged lands public easement containing 1,559,367.13 square feet or 35.80 acres, more or less.

PROJECT LOCATION:

The beach nourishment segments are located on Anna Maria Island north of the inlet, between Department Reference Monuments R-30 and 305 feet south of R-41, Sections 4, 9 and 10, Township 35 South, Range 16 East; and on Longboat Key south of the inlet, between R-43.5 and R-50.5, Sections 15, 22 and 23, Township 35 South, Range 16 East. Both beach nourishment segments are located in the Gulf of Mexico, Class III Waters, in Manatee County.

The maintenance dredging activity is located in Longboat Pass, which extends from Sarasota Bay, Class III Outstanding Florida Waters, to the Gulf of Mexico, Class III Waters, Sections 10 and 15, Township 35 South, Range 16 East, in Manatee County.

PROPRIETARY AUTHORIZATION:

This activity also requires a proprietary authorization, as the activity is located on sovereign submerged lands held in trust by the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees), pursuant to Article X, Section 11 of the Florida Constitution, and Sections 253.002 and 253.77, F.S. The activity is not exempt from the need to obtain a proprietary authorization. The Board of Trustees delegated, to the Department, the responsibility to review and take final action on this request for proprietary authorization in accordance with Section 18-21.0051, F.A.C., and the Operating Agreements executed between the Department and the water management districts, as referenced in Chapter 62-113, F.A.C. This proprietary authorization has been reviewed in accordance with Chapter 253, F.S., Chapter 18-21 and Section 62-330.075, F.A.C., and the policies of the Board of Trustees.

As staff to the Board of Trustees, the Department has reviewed the activity described above, and has determined that the sand placement activity qualifies for a Letter of Consent to use sovereign, submerged lands, as long as the work performed is located within the boundaries as described herein and is consistent with the terms and conditions herein. Therefore, consent is hereby granted, pursuant to Section 253.77, F.S., to perform the sand placement activity on the specified sovereign submerged lands.

As staff to the Board of Trustees, the Department has determined that the maintenance dredging activity requires a public easement to use sovereign, submerged lands, pursuant to Section 253.77, F.S. The Department intends to grant the public easement, subject to the conditions outlined in the previously issued *Consolidated Intent to Issue* and in the Recommended Proprietary Action (entitled *Delegation of Authority*).

The final documents required to execute the public easement will be sent to the Department's Division of State Lands. The Department intends to issue the public easement upon satisfactory execution of those documents. **You may not begin maintenance dredging on state-owned, sovereign submerged lands until the public easement has been executed to the satisfaction of the Department.**

COASTAL ZONE MANAGEMENT:

This permit constitutes a finding of consistency with Florida's Coastal Zone Management Program, as required by Section 307 of the Coastal Zone Management Act.

WATER QUALITY CERTIFICATION:

This permit constitutes certification of compliance with state water quality standards pursuant to Section 401 of the Clean Water Act, 33 United States Code (U.S.C.) § 1341.

OTHER PERMITS:

Authorization from the Department does not relieve you from the responsibility of obtaining other permits (Federal, State or local) that may be required for the project. When the Department received your permit application, a copy was sent to the U.S. Army Corps of Engineers (Corps) for review. The Corps will issue their authorization directly to you, or contact you if additional information is needed. If you have not heard from the Corps within 30 days from the date that your application was received by the Department, contact the nearest Corps regulatory office for status and further information. Failure to obtain Corps authorization prior to construction could subject you to federal enforcement action by that agency.

AGENCY ACTION:

The above named Permittee is hereby authorized to construct the work that is outlined in the project description and project location of this permit and as shown on the approved permit drawings, plans and other documents attached hereto. This agency action is based on the information submitted to the Department as part of the permit application, and adherence with the final details of that proposal shall be a requirement of the permit. **This permit and authorization to use sovereign submerged lands are subject to the General Conditions, General Consent Conditions and Specific Conditions, which are a binding part of this permit and authorization.** Both the Permittee and their Contractor are responsible for reading and understanding this permit (including the permit conditions and the approved permit drawings) prior to commencing the authorized activities, and for ensuring that the work is conducted in conformance with all the terms, conditions and drawings.

GENERAL CONDITIONS:

1. All activities authorized by this permit shall be implemented as set forth in the plans and specifications approved as a part of this permit, and all conditions and requirements of this permit. The Permittee shall notify the Department in writing of any anticipated deviation from the permit prior to implementation so that the Department can determine

whether a modification of the permit is required pursuant to section 62B-49.008, Florida Administrative Code.

2. If, for any reason, the Permittee does not comply with any condition or limitation specified in this permit, the Permittee shall immediately provide the Bureau of Beaches and Coastal Systems and the appropriate District office of the Department with a written report containing the following information: a description of and cause of noncompliance; and the period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

3. This permit does not eliminate the necessity to obtain any other applicable licenses or permits that may be required by federal, state, local, special district laws and regulations. This permit is not a waiver or approval of any other Department permit or authorization that may be required for other aspects of the total project that are not addressed in this permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgment of title, and does not constitute authority for the use of sovereignty land of Florida seaward of the mean high-water line, or, if established, the erosion control line, unless herein provided and the necessary title, lease, easement, or other form of consent authorizing the proposed use has been obtained from the State. The Permittee is responsible for obtaining any necessary authorizations from the Board of Trustees of the Internal Improvement Trust Fund prior to commencing activity on sovereign lands or other state-owned lands.

5. Any delineation of the extent of a wetland or other surface water submitted as part of the permit application, including plans or other supporting documentation, shall not be considered specifically approved unless a specific condition of this permit or a formal determination under section 373.421(2), F.S., provides otherwise.

6. This permit does not convey to the Permittee or create in the Permittee any property right, or any interest in real property, nor does it authorize any entrance upon or activities on property which is not owned or controlled by the Permittee. The issuance of this permit does not convey any vested rights or any exclusive privileges.

7. This permit or a copy thereof, complete with all conditions, attachments, plans and specifications, modifications, and time extensions shall be kept at the work site of the permitted activity. The Permittee shall require the contractor to review the complete permit prior to commencement of the activity authorized by this permit.

8. The Permittee, by accepting this permit, specifically agrees to allow authorized Department personnel with proper identification and at reasonable times, access to the

premises where the permitted activity is located or conducted for the purpose of ascertaining compliance with the terms of the permit and with the rules of the Department and to have access to and copy any records that must be kept under conditions of the permit; to inspect the facility, equipment, practices, or operations regulated or required under this permit; and to sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules. Reasonable time may depend on the nature of the concern being investigated.

9. At least forty-eight (48) hours prior to commencement of activity authorized by this permit, the Permittee shall submit to the Bureau of Beaches and Coastal Systems (JCP Compliance Officer) and the appropriate District office of the Department a written notice of commencement of construction indicating the actual start date and the expected completion date and an affirmative statement that the Permittee and the contractor, if one is to be used, have read the General and Specific Conditions of the permit and understand them.

10. If historic or archaeological artifacts, such as, but not limited to, Indian canoes, arrow heads, pottery or physical remains, are discovered at any time on the project site, the Permittee shall immediately stop all activities in the immediate area that disturb the soil in the immediate locale and notify the State Historic Preservation Officer and Bureau of Beaches and Coastal Systems (JCP Compliance Officer). In the event that unmarked human remains are encountered during permitted activities, all work shall stop in the immediate area and the proper authorities notified in accordance with Section 872.02, F.S.

11. Within 30 days after completion of construction or completion of a subsequent maintenance event authorized by this permit, the Permittee shall submit to the Bureau of Beaches and Coastal Systems (JCP Compliance Officer) and the appropriate District office of the Department a written statement of completion and certification by a registered professional engineer. This certification shall state that all locations and elevations specified by the permit have been verified; the activities authorized by the permit have been performed in compliance with the plans and specifications approved as a part of the permit, and all conditions of the permit; or shall describe any deviations from the plans and specifications, and all conditions of the permit. When the completed activity differs substantially from the permitted plans, any substantial deviations shall be noted and explained on two paper copies and one electronic copy of as-built drawings submitted to the Bureau of Beaches and Coastal Systems (JCP Compliance Officer).

GENERAL CONSENT CONDITIONS:

1. Authorizations are valid only for the specified activity or use. Any unauthorized deviation from the specified activity or use and the conditions for undertaking that activity or use shall constitute a violation. Violation of the authorization shall result in

suspension or revocation of the grantee's use of the sovereignty submerged land unless cured to the satisfaction of the Board.

2. Authorizations convey no title to sovereignty submerged land or water column, nor do they constitute recognition or acknowledgment of any other person's title to such land or water.

3. Authorizations may be modified, suspended or revoked in accordance with their terms or the remedies provided in Sections 253.04 and 258.46, F.S., or Chapter 18-14, F.A.C.

4. Structures or activities shall be constructed and used to avoid or minimize adverse impacts to sovereignty submerged lands and resources.

5. Construction, use or operation of the structure or activity shall not adversely affect any species that is endangered, threatened or of special concern, as listed in Rules 68A-27.003, 68A-27.004 and 68A-27.005, F.A.C.

6. Structures or activities shall not unreasonably interfere with riparian rights. When a court of competent jurisdiction determines that riparian rights have been unlawfully affected, the structure or activity shall be modified in accordance with the court's decision.

7. Structures or activities shall not create a navigational hazard.

8. Structures shall be maintained in a functional condition and shall be repaired or removed if they become dilapidated to such an extent that they are no longer functional. This shall not be construed to prohibit the repair or replacement subject to the provisions of Rule 18-21.005, F.A.C., within one year, of a structure damaged in a discrete event such as a storm, flood, accident or fire.

9. Structures or activities shall be constructed, operated and maintained solely for water dependent purposes, or for non-water dependent activities authorized under paragraph 18-21.004(1)(f), F.A.C., or any other applicable law.

SPECIFIC CONDITIONS:

1. All reports or notices relating to this permit shall be electronically submitted to the Department's JCP Compliance Officer (e-mail address: JCP Compliance@dep.state.fl.us) unless otherwise specified in the specific conditions of this permit. All submittals shall clearly indicate the project name (Longboat Pass Navigation Maintenance Dredging and Beach Nourishment) and the permit number (0298107-004-JC).

2. The Permittee shall not store or stockpile tools, equipment, materials, etc., within littoral zones or elsewhere within surface waters of the state without prior written approval from

the Department. Storage, stockpiling or access of equipment on, in, over or through beds of submerged aquatic vegetation, wetlands or hardbottom is prohibited unless it occurs within a work area or ingress/egress corridor that is specifically approved by this permit. Anchoring or spudding of vessels and barges within beds of aquatic vegetation or hardbottom is also prohibited.

3. The Permittee shall not conduct project operations or store project-related equipment in, on or over dunes, or otherwise impact dune vegetation, outside the approved staging, beach access and dune restoration areas designated in the permit drawings.

4. ***Notice to Proceed Requirements.*** No work shall be conducted under this permit until the Permittee has received a written Notice to Proceed (NTP) from the Department for each event. At least 30 days prior to the requested date of issuance of the NTP, the Permittee shall submit a written request for a NTP and the following items for review and approval by the Department:

   a. An electronic copy of detailed ***Final Construction Plans and Specifications*** for all authorized activities. The plans and specifications must be consistent with the Project Description of this permit and the attached permit drawings, and shall also be certified by a professional engineer (P.E.), who is registered in the State of Florida. The Permittee shall point out any deviations from the project description or the approved permit drawings. Any significant changes shall require a permit modification. The plans and specifications shall include a description of the dredging and construction methods to be utilized, an anticipated construction schedule, the anticipated volume of beach-compatible sand to be placed on the beach, and a drawing that shows all work spaces (e.g., anchoring areas, pipeline corridors, staging areas, boat access corridors, etc.) to be used for this project;

   b. ***Biological Opinion.*** In accordance with Florida Statute 161.041 (5), no construction that could result in take of threatened and marine turtles shall begin until the federal incidental take authorization is issued in accordance with the federal Endangered Species Act. All terms and conditions and conservation measures in the applicable federal incidental take authorization shall be incorporated into this permit through modification if not addressed in the existing conditions listed below;

   c. Documentation that the ***Public Easement*** has been executed and recorded to the satisfaction of the Department;

   d. ***Turbidity Monitoring Qualifications.*** Construction at the project site shall be monitored closely by an experienced, independent third party to assure that turbidity levels do not exceed the compliance standards established in this permit. Also, an individual familiar with beach construction techniques and turbidity monitoring shall be present at all times when fill material is discharged on the beach. This individual shall have authority to alter construction techniques or shut down the dredging or beach construction operations if turbidity levels exceed the compliance standards established in this permit. The names and qualifications of those individuals performing these functions along, with 24-hour contact information shall be submitted for approval;

e. A ***Scope of Work*** for the turbidity monitoring to ensure that the right equipment is available to conduct the monitoring correctly, at the correct location (i.e., wherever the densest portion of the turbidity plume crosses the edge of the mixing zone), and under any conditions. In addition to the equipment needed to collect water samples and measure turbidity, the equipment needed to access the correct sampling site shall be listed. This might include boats, jet skis, floatation devices, wet suits, SCUBA gear, etc.

f. ***Biological monitoring qualifications*** shall be submitted to the JCP Compliance Officer for review and approval. If additional monitoring team(s) are subcontracted, or new staff is added to the monitoring team, proposed changes and qualifications shall be submitted to the JCP Compliance Officer for review at least 30 days prior to the sampling event. The Permittee's selected biological monitoring firm is fully responsible for training of new staff members and subcontractors, as well as the QA/QC verification of their work;

g. A detailed ***Biological Monitoring Plan*** required in Specific Condition 26. This shall include all transect location data, monitoring specifications, as well as monitoring and reporting timelines, subject to review and approval by the Department. The baseline survey shall also be completed and submitted to the Department prior to the issuance of the NTP; and

h. A detailed ***Physical Monitoring Plan***. **This item is only required if a modification to the monitoring protocol outlined in Specific Condition 25 is requested, which can be submitted for review and approval at any time. Once a physical monitoring plan becomes available for this project, it shall be submitted during all subsequent NTP requests.**

5. ***Pre-Construction Conference.*** The Permittee shall conduct a pre-construction conference to review the specific conditions and monitoring requirements of this permit with the Permittee's contractors, the engineer of record, those responsible for turbidity monitoring and the JCP Compliance Officer (or designated alternate). In order to ensure that appropriate representatives are available, at least twenty-one (21) days prior to the intended commencement date for the permitted construction, the Permittee is advised to contact the Department, and the other agency representatives listed below:

JCP Compliance Officer
e-mail: JCPCompliance@dep.state.fl.us

Imperiled Species Management Section
Florida Fish & Wildlife Conservation Commission
620 South Meridian Street
Tallahassee, Florida 32399-1600
phone: (850) 922-4330
fax: (850) 921-4369 or email: marineturtle@myfwc.com

The Permittee is also advised to schedule the pre-construction conference at least a week prior to the intended construction commencement date. At least seven (7) days in advance of the pre-construction conference, the Permittee shall provide written notification, advising the participants (listed above) of the agreed-upon date, time and location of the meeting, and also provide a meeting agenda and a teleconference number.

6. When discharging slurried sand onto the beach from a pipeline, the Permittee shall employ best management practices (BMPs) to reduce turbidity. At a minimum, these BMPs shall include the following:

   a. Use of a shore-parallel sand dike to promote settlement of suspended sediment on the beach before return water from the dredged discharge reenters the Gulf of Mexico; and

   b. A minimum setback of 50 feet from open water, or at the landward end of the beach berm (without disturbing the dune), whichever is less, for the pipeline discharge location.

7. **Cultural Resources.** A 100-foot buffer shall be maintained between the Regina Shipwreck (Site 8MA1235, 600-feet in diameter) and construction activities that include, but are not limited to, anchoring, dredging, spudding, pipeline placement, excavation, etc. This permit only authorizes beach placement activities that to occur within the buffer and location of the Regina Shipwreck. Should any additional archaeological materials or features be encountered outside or within the 100-foot buffer, the Permittee shall immediately notify the Department of State, Division of Historical Resources (DHR) at 850-245-6333 of the discovery and shift impacts away from that location until the DHR can determine the significance of the discovery.

8. Sediment quality shall be assessed as outlined in the Sediment Quality Assurance/ Quality Control (QA/QC) Plan dated October 3, 2014. Any occurrences of placement of material not in compliance with the Sediment QA/QC Plan shall be handled according to the protocols set forth in the Sediment QA/QC Plan. Sediment testing results shall be submitted to the Department within 90 days following the completion of beach placement. The Sediment QA/QC Plan includes the following:

   a. If during construction, the Permittee or Engineer determines that the beach fill material does not comply with the sediment compliance specifications, measures shall be taken to avoid further placement of noncompliant fill and the sediment inspection results shall be reported to the Department.

   b. The Permittee shall submit post-construction sediment testing results and an analysis report as outlined in the Sediment QA/QC Plan to the Department within 90 days following beach placement. The sediment testing results shall be certified by a Professional Engineer (P.E.) or Professional Geologist (P.G.) from the testing laboratory. A summary table of the sediment samples and test results for the sediment compliance parameters as outlined in Table 1 of the Sediment QA/QC Plan shall accompany the complete set of laboratory testing results. A statement explaining how the placed fill material compares to the sediment analysis and volume calculations from the geotechnical investigation shall be included in the sediment testing results report.

   c. A post-remediation report containing the site map, sediment analysis and volume of noncompliant fill material removed and replaced shall be submitted to the Department within 7 days following completion of remediation activities.

Fish and Wildlife Protection Conditions

9. The pre-construction conference held between the contractors, the engineer and staff representative of the Department (see Specific Condition 5 above) shall also include the Marine Turtle Monitor/permit holder, Bird Monitors and staff representatives of the Florida Fish and Conservation Commission (FWC). The purpose of this portion of the meeting is to ensure that the Permittee/Contractor fully understands the wildlife protection measures and site-specific measures that need to be taken before, during and after construction. This meeting may be combined with the pre-construction conference required in Specific Condition 5 above.

   a. The Permittee/Contractor’s Environmental Plan (EPP) shall include details of monitoring for nesting marine turtles and nesting seabirds and shorebirds onsite during construction. The EPP shall be submitted for review and comment to the FWC prior to the pre-construction conference.

   b. The EPP and notification of the pre-construction conference shall be sent to the FWC at least 10 business days before the date of that meeting per the information in the attached FWC contact information exhibit, and also by email to MarineTurtle@myfwc.com.

10. **In-water Activity.** The following conditions shall be followed for all in-water activity:

    a. All personnel associated with the project shall be instructed about the presence of marine turtles and manatees, and the need to avoid collisions with (and injury to) these protected marine species. The Permittee/Contractor shall advise all construction personnel that there are civil and criminal penalties for harming, harassing or killing manatees or marine turtles, which are protected under the Endangered Species Act, the Marine Mammal Protection Act, the Marine Turtle Protection Act and the Florida Manatee Sanctuary Act.

    b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels shall follow routes of deep water whenever possible.

    c. Siltation or turbidity barriers, if used, shall be made of material in which manatees and marine turtles cannot become entangled, shall be properly secured and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers shall not impede manatee or marine turtle movement.

    d. All on-site project personnel are responsible for observing water-related activities for the presence of marine turtles and manatees. All in-water activities, including vessel operations, shall be shut down if a marine turtle or manatee comes within 50 feet of the activity. Activities shall not resume until the animal(s) has moved beyond a 50-foot radius of the project operation, or until 30 minutes elapses if the animal(s) has not reappeared within 50 feet of the operation. Animals shall not be herded away or harassed into leaving

    e. Any collision with or injury to a marine turtle or manatee shall be reported immediately to the FWC Hotline at 1-888-404-3922, and to FWC at ImperiledSpecies@myFWC.com. Any collision with and/or injury to a marine turtle shall also be reported immediately to the Sea Turtle Stranding and Salvage Network (STSSN) at SeaTurtleStranding@myfwc.com.

    f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs shall be removed by the Permittee upon completion of the project. Temporary signs that have already been approved for this use by the FWC shall be used. One sign that reads *Caution: Boaters: Watch for Manatees* shall be posted. A second sign measuring at least 8 ½" by 11" explaining the requirements for "Idle Speed/No Wake" and the shutdown of in-water operations shall be posted in a location prominently visible to all personnel engaged in water-related activities. These signs can be viewed at

MyFWC.com/manatee. Questions concerning these signs can be sent to FWC at ImperiledSpecies@myFWC.com.

11. **Hopper Dredging**. In the event a hopper dredge is utilized, the following requirements shall be met:

    a. Handling of captured sea turtles captured during hopper dredging activities shall be conducted only by persons with prior experience and training in these activities and who is duly authorized to conduct such activities through a valid Marine Turtle Permit issued by the FWC, pursuant to Chapter 68E-1, F.A.C.

    b. The standard operating procedure shall be that dredging pumps are disengaged by the operator, or the draghead bypass valve shall be open and in use when the dragheads are not firmly on the bottom to minimize impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations.

    c. A state-of-the-art rigid deflector draghead shall be used on all hopper dredges at all times of the year.

    d. The STSSN Coordinator shall be notified at 1-904-573-3930 or via e-mail at Allen.Foley@myfwc.com at the start-up and completion of hopper dredging operations. In the event of capturing or recovering sea turtles or sea turtle parts, the STSSN shall be contacted at seaturtlestranding@myfwc.com.

12. **Trawling**. If relocation trawling or non-capture trawling is required, it shall be implemented in accordance with the applicable NMFS Biological Opinion and Incidental Take authorization.

    a. Any activity involving the use of nets to harass and/or to capture and handle marine turtles in Florida waters requires a Marine Turtle Permit from FWC.

    b. The Permittee or their contractor shall e-mail (MTP@MyFWC.com) weekly reports to the Imperiled Species Management Section on Friday of each week that trawling is conducted in Florida waters. These weekly reports shall include the species and number of turtles captured in Florida waters, general health and release information. A summary (using FWC provided Excel spreadsheet) of all trawling activity (including non-capture trawling), all turtles captured in Florida waters (including all measurements), the latitude and longitude (in decimal degrees) of captures and tow start-stop points and times for the start-stop points of the tows (including those tows on which no turtles are captured) shall be submitted to MTP@myfwc.com by January 15 of the following year or at the end of the project.

13. **Beach Related Activities.**

    a. *Beach Driving.* All vehicles shall be operated in accordance with the FWC's *Best Management Practices for Operating Vehicles on the Beach* (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/). Specifically, the vehicle shall be operated at a speed <6 mph and run at or below the high-tide line. All personnel associated with the project shall be instructed about the potential presence of shorebirds and marine turtles and the need to avoid take of (including disturbance to) these protected species.

    b. *Beach Maintenance.* All derelict concrete, metal, coastal armoring material and other debris shall be removed from the beach prior to any material placement to the maximum extent practicable. If debris removal activities will take place during shorebird or sea turtle nesting seasons, the work shall be conducted during daylight hours only and shall not commence until completion of daily shorebird or sea turtle surveys each day. If flightless shorebird young are present within or adjacent to the work zone or equipment travel corridor, a Shorebird Monitor shall be present during the operation to ensure that equipment does not operate within 300 feet of the flightless young. It is the Permittee/Contractor's responsibility to ensure no chicks are in the path of the moving vehicle and no tracks capable of trapping flightless chicks result. All excavations and temporary alteration of beach topography shall be filled or leveled to the natural beach profile prior to 9:00 p.m. each day. The beach surface shall be inspected subsequent to completion of the project and all tracks or impressions due to the project or movement of heavy equipment across the beach shall be removed.

    c. *Equipment Storage and Placement*. Staging areas for construction equipment shall be located off the beach, if off-beach staging areas are available. Nighttime storage of construction equipment not in use shall be located off the beach to minimize disturbance to shorebird and marine turtle nesting and hatching activities. In addition, all construction pipes that are placed on the beach shall be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune. Temporary storage of pipes shall be located off the beach to the maximum extent possible. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible, those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season.

14. **Shorebird Protection Conditions**. Shorebird surveys shall be conducted by trained, dedicated individuals (Bird Monitor) with proven shorebird identification skills and avian survey experience.

a. *Selection of Bird Monitors*. A list of Bird Monitors with their contact information, summary of qualifications including bird identification skills and avian survey experience shall be provided to the FWC. This information will be submitted to the FWC Regional Biologist (see Exhibit 1) prior to any construction or shorebird surveys for review and consultation. Bird Monitors shall meet the following minimum qualifications.

   i. Ability to identify all species of beach-nesting birds that nest in the project area by sight and sound.

   ii. Ability to identify breeding/territorial behaviors and find nests of shorebirds and seabirds that occur in the project area.

   iii. Ability to identify habitats preferred by shorebirds and seabirds nesting in the project area.

   iv. Completed full introductory course training (online or webinar) on the *Breeding Bird Protocol for Florida's Seabirds and Shorebirds*, including training in data entry.

   v. Familiar with FWC beach driving guidelines: www.myfwc.com/conservation/you-conserve/wildlife/beach-driving.

   vi. Annually completes refresher course training (online or webinar) for the *Breeding Bird Protocol for Florida's Seabirds and Shorebirds*, including training in data entry.

   vii. Previously participated in beach-nesting bird surveys associated with FWC, Audubon or FWS in Florida (please provide references).

   viii. Experience posting beach-nesting bird sites, consistent with Florida Shorebird Alliance (FSD) Guidelines (http://flshorebirdalliance.org/resources/instructions-manuals.aspx).

   ix. Registered contributor to the Florida Shorebird Database.

b. The Bird Monitor(s) shall review and become familiar with the general information on the FWC's Florida Shorebird Database (FSD) website (www.FLShorebirdDatabase.org). They shall use the data collection protocol and implement data entry procedures as outlined on that website. An outline of data to be collected, including downloadable field data sheets, is available on the website.

c. Breeding season varies by species. Most species have completed the breeding cycle by September 1, but flightless young may be present through September. The following dates are based on the best available information regarding ranges and habitat use by species for this project: February 15 – September 1.

d. Surveys during the breeding season shall begin on the first day of the breeding season or 10 days before any site work begins, whichever is later. Surveys shall be conducted through August 31 or until all breeding activity has concluded, whichever is later.

e. During the breeding season, the Bird Monitor(s) shall survey all potential beach-nesting bird habitats that may be affected by construction or pre-construction activities. The Bird Monitor(s) shall establish one or more shorebird survey routes in the FSD website to cover these areas.

f. During the pre-construction and construction phases of the project, the Bird Monitor(s) shall complete surveys on a daily basis to detect breeding activity and the presence of flightless chicks before (1) equipment is moved to the area, (2) vehicles are operated in the area or (3) any other activities occur that have the potential to disrupt breeding behavior or cause harm to the birds or their eggs or young. Once construction is completed and all personnel and equipment have been removed from the beach, surveys may be conducted at weekly intervals.

g. The Bird Monitor(s) shall survey the project area by walking and looking for evidence of (1) shorebirds exhibiting breeding behavior, (2) shorebird chicks or (3) shorebird juveniles, as outlined in the FSD's *Breeding Bird Protocol for Shorebirds and Seabirds*. The Bird Monitor(s) shall use binoculars for these surveys.

h. If an ATV or other vehicle is needed to cover large project areas, operators shall adhere to the FWC's *Best Management Practices for Operating Vehicles on the Beach* (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/). Specifically, the vehicle shall be operated at a speed <6 mph at or below the high tide line. The Bird Monitor(s) shall stop at no greater than 200-meter intervals to look for breeding activity.

i. Once the Bird Monitor(s) confirms that birds are breeding, as evidenced by the presence of a scrape, eggs or young, the Bird Monitor(s) shall notify the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit) within 24 hours. The Bird Monitor(s) shall report all breeding activity to the FSD website within one week of data collection.

15. **Shorebird Buffer Zones and Travel Corridors**. The Bird Monitor(s) shall establish a disturbance-free buffer zone around any location within the project area where shorebirds have been engaged in breeding behavior, including territory defense. The FWC considers a 300-foot-wide buffer to be adequate based on published studies; however, a smaller, site-specific buffer may be established if approved by the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit). All sources of human disturbance (including pedestrians, pets and vehicles) shall be prohibited in the buffer zone.

    a. The Bird Monitor(s) shall keep breeding sites under sufficient surveillance to determine if birds appear agitated or disturbed by construction or other activities in adjacent areas. If birds do appear to be agitated or disturbed by these activities, then the Bird Monitor(s) shall widen the buffer zone immediately to a sufficient size to protect breeding birds.

    b. The Bird Monitor(s) shall ensure that reasonable and traditional pedestrian access shall not be blocked in situations where breeding birds will tolerate pedestrian traffic. This is generally the case with lateral movement of beach-goers walking parallel to the beach at or below the highest tide line. Pedestrian traffic may also be tolerated when breeding was initiated within 300 feet of an established beach access pathway. The Bird Monitor(s) shall work with the FWC Regional Species Conservation Biologist to determine if pedestrian access can be accommodated without compromising nesting success.

    c. The Bird Monitor(s) shall ensure that the perimeters of designated buffer zones are marked with posts, twine and signs stating: “Do Not Enter, Important Nesting Area” or similar language. The signs shall include the name and a phone number of the entity responsible for posting. Posts shall not be higher than 3 feet once installed. “Symbolic fencing” (i.e., twine, string or rope) shall be placed between all posts and shall be clearly visible to pedestrians. In areas where marine turtles nest, the ropes shall be at least 2.5 feet above the ground. If pedestrian pathways are approved by the FWC Regional Species Conservation Biologist within the 300-foot buffer zone, these pathways shall be clearly marked. The Bird Monitor(s) shall ensure that the posting is maintained in good repair until breeding is completed or terminated. Although solitary nesters may leave the buffer zone with their chicks, the posted area continues to provide a potential refuge for the family until breeding is complete. Breeding is not considered to be completed until all chicks have fledged.

    d. The Bird Monitor(s) shall ensure that no construction activities, pedestrians, moving vehicles or stockpiled equipment occur within the buffer area.

e. The Bird Monitor(s) shall designate and mark travel corridors outside the buffer areas so as not to cause disturbance to breeding birds. Heavy equipment, other vehicles, or pedestrians may go past breeding areas in these corridors. However, other activities such as stopping or turning heavy equipment and vehicles shall be prohibited within the designated travel corridors adjacent to the breeding site.

f. If flightless shorebird young are present within or adjacent to the equipment travel corridor, a Bird Monitor shall be present during the operation to ensure that equipment does not operate within 300 feet of the flightless young. It is the Permittee/Contractor's responsibility to ensure no chicks are in the path of the moving vehicle and no tracks capable of trapping flightless chicks result.

g. The FWC recommends that some activity in the travel corridor is maintained on a daily basis in order to discourage birds from nesting within the travel corridor. These activities shall not be allowed to disturb shorebirds nesting on site or interfere with sea turtle nesting, especially if the corridors are established before construction has started.

h. *Notification.* If the Bird Monitor(s) find that shorebirds are breeding within the project area, he or she shall ensure that an informational bulletin board is placed and maintained in the construction staging area. This bulletin board shall display a location map of the construction site, depict the location(s) of the bird breeding areas and include a clearly visible warning stating: "NESTING BIRDS ARE PROTECTED BY LAW INCLUDING THE FLORIDA ENDANGERED AND THREATENED SPECIES ACT AND THE STATE AND FEDERAL MIGRATORY BIRD ACTS".

16. **Marine Turtle Nest Surveys and Relocation Conditions.**

a. For sand placement during marine turtle nesting season: (April 15 – November 15), daily early morning (before 9 a.m.) surveys shall be conducted and eggs shall be relocated per the requirements below until completion of sand placement. (Note: marine turtle monitors shall not enter posted shorebird buffer areas to conduct monitoring or to relocate nests.) Monitoring and reporting shall continue throughout the nesting season and shall be conducted according to Post-construction Monitoring and Reporting Marine Turtle Protection Conditions included in this document.

b. *Turtle Monitors.* Nesting surveys and egg relocations shall only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to Chapter 68E-1, F.A.C. Please contact FWC's Marine Turtle Management Program in Tequesta at MTP@myfwc.com for information on the permit holder in the project area. It is the responsibility of the Permittee to ensure that nesting surveys are completed by the authorized Marine Turtle Permit Holder. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (in all time zones).

c. Nesting surveys shall be initiated 65 days prior to sand placement activities or by the beginning of marine turtle nesting season (April 15 – November 15), whichever is later. Nesting surveys shall continue daily through the end of the project, or November 15, or until two weeks after the last crawl in the project area, whichever is earlier. If nests are laid in areas where they may be affected by sand placement activities, eggs shall be relocated per the requirements listed in these conditions. Monitoring shall resume for subsequent nesting seasons according to Post-construction Monitoring and Reporting Marine Turtle Protection Conditions included in this document.

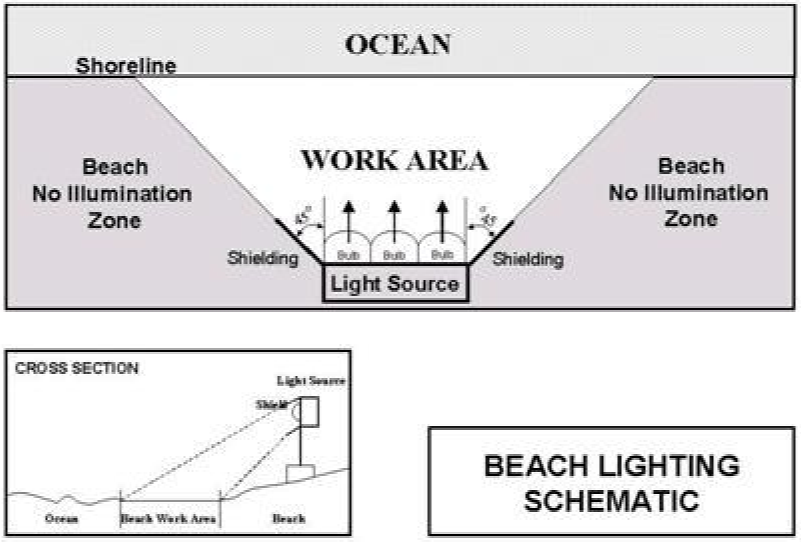
d. Only those nests in the area where sand placement will occur shall be relocated. Nest relocation shall not occur upon completion of sand placement. Nests requiring relocation shall be moved no later than 9:00 a.m., the morning following deposition to a nearby self-release beach site in a secure setting, where artificial lighting would not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides, known to routinely experience severe erosion and egg loss or subject to artificial lighting. Nest relocations in association with construction activities shall cease when sand placement activities no longer threaten nests.

e. Nests deposited within areas where construction activities have ceased, will not occur for 65 days or nests laid in the nourished berm prior to tilling shall be marked and left in place. The turtle permit holder shall install an on-beach marker at the nest site and/or a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity shall occur within this area, nor shall any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure that nest markers remain in place and the nest has not been disturbed by the project activity.

17. **Marine Turtle or Nest Encounters**. Upon locating a dead or injured sea turtle adult, hatchling or egg that may have been harmed or destroyed as a direct or indirect result of the project, the Permittee shall notify FWC Wildlife Alert at 1-888-404-FWCC (3922). Care shall be taken in handling injured marine turtles or eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis. In the event a sea turtle nest is excavated

during construction activities, but not as part of the authorized nest relocation process outlined in these specific conditions, the permitted person responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

18. **Project Lighting**. Direct lighting of the beach and nearshore waters during the marine turtle nesting season (April 15 – November 15) shall be limited to the immediate construction area and shall comply with safety requirements. Lighting on offshore or onshore equipment shall be minimized through reduction, shielding, lowering and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, EM 385-1-1 and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order to avoid misdirection of sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (see Figure below).



19. **Fill Restrictions**. During the sea turtle nesting season (April 15 – November 15), the contractor shall not extend the beach fill more than 500 feet along the shoreline between dusk and the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle monitor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500-foot length limitation is not feasible for the project, an agreed upon distance shall be established during the pre-construction conference. Once the beach has been cleared and the necessary nest relocations have been completed, the contractor shall be allowed to proceed with the placement of fill during daylight hours until dusk, at which time the 500-foot length limitation shall apply.

20. **Compaction Sampling**. Sand compaction shall be monitored in the area of sand placement immediately after completion of each beach placement event and prior to April 15th for three (3) subsequent years, and shall be monitored in accordance with a protocol agreed to by the FWC and the Permittee. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post-construction compaction levels. Out-year compaction monitoring and remediation are not required if placed material no longer remains on the beach. At a minimum, the protocol provided under a. and b. below shall be followed. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the following date listed above. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then the Permittee shall consult with the FWC to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling shall not be required.

    a. Compaction sampling stations shall be located at 500-foot intervals along the project area. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high water line (normal wrack line).

    b. At each station, the cone penetrometer shall be pushed to depths of 6, 12 and 18 inches three times (i.e., three replicates at each depth). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports shall include all 18 values for each transect line, and the final 6 averaged compaction values.

    c. No compaction sampling shall occur within 300 feet of any shorebird nest.

    d. Any vehicles operated on the beach in association with compaction surveys shall operate in accordance with the FWC's *Best Management Practices for Operating Vehicles on the Beach* (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/).

21. **Tilling Requirements**. If tilling is required, as specified above, the area shall be tilled to a depth of 24 inches. All tilling activity shall be completed prior to the marine turtle nesting season. If tilling occurs during shorebird nesting season, shorebird surveys prior to tilling shall be required per the Shorebird Conditions included within this document. It is the responsibility of the contractors (and ultimately the Permittee) to avoid tilling,

scarp removal or dune vegetation planting in areas where nesting birds are present. Each pass of the tilling equipment shall be overlapped to allow thorough and even tilling. If the project is completed during the marine turtle nesting season, tilling shall not be performed in areas where nests have been left in place or relocated. If compaction measurements are taken, a report on the results of the compaction monitoring shall be submitted electronically to FWC at marineturtle@myfwc.com prior to any tilling actions being taken.

a. No tilling shall occur within 300 feet of any shorebird nest.

b. If flightless shorebird young are present within the work zone or equipment travel corridor, a Bird Monitor shall be present during the operation to ensure that equipment does not operate within 300 feet of the flightless young.

c. A relatively even surface, with no deep ruts or furrows, shall be created during tilling. To do this, chain-linked fencing or other material shall be dragged over those areas as necessary after tilling.

d. Tilling shall occur landward of the wrack line and all vegetated areas three (3) square feet or greater shall be avoided, and a three (3) square-foot buffer shall be maintained around the vegetated areas. The slope between the mean high water line and the mean low water line shall be maintained in such a manner as to approximate natural slopes.

e. Any vehicles operated on the beach in association with tilling shall operate in accordance with the FWC's *Best Management Practices for Operating Vehicles on the Beach* (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/).

22. **Escarpment Surveys**. Visual surveys for escarpments along the project area shall be made immediately after completion of sand placement and during March 15 to April 15 for three (3) subsequent years if placed sand still remains on the beach. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of at least 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by April 15. Any escarpment removal shall be reported by location. If the project is completed during the sea turtle nesting and hatching season, escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. The Permittee shall contact FWC immediately if subsequent reformation of escarpments occurs during the nesting and hatching season and the escarpments interfere with sea turtle nesting or exceed 18 inches in height for a distance of 100 feet. The FWC would then determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the FWC shall provide a brief written authorization that describes methods to be used to reduce the

likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be submitted electronically to marineturtle@myfwc.com along with the annual summary as described below. If escarpment removal occurs during shorebird breeding season, shorebirds surveys shall be required per the Shorebird Conditions included within this document prior to removal. (NOTE: Out-year escarpment monitoring and remediation are not required if placed material no longer remains on the dry beach).

a. No heavy equipment shall operate within 300 feet of any shorebird nest.

b. If flightless shorebird young are present within the work zone or equipment travel corridor, a Bird Monitor shall be present during the operation to ensure that equipment does not operate within 300 feet of the flightless young.

c. Any vehicles operated on the beach in association with escarpment surveys or removal shall operate in accordance with the FWC's *Best Management Practices for Operating Vehicles on the Beach* (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/).

23. **Post-construction Conditions, Monitoring and Reporting Conditions.**

a. Shorebirds: If beach cleaning will occur on the nourished beach, a minimum of 30% of the biotic material within the wrack line shall be left on the beach post-cleaning at the strand line in a natural configuration to ensure that the nourished beach re-establishes its function as foraging habitat for shorebirds. This shall occur for as long as the placed sand remains on the beach.

b. Marine Turtles: Reports on all marine turtle nesting activity shall be provided for the initial marine turtle nesting season (April 15 – November 15) and for up to two additional nesting seasons as follows:

i. For the remainder of the nesting season immediately following construction, and the following year, the number and type of emergences (nests or false crawls) shall be reported per species in accordance with Table 1 below. An additional year of nesting surveys may be required if nesting success for any species on the nourished beach is less than 40%.

ii. For the remainder of the nesting season immediately following construction, reproductive success shall be reported per species in accordance with Table 1 below. Reproductive success shall be reported for all loggerhead, Kemp's ridley, green and leatherback nests.

iii. In the event that the reproductive success documented by species meets or exceeds required criteria (outlined in Table 1 below) for each species, monitoring for reproductive success shall be recommended, but not required for the second year post-construction.

iv. Monitoring of nesting activity in the seasons following construction shall include daily surveys and any additional measures authorized by the FWC. Summaries shall include all crawl activity, nesting success rates, hatching success of all relocated nests, hatching success of a representative sampling of nests left in place (if any) by species, project name and applicable project permit numbers and dates of construction.

i. Lighting Surveys. Two lighting surveys shall be conducted of all artificial lighting visible from the nourished berm. The first survey shall be conducted between May 1 and May 15 of the first nesting season following construction or immediately after placement if construction is not completed until after May 15, and a second survey between July 15 and August 1. The survey shall be conducted by the Permittee and shall be conducted to include a landward view from the seaward most extent of the new beach profile. The survey shall follow standard techniques for such a survey and include the number and type of visible lights, location of lights and photo documentation. For each light source visible, the Permittee shall document that the property owner(s) have been notified of the problem light and have been provided with recommendations for correcting the light. Recommendations must be in accordance with the Florida Model Lighting Ordinance for Marine Turtle Protection (Chapter 62B-55, F.A.C.) and local lighting restrictions. A report summarizing all lights visible shall be submitted to FWC Imperiled Species Management Section at marineturtle@myfwc.com and **copied to** JCPCompliance@dep.state.fl.us by the 1st of the month following survey. A summary report documenting what corrective actions have been taken shall also be submitted by December 15 of that year. After the annual report is completed, a meeting shall be set up with the Permittee or local sponsor, county or municipality and FWC to discuss the survey report as well as any documented sea turtle disorientations in or adjacent to the project area.

24. Data shall be reported for the nourished areas in accordance with the Table 1 below and shall include number of nests lost to erosion or washed out. Summaries of nesting activity shall be submitted in electronic format (Excel spreadsheets) to the FWC Imperiled Species Management Section at marineturtle@myfwc.com and **copied to** JCPCompliance@dep.state.fl.us. All summaries shall be submitted by January 15 of the following year. The FWC Excel spreadsheet is available upon request from marineturtle@myfwc.com.

Table 1. Marine Turtle Monitoring for Beach Placement of Material

Metric	Duration	Variable	Criterion
Nesting Success	Year of construction and one year post construction if placed sand remains on beach. Up to three years if variable does not meet criterion. [1 and 2]	Number of nests and non-nesting emergences by day by species	40% or greater
Hatching Success	Year of construction. Additional one to two years post construction if placed sand remains on beach and variable does not meet criterion. [1 and 2]	Number of hatchlings by species to completely escape egg	Average of 60% or greater (data must include washed out nests)
Emergence Success	Year of construction. Additional one to two years post construction if placed sand remains on beach and variable does not meet success criterion. [1 and 2]	Number of hatchlings by species to emerge from nest onto beach	Average must not be significantly different than the average hatching success
Disorientation	Year of construction and one to three years post construction if placed sand remains on beach. [1 and 2]	Number of nests and individuals that misorient or disorient	
Lighting Surveys	Two surveys the year following construction, one survey between May 1 and May 15 and second survey between July 15 and August 1.[1 and 2]	Number, location and photographs of lights visible from the nourished berm, corrective actions and notifications made	100% reduction in lights visible from nourished berm within one to two month period
Compaction	Not required if the beach is tilled prior to nesting season each year placed sand remains on beach.	Shear resistance	Less than 500 psi
Escarpment Surveys	Weekly during nesting season for up to three years, each year that placed sand remains on the beach.[2]	Number of scarps 18 inches or greater extending for more than 100 feet that persist for more than 2 weeks	Successful remediation of all persistent scarps as needed

Notes: [1] Not required for maintenance dredging.
[2] Not required if dredged sand is placed in the nearshore swash or littoral zones only.

MONITORING REQUIRED:

Physical Monitoring

25. The Permittee shall comply with the following conditions intended to monitor the performance of the coastal construction and determine its effects on the coastal system. Changes to the approved protocols listed under this section can be revised at any later

time by written request of the Permittee and with the written approval of the Department. However, submission of a physical monitoring plan shall be required to address such changes.

a. Bathymetric surveys of the Longboat Pass channel and shoal complex shall be conducted within 90 days prior to commencement of construction of each dredging event; surveys of the Longboat Pass channel and immediately-adjacent shoal platform shall be conducted within 60 days following completion of construction of each dredging event.

   Survey grid lines across the channel shall be spaced to provide sufficient detail for accurate volumetric calculations, but spaced no more than 500 feet apart, and shall extend a minimum of 500 feet beyond the boundaries of the shoal complex. Bathymetric surveys of the entire shoal complex, including any attachment bars, shall be conducted. In all other aspects, work activities and deliverables shall be consistent with the Department's *Monitoring Standards for Beach Erosion Control Projects, Section 01200.*

b. The Permittee shall submit a monitoring report prepared by a qualified professional engineer or coastal geologist registered in the State of Florida and the monitoring data to the Department within 90 days following completion of the post-construction survey.

   The report shall summarize and discuss the data, the performance of the project, and its effects on the inlet system and adjacent beaches. Results shall be analyzed for patterns, trends, or changes between project construction activities. The report shall incorporate topographic and bathymetric beach and offshore profile survey data as applicable from the monitoring programs for the Anna Maria Island and Longboat Key beach nourishment projects. The report shall specifically include:

   i. Updated sediment budget for Longboat Pass;

   ii. The annual average bypassing volume to be placed on the adjacent eroding beaches;

   iii. Computations, tables and graphic illustrations of bathymetric contours, and volumetric, bathymetric and shoreline position changes for the monitoring area: and,

   iv. Other shoreline position, bathymetric contour and volumetric analysis the Permittee or design professional deem useful in assessing, with quantitative measurements, the performance of the project.

c. A digital copy of the monitoring report and a digital file of the survey data shall be submitted to the Division of Water Resource Management in Tallahassee. Failure to submit reports and data in a timely manner constitutes grounds for revocation of the permit. When submitting any monitoring information to the Department, please include a transmittal cover letter clearly labeled with the following at the top of each page: **"This monitoring information is submitted in accordance with the approved monitoring protocol for Permit No. [0298107-004-JC] for the monitoring period [XX].**

This permit does not require a physical monitoring plan. However, any requested changes to modify the physical monitoring protocol described in this specific condition shall require the submission of a physical monitoring plan. The physical monitoring plan shall be approved by the Department. In the event that such a plan is drafted, reviewed and approved, the submitted monitoring information shall reference the approved Monitoring Plan for Permit No. [0298107-004-JC] for the monitoring period [XX].

Biological Monitoring

26. Biological monitoring of hardbottom resources (including nearshore hardbottom and artificial reefs) shall be conducted to document potential project-related adverse impacts to these resources, and to provide an analysis of the impacts (e.g., construction-related burial or sedimentation). Any damage to unmitigated hardbottom resources, either persistent or temporary, shall require mitigation. Monitoring shall comply with and meet the requirements of the Approved Biological Monitoring Plan. No construction shall occur until the Biological Monitoring Plan has been approved by the Department, and a baseline survey has been completed and submitted to the Department as required in Specific Condition 27a.

27. Nearshore hardbottom and artificial reefs shall be monitored once, prior to the initial construction, immediately following construction, and annually, for three years post-construction, for a total of five (5) monitoring events. Construction shall not begin until baseline (pre-construction) surveys of all resources in and adjacent to the project area (nearshore) have been conducted according to the Biological Monitoring Plan and the results of these surveys have been submitted to the Department.

a. If less than two (2) years old, the most recent monitoring survey for the 2014 Coquina Beach Restoration Project may be used as the baseline (pre-construction) survey for the Anna Maria Island beach placement area. A new baseline survey shall be completed for the Longboat Key placement area prior to construction. In either case, the survey used as the initial survey shall serve as baseline for all subsequent nourishment events under this permit.

b. Each subsequent nourishment event shall initiate another complete round of post-construction monitoring, which shall include four (4) surveys: one initial post-construction survey (within six months of project completion), and three annual post-construction surveys (Years 1, 2 and 3).

c. In some cases, the dredged sand may be placed alternately between the Anna Maria and Longboat Key shorelines, and on some occasions the sand may be split between the two shorelines during the same dredge/fill event. Regardless of whether both beach sections (Anna Maria Island and Longboat Key) are nourished together or independent of one another, each nourishment event shall initiate another complete round of post-construction monitoring for the areas that are nourished, which shall include four (4) surveys: one initial post-construction survey (within six months of project completion), and three annual post-construction surveys (Years 1, 2 and 3).

d. The Anna Maria Island and Longboat Key biological monitoring shall be conducted and reported on independently. All surveys shall be conducted in compliance with the Approved Biological Monitoring Plan, and monitoring progress shall be reported weekly until the completion of each survey, at which point the JCP Compliance Officer shall be notified that the survey is complete.

28. The Permittee shall require the biological monitoring company to submit raw data, as collected in the field and as entered into spreadsheets for analysis (Microsoft Excel file format), simultaneously to the Department, contractor and Permittee no later than 45 days after completing each survey, beginning with the pre-construction monitoring survey. Biological monitoring companies shall submit any draft reports simultaneously to the Department, contractor and Permittee and shall submit all final reports simultaneously to the Department, contractor and Permittee no later than 90 days after completing the survey.

29. The Permittee shall authorize direct communication between the biological monitoring personnel and the Department with regard to biological data collection, methodology, field sampling logistics and data discussed in reports. Biological monitoring personnel shall assess biological monitoring results independently and without consultation beyond the approved biological monitoring personnel. Any issues involving changes to the biological monitoring or mitigation plan or changes to the permit conditions shall involve coordination with the Permittee. This condition does not authorize the Department to change the scope of the biological monitoring without coordinating with the Permittee.

30. **Water Quality Monitoring.** Turbidity shall be monitored as follows:

Units: Nephelometric Turbidity Units (NTUs).

Frequency: Three times daily, at least four (4) hours apart, during all dredging and beach placement operations. Sampling shall be conducted **while the highest project-related turbidity levels are crossing the edge of the mixing zone**. Since the turbidity levels can be related to pumping rates, the dredge pumping rates shall be recorded, and provided to the Department upon request. The compliance samples and the corresponding background samples shall be collected at approximately the same time, i.e., one shall immediately follow the other.

Location: Background: At surface and mid-depth, clearly outside the influence of any artificially generated turbidity plume or the influence of an outgoing inlet plume, coincidental with compliance measurements.

Dredge Site: Samples shall be collected at surface and mid-depth, at least 500 meters upcurrent from the dredge site and clearly outside the influence of any turbidity generated by the project.

Beach Site: Samples shall be collected at surface and mid-depth, at a point approximately 500 meters upcurrent from any portion of the beach that has been, or is being, filled during the current construction event, at the same distance offshore as the compliance station, clearly outside of any turbidity plume generated by the project.

Compliance: Three times daily at least four (4) hours apart during dredging and beach placement operations, at surface and mid-depth, while the densest turbidity plume is crossing the edge of the mixing zone. **Note**: If the plume flows parallel to the shoreline, the densest portion of the plume may be close to shore, in shallow water, and may cross the edge of the mixing zone polygon less than 150 meters offshore. In that case, it may be necessary to access the sampling location from the shore, in water that is too shallow for a boat.

Dredge Site: Samples shall be collected 150 meters down-current from the dredge head in the downcurrent direction **and** from any other source of turbidity generated by the dredge, in the densest portion of any visible turbidity plume. If no plume is visible, follow the likely direction of flow.

Beach Site: Samples shall be collected where the densest portion of the turbidity plume crosses the edge of the mixing zone, which measures up to 150 meters downcurrent and up to 1,000 meters alongshore from the point where the return water from the dredged discharge reenters the Gulf of Mexico.

Intermediate: Required when using a mixing zone that exceeds 150 meters in size. Within the approved mixing zone, samples shall be collected along the densest portion of the turbidity plume (or in the direction of flow if no plume is visible), at 150 meters, 250 meters, 500 meters and 750 meters downcurrent from the point of discharge into the Gulf of Mexico (if those points are located inside the mixing zone), at surface and mid-depth. The data generated by this intermediate monitoring shall be used to adjust the size of the mixing zone for future events, not for compliance.

Calibration: The instruments used to measure turbidity shall be fully calibrated with primary standards within one month of the commencement of the project, and at least once a month throughout the project. Calibration with secondary standards shall be verified each morning prior to use, after each time the instrument is turned on, and after field sampling using two secondary turbidity "standards" that bracket the anticipated turbidity samples. If the post-sampling calibration value deviates more than 8% from the previous calibration value, results shall be reported as estimated and a description of the problem shall be included in the field notes.

The monitoring requirements for the type of activity and location of the sampling site shall be reflected on the monitoring report forms.

Analysis of turbidity samples shall be performed in compliance with DEP-SOP-001/01 FT 1600 Field Measurement of Turbidity:
http://publicfiles.dep.state.fl.us/dear/sas/sopdoc/2008sops/ft1600.pdf

If the turbidity monitoring protocol specified above prevents the collection of accurate data, the person in charge of the turbidity monitoring shall contact the JCP Compliance Officer to establish a more appropriate protocol. Once approved in writing by the Department, the new protocol shall be implemented through an administrative permit modification.

31. The compliance locations given above shall be considered the limits of the temporary mixing zone for turbidity allowed during construction. If monitoring reveals turbidity levels at the compliance sites are greater than 29 NTUs above the corresponding background turbidity levels, or 7.5 NTUs above background within the OFW, construction activities shall **cease immediately** and not resume until corrective measures have been taken and turbidity has returned to acceptable levels.

Any project-associated turbidity source other than dredging or beach placement (e.g., scow or pipeline leakage) shall be monitored as close to the source as possible. If the turbidity level exceeds 29 NTUs above background, or 7.5 NTUs above background within OFW, the construction activities related to the exceedance shall **cease immediately** and not resume until corrective measures have been taken and turbidity has returned to acceptable levels. This turbidity monitoring shall continue every hour until background turbidity levels are restored or until otherwise directed by the Department. The Permittee shall notify the Department's JCP Compliance Officer, by separate email to the JCP Compliance Officer, of such an event within 24 hours of the time the Permittee first becomes aware of the discharge. The subject line of the email shall state "OTHER PROJECT-ASSOCIATED DISCHARGE, TURBIDITY EXCEEDANCE".

When reporting a turbidity exceedance, the following information shall also be included:

a. the Project Name;

b. the Permit Number;

c. location and level (NTUs above background) of the turbidity exceedance;

d. the time and date that the exceedance occurred; and

e. the time and date that construction ceased.

Prior to re-commencing the construction, a report shall be emailed to the Department's JCP Compliance Officer with the same information that was included in the "Exceedance Report", plus the following information:

a. turbidity monitoring data collected during the shutdown documenting the decline in turbidity levels and achievement of acceptable levels;

b. corrective measures that were taken; and

c. cause of the exceedance.

32. **Turbidity Reports:** All turbidity monitoring data shall be submitted within one week of analysis. The data shall be presented in tabular format, indicating the measured turbidity levels at the compliance sites for each depth, the corresponding background levels at each depth and the number of NTUs over background at each depth. Any exceedances of the turbidity standard (29 NTUs above background, or 7.5 NTUs above background within the OFW) shall be highlighted in the table. In addition to the raw and processed data, the reports shall also contain the following information:

a. time of day samples were taken;

b. dates of sampling and analysis;

c. GPS location of sample;

d. depth of water body;

e. depth of each sample;

f. antecedent weather conditions, including wind direction and velocity;

g. tidal stage and direction of flow;

h. water temperature;

i. a map, overlaid on an aerial photograph, indicating the sampling locations, dredging and discharge locations, and direction of flow. A sample map shall reviewed and approved by the Department prior to construction;

j. a statement describing the methods used in collection, handling, storage and analysis of the samples;

k. a statement by the individual responsible for implementation of the sampling program concerning the authenticity, precision, limits of detection, calibration of the meter, accuracy of the data and precision of the GPS measurements;

l. When samples cannot be collected, an explanation shall be included in the report. If unable to collect samples due to severe weather conditions, include a copy of a current report from a reliable, independent source, such as an online weather service.

Monitoring reports shall be submitted by email to the Division in Tallahassee (attn: JCP Compliance Officer). In the subject line of the reports, include the Project Name, Permit Number and the dates of the monitoring interval. Failure to submit reports in a timely manner constitutes grounds for revocation of the permit. When submitting this information to the Department's JCP Compliance Officer, on the cover page to the submittal and at the top of each page, please state: "This information is provided in partial fulfillment of the monitoring requirements in Permit No. 0298107-004-JC, for the Longboat Pass Navigational Maintenance Dredging and Beach Nourishment Project."

33. If the Permittee is unable to complete two maintenance events within the 15-year life of the permit, the Permittee may request (prior to the expiration date of the permit), and the Department shall grant, an extension of the permit expiration date in order to allow completion of the second maintenance event. The extension would be documented through an administrative modification.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

Martin K Seeling

Martin Seeling, Program Administrator
Beaches, Inlets and Ports Program

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to Section 120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Megan Stroh 03/19/2015
Deputy Clerk Date

Prepared by Chiu Cheng.

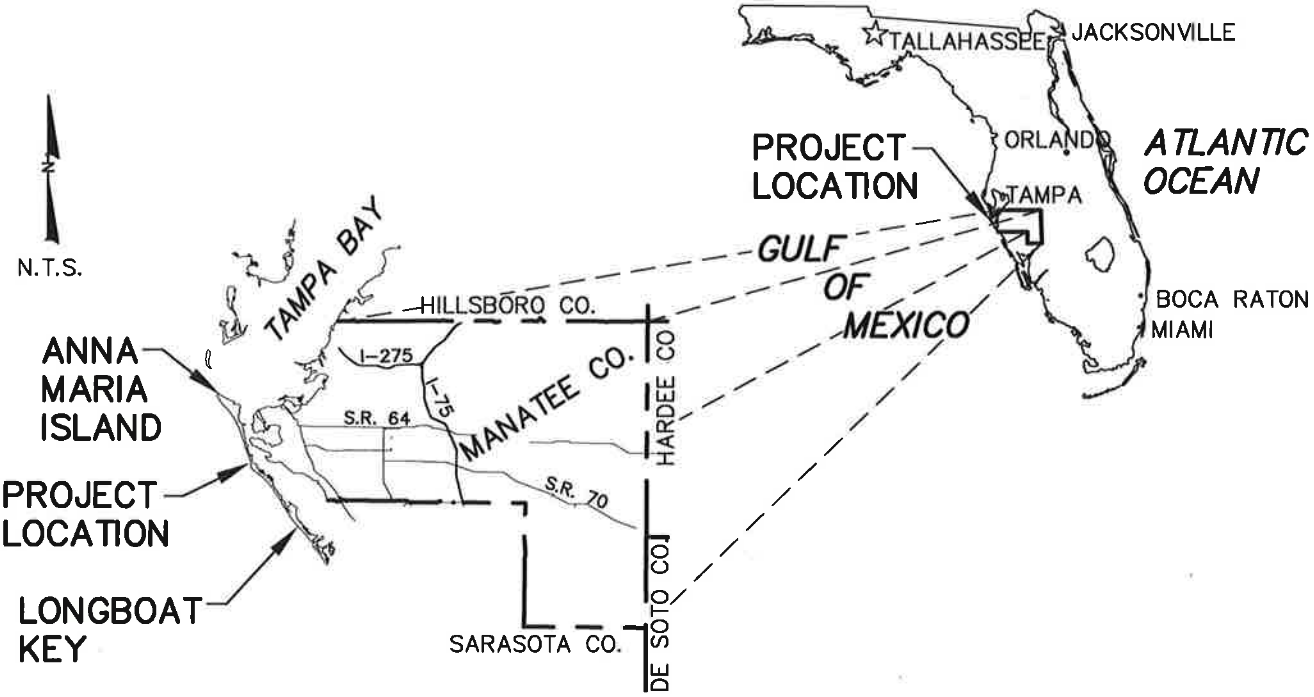
Attachments: Approved Permit Drawings (12 pages)
FWC Regional Biologist Contact Information
QA/QC Plan (dated October 3, 2014)

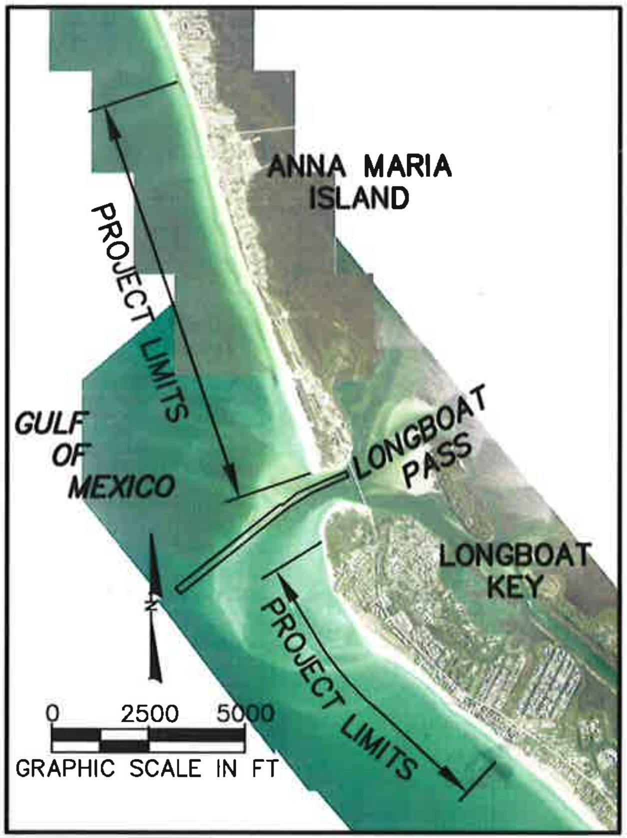
APPENDIX D1

PERMIT DRAWINGS

Permit # 0298107-004-JC

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA





SHEET INDEX

NO.	TITLE
1	COVER SHEET
2–7	PLAN VIEWS
8–9	FILL PROFILES
10	LONGBOAT PASS DREDGE AREA PLAN VIEW
11	CROSS SECTIONS A–A' AND B–B'
12	CROSS SECTIONS C–C' AND D–D'

MICHELLE REES PFEIFFER
LICENSE
No 76209

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

Michelle Rees Pfeiffer
MICHELLE REES PFEIFFER P.E. NO. 76209

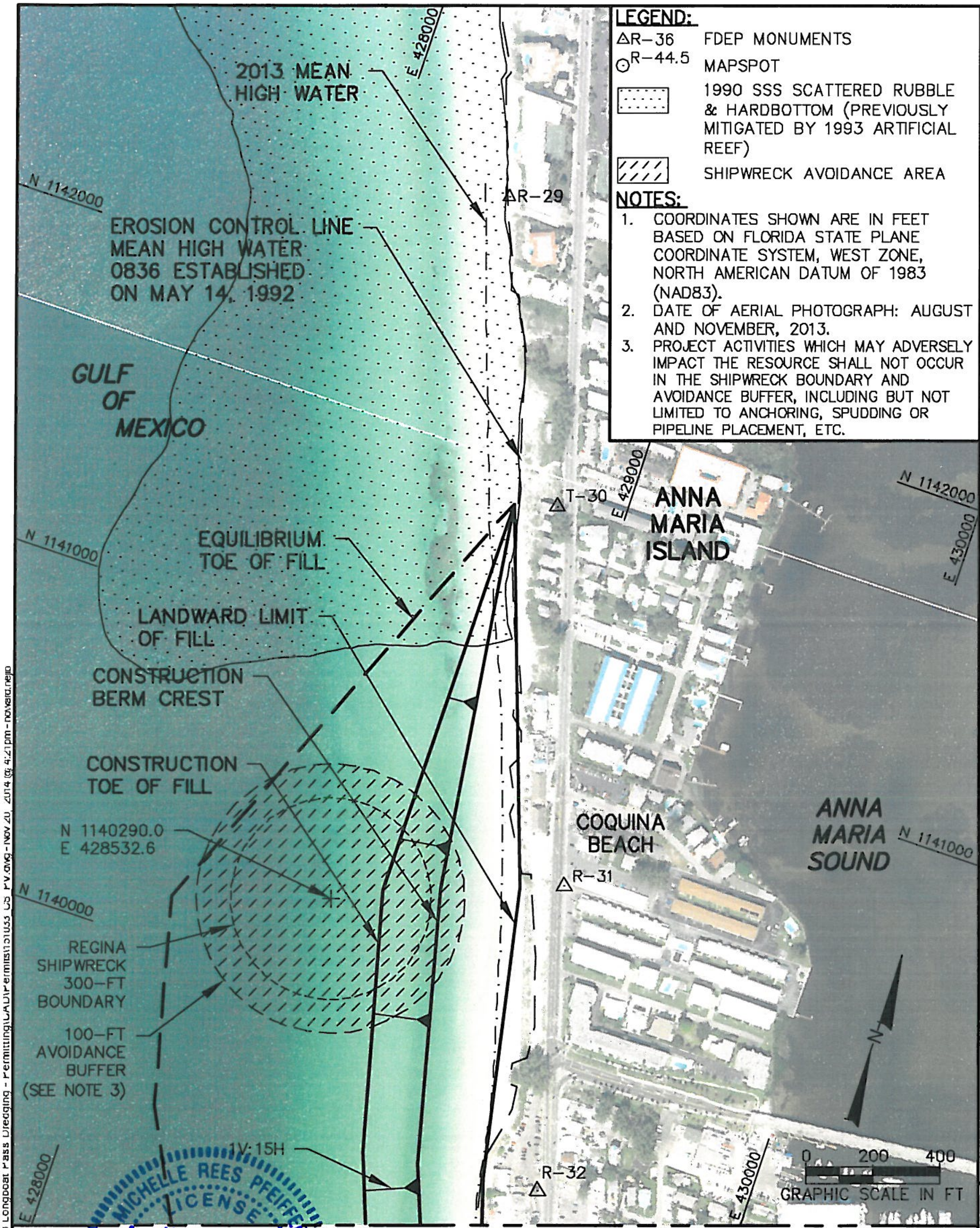
10/6/14
DATE

REVISIONS		
DATE	BY	DESCRIPTION

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
COVER SHEET

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL #4028
C.O.A. LA #2351
www.CBI.com

DATE: 2/25/14
BY: GK
COMM NO.: 151033
SHEET: 1



LEGEND:

△R-36	FDEP MONUMENTS
⊙R-44.5	MAPSPOT
⠿	1990 SSS SCATTERED RUBBLE & HARDBOTTOM (PREVIOUSLY MITIGATED BY 1993 ARTIFICIAL REEF)
▨	SHIPWRECK AVOIDANCE AREA

NOTES:

1. COORDINATES SHOWN ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
2. DATE OF AERIAL PHOTOGRAPH: AUGUST AND NOVEMBER, 2013.
3. PROJECT ACTIVITIES WHICH MAY ADVERSELY IMPACT THE RESOURCE SHALL NOT OCCUR IN THE SHIPWRECK BOUNDARY AND AVOIDANCE BUFFER, INCLUDING BUT NOT LIMITED TO ANCHORING, SPUDDING OR PIPELINE PLACEMENT, ETC.

MATCHLINE SEE SHEET 3

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
PLAN VIEW

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL. #4028
C.O.A. LA. #2531
www.CBI.com

DATE: 2/25/14
BY: GK
COMM NO.: 151033
SHEET: 2

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

No 76209

Michelle Rees Pfeiffer

MICHELLE REES PFEIFFER P.E. NO. 76209

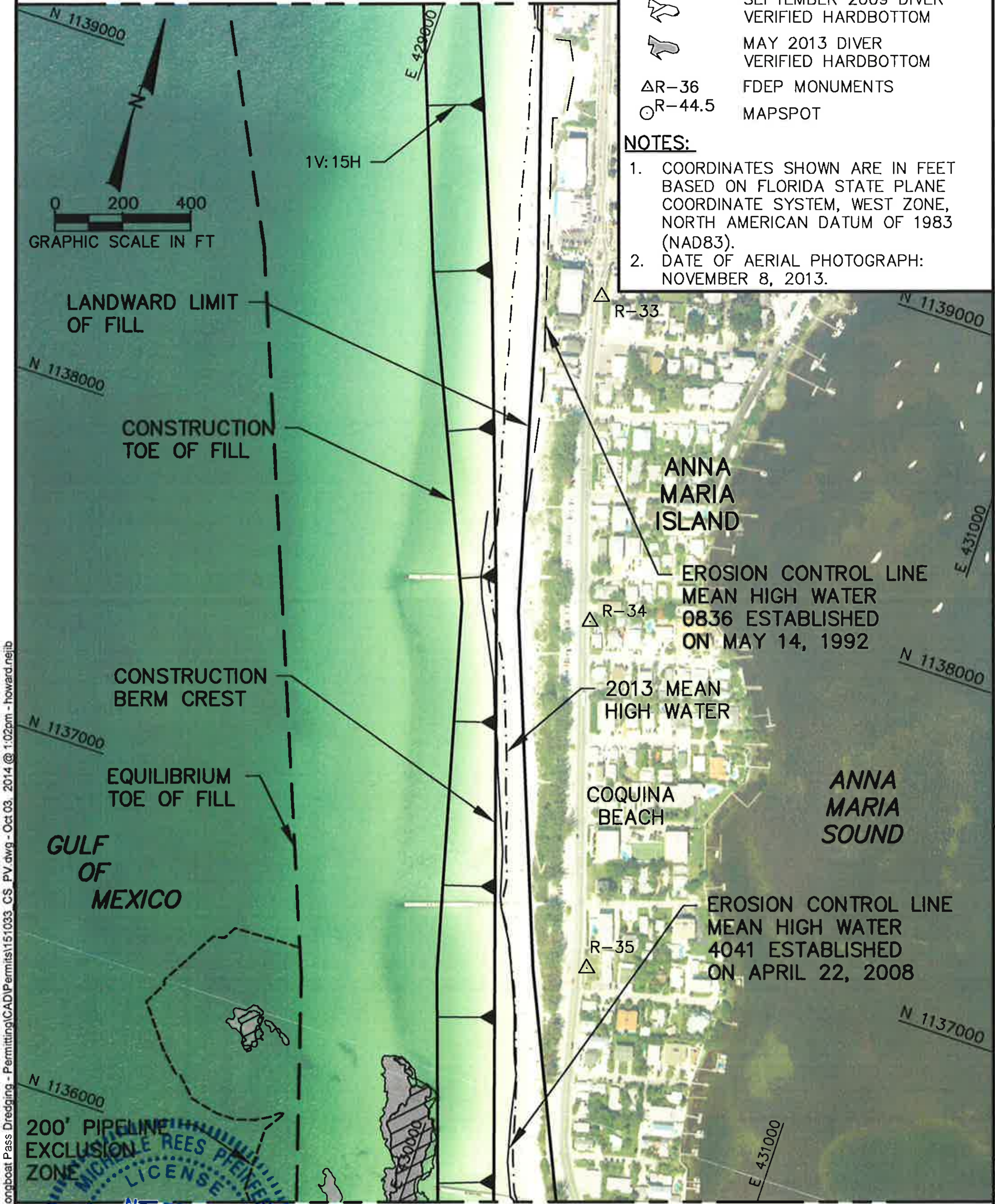
11/20/14

DATE

REVISIONS		
DATE	BY	DESCRIPTION

P:\Manatee\151033 - WA 8 Longboat Pass Dredging - Permitting\CAD\Permits\151033 CS PV.dwg - Nov 20, 2014 @ 4:27pm - howard.nelljo

MATCHLINE SEE SHEET 2



LEGEND:

▱	SEPTEMBER 2009 DIVER VERIFIED HARDBOTTOM
▨	MAY 2013 DIVER VERIFIED HARDBOTTOM
△R-36	FDEP MONUMENTS
⊙R-44.5	MAPSPOT

NOTES:

1. COORDINATES SHOWN ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
2. DATE OF AERIAL PHOTOGRAPH: NOVEMBER 8, 2013.

MATCHLINE SEE SHEET 4

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

MICHELLE REES PFEIFFER
LICENSE No 76209

Michelle Rees Pfeiffer
MICHELLE REES PFEIFFER P.E. NO. 76209

10/6/14
DATE

REVISIONS

DATE	BY	DESCRIPTION

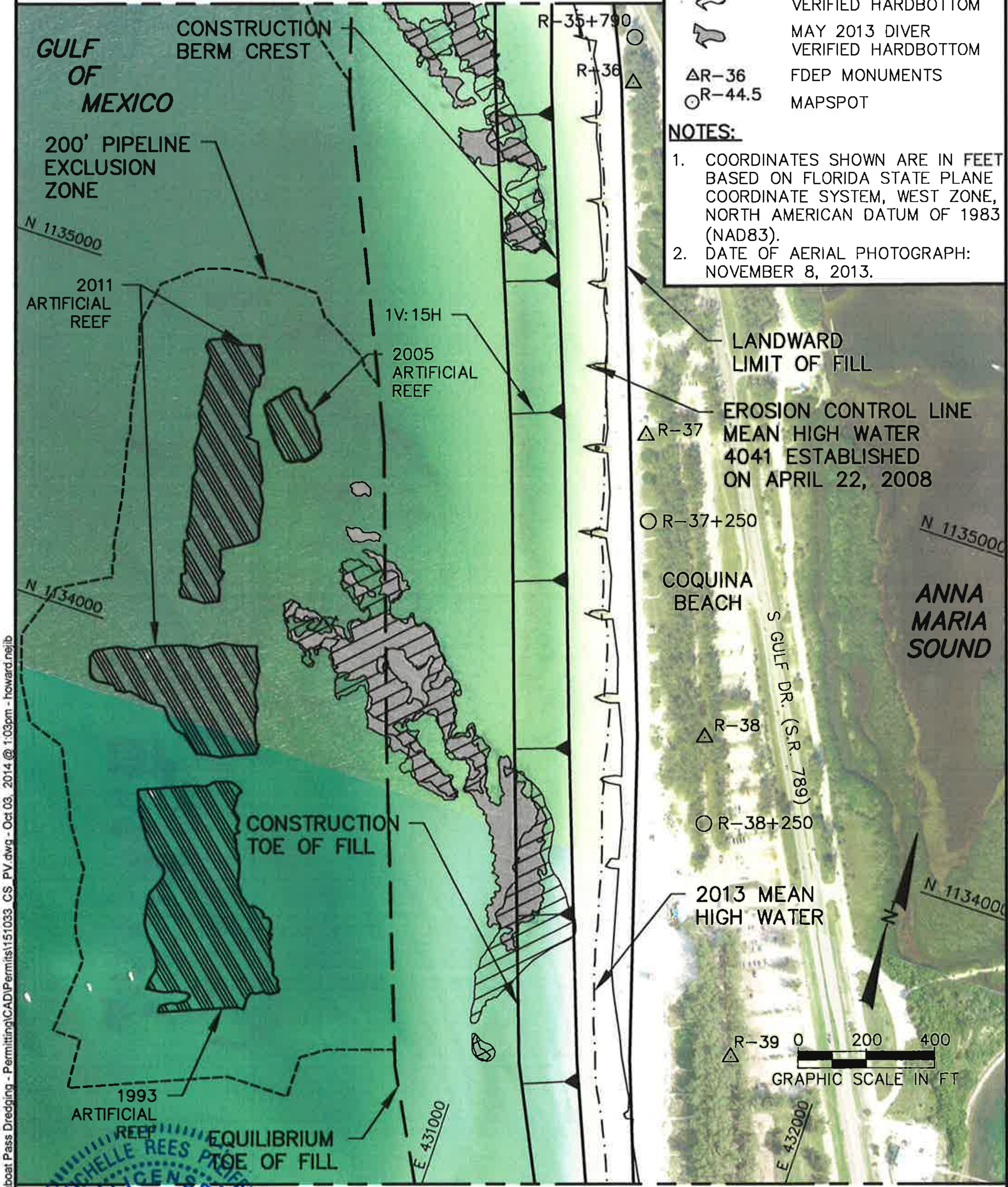
LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
PLAN VIEW

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL #4028
C.O.A. LA #2531
www.CBI.com

DATE: 2/25/14
BY: GK
COMM NO.: 151033
SHEET: 3

P:\Manatee\151033 - WA 8 Longboat Pass Dredging - Permitting\CAD\Permits\151033_CS_PV.dwg - Oct 03, 2014 @ 1:02pm - howard.neib

MATCHLINE SEE SHEET 3



LEGEND:

	SEPTEMBER 2009 DIVER VERIFIED HARDBOTTOM
	MAY 2013 DIVER VERIFIED HARDBOTTOM
△R-36	FDEP MONUMENTS
○R-44.5	MAPSPOT

NOTES:

1. COORDINATES SHOWN ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
2. DATE OF AERIAL PHOTOGRAPH: NOVEMBER 8, 2013.

MATCHLINE SEE SHEET 5

No 76209

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

Michelle Rees Pfeiffer

MICHELLE REES PFEIFFER P.E. NO. 76209

10/6/14

DATE

REVISIONS

DATE	BY	DESCRIPTION

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
PLAN VIEW

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL #4028
C.O.A. LA #2551
www.CBI.com

DATE:
2/25/14
BY:
GK
COMM NO.:
151033
SHEET:
4

P:\Manatee\151033 - WA 8 Longboat Pass Dredging - Permitting\CAD\Permits\151033_CS_PV.dwg - Oct 03, 2014 @ 1:03pm - howard.neib

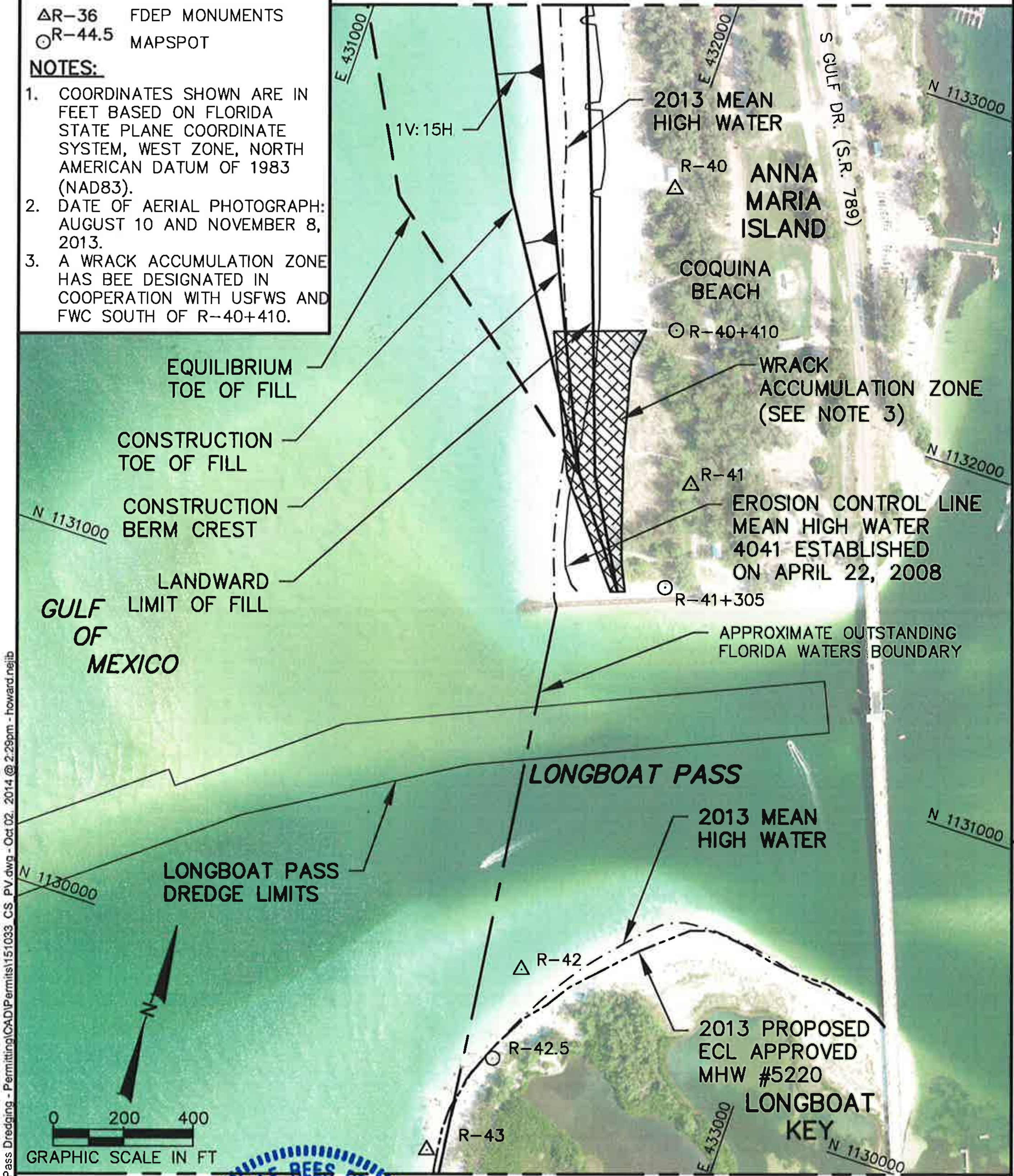
LEGEND:

△R–36	FDEP MONUMENTS
⊙R–44.5	MAPSPOT

NOTES:

1. COORDINATES SHOWN ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
2. DATE OF AERIAL PHOTOGRAPH: AUGUST 10 AND NOVEMBER 8, 2013.
3. A WRACK ACCUMULATION ZONE HAS BEE DESIGNATED IN COOPERATION WITH USFWS AND FWC SOUTH OF R–40+410.

MATCHLINE SEE SHEET 4



MATCHLINE SEE SHEET 6

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

Michelle Rees Pfeiffer

MICHELLE REES PFEIFFER P.E. NO. 76209

MICHELLE REES PFEIFFER
No 76209

10/6/14

DATE

REVISIONS		
DATE	BY	DESCRIPTION

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
PLAN VIEW

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL #4028
C.O.A. LA. #2531
www.CBI.com

DATE:
2/25/14

BY:
GK

COMM NO.:
151033

SHEET:
5

P:\Manatee\151033 - WA 8 Longboat Pass Dredging - Permitting\CAD\Permits\151033_CS_PV.dwg - Oct 02, 2014 @ 2:29pm - howard.neijb

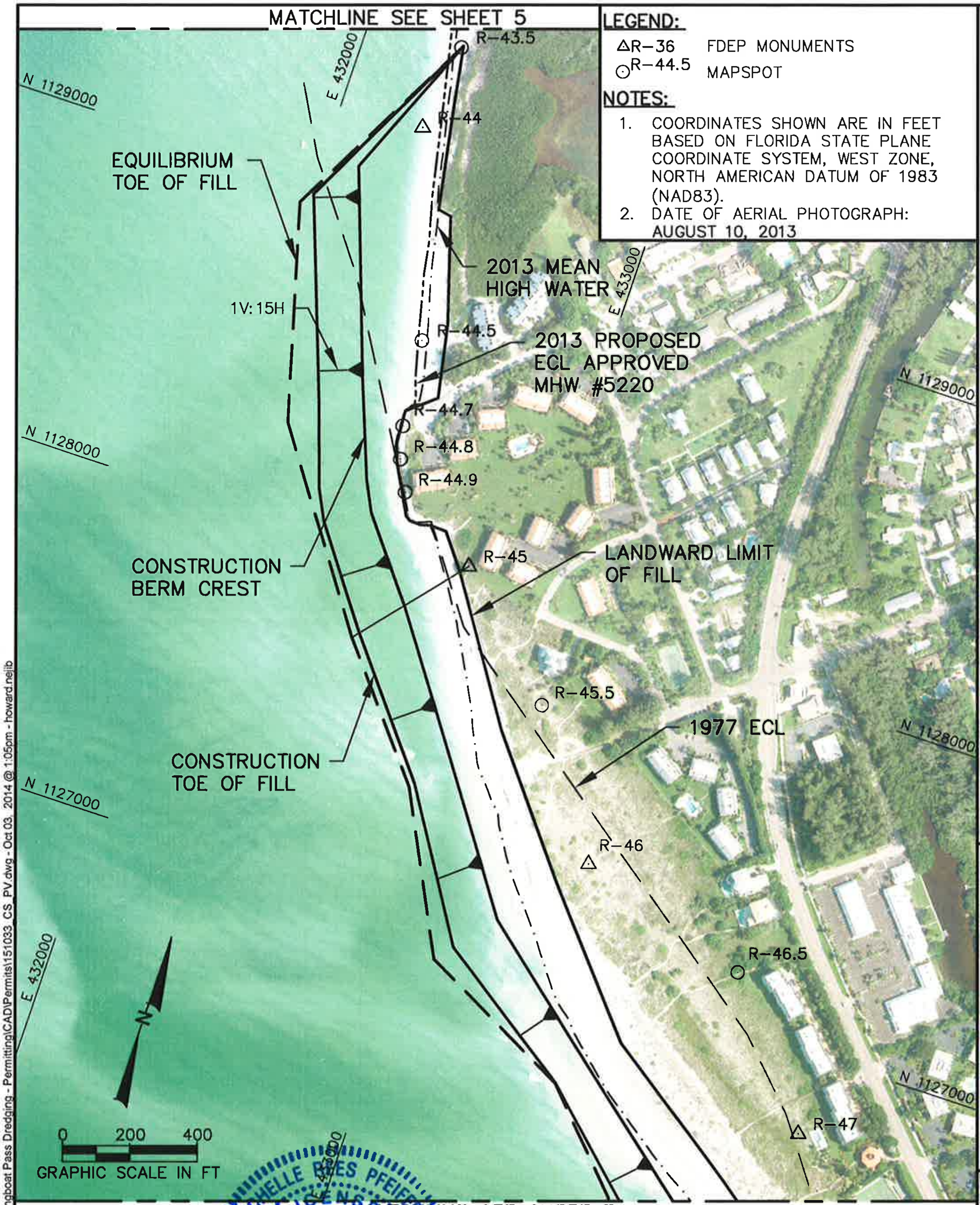
MATCHLINE SEE SHEET 5

LEGEND:

△R–36	FDEP MONUMENTS
○R–44.5	MAPSPOT

NOTES:

1. COORDINATES SHOWN ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
2. DATE OF AERIAL PHOTOGRAPH: AUGUST 10, 2013



MATCHLINE SEE SHEET 7

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

Michelle Rees Pfeiffer

MICHELLE REES PFEIFFER P.E. NO. 76209

10/6/14

DATE

MICHELLE REES PFEIFFER No 76209

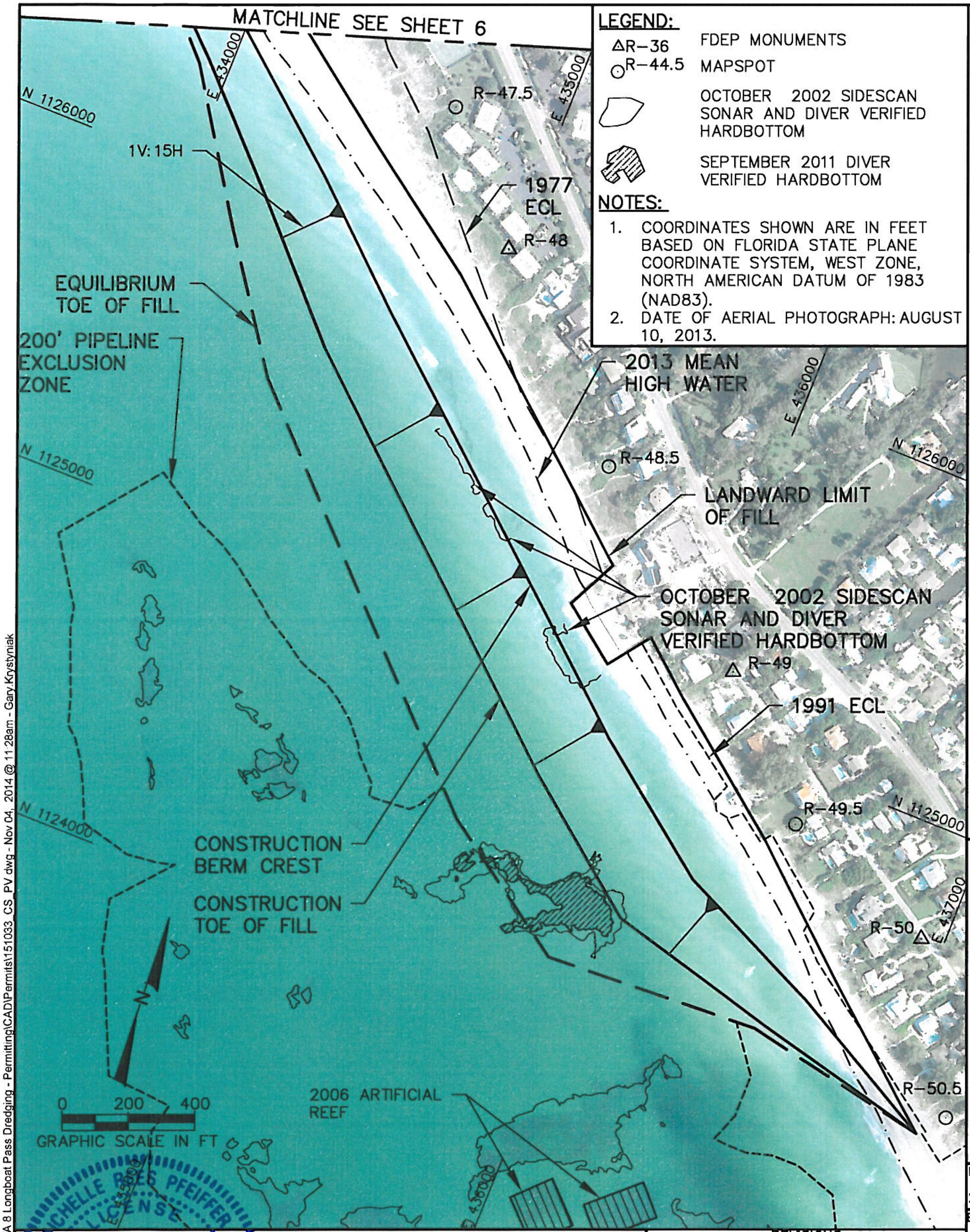
REVISIONS		
DATE	BY	DESCRIPTION

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
PLAN VIEW

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL #4028
C.O.A. LA #2531
www.CBI.com

DATE: 2/25/14
BY: GK
COMM NO.: 151033
SHEET: 6

P:\Manatee\151033 - WA 8 Longboat Pass Dredging - Permitting\CAD\Permits\151033_CS_PV.dwg - Oct 03, 2014 @ 1:05pm - howard.neiib



LEGEND:

△R-36	FDEP MONUMENTS
○R-44.5	MAPSPOT
▢	OCTOBER 2002 SIDESCAN SONAR AND DIVER VERIFIED HARDBOTTOM
▨	SEPTEMBER 2011 DIVER VERIFIED HARDBOTTOM

NOTES:

1. COORDINATES SHOWN ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
2. DATE OF AERIAL PHOTOGRAPH: AUGUST 10, 2013.

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
PLAN VIEW

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL #4028
C.O.A. LA #2531
www.CBI.com

DATE: 2/25/14
BY: GK
COMM NO.: 151033
SHEET: 7

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

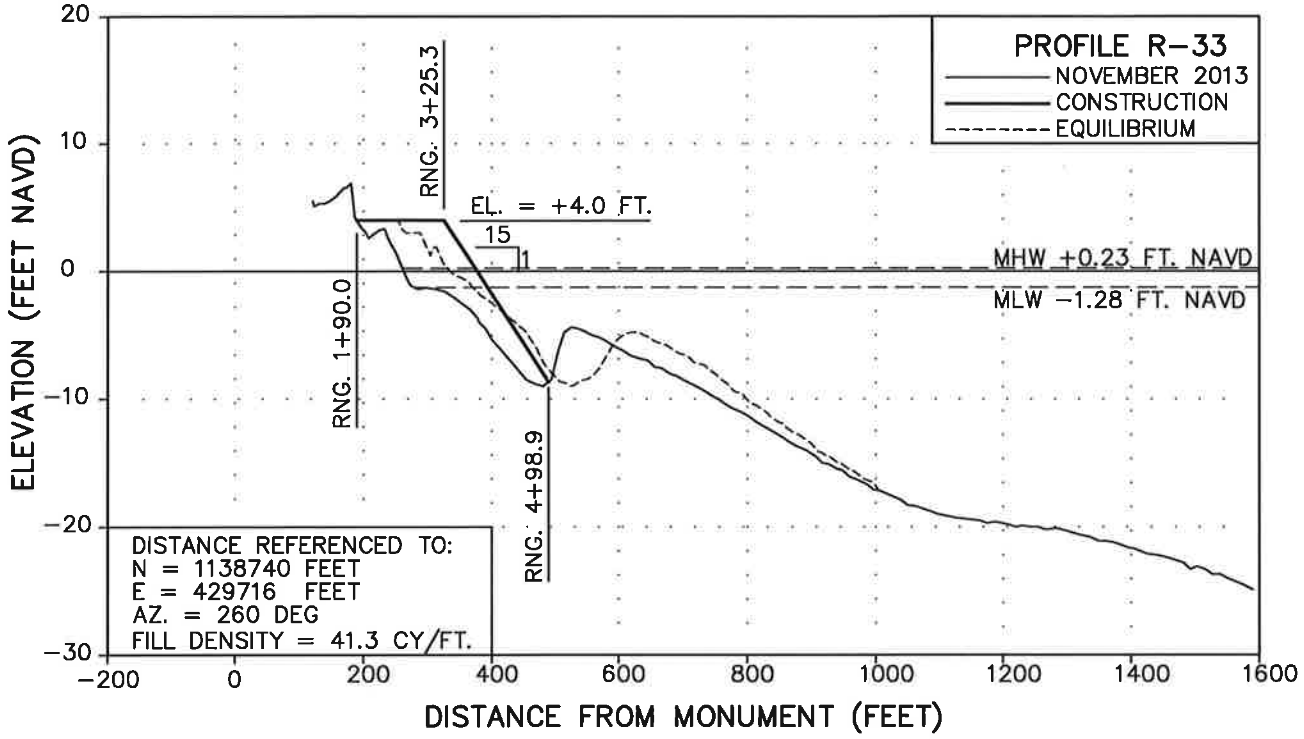
Michelle Rees Pfeiffer
MICHELLE REES PFEIFFER P.E. NO. 76209

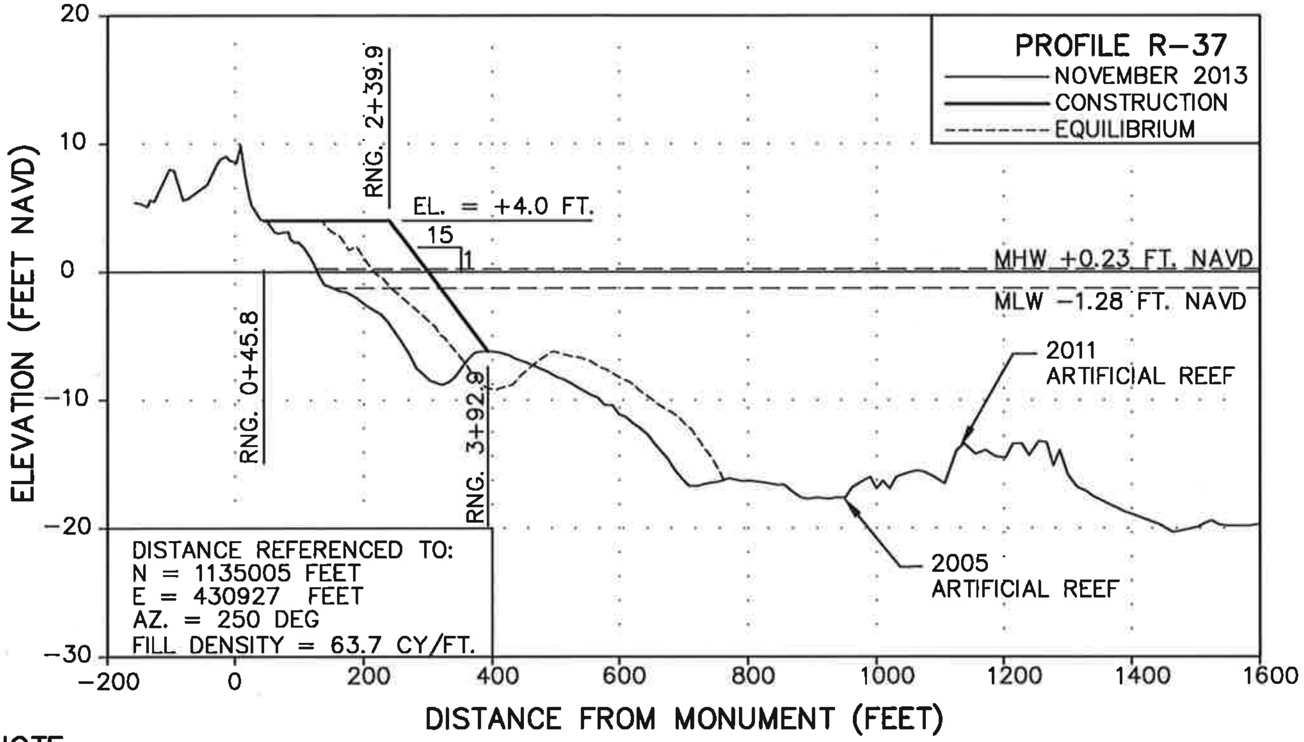
11/4/14
DATE

REVISIONS

DATE	BY	DESCRIPTION

P:\Manatee\151033 - WA 8 Longboat Pass Dredging - Permitting\CAD\Permits\151033_CS_PV.dwg - Nov 04, 2014 @ 11:28am - Gary.Krystyniak





NOTE:

1. MEAN HIGH WATER (MHW) AND MEAN LOW WATER (MLW) ELEVATIONS PUBLISHED IN NAVD 88, FROM LAND BOUNDARY INFORMATION SYSTEM (LABINS) BASED ON EPOCH 1983–2001 TIDE INTERPOLATION POINT IDENTIFICATION NUMBER 200904.
2. THE FILL DENSITIES LISTED HEREIN ARE BASED ON THE CONDITION OF THE BEACH AT THE TIME OF THE SURVEY SHOWN ON THE CROSS-SECTIONS.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

Michelle Rees Pfeiffer

10/6/14

MICHELLE REES PFEIFFER P.E. NO. 76209 DATE

No 76209

REVISIONS

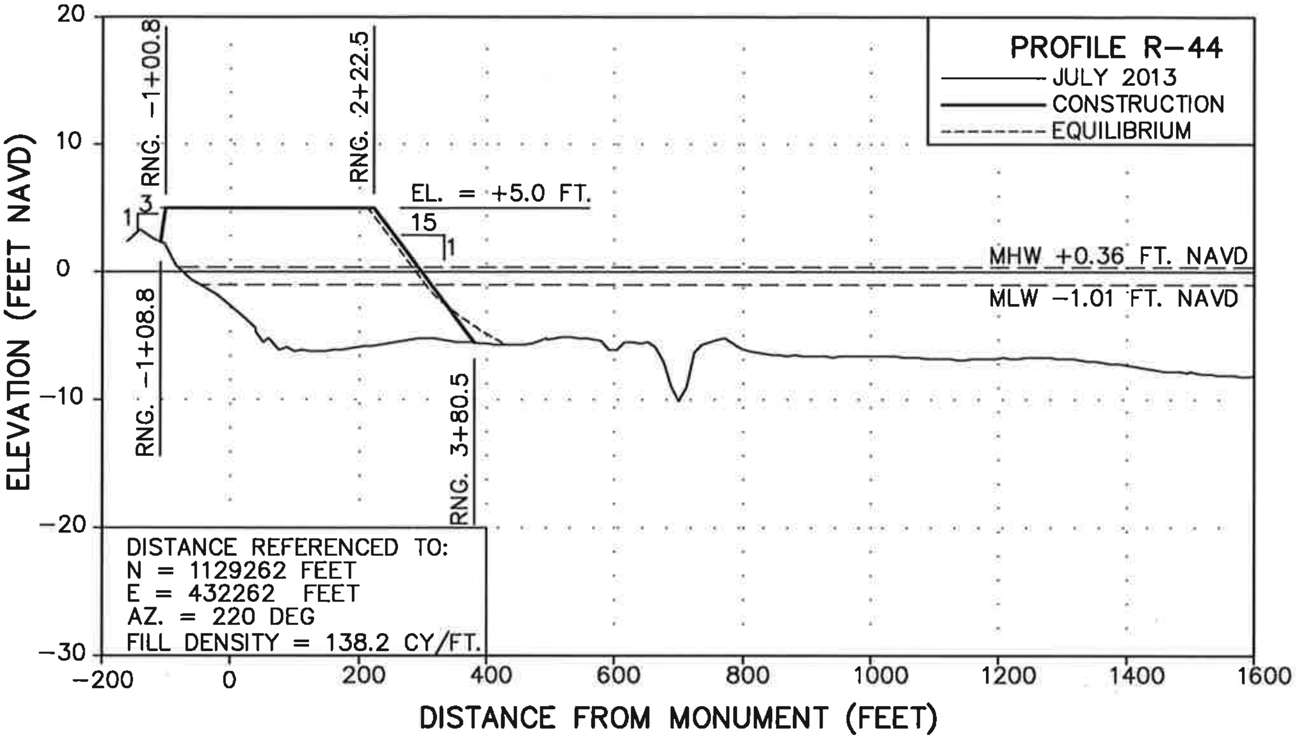
DATE	BY	DESCRIPTION
9/17/14	HN	REVISION PER RAI#1

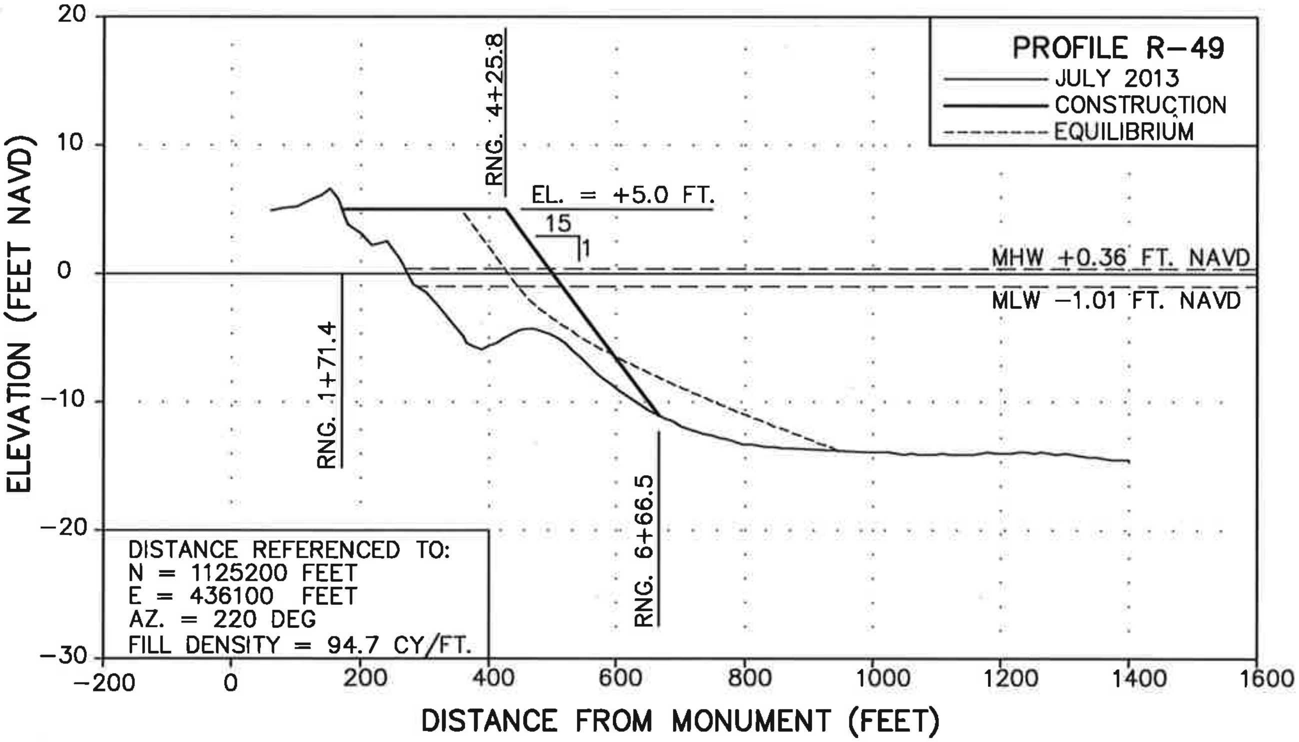
LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
COVER SHEET

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL. #4028
C.O.A. LA. #2831
www.CPE.com

DATE: 2/25/14
BY: GK
COMM NO.: 151033
SHEET: 8

P:\Manatee\151033 - WA 8 Longboat Pass Dredging - Permitting\CAD\Permits\151033_XS.dwg - Oct 03, 2014 @ 1:11pm - howard.nejib





NOTE:

1. MEAN HIGH WATER (MHW) ELEVATION WAS PROVIDED BY W. LAMAR EVERS, P.S.M. ON FEBRUARY 19,2013 FROM THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION.
2. THE FILL DENSITIES LISTED HEREIN ARE BASED ON THE CONDITION OF THE BEACH AT THE TIME OF THE SURVEY SHOWN ON THE CROSS-SECTIONS.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

Michelle Rees Pfeiffer
MICHELLE REES PFEIFFER P.E. NO. 76209

No 76209

10/6/14
DATE

REVISIONS		
DATE	BY	DESCRIPTION
9/17/14	HN	REVISION PER RAI#1

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
COVER SHEET

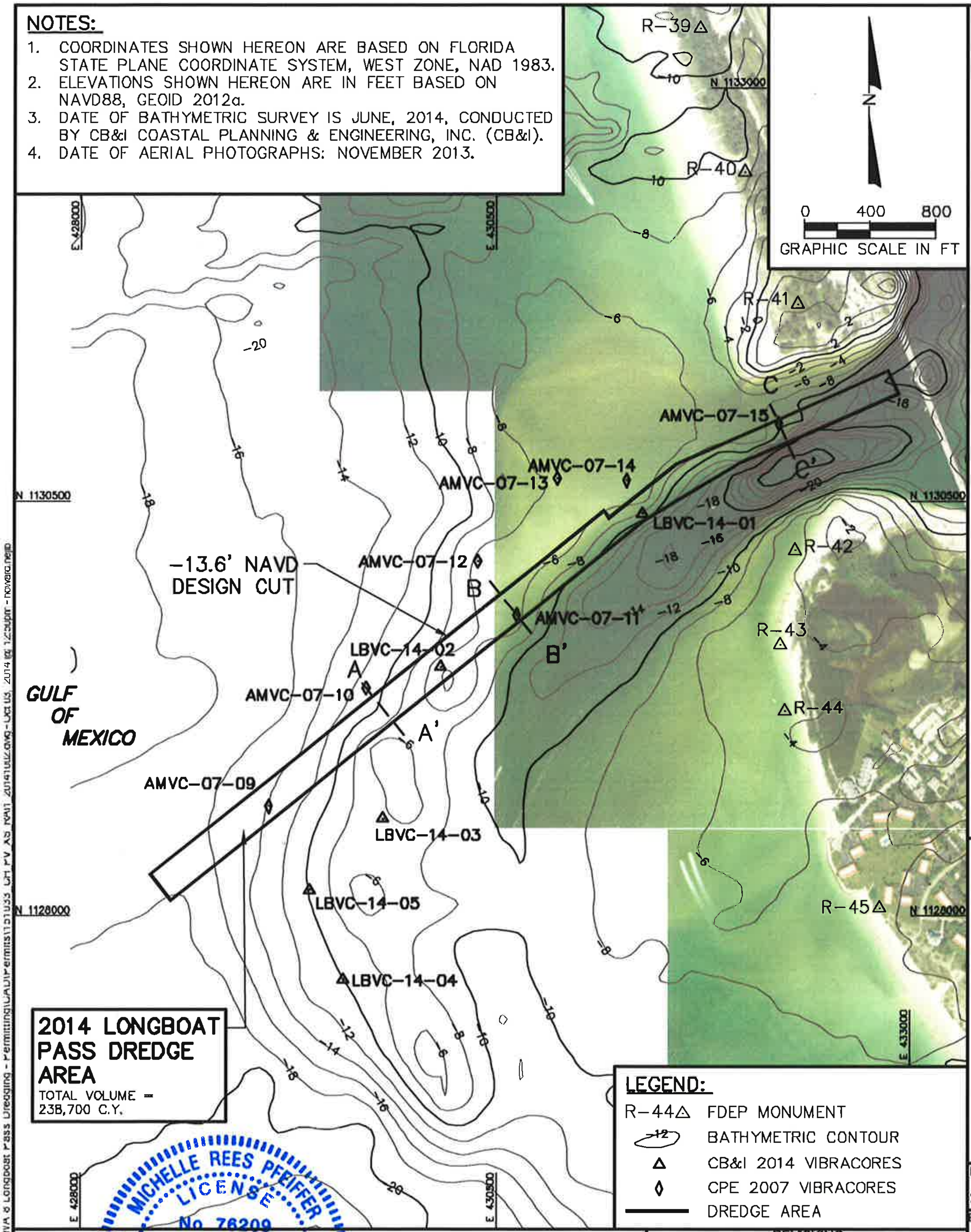
COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL. #4928
C.O.A. LA. #2531
www.CBI.com

DATE: 2/25/14
BY: GK
COMM NO.: 151033
SHEET: 9

P:\Manatee\151033 - WA 8 Longboat Pass Dredging - Permitting\CAD\Permits\151033_XS.dwg - Oct 06, 2014 @ 11:06am - howard.nejib

NOTES:

1. COORDINATES SHOWN HEREON ARE BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NAD 1983.
2. ELEVATIONS SHOWN HEREON ARE IN FEET BASED ON NAVD88, GEOID 2012a.
3. DATE OF BATHYMETRIC SURVEY IS JUNE, 2014, CONDUCTED BY CB&I COASTAL PLANNING & ENGINEERING, INC. (CB&I).
4. DATE OF AERIAL PHOTOGRAPHS: NOVEMBER 2013.



2014 LONGBOAT PASS DREDGE AREA
TOTAL VOLUME = 238,700 C.Y.

LEGEND:

R-44△	FDEP MONUMENT
-12	BATHYMETRIC CONTOUR
△	CB&I 2014 VIBRACORES
◊	CPE 2007 VIBRACORES
▬	DREDGE AREA

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
2014 LONGBOAT PASS DREDGE AREA PLAN VIEW

COASTAL PLANNING & ENGINEERING, INC.
A CB&I COMPANY
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
www.CBI.com
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL #4028

DATE: 2/25/14
BY: KM
COMM NO.: 151033
SHEET: 10

REVISIONS

DATE	BY	DESCRIPTION
080514	KM	UPDATE BA PLAN/XSECTS RAI#1
100314	HN	UPDATE BA PLAN /XSECTS

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

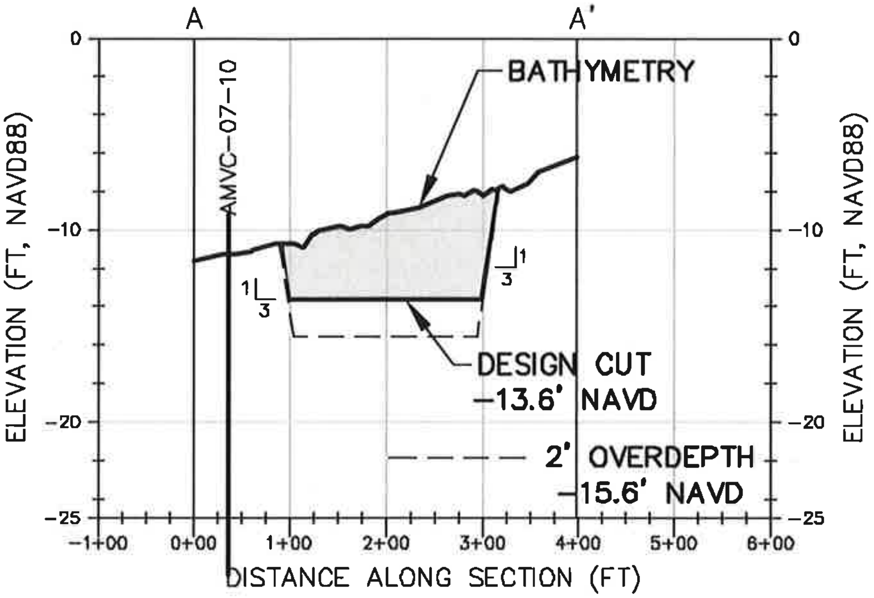
Michelle Rees Pfeiffer
MICHELLE REES PFEIFFER, P.E. NO. 76209

10/6/14
DATE

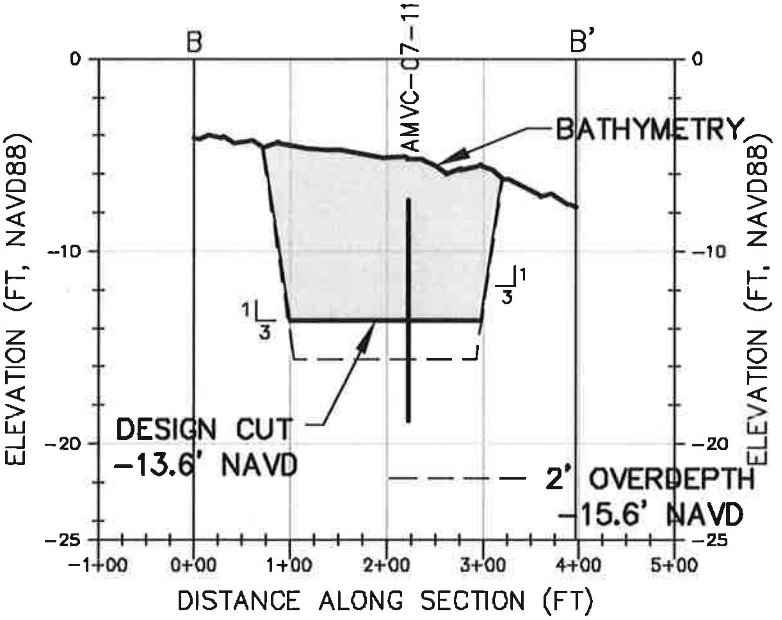
No. 76209

P:\Manatee\151033 - WA 8 Longboat Pass Dredging - Permitting\CAD\Permits\151033_CH_PV_XS_RAI1_20141002.dwg - Oct 03, 2014 @ 12:50pm - howard.nelp

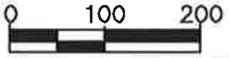
CROSS SECTION A–A'



CROSS SECTION B–B'

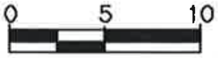


HORIZONTAL SCALE



GRAPHIC SCALE IN FT

VERTICAL SCALE



GRAPHIC SCALE IN FT

NOTES:

1. SEE SHEET 10 FOR LOCATION OF CROSS SECTION LINE.
2. ELEVATIONS SHOWN HEREON ARE IN FEET BASED ON NAVD88, GEOID 2012a.
3. DATE OF BATHYMETRIC SURVEY IS JUNE, 2014, CONDUCTED BY CB&I COASTAL PLANNING & ENGINEERING, INC. (CB&I).
4. CORES MAY NOT FALL DIRECTLY ON CROSS SECTION LINE, BUT ARE LOCATED SUFFICIENTLY CLOSE TO REPRESENT SIMILAR MATERIAL.
5. WIDTH OF LAYERS IS REPRESENTATIVE ONLY. MATERIAL MAY VARY.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

MICHELLE REES PFEIFFER
No 76209
STATE OF FLORIDA
PROFESSIONAL ENGINEER

Michelle Rees Pfeiffer
MICHELLE REES PFEIFFER P.E. NO. 76209

10/10/14
DATE

REVISIONS

DATE	BY	DESCRIPTION
080514	KM	UPDATE BA PLAN/XSECTS RAI#1
100314	HN	UPDATE BA PLAN/XSECTS

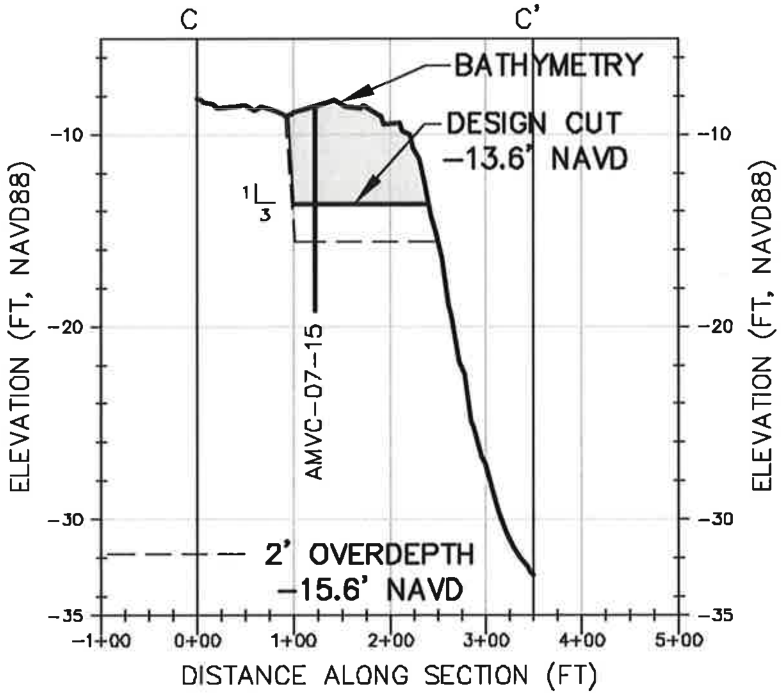
LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
2014 LONGBOAT PASS DREDGE AREA CROSS SECTIONS A-A' AND B-B'

COASTAL PLANNING & ENGINEERING, INC.
A CB&I COMPANY
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
www.CBI.com
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL 8407

DATE: 2/25/14
BY: KM
COMM NO.: 151033
SHEET: 11

P:\Manatee\151033 - WA 8 Longboat Pass Dredging - Permitting\CAD\Permits\151033 CH PV XS RAI1 20141022.dwg - Oct 03, 2014 @ 1:11pm - hoveld.hejo

CROSS SECTION C–C'



HORIZONTAL SCALE

0 100 200

GRAPHIC SCALE IN FT

VERTICAL SCALE

0 5 10

GRAPHIC SCALE IN FT

NOTES:

1. SEE SHEET 10 FOR LOCATION OF CROSS SECTION LINE.
2. ELEVATIONS SHOWN HEREON ARE IN FEET BASED ON NAVD88, GEOID 2012a.
3. DATE OF BATHYMETRIC SURVEY IS JUNE, 2014, CONDUCTED BY CB&I COASTAL PLANNING & ENGINEERING, INC. (CB&I).
4. CORES MAY NOT FALL DIRECTLY ON CROSS SECTION LINE, BUT ARE LOCATED SUFFICIENTLY CLOSE TO REPRESENT SIMILAR MATERIAL.
5. WIDTH OF LAYERS IS REPRESENTATIVE ONLY. MATERIAL MAY VARY.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

No 76209

Michelle Rees Pfeiffer

MICHELLE REES PFEIFFER P.E. NO. 76209

10/6/14

DATE

REVISIONS

DATE	BY	DESCRIPTION
080514	KM	UPDATE BA PLAN/XSECTS RAI#1
100314	HN	UPDATE BA PLAN/XSECTS

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
2014 LONGBOAT PASS DREDGE AREA CROSS SECTION C-C'

COASTAL PLANNING & ENGINEERING, INC.
A CB&I COMPANY
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
www.CBI.com
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL. #8275

DATE: 2/25/14

BY: KM

COMM NO.: 151033

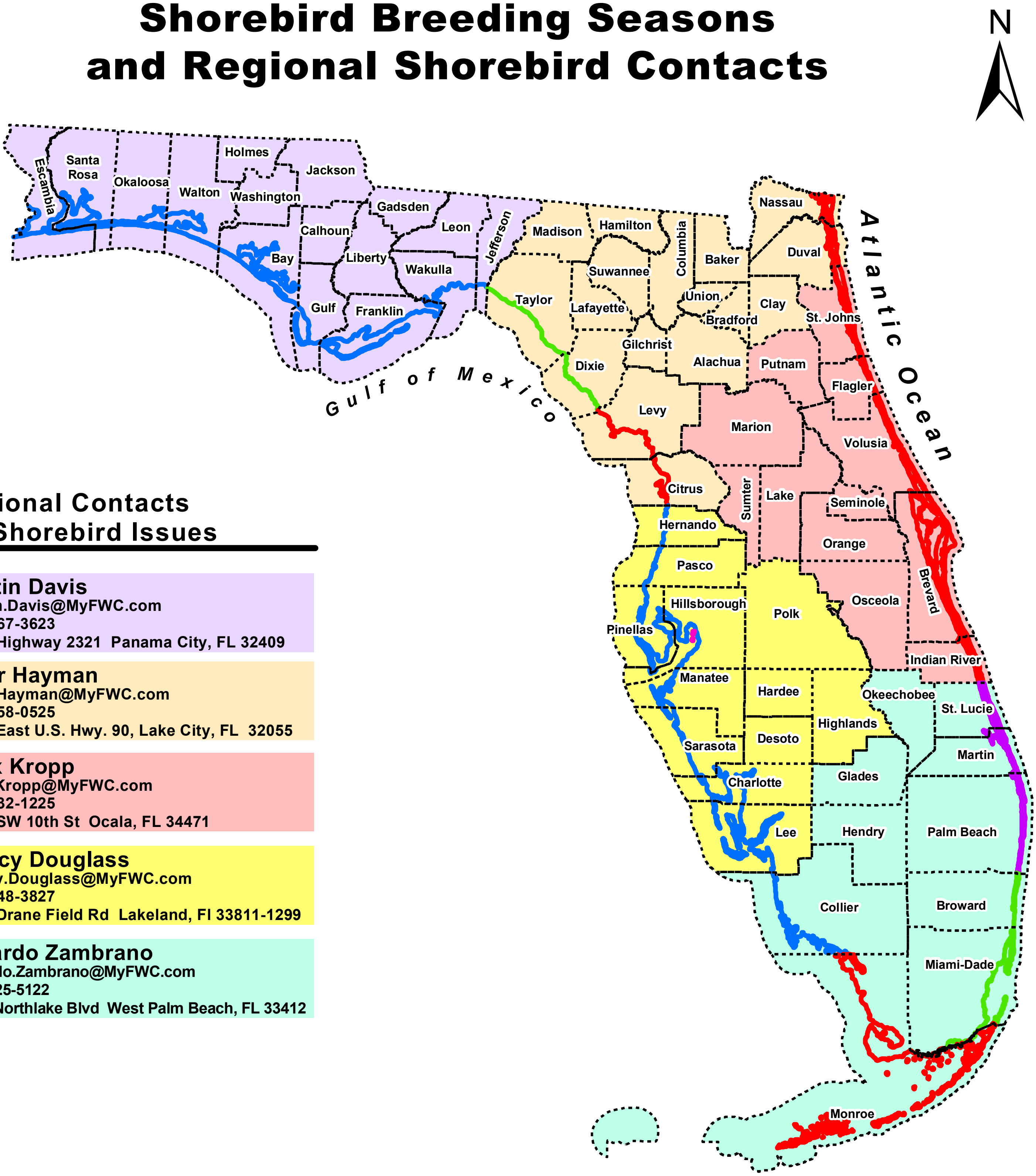
SHEET: 12

P:\Manatee\151033 - WA 8 Longboat Pass Dredging - Permitting\CAD\Permits\151033 CH PV XS RAI1 20141002.dwg - Oct 03, 2014 @ 1:10pm - hoverd.heijo

APPENDIX D2

FWC REGIONAL BIOLOGIST CONTACT INFORMATION

Shorebird Breeding Seasons and Regional Shorebird Contacts



Regional Contacts for Shorebird Issues

Justin Davis
Justin.Davis@MyFWC.com
850-767-3623
3911 Highway 2321 Panama City, FL 32409

Blair Hayman
Blair.Hayman@MyFWC.com
386-758-0525
3377 East U.S. Hwy. 90, Lake City, FL 32055

Alex Kropp
Alex.Kropp@MyFWC.com
352-732-1225
1239 SW 10th St Ocala, FL 34471

Nancy Douglass
Nancy.Douglass@MyFWC.com
863-648-3827
3900 Drane Field Rd Lakeland, Fl 33811-1299

Ricardo Zambrano
Ricardo.Zambrano@MyFWC.com
561-625-5122
8535 Northlake Blvd West Palm Beach, FL 33412

Shorebird Breeding Season

- February 15 - September 1
- Spoil Islands Hillsborough Bay March 1 - September 1
- March 15 - September 1
- April 1 - September 1
- Spoil Islands & Estuaries March 15 - September 1
Coastal Beaches April 1 - September 1

Florida Fish and Wildlife
Conservation Commission
MyFWC.com
620 South Meridian Street
Tallahassee, Florida 32399-1600

APPENDIX E

U.S. ARMY CORPS OF ENGINEERS PERMIT NO. SAJ-2014-00606 (SP-CSH)

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
10117 PRINCESS PALM AVENUE, SUITE 120
TAMPA, FLORIDA 33610

REPLY TO
ATTENTION OF

March 21, 2016

Regulatory Division
West Permits Branch
Tampa Section
SAJ-2014-00606 (SP-CSH)

Manatee County
c/o Charlie Hunsicker
5502 33rd Avenue Drive West
Bradenton, Florida 34209

Town of Longboat Key
c/o Juan Florensa
600 General Harris Street
Longboat Key, Florida 34228

Dear Mr. Hunsicker & Mr. Florensa:

The U.S. Army Corps of Engineers (Corps) is pleased to enclose the Department of the Army permit, which should be available at the construction site. Work may begin immediately but the Corps must be notified of:

a. The date of commencement of the work,

b. The dates of work suspensions and resumptions of work, if suspended over a week, and

c. The date of final completion.

This information should be mailed to the Special Projects and Enforcement Branch of the Regulatory Division of the Jacksonville District at 1520 Royal Palm Square Boulevard, Suite 310, Fort Myers, Florida, 33919-1036; or for electronic mail: CESAJ-ComplyDocs@usace.army.mil (not to exceed 10 MB). Files over 10MB can be uploaded to our web application at https://safe.amrdec.army.mil/safe. Permittee shall reference this permit number, SAJ-2014-00606 (SP -CSH), on all submittals. The Special Projects and Enforcement Branch is also responsible for inspections to determine whether Permittees have strictly adhered to permit conditions.

<u>IT IS NOT LAWFUL TO DEVIATE FROM</u>
<u>THE APPROVED PLANS ENCLOSED</u>.

Sincerely,

RYAN.ANGELA.
C.1362394429
Digitally signed by
RYAN.ANGELA.C.1362394429
DN: c=US, o=U.S. Government, ou=DoD,
ou=PKI, ou=USA,
cn=RYAN.ANGELA.C.1362394429 Date:
2016.03.21 11:41:52 -05'00'

for: Donald W. Kinard
Chief, Regulatory Division

Enclosures

Copies Furnished:

Albert E. Browder, PhD, P.E., Olson Associates, Inc.
Thomas Pierro, P.E., Coastal Planning & Engineering
FWS, Vero Beach (Jeff Howe)
FWS, Jacksonville (Peter Plage)
EPA, Atlanta
NMFS, Southeast Regional Office (Mark Sramek)
CESAJ-RD-PE

DEPARTMENT OF THE ARMY PERMIT

Permittees:	Manatee County 5502 33rd Avenue Drive West Bradenton, Florida 34209	Town of Longboat Key 600 General Harris Street Longboat Key, Florida 34228

Permit No: SAJ-2014-00606 (SP-CSH)

Issuing Office: U.S. Army Engineer District, Jacksonville

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the U.S. Army Corps of Engineers (Corps) having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: The Permittee is granted a 15 year permit to periodically dredge Longboat Pass Navigation Channel and to place the dredged beach-compatible sand along the adjacent Manatee County shorelines of southern Anna Maria Island and northern Longboat Key.

The dredge footprint is limited to the existing federally authorized Longboat Pass navigation channel. The channel will be maintained at a design dredge depth of -13.6 feet NAVD, with a maximum allowable overdepth of -15.6 feet NAVD, using a hydraulic cutterhead dredge. The fill template will have a variable term width at an elevation of 5 feet NAVD, and a foreshore slope of 1:15 (vertical: horizontal).

Dredged sediments will be placed along a 2 mile segment of Anna Maria Island shoreline between FDEP survey monuments R-30 and R-41+305 feet and along a 1.4 mile segment of Longboat Key between R-43.5 and R-50.5. The proposed sediment placement areas include beach and nearshore marine habitat, totaling approximately 69 acres along Anna Maria Island and 60 acres along Longboat Key.

A pipeline exclusion zone will be established offshore of Anna Maria Island and Longboat Key near hardbottom areas, as identified on the permit drawings. A water-sediment slurry will be pumped by the hydraulic dredge from the borrow area (Longboat Pass channel) to the beach. A system of dikes will be used to contain the water-sediment slurry on the beach to allow settlement of the sediment. The dikes will be placed parallel to the coastline, and will be of sufficient length to allow settlement of the sediment on the beach. Bulldozers and other earth moving machinery will be used to position the material in the approved fill template.

The work described above is to be completed in accordance with the 12 pages of drawings and 8 attachments affixed at the end of this permit instrument.

Project Location: The project would affect waters of the United States associated with Longboat Pass, which extends from Sarasota Bay to the Gulf of Mexico, Section 10 and 15, Township 35 South, Range 16 East, Manatee County, Florida.

The beach nourishment segments are located within the Gulf of Mexico on Anna Maria Island north of the inlet, between FDEP Reference Monuments R-30 and 305 feet south of R-41, Sections 4, 9 and 10, Township 35 South, Range 16 East; and on Longboat Key south of the inlet, between R-43.5 and R-50.5, Sections 15, 22, and 23, Township 35 South, Range 16 East, Manatee County, Florida.

Directions to site: From I-75, take exit 224 for US-301 toward Palmetto/Ellenton, go 0.3 miles. Keep right at the fork to continue toward US-301 N and merge onto US-301 N, go 3.6 miles. Continue on 10th St W, go 0.6 miles. Turn left at 8th Ave W/US-41. Continue to follow US-41 for 1.8 miles. Turn right at Manatee Ave W, go 8.4 miles to Anna Maria Island. Turn left at E Bay Dr., go 0.4 miles. Continue south on FL-789/Gulf Dr., go approximately 3.5 miles to Longboat Pass.

Approximate Coordinates:

Anna Maria Island:	Begin Project: 27.47259°, -82.70121°
	End Project: 27.44759°, -82.69118°
Longboat Key:	Begin Project: 27.43967°, -82.69072°
	End Project: 27.42611°, -82.67585°

Permit Conditions

General Conditions:

1. The time limit for completing the work authorized ends on **March 21, 2031**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith

transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature and the mailing address of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. **Reporting Addresses:** The Permittee shall submit all reports, notifications, documentation and correspondence required by the general and special conditions of this permit to the following address**:**

   a. For standard mail: U.S. Army Corps of Engineers, Regulatory Division, Special Projects & Enforcement Branch, 1520 Royal Palm Square Boulevard, Suite 310, Fort Myers, Florida 33919-1036

   b. For electronic mail: CESAJ-ComplyDocs@usace.army.mil (not to exceed 10 MB). Files over 10MB can be uploaded to our web application at https://safe.amrdec.army.mil/safe. Permittee shall reference this permit number, SAJ-2014-00606 (SP -CSH), on all submittals.

2. **Commencement Notification:** Within 10 days from the date of initiating the work authorized by this permit for each nourishment event of the authorized project, the

Permittee shall provide a written notification of the date of commencement of authorized work to the Corps.

3. **As-Built Certification:** Within 60 days of completion of authorized work for each maintenance event, the Permittee shall submit as-built drawings of the authorized work for that event and a completed “As-Built Certification by Professional Engineer” form (Attachment 3) to the Corps. The as-built drawings shall be signed and sealed by a registered professional engineer and include the following:

   a. A plan view drawing of the location of the authorized work footprint, as shown on the permit drawings, with transparent overlay of the work as constructed in the same scale as the permit drawings. The plan view drawing should show the approved beach fill templates.

   b. A list of any deviations between the work authorized by this permit and the work as constructed. In the event that the completed work deviates, in any manner, from the authorized work, describe on the attached “As-Built Certification By Professional Engineer” form the deviations between the work authorized by this permit and the work as constructed. Clearly indicate on the as-built drawings any deviations that have been listed. Please note that the depiction and/or description of any deviations on the drawings and/or “As-Built Certification By Professional Engineer” form does not constitute approval of any deviations by the Corps.

   c. Include the Department of the Army permit number on all sheets submitted.

4. **Pre-Construction Meeting:** The Permittee will schedule a pre-construction meeting with the Enforcement Section representative prior to the start of work to review the limitations and special conditions of the permit. During this meeting participants will be required to sign a form acknowledging knowledge and comprehension of what has been authorized and associated requirements. The Permittee should not start work prior to the pre-construction meeting without written approval by the Corps.

The Permittee is advised to contact the U.S. Fish & Wildlife Service (FWS), South Florida Ecological Services Office, to review the terms and conditions of its Biological Opinion(s), and to insure compliance Endangered Species Act (ESA).

5. **Points of Contact:** The Permittee shall provide a list of all points of contact associated with the project within 10 days from initiation of work to the address identified in Reporting Address Special Condition. The list should include area of responsibility and contact information for each point of contact.

6. **Biological Opinions:** This permit does not authorize the Permittee to take an endangered species, in particular the threatened piping plover (*Charadrius melodus*), the threatened red knot (*Calidris canutus rufa*), the threatened Northwest Atlantic Ocean (NWAO) Distinct Population Segment (DPS) of the loggerhead sea turtle (*Caretta caretta*), the endangered leatherback sea turtle (*Dermochelys coriacea*), the endangered green sea turtle (*Chelonia mydas*), the endangered hawksbill sea turtle (*Eretmochelys imbricata*), and the endangered Kemp's ridley sea turtle (*Lepidochelys kempii*). In order to legally take a listed species, the Permittee must have separate authorization under the Endangered Species Act (ESA) (e.g., an ESA Section 10 permit, or a Biological Opinion under ESA Section 7, with "incidental take" provisions with which you must comply).

The Biological Opinions referenced below contain mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is also specified in the Biological Opinion. Authorization under this permit is conditional upon compliance with all of the mandatory terms and conditions associated with incidental take of the enclosed Biological Opinions, which terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with incidental take of each Biological Opinion, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute noncompliance with this permit. The FWS or NMFS are the appropriate authority to determine compliance with the terms and conditions of its Biological Opinion, and with the ESA.

7. **FWS Biological Opinion (BO):** The Permittee provided information to the FWS during consultation for red knot. The BO, dated September 24, 2015, contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is also specified in the BO. The permittee shall follow the measures included to minimize impacts to red knot. The September 24, 2015 FWS BO is included as an attachment to this permit (Attachment 4).

8. **Statewide Programmatic Biological Opinion (SPBO)**: The Permittee provided information to the FWS during consultation for sea turtles. The Permittee has reviewed the Reasonable and Prudent Measures, Terms and Conditions of the 2015 SPBO and agreed to follow the measures included to minimize impacts to sea turtles, including terrestrial loggerhead sea turtle critical habitat. The FWS provided concurrence the maintenance dredging activities and sand placement activities are consistent with the SPBO provide the Permittee follows the term and conditions contained therein. The 2015 SPBO can be viewed at:

http://www.fws.gov/panamacity/resources/2015SPBO.pdf

The Permittee is responsible for obtaining and complying with the 2015 SPBO. If the Permittee is unable to view the 2015 SPBO at the above website, the Permittee shall contact the Corps to receive a copy of the 2015 SPBO.

9. **Programmatic Piping Plover Biological Opinion (P^3BO):** The Permittee provided information to the FWS during consultation for piping plover. The Permittee has reviewed the Reasonable and Prudent Measures, Terms and Conditions of the 2013 P^3BO and agreed to follow the measures included to minimize impacts to piping plover. The FWS provided concurrence the sand placement activities are consistent with the P^3BO provide the Permittee follows the term and conditions contained therein. The P^3BO can be viewed at:

http://www.saj.usace.army.mil/Portals/44/docs/Planning/EnvironmentalBranch/EnvironmentalDocs/PipingPloverProgrammaticBiologicalOpinion.pdf

The Permittee is responsible for obtaining and complying with the P^3BO. If the Permittee is unable to view the P^3BO at the above website, the Permittee shall contact the Corps to receive a copy of the P^3BO.

10. **Gulf Regional Biological Opinion**: Dredging is approved under the current National Marine Fisheries Service (NMFS) Gulf Regional Biological Opinion (GRBO) and its references which can be viewed on the following website:

http://el.erdc.usace.army.mil/seaturtles/refs-bo.cfm.

The Permittee is responsible for obtaining and complying with the GRBO. If the Permittee is unable to view the GRBO at this website, the Permittee shall contact the Corps to receive a copy of the GRBO. The GRBO contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with “incidental take” that is specified in the GRBO. Your authorization is conditional upon your compliance with all of the mandatory terms and conditions associated with the incidental take of the GRBO, which terms and conditions are incorporated by reference in the permit. Failure to comply with the terms and conditions associated with the incidental take of the GRBO, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your Corps permit. However, depending on the affected species NMFS is the appropriate authority to determine compliance with the terms and conditions of its GRBO and with the Endangered Species Act (ESA). For further clarification on this point, you should contact NMFS. Should NMFS determine the conditions of the GRBO have been violated, normally they will enforce the violation of the ESA, or refer the matter to the Department of Justice.

11. **Manatee Conditions:** The Permittee shall comply with the “Standard Manatee Conditions for In-Water Work – 2011” (Attachment 5) and the minimization measures outlined on page 4 of the above referenced 2015 SPBO to avoid potential impacts on manatees.

12. **Sea Turtle and Smalltooth Sawfish Conditions:** The Permittee shall comply with National Marine Fisheries Service's “Sea Turtle and Smalltooth Sawfish Construction Conditions” dated March 23, 2006 (Attachment 6).

13. **Dredging Quality Management (DQM):** All dump scows shall be equipped with DQM system for monitoring purposes. The system must have been certified by the Engineer Research and Development Center (ERDC) within the last year. The DQM must be turned on and transmitting during the transporting of the dredged material and/or dumping operations.

14. **Mean Grain Size and Silt content**: The sand utilized for the placement on the beach will have a maximum silt content of 10% (passing #230 sieve), and a maximum shell content of 15% (retained on #4 sieve). The Permittee will utilize the borrow site as shown on permit drawing sheet 10 (Attachment 1). The beach fill material shall not contain construction debris, toxic material, other foreign matter, coarse gravel or rocks.

15. **Sediment Quality Control/Quality Assurance:** The permittee shall implement the attached “Sediment Quality Control/Quality Assurance Plan” (Attachment 7). Material not in compliance with the Plan shall be handled according to the protocols set forth in the Sediment QA/QC Plan. The Permittee shall include the Corps in any reporting required by another agency.

16. **Hardbottom Monitoring Plan:** The permittee shall adhere to the approved Hardbottom Biological Monitoring Plan (Attachment 8). Monitoring reports and data associated with the physical monitoring plan shall be submitted to the Corps at the address listed in Special Condition #1 within 90 days of completion of the review.

17. **Spill Reporting:** In the event of leakage, overflow, or spillage of excavated material from a pipeline, dredge, or other source associated with the authorized activity, the Permittee shall notify the Corps within 48 hours of the incident. Notification shall include the cause of the discharge, time/location of the discharge, a description of the material discharged, an estimate of the area/volume of the discharge, and a description of impacts to aquatic resources, e.g., hardbottom, seagrass, mangrove. Additionally, the

notification shall include measures being taken to contain the discharge and protect aquatic resources. Failure to repair leaks or change the method of operation which is resulting in the leakage, overflow, or spillage will result in suspension of dredging operations and require prompt repair or change of operation to prevent overflow, leakage, or spillage as prerequisite to the resumption of dredging. The Corps may require remediation of impacts to aquatic resources resulting from the discharge.

18. **Cultural Resources/Historic Properties:** No structure or work shall adversely affect impact or disturb properties listed in the National Register of Historic Places (NRHP) or those eligible for inclusion in the NRHP.

a. If prehistoric or historic artifacts, such as pottery or ceramics, projectile points, dugout canoes, metal implements, historic building materials, or any other physical remains that could be associated with Native American, early European, or American settlement are encountered at any time within the project site area, the permittee shall cease all activities involving subsurface disturbance in the within a 100-meter diameter of the discovery and notify the Corps within the same business day (8 hours). The Corps shall then notify the Florida State Historic Preservation Officer (SHPO) and the appropriate Tribal Historic Preservation Officer(s) (THPO(s)) to assess the significance of the discovery and devise appropriate actions. Project activities shall not resume without verbal and/or written authorization.

b. In the unlikely event that unmarked human remains are identified on non-federal lands, they will be treated in accordance with Section 872.05 Florida Statutes. All work and ground disturbing activities within a 100-meter diameter of the unmarked human remains shall immediately cease and the Permittee shall immediately notify the medical examiner, Corps, and State Archeologist within the same business day (8-hours). The Corps shall then notify the appropriate SHPO and THPO(s). Based, on the circumstances of the discovery, equity to all parties, and considerations of the public interest, the Corps may modify, suspend or revoke the permit in accordance with 33 CFR Part 325.7. Such activity shall not resume without written authorization from the State Archeologist and from the Corps.

c. Site 8MA1235 shall be avoided along with a 100-foot buffer zone. Project activities which may adversely impact the resource shall not occur in the buffer, including, but not limited to, anchoring, dredging, spudding, pipeline placement, excavation, etc. Part of the 100-foot cultural resource buffer lies within the equilibrium toe of fill from the beach fill template. However, nourishment activity, which does not engage in excavation, is not expected to adversely impact the resource and is authorized to occur in the vicinity of the buffer zone.

19. **Posting of Permit:** The Permittee shall have available and maintain for review a copy of this permit and approved plans at the construction site.

20. **Agency Changes/Approvals:** Should any other agency require and/or approve changes to the work authorized or obligated by this permit, the Permittee is advised a modification to this permit instrument is required prior to initiation of those changes. It is the Permittee’s responsibility to request a modification of this permit from the Tampa Permits Section. The Corps reserves the right to fully evaluate, amend, and approve or deny the request for modification of this permit.

21. **Assurance of Navigation and Maintenance:** The Permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structures or work herein authorized, or if in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the Permittee will be required, upon due notice from the Corps, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(X) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403)

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344)

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413)

2. Limits of this authorization.

   a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.

   b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal projects.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision: This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions: General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Charlie Hunsicker	3/9/2016

(PERMITTEE – MANATEE COUNTY)	(DATE)

Charlie Hunsicker, Dir., Parks & Natural Resources

(PERMITTEE NAME-PRINTED)

3 MARCH, 2016

(PERMITTEE – TOWN OF LONGBOAT KEY)	(DATE)

JUAN J. FLORENSA

(PERMITTEE NAME-PRINTED) P.W. DIRECTOR

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

for	18 March 2016

(DISTRICT ENGINEER)	(DATE)

Jason A. Kirk, P.E.
Colonel, U.S. Army
District Commander

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE-SIGNATURE) (DATE)

(NAME-PRINTED)

(ADDRESS)

(CITY, STATE, AND ZIP CODE)

Attachments to Department of the Army Permit Number SAJ-2014-00606 (SP-CSH)

1. PERMIT DRAWINGS: 12 pages, dated 2/24/2014

2. WATER QUALITY CERTIFICATION: Specific Conditions of the water quality permit/certification in accordance with General Condition number 5 on page 2 of this DA permit. Environmental Resource Permit No. 0298107-004, dated 3/19/2015 and ERP Modification No. 0298107-006, dated 8/5/2015, 40 pages.

3. AS-BUILT CERTIFICATION FORM: 2 pages

4. U.S. FISH AND WILDLIFE SERVICE'S BIOLOGICAL OPINION: 82 pages, dated September 24, 2015.

5. MANATEE CONDITIONS: 2 pages, *Standard Manatee Conditions for In-Water Work – 2011*

6. SEA TURTLE – SAWFISH CONDITIONS: 1 page, *Sea Turtle and Smalltooth Sawfish Construction Conditions, revised March 23, 2006*

7. SEDIMENT QUALITY CONTROL/QUALITY ASSURANCE PLAN: 6 pages, dated October 3, 2014

8. HARDBOTTOM BIOLOGICAL MONITORING PLAN: 23 pages, dated April 2015.

APPENDIX E1

FWC STANDARD MANATEE CONDITIONS FOR IN-WATER WORK (2011)

STANDARD MANATEE CONDITIONS FOR IN-WATER WORK

2011

The permittee shall comply with the following conditions intended to protect manatees from direct project effects:

a. All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.

b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

c. Siltation or turbidity barriers shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.

d. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.

e. Any collision with or injury to a manatee shall be reported immediately to the Florida Fish and Wildlife Conservation Commission (FWC) Hotline at 1-888-404-3922. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-731-3336) for north Florida or in Vero Beach (1-772-562-3909) for south Florida, and emailed to FWC at ImperiledSpecies@myFWC.com.

f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Temporary signs that have already been approved for this use by the FWC must be used. One sign which reads *Caution: Boaters* must be posted. A second sign measuring at least 8½ " by 11" explaining the requirements for “Idle Speed/No Wake” and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities. These signs can be viewed at http://www.myfwc.com/WILDLIFEHABITATS/manatee_sign_vendors.htm. Questions concerning these signs can be forwarded to the email address listed above.

CAUTION: MANATEE HABITAT

All project vessels

IDLE SPEED / NO WAKE

When a manatee is within 50 feet of work
all in-water activities must

SHUT DOWN

Report any collision with or injury to a manatee:

Wildlife Alert:

1-888-404-FWCC(3922)

cell *FWC or #FWC

ATTACHMENT 5
SAJ-2014-00606-CSH
FEBRUARY 24, 2016
SHEET 2 OF 2

APPENDIX E2

NMFS SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS (2006)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

The permittee shall comply with the following protected species construction conditions:

a. The permittee shall instruct all personnel associated with the project of the potential presence of these species and the need to avoid collisions with sea turtles and smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of these species.

b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles or smalltooth sawfish, which are protected under the Endangered Species Act of 1973.

c. Siltation barriers shall be made of material in which a sea turtle or smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment. Barriers may not block sea turtle or smalltooth sawfish entry to or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service’s Protected Resources Division, St. Petersburg, Florida.

d. All vessels associated with the construction project shall operate at “no wake/idle” speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

e. If a sea turtle or smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

f. Any collision with and/or injury to a sea turtle or smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service’s Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

g. Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

Revised: March 23, 2006
O:\forms\Sea Turtle and Smalltooth Sawfish Construction Conditions.doc

APPENDIX E3

USFWS BIOLOGICAL OPINION, SEPTEMBER 24, 2015
TERMS AND CONDITIONS

United States Department of the Interior
U. S. FISH AND WILDLIFE SERVICE
7915 BAYMEADOWS WAY, SUITE 200
JACKSONVILLE, FLORIDA 32256-7517

IN REPLY REFER TO:
FWS Log No. . 04EF1000-2015-F-0053

September 24, 2015

Kevin D. O'Kane
Chief, Tampa Permits Section
Jacksonville District Corps of Engineers
10117 Princess Palm Avenue, Suite 120
Tampa, Florida 33610
(Attn: Mark Peterson)

Dear Mr. O'Kane:

This document transmits the U.S. Fish and Wildlife Service's (Service's) Biological Opinion on the proposed Longboat Pass Navigational Maintenance Dredging and Beach Renourishment Project (Longboat Pass Project) Manatee County, Florida (U.S. Army, Corps of Engineers (Corps): SAJ-2014-00606) with regard to its potential effects on the federally-listed (threatened) *rufa* red knot (*Calidris canutus rufa*) (hereafter, red knot). We also address the project's effects on the following: the Northwest Atlantic Ocean distinct population segment (NWAO DPS) of the loggerhead sea turtle (*Caretta caretta*) and its designated terrestrial critical habitat; the green sea turtle (*Chelonia mydas)*; the leatherback sea turtle (*Dermochelys coriacea*); the hawksbill sea turtle (*Eretmochelys imbricata*); the Kemp's ridley sea turtle (*Lepidochelys kempii*); the piping plover (*Charadrius melodus*) and its designated critical habitat; and the West Indian (Florida) manatee (*Trichechus manatus latirostris*). The Longboat Pass Project, submitted to the Corps as a permit application by Manatee County (County) and the Town of Longboat Key (Town), would entail periodic maintenance dredging of the Longboat Pass federally-authorized navigation channel and placement of dredged sediment to renourish Manatee County beaches north of the pass on Anna Maria Island and south of the pass on Longboat Key. The Corps requested initiation of formal consultation in a letter to the Service of November 6, 2014, and amended the request in a letter of March 23, 2015. We provide the following in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.). We have assigned Service Log Number 04EF1000-2014-F-0052 to this consultation.

This Biological Opinion is based on information provided in your November 6, 2014, and March 23, 2015, letters, and November 5, 2014, Public Notice; the applicants' March 3, 2014, Joint Application for Coastal Permit; emails and letters from CBI Coastal Planning and Engineering, Inc. (CBI), agent for the applicant, responding to Service and Florida Department of Environmental Protection (FDEP) requests for additional information; our additional phone and email correspondence with the Corps, CBI, FDEP, the Florida Fish and Wildlife

Conservation Commission (FWC), and the National Marine Fisheries Service (NMFS); and other sources of information. A complete administrative record of this consultation is on file at the Service's North Florida Ecological Services Office (NFESO).

CONSULTATION HISTORY

Coordination between the Corps and Service regarding the Longboat Pass Project began in February 2014. In a letter to the Service dated November 6, 2014, the Corps requested initiation of formal consultation on five species of listed sea turtle and requested concurrence of a "not likely to adversely affect" determination for the manatee and piping plover. Included with the letter was the Public Notice for the proposed project dated November 5, 2014. In an email to the Corps on November 13, 2014, the Service noted that the red knot was proposed for listing under the Act, that listing was anticipated shortly, that there was a history of the red knot use in the proposed beach renourishment areas, and that post-listing consultation over the red knot would likely be required. In the same email the Service forwarded questions regarding project details. CBI responded to Service questions in an email of November 18, 2014. On January 5, 2015, representatives of the Service, the County, CBI, and Anna Maria Island Turtle Watch and Shorebird Monitoring (AMITWSM) met to discuss the County's measures to conserve listed species on Anna Maria Island, including ongoing education efforts, and their ongoing sea turtle and shorebird surveys. On February 19, 2015, representatives of the Service, the Town, Olsen Engineering, Inc. (Olsen), and the Corps (via phone) met to discuss proposals for 2015-2016 beach renourishment projects on Longboat Key, including the Longboat Pass Project.

Your March 27, 2015, letter revised the Corps' previous request for consultation and requested the following: (1) initiation of consultation for the NWAO DPS of the loggerhead sea turtle and its designated critical habitat, the leatherback sea turtle, the green sea turtle, the hawksbill sea turtle, and the Kemp's ridley sea turtle, with inclusion under the 2015 Statewide Programmatic Biological Opinion (2015-SPBO) (Service 2015); (2) initiation of consultation for the piping plover, with inclusion under the 2013 Piping Plover Programmatic Biological Opinion (P^3BO) (Service 2013); (3) initiation of formal consultation for the red knot; and (4) concurrence with a 'may affect, not likely to adversely affect' determination for the manatee. On March 27, 2015, the Service requested additional information to help complete our analysis of potential impacts to listed species.

In an April 4, 2015, email to the Town, Peter Plage of my staff suggested conservation measures to benefit the red knot, piping plover, and other shorebirds and seabirds that the Town might consider as part of the Longboat Pass Project and other currently proposed beach renourishment projects on Longboat Key. In a May 12, 2015, document prepared by Olsen (2015) the Town responded by proposing series of island-wide conservation measures for shorebirds.

On June 1, 2015, CBI provided additional information, in the form of a report (CBI 2015), to supplement information previously provided in the County and Town's original application, the Corps' Public Notice, and subsequent emails and telephone conversations. This report provided the equivalent of a biological evaluation/assessment for potential project effects on the red knot and other listed species. Upon receipt of the report, the Service had sufficient project information to initiate formal consultation.

Application of the SPBO and P^{3}BO

After review, we have determined that the Longboat Pass Project is appropriate to apply to the 2015-SPBO and to the P^{3}BO. The minimization measures, Reasonable and Prudent Measures (RPMs), and Terms and Conditions (T&Cs) in these Programmatic Biological Opinions that are applicable to the Longboat Pass Project must be followed for the five sea turtle species, loggerhead sea turtle terrestrial critical habitat, and for the piping plover. Only the effects of the Longboat Pass Project on the red knot will be addressed in the following Biological Opinion.

Please note that the Service and the NMFS share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on nesting beaches and NMFS has jurisdiction for sea turtles in the marine environment. Provisions of the 2015-SPBO do not apply to sea turtles in the marine environment such as swimming juvenile and adult sea turtles. The 2015-SPBO only addresses activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. If applicable, you are required to consult with the NMFS on this project. For further information on compliance with NMFS under the Act, please contact Ms. Rachel Sweeney, Chief of the Interagency Cooperation Branch by e-mail at rachel.sweeney@noaa.gov or by phone at 727-824-5312.

The Longboat Pass Project occurs within the geographic range of the manatee. Based on the County and Town committing to conditions of the 2015-SPBO, including Standard Manatee Conditions for In-Water Work (FWC 2011a) and other measures outlined in the 2015-SPBO that avoid potential impacts to the manatee, we concur with the Corps' determination that the project 'may affect, but is not likely to adversely affect' the manatee.

BIOLOGICAL OPINION

A Biological Opinion is the document that states the opinion of the Service as to whether a federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat (50 CFR §402.02). This Biological Opinion addresses the impacts of the Longboat Pass Project on the red knot. It evaluates the effects of the proposed action, interrelated and interdependent actions, and cumulative effects relative to the status of the species to arrive at a Service opinion that the proposed action is or is not likely to jeopardize the species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR§402.02). Only the question of jeopardy to the red knot is addressed in this Biological Opinion, since critical habitat has not been designated for the red knot. Should red knot critical habitat be designated within the action area in the future, reinitiation of consultation will be required prior to any further work under this Corps permit that may affect red knot critical habitat.

DESCRIPTION OF THE PROPOSED ACTION

Longboat Pass is a natural inlet that separates the barrier islands of Anna Maria Island (north) and Longboat Key (south). It connects Sarasota Bay (east) with the Gulf of Mexico (west). The Longboat Pass federal navigation channel has been maintained by the Corps since 1951 and was last dredged in 1997. The channel alignment has gradually migrated south with the authorized channel being replaced by an ebb shoal. Both Anna Maria Island and Longboat Key shorelines have seen substantial erosion and repeated beach renourishment over many years. The north end of Longboat Key, FDEP R-Monument 42 (R-42) to R-46, is a public beach that has experienced a high rate of erosion, especially since 2004. A groin construction project has been recently completed to slow the rate of erosion.

The County and Town propose to periodically maintenance dredge the Longboat Pass federal navigational channel and place dredged sediments along the adjacent Manatee County shorelines of Anna Maria Island and Longboat Key. The dredge footprint would be limited to existing federally authorized navigational channel, which contains approximately 238,700 cubic yards of sand. The channel is anticipated to refill at a rate of approximately 23,750 cubic yards per year. At that rate, maintenance dredging would provide approximately 190,000 cubic yards of sand every eight years. The proposed Longboat Pass Project includes maintenance dredging every four to eight years over the 15-year life of the project. The placement location and extent of beach renourished will vary between maintenance dredging events depending on timing and volume removed from the channel, but dredged material will be placed within either one or both of the two proposed templates, along approximately 2 miles of Anna Maria Island from 12th Street North south to Longboat Pass (R-30 to R-41+305) and along approximately 1.4 miles of Longboat Key, approximately 1000 feet north of North Shore Road south to Gulfside Road (R-43.5 to R-50.5). Under the current plan all of the material dredged during the initial construction, anticipated to occur in 2015, would be deposited on Longboat Key and sediment placement from the second dredging event would be placed on Anna Maria Island. Both the County and the Town have agreed that this schedule of alternating sediment placement will continue until the expiration of the permit. However, sediment placement could be divided and placed along both shorelines simultaneously if appropriate.

The Anna Maria Island template provides for placement of up to 462,000 cubic yards. The Longboat Key template provides for placement of up to 524,000 cubic yards. The templates are larger than the volume estimated in the dredge area in order to provide the flexibility to place the sand in the area of greatest need at the time of maintenance dredging. After the initial placement, the maintenance schedule would be determined based on monitoring data. Other permitted projects providing sand within the proposed template areas may influence timing and location of the sand needed.

The project would be constructed with a hydraulic cutterhead dredge. Sediment would be transported by pipeline as a sand and water slurry to the discharge location on the beach. Bulldozers and other earth moving machinery would be used to position the material in the approved fill template. Dredging would occur 24-hours a day. The anticipated time required to construct would depend on the equipment used to dredge the channel, however, three to five months is anticipated in the event a small dredge is used. No seasonal limitations on construction have been proposed.

Conservation Measures

The County and the Town will follow and implement those minimization measures, RPMs, and the T&Cs of the 2015-SPBO and P^{3}BO that apply to the Longboat Pass Project. Many of these same measures will prove beneficial to the red knot.

On Anna Maria Island, the AMITWSM, under direction from Suzi Fox and under contract with Manatee County, conducts annual shorebird and sea turtle monitoring along Anna Maria Island's Gulf of Mexico (Gulf) beaches. AMITWSM currently completes year-round island-wide shorebird monitoring two times per month following the (FWC Monitoring Protocol for Non-Breeding Shorebirds and Seabirds. In addition, nesting surveys are conducted starting on February 15th each year. AMITWSM also plays an active role in educating the public about shorebird and sea turtle conservation through public tours, literature, visits with local business, and posting educational information on their website. There are also educational signs placed at some beach access points highlighting sea turtles, shorebirds, and wrack protection. Manatee County also maintains a wrack accumulation zone at the southern end of Coquina Beach, extending from R-40+410 to Longboat Pass. No wrack is removed from this area, unless it poses a health or safety risk. Those vehicles used by lifeguards, law enforcement, beach maintenance employees, and turtle monitoring personnel that operate on the beach follow the FWC Beach Driving Best Management Practices. There is an exception for emergency vehicles, which have full access to the entire beach.

On Longboat Key, in support of the Town's overall beach management plan and to develop information to improve the protection of the red knot and piping plover, the Town has developed a set of proposed conservation measures for shorebirds (Olsen 2015). Highlights of the proposed measures follow.

<u>Protection of wrack</u>

The Town will continue to take measures to protect wrack along its beaches and to educate the public, including tourists, private residents, and condominium/hotel managers of the importance of wrack. To discourage beach cleaning that impacts wrack, the Town will contact private property owners who remove the wrack on their beaches to provide information regarding not only the importance of wrack, but also the following desired possibilities:

i. Leaving a designated portion of wrack year round; and

ii. Leaving the wrack from September 1 through May 1.

The Town will publish information on the importance of wrack on the Longboat Key website, along with a link to the FWC site http://myfwc.com/Shorebirds.

Minimization of disturbance
The Town will seek opportunities to educate the beach-going public about shorebird disturbance, as well as wrack protection. Efforts will include the installation of educational signs highlighting the importance of beach habitats to wildlife and explaining the importance of the wrack along the shoreline. The Town will prohibit fireworks, pets, and open fires on beaches of Longboat Key.

Driving on the beach
The Town will minimize vehicular traffic on the beach and seek to balance the need for human health and safety on the beach, including emergency responders, against the potential disturbance of shorebirds. The Town closely regulates beach driving and only allows driving for emergency responders (including lifeguards) and limited all-terrain vehicle (ATV) access for official Town-approved purposes (such as turtle and shorebird monitoring, beach monitoring). Vehicles, including ATVs, traversing the beach that are used by beach lifeguards, beach maintenance employees, turtle watch volunteers, and law enforcement will avoid the soft sand areas in the wrack areas and follow the FWC's Beach Driving Best Management Practices: http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/
Emergency vehicles shall have full access to the beach including the wrack areas.

Coordination
The Town will continue to support efforts to protect shorebirds along the Longboat Key beaches and work cooperatively with the Service, FWC, and local organizations. In conjunction with the monitoring program described below, the Town will establish a primary point of contact for the Town to manage the stewardship of shorebird protection efforts. That individual will provide coordination between the Town, the Service, the FWC, the FDEP, the Corps, and representatives of other groups (Audubon, Save our Shorebirds, etc.).

Monitoring
The Town will implement a year-round shorebird monitoring program along its Gulf shoreline. The program shall identify locations of important foraging and roosting areas, in addition to nesting areas, and will identify optimal piping plover and red knot habitat. This effort may, to the maximum extent practicable, reduce disturbance of wintering shorebirds during project activities. In establishing the monitoring program, guidelines developed in the P^{3}BO shall be considered.

Prior to the first sand placement event, surveys shall occur three times per month for the first five months of this program along the entire Gulf shoreline of Longboat Key. Surveys shall occur no less than 9 days apart, and shall capture both low tide and high tide events each month. After the completion of five months of pre-construction data, surveys shall continue twice per month through the completion of the first sand placement activities in each shoreline segment.

During construction events occurring between February 1 and August 30, daily surveys for nesting activity shall be conducted in the specific sand placement project areas, beginning February 1 or at least 10 days prior to construction start, whichever is later, and continuing through the end of construction or through August 30, whichever is earlier. The permit conditions provided by the FWC for the protection of nesting and fledged shorebirds shall be adhered to. The two times per month island-wide monitoring described above would continue for the entire shoreline.

Following completion of the last sand placement event planned as part of the current renourishment cycle (to occur by 2016, approximately), island-wide surveys by ATV shall occur twice per month for a period of two years, and terminating at the end of piping plover migration season in May (anticipated to be May 2018).

Reporting

Nesting shorebird reports shall be shared directly with Service and FWC personnel (as desired) and will be submitted in the appropriate format to the Florida Shorebird Database (*https://public.myfwc.com/crossdoi/shorebirds/index.html*), generally on a monthly or more frequent basis. Wintering shorebird reports shall be prepared in EXCEL (typ.) format and shared directly with Service and FWC personnel (as desired), generally on a monthly or more frequent basis. The repositories for shorebird data may change or evolve in the future. The appropriate submittal procedures will be updated periodically.

Action Area

The action area is defined as all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action. The Service identifies the action area for the Longboat Pass Project to include the Longboat Pass dredge area, the fill placement areas on Anna Maria Island (R-30 to R-41+305) and Longboat Key (R-43.5 to R-50.5), and updrift and downdrift beaches that may be affected. Therefore, the Longboat Pass Project Action Area extends from R-29 on Anna Maria Island south to R-51.5 on Longboat Key and includes approved fill templates, all staging and discharge areas, pipeline corridors, beach access corridors, immediately adjacent nearshore waters, and all emergent shoals and sandbars within the flood-tidal and ebb-tidal deltas of Longboat Pass.

STATUS OF THE SPECIES/CRITICAL HABITAT

Red Knot

Species description

The red knot is a medium-sized shorebird about 9 to 11 inches (in) (23 to 28 centimeters [cm]) in length. The red knot is easily recognized during the breeding season by its distinctive rufous (red) plumage (feathers). The face, prominent stripe above the eye, breast, and upper belly are a rich rufous-red to a brick or salmon red, sometimes with a few scattered light feathers mixed in. The feathers of the lower belly and under the tail are whitish with dark flecks. Upperparts are dark brown with white and rufous feather edges; outer primary feathers are dark brown to black (Davis 1983; Harrington 2001). Females are similar in color to males, though the rufous colors are typically less intense, with more buff or light gray on the dorsal (back) parts (Niles et al. 2008). Red knots have a proportionately small head, small eyes, and short neck, and a black bill that tapers from a stout base to a relatively fine tip. The bill length is not much longer than head length. Legs are short and typically dark gray to black, but sometimes greenish in juveniles or older birds in nonbreeding plumage (Harrington 2001). Nonbreeding plumage is dusky gray above and whitish below. Juveniles resemble nonbreeding adults, but the feathers of the scapulars (shoulders) and wing coverts (small feathers covering base of larger feathers) are edged with white and have narrow, dark bands, giving the upperparts a scalloped appearance (Davis 1983).

There are six recognized subspecies of red knots (*C. canutus*), and on December 11, 2014, the Service listed the *rufa* subspecies of red knot as a threatened species in the Federal Register and afforded protection under the Act (Service 2014). The Service accepts the characterization of *C.c. rufa* as a subspecies because each recognized subspecies is believed to occupy separate breeding areas, in addition to having distinctive morphological traits (*i.e.*, body size and plumage characteristics), migration routes, and annual cycles. The Service has determined that the *rufa* red knot is threatened due to loss of both breeding and nonbreeding habitat; potential for disruption of natural predator cycles on the breeding grounds; reduced prey availability throughout the nonbreeding range; and increasing frequency and severity of asynchronies (mismatches) in the timing of the birds' annual migratory cycle relative to favorable food and weather conditions. Main threats to the *rufa* red knot in the U.S. include: reduced forage base at the Delaware Bay migration stopover; decreased habitat availability from beach erosion, sea level rise, and shoreline stabilization in Delaware Bay; reduction in or elimination of forage due to shoreline stabilization, hardening, dredging, beach replenishment, and beach renourishment in Massachusetts, North Carolina, and Florida; and beach raking which diminishes red knot habitat suitability.

Critical habitat has not been proposed or designated for the red knot at this time; however, critical habitat will be addressed during development of a proposed critical habitat rule for the red knot. That said, important habitat characteristics for the red knot are discussed further in the Life history section below.

Life history

Breeding

Based on estimated survival rates for a stable population, few red knots live for more than about 7 years (Niles et al. 2008). Age of first breeding is uncertain, but for most birds it is probably at least 2 years (Harrington 2001). Red knots generally nest in the Canadian Arctic in dry, slightly elevated tundra locations, often on windswept slopes with little vegetation. Breeding territories are located inland, but near Arctic coasts, and foraging areas are located near nest sites in freshwater wetlands (Harrington 2001; Niles et al. 2008). Breeding occurs in June (Niles et al. 2008), and flocks of red knots sometimes arrive at breeding latitudes before snow-free habitat is available. Upon arrival or as soon as favorable conditions exist, male and female red knots occupy breeding habitat, and territorial displays begin (Harrington 2001). In red knots, pair bonds form soon after arrival on the breeding grounds and remain intact until shortly after the eggs hatch (Niles et al. 2008). Female red knots lay only one clutch (group of eggs) per season, and, as far as is known, do not lay a replacement clutch if the first is lost. The usual clutch size is four eggs, though three-egg clutches have been recorded. The incubation period lasts approximately 22 days from the last egg laid to the last egg hatched, and both sexes participate equally in egg incubation. Young are precocial, leaving the nest within 24 hours of hatching and forage for themselves (Niles et al. 2008). No information is available regarding chick survival rates (Niles et al. 2008). Females are thought to leave the breeding grounds and start moving south soon after the chicks hatch in mid-July. Thereafter, parental care is provided solely by the males, but about 25 days (around August 10) they also abandon the newly fledged juveniles and move south. Not long after, they are followed by the juveniles (Niles et al. 2008).

Breeding success of High Arctic shorebirds such as red knot varies dramatically among years in a somewhat cyclical manner. Two main factors seem to be responsible for this annual variation: weather that affects nesting conditions and food availability and the abundance of Arctic lemmings (*Dicrostonyx torquatus* and *Lemmus sibericus*). Production of shorebird young is sensitive to adverse weather during the breeding season. Red knot chicks grow poorly during cold weather due to higher rates of energy expenditure, shorter foraging periods, and reduced prey availability (Schekkerman et al. 2003; Piersma and Lindström 2004). Growth rate of red knot chicks is very high compared to similarly sized shorebirds nesting in more temperate climates and is strongly correlated with weather-induced and seasonal variation in availability of invertebrate prey (Schekkerman et al. 2003). Second, successful shorebird reproduction occurs almost exclusively during peak lemming years when snowmelt is early (Summers and Underhill 1987; Blomqvist et al. 2002; Piersma and Lindström 2004). Arctic fox (*Alopex lagopus*) and snowy owl (*Nyctea scandiaca*) feed largely on lemmings, which are easily caught when their abundance is high. However, in years when lemming numbers are low, the predators turn to alternative prey, such as shorebird eggs, chicks, and adults. Lemming abundance is often cyclical, and the variation in shorebird production closely follows variations in lemming abundance due to their affected predation rates.

Nonbreeding Birds

Little information is available about red knots that do not travel to the Arctic to breed. Unknown numbers of nonbreeding red knots remain south of the breeding grounds during the breeding season, and many, but not all, of these knots are 1-year-old (*i.e.*, immature) birds (Niles et al. 2008). Nonbreeding knots, usually individuals or small groups, have been reported during June along the U.S. Atlantic and Gulf coasts, with smaller numbers around the Great Lakes and Northern Plains in both the U.S. and Canada (eBird.org 2012). There is also little information on where juvenile red knots spend their winter months (Service and Conserve Wildlife Foundation of New Jersey 2012), and there may be at least partial segregation of juvenile and adult red knots on the wintering grounds. All juveniles of the Tierra del Fuego wintering region are thought to remain in the Southern Hemisphere during their first year of life, possibly moving to northern South America, but their distribution is largely unknown (Niles et al. 2008). Because there is a lack of specific information on juvenile red knots, the Service uses the best available data from adult red knots to draw conclusions about juvenile foraging and habitat use.

Migration

The red knot migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast U.S., the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. Departure from the breeding grounds begins in mid-July and continues through August. Red knots tend to migrate in single-species flocks with departures typically occurring in the few hours before twilight on sunny days. Based on the duration and distance of migratory flight segments estimated from geolocator results, red knots are inferred to migrate during both day and night (Normandeau Associates, Inc. 2011). The size of departing flocks tends to be large (greater than 50 birds) (Niles et al. 2008), and females are thought to leave first followed by males and then juveniles (Harrington 2001; Niles et al. 2008).

Red knots make one of the longest distance migrations known in the animal kingdom, traveling up to 19,000 miles annually, and may undertake long flights that span thousands of miles without stopping. As red knots prepare to depart on long migratory flights, they undergo several physiological changes. Before takeoff, the birds accumulate and store large amounts of fat to fuel migration and undergo substantial changes in metabolic rates. In addition, leg muscles, gizzard (a muscular organ used for grinding food), stomach, intestines, and liver all decrease in size, while pectoral (chest) muscles and heart increase in size. Due to these physiological changes, red knots arriving from lengthy migrations are not able to feed maximally until their digestive systems regenerate, a process that may take several days. Because stopovers are time-constrained, red knots require stopovers rich in easily digested food to achieve adequate weight gain (Piersma et al. 1999; van Gils et al. 2005a, 2005b; Niles et al. 2008;) to fuel the next leg of migratory flight and, upon arrival in the Arctic, will fuel the body transformation to breeding condition (Morrison 2006). At each stopover, the adults gradually replace their red breeding plumage with white and gray, but generally they do not molt their flight or tail feathers until they reach their wintering areas (Morrison and Harrington 1992; Niles et al. 2008).

During both the northbound (spring) and southbound (fall) migrations, red knots use key staging and stopover areas to rest and feed. Major spring stopover areas along the Atlantic coast include Río Gallegos, Península Valdés, and San Antonio Oeste (Patagonia, Argentina); Lagoa do Peixe (eastern Brazil, State of Rio Grande do Sul); Maranhão (northern Brazil); the Virginia barrier islands (U.S.); and Delaware Bay (Delaware and New Jersey, U.S.) (González 2005; Niles et al. 2008; Cohen et al. 2009). Important fall stopover sites include southwest Hudson Bay (including the Nelson River delta), James Bay, the north shore of the St. Lawrence River, the Mingan Archipelago, and the Bay of Fundy in Canada; the coasts of Massachusetts and New Jersey and the mouth of the Altamaha River in Georgia, U.S.; the Caribbean (especially Puerto Rico and the Lesser Antilles); and the northern coast of South America from Brazil to Guyana (Spaans 1978; Morrison and Harrington 1992; Antas and Nascimento 1996; Niles et al. 2008; Schneider and Winn 2010; Niles et al. 2010; Niles 2012b; Newstead et al. 2013). However, large and small groups of red knots, sometimes numbering in the thousands, may occur in suitable habitats all along the Atlantic and Gulf coasts from Argentina to Canada during migration (Niles et al. 2008).

Red knots are restricted to the ocean coasts during winter, and occur primarily along the coasts during migration. However, small numbers of red knots are reported annually across the interior U.S. (*i.e.*, greater than 25 miles from the Gulf or Atlantic Coasts) during spring and fall migration. Such reported sightings are concentrated along the Great Lakes, but multiple reports have been made from nearly every interior State (eBird.org 2012). For example, Texas red knots follow an inland flyway to and from the breeding grounds, using spring and fall stopovers along western Hudson Bay in Canada and in the northern Great Plains (Skagen et al. 1999; Newstead et al. 2013). Some red knots wintering in the southeastern U.S. and the Caribbean migrate north along the U.S. Atlantic coast before flying over land to central Canada from the mid-Atlantic, while others migrate over land directly to the Arctic from the southeastern U.S. coast (Niles et al. 2012a). These eastern red knots typically make a short stop at James Bay in Canada, but may also stop briefly along the Great Lakes, perhaps in response to weather conditions (Morrison and Harrington 1992; Niles et al. 2008). Thus, red knots from different wintering areas appear to employ different migration strategies, including differences in timing, routes, and stopover areas. However, full segregation of migration strategies, routes, or stopover areas does not occur among red knots from different wintering areas.

Wintering

Red knots occupy all known wintering areas from December to February, but may be present in some wintering areas as early as September or as late as May. In the Southern Hemisphere, these months correspond to the austral summer (*i.e.*, summer in the Southern Hemisphere). Wintering areas for the red knot include the Atlantic coasts of Argentina and Chile (particularly the island of Tierra del Fuego that spans both countries), the north coast of Brazil (particularly in the State of Maranhão), the Northwest Gulf of Mexico from the Mexican State of Tamaulipas through Texas (particularly at Laguna Madre) to Louisiana, and the Southeast U.S.

from Florida (particularly the central Gulf coast) to North Carolina (Niles et al. 2008; Newstead et al. 2013). Smaller numbers of red knots winter in the Caribbean, and along the central Gulf coast (Alabama, Mississippi), the mid-Atlantic, and the Northeast U.S. Red knots are also known to winter in Central America and northwest South America, but it is not yet clear if those birds are the *rufa* subspecies. Little information exists on where juvenile red knots spend the winter months (Service and Conserve Wildlife Foundation of New Jersey 2012), and there may be at least partial segregation of juvenile and adult red knots on the wintering grounds.

Examples of red knots changing wintering regions do exist, but are few. Generally red knots are thought to return to the same wintering region each year. Re-sightings of marked birds indicate few or no inter-annual movements of red knots between the Brazil and Tierra del Fuego wintering areas, or between the Southeast and Tierra del Fuego wintering areas (Baker et al. 2005; Harrington 2005a).

Migration and Wintering Habitat

Long-distance migrant shorebirds are highly dependent on the continued existence of quality habitat at a few key staging areas. These areas serve as stepping stones between wintering and breeding areas. Habitats used by red knots in migration and wintering areas are generally coastal marine and estuarine habitats with large areas of exposed intertidal sediments. In many wintering and stopover areas, quality high-tide roosting habitat (*i.e.*, close to feeding areas, protected from predators, with sufficient space during the highest tides, free from excessive human disturbance) is limited. The supra-tidal (above the high tide) sandy habitats of inlets provide important areas for roosting, especially at higher tides when intertidal habitats are inundated (Harrington 2008). In some localized areas, red knots will use artificial habitats that mimic natural conditions, such as nourished beaches, dredged spoil sites, elevated road causeways, or impoundments; however, there is limited information regarding the frequency, regularity, timing, or significance of red knots’ use of such artificial habitats.

In South American wintering areas, red knots are found in intertidal marine habitats, especially near coastal inlets, estuaries, and bays. Habitats include sandy beaches, mudflats, mangroves, saltwater and brackish lagoons, and “restinga” formations (an intertidal shelf of densely packed dirt blown by strong, offshore winds) (Harrington 2001; Niles et al. 2008). Red knots were recently observed using rice fields in French Guiana (Niles 2012b) and in Trinidad (eBird.org 2012). In Suriname in the early 1970s, small numbers of red knots were observed on firm and tough clay banks emerging from the eroding coastline and in shallow lagoons, but knots were never found on soft tidal flats (Spaans 1978). Those observations suggest a deviation from the red knot’s typical nonbreeding habitats.

In North America, red knots are commonly found along sandy, gravel, or cobble beaches, tidal mudflats, salt marshes, shallow coastal impoundments and lagoons, and peat banks (Harrington 2001; Truitt et al. 2001; Niles et al. 2008; Cohen et al. 2009; Cohen et al. 2010). In Massachusetts, red knots use sandy beaches and tidal mudflats during fall migration. In New York and the coast of New Jersey, red knots use sandy beaches during spring and fall migration (Niles et al. 2008). In Delaware Bay, red knots are found primarily on beaches of sand or peat at the mouths of tidal creeks, along the edge of tidal marshes dominated by salt marsh cordgrass (*Spartina alterniflora*) and saltmeadow cordgrass (*S. patens*), and in salt pannes (shallow, high salinity, mud-bottomed depressions on the marsh surface) and shallow coastal ponds or embayments (Burger et al. 1997; Meyer et al. 1999; Karpanty et al. 2006; Niles et al. 2008; Cohen et al. 2009). In the southeastern U.S., red knots forage along sandy beaches during spring and fall migration from Maryland through Florida. During migration, knots also use tidal mudflats in Maryland and along North Carolina's barrier islands. In addition to the sandy beaches, red knots forage along peat banks for mussel spat in Virginia and along small pockets of peat banks where the beach is eroding in Georgia (Niles et al. 2008). In Florida, the red knots also use mangrove and brackish lagoons. Along the Texas coast, red knots forage on beaches, oyster reefs, and exposed bay bottoms and roost on high sand flats, reefs, and other sites protected from high tides. Red knots also show some fidelity to particular migration staging areas between years (Harrington 2001; Duerr et al. 2011).

Foraging

The red knot is a specialized molluscivore, eating hard-shelled mollusks, sometimes supplemented with easily accessed softer invertebrate prey, such as shrimp- and crab-like organisms, marine worms, and horseshoe crab (*Limulus polyphemus*) eggs (Harrington 2001; Piersma and van Gils 2011). Mollusk prey are swallowed whole and crushed in the gizzard (Piersma and van Gils 2011). From studies of other subspecies, Zwarts and Blomert (1992) concluded that the red knot cannot ingest prey with a circumference greater than 1.2 in (30 millimeters). Foraging activity is largely dictated by tidal conditions, as the red knot rarely wades in water more than 0.8 to 1.2 in (2 to 3 cm) deep (Harrington 2001). Due to bill morphology, the red knot is limited to foraging on only shallow-buried prey, within the top 0.8 to 1.2 in (2 to 3 cm) of sediment (Zwarts and Blomert 1992; Gerasimov 2009).

On the breeding grounds, the red knot's diet consists mostly of terrestrial invertebrates such as insects (Harrington 2001). In non-breeding habitats, the primary prey of the red knot include blue mussel (*Mytilus edulis*) spat (juveniles); *Donax* and *Darina* clams; snails (*Littorina spp*.), and other mollusks, with polycheate worms, insect larvae, and crustaceans also eaten in some locations. A prominent departure from typical prey items occurs each spring when red knots feed on the eggs of horseshoe crabs, particularly during the key migration stopover within the Delaware Bay of New Jersey and Delaware. Delaware Bay serves as the principal spring migration staging area for the red knot because of the availability of horseshoe crab eggs (Morrison and Harrington 1992; Harrington 1996; Harrington 2001; Clark et al. 2009), which provide a superabundant source of easily digestible food.

Red knots and other shorebirds that are long-distance migrants, must take advantage of seasonally abundant food resources at intermediate stopovers to build up fat reserves for the next nonstop, long distance flight (Clark et al. 1993). Although foraging red knots can be found widely distributed in small numbers within suitable habitats during the migration period, birds tend to concentrate in those areas where abundant food resources are consistently available from year to year.

Population dynamics

Localized and regional red knot surveys have been conducted across the subspecies' range with widely differing levels of geographic, temporal, and methodological consistency. Available population surveys are available in the November 2014 Rufa Red Knot Background Information and Threats Assessment (Supplemental Document), available at www.regulations.gov under Docket Number FWS-R5-ES-2013-0097. Some general characterizations of the available data are noted as follows:
* No population information exists for the breeding range because, in breeding habitats, red knots are thinly distributed across a huge and remote area of the Arctic. Despite some localized survey efforts, (*e.g.*, Niles et al. 2008; Bart and Johnston 2012), there are no regional or comprehensive estimates of breeding abundance, density, or productivity (Niles et al. 2008).
* Few regular surveys are conducted in the fall because southbound red knots tend to be less concentrated than during winter or spring.
* Some survey data are available for most wintering and spring stopover areas. For some areas, long-term data sets have been compiled using consistent survey methodology. Because there can be considerable annual fluctuations in red knot counts, longer-term trends are more meaningful. At several key sites, the best available data show that numbers of red knots declined and remain low relative to counts from the 1980s, although the rate of decline appears to have leveled off since the late 2000s.

Inferring long-term population trends from various national or regional datasets derived from volunteer shorebird surveys and other sources, Morrison et al. (2006) and Andres (2009) concluded that red knot numbers declined, probably sharply, in recent decades.

Wintering Areas

Counts in wintering areas are particularly useful in estimating red knot populations and trends because the birds generally remain within a given wintering area for a longer period of time compared to the areas used during migration. This eliminates errors associated with turnover or double-counting that can occur during migration counts.

Argentina and Chile

Aerial surveys of Tierra del Fuego (Chile and Argentina) and the adjacent Patagonian coast to the north (Argentina) have been conducted since 2000, and previously in the early 1980s, by the same observers using consistent methodology (Morrison et al. 2004). This is the best available long-term data set for a wintering area. However, as those are not the only red knot wintering areas, the survey results are best interpreted as one indicator of population trends rather than estimates of the total population.

Counts have been markedly lower in recent years. Comparing the average counts for Tierra del Fuego from 1985 and 2000 with counts from 2010 to 2012, the recent counts are about 75 percent lower than the earlier counts. An independent population estimate, using re-sighting data from Río Grande fitted to binomial models, supports the observation that declines did not begin until after 2000. This same model produced population estimates that were within 5 to 15 percent of the aerial counts from 2001 to 2003, giving confidence in the model results. Declines were even sharper (about 96 percent) along the roughly 1,000 miles of Patagonian coast than in the core area on Tierra del Fuego. Thus, the population appears to have contracted to the core sites, leaving few birds at the "peripheral" Patagonian sites (Committee on the Status of Endangered Wildlife Canada [COSEWIC] 2007). Reflecting the larger downward trend in Patagonia, local winter counts at Península Valdés also show an overall decline in bird numbers from 1994 to 2010 (Western Hemisphere Shorebird Reserve Network [WHSRN] 2012).

Northern South America and Central America

Counts of wintering red knots along the north coast of South America have been sporadic and have varied in geographic coverage. Morrison and Ross (1989) conducted aerial surveys of the entire South American coast in the 1980s. In northern Brazil, red knots were found in three out of four survey segments: North, North-Central, and Northeast. No red knots were observed in the Amazon survey segment of Brazil, which is between North and North-Central (Morrison and Ross 1989). Using the same surveyor team and methods as the 1986 survey, the North-Central segment of Brazil was again surveyed by air in 2011 (Morrison et al. 2012) and results may suggest a decline. These 2011 results require further confirmation; however, redistribution of birds to the west is an unlikely explanation for the lower numbers in 2011, based on recent surveys of Guyana, Suriname, and French Guiana (discussed below) (Morrison et al. 2012).

Covering about 30 percent (by linear miles of coastline) of the North-Central Brazil survey segment, Baker et al. (2005) counted knots in western Maranhão during an aerial survey in February 2005. In a repeat of this survey in December 2006 (winter of 2007), fewer knots were counted (Niles et al. 2008). The shores of Maranhão are complex and highly fragmented making accurate counting more difficult. To allow for this, aerial coverage was more extensive and included not only the ocean shore, but also a variety of back bays and channels (Niles et al. 2008). In December 2007 (winter of 2008), ground surveys were conducted at two sites in the Brazilian State of Ceará, within the Northeast Brazil survey segment (where only 15 red knots had been counted in 1983). Only small numbers of knots (average peak of 8 ± 8.5) were observed at Ilha Grande, but an average peak count of 481 ± 31 red knots was recorded at Cajuais Bank (Carlos et al. 2010).

Morrison and Ross (1989) documented 520 red knots in western Venezuela in 1982. It is not known if the birds observed around the Colombia-Venezuela border were all of the *rufa* subspecies, but recent geolocator results suggest at least some of the winter birds in this area are *C. c. rufa* (Niles et al. 2012a). During the 1980s surveys, no red knots were observed between western Venezuela and the west end of Brazil (the North segment), with no knots recorded in eastern Venezuela, Trinidad, Guyana, Suriname, or French Guiana (Morrison and Ross 1989). With the same survey team and methods from the 1980s, aerial shorebird surveys were recently repeated in Guyana (January 2010), Suriname (December 2008, January 2010, and January 2011), and French Guiana (December 2008 and January 2010) (Morrison et al. 2012). No red knots were detected in 2011, and a negligible number in December 2008 (*i.e.*, winter 2009) and in 2010 (Mizrahi 2011). However, small, isolated groups of wintering red knots may extend along most of the northern coast of South America.

On the southern (Pacific) coast of Panama, Buehler (2002) counted 100 red knots near Panama City and another 100 near Chitré in February 2002. Another researcher surveyed this area and agreed with an estimate of about 200 wintering red knots). It is not known if all the birds observed in Panama were of the *rufa* subspecies, but three marked birds re-sighted in Panama were all banded in known *rufa* red knot areas (Buehler 2002; Niles et al. 2008). Thus, as least some of these birds are considered *rufa* red knots. Also on the Pacific, Laguna Superior (State of Oaxaca, Mexico) is a recently documented wintering area for red knots, with over 300 birds reported in the winters of 2011 and 2012 (eBird.org 2012).

The North American Atlantic Coast

Small numbers of wintering red knots have been reported from Maryland, U.S., to Nova Scotia, Canada (BandedBirds.org 2012; Burger et al. 2012; eBird.org 2012), but no systematic winter surveys have been conducted in these northern areas. In surveys of five sites within North Carolina's Outer Banks in 1992 and 1993, Dinsmore et al. (1998) found over 500 red knots per year.

Southeastern U.S. and Caribbean

Extensive data for Florida are available from the International Shorebird Survey and other sources. However, geographic coverage has been inconsistent, ranging from 1 to 29 sites per year from 1974 to 2004. Statewide annual totals ranged from 5 knots (1 site in 1976) to 7,764 knots (7 sites in 1979). The greatest geographic coverage occurred in 1993 (4,265 knots at 25 sites) and 1994 (5,018 knots at 29 sites) (Niles et al. 2008). Harrington et al. (1988) reported that the mean count of birds wintering in Florida was 6,300 birds (± 3,400, one standard deviation) based on four aerial surveys conducted from October to January in 1980 to 1982. These surveys covered the Florida Gulf coast from Dunedin to Sanibel-Captiva, sometimes going as far south as Cape Sable). Based on those surveys and other work, the Southeast wintering group was estimated at roughly 10,000 birds in the 1970s and 1980s (Harrington 2005a).

Sprandel et al. (1997) identified the top 60 sites for wintering shorebirds in Florida and surveyed those areas in 1994. Red knots were found at 27 sites, mainly on the central Gulf coast. Adding the average number of birds counted at each site, these authors estimated a statewide total of 1,452 red knots across three sites in the Florida Panhandle, 18 sites in southwest Florida, four sites in the Everglades, and two sites in Northeast Florida (Sprandel et al. 1997). During frequent surveys of nine sites along about 55 miles of the central Florida Panhandle, Smith (2010) found a mean of about 84 wintering red knots in the winter of 2007. Smith (2010) covered roughly 25 percent of the Panhandle region as delineated by Sprandel et al. (1997), with the survey sites clustered on the eastern end of that region.

Niles (2009) conducted winter aerial and ground counts along Florida's Gulf coast from 2006 to 2010, covering essentially the same area in which Harrington et al. (1988) had reported an average of 6,300 red knots (± 3,400) in the winters of 1980 to 1982. As the more recent aerial counts were lower, red knot numbers may have decreased in western Florida, perhaps due to birds shifting elsewhere within the larger Southeast wintering region (Harrington 2005a). However, a comparison of the geographic coverage of Sprandel et al. (1997) with Niles (2009) suggests that red knot numbers did not change much from 1994 to 2010.

Based on re-sightings of birds banded in South Carolina and Georgia from 1999 to 2002, the Southeast wintering population was estimated at 11,700 ± 1,000 (one standard error) red knots. Although there appears to have been a gradual shift by some of the southeastern knots from the Florida Gulf coast to the Atlantic coasts of Georgia and South Carolina, population estimates for the Southeast region in the 2000s were at about the same level as during the 1980s (Harrington 2005a). Based on recent modeling using re-sightings of marked birds staging in Georgia in fall, as well as other evidence, the Southeast wintering group may number as high as 20,000, but field survey data are not available to corroborate this estimate.

Two recent winter estimates are available for the central Gulf of Mexico. During the International Piping Plover Census in 2006 and 2011, 250 to 500 knots were counted from Alabama to Louisiana. From work related to the Deepwater Horizon oil spill, an estimated 900 red knots were reported from the Florida Panhandle to Mississippi. Older surveys recorded similar numbers from the central Gulf coast, with peak counts of 752 red knots in Alabama (1971) and 40 knots in Mississippi (1979) (Morrison and Harrington 1992). Numbers of red knots wintering in the Caribbean are essentially unknown, but in the course of piping plover surveys in February 2011 in the Bahamas, 70 red knots were observed on the Joulters Cays just north of Andros Island, and 7 knots were observed on the Berry Islands. In December 2012 (*i.e.*, winter 2013), 52 red knots were observed in the Green Turtle Cay flats in Abaco, Bahamas. Roughly 50 red knots occur annually on Green Turtle Cay (eBird.org 2012).

Northwest Gulf of Mexico

Except for localized areas, there have been no long-term systematic surveys of red knots in Texas or Louisiana, and no information is available about the number of red knots that winter in northeastern Mexico. From survey work in the 1970s, Morrison and Harrington (1992) reported peak winter counts of 120 red knots in Louisiana and 1,440 in Texas, although numbers in Texas between December and February were typically in the range of 100 to 300 birds. Records compiled by Skagen et al. (1999) give peak counts of 2,838 and 2,500 red knots along the coasts of Texas and Louisiana, respectively, between January and June over the period 1980 to 1996, but these figures could include spring migrants. Morrison et al. (2006) estimated only about 300 red knots wintering along the Texas coast, based on surveys in January 2003 (Niles et al. 2008). Higher counts of roughly 700 to 2,500 red knots have recently been made on Padre Island, Texas, during October, which could include wintering birds (Niles et al. 2009; Newstead et al. 2013).

Foster et al. (2009) found a mean daily abundance of 61.8 red knots on Mustang Island, Texas, based on surveys every other day from 1979 to 2007. Similar winter counts were reported by Dey et al. (2011b) for Mustang Island from 2005 to 2011. From 1979 to 2007, mean abundance of red knots on Mustang Island decreased 54 percent, but this may have been a localized response to increasing human disturbance, coastal development, and changing beach management practices (Foster et al. 2009; Newstead et al. 2013).

There are no current estimates for the size of the Northwest Gulf of Mexico wintering group as a whole (Mexico to Louisiana). The best available current estimates for portions of this wintering region are about 2,000 in Texas (Niles 2012a) or approximately 3,000 in Texas and Louisiana, with about half in each State and movement between them.

Spring Stopover Areas

Records of migrating red knots have been collected at many sites along the Atlantic coast. Not all migration areas are well surveyed, and considerable turnover of individuals occurs as birds migrate through an area. Consequently, using counts of migrating red knots as a basis for population estimates may lead to inaccuracies due to errors associated with turnover or double-counting. However, long-term counts made at a specific location are good indicators of usage trends for that area and, considered together, may reflect trends in the overall population of the red knot.

South America

Peak counts of red knots declined at three South American stopover sites (*i.e.*, Fracasso Beach, Argentina; Bahía San Antonio, Argentina; and Lagoa do Peixe, Brazil) from the 1990s through the mid-2000s. Although trends at stopover areas can reflect changing usage of the site, the timing of these declines over roughly the same period as those in Tierra del Fuego and Delaware Bay (late 1990s to early 2000s) is more suggestive of a decrease in the overall subspecies. At Fracasso Beach on Península Valdés in Argentina, ground surveys were conducted weekly from February through April (González 2005). At Bahía San Antonio in Argentina, the surveys were ground-based counts conducted January to April, weekly through 1999, but varying from daily to every 10 days from 2000 to 2005 (González 2005). Counts at Lagoa do Peixe in Brazil were obtained during expeditions that covered the peak spring passage in April (Niles et al. 2008). Other observers noted 5,000 red knots at Lagoa do Peixe in April 2005 (Fedrizzi and Carlos in Lanctot 2009) suggesting that usage of this site had partially rebounded from lower numbers seen in the early 2000s.

Virginia

Aerial surveys of the entire chain of barrier island beaches in Virginia have been conducted since 1995 using consistent methods and observers. Although the number of surveys has varied from one to six per year, the aerial survey effort has consistently covered the peak period during the last week of May. Since 2007, Karpenty et al. (2012) have estimated total red knots based on ground counts at 100 to 150 randomly selected points throughout Virginia's barrier island beaches including peat banks, with each location visited from one to three times per stopover season. Although the recent ground surveys show an upward trend, the aerial counts have been relatively steady since the mid-1990s. Because of differences in methodology and timing, the two data sets are not comparable.

Because birds pass in and out of a stopover area, the peak count (the highest number of birds seen on a single day) for a particular year is lower than the total passage population (*i.e.*, the total number of birds that stopped at that site over the course of that migration season). Using re-sightings of marked birds, several attempts have been made to estimate the total passage population of Virginia through mathematical modeling.

Delaware Bay

Aerial surveys have been conducted in Delaware Bay since 1981. Methods and observers were consistent from 1986 to 2008. The methodology during this period involved weekly counts; thus, it was possible the absolute peak number of birds was missed in some years. However, since most shorebirds remain in Delaware Bay at least a week, it is likely that the true peak was captured in most years (Clark et al. 1993). The surveys covered consistent areas of New Jersey and Delaware from the first week of May to the second week of June. All flights were conducted 3 to 4 hours after high tide, a period when birds are usually feeding on the beaches (Clark et al. 2009).

Methodologies and observers changed several times from 2009 to 2012. Flights are now flown only during the end of May. In addition, aerial counts for 2010 and 2011 were adjusted with ground counts from Mispillion Harbor, Delaware, to more accurately reflect large concentrations of birds at this key site (Dey et al. 2011b). Further, problems in 2009 and 2012 prevented accurate aerial counts, and ground counts have been substituted. Caution should be used in comparing ground and aerial counts (Laursen et al. 2008). Differences between the two methods may account for markedly higher counts in 2009 and 2012. Although aerial counts had typically been higher than ground counts prior to 2009, this was likely because many areas that could be surveyed by air were inaccessible on the ground. Since 2009, ground survey crews have attempted to minimize the access problem by using boats in remote areas.

As with other stopover areas, it is impossible to separate population-wide trends from trends in usage of a particular spring site. Because birds pass in and out of a stopover area, the peak count for a particular year is lower than the total passage population. Thus, differences in the number of birds in Delaware Bay may reflect stopover patterns rather than (or in addition to) trends in the overall red knot population (Clark et al. 1993). Using re-sightings of marked birds, several attempts have been made to estimate the total passage population of Delaware Bay through mathematical modeling. However, the pattern and timing of these declines in Delaware Bay relative to Tierra del Fuego and other stopovers is suggestive of a decrease in the overall population. Comparing four different time periods, average red knot counts in Delaware Bay declined by approximately 70 percent from 1981 to 2012.

Other areas along the U.S. Atlantic Coast

Beginning in 2006, coordinated red knot surveys have been conducted from Florida to Delaware Bay during two consecutive days from May 20 to 24. This period is thought to represent the peak of the red knot migration. There has been variability in methods, observers and areas covered. From 2006 to 2010, there was no change in counts that could not be attributed to varying geographic survey coverage (Dey et al. 2011b); thus, we do not consider any apparent trends in these data before 2010. Because red knot numbers peak earlier in the Southeast than in the mid-Atlantic, the late-May coast-wide survey data likely reflect the movement of some birds north along the coast, and may miss other birds that depart for Canada from the Southeast along an interior (overland) route prior to the survey window. Thus, greater numbers of red knots may utilize southeastern stopovers than suggested by the data.

Fall stopover areas

Few regular surveys are conducted in fall because southbound red knots tend to be less concentrated than during winter or spring. No regular surveys are conducted in Hudson Bay or James Bay, Canada. However, aerial surveys of the Ontario coastlines of James Bay and Hudson Bay in the late 1970s produced totals of 7,000 to 10,000 red knots, with more recent surveys reporting 5,000 to 10,000 (Morrison and Harrington 1992). There were numerous reports of 100 to 1,300 red knots at James Bay (Ontario) in August 2011, and one report of nearly 4,000 birds in this area (eBird.org 2012). Based on intensive field work and analysis of re-sightings of marked birds, at least 7,200 red knots are estimated to have used the Mingan Islands Archipelago (Canada) in fall 2008 (Wilson et al. 2010; Service 2011a).

Using daily checklist data submitted by birdwatchers during fall migrations from 1976 to 1998 in southern Quebec, Canada, Aubry and Cotter (2001) found a statistically significant decline in sightings of red knots. In surveys of Eastern Canada (New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland), fall counts of red knots dropped 5.3 to 15.3 percent per year (depending on the statistical method used) from 1974 to 1991, with considerably greater decreases later in the study period; however, the findings were not statistically significant (Morrison et al. 1994). Analyzing more years from this same data set from 1974 to 1998, Morrison et al. (2001) found a statistically significant annual decrease of 17.6 percent.

Fall peak counts from International Shorebird Survey sites along the U.S. Atlantic coast ranged from 6,000 to 9,000 red knots during the mid- to late-1970s (Morrison and Harrington 1992). In a review of numbers and distribution of red knots on the Massachusetts coast during southward migration, Harrington et al. (2010a) found that overall red knot numbers increased from the late 1940s to the early 1970s, especially on the mainland (western Cape Cod Bay), with a smaller increase on outer Cape Cod. After 1975, counts declined significantly on the mainland, but increased significantly on outer Cape Cod (Harrington et al. 2010b). Evidence suggests that both the mainland and the Cape Cod areas were historically used by red knots having Argentina-Chile destinations, but that recently the Cape Cod locations have increasingly been used by red knots with wintering destinations in the Southeast U.S., thus, balancing out the declining numbers of red knots with Argentina-Chile wintering destinations (Harrington et al. 2010b). By 2008, peak counts of Argentina-Chile red knots in Massachusetts had fallen to about 1,000 birds, while birds from the Southeast group increased to about 800 (Harrington et al. 2010a).

No regular counts are currently conducted in Massachusetts, but flocks of over 100 knots are routinely reported from Monomoy National Wildlife Refuge (eBird.org 2012). About 1,500 red knots were present in Avalon on the coast of New Jersey in the fall of 2011 (Service 2011b). Also, on the coast of New Jersey, hundreds of red knots are regularly reported from North Brigantine and Stone Harbor, sometimes in flocks of over 500 (eBird.org 2012). Islands at the mouth of the Altamaha River, Georgia, support the only known late summer and fall staging site on the east coast of the U.S., attracting as many as 12,000 knots at one time (Schneider and Winn 2010).

The Caribbean islands may be an important refuge for migrating shorebirds during storms (Nebel 2011). Puerto Rico and some of the Lesser Antilles (*e.g.,* St. Croix in the U.S. Virgin Islands, Guadeloupe, Barbados, and Trinidad) are also used as fall stopover areas (Niles et al. 2010; eBird.org 2012), with birds occurring regularly, but in small numbers. In Guadeloupe, the red knot is an uncommon, but regular visitor during fall migration, typically in small groups of up to 3 birds, but as many as 16 have been observed in a flock. In Barbados, the red knot is a fairly regular fall transient in small numbers, usually occurring as single individuals and in small groups, but occasionally knots may occur in flocks of up to a dozen birds, and a group of 63 birds was recorded in 1951. Detailed records from 1950 to 1965 show an average of about 20 red knots per year in Barbados (Hutt and Hutt 1992). Flocks of up to a dozen red knots were reported from Trinidad each year from 2008 to 2011, with multiple sightings each fall (eBird.org 2012).

In late August 2012, 1,700 knots were observed in rice fields near Mana, French Guiana, and a large number of these birds had been marked in the Chile portion of Tierra del Fuego (Niles 2012b). Based on this survey and recent geolocator results, French Guiana is emerging as an important fall stopover area (Niles 2012b). Adjacent Suriname and Brazil are also used in the fall (Niles et al. 2010; Spaans 1978), but little information is available regarding the numbers of birds in these areas. In Suriname, a total of nearly 160 red knots were counted during two surveys conducted in late August of 1970 to 1973. Larger red knot numbers apparently do not occur in Suriname as the habitat is not ideal. In September 2007, the average peak count of red knots at Cajuais Bank in the Brazilian State of Ceará was 434 ± 95 (Carlos et al. 2010). During aerial surveys of Panama Bay in the fall of 1997, Watts (1998) documented a peak count of 2,460 red knots in September; the subspecies composition is unknown. Watts (1998) also reported that red knot counts in Panama were likely underestimated.

Summary

After a careful review of available survey data from areas regularly used by substantial numbers of red knots in spring, fall, and winter, the Service has determined that:

- For some areas, available data are insufficient to substantiate any conclusions regarding population trends over time.

- For other areas, there are apparent trends, but they are associated with relatively low confidence.
- For a few key areas, the consistency of geographic coverage, methodologies, and surveyors lead us to greater confidence in apparent trends. Those population data are summarized as follows:

Patagonia and Tierra del Fuego wintering region: There are declines through the 2000s, possibly stabilizing at a relatively low level since 2008, which are associated with higher confidence.
North-Central Brazil wintering region: There is an apparent decline when comparing surveys with similar methods, coverage, and observers in 1982 and 2011, which are associated with lower confidence due to the availability of only two data points, and the complexity of the shoreline that makes surveying difficult. Partial surveys in the winters of 2005 and 2007 suggest that any declines occurred after 2005.
Northwest Gulf of Mexico wintering region: There are insufficient data for trend analysis.
Southeast wintering region: There is an apparent decline on Florida's Gulf coast when comparing aerial surveys from 1980 to 1982, with similar surveys (using different surveyors) of approximately the same area from 2006 to 2010, which are associated with lower confidence because birds may have simply shifted elsewhere within this large wintering region. The two region-wide survey efforts to date (from the 2006 and 2011 piping plover surveys) are associated with lower confidence inherent in the methodology (red knots are not the focus of this survey), but do tend to support the perception that knots shift from state to state within this region among years. A long-term data set from Georgia, showing wide inter-annual fluctuations, also supports this perception. Data from the Caribbean are insufficient to infer any trends. Comparing ground surveys of Florida's Gulf coast in 1994 to aerial surveys of about this same area from 2006 to 2010, red knot counts were roughly the same over this time period.
South American spring stopover sites: There are apparent declines at three key stopover sites from the late 1990s through the mid-2000s, which are associated with moderate confidence because we have little information regarding the consistency of methodologies or surveyors and because no data are available after 2005.
Virginia barrier islands spring stopover area: There is no apparent trend based on aerial surveys since 1995, which is associated with high confidence. A newer data set based on ground surveys suggests an increase since 2007.
Delaware Bay spring stopover area: There is a highly variable data set showing possible declines in the 1990s, and more consistent and substantial declines through the mid-2000s, which are associated with high confidence during the core years of 1986 to 2008. Numbers may have stabilized from 2009 to 2012, but we have lower confidence in trends over this later period due to multiple shifts in methodology and surveyors.
Atlantic coast spring window survey: There is an apparent increase from 2010 to 2012, but it is associated with lower confidence because, despite improvements, methodology and geographic coverage are still stabilizing and because only 3 years of (relatively consistent) data are available.
Fall stopover areas: There are insufficient data for trend analysis in most areas. Since the 1970s, there were probable declines in some parts of eastern Canada and changes in red knot

usage of Massachusetts (mainland versus Cape Cod, proportion of birds bound for Southeast versus Argentina-Chile wintering destinations).

In conclusion, we have high confidence in two data sets from key red knot areas, Tierra del Fuego and Delaware Bay, showing declines over roughly the same period. Data sets associated with lower confidence from the Brazil wintering region and three South American spring stopovers also suggest declines roughly over this same timeframe. We conclude that the Virginia spring stopover was stable during this period (the 2000s). We do not conclude that the Southeast wintering region declined, due to the likelihood that knot usage shifted geographically within this region from year to year. Our analysis of the best available data concludes that an overall, sustained decline of red knot numbers occurred in the 2000s, and that red knot populations may have stabilized at a relatively low level in the last few years. Inferring long-term population trends from various national or regional datasets derived from volunteer shorebird surveys and other sources, Morrison et al. (2006) and Andres (2009) also concluded that red knot numbers declined, probably sharply, in recent decades.

Status and distribution

The red knot's range spans 40 states, 24 countries, and their administrative territories or regions extending from their breeding grounds in the Canadian Arctic to migration stopover areas along the Atlantic and Gulf coasts of North America, to wintering grounds throughout the southeastern U.S., the Gulf coast, and South America (reaching as far south as Tierra del Fuego at the southern tip of South America). In Delaware Bay and Tierra del Fuego, the era of modern surveys for the red knot and other shorebird species began in the early 1980s. Systematic red knot surveys of other areas began later, and for many portions of the knot's range, available survey data are patchy. Prior to the 1980s, numerous natural history accounts are available, but provide mainly qualitative or localized population estimates. Nonetheless, a consistent narrative emerges across many historical accounts that red knots were extremely abundant in the early 1800s, decreased sharply starting in the mid-1800s, and may have begun to recover by the mid-1900s. Most writers agree the cause of that historical decline was intensive sport and market hunting. It is unclear whether the red knot population fully recovered its historical numbers (Harrington 2001) following the period of unregulated hunting.

The current geographic distribution of the red knot has not changed relative to that recorded in historical writings with the notable exception of Delaware Bay (discussed in detail below). Several early writers reported that red knots breed in the Arctic and winter along the U.S. Gulf coast and in South America including Brazil and Tierra del Fuego (Audubon 1844; Mackay 1893; Shriner 1897; Eaton 1910; Forbush 1912; Ridgway 1919; Bent 1927; Hellmayr and Conover 1948; Lowery 1974). Bent (1927) included Jamaica and Barbados as part of the possible wintering range of red knots, and described knots as "rarely" wintering in parts of Louisiana and Florida. Hellmayr and Conover (1948) noted the use of the West Indies (Jamaica, Barbados, and Trinidad) during migration. Several writers described the red knot as occurring primarily along the coasts with relatively few sightings inland, but interior migration routes through the central U.S. were also known (Audubon 1844; Eaton 1910; Forbush 1912; Ridgway 1919; Bent 1927; Hellmayr and Conover 1948; Lowery 1974). As with the geographic distribution, a number of historical accounts suggest that the timing of the red knot's spring and fall migrations along the Atlantic coast was generally the same in the past as it is today (Wilson 1829; Roosevelt 1866; Stearns and Coues 1883; Giraud 1844; Mackay 1893; Dixon 1895 in Barnes and Truitt 1997; Shriner 1897; Forbush 1912; Bent 1927; Stone 1937; Urner and Storer 1949; Myers and Myers).

Although the large-scale geographic distribution of migration stopover habitats does not seem to have changed, some authors have noted regional changes in the patterns of red knot stopover habitat usage along the U.S. Atlantic coast. For example, based on a review of early literature, Cohen et al. (2008) suggest that red knots had a more extensive spring stopover range a century ago than now, with thousands of birds noted in Massachusetts, New York, New Jersey, and Virginia during the spring. Harrington et al. (2010a) found changes in the regional patterns of stopover habitat usage in Massachusetts, as well as a shift in the wintering destination of birds stopping in Massachusetts during fall migration.

Delaware Bay

Delaware Bay was not recognized as a major shorebird stopover area until the early 1980s, despite detailed shorebird studies (*e.g.*, Stone 1937; Urner and Storer 1949) in the South Jersey region (Clark et al. 1993; Clark in Farrell and Martin 1997; Botton et al. in Shuster et al. 2003; Clark et al. 2009). There were some early anecdotal reports involving horseshoe crabs, as summarized by Botton et al. (in Shuster et al. 2003). Wilson (1829) noted that ruddy turnstones in the bay fed "almost wholly on the eggs, or spawn, of the great king crab," but no similar accounts were made of red knots. Forbush (1912) noted that red knots "are fond of the spawn of the horsefoot crab, which, often in company with the Turnstone, they dig out of the sand…" Stone (1937) observed ruddy turnstones and black-bellied plovers regularly feeding on dead horseshoe crabs in Delaware Bay. Stone (1937) also mentions flights of ruddy turnstones across the Cape May Peninsula in the spring, as happens today when they go to roost at night along the Atlantic coastal marshes (Botton et al. in Shuster et al. 2003). Interestingly, no mention of horseshoe crab eggs as food is found in Stone's (1937) accounts of any shorebird in the Cape May area, or in the decade-long study by Urner and Storer (1949) and (Botton et al. in Shuster et al. 2003). During his early studies of horseshoe crabs in 1951, Shuster observed many shorebirds feeding along Delaware Bay beaches, including red knots. However, another 30 years elapsed before scientists began to study the shorebird/horseshoe crab relationship in detail, and documented the very large numbers of shorebirds using the bay as a stopover (Botton et al. in Shuster et al. 2003). Lack of earlier scientific documentation cannot be attributed to remoteness. Delaware Bay is located within a few hours' drive of millions of people, and university marine laboratories were established many years ago on both shores of the bay (Botton et al. in Shuster et al. 2003).

It is unclear if the large magnitude of the shorebird-horseshoe crab phenomenon was simply missed by science until 1981, or if the distribution of the red knot and other shorebird species changed over the period of the historical record. For much of the 20th century, this phenomenon in Delaware Bay may have been much reduced (relative to 1980s levels), and therefore, easier to miss, due to the occurrence of low points in the abundance of both shorebirds (caused by hunting) and horseshoe crabs (caused by intensive harvest) (Clark in Farrell and Martin 1997; Botton et al. in Shuster et al. 2003). Alternatively, it may be that the red knot did not make extensive use of Delaware Bay prior to its population decline a century ago. Under this scenario, red knots came to rely on Delaware Bay because their populations were recovering at the same time that Atlantic-side stopover habitats in the region were becoming developed and the shorelines stabilized (Cohen et al. 2008). We have no means to determine how long shorebirds have been reliant on horseshoe crab eggs in Delaware Bay (Botton et al. in Shuster et al. 2003) prior to the early 1980s.

The middle part of the 20th century coincided with the recovery of shorebird populations following the regulation of hunting (Bent 1927; Urner and Storer 1949), a low point in horseshoe crab abundance following a period of intensive harvest (Atlantic States Marine Fisheries Commission (ASMFC) 2009), and the large-scale development and stabilization of Atlantic coast beaches in the mid-Atlantic region (Nordstrom 2000; Nordstrom and Mauriello 2001). Any or all of these factors may have influenced the red knot’s use of, and reliance on, Delaware Bay as its primary Atlantic stopover site in spring.

Threats to Red Knots and Their Habitat

In this section, we provide an analysis of threats to red knots and their habitat in their migration and wintering range, with some specific references to their breeding range. Because we lack information on threats to red knots for many countries outside the U.S. (with a few exceptions), this analysis is mainly focused on threats to red knots within the continental U.S. portion of their migration and wintering range, unless otherwise noted.

Climate change

The natural history of Arctic-breeding shorebirds makes this group of species particularly vulnerable to global climate change (*e.g.,* Lindström and Agrell 1999; Piersma and Baker 2000; Zöckler and Lysenko 2000; Rehfisch and Crick 2003; Piersma and Lindström 2004; Meltofte et al. 2007). Relatively low genetic diversity, which is thought to be a consequence of survival through past climate-driven population bottlenecks, may put shorebirds at more risk from human-induced climate variation than other avian taxa (Meltofte et al. 2007); low genetic diversity may result in reduced adaptive capacity as well as increased risks when population sizes drop to low levels.

In the short term, red knots may benefit if warmer temperatures result in fewer years of delayed horseshoe crab spawning in Delaware Bay (Smith and Michaels 2006) or fewer occurrences of late snow melt in the breeding grounds (Meltofte et al. 2007). However, there are indications that changes in the abundance and quality of red knot prey are already under way (Jones et al. 2010; Escudero et al. 2012), and prey species face ongoing climate-related threats from warmer temperatures (Philippart et al. 2003; Rehfisch and Crick 2003; Fabry et al. 2008; Jones et al. 2010), ocean acidification (National Research Council (NRC) 2010), and possibly increased prevalence of disease and parasites (Ward and Lafferty 2004). In addition, red knots face imminent threats from loss of habitat caused by sea level rise (Titus 1990; Galbraith et al. 2002;

NRC 2010), and increasing asynchronies (‘‘mismatches’’) between the timing of their annual breeding, migration, and wintering cycles and the windows of peak food availability on which the birds depend (Baker et al. 2004; van Gils et al. 2005a; Meltofte et al. 2007; McGowan et al. 2011; Smith et al. 2011).

Several threats are related to the possibility of changing storm patterns. While variation in weather is a natural occurrence and is normally not considered a threat to the survival of a species, persistent changes in the frequency, intensity, or timing of storms at key locations where red knots congregate (*e.g.*, key stopover areas) can pose a threat. Storms impact migratory shorebirds like the red knot both directly and indirectly. Direct impacts include energetic costs from a longer migration route as birds avoid storms, blowing birds off course, and outright mortality (Niles et al. 2010). Indirect impacts include changes to habitat suitability, storm-induced asynchronies between migration stopover periods and the times of peak prey availability, and possible prompting of birds to take refuge in areas where shorebird hunting is still practiced (Dey et al. 2011a; Nebel 2011; Niles et al. 2012b).

With Arctic warming, vegetation conditions in the red knot’s breeding grounds are expected to change, causing the zone of nesting habitat to shift and perhaps contract, but this process may take decades to unfold (Kaplan et al. 2003; Meltofte et al. 2007; Feng et al. 2012). Ecological shifts in the Arctic may appear sooner. High uncertainty exists about when and how changing interactions among vegetation, predators, competitors, prey, parasites, and pathogens may affect the red knot, but the impacts are potentially profound (Ims and Fuglei 2005; Meltofte et al. 2007; Schmidt et al. 2012; Fraser et al. 2013).

Due to background rates of sea level rise and the naturally dynamic nature of coastal habitats, we conclude that red knots are adapted to moderate (although sometimes abrupt) rates of habitat change in their wintering and migration areas. However, rates of sea level rise are accelerating beyond those that have occurred over recent millennia. In most of the red knot’s nonbreeding range, shorelines are expected to undergo dramatic reconfigurations over the next century as a result of accelerating sea level rise. Extensive areas of marsh are likely to become inundated, which may reduce foraging and roosting habitats. Marshes may be able to establish farther inland, but the rate of new marsh formation (*e.g.*, intertidal sediment accumulation, development of hydric soils, colonization of marsh vegetation) may be slower than the rate of deterioration of existing marsh, particularly under higher sea level rise scenarios. The primary red knot foraging habitats (*i.e.*, intertidal flats and sandy beaches) will likely be locally or regionally inundated, but replacement habitats are likely to reform along the shoreline in its new position. However, if shorelines experience a decades-long period of high instability and landward migration, the formation rate of new beach habitats may be slower than the inundation rate of existing habitats. In addition, low-lying and narrow islands (*e.g.*, in the Caribbean and along the Gulf and Atlantic coasts) may disintegrate rather than migrate, representing a net loss of red knot habitat. Superimposed on these changes are widespread human attempts to stabilize the shoreline, which are known to exacerbate losses of intertidal habitats by blocking their landward migration. The cumulative loss of habitat across the nonbreeding range could affect the ability of red knots to complete their annual cycles, possibly affecting fitness and survival, and is thereby likely to negatively influence the long-term survival of the red knot.

In summary, climate change is expected to affect red knot fitness and, therefore, survival through direct and indirect effects on breeding and nonbreeding habitat, food availability, and timing of the birds' annual cycle. Ecosystem changes in the Arctic (*e.g.*, changes in predation patterns and pressures) may also reduce reproductive output. Together, these anticipated changes will likely negatively influence the long-term survival of the red knot.

Reduced food availability

Commercial harvest of horseshoe crabs has been implicated as a causal factor in the decline of the red knot populations in the 2000s, by decreasing the availability of horseshoe crab eggs in the Delaware Bay stopover (Niles et al. 2008). Due to harvest restrictions and other conservation actions, horseshoe crab populations showed some signs of recovery in the early 2000s, with apparent signs of red knot stabilization (survey counts, rates of weight gain) occurring a few years later (as might be expected due to biological lag times). Since about 2005, however, horseshoe crab population growth has stagnated for unknown reasons. Under the current management framework, the present horseshoe crab harvest is not considered a threat to the red knot. However, it is not yet known if the horseshoe crab egg resource will continue to adequately support red knot populations over the next 5 to 10 years. In addition, implementation of the current management framework could be impeded by insufficient funding.

The causal role of reduced Delaware Bay food supplies in driving red knot population declines shows the vulnerability of red knots to declines in the quality or quantity of their prey. This vulnerability has also been demonstrated in other *C. canutus* subspecies, although not to the severe extent experienced by the *rufa* subspecies. In addition to the fact that horseshoe crab population growth has stagnated, red knots now face several emerging threats to their food supplies throughout their nonbreeding range. These threats include: small prey sizes (from unknown causes) at two key wintering sites on Tierra del Fuego; warming water temperatures that may cause mollusk population declines and range contractions (including the likely loss of a key prey species from the Virginia spring stopover within the next decade); ocean acidification to which mollusks are particularly vulnerable; physical habitat changes from climate change affecting invertebrate communities; possibly increasing rates of mollusk diseases due to climate change; invasive marine species from ballast water and aquaculture; and the burial and crushing of invertebrate prey from sand placement and recreational activities. Although threats to food quality and quantity are widespread, red knots in localized areas have shown some adaptive capacity to switch prey when the preferred prey species became reduced (Musmeci et al. 2011; Escudero et al. 2012), suggesting some adaptive capacity to cope with this threat. Nonetheless, based on the combination of documented past impacts and a spectrum of ongoing and emerging threats, we conclude that reduced quality and quantity of food supplies is a threat to the *rufa* red knot at the subspecies level, and the threat is likely to continue into the future.

Asynchronies ("mismatches") in the red knot's annual cycle

The red knot's life history strategy makes this species inherently vulnerable to mismatches in timing between its annual cycle and those periods of optimal food and weather conditions upon which it depends. For unknown reasons, more red knots arrived late in Delaware Bay in the early 2000s, which is generally accepted as a key causative factor (along with reduced supplies of horseshoe crab eggs) behind red knot population declines that were observed over this same timeframe. Thus, the red knot's sensitivity to timing asynchronies has been demonstrated through a population-level response. Both adequate supplies of horseshoe crab eggs and high-quality foraging habitat in Delaware Bay, can serve to partially mitigate minor asynchronies at this key stopover site. However, the factors that caused delays in the spring migrations of red knots from Argentina and Chile are still unknown, and we have no information to indicate if this delay will reverse, persist, or intensify.

Superimposed on this existing threat of late arrivals in Delaware Bay are new threats of asynchronies emerging due to climate change. Climate change is likely to affect the reproductive timing of horseshoe crabs in Delaware Bay, mollusk prey species at other stopover sites, or both, possibly pushing the peak seasonal availability of food outside of the windows when red knots rely on them. In addition, both field studies and modeling have shown strong links between the red knot's reproductive output and conditions in the Arctic including insect abundance and snow cover. Climate change may also cause shifts in the period of optimal Arctic conditions relative to the time period when red knots currently breed.

The red knot's adaptive capacity to deal with numerous changes in the timing of resource availability across its geographic range is largely unknown. A few examples suggest some flexibility in migration strategies. However, available information suggests that the timing of the red knot's annual cycle is controlled at least partly by celestial and endogenous cues, while the reproductive seasons of prey species, including horseshoe crabs and mollusks, are largely driven by environmental cues such as water temperature. These differences between the timing cues of red knots and their prey suggest limitations on the adaptive capacity of red knots to deal with numerous changes in the timing of resource availability across their geographic range. Based on the combination of documented past impacts and a spectrum of ongoing and emerging threats, we conclude that asynchronies (mismatches between the timing of the red knot's annual cycles and the periods of favorable food and weather upon which it depends) are likely to cause deleterious subspecies-level effects.

Shoreline stabilization and coastal development

Much of the U.S. coast within the range of the red knot is already extensively developed. Direct loss of shorebird habitats occurred over the past century as substantial commercial and residential developments were constructed in and adjacent to ocean and estuarine beaches along the Atlantic and Gulf coasts. In addition, red knot habitat was also lost indirectly, as sediment supplies were reduced and stabilization structures were constructed to protect developed areas. Sea level rise and human activities within coastal watersheds can lead to long-term reductions in sediment supply to the coast. The damming of rivers, bulk-heading of highlands, and armoring of coastal bluffs have reduced erosion in natural source areas and consequently the sediment loads reaching coastal areas. Although it is difficult to quantify, the cumulative reduction in sediment supply from human activities may contribute substantially to the long-term shoreline erosion rate. Along coastlines subject to sediment deficits, the amount of sediment supplied to the coast is less than that lost to storms and coastal sinks (inlet channels, bays, and upland deposits), leading to long-term shoreline recession (Greene 2002; Herrington 2003; Morton 2003; Morton et al. 2004; Defeo et al. 2009; Climate Change Science Program [CCSP] 2009; Florida Oceans and Coastal Council 2010; Coastal Protection and Restoration Authority of Louisiana 2012).

In addition to reduced sediment supplies, other factors such as stabilized inlets, shoreline stabilization structures, and coastal development can exacerbate long-term erosion (Herrington 2003). Coastal development and shoreline stabilization can be mutually reinforcing. Coastal development often encourages shoreline stabilization because stabilization projects cost less than the value of the buildings and infrastructure. Conversely, shoreline stabilization sometimes encourages coastal development by making a previously high-risk area seem safer for development (CCSP 2009). Protection of developed areas is the driving force behind ongoing shoreline stabilization efforts. Large-scale shoreline stabilization projects became common in the past 100 years with the increasing availability of heavy machinery. Shoreline stabilization methods change in response to changing new technologies, coastal conditions, and preferences of residents, planners, and engineers. Along the Atlantic and Gulf coasts, an early preference for shore-perpendicular structures (*e.g.*, groins) was followed by a period of construction of shore-parallel structures (*e.g.*, seawalls), and then a period of beach renourishment, which is now favored (Nordstrom 2000; Morton et al. 2004).

The mid-Atlantic coast from New York to Virginia is the most urbanized shoreline in the country, except for parts of Florida and southern California. In New York and New Jersey, hard structures and beach renourishment programs cover much of the coastline. Farther south, there are more undeveloped and preserved sections of coast (Leatherman 1989). Along the entire Atlantic, most of the ocean coast is fully or partly developed, less than 10 percent is in conservation, and about one-third is undeveloped and still available for new development (Titus et al. 2009).

The U.S. southeastern coast from North Carolina to Florida is the least urbanized along the Atlantic coast, although both coasts of Florida are urbanizing rapidly. Texas has the most extensive sandy coastline in the Gulf, and much of the area is sparsely developed (Leatherman 1989). Region-wide, about 40 percent of the southeast and Gulf coast is already developed (Rice 2012; Service 2012a). Not all of the remaining 60 percent in the ‘‘undeveloped’’ category, however, is still available for development because about 43 percent (about 910 miles) of beaches across this region are considered preserved. Preserved beaches include those in public or nongovernmental conservation ownership and those under conservation easements.

Past and ongoing stabilization projects fundamentally alter the naturally dynamic coastal processes that create and maintain beach strand and bayside habitats, including those habitat components that red knots rely upon. Past loss of stopover and wintering habitat likely reduce the resilience of the red knot by making it more dependent on those habitats that remain, and more vulnerable to threats (*e.g.*, disturbance, predation, reduce quality or abundance of prey, increased intraspecific and interspecific competition) within those restricted habitats.

Hard structures

Hard structures constructed of stone, concrete, wood, steel, or geotextiles have been used for centuries as a coastal defense strategy (Defeo et al. 2009). The most common hard stabilization structures fall into two groups: structures that run parallel to the shoreline (*e.g.*, seawalls, revetments, bulkheads) and structures that run perpendicular to the shoreline (*e.g.*, groins, jetties). Groins are often clustered in groin fields, and are intended to protect a finite section of beach, while jetties are normally constructed at inlets to keep sand out of navigation channels and provide calm-water access to harbor facilities (Corps 2002). Descriptions of the different types of stabilization structures can be found in Corps (2002), Herrington (2003), and Rice (2009).

Prior to the 1950s, the general practice in the U.S. was to use hard structures to protect developments from beach erosion or storm damages (Corps 2002). The pace of constructing new hard stabilization structures has since slowed considerably (Corps 2002). Many states within the range of the red knot now discourage or restrict the construction of new, hard oceanfront protection structures, although the hardening of bayside shorelines is generally still allowed (Titus 2000; Greene 2002; Kana 2011). Most existing hard oceanfront structures continue to be maintained, and some new structures continue to be built. While some states have restricted new construction, hard structures are still among the alternatives in the Federal shore protection program (Corps 2002).

Hard shoreline stabilization projects are typically designed to protect property (and its human inhabitants) not beaches (Pilkey and Howard 1981; Kana 2011). Through effects on waves and currents, sediment transport rates, Aeolian (wind) processes, and sand exchanges with dunes and offshore bars, hard structures change the erosion/accretion dynamics of beaches and constrain the natural migration of shorelines (Nordstrom 2000; Scavia et al. 2002; Morton 2003; CCSP 2009; Defeo et al. 2009). There is ample evidence of accelerated erosion rates, pronounced breaks in shoreline orientation, and truncation of the beach profile down-drift of perpendicular structures, and of reduced beach widths (relative to unprotected segments) where parallel structures have been in place over long periods of time (Pilkey and Wright 1988; Nordstrom 2000; Scavia et al. 2002; Corps 2002; Morton 2003; CCSP 2009; Hafner 2012). In addition, marinas and port facilities built out from the shore can have effects similar to hard stabilization structures (Nordstrom 2000).

Structural development along the shoreline and manipulation of natural inlets upset the naturally dynamic coastal processes and result in loss or degradation of beach habitat (Melvin et al. 1991). As beaches narrow, the reduced habitat can directly lower the diversity and abundance of biota (life forms), especially in the upper intertidal zone. Shorebirds may be impacted both by reduced habitat area for roosting and foraging, and by declining intertidal prey resources, as has been documented in California (Dugan and Hubbard 2006; Defeo et al.

2009). In an estuary in England, Stillman et al. (2005) found that a 2 to 8 percent reduction in intertidal area (the magnitude expected through sea level rise and industrial developments including extensive stabilization structures) decreased the predicted survival rates of five out of nine shorebird species evaluated (although not of red knots). In Delaware Bay, hard structures also cause or accelerate loss of horseshoe crab spawning habitat (Botton et al. 1988; Botton et al. in Shuster et al. 2003; CCSP 2009), and shorebird habitat has been, and may continue to be, lost where bulkheads have been built (Clark in Farrell and Martin 1997). In addition to directly eliminating red knot habitat, hard structures interfere with the creation of new shorebird habitats by interrupting the natural processes of over-wash and inlet formation. Where hard stabilization is installed, the eventual loss of the beach and its associated habitats is virtually assured (Rice 2009) in the absence of beach renourishment, and therefore, may impact red knots as discussed below. Where they are maintained, hard structures are likely to significantly increase the amount of red knot habitat lost as sea levels continue to rise.

In a few isolated locations, however, hard structures may enhance red knot habitat, or may provide artificial habitat. In Delaware Bay, for example, Botton et al. (1994) found that creek mouths, jetties and other artificial obstructions can act to concentrate drifting horseshoe crab eggs and thereby attract shorebirds. Another example comes from the Delaware side of the bay, where a seawall and jetty at Mispillion Harbor protect the confluence of the Mispillion River and Cedar Creek. These structures create a low energy environment in the harbor, which seems to provide highly suitable conditions for horseshoe crab spawning over a wider variation of weather and sea conditions than anywhere else in the bay. Horseshoe crab egg densities at Mispillion Harbor are consistently an order of magnitude higher than at other bay beaches (Dey et al. 2011b), and this site consistently supports upwards of 15 to 20 percent of all red knots recorded in Delaware Bay (Lathrop 2005). In Florida, red knots have been observed on multiple instances using artificial structures such as docks, piers, jetties, causeways, and construction barriers. The Service does not have any information regarding the frequency, regularity, timing, or significance of this use of artificial habitats.

Mechanical sediment transport

Several types of sediment transport are employed to stabilize shorelines, protect development, maintain navigation channels, and provide for recreation (Corps 2002; Kana 2011; Gebert 2012). The effects of these projects are typically expected to be relatively short in duration, usually less than 10 years, but often these actions are carried out every few years in the same area, resulting in a more lasting impact on habitat suitability for shorebirds. Mechanical sediment transport practices include beach renourishment, sediment back-passing, sand scraping, and dredging.

Since the 1970s, 90 percent of the Federal appropriation for shore protection has been for beach renourishment (Corps 2002), which has become the preferred course of action to address shoreline erosion in the U.S. (Greene 2002; Morton and Miller 2005; Kana 2011). Beach renourishment requires an abundant source of sand that is compatible with the native beach material. The sand is trucked to the target beach or hydraulically pumped using dredges (Hafner 2012). Sand for beach renourishment operations can be obtained from dry land-based sources; estuaries, lagoons, or inlets on the backside of the beach; sandy shoals in inlets and navigation channels; near-shore ocean waters; or offshore ocean waters; with the last two being the most common sources (Greene 2002).

Where shorebird habitat has been severely reduced or eliminated by hard stabilization structures, beach renourishment may be the only means available to replace any habitat for as long as the hard structures are maintained (Nordstrom and Mauriello 2001), although such habitat will persist only with regular renourishment episodes (typically on the order of every 2 to 6 years). In Delaware Bay, beach renourishment has been recommended to prevent loss of spawning habitat for horseshoe crabs (ASMFC 1998; Carter et al. in Guilfoyle et al. 2007; Kalasz 2008), and is being pursued as a means of restoring shorebird habitat in Delaware Bay following Hurricane Sandy (Corps 2012; Niles et al. 2013). Beach renourishment was part of a 2009 project to maintain important shorebird foraging habitat at Mispillion Harbor, Delaware (Siok and Wilson 2011). However, red knots may be directly disturbed if beach renourishment takes place while the birds are present. On New Jersey's Atlantic coast, beach renourishment has typically been scheduled for the fall, when red knots are present, because of various constraints at other times of year. In addition to causing disturbance during construction, beach renourishment often increases recreational use of the widened beaches that, without careful management, can increase disturbance of red knots. Beach renourishment can also temporarily depress, and sometimes permanently alter, the invertebrate prey base on which shorebirds depend.

In addition to disturbing the birds and impacting the prey base, beach renourishment can affect the quality and quantity of red knot habitat (Greene 2002). The artificial beach created by renourishment may provide only suboptimal habitat for red knots, as a steeper beach profile is created when sand is stacked on the beach during the renourishment process. In some cases, renourishment is accompanied by the planting of dense beach grasses, which can directly degrade habitat, as red knots require sparse vegetation to avoid predation. By precluding over-wash and Aeolian transport, especially where large artificial dunes are constructed, beach renourishment can also lead to further erosion on the bayside and promote bayside vegetation growth, both of which can degrade the red knot's preferred foraging and roosting habitats (sparsely vegetated flats in or adjacent to intertidal areas). Preclusion of over-wash also impedes the formation of new red knot habitats. Beach renourishment can also encourage further development, bringing further habitat impacts, reducing future alternative management options such as a retreat from the coast, and perpetuating the developed and stabilized conditions that may ultimately lead to inundation where beaches are prevented from migrating (Greene 2002).

Following placement of sediments much coarser than those native to the beach, Peterson et al. (2006) found that the area of intertidal-shallow sub-tidal shorebird foraging habitat was reduced by 14 to 29 percent at a site in North Carolina. Presence of coarse shell material armored the substrate surface against shorebird probing, further reducing foraging habitat by 33 percent, and probably also inhibiting manipulation of prey when encountered by a bird's bill (Peterson et al. 2006). In addition to this physical change from adding coarse sediment, renourishment that places sediment dissimilar to the native beach also substantially increases impacts to the red knot's invertebrate prey base.

Sediment back-passing is a technique that reverses the natural migration of sediment by mechanically (via trucks) or hydraulically (via pipes) transporting sand from accreting, downdrift areas of the beach to eroding, up-drift areas of the beach (Chasten and Rosati 2010; Kana 2011). Currently, less prevalent than beach renourishment, sediment back-passing is an emerging practice because traditional renourishment methods are beginning to face constraints on budgets and sediment availability (Chase 2006; Hafner 2012). Beach bulldozing or scraping is the process of mechanically redistributing beach sand from the littoral zone (along the edge of the sea) to the upper beach to increase the size of the primary dune or to provide a source of sediment for beaches that have no existing dune; no new sediment is added to the system (Lindquist and Manning 2001; Greene 2002; Kana 2011). Beach scraping tends to be a localized practice. In Florida, beach scraping is usually used only in emergencies such as after hurricanes and other storms, but in New Jersey this practice is more routine in some areas. Many of the effects of sediment back-passing and beach scraping are similar to those for beach renourishment (Lindquist and Manning 2001; Service 2011c), including disturbance during and after construction, alteration of prey resources, reduced habitat area and quality, and precluded formation of new habitats. Relative to beach renourishment, sediment back-passing and beach scraping can involve considerably more driving of heavy trucks and other equipment on the beach including areas outside the sand placement footprint, potentially impacting shorebird prey resources over a larger area (Service 2011c). In addition, these practices can directly remove sand from red knot habitats, as is the case in one red knot concentration area in New Jersey (Service 2011c). Back-passing and sand scraping can involve routine episodes of sand removal or transport that maintain the beach in a narrower condition, indefinitely reducing the quantity of back-beach roosting habitat.

Sediments are also manipulated to maintain navigation channels. Many inlets in the U.S. range of the red knot are routinely dredged and sometimes relocated. In addition, near-shore areas are routinely dredged (‘‘mined’’) to obtain sand for beach renourishment. Regardless of the purpose, inlet and nearshore dredging can affect red knot habitats. Dredging often involves removal of sediment from sand bars, shoals, and inlets in the near-shore zone, directly impacting optimal red knot roosting and foraging habitats (Winn and Harrington in Guilfoyle et al. 2006; Harrington in Guilfoyle et al. 2007; Harrington 2008). These ephemeral habitats are even more valuable to red knots because they tend to receive less recreational use than the main beach strand. In addition to causing this direct habitat loss, the dredging of sand bars and shoals can preclude the creation and maintenance of red knot habitats by removing sand sources that would otherwise act as natural breakwaters and weld onto the shore over time (Morton 2003; Hayes and Michel 2008). Further, removing these sand features can cause or worsen localized erosion by altering depth contours and changing wave refraction (Hayes and Michel 2008), potentially degrading other nearby red knot habitats indirectly because inlet dynamics exert a strong influence on the adjacent shorelines. Studying barrier islands in Virginia and North Carolina, Fenster and Dolan (1996) found that inlet influences extend 3.4 to 8.1 mi (5.4 to 13.0 kilometer [km]), and that inlets dominate shoreline changes for up to 2.7 mi

(4.3 km). Changing the location of dominant channels at inlets can create profound alterations to the adjacent shoreline (Nordstrom 2000).

Wrack removal and beach cleaning

Wrack on beaches and baysides provides important foraging and roosting habitat for red knots and many other shorebirds on their winter, breeding, and migration grounds. Because shorebird numbers are positively correlated with wrack cover and biomass of their invertebrate prey that feed on wrack (Tarr and Tarr 1987; Dugan et al. 2003; Hubbard and Dugan 2003), beach grooming will lower bird numbers (Defeo et al. 2009).

There is increasing popularity along developed beaches in the Southeast, especially in Florida, for beach communities to carry out "beach cleaning" and "beach raking" actions. Beach cleaning occurs on private beaches, where red knot use is not well documented, and on some municipal or county beaches that are used by red knots. Most wrack removal on state and Federal lands is limited to post-storm cleanup and does not occur regularly.

Man-made beach cleaning and raking machines effectively remove seaweed, fish, glass, syringes, plastic, cans, cigarettes, shells, stone, wood, and virtually any unwanted debris (Barber Beach Cleaning Equipment 2009). These efforts remove accumulated wrack, topographic depressions, and sparse vegetation nodes used by roosting and foraging red knots. Removal of wrack also eliminates a beach's natural sand-trapping abilities, further destabilizing the beach. In addition, sand adhering to seaweed and trapped in the cracks and crevices of wrack is removed from the beach. Although the amount of sand lost due to single sweeping actions may be small, it adds up considerably over a period of years (Nordstrom et al. 2006; Neal et al. 2007). Beach cleaning or grooming can result in abnormally broad unvegetated zones that are inhospitable to dune formation or plant colonization, thereby enhancing the likelihood of erosion (Defeo et al. 2009).

The Service estimates that 240 of 825 miles (29 percent) of sandy beach shoreline in Florida are cleaned or raked on various schedules (*i.e.*, daily, weekly, monthly) (FDEP 2008). Service biologists estimate that South Carolina mechanically cleans approximately 34 of its 187 shoreline miles (18 percent), and Texas mechanically cleans approximately 20 of its 367 shoreline miles (5.4 percent). In Louisiana, beach raking occurs on Grand Isle (the state's only inhabited island) along approximately 8 miles of shoreline, roughly 2 percent of the state's 397 sandy shoreline miles.

Tilling beaches to reduce soil compaction, as sometimes required by the Service for sea turtle protection after beach renourishment activities, also has similar impacts. Recently, the Service improved sea turtle protection provisions in Florida; these provisions now require tilling, when needed, to be above the primary wrack line, not within it.

Invasive vegetation

A recently identified threat to red knot is the spread of coastal invasive plants into suitable red knot habitat. Like most invasive species, coastal exotic plants reproduce and spread quickly and exhibit dense growth habits, often outcompeting native plant species. If left uncontrolled, invasive plants cause a habitat shift from open or sparsely vegetated sand to dense vegetation, resulting in the loss or degradation of red knot roosting habitat, which is especially important during high tides and migration periods.

Beach vitex (*Vitex rotundifolia*) is a woody vine introduced into the southeastern U.S. as a dune stabilization and ornamental plant (Westbrooks and Madsen 2006). It currently occupies a very small percentage of its potential range in the U.S.; however, it is expected to grow well in coastal communities throughout the southeastern U.S. from Virginia to Florida, and west to Texas
(Westbrooks and Madsen 2006). In 2003, the plant was documented in New Hanover, Pender, and Onslow counties in North Carolina, and at 125 sites in Horry, Georgetown, and Charleston counties in South Carolina. Beach vitex has been documented from two locations in northwest Florida, but one site disappeared after erosional storm events. The landowner of the other site has indicated an intention to eradicate the plant, but follow through is unknown. The task forces formed in North and South Carolina in 2004 and 2005 have made great strides to remove this plant from their coasts. To date, about 200 sites in North Carolina have been treated, with 200 additional sites in need of treatment. Similar efforts are underway in South Carolina.

Unquantified amounts of crowfoot grass (*Dactyloctenium aegyptium*) grow invasively along portions of the Florida coastline. It forms thick bunches or mats that may change the vegetative structure of coastal plant communities and alter shorebird habitat. The Australian pine (*Casuarina equisetifolia*) also changes the vegetative structure of the coastal community in south Florida and islands within the Bahamas. Shorebirds prefer foraging in open areas where they are able to see potential predators, and tall trees provide good perches for avian predators. Australian pines potentially impact shorebirds, including the red knot, by reducing attractiveness of foraging habitat and/or increasing avian predation.

The propensity of these exotic species to spread, and their tenacity once established, make them a persistent threat, partially countered by increasing landowner awareness and willingness to undertake eradication activities.

Aquaculture and agriculture

In some localized areas within the red knot’s range, aquaculture or agricultural activities are impacting habitat quality and quantity. Those impacts, however, occur mainly in Canada, Brazil, Río Gallegos (southern Argentina), and Bahía Lomas (Chilean Tierra del Fuego). In the U.S., Luckenbach (2007) found that aquaculture of clams (*Mercenaria mercenaria*) in the lower Chesapeake Bay occurs in close proximity to shorebird foraging areas. The current distribution of clam aquaculture in the very low intertidal zone minimizes the amount of direct overlap with shorebird foraging habitats, but if clam aquaculture expands farther into the intertidal zone, more shorebird impacts (*e.g.,* habitat alteration) may occur. However, these Chesapeake Bay intertidal zones are not considered the primary habitat for red knots (Cohen et al. 2009), and red knots were not among the shorebirds observed in this study (Luckenbach 2007). Likewise, oyster aquaculture is practiced in Delaware Bay (New Jersey Department of Environmental Protection [NJDEP] 2011), but we have no information to indicate that this activity is affecting red knots.

Hunting

Since the late 19th century, hunters concerned about the future of wildlife and the outdoor tradition have made countless contributions to conservation. In many cases, managed hunting is an important tool for wildlife management. However, unregulated or illegal hunting can cause population declines, as was documented in the 1800s for red knots in the U.S. While no longer a concern in the U.S., under-regulated or illegal hunting of red knots and other shorebirds is ongoing in parts of the Caribbean and South America.

Scientific study

Considerable care is taken to minimize disturbance caused to shorebirds from these research activities. Numbers of birds per catch and total numbers caught over the season are limited, and careful handling protocols are followed, including a 3-hour limit on holding times (Niles et al. 2008; Niles et al. 2010). Despite these measures, hundreds of red knots are temporarily stressed during the course of annual research, and mortality, though rare, does occasionally occur (Taylor 1981). However, we conclude that these research activities are not a threat to the red knot because evaluations have shown no effects of these short-term stresses on red knot survival. Further, the rare, carefully documented, and properly permitted mortality of an individual bird in the course of well-founded research does not affect red knot populations or the overall subspecies.

Disease

Red knots are exposed to parasites and disease throughout their annual cycle. Susceptibility to disease may be higher when the energy demands of migration have weakened the immune system. Studying red knots in Delaware Bay in 2007, Buehler et al. (2010) found that several indices of immune function were lower in birds recovering protein after migration than in birds storing fat to fuel the next leg of the migration. These authors hypothesized that fueling birds may have an increased rate of infection or may be bolstering immune defense, or recovering birds may be immuno-compromised because of the physical strain of migratory flight or as a result of adaptive energy tradeoffs between immune function and migration, or both (Buehler et al. 2010). A number of known parasites (*e.g.,* sporozoans, hookworms, flatworms, and ectoparasites) and viruses (*e.g.,* avian influenza and avian paramyxovirus) have been documented in red knots, but we have no evidence that disease is a current threat to the red knot.

Predation

In wintering and migration areas, the most common predators of red knots are peregrine falcons (*Falco peregrinus*), harrier hawks (*Circus* spp.), accipiters (*Accipiter* spp.), merlins (*Falco columbarius*), short-eared owls (*Asio flammeus*), and greater black-backed gulls (*Larus marinus*) (Niles et al. 2008). In addition to greater black-backed gulls, other large gulls (*e.g.*, herring gulls [*Larus* spp.]) are anecdotally known to prey on shorebirds (Breese 2010). Predation by a great horned owl (*B. virginianus*) has been documented in Florida. Nearly all documented predation of wintering red knots in Florida has been by avian, not terrestrial, predators. However in migration areas like Delaware Bay, terrestrial predators such as red foxes (*V. vulpes*) and feral cats may be a threat to red knots by causing disturbance, but direct mortality from these predators may be low (Niles et al. 2008).

Raptor predation has been shown to be an important mortality factor for shorebirds at several sites (Piersma et al. 1993). However, Niles et al. (2008) concluded that increased raptor populations have not been shown to affect the size of shorebird populations. Based on studies of other red knot subspecies in the Dutch Wadden Sea, Piersma et al. (1993) concluded that the chance for an individual to be attacked and captured is small, as long as the birds remain in the open and in large flocks so that approaching raptors are likely to be detected. Although direct mortality from predation is generally considered relatively low in nonbreeding areas, predators also impact red knots by affecting habitat use and migration strategies (Stillman et al. 2005; Niles et al. 2008) and by causing disturbance, thereby potentially affecting red knots’ rates of feeding and weight gain.

In wintering and migration areas, predation is not directly impacting red knot populations despite some direct mortality. At key stopover sites, however, localized predation pressures are likely to exacerbate other threats to red knot populations, such as habitat loss, food shortages, and asynchronies between the birds’ stopover period and the occurrence of favorable food and weather conditions. Predation pressures worsen these threats by pushing red knots out of otherwise suitable foraging and roosting habitats, causing disturbance, and possibly causing changes to stopover duration or other aspects of the migration strategy.

Although little information is available from the breeding grounds, the long-tailed jaeger (*Stercorarius longicaudus*) is prominently mentioned as a predator of red knot chicks in most accounts. Other avian predators include parasitic jaeger (*S. parasiticus*), pomarine jaeger (*S. pomarinus*), herring gull, glaucous gull (*L. hyperboreus*), gyrfalcon (*F. rusticolus*), peregrine falcon, and snowy owl. Mammalian predators include arctic fox and sometimes arctic wolves (*Canis lupus arctos*) (COSEWIC 2007; Niles et al. 2008). Predation pressure on Arctic-nesting shorebird clutches varies widely regionally, inter-annually, and even within each nesting season, with nest losses to predators ranging from close to 0 percent to near 100 percent (Meltofte et al. 2007), depending on ecological factors. In the Arctic, 3-to 4-year lemming cycles give rise to similar cycles in the predation of shorebird nests. When lemmings are abundant, predators concentrate on the lemmings, and shorebirds breed successfully. When lemmings are in short supply, predators switch to shorebird eggs and chicks (Summers and

Underhill 1987; Blomqvist et al. 2002; Service 2003; COSEWIC 2007; Meltofte et al. 2007; Niles et al. 2008).

In addition to affecting reproductive output, these cyclic predation pressures have been shown to influence shorebird nesting chronology and distribution. Studying 12 shorebird species, including red knot, over 11 years at four sites in the eastern Canadian Arctic, Smith et al. (2010) found that both snow conditions and predator abundance have significant effects on the chronology of breeding. Higher predator abundance resulted in earlier nesting than would be predicted by snow cover alone (Smith et al. 2010). Based on the adaptations of various species to deal with predators, Larson (1960) concluded that the distribution and abundance of red knots and other Arctic-breeding shorebirds were strongly influenced by arctic fox and rodent cycles, such that birds were in low numbers or absent in areas without lemmings because foxes preyed predominately on birds in those areas (Fraser et al. 2013). Unsuccessful breeding seasons contributed to at least some of the observed reductions in the red knot population in the 2000s. However, rodent-predator cycles have always affected the productivity of Arctic-breeding shorebirds and have generally caused only minor year-to-year changes in otherwise stable populations (Niles et al. 2008).

We conclude that cyclic predation in the Arctic results in years with extremely low reproductive output, but this does not threaten the red knot. The cyclical nature of this predation on shorebirds is a situation that has probably occurred over many centuries, and under historic conditions likely had no lasting impact on red knot populations. Where and when rodent-predator cycles are operating, we expect red knot reproductive success will also be cyclic. However, these cycles are being interrupted for reasons that are not yet fully clear. The geographic extent and duration of future interruptions to the cycles cannot be forecasted, but may intensify as the arctic climate changes. Disruptions in the rodent-predator cycle pose a substantial threat to red knot populations, as they may result in prolonged periods of very low reproductive output. Superimposed on these potential cycle disruptions are warming temperatures and changing vegetative conditions in the Arctic, which are likely to bring about additional changes in the predation pressures faced by red knots on the breeding grounds.

Human disturbance

In some wintering and stopover areas, red knots and recreational users (*e.g.*, pedestrians, offroad vehicles, dog walkers, boaters) are concentrated on the same beaches (Niles et al. 2008; Tarr 2008). Recreational activities affect red knots both directly and indirectly. These activities can cause habitat damage (Anders and Leatherman 1987; Schlacher and Thompson 2008), cause shorebirds to abandon otherwise preferred habitats, negatively affect the birds' energy balances, and reduce the amount of available prey. In Florida, the most immediate and tangible threat to migrating and wintering red knots is chronic disturbance (Niles et al. 2006, 2008), which may affect the ability of birds to maintain adequate weights in some areas (Niles 2009).

Effects to red knots from vehicle and pedestrian disturbance can also occur during construction of shoreline stabilization projects including beach renourishment. Red knots can also be disturbed by motorized and non-motorized boats, fishing, kite surfing, aircraft, and research activities (Burger 1986; Meyer et al. 1999; Harrington 2005b; Peters and Otis 2007; Niles et al. 2008) and by beach raking. In Delaware Bay, red knots could also potentially be disturbed by hand-harvest of horseshoe crabs during the spring migration stopover period, but under the current management of this fishery, State waters from New Jersey to coastal Virginia are closed to horseshoe crab harvest and landing from January 1 to June 7 each year (ASMFC 2012); thus, disturbance from horseshoe crab harvest is no longer occurring. Active management can be effective at reducing and minimizing the adverse effects of recreational disturbance (Burger et al. 2004; Forys 2011), but such management is not occurring throughout the red knot's range.

Red knots are exposed to disturbance from recreational and other human activities throughout their nonbreeding range. Excessive disturbance has been shown to preclude shorebird use of otherwise preferred habitats and can impact energy budgets. Both of these effects are likely to exacerbate other threats to the red knot, such as habitat loss, reduced food availability, asynchronies in the annual cycle, and competition with gulls (such competition is greater in Delaware Bay when foraging on horseshoe crab eggs; in other areas, the two species' diets do not tend to overlap).

Harmful algal blooms

A harmful algal bloom (HAB) is the proliferation of a toxic or nuisance algal species (which can be microscopic or macroscopic, such as seaweed) that negatively affects natural resources or humans (Florida Fish and Wildlife Conservation Commission [FWC] 2011b). The primary groups of microscopic species that form HABs are flagellates (including dinoflagellates), diatoms, and blue green algae (which are actually cyanobacteria, rather than true algae). Of the approximately 85 HAB-forming species currently documented, almost all of them are plant-like microalgae that require light and carbon dioxide to produce their own food using chlorophyll (FWC 2011b). Blooms can appear green, brown, or red-orange, or may be colorless, depending upon the species blooming and environmental conditions. Although HABs are popularly called ''red tides,'' this name can be misleading, as it includes many blooms that discolor the water but cause no harm, while also excluding blooms of highly toxic cells that cause problems at low (and essentially invisible) concentrations (Woods Hole 2012). In this document, the term ''red tide'' refers only to blooms of the dinoflagellate *Karenia brevis*.

For shorebirds, shellfish are a key route of exposure to algal toxins. When toxic algae are filtered from the water as food by shellfish, their toxins accumulate in those shellfish to levels that can be lethal to animals that eat the shellfish (Anderson 2007). Several shellfish poisoning syndromes have been identified according to their symptoms. Those shellfish poisoning syndromes that occur prominently within the range of the red knot include: Amnesic Shellfish Poisoning, occurring in Atlantic Canada, caused by *Pseudo-nitzchia* spp.; Neurotoxic Shellfish Poisoning (also called ''red tide''), occurring on the U.S. coast from Texas to North Carolina, caused by *K. brevis* and other species; and Paralytic Shellfish Poisoning (PSP), occurring in Atlantic Canada, the U.S. coast in New England, Argentina, and Tierra del Fuego, caused by *Alexandrium* spp. and others (Food and Agriculture Organization of the United Nations [FAO] 2004; Woods Hole 2012). The highest levels of PSP toxins have been recorded in shellfish from Tierra del Fuego (International Atomic Energy Agency 2004), and high levels can persist in mollusks for months following a PSP bloom (FAO 2004). In Florida, the St. Johns, St. Lucie, and Caloosahatchee Rivers and estuaries have also been affected by persistent HABs of cyanobacteria (FWC 2011b).

Algal toxins may be a direct cause of death in seabirds and shorebirds via an acute or lethal exposure, or birds can be exposed to chronic, sub-lethal levels of a toxin over the course of an extended bloom. Sub-acute doses may contribute to mortality due to an impaired ability to forage productively, disrupted migration behavior, reduced nesting success, or increased vulnerability to predation, dehydration, disease, or injury (VanDeventer 2007). It is commonly believed that the primary risk to shorebirds during an HAB is via contamination of shellfish and other invertebrates that constitute their normal diet. Coquina clams and other items that shorebirds feed upon can accumulate marine toxins during HABs and may pose a risk to foraging shorebirds. In addition to consuming toxins via their normal prey items, shorebirds have been observed consuming dead fish killed by HABs (VanDeventer 2007). Brevetoxins were found both in the dead fish and in the livers of dead shorebirds that were collected from beaches and rehabilitation centers (VanDeventer et al. 2011). Although scavenging has not been documented in red knots, clams and other red knot prey species are among the organisms that accumulate algal toxins.

Sick or dying birds often seek shelter in dense vegetation; thus, those that succumb to HAB exposure are not often observed or documented. Birds that are debilitated or die in exposed areas are subject to predation or may be swept away in tidal areas. When extensive fish kills occur from HABs, the carcasses of smaller birds such as shorebirds may go undetected. Some areas affected by HABs are remote and rarely visited. Thus, mortality of shorebirds associated with HABs is likely underreported.

To date, direct impacts to red knots from HABs have been documented only in Texas, although a large die-off in Uruguay may have also been linked to an HAB. We conclude that some level of undocumented red knot mortality from HABs likely occurs most years, based on probable underreporting of shorebird mortalities from HABs and the direct exposure of red knots to algal toxins (particularly via contaminated prey) throughout the knot's nonbreeding range. We have no documented evidence that HABs were a driving factor in red knot population declines in the 2000s. However, HAB frequency and duration have increased and do not show signs of abating over the next few decades. Combined with other threats, ongoing and possibly increasing mortality from HABs may affect the red knot at the population level.

Environmental contaminants

Although red knots are exposed to a variety of contaminants across their nonbreeding range, we have no evidence that such exposure is impacting health, survival, or reproduction at the subspecies level. Exposure risks exist in localized red knot habitats in Canada, but best available data suggest shorebirds in Canada are not impacted by background levels of contamination. Levels of most metals in red knot feathers from the Delaware Bay have been somewhat high, but generally similar to levels reported from other studies of shorebirds. One preliminary study suggests organochlorines and trace metals are not elevated in Delaware Bay shorebirds, although this finding cannot be confirmed without updated testing. Levels of metals in horseshoe crabs are generally low in the Delaware Bay region and not likely impacting red knots or recovery of the crab population.

Horseshoe crab reproduction does not appear impacted by the mosquito control chemical methoprene (at least through the first juvenile molt) or by ambient water quality in mid-Atlantic estuaries. Shorebirds have been impacted by pesticide exposure, but use of the specific chemical that caused a piping plover death in Florida has subsequently been banned in the U.S. Exposure of shorebirds to agricultural pollutants in rice fields may occur regionally in parts of South America, but red knot usage of rice field habitats was low in the several countries surveyed. Finally, localized urban pollution has been shown to impact South American red knot habitats, but we are unaware of any documented health effects or population-level impacts. Thus, we conclude that environmental contaminants are not a threat to the red knot.

Oil spills

The red knot has the potential to be exposed to oil spills and leaks throughout its migration and wintering range. Oil, as well as spill response activities, can directly and indirectly affect both the bird and its habitat through several pathways. Red knots can be exposed to petroleum products via spills from shipping vessels, leaks or spills from offshore oil rigs or undersea pipelines, leaks or spills from onshore facilities such as petroleum refineries and petrochemical plants, and beach-stranded barrels and containers that can fall from moving cargo ships or offshore rigs. Several key red knot wintering or stopover areas also contain large-scale petroleum extraction, transportation, or both activities. With regard to potential effects on red knot habitats, the geographic location of a spill, weather conditions (*e.g.*, prevailing winds), and type of oil spilled are as important, if not more so, than the volume of the discharge.

Red knots are exposed to large-scale petroleum extraction and transportation operations in many key wintering and stopover habitats including Tierra del Fuego, Patagonia, the Gulf of Mexico, Delaware Bay, and the Gulf of St. Lawrence. To date, the documented effects to red knots from oil spills and leaks have been minimal; however, information regarding any oiling of red knots during the Deepwater Horizon spill has not yet been released. We conclude that high potential exists for small or medium spills to impact moderate numbers of red knots or their habitats, such that one or more such events is likely over the next few decades, based on the proximity of key red knot habitats to high-volume oil operations. Risk of a spill may decrease with improved spill contingency planning, infrastructure safety upgrades, and improved spill response and recovery methods. However, these decreases in risk (*e.g.*, per barrel extracted or transported) could be offset if the total volume of petroleum extraction and transport continues to grow. A major spill affecting habitats in a key red knot concentration area (*e.g.*, Tierra del Fuego, Gulf coasts of Florida or Texas, Delaware Bay, Mingan Archipelago) while knots are present is less likely, but would be expected to cause population-level impacts.

Wind energy development

Within the red knot's U.S. wintering and migration range, substantial development of offshore wind facilities is planned, and the number of wind turbines installed on land has increased considerably over the past decade. The rate of wind energy development will likely continue to increase into the future as the U.S. looks to decrease reliance on the traditional sources of energy (*e.g.*, fossil fuels). Wind turbines can have a direct (*e.g.*, collision mortality) and indirect (*e.g.*, migration disruption, displacement from habitat) impact on shorebirds. We have no information on wind energy development trends in other countries, but risks of red knot collisions would likely be similar wherever large numbers of turbines are constructed along migratory pathways, either on land or offshore.

We analyzed shorebird mortality at land-based wind turbines in the U.S., and we considered the red knot's vulnerability factors for collisions with offshore wind turbines that we expect will be built in the next few decades. Based on our analysis of wind energy development in the U.S., we expect ongoing improvements in turbine siting, design, and operation will help minimize bird collision hazards. However, we also expect cumulative avian collision mortality to increase through 2030 as the number of turbines continues to grow, and as wind energy development expands into coastal and offshore environments. Shorebirds as a group have constituted only a small percentage of collisions with U.S. turbines in studies conducted to date, but wind development along the coasts (where shorebirds might be at greater risk) did not begin until 2005.

We are not aware of any documented red knot mortalities at any wind turbines to date, but low levels of red knot mortality from turbine collisions may be occurring now based on the number of turbines along the red knot's migratory routes and the frequency with which red knots traverse these corridors. Based on the current number and geographic distribution of turbines, if any such mortality is occurring, it is likely not causing subspecies-level effects. However, as build-out of offshore, coastal, and inland wind energy infrastructure progresses, increasing mortality from turbine collisions may contribute to a subspecies-level effect due to the red knot's vulnerability to direct human-caused mortality. We anticipate that the threat to red knots from wind turbines will be primarily related to collision or behavioral changes during migratory or daily flights. Unless facilities are constructed at key stopover or wintering habitats, we do not expect wind energy development to cause significant direct habitat loss or degradation, or displacement of red knots from otherwise suitable habitats.

Threats summary

The Service has assessed the best scientific and commercial data available regarding past, present, and future threats to the red knot. The primary threats to the red knot are from habitat loss and degradation due to sea level rise, shoreline stabilization, and Arctic warming; and reduced food availability and asynchronies in the annual cycle. Other threats are moderate in comparison to the primary threats; however, cumulatively, they could become significant when working in concert with the primary threats if they further reduce the species' resiliency. Such secondary threats include hunting, predation, human disturbance, harmful algal blooms, oil spills, and wind energy development, all of which affect red knots across their range. Although conservation efforts (*e.g.,* management of the horseshoe crab population and regulatory mechanisms for the species and its habitat) are being implemented in many areas of the red knot's range and reduce some threats, significant risks to the subspecies remain.

ENVIRONMENTAL BASELINE

The sandy beaches of Anna Maria Island and Longboat Key are characteristic of low energy shorelines, having a relatively gentle, shallow offshore slope. Currently, narrow low dunes are generally present throughout the length of the islands, interrupted in some places by seawalls. Within the action area, the beach and vegetated dune habitat is limited in places due to the development of the shoreline and ongoing erosion. Beach and dune habitat varies in width, in part related to past renourishment projects. Coquina Beach Park, located in the City of Bradenton Beach at the south end of Anna Maria Island, has dune habitat ranging up to 250 feet in width. Beaches along the southern shoreline of the park are, in part, stabilized by the jetty on the north side of Longboat Pass. This 96-acre beach and park system includes areas for picnicking, grilling, bath houses with restroom facilities, a playground, lifeguard stations and recreation areas. North of the park, little or no dunes remain between the Gulf beaches and development, which mainly consists of private residences and beach resorts. On the north end of Longboat Key, Beer Can Island (now contiguous with Longboat Key) remains undeveloped, but has suffered intense erosion; about a quarter mile of Gulf beach remains. Further south within the action area, beach and dune widths range from near zero at armored shoreline protecting development to over 500 feet along portions of Whitney Beach. Aside from the extreme north end, the Longboat Key portion of the action area is bordered primarily by residential development (private homes, condominiums, or time shares).

Other projects on Anna Maria Island and Longboat Key overlap the Longboat Pass Project action area. All of the Anna Maria Island portion of the action area and much of the Longboat Key portion of the action area were renourished in 2014. Recent, ongoing, and anticipated future projects that occur within the action area were summarized by CBI (2015). These included the completed Coquina Beach Restoration Project (SAJ-2000-03874), the federal (Corps) Manatee County Beach Renourishment Project (125429), the ongoing Cortez Groins Replacement Project (SAJ-2013-01353), the North End Stabilization Structures (SAJ-2012-01018), and the Longboat Key (Island Wide) Renourishment Project (SAJ-2009-03350). An additional project, not referenced, is the West Coast Inland Navigation District's Longboat Pass Flood Shoal Project (SAJ-2011-02907).

On Anna Maria Island, the Cortez Groins Replacement Project (R-33 to R-36) is currently under construction and is anticipated to be completed by December 2015. The Coquina Beach Restoration Project (R-33 to R-40.5+220) and Manatee County Beach Renourishment Project (R-12 to R-36) were completed in 2014. The next federal Beach Renourishment Project on Anna Maria Island is expected to be constructed sometime between 2022 and 2024, barring storm impacts. The Longboat Key North End Stabilization Structures (R-42 to R-45), consisting of two semi-permeable groins, are complete, with sand being placed around the groins to provide additional stabilization. The Longboat Key Renourishment

Project will allow for renourishment of eroded areas as-needed along the length of the island through 2023. Longboat Pass Flood Shoal Project in 2014 deposited sand on Longboat Key from R-44 to R-48. Future work under this permit may deposit sand on both the southern beaches of Anna Maria Island (R-36 to R-41) and northern beaches of Longboat Key.

Status of the red knot within the action area

Red knots are typically most abundant in the action area from November through April, but are often present mid-July through early May. Summering birds are rarely encountered. Lack of regular historical surveys, apparent fluctuations in use by red knots from year to year, and inability at times to distinguish migrating birds (generally passing through July to October and March to May) from those that are over-wintering, make it difficult to estimate the number of red knots using the action area.

CBI (2015) summarized reports of red knots within the action area. They provided two occurrences from 2009 to 2015 between R-30 to R-41+305 on Anna Maria Island. Records available to the Service include two additional reports in that area since 2007. The highest reported count was 20 individuals. CBI also provided 20 occurrences of red knot since 2004 from R-43.5 to R-50.5 on Longboat Key. In 12 cases reports were of 50 individuals or more, with a high count of 432.

Sauers (2015) provided the Town with a summary of red knots and piping plover he encountered during bird surveys in 2005 to 2007, 2010, 2011, and 2014, in various seasons and over various reaches of the Longboat Key shoreline. Surveys were often conducted during the bird nesting season (spring and summer). Separately, Sauers reported a group of 538 red knots just south of the action area during a survey of all Longboat Key Gulf beaches conducted on February 10, 2015. Reports by Sauers and CBI indicate that the Whitney Beach area, centered at approximately R-46, has regularly supported high numbers of red knot. Dates when high numbers of red knots were reported suggest that while Longboat Key often supports relatively large numbers of wintering red knots, use by migratory knots (spring and fall) is more modest. Even in winter, there appears considerable variability in numbers of red knots from year to year and within year, from month to month.

Conservation significance

Estimates of the wintering red knot populations in the southeastern U.S. vary greatly (see Population Dynamics above). Recent sightings on Longboat Key suggest that, at least on occasion, 5 percent of the southeastern U.S. wintering population of the red knots may be present, many using the action area of the Longboat Pass Project. There is little indication that Longboat Key receives a significant influx or migratory red knots in spring or fall, or is an important stopover site for migrants. Unlike Longboat Key and northern portions Anna Maria Island, southern portions of the Anna Maria Island appear to support relatively few red knots. Reasons for the discrepancy are not obvious. Three of the four reports within the action area on Anna Maria Island were from winter.

Factors affecting the red knot within the action area

Gulf beaches of Anna Maria Island and Longboat Key within the action area are mostly developed with private residences and beach resorts, and, where not developed, support significant human recreation. Beach width and profile at any one location and time is dependent on past beach renourishment projects, localized rates of erosion or accretion, season, and recent storms.

Like beach width and profile, the extent and quality of red knot feeding and roosting habitat within the action area varies over location and time. Beach renourishment temporarily creates wider beaches seaward of existing development, often augmenting the extent of usable red knot habitat where the beach had been lost due to erosion. Beach renourishment projects can also degrade habitat by smothering benthic invertebrates upon which the red knots feed, altering the natural sediment composition, and adversely modifying the beach profile. The effects of beach renourishment projects to red knot habitat, both beneficial and detrimental, are typically temporary and relatively short in duration. However, if beach renourishment is carried out frequently in an area, impacts become intermittent and the cumulative impacts on red knot habitat over time are more substantial.

Within the action area, low elevations and proximity to the Gulf make red knot foraging and roosting habitats vulnerable to the effects of rising sea-level. Inundation of red knot habitat by rising seas can lead to permanent loss or modification of habitat waterward of structures, roads, and armored shoreline. Natural overwash and barrier island migration with sea-level rise are impeded by development, which prevents sand on Gulf-facing beaches from washing east over the island and to the bay side. Without additional sand, bayside flats and shorelines often used by red knots become increasingly submerged with rising sea levels.

Coastal development brings an increase in humans and sources of disturbance that may limit red knot use of beaches. Chronic disturbance has been singled out as the greatest threat to migrating and wintering red knots on the Gulf Coast of Florida (Niles et al. 2006). Within the action area on Anna Maria Island and Longboat Key, recreational use of beaches, beach raking or cleaning that occurs in some locations, and vehicle use contribute to disturbance that red knots face while feeding or roosting.

EFFECTS OF THE ACTION

This section is an analysis of the beneficial, direct, and indirect effects of the proposed actions on migrating and wintering red knots within the action area. The analysis includes effects of interrelated and interdependent activities. An interrelated activity is an activity that is part of a proposed action and depends on the proposed action. An interdependent activity is an activity that has no independent utility apart from the action.

Factors to be considered

The Longboat Pass Project may include dredging and beach renourishment events occurring year-round within habitat that is used by migrating and wintering red knots. Effects of the action may include: disturbance of feeding and roosting red knots in the construction area due to human and equipment presence, noise, vehicle movement, sand placement, contouring, and subsequent tilling as may be required under the 2015-SPBO; burying of intertidal benthic invertebrates resulting in loss of organisms on which the red knots feed; removal of wrack that red knots use for foraging and roosting; modification of beach habitat through changes to sediment composition and beach profile; and, increased recreational disturbance resulting from presence of enhanced, nourished beaches. These effects may hinder the ability of wintering red knots to recuperate from the migratory flight from their breeding grounds, survive through the winter, build fat reserves in preparation for migration back to the Arctic breeding grounds, and once there to reproduce successfully. Channel dredging may affect dynamics of Longboat Pass and adjacent beaches, including the formation of spits, shoals, and sandbars that could be used by the red knot.

Proximity of the action

Construction would occur within and adjacent to habitat used by red knots for foraging and roosting.

Distribution

Beach renourishment events and resulting impacts would occur on Gulf beaches of Anna Maria Island and Longboat Key. Dredging could affect development of shoals and sandbars associated with the flood and ebb tide deltas of Longboat Pass.

Timing

Beach renourishment activities could directly impact red knots at any time of year, with the possible exception of June when red knots are rarely present. Greatest potential for direct impacts would occur from project construction November through February when the maximum number of wintering red knots is usually present.

Nature of the effect

The effects of beach renourishment activities may change the feeding and roosting behavior of red knots in the action area; temporarily reduce foraging habitat; force them to seek alternate, potentially inferior habitat; and, diminish their fitness, affecting survival and fecundity.

Duration

Individual beach renourishment events are expected to take from up to 3 to 5 months to complete. While some direct effects from construction would be of relatively short duration, recovery of the intertidal benthic invertebrate community typically takes 6 months to 2 years to recover (Peterson *et al.* 2006). Changes in habitat, including sediment composition and beach profile, in some instances may last for years, potentially impacting red knots over multiple migration and wintering seasons.

Disturbance frequency

Over the proposed 15-year permit for the Longboat Pass Project, the Anna Maria Island and Longboat Key shoreline may be subject to multiple beach renourishment events. Dredging is expected to occur every 4 to 8 years. Other projects, including the Longboat Pass Flood Shoal Project, could place material on the same beaches. Since effects of a single event may last multiple years, some reaches could experience impacts from repeated disturbance over a significant portion of the permit life.

Disturbance intensity and severity

Intensity and severity of disturbance will be dependent on the number, location, and extent of renourishment events within the action area over time. Some beach renourishment events may be limited to highly eroded beaches that support less than optimal feeding or roosting habitat. Since red knots are considered fairly mobile when wintering and more so when migrating, availability of quality alternative habitat on undisturbed shorelines within or outside of the action area may be significant. Conservation measures have been incorporated into the project to minimize impacts and monitor red knot use of the action area.

Analyses for effects of the action

Beneficial effects

Beneficial effects are wholly positive without any adverse effects. The Longboat Pass Project is designed to use compatible sand to widen eroding beaches, which at times will provide more roosting habitat for the red knot. Deposited sand will be reworked and redistributed through wind and wave action, and storm events. Natural processes working on the added sand may serve to maintain or enhance habitat features suitable for the red knot.

Direct effects

Direct effects are those direct or immediate effects of a project on the species or its habitat. Implementation of the Longboat Pass Project is not likely to directly kill red knots since the birds are highly mobile and can quickly move from areas of construction. Heavy machinery and equipment operating within the action area, potential placement of the dredge pipeline along the shoreline, sand placement, and subsequent grading and tilling may directly affect migrating and wintering red knots in the action area through disruption of foraging and roosting. The proposed permit would allow for multiple beach renourishment events. Construction windows may extend through one red knot wintering season and one or more migration seasons. While a renourishment event may last up to 5 months, any one location will see active sand placement and grading for a shorter duration.

Sand placement will result in burial and suffocation of intertidal benthic invertebrate prey of the red knot and loss of wrack. Time frames projected for benthic invertebrate recruitment and re-establishment following sand placement are from 6 months to 2 years, assuming sand used for renourishment and the resulting beach profile is supportive of benthic invertebrates. Wrack will be restored over time as it is deposited on the beach by tides and wave action.

Disturbance and habitat alteration from construction activities may result in increased energy expenditure by red knots and reduced food availability. This in turn can contribute to decreased fitness, decreased survival rates, and decreased fecundity in the following breeding season.

Indirect effects

Indirect effects are those that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Beach renourishment restores eroded beaches, making them increasingly attractive for human recreation. Recreational uses including swimming, sports activities, sunbathing, picnicking, and walking may adversely affect the red knot through disturbance. In Florida, the most immediate and tangible threat to migrating and wintering red knots is likely chronic disturbance while feeding and resting. Long-term effects could include decrease in red knot use of desirable habitat due to increased human disturbance (Niles et al. 2006). Conservation measures proposed by the County and Town, including education regarding effects of disturbance on shorebirds, will help to reduce impacts of human disturbance. There is potential for channel dredging and renourishment to affect inlet and shoreline dynamics, though it appears uncertain whether significant positive or negative effects to red knot habitat would occur.

Species response to the proposed action

The proposed project will occur in habitat used by migrating and wintering red knots almost year-round. Construction is likely to occur when red knots are utilizing these beaches. During construction work red knots are likely to avoid or be flushed from foraging and roosting habitat. Habitat impacts resulting from beach renourishment may discourage red knots from using nourished beaches until food resources return. Increased human recreational use of nourished beaches may disturb red knots and discourage their use of otherwise favorable habitat.

It is unknown how far migrating and wintering red knots may be displaced due to disturbance or reduced food resources. Variability of red knot presence on Anna Maria Island and Longboat Key from year to year and within the winter season suggests use of alternate sites by wintering birds. Beyond the action area, the Gulf beaches further north on Anna Maria Island and further south on Longboat Key are regularly used by red knots. However, these beaches may also be impacted at times by beach renourishment projects and human recreational disturbance, or may otherwise provide less than favorable habitat. Bayside locations may also provide alternative habitat, including feeding habitat at low tides on intertidal flats. Migrating red knots passing south or north along the Gulf Coast may continue through the project area and choose alternate locations to feed or rest.

Cumulative effects

Cumulative effects include the effects of State, tribal, local, or private actions that are reasonably certain to occur in the action area. The Anna Maria Island and Longboat Key coastline is already extensively developed; however, it is reasonable to expect continued private development and redevelopment along these beaches. Given the available information concerning the effects of global climate change and the rate of sea level rise, it is reasonable to expect more frequent beach renourishment and shoreline stabilization projects along developed shorelines present in the action area. While some may have no federal nexus, we have identified no specific actions that meet the cumulative effects criteria.

CONCLUSION

The survival and recovery of the red knot is fundamentally dependent on the continued availability of sufficient appropriate habitat in their coastal migration and wintering ranges, where the species spends more than two-thirds of its annual cycle. The approximately 3.4 miles of Gulf beaches within the action area represent a small fraction (much less than 1 percent) of migratory and wintering habitat used by the red knot. Implementation of the Longboat Pass Project is not likely to directly kill any red knots since they are highly mobile and can move out of harm’s way. Construction disturbance would alter normal red knot foraging and roosting behavior and result in increased energy expenditure by individuals at or near active construction areas. Most effects (both beneficial and detrimental) to migrating and wintering red knot habitat would be temporary and would affect only a portion of the action area at any one time during the course of the 15-year permit. Both construction disturbance, the temporary reduction of red knot feeding and roosting habitat (including the elimination of wrack), may affect survival, fitness, and fecundity of some red knots. Some wintering red knots will likely be displaced by disturbance or choose to relocate due to reduced food resources following renourishment events. Red knots may seek out alternate coastal habitat within, near, or far from the action area. Increased human recreational use and accompanying disturbance may follow renourishment events. Conservation measures pursued by the County and by the Town will help reduce the potential impacts of the Longboat Pass Project to red knot populations, especially those impacts attributable to human disturbance. After reviewing the environmental baseline for the action area, the effects of the project, and the cumulative effects, it is the Service’s Biological Opinion that implementation of the Longboat Pass Project, as proposed, is not likely to significantly affect the survival and recovery of the red knot and will, therefore, not jeopardize the continued existence of the species.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the T&Cs of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the T&Cs, or (2) fails to adhere to the T&Cs of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps or applicant must report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Amount or extent of take

Disturbance to the red knot resulting from construction and associated impacts to habitat will affect the ability of an undetermined number of red knots to find suitable foraging and roosting habitat during any given time over the life of the permit and potentially for some time thereafter. It is difficult for the Service to predict the number of red knots what would be migrating through or wintering in the action area at any particular time. The frequency or of beach renourishment that will occur at any one location under the proposed 15-year permit is also difficult to predict.

Incidental take of red knots will be difficult to detect for the following reasons:

1. The number of red knots present within the action area and that may be impacted by the project will be difficult to assess. Wintering red knot numbers vary from year to year and within years. Migrating red knot numbers are difficult to monitor since their presence is transitory and their occurrence overlaps with that of wintering birds, from which they cannot generally be differentiated.

2. Over-wintering survival will be difficult to determine because it is difficult to detect birds that do not survive. During winter, movements of red knots present likely take them well beyond the action area. Dead birds may be carried away by predators. If a carcass is found, cause of mortality may be difficult to determine. Survival rates could be impacted by a number of non-project related factors.

3. Harassment to the level of harm may only be apparent away from the action area, in migration or on the breeding grounds as lowered survival, or resulting in reduced fitness and fecundity. All would be difficult to detect because of our inability to track individual birds from their wintering grounds to their breeding grounds.

The Service anticipates that directly or indirectly an unspecified number of red knots will be taken in the form of harm or harassment as the result of the proposed action because:

1. Red knots are known to migrate through and winter in the action area.

2. The placement of sand and associated actions will disturb red knots that are present and will temporarily degrade up to approximately 3.4 miles of red knot feeding and roosting habitat over multiple migrating and wintering seasons, until all beach renourishment is complete and until intertidal benthic invertebrate populations recover.

3. Disturbance (harassment), and loss and degradation of foraging and roosting habitat, will result in decreased fitness and survival (injury via habitat modification) of migrating or wintering red knots during the non-breeding season.

4. Disturbance, and loss and degradation of foraging and roosting habitat will result in decreased fitness, survival, and fecundity of red knots during the subsequent Arctic breeding season.

The following surrogate for take of red knots can be utilized because disturbance, and degradation of suitable habitat on Gulf beaches of Anna Maria Island and Longboat Key would affect the ability of an unknown number of red knots to find foraging and roosting habitat throughout the migrating and wintering periods for the duration of Longboat Pass Project and until intertidal benthic invertebrate populations recover. The Service anticipates that, directly and indirectly, red knots using approximately 3.4 miles of Gulf beaches on Anna Maria Island and Longboat Key will be taken in the form of harm or harassment as a result of the proposed action.

Effect of Take

In the accompanying Biological Opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the red knot.

REASONABLE AND PRUDENT MEASURES

The Service believes the following RPMs are necessary and appropriate to monitor and minimize take of red knots during implementation of the Longboat Pass Project. Note that some RPMs and implementing T&Cs that follow may be similar or identical to those in the 2015-SPBO or the P^{3}BO.

1. Conservation measures agreed to by the County and Town shall be implemented as part of the Longboat Pass Project.

2. All derelict material or other debris shall be removed from the beach prior to any sand placement.

3. All sand placed on the beach or in the nearshore shall be compatible with the existing beach and will maintain the general character and functionality of the existing beach.

4. Measures shall be taken on and near the site of active beach renourishment events to protect red knots and their habitats from construction activities.

5. A meeting or conference call among appropriate agencies and parties shall be held prior to initiation of construction for any beach renourishment events authorized by this permit.

6. For one year prior and two years following a renourishment event, red knot and all other shorebird occurrence will be monitored in the relevant portion of the action area and summarized annually in the form of a report to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps shall comply with the following T&Cs, which implement the RPMs, described above and outline reporting/monitoring requirements. These T&Cs are nondiscretionary.

1. Conservation measures cited by the County in CBI’s June 1, 2015, submittal and in the Town’s May 12, 2015, “Conservation Measures for Shorebirds” document shall be implemented as stated, unless revised by the RPMs and Terms and Conditions below. These measures shall be incorporated as a requirement of any permit issued by the Corps for the Longboat Pass Project.

2. Monitoring and reporting of non-breeding shorebirds proposed as conservation measures by the County and Town will be consistent with protocols and data sheet formats developed for the FWC non-breeding shorebird database and will be provided to the Service annually by July 31 (to JAXREGS@fws.gov). Once online entry is available, all shorebird survey data will also be entered to the FWC on line database by the applicants.

3. All derelict concrete, metal, and coastal armoring geotextile material, and other debris shall be removed from the beach to the maximum extent possible prior to any sand placement.

4. Beach-compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that

maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection Rule 62B-412.007(2)(j).. If a variance is requested from FDEP, the Service must be contacted to discuss whether the variance is acceptable. A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

5. Red knot habitat adjacent to or outside of construction areas shall be avoided to the maximum extent practicable when staging and storing equipment, establishing access and travel corridors, and aligning pipeline.

6. Driving on the beach for construction shall be limited to the minimum necessary and, if outside the immediate beach renourishment area (for example where beach access must be located away from the active beach renourishment site), shall be within designated travel corridors established just above or just below the primary wrack line.

7. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for project construction, to minimize the potential for attracting predators of red knots and other shorebirds. Workers shall be briefed on the importance of not littering and keeping the action area trash and debris free.

8. A meeting between representatives of the Service, FWC, Corps, County and/or Town, contractor, the permitted shorebird surveyor, and other species surveyors as appropriate, shall be held prior to the commencement of construction for beach renourishment events authorized by this permit. A conference call may be held instead of a meeting if agreed to by all parties. Notification of the meeting shall occur at least 10 business days prior to its occurrence. At the meeting the County and/or Town shall confirm: 1) the project location (including the FDEP Range Monuments and latitude and longitude coordinates); 2) project details including linear feet of beach that will be affected, actual fill template, and access routes; 3) anticipated date of commencement and anticipated duration of construction; and, 4) names and qualifications of personnel involved in shorebird surveys.

9. In addition to T&C 2. above, for one year prior and two years following a renourishment event, red knot and all other shorebird occurrence will be monitored in the relevant portion of the action area and summarized in the form of a report to the Service. The County or Town (depending on the renourishment location) shall submit (to JAXREGS@fws.gov), by July 31 of each year (or by another date agreed to by the Service), a report for previous non-breeding shorebird season (through May 15) that that is specific to the action area. The report shall include shorebird survey data for the action area, and discuss the location of any identified feeding or roosting area of importance and any significant sources of disturbance to red knots or other shorebirds that was observed. A final report covering the second year of post-construction shorebird monitoring shall address any discernable trends in pre-construction, during construction, and post-construction beach use by feeding and roosting red knots; any apparent effects attributable to the beach nourishment event; and any conclusions reached regarding red knot distribution and abundance in the action area.

10. Upon locating injured, sick, or dead red knot, initial notification should be made to FWC Wildlife Alert at 1-888-404-FWCC (3922) and the Service's North Florida Ecological Services Field Office at 904-731-3336. Care shall be taken in handling injured red knots to ensure effective treatment or care, and in handling dead specimens to preserve biological materials in the best possible state for potential analysis into cause of death.

COORDINATION OF INCIDENTAL TAKE STATEMENT WITH THE MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act (MBTA), as amended (16 U.S.C. 703 et. seq.) implements various treaties and conventions between the U.S., Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the provisions of the MBTA, it is unlawful "by any means or manner to pursue, hunt, take, capture or kill any migratory bird except as permitted by regulations issued by the Service. The term "take" is not defined in the MBTA, but the Service has defined it by regulation to mean to pursue, hunt, shoot, wound, kill, trap, capture or collect any migratory bird, or any part, nest or egg or any migratory bird covered by the conventions or to attempt those activities.

All sand placement events have the potential to impact nesting shorebirds protected under the MBTA (16 U.S.C. 701 et seq.). In order to comply with the MBTA and address the potential for the project to impact nesting shorebirds, the Town shall comply with the FWC standard shorebird protection guidelines to protect against impacts to nesting shorebirds during implementation of the project.

The Service will not refer the incidental take of red knots associated with this Project for prosecution under the MBTA, as amended (16 U.S.C. 703-712), if such take is in compliance with the Terms and Conditions specified here.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The Corps, in conjunction with Manatee County, the Town of Longboat Key, and the West Coast Inland Navigation District, should coordinate renourishment of beaches near Longboat Pass to minimize frequency of renourishment events on any one beach.

2. The Corps should work with the Service to improve monitoring and reporting compliance on beach renourishment projects.

3. The Corps should work with the Service, FWC, local partners, and applicants to reduce human disturbance to red knots (e.g., placing symbolic fencing around important feeding or roosting areas, arranging for bird stewards where high human use and important feeding or roosting habitat overlaps, encouraging enactment and enforcement of dog regulations, providing outreach materials regarding red knots and beach habitat, erecting appropriate signage at beach access points).

4. The Corps should work with the Service and the FWC to develop best management practices for beach renourishment projects to benefit the red knot, piping plover, and other declining shorebird species. Where appropriate, projects could include the creation of habitat features such as ephemeral tide pools, irregular shorelines, and extended intertidal flats to enhance feeding and roosting habitats. Such features would prove most beneficial if provided near inlets and passes.

5. The Corps should discourage dredging of sand spits, submerged and emergent shoals, and sandbars whenever possible to maintain natural inlet and beach dynamics that support shorebird habitat. These features provide excellent foraging and roosting habitat for migrating and wintering red knots

6. The Corps should support scientific study of the effects of beach renourishment on intertidal benthic invertebrate prey upon which the red knot depends.

In order for the Service to keep informed of actions minimizing or avoiding adverse effects, or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if:

1. The amount or extent of incidental take is exceeded;

2. New information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Biological Opinion;

3. The agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Biological Opinion; or,

4. A new species is listed or critical habitat designated that may be affected by the action.

In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation in the effort to protect fish and wildlife resources. Should you have questions regarding this Biological Opinion or require clarification, please contact Peter Plage at 904-371-3085 or peter_plage@fws.gov.

Sincerely,

Heath

for Jay B. Herrington
Field Supervisor

cc: Corps, Tampa (M. Peterson)
FWS, Vero Beach (J. Howe)
FWS, Tallahassee Florida (J. Ziewitz)
FWC, Lakeland (N. Douglas)

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Appendix A

Town Of Longboat Key, FL
Beach Renourishment

Proposed Conservation Measures for Shorebirds

Town Of Longboat Key, FL
Beach Renourishment

Proposed Conservation Measures for Shorebirds

Prepared for:
Town of Longboat Key

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12 May 2015

This document describes Conservation Measures proposed by the Town of Longboat Key to protect nesting, migratory, and over-wintering shorebirds along the Gulf of Mexico shoreline. The Town currently manages 10 miles of beaches along the Gulf (**Figure 1**), and as such holds or is seeking several different permits for beach nourishment projects along various segments of the island. Most notably, the Town holds FDEP Joint Coastal Permit 0296464-006 and USACE Permit SAJ-2009-03350 (IP-MEP)[1]. Longboat Key supports two federally-threatened non-breeding species, the piping plover (*Charadrius melodus*) and rufa red knot (*Calidris canuta* rufa), as well as several species of state-listed nesting shorebirds including snowy plover (*Charadrius nivosus*), least terns (*Sterna antillarum*), black skimmers (*Rynchops niger*), and numerous other species of terns. Red knots are found in Florida year round, but most frequently documented between November and May. The piping plover wintering and migration season is between July 15 and May 15.

In support of the Town's overall beach management plan and to develop information to improve the protection of the o federally-listed piping plover and red knot, ,, the Town has developed a set of proposed Conservation Measures. It is important to recognize that shorebird habitat on Longboat Key is protected by the Town's existing rules and regulations which prohibit pets, campfires, and recreational motorized vehicle operation on the beach. These existing

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[1] As of April 2015, the master permit is currently being reviewed for modification to allow for the nourishment of the central and southern segments of the island via upland truck-hauled sand sources. For these modifications, and the addition of the USFWS listing of the Rufa Red Knot as a Threatened species, reconsultation with the USFWS has been reinitiated for the master permit.

regulations currently provide habitat protection and reduce disturbance to shorebirds on the Town's beaches.

Figure 1 depicts the project area and the extended affected areas around Longboat Pass and New Pass. The affected area includes the sandy shorelines along the length of the island from the Gulf of Mexico Drive (S.R. 789) bridge east of R-42 in Manatee County to the terminal groin at New Pass south of R-29 in Sarasota County. In the cross shore, the affected area generally extends from the low-water line landward to the edge of development.

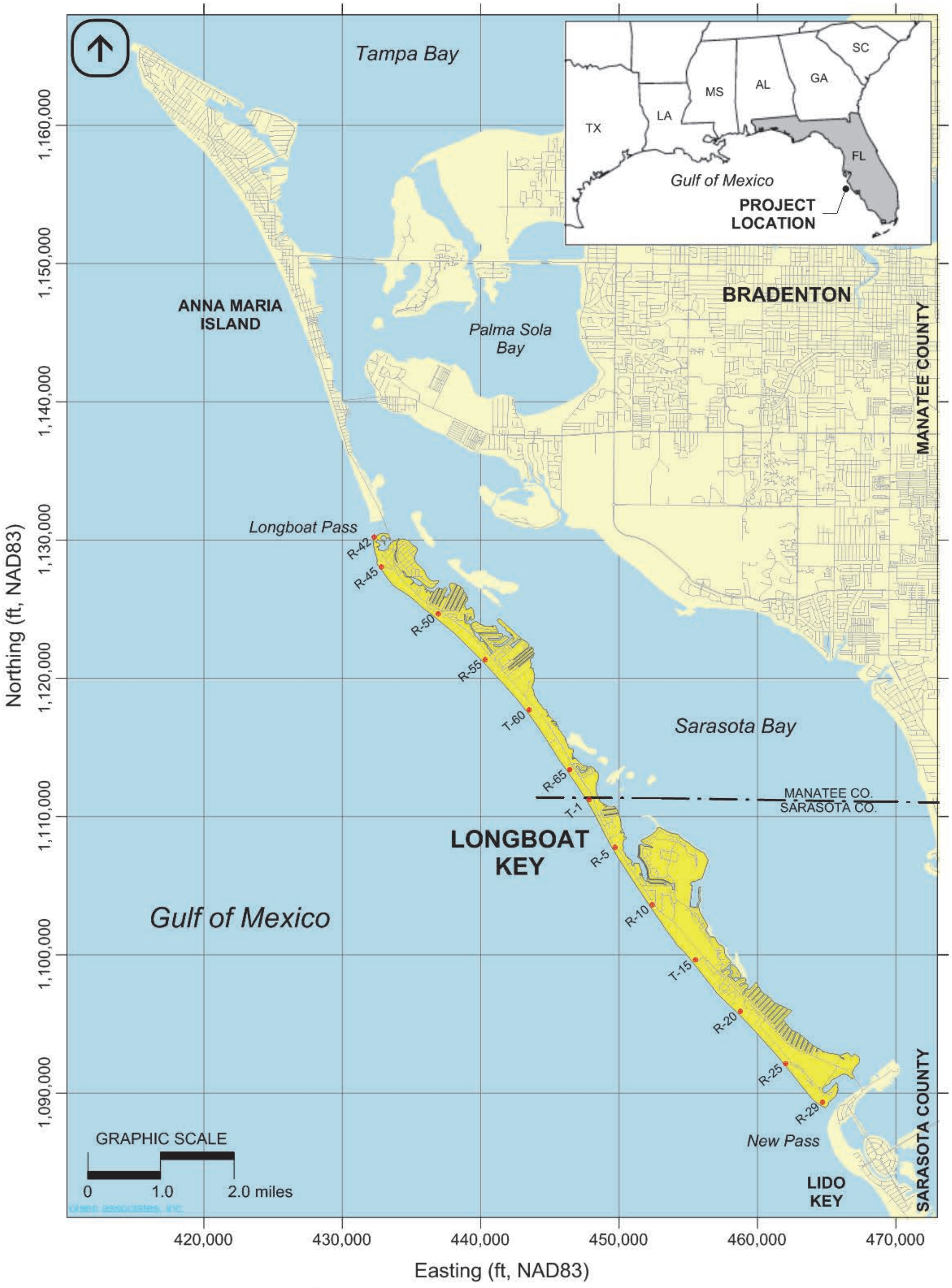

Figure 1 – Location Map, Longboat Key, FL

PART B: PROPOSED CONSERVATION MEASURES

1.0 Protection of Wrack

The Town recognizes the importance of protecting wrack -- stranded seaweed and other vegetative debris left by the high tides -- along the shoreline. Protection of wrack will minimize impacts to shorebird habitat occurring directly or indirectly by human disturbance and the proposed project(s). The Town will continue to take measures to protect wrack along its beaches and to educate the public, including tourists, private residents and condominium/hotel managers.

Measures include:

a) Discourage beach cleaning that impacts wrack.
   - i. The Town presently does not conduct any beach cleaning activities other than the removal of hazardous materials and trash.
   - ii. The Town does not conduct or regulate beach cleaning activities.
   - iii. The Town presently does not allow access for private beach cleaning equipment on Town-owned beach access areas.

b) The Town will contact private property owners who remove the wrack on their beach to provide information regarding not only the importance of wrack, but also the following desired possibilities:
   - i. Leaving a designated portion of wrack year round; and
   - ii. Leaving the wrack from September 1st through May 1st.

c) Public education - The Town will publish information on the importance of wrack on the Longboat Key website, along with a link to the FWC site http://myfwc.com/Shorebirds which includes numerous links to educational materials regarding shorebirds and their protection, including
   - i. coastal_beach_wrack.pdf
   - ii. Share the Beach with Beach-nesting Birds
   - iii. beach driving tips to avoid shorebirds

2.0 Minimization of Disturbance

The Town will seek opportunities to educate the beach-going public about bird disturbance and wrack protection (see 1.0 above). Educational efforts will including:

a) Educational signs will be installed highlighting the importance of beach habitats to wildlife and explaining the importance of the wrack along the shoreline. Examples will be obtained from the USFWS and FWC.

b) Prohibit fireworks, pets, and open fires along the beaches of Longboat Key

3.0 Driving on the Beach

The Town recognizes the need to minimize vehicular traffic on the beach and will seek to balance the need for health and safety on the beach, including emergency responders, against the potential disturbance of shorebirds. The Town supports the following measures:

a) The Town already closely regulates beach driving and only allows driving for emergency responders (including lifeguards) and limited ATV access for official Town-approved purposes (such as turtle and shorebird monitoring, beach monitoring).

b) Vehicles including all-Terrain Vehicles (ATVs) traversing the beach, used by beach life-guards, beach maintenance employees, turtle watch volunteers and law enforcement will avoid the soft sand areas in the wrack areas and follow the FWC's Beach Driving Best Management Practices:
http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/

c) Emergency vehicles shall have full access to the beach including the wrack areas.

4.0 Coordination

The Town will continue to support efforts to protect shorebirds along the Longboat Key beaches and work cooperatively with the USFWS, FWC, and local organizations. In conjunction with the monitoring program described below, the Town will establish a primary point of contact for the Town in regard to shorebird protection, to manage the stewardship of these measures. That individual will provide coordination between

a) the Town,
b) the USFWS,
c) the FWC,
d) the FDEP
e) the USACE
f) representatives of other groups (Audubon, Save our Shorebirds, etc.).

5.0 Monitoring

The Town will seek to implement a year-round shorebird monitoring program along the Gulf of Mexico shoreline. The program will identify locations of important foraging and roosting areas, in addition to nesting areas, and shall seek to identify optimal piping plover and red knot habitat in order to potentially reduce disturbance of wintering shorebirds during project activities -- to the maximum extent practicable.

In establishing the monitoring program, the following guidelines shall be considered, as developed in the USFWS Programmatic Piping Plover Biological Opinion (P3BO).

a) The person(s) conducting the survey must demonstrate the qualifications and ability to identify shorebird species and be able to provide the following:
  i. Date, location, time of day, weather, and tide cycle when survey was conducted;
  ii. Latitude and longitude of observed piping plover and red knot locations (decimal degrees preferred);
  iii. Any color bands observed on piping plovers;
  iv. Behavior of piping plovers and red knots (*e.g.*, foraging, roosting, preening, bathing, flying, aggression, walking);
  v. Landscape features(s) where piping plovers and red knots are located (*e.g.*, inlet spit, tidal creeks, shoals, lagoon shoreline);
  vi. Habitat features(s) used by piping plovers and red knots when observed (*e.g.*, intertidal, fresh wrack, old wrack, dune, mid-beach, vegetation);
  vii. Substrata used by piping plovers and red knots (*e.g.*, sand, mud/sand, mud, algal mat);
  viii. The amount and type of recreational use (*e.g.*, people, dogs on or off leash, vehicles, kite-boarders); and
  ix. All other shorebirds/waterbirds seen within the survey area.

b) Monitoring Frequency
  i. Pre-construction – Prior to the first sand placement event, surveys shall occur three times per month for the first five months of this program (May/June to September/October 2015, approx.) along the entire Gulf of Mexico shoreline of Longboat Key. Surveys shall occur no less than 9 days apart, and shall capture both low tide and high tide events each month. After the completion of five months of pre-construction data, surveys shall continue twice per month through the completion of the first sand placement activities in each shoreline segment (expected to be

completed by 2016, approx.). Subsequent post-construction monitoring is described in item b(iii), below.

ii. Construction Periods - During construction events occurring between February 1 and August 30, daily surveys for nesting activity shall be conducted in the specific sand placement project areas, beginning February 1 or at least 10 days prior to construction start, whichever is later, and continuing through the end of construction or through August 30, whichever is earlier. The permit conditions provided by FWC for the protection of nesting and fledged shorebirds shall be adhered to. The 2x/month islandwide monitoring described in b(i) above would continue for the entire shoreline.

iii. Post-construction – Following completion of the last sand placement event planned as part of the current nourishment cycle (to occur by 2016, approx.), islandwide surveys by ATV shall occur twice per month for a period of two years, and terminating at the end of piping plover migration season in May (anticipated to be May 2018, approx.). Annual fall and spring migration piping plover and red knot abundance and distribution surveys will be conducted as a part of that effort along the entire island shoreline by vehicle (weather and tide permitting, no surveys should be conducted if sustained winds exceed 20 mph) once in early September and once in late March each season for two years post construction after the last placement event. Those surveys will be scheduled around the peak of migration and conducted around mid-tide when birds will still be foraging, making legs easier to see for re-sighting bands.

c) Reporting

i. Nesting shorebird reports shall be shared directly with USFWS and FWC personnel (as desired) and will be submitted in the appropriate format to the Florida Shorebird Database, generally on a monthly or more frequent basis. *https://public.myfwc.com/crossdoi/shorebirds/index.html*

ii. Wintering shorebird reports shall be prepared in EXCEL (typ.) format and shared directly with USFWS and FWC personnel (as desired), generally on a monthly or more frequent basis.

iii. The repositories for shorebird data may change or evolve in the future. The appropriate submittal procedures will be updated periodically.

APPENDIX E4

USFWS STATEWIDE PROGRAMMATIC BIOLOGICAL OPINION TERMS AND CONDITIONS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

Service Log Number: 41910-2011-F-0170

March 13, 2015

Alan M. Dodd, Colonel
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Dear Colonel Dodd:

This letter transmits the U.S. Fish and Wildlife Service's revised Statewide Programmatic Biological Opinion (SPBO) for the U.S. Army Corps of Engineers (Corps) Civil Works and Regulatory sand placement activities in Florida and their effects on the following sea turtles: Northwest Atlantic Ocean distinct population segment (NWAO DPS) of loggerhead (*Caretta caretta*) and its designated terrestrial critical habitat; green (*Chelonia mydas);* leatherback (*Dermochelys coriacea*); hawksbill (*Eretmochelys imbricata*); and Kemp's ridley (*Lepidochelys kempii*) ; and the following beach mice: southeastern (*Peromyscus polionotus niveiventris*); Anastasia Island (*Peromyscus polionotus phasma*); Choctawhatchee (*Peromyscus polionotus allophrys*); St. Andrews (*Peromyscus polionotus peninsularis*); and Perdido Key (*Peromyscus polionotus trissyllepsis*) and their designated critical habitat. It does not address effects of these activities on the non-breeding piping plover (*Charadrius melodus*) and its designated critical habitat or for the red knot (*Calidris canutus rufa*). Effects of Corps planning and regulatory shore protection activities on the non-breeding piping plover and its designated critical habitat within the North Florida Ecological Services office area of responsibility and the South Florida Ecological Services office area of responsibility are addressed in the Service's May 22, 2013, Programmatic Piping Plover Biological Opinion. Effects of shore protection activities for the piping plover in the Panama City Ecological Services office area of responsibility will be addressed on a project by project basis.

Each proposed project will undergo an evaluation process by the Corps to determine if it properly fits within a programmatic approach. The project description will determine if the project is appropriate to apply to this programmatic consultation. If it is determined that the minimization measures, Reasonable and Prudent Measures, and Terms and Conditions in the SPBO are applicable to the project, it will be covered by this programmatic consultation. If not, the Corps will consult separately on individual projects that do not fit within this programmatic approach.

We will meet annually during the fourth week of August to review the sand placement projects, assess new data, identify information needs, and scope methods to address those needs, including, but not limited to, evaluations and monitoring specified in this SPBO, reviewing results, formulating or amending actions that minimize take of listed species, and monitoring the effectiveness of those actions.

The entire programmatic consultation will be reviewed every five years or sooner if new information concerning the projects or protected species occurs. Reinitiation of formal consultation is also required 10 years after the issuance of this SPBO.

We are available to meet with agency representatives to discuss the remaining issues with this consultation. If you have any questions, please contact Peter Plage at the North Florida Ecological Services Office at (904) 731-3085, Jeffrey Howe at the South Florida Ecological Services Office at (772) 469-4283, or Lisa Lehnhoff at the Panama City Ecological Services Office at (850) 769-0552, extension 241.

Sincerely,

Donald R Progulske

for Larry Williams
State Supervisor

Shore Protection Activities along the Coast of Florida

Statewide Programmatic Biological Opinion

(Revised)

February 27, 2015

Prepared by:
U.S. Fish and Wildlife Service

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Acronyms

ABM	Alabama Beach Mouse
Act	Endangered Species Act
AFB	Air Force Base
AIBM	Anastasia Island Beach Mouse
ASP	Anastasia State Park
BO	Biological Opinion
CBM	Choctawhatchee Beach Mouse
CBRA	Coastal Barrier Resources Act
CCAFS	Cape Canaveral Air Force Station
CFR	Code of Federal Regulations
CH	Critical Habitat
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Corps	U.S. Army Corps of Engineers
DOI	U.S. Department of the Interior
DTRU	Dry Tortugas Recovery Unit
F	Fahrenheit
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FMNM	Fort Matanzas National Monument
FR	*Federal Register*
FWC	Florida Fish and Wildlife Conservation Commission

FWC/FWRI	Florida Fish and Wildlife Conservation Commission’s Florida Fish and Wildlife Research Institute
GCRU	Greater Caribbean Recovery Unit
GINS	Gulf Islands National Seashore
GTMNERR	Guana Tolomato Matanzas National Estuarine Research Reserve
HCP	Habitat Conservation Plan
IMA	Important Manatee Areas
INBS	Index Nesting Beach Survey
IPCC	Intergovernmental Panel on Climate Change
ITP	Incidental Take Permit
K	Carrying Capacity
MANLAA	May Affect, but is Not Likely to Adversely Affect
MHW	Mean High Water
MHWL	Mean High Water Line
MMPA	Marine Mammal Protection Act
mtDNA	Mitochondrial Deoxyribonucleic Acid
NGMRU	Northern Gulf of Mexico Recovery Unit
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRU	Northern Recovery Unit
NWAO DPS	Northwest Atlantic Ocean Distinct Population Segment
NWR	National Wildlife Refuge
PBA	Programmatic Biological Assessment
PCE	Primary Constituent Elements

PFRU	Peninsular Florida Recovery Unit
PHVA	Population and Habitat Viability Analysis
PKBM	Perdido Key Beach Mouse
PKSP	Perdido Key State Park
PSI	Per Square Inch
PVA	Population Viability Analysis
SABM	St. Andrews Beach Mouse
SAJ	South Atlantic Jacksonville
SAM	South Atlantic Mobile
SAV	submerged aquatic vegetation
SEBM	Southeastern Beach Mouse
Service	U.S. Fish and Wildlife Service
SNBS	Statewide Nesting Beach Survey
SPBO	Statewide Programmatic Biological Opinion
SR	State Road
TED	Turtle Excluder Device
TEWG	Turtle Expert Working Group
U.S.C.	United States Code
U.S.	United States

March 13, 2015

Alan M. Dodd, Colonel
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Service Federal Activity No: 41910-2010-F-0284
Applicant: U.S. Army Corps of Engineers
Date Started: May 30, 2007
Project Title: Shore Protection Activities
Ecosystem: Florida Coastline
Counties: Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, Escambia.

Dear Colonel Dodd:

This document is the U.S. Fish and Wildlife Service's (Service) Statewide Programmatic Biological Opinion (SPBO) for the U.S. Army Corps of Engineers (Corps) planning and regulatory shore protection activities in Florida and their effects on the Northwest Atlantic Ocean distinct population (NWAO DPS) of loggerhead (*Caretta caretta*) and its designated terrestrial critical habitat, green (*Chelonia mydas),* leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempii*) sea turtles, and southeastern (*Peromyscus polionotus niveiventris*), Anastasia Island (*Peromyscus polionotus phasma*), Choctawhatchee (*Peromyscus polionotus allophrys*), St. Andrews (*Peromyscus polionotus peninsularis*), and Perdido Key (*Peromyscus polionotus trissyllepsis*) beach mice and designated critical habitat (CH) for the Perdido Key beach mouse (PKBM), Choctawhatchee beach mouse (CBM), and St. Andrews beach mouse (SABM) **(Table 1)**. This SPBO is provided in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.). We have assigned Service Federal Activity number 41910-2010-F-0284 for this consultation.

The Corps determined that the proposed project "may affect and is likely to adversely affect the above listed species (**Table 1)**. The Corps also has determined that the proposed project "may affect, but is not likely to adversely affect" (MANLAA) the West Indian (Florida) manatee (*Trichechus manatus latirostris*), the roseate tern (*Sterna dougallii dougallii*), the beach jacquemontia (*Jacquemontia reclinata*), and the Garber's spurge (*Chamaesyce garberi*) **(Table 2)**. Based on our review of the project plans and the incorporation of the minimization measures listed in the final Programmatic Biological Assessment (PBA) as conditions of the projects where these species are known to exist, we concur with these determinations.

Table 1. Status of federally listed species within the Action Area that may be adversely affected by the shore protection activities.

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	STATUS/CH
Mammals		
Choctawhatchee beach mouse	*Peromyscus polionotus allophrys*	Endangered(CH)
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	Threatened
Anastasia Island beach mouse	*Peromyscus polionotus phasma*	Endangered
St. Andrews beach mouse	*Peromyscus polionotus peninsularis*	Endangered (CH)
Perdido Key beach mouse	*Peromyscus polionotus trissyllepsis*	Endangered (CH)
Birds		
Piping Plover*	*Charadrius melodus*	Threatened
Red Knot*	*Calidris canutus rufa*	Proposed
Reptiles		
Green sea turtle	*Chelonia mydas*	Endangered
Hawksbill turtle	*Eretmochelys imbricata*	Endangered
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle (Northwest Atlantic Ocean population)	*Caretta caretta*	Threatened (CH)

* Not covered by the revised SPBO

Table 2. Species and critical habitat evaluated for effects and those where the Service has concurred with a "may affect, not likely to adversely affect (MANLAA)" determination.

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	STATUS/CH	PRESENT IN ACTION AREA	MANLAA
Florida manatee	*Trichechus manatus latirostris*	Endangered (CH)	Yes	Yes
Roseate tern	*Sterna dougallii dougallii*	Threatened	Yes	Yes
Beach jacquemontia	*Jacquemontia reclinata*	Endangered	Yes	Yes
Garber's spurge	*Chamaesyce garberi*	Threatened	Yes	Yes

Florida Manatee

For all dredging activities, including offshore dredging activities associated with submerged borrow areas and navigational channel maintenance:

The Corps has determined that the proposed projects "may affect, but are not likely to adversely affect" the Florida manatee. The Service has reviewed the draft PBA and concurs that, if the 2011 Standard Manatee In-water Construction Conditions are made a condition of the issued permit or Corps project plan and implemented, these activities are not likely to adversely affect the Florida manatee. We also conclude that these activities will not adversely modify its critical habitat. These findings fulfill section 7 requirements of the Act in regard to manatees. In addition, because no incidental take of manatees is anticipated, no such authorization under the Marine Mammal Protection Act (MMPA) is needed. The web link to these conditions: http://www.fws.gov/northflorida/Manatee/Manate_Key_Programmatic/20130425_gd_Appendix%20B_2011_Standard%20Manatee%20Construction%20Conditions.pdf.

For all dredging activities within estuaries and adjacent to the shore, inlets, and/or inshore areas including channels associated with submerged borrow areas and navigational channels:

If the 2011 Standard Manatee In-water Construction Conditions and the following additional conditions are made a condition of the issued permit or Corps project plan and implemented, the Service would be able to concur with a determination by the Corps that these activities are not likely to adversely affect the Florida manatee. We also conclude that these activities will not adversely modify its critical habitat. These findings fulfill section 7 requirements of the Act in regard to manatees. In addition, because no incidental take of manatees is anticipated, no such authorization under the Marine Mammal Protection Act (MMPA) is needed.

Additional conditions:

1. Barges shall install mooring bumpers that provide a minimum 4-foot standoff distance under maximum compression between other moored barges and large vessels, when in the vicinity of inlets, river mouths, and large estuaries where manatees are known to congregate.

2. Pipelines shall be positioned such that they do not restrict manatee movement to the maximum extent possible. Plastic pipelines shall be weighted or floated. Pipelines transporting dredged material within the vicinity of inlets, river mouths, and large estuaries where manatees are known to congregate shall be weighted or secured to the bottom substrate as necessary to prevent movement of the pipeline and to prevent manatee entrapment or crushing.

3. In the event that such positioning has the potential to impact submerged aquatic vegetation (SAV) or nearshore hardbottom, the pipeline may be elevated or secured to the bottom substrate to minimize impacts to SAV.

For dredging activities located within Important Manatee Areas (IMAs), including Warm Water Aggregation Areas (WWAAs):

Important Manatee Areas (IMAs) are areas where large numbers of manatees occur because of the presence of warm water sites (including power plants, springs, etc.), feeding sites, drinking water sites, and other attractants. Manatees congregate at these sites to shelter from the cold, rest, feed and drink, travel, and engage in other activities. Current IMA maps, including maps of Warm Water Aggregation Areas (WWAAs) and areas of inadequate protection (AIPs), can be found at the Corps' weblink: http://www.saj.usace.army.mil/Missions/Regulatory/SourceBook.aspx.

Dredging activities that occur within the IMA sites (including WWAAs) are not included in this SPBO. For dredging activities within IMAs, the Corps shall contact the appropriate FWS Ecological Services Office for project-specific conditions. See Table 3.

Table 3. FWS Ecological Services (ES) offices and areas of responsibility (counties).

County	Service ES Office	Address	Telephone
Brevard, Citrus, Dixie, Duval, Flagler, Hernando, Hillsborough, Levy, Manatee, Nassau, Pasco, Pinellas, St Johns, Taylor, Volusia	North Florida ES Office	7915 Baymeadows Way Jacksonville, FL 32256	(904) 731-3336
Broward, Charlotte, Collier, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach, St Lucie, Sarasota	South Florida ES Office	1339 20th Street Vero Beach, FL 32960	(772) 562-3909
Bay, Escambia, Franklin, Gulf, Jefferson, Okaloosa, Santa Rosa, Taylor, Wakulla, Walton,	Panama City ES Office	1601 Balboa Avenue Panama City, FL 32405	(850) 769-0552

Although this does not represent a biological opinion for the manatee as described in section 7 of the Act, it does fulfill the requirements of the Act and no further action is required regarding manatees. It also fulfills the requirements of the MMPA. If modifications are made in the programmatic action or additional information becomes available, re-initiation of consultation may be required.

Loggerhead Terrestrial Critical Habitat

The Corps has determined that the proposed projects “may affect, but are not likely to adversely affect” the terrestrial critical habitat of the Northwest Atlantic Ocean loggerhead sea turtle population. The Service concurs with the Corps’ determination and furthermore concludes that the proposed projects will not adversely modify the terrestrial critical habitat of the Northwest Atlantic Ocean loggerhead sea turtle population.Designated Critical Habitat: The Service has designated terrestrial critical habitat for Northwest Atlantic loggerhead population on July 10, 2014. NOTE: The proposed rule was dated March 25, 2013 (78 FR 18000) and the notice of availability of the economic analysis for the proposed rule (78 FR 42921) was dated July 18, 2013. The final rule of terrestrial critical habitat includes 88 units encompassing approximately 1,102 kilometers (685 miles) of mapped shoreline along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi: http://www.fws.gov/northflorida/SeaTurtles/2014_Loggerhead_CH/Maps/2014_NWA_Loggerhead_Terrestrial_CH_index_maps.pdf.

Table 4. List of NWAO DPS loggerhead critical habitat in the terrestrial habitat Florida and ownership.

Critical Habitat Unit	**Length of Unit in kilometers (miles)**	**Federal Lands**	**State Lands**	**Private and Other (counties and municipalities)**
LOGG-T-FL-01: South Duval County Beaches–County line at Duval and St. Johns Counties	11.5 (7.1)	0 (0)	0 (0)	11.5 (7.1)
LOGG-T-FL-02: Fort Matanzas National Monument, St. Johns County	1.4 (0.9)	1.4 (0.9)	0 (0)	0 (0)
LOGG-T-FL-03: River to Sea Preserve at Marineland — North Peninsula State Park, Flagler and Volusia Counties	31.8 (19.8)	0 (0)	6.1 (3.8) North Peninsula State Park, Washington Oaks Garden State Park (in Guana Tolomato Matanzas NERR), and Gamble Rogers Memorial State Recreation Area at Flagler Beach	25.7 (16.0)
LOGG-T-FL-04: Canaveral National Seashore North, Volusia County	18.2 (11.3)	18.2 (11.3) Canaveral National Seashore	0 (0)	0 (0)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-05: Canaveral National Seashore South — Merritt Island NWR-Kennedy Space, Brevard County	28.4 (17.6)	28.4 (17.6) includes Canaveral National Seashore (Brevard portion) and Merritt Island NWR/KSC	0 (0)	0 (0)
LOGG-T-FL-06: Central Brevard Beaches, Brevard County	19.5 (12.1)	0 (0)	0 (0)	19.5 (12.1)
LOGG-T-FL-07: South Brevard Beaches, Brevard County	20.8 (12.9)	4.2 (2.6) Archie Carr NWR	1.5 (1.0) Sebastian Inlet State Park	15.0 (9.3)
LOGG-T-FL-08: Sebastian Inlet — Indian River Shores, Indian River County	4.1 (2.5)	0.9 (0.6) Archie Carr NWR	3.2 (2.0) Sebastian Inlet State Park	0 (0)
LOGG-T-FL-09: Fort Pierce Inlet — St. Lucie Inlet, St. Lucie and Martin Counties	35.2 (21.9)	0 (0)	0 (0)	35.2 (21.9)
LOGG-T-FL-10: St. Lucie Inlet — Jupiter Inlet, Martin and Palm Beach Counties	24.9 (15.5)	4.8 (3.0) Hobe Sound NWR	3.7 (2.3) St. Lucie Inlet Preserve State Park	16.4 (10.2)
LOGG-T-FL-11: Jupiter Inlet — Lake Worth Inlet, Palm Beach County	18.8 (11.7)	0 (0)	2.5 (1.5) John D. MacArthur Beach State Park	16.3 (10.1)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-12: Lake Worth Inlet — Boynton Inlet, Palm Beach County	24.3 (15.1)	0 (0)	0 (0)	24.3 (15.1)
LOGG-T-FL-13: Boynton Inlet — Boca Raton Inlet, Palm Beach County	22.6 (14.1)	0 (0)	0 (0)	22.6 (14.1)
LOGG-T-FL-14: Boca Raton Inlet — Hillsboro Inlet, Palm Beach and Broward Counties	8.3 (5.2)	0 (0)	0 (0)	8.3 (5.2)
LOGG-T-FL-15: Long Key, Monroe County	4.2 (2.6)	0 (0)	4.2 (2.6) Long Key State Park	0 (0)
LOGG-T-FL-16: Bahia Honda Key, Monroe County	3.7 (2.3)	0 (0)	3.7 (2.3) Bahia Honda Key State Park	0 (0)
LOGG-T-FL-17: Longboat Key, Manatee and Sarasota Counties	16.0 (9.9)	0 (0)	0 (0)	16.0 (9.9)
LOGG-T-FL-18: Siesta and Casey Keys, Sarasota County	20.8 (13.0)	0 (0)	0 (0)	20.8 (13.0)
LOGG-T-FL-19: Venice Beaches and Manasota Key, Sarasota and Charlotte Counties	26.0 (16.1)	0 (0)	1.9 (1.2) Stump Pass Beach State Park	24.1 (15.0)

Critical Habitat Unit	**Length of Unit in kilometers (miles)**	**Federal Lands**	**State Lands**	**Private and Other (counties and municipalities)**
LOGG-T-FL-20: Knight, Don Pedro, and Little Gasparilla Islands, Charlotte County	10.8 (6.7)	0 (0)	1.9 (1.2) Don Pedro Island State Park	8.9 (5.5)
LOGG-T-FL-21: Gasparilla Island, Charlotte and Lee Counties	11.2 (6.9)	0 (0)	1.5 (1.0) Gasparilla Island State Park	9.6 (6.0)
LOGG-T-FL-22: Cayo Costa, Lee County	13.5 (8.4)	0 (0)	13.2 (8.2) Cayo Costa State Park	0.3 (0.2)
LOGG-T-FL-23: Captiva Island, Lee County	7.6 (4.7)	0 (0)	0 (0)	7.6 (4.7)
LOGG-T-FL-24: Sanibel Island West, Lee County	12.2 (7.6)	0 (0)	0 (0)	12.2 (7.6)
LOGG-T-FL-25: Little Hickory Island, Lee and Collier Counties	8.7 (5.4)	0 (0)	0 (0)	8.7 (5.4)
LOGG-T-FL-26: Wiggins Pass — Clam Pass, Collier County	7.7 (4.8)	0 (0)	2.0 (1.2) Delnor-Wiggins Pass State Park	5.7 (3.6)
LOGG-T-FL-27: Clam Pass — Doctors Pass, Collier County	4.9 (3.0)	0 (0)	0 (0)	4.9 (3.0)
LOGG-T-FL-28: Keewaydin Island and Sea Oat Island, Collier County	13.1 (8.1)	0 (0)	12.4 (7.7) Rookery Bay NERR	0.7 (0.5)
LOGG-T-FL-29: Cape Romano, Collier County	9.2 (5.7)	0 (0)	7.2 (4.5) Rookery Bay NERR	2.0 (1.2)

Critical Habitat Unit	**Length of Unit in kilometers (miles)**	**Federal Lands**	**State Lands**	**Private and Other (counties and municipalities)**
LOGG-T-FL-30: Ten Thousand Islands North, Collier County	7.8 (4.9)	2.9 (1.8) Ten Thousand Islands NWR	4.9 (3.1) Rookery Bay NERR	0 (0)
LOGG-T-FL-31: Highland Beach, Monroe County	7.2 (4.5)	7.2 (4.5) Everglades National Park	0 (0)	0 (0)
LOGG-T-FL-32: Graveyard Creek — Shark Point, Monroe County	0.9 (0.6)	0.9 (0.6) Everglades National Park	0 (0)	0 (0)
LOGG-T-FL-33: Cape Sable, Monroe County	21.3 (13.2)	21.3 (13.2) Everglades National Park	0 (0)	0 (0)
LOGG-T-FL-34: Dry Tortugas, Monroe County	5.7 (3.6)	5.7 (3.6) Dry Tortugas National Park	0 (0)	0 (0)
LOGG-T-FL-35: Marquesas Keys, Monroe County	5.6 (3.5)	5.6 (3.5) Key West NWR	0 (0)	0 (0)
LOGG-T-FL-36: Boca Grande Key, Monroe County	1.3 (0.8)	1.3 (0.8) Key West NWR	0 (0)	0 (0)
LOGG-T-FL-37: Woman Key, Monroe County	1.3 (0.8)	1.3 (0.8) Key West NWR	0 (0)	0 (0)
LOGG-T-FL-38: Perdido Key, Escambia County	20.2 (12.6)	11.0 (6.8) Gulf Islands National Seashore	2.5 (1.6) Perdido Key State Park	6.7 (4.2)
LOGG-T-FL-39: Mexico Beach and St. Joe Beach, Bay and Gulf Counties	18.7 (11.7)	0 (0)	0 (0)	18.7 (11.7)

Critical Habitat Unit	**Length of Unit in kilometers (miles)**	**Federal Lands**	**State Lands**	**Private and Other (counties and municipalities)**
LOGG-T-FL-40: St. Joseph Peninsula, Gulf County	23.5 (14.6)	0 (0)	15.5 (9.7) T.H. Stone Memorial St. Joseph Peninsula State Park and St. Joe Bay State Buffer Preserve	8.0 (4.9)
LOST-T-FL-41: Cape San Blas, Gulf County	11.0 (6.8)	0 (0)	0.1 (0.1) St. Joseph Bay State Buffer Preserve	10.8 (6.7)
LOGG-T-FL-42: St. Vincent Island, Franklin County	15.1 (9.4)	15.1 (9.4) St. Vincent NWR	0 (0)	0 (0)
LOGG-T-FL-43: Little St. George Island, Franklin County	15.4 (9.6)	0 (0)	15.4 (9.6) Apalachicola NERR	0 (0)
LOGG-T-FL-44: St. George Island, Franklin County:	30.7 (19.1)	0 (0)	14.0 (8.7) Dr. Julian G. Bruce St. George Island State Park	16.7 (10.4)
LOGG-T-FL-45: Dog Island, Franklin County	13.1 (8.1)	0 (0)	0 (0)	13.1 (8.1)
Florida State Totals	**637.1 (396.4)**	**130.3 (81.0)**	**117.4.0 (72.9)**	**390.3 (242.6)**

The primary constituent elements (PCEs) for loggerhead terrestrial critical habitat are those specific elements of the biological and physical features (BPF) that provide for the species' life-history processes and are essential to the conservation of the species. PBFs include those habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support these habitat components. The PBFs and PCEs are described as follows:

Physical and Biological Features (PBF):

PBF 1: Sites for Breeding, Reproduction, or Rearing (or Development) of Offspring

PBF 2: Habitats Protected from Disturbance or Representative of the Historical, Geographic, and Ecological Distributions of the Species

Primary Constituent Elements (PCE):

(1) Suitable nesting beach habitat that has (a) relatively unimpeded nearshore access from the ocean to the beach for nesting females and from the beach to the ocean for both post-nesting females and hatchlings and (b) is located above MHW to avoid being inundated frequently by high tides.

(2) Sand that (a) allows for suitable nest construction, (b) is suitable for facilitating gas diffusion conducive to embryo development, and (c) is able to develop and maintain temperatures and a moisture content conducive to embryo development.

(3) Suitable nesting beach habitat with sufficient darkness to ensure nesting turtles are not deterred from emerging onto the beach and allows hatchlings and post-nesting females to orient successfully to the sea.

(4) Natural coastal processes or artificially created or maintained habitat mimicking natural conditions.

Substantial amounts of sand are deposited along Gulf of Mexico and Atlantic Ocean beaches to protect coastal properties in anticipation of preventing erosion and to mimic what otherwise would be natural processes of overwash and island migration. Constructed beaches tend to differ from natural beaches in several important ways for sea turtles. They are typically wider, flatter, and more compacted, and the sediments are moister than those on natural beaches (Nelson *et al*. 1987; Ackerman *et al.* 1991; Ernest and Martin 1999).

Regarding PCE 1 and PCE 4 for sand placement projects, construction on the beach during sea turtle nesting and hatching season can obstruct nesting females from accessing the beach and hatchlings from entering the water unimpeded. To minimize these impacts, the Corps has agreed to avoid construction during peak nesting and hatching season in the higher density beaches within the entire NWAO DPS of the loggerhead sea turtle as described. This SPBO includes required terms and conditions that minimize incidental take of turtles and reduces the impacts to the PCE 3 by limiting activities at night and placing equipment and staging areas off the nesting beach.

More nests are washed out on the wide, flat beaches resulting from sand placement than narrower steeply sloped natural beaches. This phenomenon may persist through the second postconstruction year and results 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.

A study performed for the Florida Department of Environmental Protection (FDEP) promoted the test construction of a more “turtle-friendly” beach. The Service, along with the National Fish and Wildlife Foundation and the Florida Fish and Wildlife Conservation Commission (FWC), began a study to determine if statistically significant improvements in nesting success, nest densities, and/or hatchling production can be achieved through modifications to the traditional construction template for beach nourishment projects.   It is anticipated that a more natural beach profile will reduce the incidence of scarping, improve nesting success, and reduce the proportion of nests placed along the seaward portion of the berm (those at increased risk of being lost to erosion during profile equilibration), relative to a traditionally built beach. The Corps remains committed to incorporating the results of this study into future design templates.

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). This directly impacts PCE 2 above; however, on severely eroded sections of beach, where little or no suitable nesting habitat exists, and sand placement can result in increased nesting (Ernest and Martin 1999). The placement of sand on a beach with reduced dry foredune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (i.e., grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may benefit sea turtles more than the eroding beach it replaces.

Regarding PCE 3, during construction, any lights directly visible on the beach during the nesting and hatching seasons are minimized by shielding and directing the lights downward and away from the nesting beach as required in the Terms and Conditions of this SPBO.

The newly created wider and flatter beach berm exposes sea turtles and their nests to lights that were less visible, or not visible, from nesting areas before the sand placement activity leading to a higher probability of hatchling mortality due to disorientation. Changing to sea turtle compatible lighting can be accomplished at the local level through voluntary compliance or by adopting appropriate regulations. The Terms and Conditions in the Biological Opinion require a lighting survey prior to construction and post construction to determine the additional level of impacts as a result of the proposed project. The Terms and Conditions include working with the local sponsor to minimize the impacts of lighting as a result of the proposed project.

The Service has determined that with the incorporation of the conservation measures as described above, that the proposed projects will not adversely affect nor adversely modify the terrestrial critical habitat of the Northwest Atlantic Ocean loggerhead sea turtle population.

Migratory Birds

In order to comply with the Migratory Bird Treaty Act (16 U.S.C. 701 *et seq*.) and reduce the potential for this project to impact nesting shorebirds, the Corps or the Applicant should follow the latest Florida Fish and Wildlife Conservation Commission (FWC) standard guidelines to protect against impacts to nesting shorebirds during implementation of this project during the periods from February 15 to August 31.

Consultation History

1980s and 1990s — Beach nourishment projects in Florida began to occur frequently in the late 1980s and early 1990s. During that time, sea turtle protection measures were developed based on research findings available at that time. These measures addressed sand compaction, escarpment formation, and timing restrictions for projects in six south Florida counties with high nesting densities. In the mid-1990s, a sea turtle Biological Opinion (BO) template was developed that included protection measures and information on the status of sea turtles. In 1995, an expanded version of the sea turtle template BO was developed to incorporate new guidance on the required format for BOs and a biological rationale for the Terms and Conditions to be imposed. This document underwent review by four State conservation agencies and the Corps, and was subsequently revised. The primary purposes of the template BO were to: (1) incorporate a standardized format and language required for use in all BOs based on guidance from the Service's Washington Office, (2) assist Service biologists in the preparation of BOs, (3) increase consistency among Service field offices, and (4) increase consistency between the Service and the State agencies.

March 7 and 8, 2006 — The Corps met with the Services' three Florida field office representatives, a representative of the FWC, and a representative of the FDEP. The purpose of that meeting was to begin discussions about a regional consultation for sand placement activities along the coast of Florida and preparation of a PBA for sand placement activities in Florida. In addition to sea turtles, other Federal and state protected species were included in the discussions. At that meeting, the following topics were discussed:

1. Sand placement activities;
2. Sand source and placement methods;
3. Species and habitat;
4. Geographic scope;
5. Information availability; and
6. Minimization of impacts.

July 13, 2006 — A second meeting was held to further discuss the draft PBA. The Service provided the Corps with copies of the latest BO templates for each species to be considered. The Service held conference calls with the species recovery leads during August 2006.

October 16, 2006	The Service received the draft PBA via email from the Corps for sand placement activities along the coast of Florida.
October 27, 2006	The Service provided the Corps with draft comments on the PBA via email.
October 31, 2006	The Corps provided a response to the Service's comments on the PBA via email.
November 9, 2006	The Service and the Corps held a conference call to discuss the comments.
December 20, 2006	The Service sent the Corps a letter with the final comments on the draft PBA.
September 18 and 19, 2007	The Corps met with the Services' three Florida field office representatives, a representative of the FWC, and a representative of the FDEP. The purpose of this meeting was to discuss the Terms and Conditions to be included in the BO.
October 5, 2007	The Service sent the Corps, via email, the modifications to the draft Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice as discussed in the previous meeting.
November 1, 2007	The Corps provided the Service with comments via email on the revised Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice.
March 31, 2008	The Service revised the Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice. The Service also revised the minimization measures for the manatee. The revisions were sent to the Corps.
September 16, 2008	The Service sent the Corps via mail the draft SPBO.
October 2, 2008	The Corps provided the Service via email with a summary of the remaining issues concerning the Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice.
October 15, 2008	The Service sent the Corps, via email, the modifications to the draft Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice as discussed in the previous email.

March 11, 2009	The Service received via email examples of previous agreements between the Corps and the local sponsor to carry out the Terms and Conditions in previous BOs.
April 7, 2009	The Service sent an email to the Corps with an update of the progress of our analysis of including piping plovers in the SPBO.
August 26, 2009	The Service sent to the Corps via email the latest Terms and Conditions for sea turtles and beach mice.
September 17, 2009	The Corps sent an email to the Service describing the actions to be taken for the completion and submittal of the PBA.
January 6, 2010	The Corps and the Service participated in a meeting to finalize the draft SPBO.
January 21, 2010	The Corps sent to the Service via email the revised draft PBA.
March 25, 2010	The Corps and the Service participated in an implementation meeting and submittal of the final PBA.
February 22, 2011	The Corps submitted the final PBA to the Service.
April 18, 2011	The Service sent the final Statewide PBO to the Corps.
June 21, 2010	The Corps provided written concerns with the final Statewide PBO
June 30, 2011	The Service revised the final Statewide PBO.
July 18, 2011	The Corps provided written agreement with the changes that were made and asked for additional changes.
July 22, 2011	The Service made additional revisions per the Corps request.
July 25, 2011	The Corps provided written agreement with the additional revisions.
March 25, 2013	The Service published the proposed rule for loggerhead terrestrial critical habitat.
March 3, 2014	The Corps contacted the Service on revising the SPBO to include loggerhead critical habitat in the terrestrial environment.
August 25, 2014	The Service provided the Corps with a Draft Revised SPBO

September 4, 2014	The Corps and Service met and discussed the Draft Revised SPBO at the annual SPBO meeting.
October 23, 2014	The Service received a letter from the Corps requesting the SPBO be revised to include loggerhead critical habitat.
November 3, 2014	The Service sent a draft Revised SPBO to the Corps for review and comment
November 20, 2014	The Corps agreed with the changes made to the draft Revised SPBO
November 24, 2014	The Corps submitted proposed section 7(a)(1) conservation recommendations
January 30, 2014	The Corps and Service agreed on proposed section 7(a)(1) conservation recommendations and finalized draft revised SPBO

This SPBO is based on the PBA, and information provided during meetings and discussions with the Corps' representatives and information from the Florida Fish and Wildlife Conservation Commission's Florida Fish and Wildlife Research Institute (FWC/FWRI) sea turtle databases. A complete administrative record of this consultation is on file in the Service's North Florida, Panama City, and South Florida Ecological Services Offices.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action includes all activities associated with the placement of compatible sediment on beaches of the Atlantic and Gulf coasts of Florida encompassing both South Atlantic Jacksonville (SAJ) and South Atlantic Mobile (SAM) Corps Districts. Additionally, the proposed action includes the replacement and rehabilitation of groins that are included as design components of beach projects for longer retention time and stabilization of associated sediment placed on the beach. This SPBO includes projects authorized through the Corps Regulatory Program, and funded or carried out as part of its Civil Works program. Corps Regulatory activities may include the involvement of other Federal agencies, such as the Department of Defense, Bureau of Ocean Energy Management, and the Federal Emergency Management Agency (FEMA). The shore protection activities covered in the SPBO encompass the following shore protection activities:

1. Sand placement originating from Dredged Material Management Areas (DMMAs), offshore borrow sites, and other compatible sand sources;
2. Sand placement as an associated authorization of sand extraction from the outer continental shelf by the Bureau of Ocean Energy Management;

3. Sand washed onto the beach from being placed in the swash zone;
4. Sand by-passing/back-passing (sand discharge on beach);
5. Current Operations and Maintenance (O&M) dredging of navigation channels with beach disposal (does not include new navigation projects or expansion (deepening or widening) of existing authorized navigation projects); and
6. Groins and jetty repair or replacement.

For nearshore borrow sites, the Corps must provide information to the Service on the sand flow when this sand is removed from these nearshore areas. If removal of sand from these nearshore areas is shown to cause increased erosion on the adjacent beach, a separate consultation will be required.

A detailed description of each activity is found in the final PBA. The history of shore protection activities throughout the Atlantic and Gulf Coasts of Florida is extensive and consists of a myriad of actions performed by local, State, and Federal entities. Future beach placement actions addressed in this SPBO may include maintenance of these existing projects or beaches that have not experienced a history of beach placement activities.

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment. This SPBO only addresses activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. NMFS will assess and consult with the Corps concerning potential impacts to sea turtles in the marine environment and the shoreline updrift and downdrift area of the project.

Corps Commitments as listed in the final PBA

The following paragraph from the final PBA summarizes the Corps' Commitments as listed below:

"For Corps projects, please note that "fish and wildlife enhancement" activities (which are beyond mitigation of project impacts) must be authorized as a project purpose or project feature or must be otherwise approved through Corps headquarters (Engineer Regulation ER 1105-2-100 Appendix G, Amendment #1, 30 Jun 2004). At the present time, no beach fill placement or shore protection activity in Florida has fish and wildlife enhancement as a project purpose or project feature. Since adding fish and wildlife enhancement as a project purpose or feature is not a budgetary priority (ER 1105-2-100 22 Apr 2000, Appendix C, part C-3b.(3)), authorization and funding for such is not expected."

Sea Turtles

1. Avoid construction during the peak nesting and hatching season in the higher density beaches, and to the maximum extent practicable during all other nesting times and locations;

2. Except for O&M disposal actions, implement sea turtle nest monitoring and relocation plan during construction if nesting window cannot be adhered to;

3. Except for O&M disposal actions, escarpments that are identified prior to or during the nesting season that interfere with sea turtle nesting (exceed 18 inches in height for a distance of 100 feet) can be leveled to the natural beach for a given area. If it is determined that escarpment leveling is required during the nesting or hatching season, leveling actions should be directed by the Service. For Corps Civil Works projects, leveling of escarpments would be limited to the term of the construction or as otherwise may be authorized and funded;

4. Placement of pipe parallel to the shoreline and as far landward as possible so that a significant portion of available nesting habitat can be utilized, nest placement is not subject to inundation or washout, and turtles do not become trapped landward of the pipe;

5. Temporary storage of pipes and equipment will be located off the beach to the maximum extent possible;

6. The Corps will continue to work with the FDEP to identify aspects of beach nourishment construction templates that negatively impact sea turtles and develop and implement alternative design criteria that may minimize these impacts;

7. Except for O&M disposal actions, Service compaction assessment guidelines will be followed and tilling will be performed where appropriate. For Corps Civil Works projects, assessment of compaction and tilling will be limited to the term of the construction or as otherwise may be authorized and funded; and

8. All lighting associated with project construction will be minimized to the maximum extent possible, through reduction, shielding, angling, etc., while maintaining compliance with all Corps, U.S. Coast Guard, and OSHA safety requirements.

Beach Mice

1. Pipeline routes for beach construction projects will avoid identified primary constituent elements for beach mouse critical habitat to the maximum extent practicable;

2. Implementation of a trapping and relocation plan if avoidance alternatives of occupied habitat are not practical; and

3. Implementation of a lighting plan to reduce, shield, lower, angle, etc. light sources in order to minimize illumination impacts on nocturnal beach mice during construction.

Action Area

The Service has described the action area to include sandy beaches of the Atlantic Coast of Florida (Key West to Fernandina/Kings Bay) and the Gulf Coast (Ten Thousand Islands to Alabama State

Line) for reasons that will be explained and discussed in the “EFFECTS OF THE ACTION” section of this consultation.

Underlying Dynamics of a Barrier Island

Of all the states and provinces in North America, Florida is most intimately linked with the sea. Florida’s 1,200-mile coastline (exclusive of the Keys) is easily the longest in the continental U.S. Of the 1,200 miles, 745 miles are sandy and mostly in the form of barrier islands. The coastline is dynamic and constantly changing as a result of waves, wind, tides, currents, sea level change, and storms. The entire state lies within the coastal plain, with a maximum elevation of about 400 feet, and no part is more than 60 miles from the Atlantic Ocean or Gulf of Mexico.

The east coast of Florida consists of a dynamic shoreline, with a relatively sloped berm, coarse-grained sand, and moderate to high surf (Witherington 1986). The southeast coast of Florida consists of continuous, narrow, sandy barrier islands bordering a narrow continental shelf (Wanless and Maier 2007). The dynamics of the east coast shoreline are due to the occurrence of storm surges and seas from tropical storms that occur mainly during August through early October. More erosion events can also occur during late September through March due to nor’easters. The impacts of these two types of storms may vary from event to event and year to year.

Northwest (panhandle) and Southwest Florida beaches are considered to be low energy beaches with a gradual offshore slope and low sloped fine grained quartz sand beaches. As along the east coast of Florida, the shoreline dynamics are shaped by tropical storms and hurricanes. Although Gulf beaches may experience winter erosion, they are largely protected from the severe nor’easters.

Coasts with greater tidal ranges are more buffered against storm surges than are those with low tidal ranges, except when the storm strikes during high tide. Mean tidal ranges decrease southward along the Atlantic coast from a mean of seven feet at the Florida-Georgia line to less than two feet in Palm Beach County. The mean tidal range along the Gulf Coast is less than three feet (microtidal) except in the extreme south where it ranges from three to four feet. Because of its lower elevation and lower wave energy regime, the West Coast of the peninsula is subject to greater changes during storm events than is the east coast.

Microtidal coasts have a high vulnerability to sea level rise and barrier islands respond by migrating landward. Migration occurs as a result of overwash from extreme storms that flatten topography and deposit sand on the backside of the island, extending the island landward (Young 2007). Significant widening can occur from a single storm event. For example, Dauphin Island, a barrier island in Alabama, has nearly doubled its width following Hurricanes Ivan and Katrina in 2004 and 2005, respectively.

Sea level has risen globally approximately 7.1 inches in the past century (Douglas 1997). Climate models predict a doubling of the rate of sea level rise over the next 100 years (Pendleton *et al.* 2004). Recent studies indicate a trend toward increasing hurricane number and intensity (Emanuel

2005, Webster *et al.* 2005). Barrier islands need to be able to move and respond to these conditions. By locking in a barrier island's location with infrastructure, the island loses its ability to migrate to higher elevations which can lead to its eventual collapse (Moore 2007).

Overwash from less intense storms can positively affect island topography. Low natural berms can develop along beach fronts, but generally can be exceeded by overwash from frontal storms. The berm is an accretionary feature at the landward extreme of wave influence. Sediment is transported over the berm crest and is deposited in a nearshore overwash fan and in breach corridors. Overwash deposition provides source sand for re-establishing dunes. Onshore winds transport the sediment from overwash fans to the dunes, gradually building back dune elevation during storm-free periods.

The interaction between the biology and geomorphology of barrier islands is complex. Just as the barrier island undergoes a process of continual change, so do the ecological communities present. Vegetation zones gradually re-establish following storms, and in turn affect physical processes such as sand accretion, erosion, and overwash. The beach front, dunes, and overwash areas all provide important habitat components. Many barrier island species are adapted to respond positively to periodic disturbance. As the island widens, new feeding habitat (sand/mud flats) is created for shorebirds such as the piping plover. The beaches provide nesting habitat for sea turtles. Early colonizer plants are favored as a food source by beach mice. These barrier island habitats are becoming increasingly rare as our Nation's coastlines rapidly develop and are stabilized.

SEA TURTLES

STATUS OF THE SPECIES/CRITICAL HABITAT

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment. This SPBO addresses nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. Five species of sea turtles are analyzed in this SPBO: the loggerhead, green, leatherback, hawksbill, and Kemp's ridley.

Loggerhead Sea Turtle

The loggerhead sea turtle was federally listed as a threatened species on July 28, 1978 (43 *Federal Register* [*FR*] 32800). The Service and the National Marine Fisheries Service (NMFS) listed the Northwest Atlantic Ocean distinct population segment (DPS) of the loggerhead sea turtle as threatened on September 22, 2011 (76 *FR* 58868). The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans.

The loggerhead sea turtle grows to an average weight of about 200 pounds and is characterized by a large head with blunt jaws. Adults and subadults have a reddish-brown carapace. Scales on the top of the head and top of the flippers are also reddish-brown with yellow on the borders. Hatchlings are a dull brown color (NMFS 2009a). The loggerhead feeds on mollusks, crustaceans, fish, and other marine animals.

The loggerhead may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas.

Within the Northwest Atlantic, the majority of nesting activity occurs from April through September, with a peak in June and July (Williams-Walls *et al*. 1983, Dodd 1988, Weishampel *et al*. 2006). Nesting occurs within the Northwest Atlantic along the coasts of North America, Central America, northern South America, the Antilles, Bahamas, and Bermuda, but is concentrated in the southeastern U.S. and on the Yucatán Peninsula in Mexico on open beaches or along narrow bays having suitable sand (Sternberg 1981, Ehrhart 1989, Ehrhart *et al*. 2003, NMFS and Service 2008).

Critical habitat has been designated for the NWAO DPS of the loggerhead sea turtle. **Table 4** has the list of the critical habitat units within the project area.

Green Sea Turtle

The green sea turtle was federally listed on July 28, 1978 (43 *FR* 32800). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered; all other populations are listed as threatened. The green sea turtle has a worldwide distribution in tropical and subtropical waters.

The green sea turtle grows to a maximum size of about four feet and a weight of 440 pounds. It has a heart-shaped shell, small head, and single-clawed flippers. The carapace is smooth and colored gray, green, brown and black. Hatchlings are black on top and white on the bottom (NMFS 2009b). Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrasses and marine algae.

Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (NMFS and Service 1991). Nesting also has been documented along the Gulf coast of Florida from Escambia County through Santa Rosa County in northwest Florida and from Pinellas County through Collier County in southwest Florida (FWC 2009a).

Most green turtles spend the majority of their lives in coastal foraging grounds. These areas include fairly shallow waters both open coastline and protected bays and lagoons. While in these areas, green turtles rely on marine algae and seagrass as their primary diet constituents, although some populations also forage heavily on invertebrates. These marine habitats are often highly dynamic and in areas with annual fluctuations in seawater and air temperatures, which can cause the distribution and abundance of potential green turtle food items to vary substantially between seasons and years (Carballo *et al.*, 2002). Many prey species that are abundant during winter and spring periods become patchy during warm summer periods. Some species may altogether vanish during extreme temperatures, such as those that occur during El Niño Southern Oscillation events (Carballo *et al.*, 2002).

Open beaches with a sloping platform and minimal disturbance are required for nesting.

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys.

Leatherback Sea Turtle

The leatherback sea turtle was federally listed as an endangered species on June 2, 1970 (35 *FR* 8491). Leatherbacks have the widest distribution of the sea turtles; nonbreeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Foraging leatherback excursions have been documented into higher-latitude subpolar waters. They have evolved physiological and anatomical adaptations (Frair *et al.* 1972, Greer *et al.* 1973) that allow them to exploit waters far colder than any other sea turtle species would be capable of surviving.

The adult leatherback can reach four to eight feet in length and weigh 500 to 2,000 pounds. The carapace is distinguished by a rubber-like texture, about 1.6 inches thick, made primarily of tough, oil-saturated connective tissue. Hatchlings are dorsally mostly black and are covered with tiny scales; the flippers are edged in white, and rows of white scales appear as stripes along the length of the back (NMFS 2009c). Jellyfish are the main staple of its diet, but it is also known to feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. This is the largest, deepest diving of all sea turtle species.

Leatherback turtle nesting grounds are distributed worldwide in the Atlantic, Pacific and Indian Oceans on beaches in the tropics and sub-tropics. The Pacific Coast of Mexico historically supported the world’s largest known concentration of nesting leatherbacks.

The leatherback turtle regularly nests in the U.S. Caribbean in Puerto Rico and the U.S. Virgin Islands. Along the U.S. Atlantic coast, most nesting occurs in Florida (NMFS and Service 1992). Leatherback nesting has also been reported on the northwest coast of Florida (LeBuff 1990, FWC 2009a); and in southwest Florida a false crawl (nonnesting emergence) has been observed on Sanibel Island (LeBuff 1990). Nesting has also been reported in Georgia, South Carolina, and North Carolina (Rabon *et al.* 2003) and in Texas (Shaver 2008).

Adult females require sandy nesting beaches backed with vegetation and sloped sufficiently so the distance to dry sand is limited. Their preferred beaches have proximity to deep water and generally rough seas.

Marine and terrestrial critical habitat for the leatherback sea turtle has been designated at Sandy Point on the western end of the island of St. Croix, U.S. Virgin Islands (50 Code of Federal Regulations (CFR) 17.95).

Hawksbill Sea Turtle

The hawksbill sea turtle was federally listed as an endangered species on June 2, 1970 (35 *FR* 8491). The hawksbill is found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean.

Data collected in the Wider Caribbean reported that hawksbills typically weigh around 176 pounds or less; hatchlings average about 1.6 inches straight length and range in weight from 0.5 to 0.7 ounces. The carapace is heart shaped in young turtles, and becomes more elongated or egg-shaped with maturity. The top scutes are often richly patterned with irregularly radiating streaks of brown or black on an amber background. The head is elongated and tapers sharply to a point. The lower jaw is V-shaped (NMFS 2009d).

Within the continental U.S., hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Miami-Dade Counties) and the Florida Keys (Monroe County) (Meylan 1992, Meylan *et al.* 1995). However, hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by surveyors. Therefore, surveys in Florida likely underestimate actual hawksbill nesting numbers (Meylan *et al.* 1995). In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (NMFS and Service 1993).

Critical habitat for the hawksbill sea turtle has been designated for selected beaches and/or waters of Mona, Monito, Culebrita, and Culebra Islands, Puerto Rico.

Kemp’s Ridley Sea Turtle

The Kemp’s ridley sea turtle was federally listed as endangered on December 2, 1970 (35 *FR* 18320). The Kemp's ridley, along with the flatback sea turtle (*Natator depressus*), has the most geographically restricted distribution of any sea turtle species. The range of the Kemp’s ridley includes the Gulf coasts of Mexico and the U.S., and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland.

Adult Kemp's ridleys, considered the smallest sea turtle in the world, weigh an average of 100 pounds with a carapace measuring between 24-28 inches in length. The almost circular carapace has a grayish green color while the plastron is pale yellowish to cream in color. The carapace is often as wide as it is long. Their diet consists mainly of swimming crabs, but may also include fish, jellyfish, and an array of mollusks.

The majority of nesting for the entire species occurs on the primary nesting beach at Rancho Nuevo, Mexico (Marquez-Millan 1994). Outside of nesting, adult Kemp's ridleys are believed to spend most of their time in the Gulf of Mexico, while juveniles and subadults also regularly occur along the eastern seaboard of the U.S. (Service and NMFS 1992). There have been rare instances when immature ridleys have been documented making transatlantic movements (Service and NMFS 1992). It was originally speculated that ridleys that make it out of the Gulf of Mexico might be lost to the breeding population (Hendrickson 1980), but data indicate that many of these turtles are capable of moving back into the Gulf of Mexico (Henwood and Ogren 1987). In fact, there are documented cases of ridleys captured in the Atlantic that migrated back to the nesting beach at Rancho Nuevo (Schmid and Witzell 1997, Schmid 1998, Witzell 1998).

Hatchlings, after leaving the nesting beach, are believed to become entrained in eddies within the Gulf of Mexico, where they are dispersed within the Gulf and Atlantic by oceanic surface currents until they reach about 7.9 inches in length, at which size they enter coastal shallow water habitats (Ogren 1989).

No critical habitat has been designated for the Kemp's ridley sea turtle.

Life history

Loggerhead Sea Turtle

Loggerheads are long-lived, slow-growing animals that use multiple habitats across entire ocean basins throughout their life history. This complex life history encompasses terrestrial, nearshore, and open ocean habitats. The three basic ecosystems in which loggerheads live are the:

1. Terrestrial zone (supralittoral) - the nesting beach where both oviposition (egg laying) and embryonic development and hatching occur.

2. Neritic zone - the inshore marine environment (from the surface to the sea floor) where water depths do not exceed 656 feet (200 meters). The neritic zone generally includes the continental shelf, but in areas where the continental shelf is very narrow or nonexistent, the neritic zone conventionally extends to areas where water depths are less than 656 feet.

3. Oceanic zone - the vast open ocean environment (from the surface to the sea floor) where water depths are greater than 656 feet.

Maximum intrinsic growth rates of sea turtles are limited by the extremely long duration of the juvenile stage and fecundity. Loggerheads require high survival rates in the juvenile and adult stages, common constraints critical to maintaining long-lived, slow-growing species, to achieve positive or stable long-term population growth (Congdon *et al.* 1993, Heppell 1998, Crouse 1999, Heppell *et al.* 1999, 2003, Musick 1999).

The generalized life history of Atlantic loggerheads is shown in **Figure 1** (from Bolten 2003).

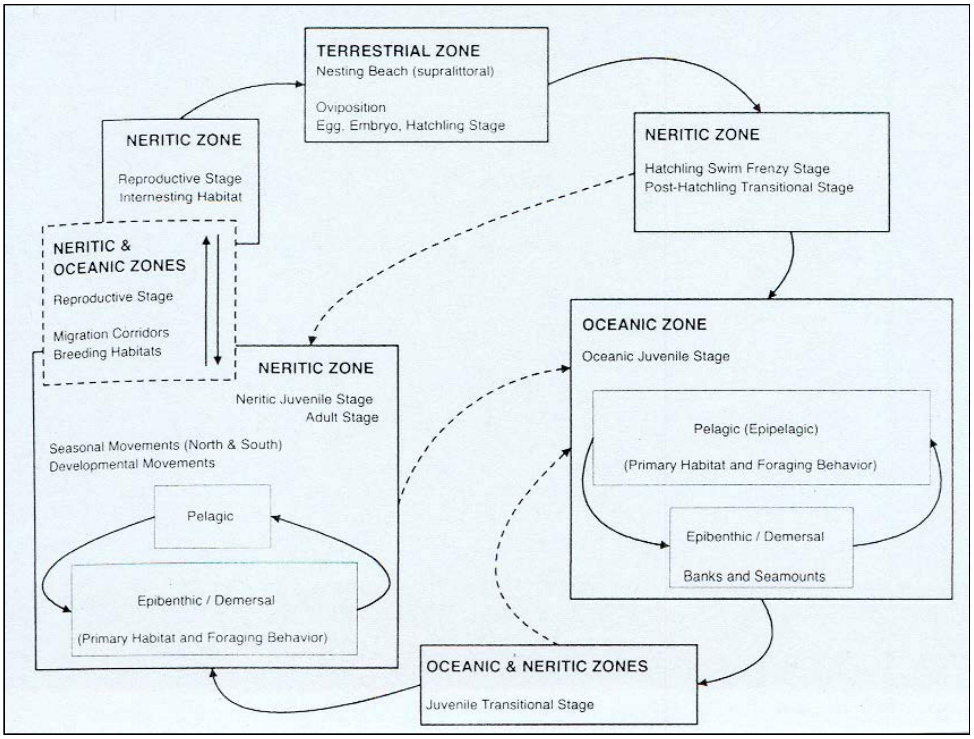

Figure 1. Life history stages of a loggerhead turtle. The boxes represent life stages and the corresponding ecosystems, solid lines represent movements between life stages and ecosystems, and dotted lines are speculative (Bolten 2003).

Numbers of nests and nesting females are often highly variable from year to year due to a number of factors including environmental stochasticity, periodicity in ocean conditions, anthropogenic effects, and density-dependent and density-independent factors affecting survival, somatic growth, and reproduction (Meylan 1982, Hays 2000, Chaloupka 2001, Solow *et al.* 2002). Despite these sources of variation, and because female turtles exhibit strong nest site fidelity, a nesting beach survey can provide a valuable assessment of changes in the adult female population, provided that the study is sufficiently long and effort and methods are standardized (Meylan 1982, Gerrodette and Brandon 2000, Reina *et al*. 2002). **Table 4** summarizes key life history characteristics for loggerheads nesting in the U.S.

Table 5. Typical values of life history parameters for loggerheads nesting in the U.S. (NMFS and Service 2008).

Life History Trait	**Data**
Clutch size (mean)	100-126 eggs[1]
Incubation duration (varies depending on time of year and latitude)	Range = 42-75 days[2,3]
Pivotal temperature (incubation temperature that produces an equal number of males and females)	84˚F[5]
Nest productivity (emerged hatchlings/total eggs) x 100 (varies depending on site specific factors)	45-70 percent[2,6]
Clutch frequency (number of nests/female/season)	3-4 nests[7]
Internesting interval (number of days between successive nests within a season)	12-15 days[8]
Juvenile (<34 inches Curved Carapace Length) sex ratio	65-70 percent female[4]
Remigration interval (number of years between successive nesting migrations)	2.5-3.7 years[9]
Nesting season	late April-early September
Hatching season	late June-early November
Age at sexual maturity	32-35 years[10]
Life span	>57 years[11]

[1] Dodd (1988).
[2] Dodd and Mackinnon (1999, 2000, 2001, 2002, 2003, 2004).
[3] Witherington (2006) (information based on nests monitored throughout Florida beaches in 2005, n = 865).
[4] National Marine Fisheries Service (2001); Foley (2005).
[5] Mrosovsky (1988).
[6] Witherington (2006) (information based on nests monitored throughout Florida beaches in 2005, n = 1,680).
[7] Murphy and Hopkins (1984); Frazer and Richardson (1985); Hawkes *et al*. 2005; Scott 2006.
[8] Caldwell (1962), Dodd (1988).
[9] Richardson *et al.* (1978); Bjorndal *et al.* (1983).
[10] Snover (2005).
[11] Dahlen *et al.* (2000).

Loggerheads nest on ocean beaches and occasionally on estuarine shorelines with suitable sand. Nests are typically laid between the high tide line and the dune front (Routa 1968, Witherington

1986, Hailman and Elowson 1992). Wood and Bjorndal (2000) evaluated four environmental factors (slope, temperature, moisture, and salinity) and found that slope had the greatest influence on loggerhead nest-site selection on a beach in Florida. Loggerheads appear to prefer relatively narrow, steeply sloped, coarse-grained beaches, although nearshore contours may also play a role in nesting beach site selection (Mortimer 1982; Provancha and Ehrhart 1987).

The warmer the sand surrounding the egg chamber, the faster the embryos develop (Mrosovsky and Yntema 1980). Sand temperatures prevailing during the middle third of the incubation period also determine the sex of hatchling sea turtles (Mrosovsky and Yntema 1980). Incubation temperatures near the upper end of the tolerable range produce only female hatchlings while incubation temperatures near the lower end of the tolerable range produce only male hatchlings.

Loggerhead hatchlings pip and escape from their eggs over a one to three day interval and move upward and out of the nest over a two to four day interval (Christens 1990). The time from pipping to emergence ranges from four to seven days with an average of 4.1 days (Godfrey and Mrosovsky 1997). Hatchlings emerge from their nests en masse almost exclusively at night, and presumably using decreasing sand temperature as a cue (Hendrickson 1958, Mrosovsky 1968, Witherington *et al.* 1990). Moran *et al.* (1999) concluded that a lowering of sand temperatures below a critical threshold, which most typically occurs after nightfall, is the most probable trigger for hatchling emergence from a nest. After an initial emergence, there may be secondary emergences on subsequent nights (Carr and Ogren 1960, Witherington 1986, Ernest and Martin 1993, Houghton and Hays 2001).

Hatchlings use a progression of orientation cues to guide their movement from the nest to the marine environments where they spend their early years (Lohmann and Lohmann 2003). Hatchlings first use light cues to find the ocean. On naturally lighted beaches without artificial lighting, ambient light from the open sky creates a relatively bright horizon compared to the dark silhouette of the dune and vegetation landward of the nest. This contrast guides the hatchlings to the ocean (Daniel and Smith 1947, Limpus 1971, Salmon *et al.* 1992, Witherington and Martin 1996, Witherington 1997, Stewart and Wyneken 2004).

Loggerheads in the Northwest Atlantic display complex population structure based on life history stages. Based on mitochondrial deoxyribonucleic acid (mtDNA), oceanic juveniles show no structure, neritic juveniles show moderate structure and nesting colonies show strong structure (Bowen *et al*. 2005). In contrast, a survey using microsatellite (nuclear) markers showed no significant population structure among nesting populations (Bowen *et al*. 2005), indicating that while females exhibit strong philopatry, males may provide an avenue of gene flow between nesting colonies in this region.

Green Sea Turtle

Green sea turtles deposit from one to nine clutches within a nesting season, but the overall average is about 3.3 nests. The interval between nesting events within a season varies around a mean of about 13 days (Hirth 1997). Mean clutch size varies widely among populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Only occasionally do females produce clutches in successive years. Usually two or more years intervene between breeding seasons (NMFS and Service 1991). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997).

Leatherback Sea Turtle

Leatherbacks nest an average of five to seven times within a nesting season, with an observed maximum of 11 nests (NMFS and Service 1992). The interval between nesting events within a season is about nine to 10 days. Clutch size averages 80 to 85 yolked eggs, with the addition of usually a few dozen smaller, yolkless eggs, mostly laid toward the end of the clutch (Pritchard 1992). Nesting migration intervals of two to three years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in six to 10 years (Zug and Parham 1996).

Hawksbill Sea Turtle

Hawksbills nest on average about 4.5 times per season at intervals of approximately 14 days (Corliss *et al.* 1989). In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest (NMFS and Service 1993). On the basis of limited information, nesting migration intervals of two to three years appear to predominate. Hawksbills are recruited into the reef environment at about 14 inches in length and are believed to begin breeding about 30 years later. However, the time required to reach 14 inches in length is unknown and growth rates vary geographically. As a result, actual age at sexual maturity is unknown.

Kemp’s Ridley Sea Turtle

Nesting occurs from April into July during which time the turtles appear off the Tamaulipas and Veracruz coasts of Mexico. Precipitated by strong winds, the females swarm to mass nesting emergences, known as “arribadas or arribazones,” to nest during daylight hours. The period between Kemp's ridley arribadas averages approximately 25 days (Rostal *et al.* 1997), but the precise timing of the arribadas is highly variable and unpredictable (Bernardo and Plotkin 2007). Clutch size averages 100 eggs and eggs typically take 45 to 58 days to hatch depending on temperatures (Marquez-Millan 1994, Rostal 2007).

Some females breed annually and nest an average of one to four times in a season at intervals of 10 to 28 days. Analysis by Rostal (2007) suggested that ridley females lay approximately 3.1 nests per nesting season. Interannual remigration rate for female ridleys is estimated to be approximately 1.8 (Rostal 2007) to 2.0 years (Marquez-Millan *et al.* 1989). Age at sexual maturity is believed to be between 10 to 17 years (Snover *et al*. 2007).

Population dynamics

Loggerhead Sea Turtle

The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. However, the majority of loggerhead nesting is at the western rims of the Atlantic and Indian Oceans. The most recent reviews show that only two loggerhead nesting beaches have greater than 10,000 females nesting per year (Baldwin *et al.* 2003, Ehrhart *et al.* 2003, Kamezaki *et al.* 2003, Limpus and Limpus 2003, Margaritoulis *et al.* 2003): South Florida (U.S.) and Masirah (Oman). Those beaches with 1,000 to 9,999 females nesting each year are Georgia through North Carolina (U.S.), Quintana Roo and Yucatán (Mexico), Cape Verde Islands (Cape Verde, eastern Atlantic off Africa), and Western Australia (Australia). Smaller nesting aggregations with 100 to 999 nesting females annually occur in the Northern Gulf of Mexico (U.S.), Dry Tortugas (U.S.), Cay Sal Bank (Bahamas), Sergipe and Northern Bahia (Brazil), Southern Bahia to Rio de Janerio (Brazil), Tongaland (South Africa), Mozambique, Arabian Sea Coast (Oman), Halaniyat Islands (Oman), Cyprus, Peloponnesus (Greece), Island of Zakynthos (Greece), Turkey, Queensland (Australia), and Japan.

The loggerhead is commonly found throughout the North Atlantic including the Gulf of Mexico, the northern Caribbean, the Bahamas archipelago, and eastward to West Africa, the western Mediterranean, and the west coast of Europe.

The major nesting concentrations in the U.S. are found in South Florida. However, loggerheads nest from Texas to Virginia. Total estimated nesting in Florida, where 90 percent of nesting occurs, has fluctuated between 52,374 and 98,602 nests per year from 2009-2013 (FWC 2014, http://myfwc.com/media/2786250/loggerheadnestingdata09-13.pdf). About 80 percent of loggerhead nesting in the southeast U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties). Adult loggerheads are known to make considerable migrations between foraging areas and nesting beaches (Schroeder *et al.* 2003, Foley *et al.* 2008). During non-nesting years, adult females from U.S. beaches are distributed in waters off the eastern U.S. and throughout the Gulf of Mexico, Bahamas, Greater Antilles, and Yucatán.

From a global perspective, the U.S. nesting aggregation is of paramount importance to the survival of the species as is the population that nests on islands in the Arabian Sea off Oman (Ross 1982, Ehrhart 1989). The status of the Oman loggerhead nesting population, reported to be the largest in the world (Ross 1979), is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interaction on foraging grounds and migration routes (Possardt 2005). The loggerhead nesting aggregations in Oman and the U.S. account for the majority of nesting worldwide.

Green Sea Turtle

The majority of nesting occurs along the Atlantic coast of eastern central Florida, with an average of 10,377 each year from 2008 to 2012 (B. Witherington, Florida Fish and Wildlife Conservation Commission, pers. comm., 2013). In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year (NMFS and Service 1998b). Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting aggregation in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season (Limpus *et al.* 1993). In the Indian Ocean, major nesting beaches occur in Oman where 30,000 females are reported to nest annually (Ross and Barwani 1995).

Leatherback Sea Turtle

A dramatic drop in nesting numbers has been recorded on major nesting beaches in the Pacific. Spotila *et al.* (2000) have highlighted the dramatic decline and possible extirpation of leatherbacks in the Pacific.

The East Pacific and Malaysia leatherback populations have collapsed. Spotila *et al.* (1996) estimated that only 34,500 females nested annually worldwide in 1995, which is a dramatic decline from the 115,000 estimated in 1980 (Pritchard 1982). In the eastern Pacific, the major nesting beaches occur in Costa Rica and Mexico. At Playa Grande, Costa Rica, considered the most important nesting beach in the eastern Pacific, numbers have dropped from 1,367 leatherbacks in 1988-1989 to an average of 188 females nesting between 2000-2001 and 2003-2004. In Pacific Mexico, 1982 aerial surveys of adult female leatherbacks indicated this area had become the most important leatherback nesting beach in the world. Tens of thousands of nests were laid on the beaches in 1980s, but during the 2003-2004 seasons a total of 120 nests was recorded. In the western Pacific, the major nesting beaches lie in Papua New Guinea, Papua, Indonesia, and the Solomon Islands. These are some of the last remaining significant nesting assemblages in the Pacific. Compiled nesting data estimated approximately 5,000 to 9,200 nests annually with 75 percent of the nests being laid in Papua, Indonesia.

However, the most recent population size estimate for the North Atlantic alone is a range of 34,000 to 94,000 adult leatherbacks (TEWG 2007). In Florida, the number of nests has been increasing since 1979 (Stewart *et al.* 2011). The average annual number of nests in the 1980s was 63 nests, which rose to 263 nests in the 1990s and to 754 nests in the 2000s (Stewart *et al.* 2011). In 2012, 1,712 nests were recorded statewide (http://myfwc.com/research/wildlife/sea-turtles/nesting/).

Nesting in the Southern Caribbean occurs in the Guianas (Guyana, Suriname, and French Guiana), Trinidad, Dominica, and Venezuela. The largest nesting populations at present occur in the western Atlantic in French Guiana with nesting varying between a low of 5,029 nests in 1967 to a high of 63,294 nests in 2005, which represents a 92 percent increase since 1967 (TEWG 2007). Trinidad supports an estimated 6,000 leatherbacks nesting annually, which represents more than 80 percent of the nesting in the insular Caribbean Sea. Leatherback nesting along the Caribbean Central American coast takes place between Honduras and Colombia. In Atlantic Costa Rica, at Tortuguero, the number of nests laid annually between 1995 and 2006 was estimated to range from 199 to 1,623.

In Puerto Rico, the main nesting areas are at Fajardo on the main island of Puerto Rico and on the island of Culebra. Between 1978 and 2005, annual population growth rate was estimated to be 1.10 percent (TEWG 2007). Recorded leatherback nesting on the Sandy Point National Wildlife Refuge on the island of St. Croix, U.S. Virgin Islands between 1990 and 2005, ranged from a low of 143 in 1990 to a high of 1,008 in 2001 (Garner *et al*. 2005). In the British Virgin Islands, annual nest numbers have increased in Tortola from zero to six nests per year in the late 1980s to 35 to 65 nests per year in the 2000s (TEWG 2007).

The most important nesting beach for leatherbacks in the eastern Atlantic lies in Gabon, Africa. It was estimated there were 30,000 nests along 60 miles of Mayumba Beach in southern Gabon during the 1999-2000 nesting season (Billes *et al*. 2000). Some nesting has been reported in Mauritania, Senegal, the Bijagos Archipelago of Guinea-Bissau, Turtle Islands and Sherbro Island of Sierra Leone, Liberia, Togo, Benin, Nigeria, Cameroon, Sao Tome and Principe, continental Equatorial Guinea, Islands of Corisco in the Gulf of Guinea and the Democratic Republic of the Congo, and Angola. In addition, a large nesting population is found on the island of Bioko (Equatorial Guinea) (Fretey *et al*. 2007). .

Hawksbill Sea Turtle

About 15,000 females are estimated to nest each year throughout the world with the Caribbean accounting for 20 to 30 percent of the world's hawksbill population. Only five regional populations remain with more than 1,000 females nesting annually (Seychelles, Mexico, Indonesia, and two in Australia) (Meylan and Donnelly 1999). Mexico is now the most important region for hawksbills in the Caribbean with about 3,000 nests per year (Meylan 1999). In the U.S. Pacific, hawksbills nest only on main island beaches in Hawaii, primarily along the east coast of the island of Hawaii. Hawksbill nesting has also been documented in American Samoa and Guam (NMFS and Service 1998c).

Kemp's Ridley Sea Turtle

Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a small number of Kemp's ridleys nest consistently along the Texas coast (TEWG 1998). In addition, rare nesting events have been reported in Alabama, Florida, Georgia, South Carolina, and North Carolina. Historical information indicates that tens of thousands of ridleys nested near Rancho Nuevo, Mexico, during the late 1940s (Hildebrand 1963). The Kemp's ridley population experienced a devastating decline between the late 1940s and the mid 1980s. The total number of nests per nesting season at Rancho Nuevo remained below 1,000 throughout the 1980s, but gradually began to increase in the 1990s. In 2009, 16,273 nests were documented along the 18.6 miles of coastline patrolled at Rancho Nuevo, and the total number of nests documented for all the monitored beaches in Mexico was 21,144 (Service 2009). In 2010, a total of 13,302 nests were documented in Mexico (Service 2010). In addition, 207 and 153 nests were recorded during 2009 and 2010, respectively, in the U.S., primarily in Texas.

Status and distribution

Loggerhead Sea turtle

Five recovery units have been identified in the Northwest Atlantic based on genetic differences and a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries (NMFS and Service 2008). Recovery units are subunits of a listed species that are geographically or otherwise identifiable and essential to the recovery of the species. Recovery units are individually necessary to conserve genetic robustness, demographic robustness, important life history stages, or some other feature necessary for long-term sustainability of the species. The five recovery units identified in the Northwest Atlantic (**Figure 2**) are:

1. Northern Recovery Unit (NRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through southern Virginia (the northern extent of the nesting range);

2. Peninsula Florida Recovery Unit (PFRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through Pinellas County on the west coast of Florida, excluding the islands west of Key West, Florida;

3. Dry Tortugas Recovery Unit (DTRU) - defined as loggerheads originating from nesting beaches throughout the islands located west of Key West, Florida;

4. Northern Gulf of Mexico Recovery Unit (NGMRU) - defined as loggerheads originating from nesting beaches from Franklin County on the northwest Gulf coast of Florida through Texas; and

5. Greater Caribbean Recovery Unit (GCRU) - composed of loggerheads originating from all other nesting assemblages within the Greater Caribbean (Mexico through French Guiana, The Bahamas, Lesser Antilles, and Greater Antilles).

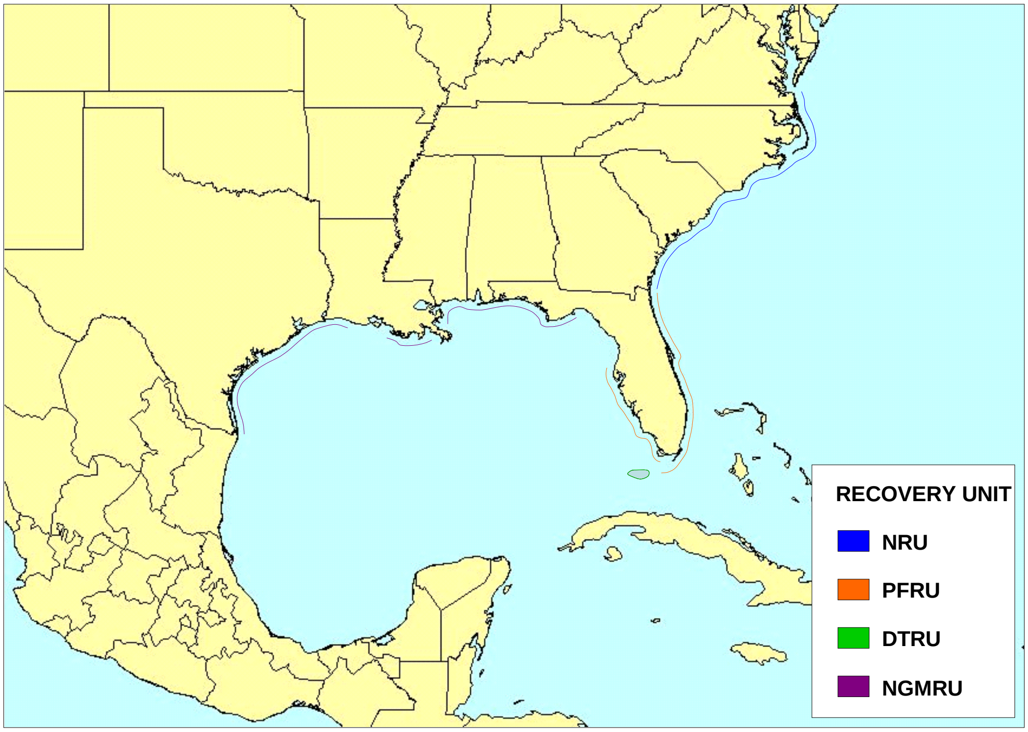

Figure 2. Map of the distribution of the loggerhead recovery units.

The mtDNA analyses show that there is limited exchange of females among these recovery units (Ehrhart 1989, Foote *et al.* 2000, NMFS 2001, Hawkes *et al.* 2005). Based on the number of haplotypes, the highest level of loggerhead mtDNA genetic diversity in the Northwest Atlantic has been observed in females of the GCRU that nest at Quintana Roo, Mexico (Encalada *et al.* 1999, Nielsen *et al*. 2012).

Nuclear DNA analyses show that there are no substantial subdivisions across the loggerhead nesting colonies in the southeastern U.S. Male-mediated gene flow appears to be keeping the subpopulations genetically similar on a nuclear DNA level (Francisco-Pearce 2001).

Historically, the literature has suggested that the northern U.S. nesting beaches (NRU and NGMRU) produce a relatively high percentage of males and the more southern nesting beaches (PFRU, DTRU, and GCRU) a relatively high percentage of females (e.g., Hanson *et al.* 1998, NMFS 2001, Mrosovsky and Provancha 1989). The NRU and NGMRU were believed to play an important role in providing males to mate with females from the more female-dominated subpopulations to the south. However, in 2002 and 2003, researchers studied loggerhead sex ratios for two of the U.S. nesting subpopulations, the northern and southern subpopulations (NGU and PFRU, respectively) (Blair 2005, Wyneken *et al.* 2005). The study produced interesting results. In 2002, the northern beaches produced more females and the southern beaches produced more males than previously believed. However, the opposite was true in 2003 with the northern beaches producing more males and the southern beaches producing more females in keeping with prior literature. Wyneken *et al.* (2005) speculated that the 2002 result may have been anomalous; however, the study did point out the potential for males to be produced on the southern beaches. Although this study revealed that more males may be produced on southern recovery unit beaches than previously believed, the Service maintains that the NRU and NGMRU play an important role in the production of males to mate with females from the more southern recovery units.

The NRU is the second largest loggerhead nesting aggregation in the Northwest Atlantic. Annual nest totals from northern beaches averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (NMFS and Service 2008), representing approximately 1,272 nesting females per year (4.1 nests per female, Murphy and Hopkins 1984). The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3 percent annually. Nest totals from aerial surveys conducted by the South Carolina Department of Natural Resources showed a 1.9 percent annual decline in nesting in South Carolina since 1980. Overall, there is strong statistical data to suggest the NRU has experienced a long-term decline (NMFS and Service 2008).

The PFRU is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census of the PFRU undertaken from 1989 to 2007 reveals a mean of 64,513 loggerhead nests per year representing approximately 15,735 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (FWC 2008d). This near-complete census provides the best statewide estimate of total abundance, but because of variable survey effort, these numbers cannot be used to assess trends. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. In 1979, the Statewide Nesting Beach Survey (SNBS) program was initiated to document the total distribution, seasonality, and abundance of sea turtle nesting in Florida. In 1989, the INBS program was initiated in Florida to measure seasonal productivity, allowing comparisons between beaches and between years (FWC 2009b). Of the 190 SNBS surveyed areas, 33 participate in the INBS program (representing 30 percent of the SNBS beach length).

INBS nest counts from 1989–2010 show a shallow decline. However, recent trends (1998–2010) in nest counts have shown a 25 percent decline, with increases only observed in the most recent 6-year period, 2008–2013 although there was no trend observed (FWC/FWRI 2014). The analysis that reveals this decline uses nest-count data from 345 representative Atlantic-coast index zones (total length = 187 miles) and 23 representative zones on Florida's southern Gulf coast (total length = 14.3 miles). The spatial and temporal coverage (annually, 109 days and 368 zones) accounted for an average of 70 percent of statewide loggerhead nesting activity between 1989 and 2010.

The NGMRU is the third largest nesting assemblage among the four U.S. recovery units. Nesting surveys conducted on approximately 186 miles of beach within the NGMRU (Alabama and Florida only) were undertaken between 1995 and 2007 (statewide surveys in Alabama began in 2002). The mean nest count during this 13-year period was 906 nests per year, which equates to about 221 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984; FWC 2008d). Evaluation of long-term nesting trends for the NGMRU is difficult because of changed and expanded beach coverage. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. There are 12 years (1997-2008) of Florida INBS data for the NGMRU (FWC 2008d). A log-linear regression showed a significant declining trend of 4.7 percent annually (NMFS and Service 2008).

The DTRU, located west of the Florida Keys, is the smallest of the identified recovery units. A near-complete nest census of the DTRU undertaken from 1995 to 2004, excluding 2002, (nine years surveyed) reveals a mean of 246 nests per year, which equates to about 60 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (FWC 2008d). Surveys after 2004 did not include principal nesting beaches within the recovery unit (*i.e*., Dry Tortugas National Park). The nesting trend data for the DTRU are from beaches that are not part of the INBS program, but are part of the SNBS program. There are nine years of data for this recovery unit. A simple linear regression accounting for temporal autocorrelation revealed no trend in nesting numbers. Because of the annual variability in nest totals, a longer time series is needed to detect a trend (NMFS and Service 2008).

The GCRU is composed of all other nesting assemblages of loggerheads within the Greater Caribbean. Statistically valid analyses of long-term nesting trends for the entire GCRU are not available because there are few long-term standardized nesting surveys representative of the region. Additionally, changing survey effort at monitored beaches and scattered and low-level nesting by loggerheads at many locations currently precludes comprehensive analyses. The most complete data are from Quintana Roo and Yucatán, Mexico, where an increasing trend was reported over a 15-year period from 1987-2001 (Zurita *et al.* 2003). However, since 2001, nesting has declined and the previously reported increasing trend appears not to have been sustained (NMFS and Service 2008). Other smaller nesting populations have experienced declines over the past few decades (e.g., Amorocho 2003).

Recovery Criteria (only the Demographic Recovery Criteria are presented below; for the Listing Factor Recovery Criteria, please see NMFS and Service 2008)

1. Number of Nests and Number of Nesting Females
    a. Northern Recovery Unit
        i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is 2 percent or greater resulting in a total annual number of nests of 14,000 or greater for this recovery unit (approximate distribution of nests is North Carolina =14 percent [2,000 nests], South Carolina =66 percent [9,200 nests], and Georgia =20 percent [2,800 nests]); and

        ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

    b. Peninsular Florida Recovery Unit
        i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is statistically detectable (one percent) resulting in a total annual number of nests of 106,100 or greater for this recovery unit; and
        ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

    c. Dry Tortugas Recovery Unit
        i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is three percent or greater resulting in a total annual number of nests of 1,100 or greater for this recovery unit; and
        ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

    d. Northern Gulf of Mexico Recovery Unit
        i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is three percent or greater resulting in a total annual number of nests of 4,000 or greater for this recovery unit (approximate distribution of nests (2002-2007) is Florida= 92 percent [3,700 nests] and Alabama =8 percent [300 nests]); and
        ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

    e. Greater Caribbean Recovery Unit
        i. The total annual number of nests at a minimum of three nesting assemblages, averaging greater than 100 nests annually (e.g., Yucatán, Mexico; Cay Sal Bank, Bahamas) has increased over a generation time of 50 years; and
        ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

2. Trends in Abundance on Foraging Grounds
   A network of in-water sites, both oceanic and neritic, across the foraging range is established and monitoring is implemented to measure abundance. There is statistical confidence (95 percent) that a composite estimate of relative abundance from these sites is increasing for at least one generation.

3. Trends in Neritic Strandings Relative to In-water Abundance
   Stranding trends are not increasing at a rate greater than the trends in in-water relative abundance for similar age classes for at least one generation.

The Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle was signed in 2008 (NMFS and Service 2008), and the Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle was signed in 1998 (NMFS and Service 1998e).

Green Sea Turtle

Annual nest totals documented as part of the Florida SNBS program from 1989-2008 have ranged from 435 nests laid in 1993 to 12,752 in 2007. The nest count for 2013 was more than twice the count from 2007 with a total of 36,195 nests recorded (http://myfwc.com/research/wildlife/sea-turtles/nesting/statewide/). Nesting occurs in 26 counties with a peak along the east coast, from Volusia through Broward Counties. Although the SNBS program provides information on distribution and total abundance statewide, it cannot be used to assess trends because of variable survey effort. Therefore, green turtle nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time (1989-2009). Green sea turtle nesting in Florida is increasing based on 19 years (1989-2009) of INBS data from throughout the state (FWC 2009a). The increase in nesting in Florida is likely a result of several factors, including: (1) a Florida statute enacted in the early 1970s that prohibited the killing of green turtles in Florida; (2) the species listing under the Act afforded complete protection to eggs, juveniles, and adults in all U.S. waters; (3) the passage of Florida's constitutional net ban amendment in 1994 and its subsequent enactment, making it illegal to use any gillnets or other entangling nets in State waters; (4) the likelihood that the majority of Florida green turtles reside within Florida waters where they are fully protected; (5) the protections afforded Florida green turtles while they inhabit the waters of other nations that have enacted strong sea turtle conservation measures (e.g., Bermuda); and (6) the listing of the species on Appendix I of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which stopped international trade and reduced incentives for illegal trade from the U.S.

Recovery Criteria

The U.S. Atlantic population of green sea turtles can be considered for delisting if, over a period of 25 years, the following conditions are met:

1. The level of nesting in Florida has increased to an average of 5,000 nests per year for at least six years. Nesting data must be based on standardized surveys;

2. At least 25 percent (65 miles) of all available nesting beaches (260 miles) is in public ownership and encompasses at least 50 percent of the nesting activity;

3. A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds; and

4. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for U.S. Population of Atlantic Green Turtle was signed in 1991 (NMFS and Service 1991), the Recovery Plan for U.S. Pacific Populations of the Green Turtle was signed in 1998 (NMFS and Service 1998b), and the Recovery Plan for U.S. Pacific Populations of the East Pacific Green Turtle was signed in 1998 (NMFS and Service 1998a).

Leatherback Sea Turtle

Declines in leatherback nesting have occurred over the last two decades along the Pacific coasts of Mexico and Costa Rica. The Mexican leatherback nesting population, once considered to be the world's largest leatherback nesting population (historically estimated to be 65 percent of the worldwide population), is now less than one percent of its estimated size in 1980. Spotila *et al.* (1996) estimated the number of leatherback sea turtles nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200, and an upper limit of about 42,900. This is less than one-third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. The largest population is in the western Atlantic. Using an age-based demographic model, Spotila *et al.* (1996) determined that leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and that the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded that leatherbacks are on the road to extinction and further population declines can be expected unless action is taken to reduce adult mortality and increase survival of eggs and hatchlings.

In the U.S., nesting populations occur in Florida, Puerto Rico, and the U.S. Virgin Islands. In Florida, the SNBS program documented an increase in leatherback nesting numbers from 98 nests in 1988 to between 800 and 900 nests per season in the early 2000s (FWC 2009a, Stewart and Johnson 2006). Although the SNBS program provides information on distribution and total abundance statewide, it cannot be used to assess trends because of variable survey effort. Therefore, leatherback nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time (1989-2009). An analysis of the INBS data has shown a substantial increase in leatherback nesting in Florida since 1989 (FWC 2009b, TEWG Group 2007).

Recovery Criteria

The U.S. Atlantic population of leatherbacks can be considered for delisting if the following conditions are met:

1. The adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto Rico, St. Croix, U.S. Virgin Islands, and along the east coast of Florida;

2. Nesting habitat encompassing at least 75 percent of nesting activity in U.S. Virgin Islands, Puerto Rico, and Florida is in public ownership; and.

3. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for Leatherback Turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico was signed in 1992 (NMFS and Service 1992), and the Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle was signed in 1998 (NMFS and Service 1998d).

Hawksbill Sea Turtle

The hawksbill sea turtle has experienced global population declines of 80 percent or more during the past century and continued declines are projected (Meylan and Donnelly 1999). Most populations are declining, depleted, or remnants of larger aggregations. Hawksbills were previously abundant, as evidenced by high-density nesting at a few remaining sites and by trade statistics.

Recovery Criteria

The U.S. Atlantic population of hawksbills can be considered for delisting if, over a period of 25 years, the following conditions are met:

1. The adult female population is increasing, as evidenced by a statistically significant trend in the annual number of nests on at least five index beaches, including Mona Island and Buck Island Reef National Monument;

2. Habitat for at least 50 percent of the nesting activity that occurs in the U.S. Virgin Islands and Puerto Rico is protected in perpetuity;

3. Numbers of adults, subadults, and juveniles are increasing, as evidenced by a statistically significant trend on at least five key foraging areas within Puerto Rico, U.S. Virgin Islands, and Florida; and

4. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for the Hawksbill Turtle in the U.S. Caribbean, Atlantic, and Gulf of Mexico was signed in 1993 (NMFS and Service 1993), and the Recovery Plan for U.S. Pacific Populations of the Hawksbill Turtle was signed in 1998 (NMFS and Service 1998c).

Kemp's Ridley Sea Turtle

Today, under strict protection, the population appears to be in the early stages of recovery. The recent nesting increase can be attributed to full protection of nesting females and their nests in Mexico resulting from a binational effort between Mexico and the U.S. to prevent the extinction of the Kemp's ridley, and the requirement to use Turtle Excluder Devices (TEDs) in shrimp trawls both in the U.S. and Mexico.

The Mexico government also prohibits harvesting and is working to increase the population through more intensive law enforcement, by fencing nest areas to diminish natural predation, and by relocating most nests into corrals to prevent poaching and predation. While relocation of nests into corrals is currently a necessary management measure, this relocation and concentration of eggs into a "safe" area is of concern since it can reduce egg viability.

Recovery Criteria

The goal of the recovery plan is for the species to be reduced from endangered to threatened status. The Recovery Team members feel that the criteria for a complete removal of this species from the endangered species list need not be considered now, but rather left for future revisions of the plan. Complete removal from the federal list would certainly necessitate that some other instrument of protection, similar to the MMPA, be in place and be international in scope. Kemp's ridley can be considered for reclassification to threatened status when the following four criteria are met:

1. Continuation of complete and active protection of the known nesting habitat and the waters adjacent to the nesting beach (concentrating on the Rancho Nuevo area) and continuation of the bi-national protection project;

2. Elimination of mortality from incidental catch in commercial shrimping in the U.S. and Mexico through the use of TEDs and achievement of full compliance with the regulations requiring TED use;

3. Attainment of a population of at least 10,000 females nesting in a season; and

4. Successful implementation of all priority one recovery tasks in the recovery plan.

The Recovery Plan for the Kemp's Ridley Sea Turtle was signed in 1992 (Service and NMFS 1992). Significant new information on the biology and population status of Kemp's ridley has become available since 1992. Consequently, a full revision of the recovery plan has been completed by the Service and NMFS. The Bi-National Recover Plan for the Kemp's Ridley Sea turtle (2011) provides updated species biology and population status information, objective and measurable recovery criteria, and updated and prioritized recovery actions.

Common threats to sea turtles in Florida

Anthropogenic factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching include: beach erosion; armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants (*Solenopsis* spp.), feral hogs (*Sus scrofa*), dogs (*Canis familiaris),* and an increased presence of native species (e.g., raccoons (*Procyon lotor*), armadillos (*Dasypus novemcinctus*), and opossums (*Didelphis virginiana*)), which raid nests and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the western North Atlantic coast, other areas along these coasts have limited or no protection.

Anthropogenic threats in the marine environment include oil and gas exploration and transportation; marine pollution; underwater explosions; hopper dredging; offshore artificial lighting; power plant entrainment or impingement; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; and poaching and fishery interactions. On April 20, 2010, an explosion and fire on the Mobile Offshore Drilling Unit *Deepwater Horizon* MC252 occurred approximately 50 miles southeast of the Mississippi Delta. A broken well head at the sea floor resulted in a sustained release of oil, estimated at 35,000 and 60,000 barrels per day. On July 15, the valves on the cap were closed, which effectively shut in the well and all sub-sea containment systems. Damage assessment from the sustained release of oil is currently ongoing and the Service does not have a basis at the present time to predict the complete scope of effects to sea turtles range-wide.

Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor, particularly for green turtles. This disease has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. The tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens may die.

Analysis of the species/critical habitat likely to be affected

The threatened loggerhead sea turtle, the endangered green sea turtle, the endangered leatherback sea turtle, the endangered hawksbill sea turtle, and the endangered Kemp’s ridley sea turtle are currently listed because of their reduced population sizes caused by overharvest and habitat loss with continuing anthropogenic threats from commercial fishing, disease, and degradation of remaining habitat. The proposed action has the potential to adversely affect nesting females of these species, their nests, and hatchlings on all nesting beaches where shore protection activities (including the placement of compatible sediment, repair or replacement of groins and jetties, and navigation channel maintenance on the beaches of the Atlantic and Gulf coasts of Florida) occur.

The Service and the National Oceanic and Atmospheric Administration’s National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment.

In accordance with the Act, the Service completes consultations with all Federal agencies for actions that may adversely affect sea turtles on the nesting beach. The Service’s analysis only addresses activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. NMFS assesses and consults with Federal agencies concerning potential impacts to sea turtles in the marine environment, including updrift and downdrift nearshore areas affected by sand placement projects on the beach.

The proposed action has the potential to adversely affect nesting females, nests, and hatchlings within the proposed project area. Potential effects include destruction of nests deposited within the boundaries of the proposed project, harassment as a result of construction activities in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches; disorientation of hatchling turtles resulting from project lighting on beaches adjacent to the construction area as they emerge from the nest and crawl to the water; disorientation that occurs after project construction due to landward lights impacting the elevated berm; and behavior modification of nesting females due to escarpment formation within the project area during a nesting season resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs. The quality of the placed sand could affect the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest. The effects of the proposed action on sea turtles will be considered further in the remaining sections of this biological opinion.

Some individuals in a population are more “valuable” than others in terms of the number of offspring they are expected to produce. An individual’s potential for contributing offspring to future generations is its reproductive value. Because of delayed sexual maturity, reproductive longevity, and low survivorship in early life stages, nesting females are of high value to a population. The loss of a nesting female in a small recovery unit would represent a significant loss to the recovery unit. The reproductive value for a nesting female has been estimated to be approximately 253 times greater than an egg or a hatchling (NMFS and Service 2008). However, the SPBO includes avoidance and minimization measures that reduce the possibility of mortality of a nesting female on the beach as a result of the project. Therefore, we do not anticipate the loss of any nesting females on the beach as a result of the activities listed in this SPBO.

Sand placement projects are anticipated to result in decreased nesting and loss of nests that do get laid within the project area for two subsequent nesting seasons following the completion of the proposed sand placement. However, it is important to note that it is unknown whether nests that would have been laid in a project area during the two subsequent nesting seasons had the project not occurred are actually lost from the population or if nesting is simply displaced to adjacent beaches. Regardless, eggs and hatchlings have a low reproductive value; each egg or hatchling has been estimated to have only 0.004 percent of the value of a nesting female (NMFS and Service

2008). Thus, even if the majority of the eggs and hatchlings that would have been produced on the project beach are not realized for up to 2 years following project completion, the Service would not expect this loss to have a significant effect on the recovery and survival of the species, for the following reasons: 1) some nesting is likely just displaced to adjacent non-project beaches, 2) not all eggs will produce hatchlings, and 3) destruction and/or failure of nests will not always result from a sand placement project. A variety of natural and unknown factors negatively affect incubating egg clutches, including tidal inundation, storm events, and predation.

During project construction, direct mortality of the developing embryos in nests within the project area may occur for nests that are missed and not relocated. The exact number of these missed nests is not known. However, in two separate monitoring programs on the east coast of Florida where hand digging was performed to confirm the presence of nests and thus reduce the chance of missing nests through misinterpretation, trained observers still missed about 6 to 8 percent of the nests because of natural elements (Martin 1992, Ernest and Martin 1993). This must be considered a conservative number, because nests missed during surveys are not always discovered after hatching. In another study, Schroeder (1994) found that even under the best of conditions, about 7 percent of nests can be misidentified as false crawls by highly experienced sea turtle nest surveyors. Missed nests are usually identified by signs of hatchling emergences in areas where no nest was previously documented. Signs of hatchling emergence are very easily obliterated by the same elements that interfere with detection of nests.

In the U.S., consultations with the Service have included military missions and operations, beach nourishment and other shoreline protection projects, and actions related to protection of coastal development on sandy beaches along the coast. Much of the Service’s section 7 consultation involves beach nourishment projects. A list of the Service’s consultations completed over the last 5 years is included in Appendix A. The Act does not require entities conducting projects with no Federal nexus to apply for a section 10(a)(1)(B) permit. This is a voluntary process and is applicant driven. Section 10(a)(1)(A) permits are scientific permits that include activities that would enhance the survival and conservation of a listed species. Those permits are not listed as they are expected to benefit the species and are not expected to contribute to the cumulative take assessment.

A list of completed NMFS consultations is included in Appendix B.

ENVIRONMENTAL BASELINE

Status of the species/critical habitat within the action area

INBS nest counts represent approximately 69 percent of known loggerhead nesting in Florida, 74 percent of known green turtle nesting, and 34 percent of known leatherback nesting (FWC 2009a). The INBS program was established with a set of standardized data-collection criteria to measure seasonal nesting, and to allow accurate comparisons between both beaches and years. The reliability of these comparisons results from the uniformity of beach-survey effort in space and time, and from the specialized annual training of beach surveyors. Under the core INBS program, 178 miles of nesting beach have been divided into zones, known as core index zones, averaging 0.5 mile in length. These beaches are monitored daily beginning May 15 and ending August 31. On all index beaches, researchers record nests and nesting attempts by species, the location of each nest, and the date each nest was laid.

Nesting surveys begin at or just before sunrise. Turtle crawls are identified as a true nesting crawl or false crawl (*i.e.*, nonnesting emergence). Nests are marked with stakes and some are surrounded with surveyor flagging tape and, if needed, screened or caged to prevent predation. The marked nests are monitored throughout the incubation period for storm damage, predation, hatching activity and hatching and emerging success. Nest productivity surveys may continue into mid-November depending on nest incubation periods. All monitoring is conducted in accordance with the FWC's Marine Turtle Conservation Guidelines.

Loggerhead Sea Turtle

Five loggerhead sea turtle recovery units have been identified in the Northwest Atlantic (NMFS and Service 2008). Mitochondrial DNA analyses show that there is limited exchange of females among these recovery units (Foote *et al*. 2000, NMFS 2001, Hawkes *et al*. 2005). However, nuclear DNA analyses show that there are no substantial subdivisions across the loggerhead nesting colonies in the southeastern U.S. Male-mediated gene flow appears to be keeping the subpopulations genetically similar on a nuclear DNA level (Francisco-Pearce 2001). The NRU and NGMRU are believed to play an important role in providing males to mate with females from the more female-dominated recovery units.

Two (NGMRU and PFRU) of the five nesting subpopulations occur within the proposed Action Area. Northwest Florida, which accounts for 92 percent of the NGMRU in nest numbers, consists of approximately 234 miles of nesting shoreline. The PFRU makes up 1,166 miles of shoreline and consists of approximately was 69,982 nests per year (2008 to 2012)..

Recovery Units	**Nesting Range**
NGMRU	Escambia through Franklin Counties
PFRU	Pinellas through Nassau Counties

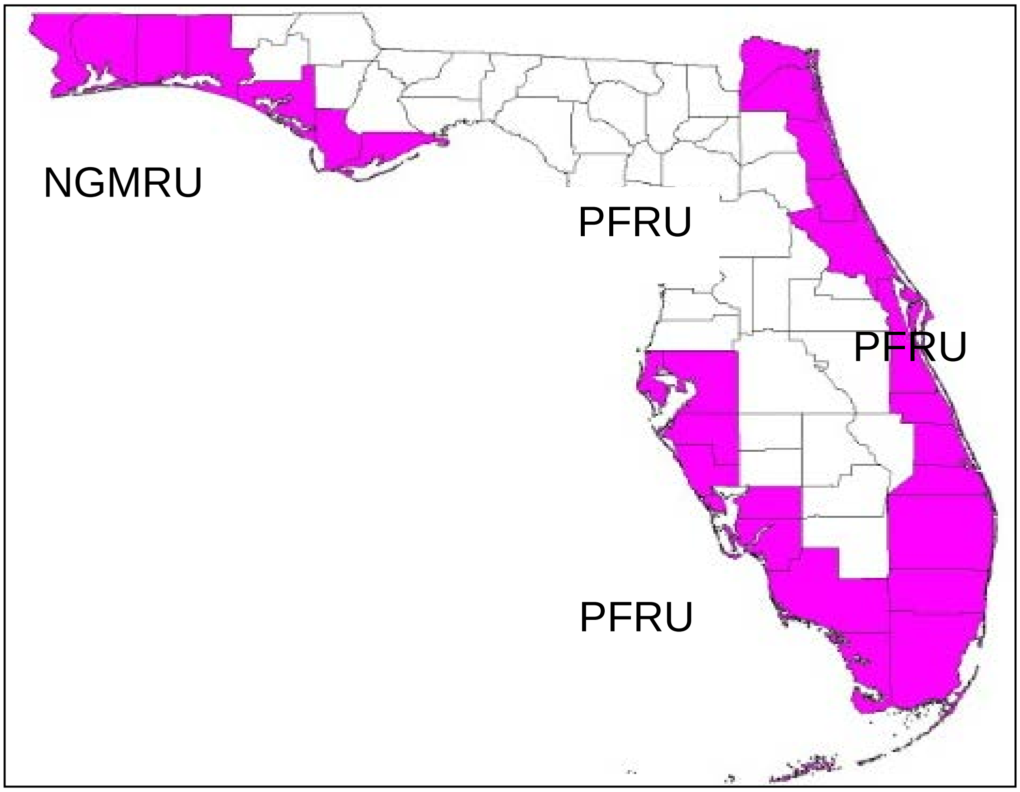

Figure 3. Distribution of loggerhead sea nesting in the PFRU and NGMRU in Florida.

The main loggerhead sea turtle nesting and hatching season throughout Florida is shown in **Table 5.**

Table 6. Loggerhead sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 1 through October 31
Southern Gulf of Mexico	Pinellas through Monroe	April 1 through November 30
Southern Florida Atlantic	Brevard through Miami-Dade	March 1 through November 30
Northern Florida Atlantic	Nassau through Volusia	April 15 through November 30

An updated analysis by FWC/FWRI reveals a shallow decline in loggerhead nest numbers around the State of Florida based on INBS nest counts from 1989 through 2010 (FWC/FWRI 2010). Analysis of nest counts over the last six years (2009 through 2013) have found no trend, although when added to the data from 1989, the overall change is an increase in loggerhead nests since 1989 (FWC/FWRI 2014). The five year average (2008 to2012) for the PFRU was 69,982 nests. The five-year average (2008 to 2012) for the NGMRU was 966 nests.

Sea turtles play a vital role in maintaining healthy and productive ecosystems. Nesting sea turtles introduce large quantities of nutrients from the marine ecosystem to the beach and dune system (Bouchard and Bjorndal 2000). In the U.S., loggerheads play a particularly important role in this regard due to their greater nesting numbers. The nutrients they leave behind on the nesting beaches in the form of eggs and eggshells play an important role for dune vegetation and terrestrial predator populations (Bouchard and Bjorndal 2000). In a study at Melbourne Beach, Florida, Bouchard and Bjorndal (2000) estimated that only 25 percent of the organic matter introduced into nests by loggerheads returned to the ocean as hatchlings. They found that 29-40 percent of all nutrients were made available to detritivores, decomposers, and plants, while 26-31 percent of all nutrients were consumed by nest predators. Thus, all loggerhead recovery units play a vital role in the maintenance of a healthy beach and dune ecosystem within their geographic distribution.

Green Sea Turtle

Green turtle nest numbers are increasing in Florida with a record number of nests being recorded during the 2013 season (FWC 2014). The five year average (2008 to 2012) for green turtles within the action area was 10,384 nests. The number of green turtle nests recorded in Florida during the 2013 nesting season was a record high of 36,195.

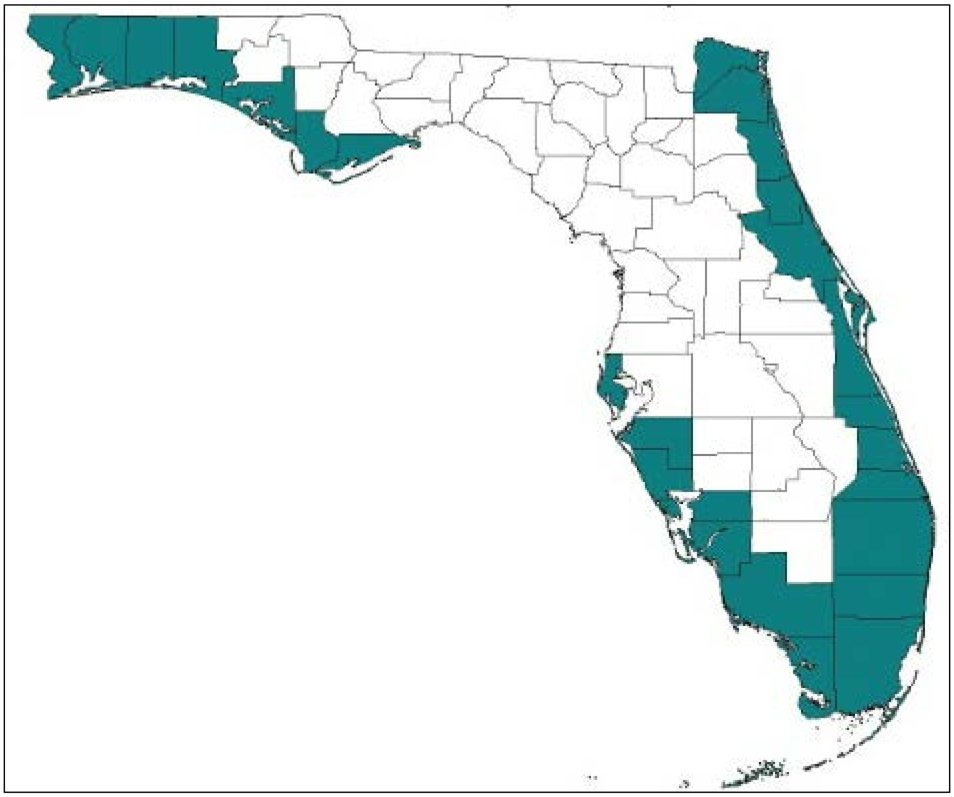

Figure 4. Distribution of green sea turtle nesting in Florida.

The main green sea turtle nesting and hatching season throughout Florida is shown in **Table 6**.

Table 7. Green sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 15 through October 31
Southern Gulf of Mexico	Pinellas through Monroe	May 15 through October 31
Southern Florida Atlantic	Brevard through Miami-Dade	May 1 through November 30
Northern Florida Atlantic	Nassau through Volusia	May 15 through November 15

Leatherback Sea Turtle

Leatherback nest numbers are increasing in Florida with a record number of leatherback nests recorded during the 2009 season (FWC 2009a). The five year average (2008 to 2012) for leatherback sea turtles within the action area was 1,435 nests with a total of 896 nests recorded in 2013.

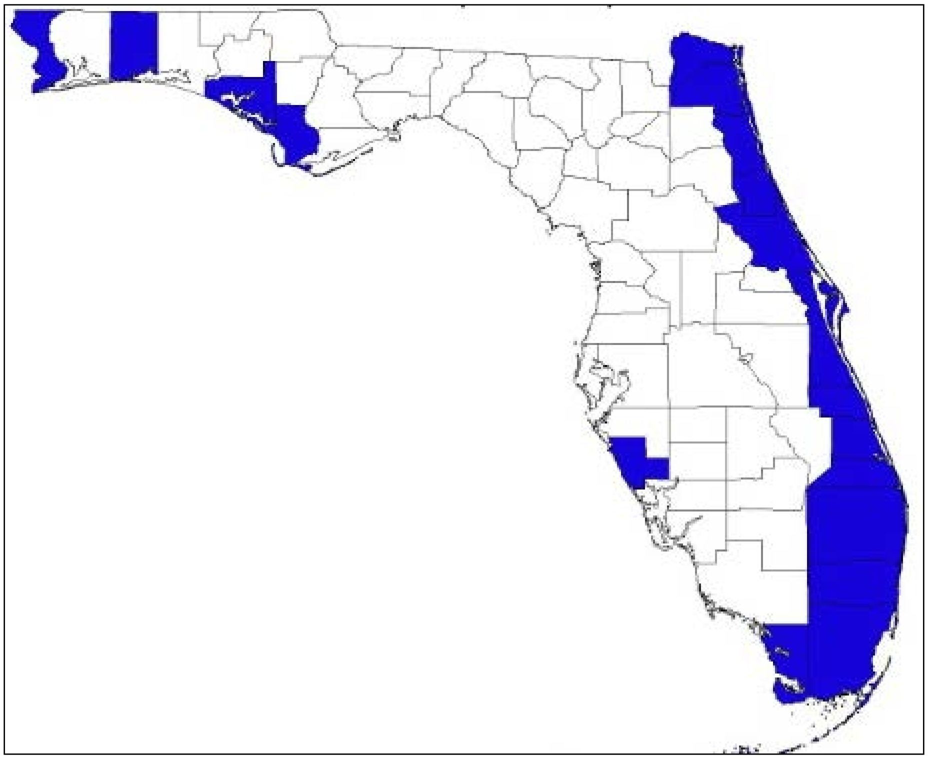

Figure 5. Distribution of leatherback sea turtle nesting in Florida.

The main leatherback sea turtle nesting and hatching season throughout Florida is shown in **Table 7**.

Table 8. Leatherback sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 1 through September 30
Southern Florida Atlantic	Brevard through Miami-Dade	February 15 through November 30
Northern Florida Atlantic	Nassau through Volusia	April 15 through September 30

Hawksbill Sea Turtle

Forty-six hawksbill nests have been documented in Florida from 1979-2013 in Volusia, Martin, Palm Beach, Broward, Miami-Dade, Monroe, and Manatee counties (FWC/FWRI 2014a). The hawksbill sea turtle nesting and hatching season throughout Florida is shown in **Table 8**.

Table 9. Hawksbill sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Southern tip of Florida	Monroe	June 1 through December 31
Southern Florida Atlantic	Brevard through Miami-Dade	June 1 through December 31
Northeast Florida	Volusia	June 1 through December 31
Southwest Florida	Manatee	June 1 through December 31

Kemp’s Ridley Sea Turtle

Eighty Kemp’s ridley nests have been documented in Florida from 1979-2013 in Duval, Flagler, Volusia, Brevard, Martin, Palm Beach, Lee, Charlotte, Sarasota, Pinellas, Franklin, Gulf, Walton, Okaloosa, Santa Rosa, and Escambia counties (FWC/FWRI 2014).

Factors affecting species habitat within the action area

In accordance with the Act, the Service completes consultations with all federal agencies for actions that may adversely affect sea turtles. In Florida, consultations have included military missions and operations, beach nourishment and other shoreline protection, and actions related to protection of coastal development on sandy beaches of Florida’s Atlantic Coast (Key West to

Fernandina/Kings Bay) and the Gulf Coast (Ten Thousand Islands to Alabama State Line) (**Appendix A**).

Coastal Development

Loss of nesting habitat related to coastal development has had the greatest impact on nesting sea turtles in Florida. Beachfront development not only causes the loss of suitable nesting habitat, but can result in the disruption of powerful coastal processes accelerating erosion and interrupting the natural shoreline migration (National Research Council 1990b). This may in turn cause the need to protect upland structures and infrastructure by armoring, groin placement, beach emergency berm construction and repair, and beach nourishment which cause changes in, additional loss of, or impact to, the remaining sea turtle habitat.

Hurricanes

Hurricanes were probably responsible for maintaining coastal beach habitat upon which sea turtles depend through repeated cycles of destruction, alteration, and recovery of beach and dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain, which can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes and other storms can result in the direct or indirect loss of sea turtle nests, either by erosion or washing away of the nests by wave action, inundation or “drowning” of the eggs or hatchlings developing within the nest or indirectly by loss of nesting habitat. Depending on their frequency, storms can affect sea turtles on either a short-term basis (nests lost for one season and/or temporary loss of nesting habitat) or long term, if frequent (habitat unable to recover). How hurricanes affect sea turtle nesting also depends on its characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining nesting habitat in a natural state with no development landward of the sandy beach, frequent or successive severe weather events could threaten the ability of certain sea turtle populations to survive and recover. Sea turtles evolved under natural coastal environmental events such as hurricanes. The extensive amount of predevelopment coastal beach and dune habitat allowed sea turtles to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to sea turtle survival and recovery. On developed beaches, typically little space remains for sandy beaches to become reestablished after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their prestorm locations can result in a loss of nesting habitat.

The 2004 hurricane season was the most active storm season in Florida since weather records began in 1851. Hurricanes Charley, Frances, Ivan, and Jeanne, along with Tropical Storm Bonnie, damaged the beach and dune system, upland structures and properties, and infrastructure in the majority of Florida's coastal counties. The cumulative impact of these storms exacerbated erosion conditions throughout the state.

The 2005 hurricane season was a record-breaking season with 27 named storms. Hurricanes Dennis, Katrina, Ophelia, Rita, and Wilma, and Tropical Storms Arlene and Tammy impacted Florida. The cumulative impact of these storms exacerbated erosion conditions in south and northwest Florida.

A common question is whether the 2004 and 2005 hurricane seasons contributed to reduced loggerhead nest numbers observed from 2004-2007. Although Florida has been subject to numerous hurricanes in recent years, these storm events cannot account for the recent decline (1998-2010) observed in the number of loggerhead nests on Florida beaches. The hurricanes have a very limited effect on nesting activity of adult female turtles. Because loggerheads that hatch on Florida beaches require some 20 to 30 years to reach maturity, storm impacts would not manifest themselves for many years. Moreover, hurricane impacts to nests tend to be localized and often occur after the main hatching season for the loggerhead is over (FWC 2008a).

Erosion

The designation of a Critically Eroded Beach is a planning requirement of the State's Beach Management Funding Assistance Program http://www.dep.state.fl.us/beaches/programs/becp/index.htm. A segment of beach shall first be designated as critically eroded in order to be eligible for State funding. A critically eroded area is a segment of shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. Critically eroded areas may also include peripheral segments or gaps between identified critically eroded areas which, although they may be stable or slightly erosional now, their inclusion is necessary for continuity of management of the coastal system or for the design integrity of adjacent beach management projects (FDEP 2009). It is important to note, that for an erosion problem area to be critical, there shall exist a threat to or loss of one of four specific interests – upland development, recreation, wildlife habitat, or important cultural resources.

Beachfront Lighting

Artificial beachfront lighting may cause disorientation (loss of bearings) and misorientation (incorrect orientation) of sea turtle hatchlings. Visual signs are the primary sea-finding mechanism for hatchlings (Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). Artificial beachfront lighting is a documented cause of hatchling disorientation and misorientation on nesting beaches (Philibosian 1976, Mann 1977, Witherington and Martin 1996). The emergence from the nest and crawl to the sea is one of the most critical periods of a sea turtle's life. Hatchlings that do not make it to the sea quickly become food for ghost crabs, birds, and other predators, or become dehydrated and may never reach the sea. Some types of beachfront lighting attract hatchlings away from the sea while some lights cause adult turtles to avoid stretches of brightly illuminated beach. Research has documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights (Witherington 1992). During the 2007 to 2010 sea turtle nesting seasons in Florida, turtle hatchlings that were documented as being disoriented ranged from 44,828 to more than 64,000 hatchlings per year (**Table 9**) (FWC/FWRI 2014b). Exterior and interior lighting associated with condominiums had the greatest impact causing approximately 42 percent of documented hatchling disorientation/misorientation. Other causes included urban sky glow and street lights (FWC 2007a).

Table 10. Documented disorientations along the Florida coast (FWC 2007a).

Year	Total Number of Hatchling Disorientation Events	Total Number of Hatchlings Involved in Disorientation Events	Total Number of Adult Disorientation Events
2001	743	28,674	19
2002	896	43,226	37
2003	1,446	79,357	18
2004	888	46,487	24
2005	976	41,521	50
2006	1,521	71,798	40
2007	1,410	64,433	25
2008	1,192	49,623	62
2009	1,274	44,828	42
2010	1,513	46,978	82

Predation

Predation of sea turtle eggs and hatchlings by native and introduced species occurs on almost all nesting beaches. Predation by a variety of predators can considerably decrease sea turtle nest hatching success. The most common predators in the southeastern U.S. are ghost crabs (*Ocypode quadrata*), raccoons, feral hogs, foxes (*Urocyon cinereoargenteus* and *Vulpes vulpes*), coyotes (*Canis latrans*), armadillos, and fire ants (Dodd 1988, Stancyk 1995). In the absence of nest protection programs in a number of locations throughout the southeast U.S., raccoons may depredate up to 96 percent of all nests deposited on a beach (Davis and Whiting 1977, Hopkins and Murphy 1980, Stancyk *et al.* 1980, Talbert *et al*. 1980, Schroeder 1981, Labisky *et al.* 1986). In response to increasing predation of sea turtle nests by coyotes, foxes, hogs, and raccoons, multi-agency cooperative efforts have been initiated and are ongoing throughout Florida, particularly on public lands.

Driving on the Beach

The operation of motor vehicles on the beach affects sea turtle nesting by interrupting or striking a female turtle on the beach, headlights disorienting or misorienting emergent hatchlings, vehicles running over nests or hatchlings attempting to reach the ocean, and vehicle tracks traversing the beach which interfere with hatchlings crawling to the ocean. Hatchlings appear to become diverted not because they cannot physically climb out of the rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier *et al.* 1981). Driving on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings, decreasing nest success and directly killing preemergent hatchlings (Mann 1977, Nelson and Dickerson 1987, Nelson 1988).

The physical changes and loss of plant cover caused by vehicles on dunes can lead to various degrees of instability, and therefore encourage dune migration. As vehicles move either up or down a slope, sand is displaced downward. Since the vehicles also inhibit plant growth, and open the area to wind erosion, dunes may become unstable, and begin to migrate. Unvegetated sand dunes may continue to migrate across stable areas as long as vehicle traffic continues. Vehicular traffic through dune breaches or low dunes on an eroding beach may cause an accelerated rate of overwash and beach erosion (Godfrey *et al.* 1978). If driving is required, the area where the least amount of impact occurs is the beach between the low and high tide water lines. Vegetation on the dunes can quickly reestablish provided the mechanical impact is removed.

In 1985, the Florida Legislature severely restricted vehicular driving on Florida’s beaches, except that which is necessary for cleanup, repair, or public safety. This legislation also allowed an exception for five counties to continue to allow vehicular access on coastal beaches due to the availability of less than 50 percent of its peak user demand for off-beach parking. The counties affected by this exception are Volusia, St. Johns, Gulf, Nassau, and Flagler Counties, as well as limited vehicular access on Walton County beaches for boat launching.

Climate Change

The varying and dynamic elements of climate science are inherently long term, complex, and interrelated. Regardless of the underlying causes of climate change, glacial melting and expansion of warming oceans are causing sea level rise, although its extent or rate cannot as yet be predicted with certainty. At present, the science is not exact enough to precisely predict when and where climate impacts will occur. Although we may know the direction of change, it may not be possible to predict its precise timing or magnitude. These impacts may take place gradually or episodically in major leaps.

Climate change is evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level, according to the Intergovernmental Panel on Climate Change Report (IPCC 2007a). The IPCC Report (2007a) describes changes in natural ecosystems with potential widespread effects on many organisms, including marine mammals and migratory birds. The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of changing climate. Based on these findings and other similar studies, the U.S. Department of the Interior (DOI) requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2007c).

Climatic changes in Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management. Global warming will be a particular challenge for endangered, threatened, and other "at risk" species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006). As the level of information increases relative to the effects of global climate change on sea turtles and its designated critical habitat, the Service will have a better basis to address the nature and magnitude of this potential threat and will more effectively evaluate these effects to the range-wide status of sea turtles.

Florida is one of the areas most vulnerable to the consequences of climate change. Sea level rise and the possibility of more intense hurricanes are the most serious threats to Florida potentially from climate change. Florida has over 1,350 miles of coastline, low-lying topography, and proximity to the hurricane-prone subtropical mid-Atlantic Ocean and Gulf of Mexico.

One of the most serious threats to Florida's coasts comes from the combination of elevated sea levels and intense hurricanes. Florida experiences more landings of tropical storms and hurricanes than any other state in the U.S. Storm surges due to hurricanes will be on top of elevated sea levels, tides, and wave action. As a result, barrier islands and low-lying areas of Florida will be more susceptible to the effects of storm surge. An important element of adaptation strategy is how to protect beaches, buildings and infrastructure against the effects of rising seas and wind, wave action, and storm surge due to hurricanes while maintaining viable nesting habitat along Florida's coasts.

Temperatures are predicted to rise from 1.6^{o}F to 9^{o}F for North America by the end of this century (IPCC 2007a,b). Alterations of thermal sand characteristics could result in highly female-biased sex ratios because sea turtles exhibit temperature dependent sex determination (e.g., Glen and Mrosovsky 2004, Hawkes *et al*. 2008).

Along developed coastlines, and especially in areas where shoreline protection structures have been constructed to limit shoreline movement, rising sea levels will cause severe effects on nesting females and their eggs. Erosion control structures can result in the permanent loss of dry nesting beach or deter nesting females from reaching suitable nesting sites (National Research Council

1990a). Nesting females may deposit eggs seaward of the erosion control structures potentially subjecting them to repeated tidal inundation or washout by waves and tidal action.

Based on the present level of available information concerning the effects of global climate change on the status of sea turtles and their designated critical habitat, the Service acknowledges the potential for changes to occur in the action area, but presently has no basis to evaluate if or how these changes are affecting sea turtles or their designated critical habitat. Nor does our present knowledge allow the Service to project what the future effects from global climate change may be or the magnitude of these potential effects.

EFFECTS OF THE ACTION

This section is an analysis of the beneficial, direct, and indirect effects of the proposed actions on nesting sea turtles, nests, eggs, and hatchling sea turtles within the Action Area. The analysis includes effects interrelated and interdependent of the project activities. An interrelated activity is an activity that is part of a proposed action and depends on the proposed activity. An interdependent activity is an activity that has no independent utility apart from the action.

Factors to be considered

The proposed projects will occur within habitat that is used by sea turtles for nesting and may be constructed during a portion of the sea turtle nesting season. Long-term and permanent impacts could include a change in the nest incubation environment from the sand placement activities. Short-term and temporary impacts to sea turtle nesting activities could result from project work occurring on the nesting beach during the nesting or hatching period, from changes in the physical characteristics of the beach from the placement of the sand including the profile and from sediment-induced changes in the nest incubation environment.

Proximity of action: Sand placement activities would occur within and adjacent to nesting habitat for sea turtles and dune habitats that ensure the stability and integrity of the nesting beach. Specifically, the project would potentially impact loggerhead, green, leatherback, hawksbill, and Kemp’s ridley nesting females, their nests, nesting habitat, and hatchling sea turtles.

Distribution: Sand placement activities that may impact nesting and hatchling sea turtles and sea turtle nests would occur along Gulf of Mexico and Atlantic Ocean coasts.

Timing: The timing of the sand placement activities could directly and indirectly impact nesting females, their nests, and hatchling sea turtles when conducted between March 1 and November 30.

Nature of the effect: The effects of the sand placement activities may change the nesting behavior of adult female sea turtles, diminish nesting success, and reduce hatching and emerging success. Sand placement can also change the incubation conditions within the nest. Any decrease in productivity and/or survival rates would contribute to the vulnerability of the sea turtles nesting in Florida.

Duration: The sand placement activity may be a one-time activity or a multiple-year activity and each sand placement project may take between three and seven months to complete. Thus, the direct effects would be expected to be short-term in duration. Indirect effects from the activity may continue to impact nesting and hatchling sea turtles and sea turtle nests in subsequent nesting seasons.

Disturbance frequency: Sea turtle populations in Florida may experience decreased nesting success, hatching success, and hatchling emergence success that could result from the sand placement activities being conducted at night during one nesting season, or during the earlier or later parts of two nesting seasons. Disturbance due to alterations of the incubation substrate and beach profile could persist for several years, depending on continued presence of placed sand in the nesting beach.

Disturbance intensity and severity: Depending on the amount (including post-disaster work) and the timing of the sand placement activities during sea turtle nesting season, effects to the sea turtle populations of Florida, and potentially the U.S. populations, could be important.

Analyses for effects of the action

Beneficial Effects

The placement of sand on a beach with reduced dry foredune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (*i.e.*, grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may benefit sea turtles more than an eroding beach it replaces.

Adverse Effects

Through many years of research, it has been documented that beach nourishment can have adverse effects on nesting female sea turtles and hatchlings and sea turtle nests. Results of monitoring sea turtle nesting and beach nourishment activities provide additional information on how sea turtles respond to nourished beaches, minimization measures, and other factors that influence nesting, hatching, and emerging success. Science-based information on sea turtle nesting biology and review of empirical data on beach nourishment monitoring is used to manage beach nourishment activities to eliminate or reduce impacts to nesting and hatchling sea turtles and sea turtle nests so that beach nourishment can be accomplished. Measures can be incorporated pre-, during, and post-construction to reduce impacts to sea turtles. Because of the long history of sea turtle monitoring in Florida, it is not necessary to require studies on each project beach to document those effects each time.

Direct Effects

Direct effects are those direct or immediate effects of a project on the species or its habitat. Placement of sand on a beach in and of itself may not provide suitable nesting habitat for sea turtles. Although sand placement activities may increase the potential nesting area, significant negative impacts to sea turtles may result if protective measures are not incorporated during project construction. Sand placement activities during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of eggs and hatchlings and, along with other mortality sources, may significantly impact the long-term survival of the species. For instance, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. While a nest monitoring and egg relocation program would reduce these impacts, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, or tides) or misidentified as false crawls during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed. Even under the best of conditions, about seven percent of the nests can be misidentified as false crawls by experienced sea turtle nest surveyors (Schroeder 1994).

Nest relocation

Besides the potential for missing nests during surveys and a nest relocation program, there is a potential for eggs to be damaged by nest movement or relocation, particularly if eggs are not relocated within 12 hours of deposition (Limpus *et al.* 1979). Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus *et al.* 1979, Ackerman 1980, Parmenter 1980, Spotila *et al.* 1983, McGehee 1990). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings. Water availability is known to influence the incubation environment of the embryos and hatchlings of turtles with flexible-shelled eggs, which has been shown to affect nitrogen excretion (Packard *et al.* 1984), mobilization of calcium (Packard and Packard 1986), mobilization of yolk nutrients (Packard *et al.* 1985), hatchling size (Packard *et al.* 1981, McGehee 1990), energy reserves in the yolk at hatching (Packard *et al.* 1988), and locomotory ability of hatchlings (Miller *et al.* 1987).

In a 1994 Florida study comparing loggerhead hatching and emerging success of relocated nests with nests left in their original location, Moody (1998) found that hatching success was lower in relocated nests at nine of 12 beaches evaluated. In addition, emerging success was lower in relocated nests at 10 of 12 beaches surveyed in 1993 and 1994. Many of the direct effects of beach nourishment may persist over time. These direct effects include increased susceptibility of relocated nests to catastrophic events, the consequences of potential increased beachfront development, changes in the physical characteristics of the beach, the formation of escarpments, repair/replacement of groins and jetties and future sand migration.

Equipment

The use of heavy machinery on beaches during a construction project may also have adverse effects on sea turtles. Equipment left on the nesting beach overnight can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure.

The operation of motor vehicles or equipment on the beach to complete the project work at night affects sea turtle nesting by: interrupting or colliding with a female turtle on the beach; headlights disorienting or misorienting emergent hatchlings; vehicles running over nesting females or hatchlings attempting to reach the ocean, and vehicle tracks traversing the beach interfering with hatchlings crawling to the ocean. Apparently, hatchlings become diverted not because they cannot physically climb out of the rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier *et al*. 1981). Driving directly above or over incubating egg clutches or on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings, decreasing nest success and directly killing preemergent hatchlings (Mann 1977, Nelson and Dickerson 1987, Nelson 1988).

Depending on when the dune project is completed, dune vegetation may have become established in the vicinity of dune restoration sites. The physical changes and loss of plant cover caused by vehicles on vegetated areas or dunes can lead to various degrees of instability and cause dune migration. As vehicles move over the sand, sand is displaced downward, lowering the substrate. Since the vehicles also inhibit plant growth, and open the area to wind erosion, the beach and dunes may become unstable. Vehicular traffic on the beach or through dune breaches or low dunes may cause acceleration of overwash and erosion (Godfrey *et al.* 1978). Driving along the beachfront should be limited to between the low and high tide water lines. To minimize the impacts to the beach and recovering dunes, transport and access to the dune restoration sites should be from the road. However, if the work needs to be conducted from the beach, work areas for the truck transport and bulldozer/bobcat equipment should be designated and marked.

Artificial lighting

Visual cues are the primary sea-finding mechanism for hatchling sea turtles (Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). When artificial lighting is present on or near the beach, it can misdirect hatchlings once they emerge from their nests and prevent them from reaching the ocean (Philibosian 1976, Mann 1977, FWC 2007a). In addition, a significant reduction in sea turtle nesting activity has been documented on beaches illuminated with artificial lights (Witherington 1992). Therefore, construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, misdirect females trying to return to the surf after a nesting event, and misdirect emergent hatchlings from adjacent non-project beaches.

The newly created wider and flatter beach berm exposes sea turtles and their nests to lights that were less visible, or not visible, from nesting areas before the sand placement activity leading to a higher mortality of hatchlings. Review of over 10 years of empirical information from beach nourishment projects indicates that the number of sea turtles impacted by lights increases on the post-construction berm. A review of selected nourished beaches in Florida (South Brevard, North Brevard, Captiva Island, Ocean Ridge, Boca Raton, Town of Palm Beach, Longboat Key, and Bonita Beach) indicated disorientation reporting increased by approximately 300 percent the first nesting season after project construction and up to 542 percent the second year compared to prenourishment reports (Trindell *et al.* 2005).

Specific examples of increased lighting disorientations after a sand placement project include Brevard and Palm Beach Counties, Florida. A sand placement project in Brevard County, completed in 2002, showed an increase of 130 percent in disorientations in the nourished area. Disorientations on beaches in the County that were not nourished remained constant (Trindell 2007). This same result was also documented in 2003 when another beach in Brevard County was nourished and the disorientations increased by 480 percent (Trindell 2007). Installing appropriate beachfront lighting is the most effective method to decrease the number of disorientations on any developed beach including nourished beaches. A shoreline protection project was constructed at Ocean Ridge in Palm Beach County, Florida, between August 1997 and April 1998. Lighting disorientation events increased after nourishment. In spite of continued aggressive efforts to identify and correct lighting violations in 1998 and 1999, 86 percent of the disorientation reports were in the nourished area in 1998 and 66 percent of the reports were in the nourished area in 1999 (Howard and Davis 1999).

While the effects of artificial lighting have not been specifically studied on each beach that is nourished in Florida, based on the experience of increased artificial lighting disorientations on other Florida beaches, impacts are expected to potentially occur on all nourished beaches statewide.

Changing to sea turtle compatible lighting can be easily accomplished at the local level through voluntary compliance or by adopting appropriate regulations. Of the 27 coastal counties in Florida where sea turtles are known to nest, 21 have passed beachfront lighting ordinances in addition to 58 municipalities (http://myfwc.com/media/418420/seaturtle_lightordmap.pdf). Local governments have realized that adopting a lighting ordinance is the most effective method to address artificial lighting along the beachfront.

Indirect Effects

Indirect effects are those effects that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Effects from the proposed project may continue to affect sea turtle nesting on the project beach and adjacent beaches in future years.

Increased susceptibility to catastrophic events

Nest relocation within a nesting season may concentrate eggs in an area making them more susceptible to catastrophic events. Hatchlings released from concentrated areas also may be subject to greater predation rates from both land and marine predators, because the predators learn where to concentrate their efforts (Glenn 1998, Wyneken *et al.* 1998).

Increased beachfront development

Pilkey and Dixon (1996) stated that beach replenishment frequently leads to more development in greater density within shorefront communities that are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also noted that the very existence of a beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new and updated facilities substantially increased tourism there (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as much larger buildings that accommodated more beach users replaced older buildings. Overall, shoreline management creates an upward spiral of initial protective measures resulting in more expensive development which leads to the need for more and larger protective measures. Increased shoreline development may adversely affect sea turtle nesting success. Greater development may support larger populations of mammalian predators, such as foxes and raccoons, than undeveloped areas (National Research Council 1990a), and can also result in greater adverse effects due to artificial lighting, as discussed above.

Changes in the physical environment

Beach nourishment may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand (Nelson and Dickerson 1988a). These changes could result in adverse impacts on nest site selection, digging behavior, clutch viability, and hatchling emergence (Nelson and Dickerson 1987, Nelson 1988).

Beach nourishment projects create an elevated, wider, and unnatural flat slope berm. Sea turtles nest closer to the water the first few years after nourishment because of the altered profile (and perhaps unnatural sediment grain size distribution) (Ernest and Martin 1999, Trindell 2005) (**Figure 6**).

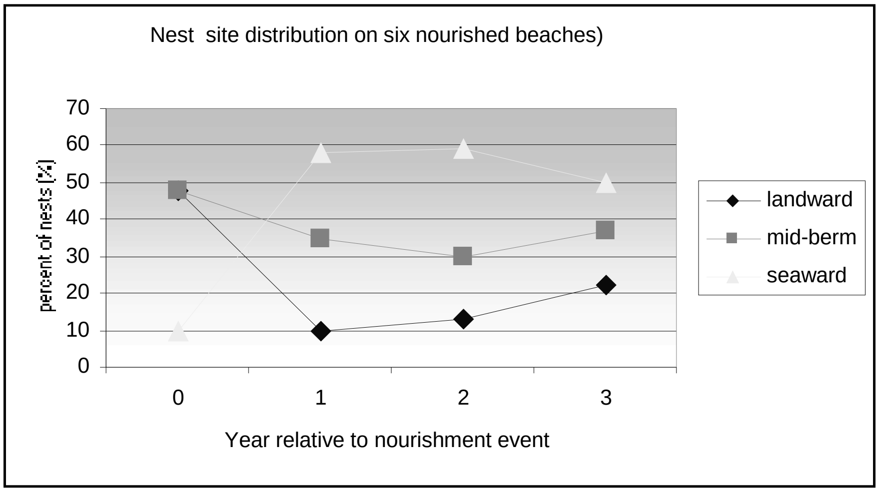

Figure 6. Review of sea turtle nesting site selection following nourishment (Trindell 2005).

Beach compaction and unnatural beach profiles resulting from beach nourishment activities could negatively impact sea turtles regardless of the timing of projects. Very fine sand or the use of heavy machinery can cause sand compaction on nourished beaches (Nelson *et al.* 1987, Nelson and Dickerson 1988a). Significant reductions in nesting success (*i.e*., false crawls occurred more frequently) have been documented on severely compacted nourished beaches (Fletemeyer 1980, Raymond 1984, Nelson and Dickerson 1987, Nelson *et al.* 1987), and increased false crawls may result in increased physiological stress to nesting females. Sand compaction may increase the length of time required for female sea turtles to excavate nests and cause increased physiological stress to the animals (Nelson and Dickerson 1988b). Nelson and Dickerson (1988c) concluded that, in general, beaches nourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and accretion of sand, others may remain hard for 10 years or more.

These impacts can be minimized by using suitable sand and by tilling (minimum depth of 36 inches) compacted sand after project completion. The level of compaction of a beach can be assessed by measuring sand compaction using a cone penetrometer (Nelson 1987). Tilling of a nourished beach with a root rake may reduce the sand compaction to levels comparable to unnourished beaches. However, a pilot study by Nelson and Dickerson (1988c) showed that a tilled nourished beach will remain uncompacted for up to one year. Multi-year beach compaction monitoring and, if necessary, tilling would ensure that project impacts on sea turtles are minimized.

A change in sediment color on a beach could change the natural incubation temperatures of nests in an area, which, in turn, could alter natural sex ratios. To provide the most suitable sediment for nesting sea turtles, the color of the nourished sediments should resemble the natural beach sand in the area. Natural reworking of sediments and bleaching from exposure to the sun would help to lighten dark nourishment sediments; however, the timeframe for sediment mixing and bleaching to occur could be critical to a successful sea turtle nesting season.

Escarpment formation

On nourished beaches, steep escarpments may develop along the water line interface as the beach adjusts from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984, Nelson *et al.* 1987). These escarpments can hamper or prevent access to nesting sites (Nelson and Blihovde 1998). Researchers have shown that female sea turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (e.g., in front of the escarpments, which often results in failure of nests due to prolonged tidal inundation). This impact can be minimized by leveling any escarpments prior to the nesting season.

Construction of groins and jetties

Groins and jetties are shore-perpendicular structures that are designed to trap sand that would otherwise be transported by longshore currents. Jetties are defined as structures placed to keep sand from flowing into channels (Kaufman and Pilkey 1979, Komar 1983). In preventing normal sand transport, these structures accrete updrift beaches while causing accelerated beach erosion downdrift of the structures (Komar 1983, Pilkey *et al.* 1984, National Research Council 1987), a process that results in degradation of sea turtle nesting habitat. As sand fills the area updrift from the groin or jetty, some littoral drift and sand deposition on adjacent downdrift beaches may occur due to spillover. However, these groins and jetties often force the stream of sand into deeper offshore water where it is lost from the system (Kaufman and Pilkey 1979). The greatest changes in beach profile near groins and jetties are observed close to the structures, but effects eventually may extend many miles along the coast (Komar 1983).

Jetties are placed at ocean inlets to keep transported sand from closing the inlet channel. Together, jetties and inlets are known to have profound effects on adjacent beaches (Kaufman and Pilkey 1979). Witherington *et al.* (2005) found a significant negative relationship between loggerhead nesting density and distance from the nearest of 17 ocean inlets on the Atlantic coast of Florida. The effect of inlets in lowering nesting density was observed both updrift and downdrift of the inlets, leading researchers to propose that beach instability from both erosion and accretion may discourage loggerhead nesting.

Construction or repair of groins and jetties during the nesting season may result in the destruction of nests, disturbance of females attempting to nest, and disorientation of emerging hatchlings from project lighting. Following construction, the presence of groins and jetties may interfere with nesting turtle access to the beach, result in a change in beach profile and width (downdrift erosion, loss of sandy berms, and escarpment formation), trap hatchlings, and concentrate predatory fishes, resulting in higher probabilities of hatchling predation.

Escarpments may develop on beaches between groins as the beaches equilibrate to their final profiles. These escarpments are known to prevent females from nesting on the upper beach and can cause them to choose unsuitable nesting areas, such as seaward of an escarpment. These nest sites commonly receive prolonged tidal inundation and erosion, which results in nest failure (Nelson and Blihovde 1998). As groin structures fail and break apart, they spread debris on the beach, which may further impede nesting females from accessing suitable nesting sites and trap both hatchlings and nesting turtles.

Species' response to a proposed action

The following summary illustrates sea turtle responses to and recovery from a nourishment project comprehensively studied by Ernest and Martin (1999). A significantly larger proportion of turtles emerging on nourished beaches abandoned their nesting attempts than turtles emerging on natural or prenourished beaches. 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 associated with the nourishment project (e.g., beach profile, sediment grain size, beach compaction, frequency and extent of escarpments). 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 conditions. However, tilling (minimum depth of 36 inches) is effective in reducing sediment compaction to levels that did not significantly prolong digging times. As natural processes reduced compaction levels on nourished beaches during the second post-construction year, digging times returned to natural levels (Ernest and Martin 1999).

During the first post-construction year, nests on nourished beaches are deposited significantly seaward of the toe of the dune and significantly landward of the tide line 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 monitoring 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.

The principal effect of beach nourishment on sea turtle reproduction is a reduction in nesting success during the first year following project construction. Although most studies have attributed this phenomenon to an increase in beach compaction and escarpment formation, Ernest and Martin (1999) indicated that changes in beach profile may be more important. Regardless, as a nourished beach is reworked by natural processes in subsequent years and adjusts from an unnatural construction profile to a natural beach profile, beach compaction and the frequency of escarpment formation decline, and nesting and nesting success return to levels found on natural beaches.

BEACH MICE

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/critical habitat description

The formal taxonomic classification of beach mouse subspecies follows the geographic variation in pelage and skeletal measurements documented by Bowen (1968). This peer-reviewed, published classification was also accepted by Hall (1981). Since the listing of the beach mice, further research concerning the taxonomic validity of the subspecific classification of beach mice has been initiated and/or conducted. Preliminary results from these studies support the separation of beach mice from inland forms, and support the currently accepted taxonomy (Bowen 1968) (*i.e.*, each beach mouse group represents a unique and isolated subspecies). Recent research using mitochondrial DNA data illustrates that Gulf Coast beach mouse subspecies form a well-supported and independent evolutionary cluster within the global population of the mainland or inland old field mice (Van Zant and Wooten 2006).

The old-field mouse (*Peromyscus polionotus)* is different in form and structure as well as being genetically diverse throughout its range in the southeastern U.S. (Bowen 1968, Selander *et al.* 1971). Currently there are 16 recognized subspecies of old-field mice (Hall 1981). Eight subspecies occupy coastal rather than inland habitat and are referred to as beach mice (Bowen 1968). Two existing subspecies of beach mouse and one extinct subspecies are known from the Atlantic coast of Florida and five subspecies live along the Gulf coast of Alabama and northwestern Florida.

Rivers and various inlets bisect the Gulf and Atlantic beaches and naturally isolate habitats in which the beach mice live. The outer coastline and barrier islands are typically separated from the mainland by lagoons, swamps, tidal marshes, and flatwood areas with hardpan soil conditions. However, these dispersal barriers are not absolute; sections of sand peninsulas may from time to time be cut off by storms and shift over time due to wind and current action. Human development has also fragmented the ranges of the subspecies. As a consequence of coastal development and the dynamic nature of the coastal environment; beach mouse populations are generally comprised of various disjunct populations.

Atlantic Coast beach mice

The southeastern beach mouse (SEBM) was listed as a threatened species under the Act in 1989 (54 *FR* 20598). Critical habitat was not designated for this subspecies. SEBM is also listed as threatened by the State of Florida. The original distribution of the SEBM was from Ponce Inlet, Volusia County, southward to Hollywood, Broward County, and possibly as far south as Miami in Miami-Dade County. It is currently restricted to Volusia, Brevard, and Indian River Counties. Formerly, this subspecies occurred along about 175 miles of Florida's southeast coast; it now occupies about 50 miles, a significant reduction in range (**Figure 7**).

This subspecies uses both beach dunes and inland areas of scrub vegetation. The most seaward vegetation typically consists of sea oats (*Uniola paniculata*), bitter panicgrass (*Panicum amarum*), railroad vine (*Ipomoea pes-caprae*), beach morning-glory (*Ipomoea stolonifera*), and camphorweed (*Heterotheca subaxillaris*). Further landward, vegetation is more diverse, including beach tea (*Croton punctatus*), pricklypear (*Opuntia humifusa*), saw palmetto (*Serenoa repens)*, wax myrtle (*Myrica cerifera)*, and sea grape (*Coccoloba uvifera*).

Anastasia Island beach mice

The Anastasia Island beach mouse (AIBM), was listed as endangered under the Act in 1989 (54 *FR* 20598). Critical habitat was not designated for the subspecies. AIBM is also listed as an endangered species by the State of Florida. The distribution of the AIBM has declined significantly, particularly in the northern part of its range. AIBM was historically known from the vicinity of the Duval-St. Johns County line southward to Matanzas Inlet, St. Johns County, Florida (Frank and Humphrey 1996). Included in their range, AIBM populations are found along 14.5 miles of Anastasia Island, mainly on 3.5 miles at Anastasia State Park (ASP) and one mile at Fort Matanzas National Monument (FMNM). AIBM have been found at low densities in dunes on the remainder of the island. Beach mice have also been located along sections of the 4.2 miles of dune habitat at Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR)-Guana River. Anastasia Island is separated from the mainland of Florida to the west by extensive salt marshes and the Mantazas River, to the north by the St. Augustine Inlet, and to the south by the Matanzas Inlet which are both maintained and open. This has restricted the range of AIBM to 14.5 mile length of Anastasia Island and sections of GTMNERR-Guana River (**Figure 8**).

In 1992 to 1993, the Service funded the reintroduction of AIBM to GTMNERR in St. Johns County where historical habitat for the subspecies existed (Service 1993). GMTNERR-Guana River portion of the Reserve (4.0 miles of undeveloped beach) is nine miles north of the existing population of beach mice at ASP. Fifty-five mice (27 females and 28 males) were trapped at FMNM and ASP from September 24, to November 12, 1992, and placed in soft-release enclosures at the state park on September 27, and November 12, 1992. During follow-up trapping conducted in February 1993, beach mice occupied the entire 4.2-mile length of the park; 34 were captured and it was estimated that the population totaled 220. Quarterly trapping has been conducted since the reintroduction and mice have not been captured since September 2006. This may be a result of habitat loss alteration from storms or habitat conditions. Sneckenberger 2001 indicates that the scrub habitat found in the tertiary dunes provides a more stable level of food resources, which becomes crucial when food is scarce or nonexistent in the primary and secondary dunes. This suggests that access to primary, secondary, and scrub dune habitat is essential to beach mice at the individual level, which may be an issue for this population as A1A Highway separates/bisects the primary dune from the secondary dunes and scrub dune habitats.

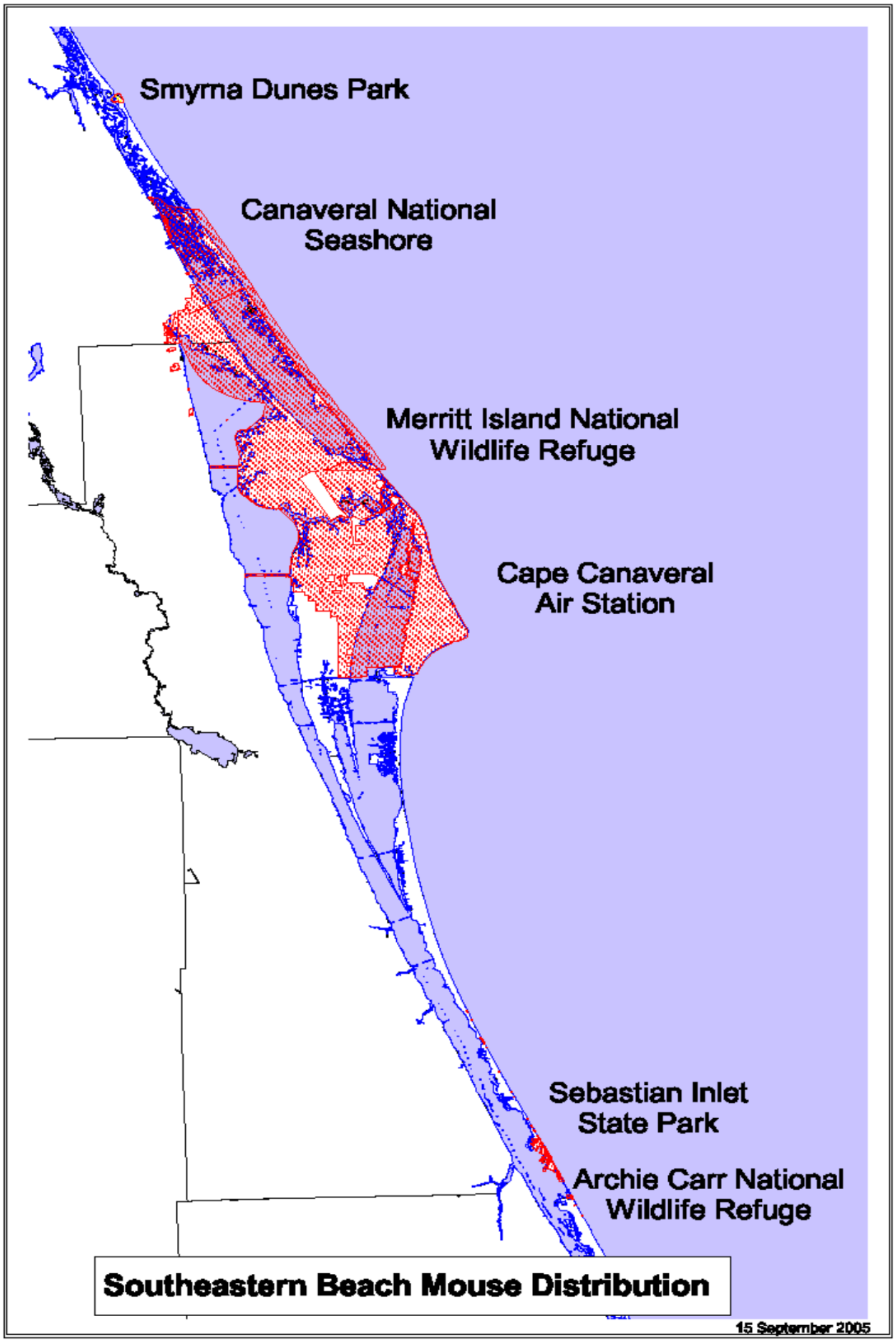

Figure 7. The distribution of the southeastern beach mouse.

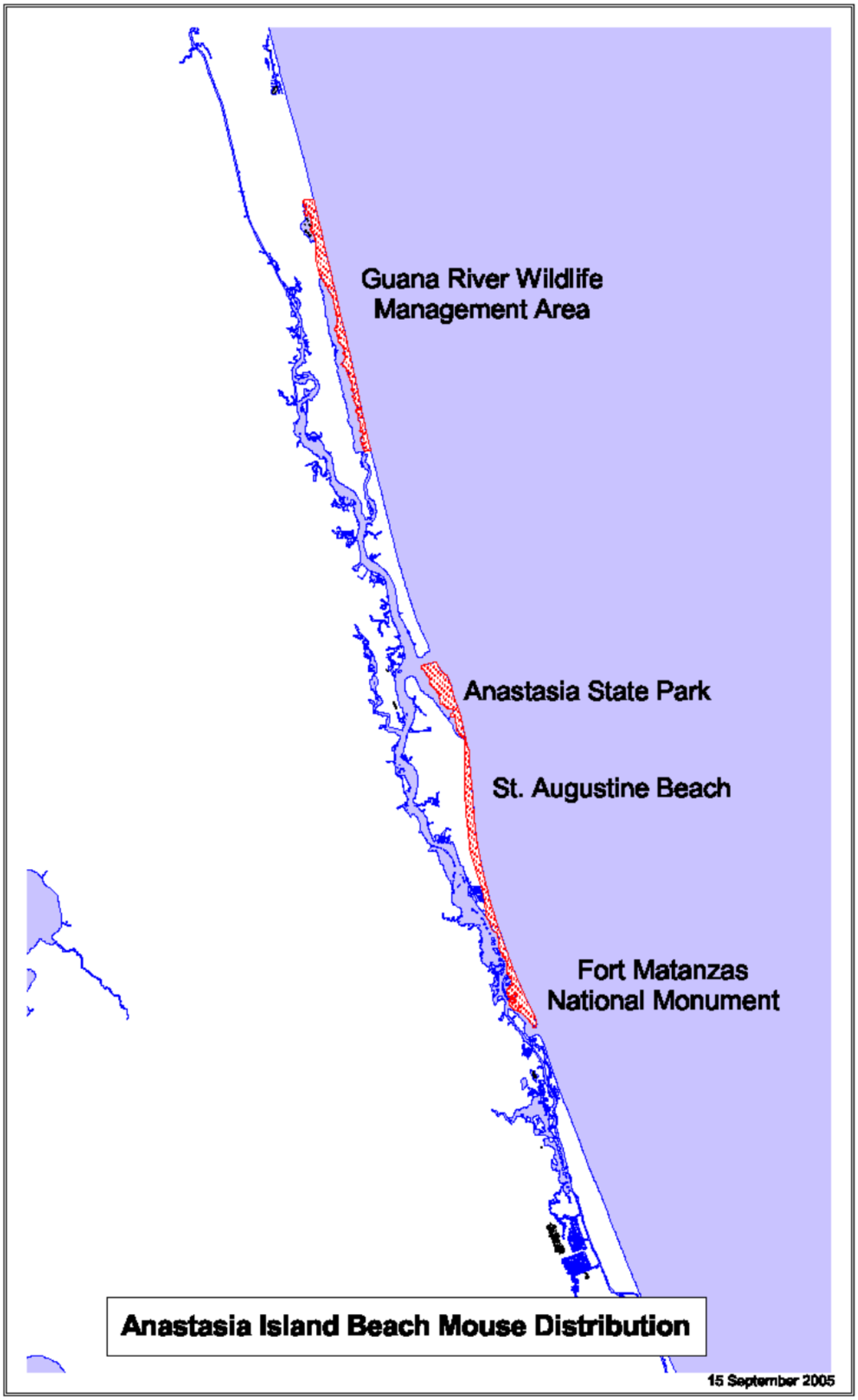

Figure 8. The distribution of the Anastasia Island beach mouse.

Gulf Coast Beach Mice

The CBM and the PKBM were listed with the Alabama beach mouse (ABM) (*Peromyscus polionotus ammobates*), as endangered species under the Act in 1985 (50 *FR* 23872). The SABM was listed under the Act in 1998 (63 *FR* 70053). CBM, SABM, and PKBM are also listed as endangered species by the State of Florida (FWC 2010). Critical habitat was designated for the CBM, and PKBM at the time of listing; however, critical habitat was revised in 2006 (71 *FR* 60238). Critical habitat was also designated for the SABM in 2006 (71 *FR* 60238).

The historical range of the CBM extended 53 miles between Destin Pass, Choctawhatchee Bay in Okaloosa County and East Pass in St. Andrew Bay, Bay County, Florida. PKBM historically ranged along the entire length of Perdido Key for 16.9 miles between Perdido Bay, Alabama (Perdido Pass) and Pensacola Bay, Florida (Bowen 1968). The historical range of the SABM extended 38 miles between Money Bayou in Gulf County, and Crooked Island at the East Pass of St. Andrews Bay, Bay County, Florida including the St. Joseph peninsula and the coastal mainland adjacent to St. Joseph Bay, Florida (**Figure 9**).

Critical habitat

Since the listing of the PKBM and CBM in 1985, research has refined previous knowledge of Gulf Coast beach mouse habitat requirements and factors that influence their use of habitat. Based on the current knowledge of the life history, biology, and ecology of the subspecies and the requirements of the habitat to sustain the essential life history functions of the subspecies, the primary constituent elements (PCE) of critical habitat for Gulf Coast beach mice consist of:

1. A contiguous mosaic of primary, secondary scrub vegetation, and dune structure, with a balanced level of competition and predation and few or no competitive or predaceous nonnative species present, that collectively provide foraging opportunities, cover, and burrow sites;

2. Primary and secondary dunes, generally dominated by sea oats that despite occasional temporary impacts and reconfiguration from tropical storms and hurricanes provide abundant food resources, burrow sites, and protection from predators;

3. Scrub dunes, generally dominated by scrub oaks, that provide food resources and burrow sites, and provide elevated refugia during and after intense flooding due to rainfall and/or hurricane induced storm surge;.

4. Functional, unobstructed habitat connections that facilitate genetic exchange, dispersal, natural exploratory movements, and recolonization of locally extirpated areas; and

5. A natural light regime within the coastal dune ecosystem, compatible with the nocturnal activity of beach mice, necessary for normal behavior, growth and viability of all life stages.

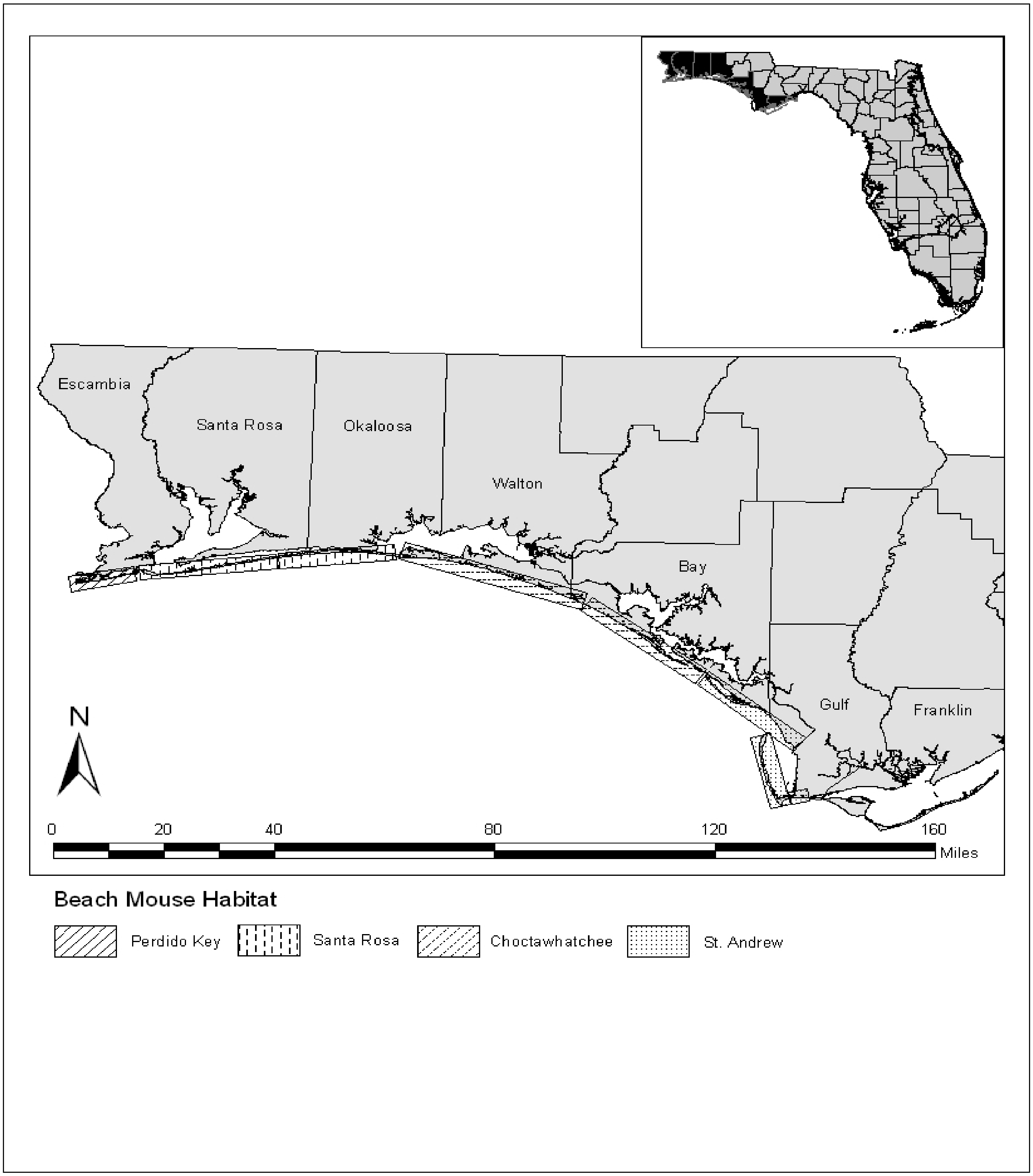

Figure 9. Historical range of Gulf Coast beach mouse subspecies.

Thirteen coastal dune areas (critical habitat units) in southern Alabama and the panhandle of Florida have been determined to be essential to the conservation of PKBM, CBM, and SABM and are designated as critical habitat (**Figures 10 through 12**). These 13 units include five units for PKBM, five units for CBM, and three units for the SABM. These units total 6,194 acres of coastal dunes, and include 1,300 acres for the PKBM in Escambia County, Florida and Baldwin County, Alabama (**Table 10**); 2,404 acres for the CBM, in Okaloosa, Walton, and Bay Counties, Florida (**Table 11**); and 2,490 acres for the SABM in Bay and Gulf Counties, Florida (**Table 12**).

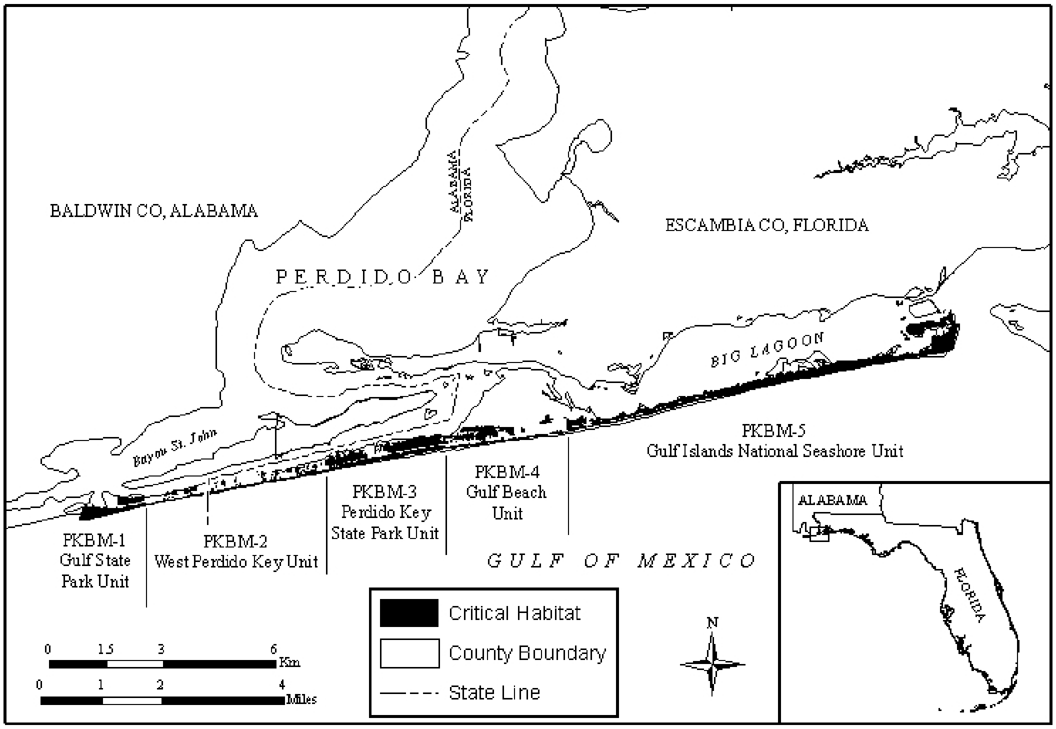

Figure 10. Critical habitat units designated for the Perdido Key beach mouse.

Table 11. Critical habitat units designated for the Perdido Key beach mouse.

Perdido Key Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. Gulf State Park Unit	0	115	0	115
2. West Perdido Key Unit	0	0	147	147
3. Perdido Key State Park Unit	0	238	0	238
4. Gulf Beach Unit	0	0	162	162
5. Gulf Islands National Seashore Unit	638	0	0	638
Total	638	353	309	1300

Gulf State Park

The Gulf State Park Unit (PKBM-1) consists of 115 acres of PKBM habitat in southern Baldwin County, Alabama, on the westernmost region of Perdido Key. PKBM were known to inhabit this unit during surveys in 1979 and 1982, and by 1986 this was the only known existing population of the subspecies (Humphrey and Barbour 1981; Holler *et al*. 1989). This population of less than 30 individuals was the donor for the reestablishment of PKBM into Gulf Islands National Seashore in 1986. This project ultimately saved Perdido Key beach mice from extinction as the population at Gulf State Park was considered extirpated in 1998 due to tropical storms and predators (Moyers *et al*. 1999). In 2010, captive bred mice are released at Gulf State Park. This reintroduction was deemed a success and the population has continued to increase. The track tube monitoring was established at GSP in 2010, which began with only a 9 percent occurrence rate and the end of the year yielded an 83 percent occurrence rate, 2011 started with an 85 percent occurrence rate and continued to increase slightly until September 2011 which yielded a 73 percent occurrence rate in the tracking tubes (FWC 2012a and FWC 2014b). A 3-day trapping effort the week of May 7, 2012, continued to find PKBM distributed throughout habitat south of Highway 182. Two reproductively-active male PKBM were found north of Highway 182 (J. Gore pers. comm. 2012). The release appears to have been a success and PKBM are occupying all three public lands for the first time since being listed as endangered. Recent track tube data for 2013 shows an average of 93 percent occurrence of PKBM in the tracking tubes at GSP (FWC 2013a and FWC 2013b).

Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. Because scrub habitat is separated from the frontal dunes by a highway in some areas, the population inhabiting this unit can be especially vulnerable to hurricane impacts, and therefore further linkage to scrub habitat and/or habitat management would improve connectivity. This unit is managed by the Alabama Department of Conservation and Natural Resources and provides primary constituent elements (PCEs) 2, 3, 4, and 5. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit, which contains interior scrub habitat as well as primary and secondary dunes, serves as a re-designation and expansion of the original critical habitat designation (50 *FR* 23872). The original designation did not include scrub habitat which we now know is necessary for the long-term persistence of beach mouse populations.

The West Perdido Key Unit (PKBM-2) consists of 114 acres in southern Escambia County, Florida, and 33 acres in southern Baldwin County, Alabama. This unit encompasses essential features of beach mouse habitat from approximately 1.0 mile west of where the Alabama-Florida State line bisects Perdido Key east to 2.0 miles east of the State line and areas from the MHWL north to the seaward extent of human development or maritime forest. This unit consists of private lands and ultimately includes essential features of beach mouse habitat between Perdido Key State Park (Unit 3) and GSP (Unit 1). Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat and provides PCEs 2, 3, and 4.

Habitat fragmentation and other threats specific to this unit are mainly due to development. Consequently, threats to this unit that may require special management considerations include habitat fragmentation and habitat loss, artificial lighting, presence of feral cats as well as other predators at unnatural levels, excessive foot traffic and soil compaction, and damage to dune vegetation and structure. This area was not known to be occupied at the time of listing. While no trapping has been conducted on these private lands to determine presence, sign of beach mouse presence was confirmed by the Service in 2013 and 2014 through observations of beach mouse burrows and tracks, and this unit is contiguous with two occupied units. Therefore, we have determined this unit to be currently occupied. This unit provides essential connectivity between two core population areas (PKBM-3 and PKBM-1), provides habitat for expansion, natural movements, and re-colonization, and is therefore essential to the conservation of the species. Specifically, this unit may have historically provided for the re-colonization of GSP (PKBM-1) and/or may facilitate similar re-colonization in the future as the habitat recovers from recent hurricane events.

The Perdido Key State Park Unit (PKBM-3) consists of 238 acres in southern Escambia County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of PKSP from approximately 2.0 miles east of the Alabama–Florida State line to 4.0 mile east of the State line and the area from the MHWL north to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. This unit provides PCEs 2, 3, 4, and 5 and is essential to the conservation of the species. Improving and/or restoring habitat connections would increase habitat quality and provide more functional connectivity for dispersal, exploratory movements, and population expansion. This unit is managed by the Florida Park Service. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit serves as a redesignation and expansion of a zone included in the initial critical habitat designation (50 *FR* 23872); however, the zone did not include scrub habitat, which we now know is necessary for the long-term persistence of beach mouse populations.

Trapping efforts in this area were limited in the past. In 2000, a successful relocation program reestablished mice at PKSP. In 2004 and 2005, hurricane/tropical storm damage to the habitat at PKSP dropped PKBM detection to only 10 percent of the available habitat, indicating low densities (Loggins 2007). In 2005, the FWC started monitoring the presence of PKBM on public lands by tracking tubes. The Service and other land managers have relied on this data as a means of tracking the presence of PKBM in GSP, PKSP, and GINS. Tracking data from June 2006 indicated that about 25 percent of the available habitat was occupied at PKSP (FWC 2007). Trapping at PKSP and GINS in March 2007 was cancelled after one night after the capture of only one mouse (a fatality) and very limited sightings of beach mouse sign (tracks, burrows) (FWC 2007). Trapping conducted in April of 2008 found no mice on PKSP (J. Himes pers. comm. 2008). According to 2009 tracking data, there were no mice occurrences at PKSP until May 2009, then only sporadic occurrences until November 2009 as the occurrence data started to show a slow but steady increase (FWC 2014b). Tracking data from 2010 showed a dramatic increase in PKBM occurrences within PKSP with 20 percent occurrence at the beginning of the year, and 84 percent occurrence at the end of 2010 (FWC 2010c). Trapping in 2010 on PKSP captured 11 individual beach mice (11 total captures) in February and 36 individuals (106 total captures) in May. At that time, information was insufficient to accurately estimate population size. These captures represent the minimum number of mice in the park for those months. Trapping at GINS and PKSP in spring 2010 generally confirmed the population was increasing with PKBM widely distributed at both public lands.

The number of track tubes visited by mice has increased over the past several years and recent years indicate almost all track tubes contain PKBM tracks. This is likely due to the fact that the storm-impacted coastal habitats have basically recovered and development and predator pressures have decreased. Data from 2011 showed that 96 percent (81 total traps) of track tubes registered beach mouse tracks, indicating that mice were becoming widespread throughout PKSP (J. Gore pers. comm. 2011, FWC 2012a, and FWC 2014b). The 2012 track tube surveys yielded 99 percent of track tubes with beach mouse tracks at PKSP (D. Greene pers. comm. 2012 and FWC 2012a, FWC 2012b, and FWC 2012c). During 2013, the track tube data indicates 97 percent of track tubes contained PKBM tracks (FWC 2013a and FWC 2013b).

There were effects to the Unit resulting from the overwash and inundation by storm surge that occurred several times during the 2004 and 2005 storm seasons. Blow outs occurred on the west and east portions of the PKSP. Two sections of the Hwy 292 were washed out. Park facilities were destroyed. Dune vegetation was significantly impacted, but has been restored passively and actively. Park facilities have been reconstructed in accordance with protected species guidelines.

The Gulf Beach Unit (PKBM-4) consists of 162 acres in southern Escambia County, Florida. This unit includes essential features of beach mouse habitat between GINS and Perdido Key State Park from approximately 4.0 miles east of the Alabama–Florida State line to 6.0 miles east of the State line and areas from the MHWL north to the seaward extent of human development or maritime forest. This unit consists of private lands. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. Habitat fragmentation and other threats specific to this unit are mainly due to development. Consequently, threats to this unit that may require special management considerations include habitat fragmentation and habitat loss, artificial lighting, presence of feral cats as well as other predators at unnatural levels, excessive foot traffic and soil compaction, and damage to dune vegetation and structure. While not known to be occupied at the time of listing, a single beach mouse was trapped within the unit as a result of trapping efforts in 2004 (Service 2004). There have been no data collected within this unit to confirm either absence or presence since this single trapping event in 2004. However, Service personnel have observed burrows and tracks indicating PKBM are occupying the area. This unit provides PCEs 2, 3, and 4 and is essential to the conservation of the species. This unit includes high-elevation scrub habitat and serves as a refuge during storm events and as an important repopulation source if storms extirpate or greatly reduce local populations. This unit currently provides essential connectivity between two core populations GINS (PKBM-5) and PKSP (PKBM-3) and provides essential habitat for expansion, natural movements, and recolonization (PCE 4).

The Gulf Islands National Seashore Unit (Unit 5) consists of 638 acres in southern Escambia County, Florida, on the easternmost region of Perdido Key. This unit encompasses essential features of beach mouse habitat within the boundary of Gulf Islands National Seashore–Perdido Key Area (also referred to as Johnson Beach) from approximately 6.0 miles east of the Alabama–Florida State line to the eastern tip of Perdido Key at Pensacola Bay and the area from the MHWL north to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists mainly of primary and secondary dune habitat, but provides the longest contiguous expanse of frontal dune habitat within the historic range of the PKBM. PBKM were known to inhabit this unit in 1979. No beach mice were captured during surveys in 1982 and 1986 (Humphrey and Barbour 1981; Holler *et al*. 1989). However the population was impacted by Hurricane Frederic (1979), and considered unoccupied at the time of listing. However, no beach mice were captured during surveys in 1982 and 1986 (Humphrey and Barbour 1981; Holler *et al*. 1989). In 1986, PKBM were re-established to GINS as part of the State of Florida and Service recovery efforts. In 2000 and 2001, PKBM captured from this site served as donors to re-establish beach mice at PKSP. Due to damage from storm surge during the 2004 and 2005 storm seasons, PKBM are detected on approximately 30 percent of the beach mouse habitat available (Loggins 2007). Tracking data from June 2006 indicated that about 32 percent of the available habitat was occupied at GINS (FWC 2007). Trapping at PKSP and GINS in March 2007 was cancelled after one night after the capture of only one mouse (a fatality) and very limited sightings of beach mouse sign (tracks, burrows) (FWC 2007). Trapping conducted in April of 2008 was more encouraging with the capture of 35 mice at GINS (S. Sneckenberger pers. comm. 2008). Through 2008-2010 the population continues to expand from GINS to PKSP and beyond. This is the first natural recolonization of a park without the need for a translocation. From 2010 to 2013, the track tube occurrences have averaged 84 percent, 94 percent, 95 percent, and 94 percent respectively (FWC 2014b, FWC 2012a, FWC 2012b, FWC 2012c, FWC 2013a, and FWC 2013b).

PKBM-5, in its entirety, possesses all five PCEs and is essential to the conservation of the species. However, most of this unit consists of frontal dunes, making the population inhabiting this unit particularly threatened by storm events. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit is managed by the National Park Service–Gulf Islands National Seashore. This unit was included in the initial critical habitat designation (50 *FR* 23872) as well as the 2006 revision (71 *FR* 60238). The majority of this unit was overwashed and inundated by storm surge several times during the 2004 and 2005 storm seasons. Park facilities were destroyed and most of the Park road was destroyed. Dune vegetation was washed away or covered with sand. Habitat has since recovered and was comprised of natural and human facilitated dune restoration by GINS staff. Park structures were reconstructed landward of their former locations and in accordance with protected species guidelines.

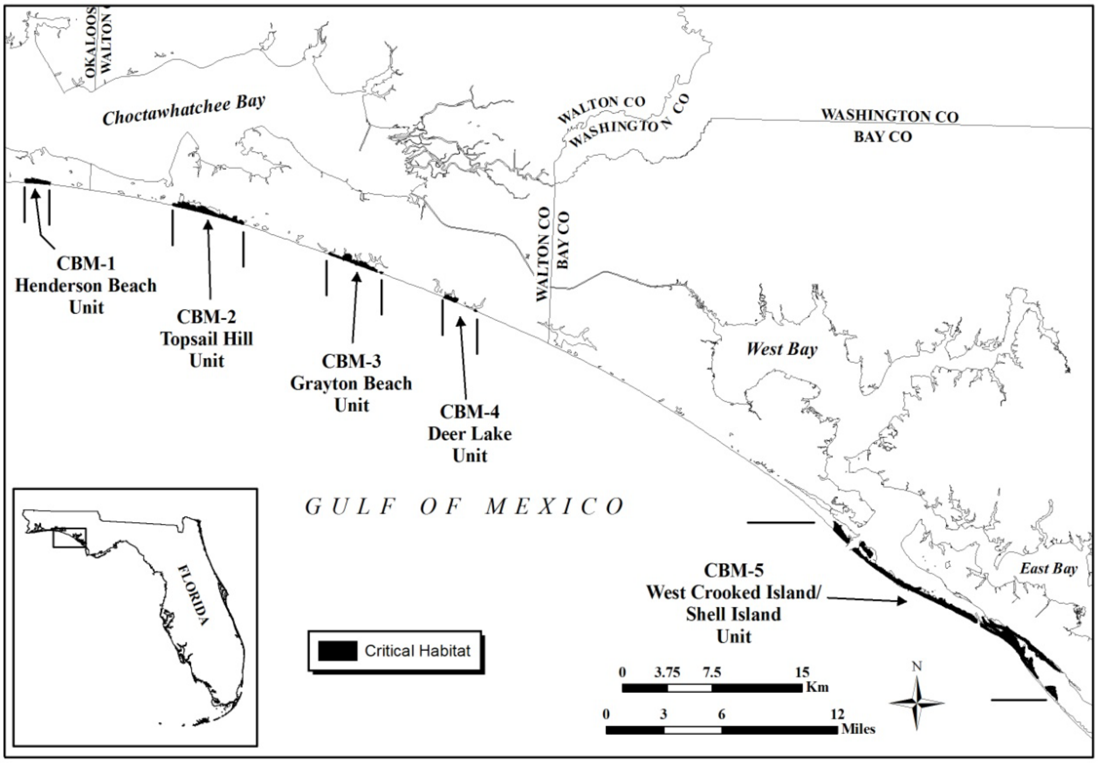

Figure 11. Critical habitat units designated for the Choctawhatchee beach mouse.

Table 12. Critical habitat units designated for the Choctawhatchee beach mouse.

Choctawhatchee Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. Henderson Beach Unit	0	96	0	96
2. Topsail Hill Unit	0	277	31	308
3. Grayton Beach Unit	0	162	17	179
4. Deer Lake Unit	0	40	9	49
5. W. Crooked Island/Shell Island Unit	1333	408	30	1771
Total	1333	982	87	2404

The Henderson Beach unit (CBM–1) consists of 96 acres in Okaloosa County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Henderson Beach State Park from 0.5 miles east of the intersection of Highway 98 and Scenic Highway 98 to 0.25 miles west of Matthew Boulevard and the area from the MHWL north to the seaward extent of the maritime forest. This westernmost unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3). This unit is within the historical range of the subspecies; however, it was not known to be occupied at the time of listing and current occupancy is unknown because no recent efforts have been made to document beach mouse presence or absence. Because this unit includes protected, high-elevation scrub habitat, it may serve as a refuge during storm events and as an important source population if storms extirpate or greatly reduce local populations or populations to the east.

This unit is managed by the Florida Park Service and is essential to the conservation of the species. Threats specific to this unit that may require special management considerations include habitat fragmentation, Park development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The Topsail Hill Unit (CBM–2) consists of 308 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Topsail Hill Preserve State Park, as well as adjacent private lands from 0.1 miles east of the Gulf Pines subdivision to 0.6 miles west of the Oyster Lake outlet and the area from the MHWL north to the seaward extent of human development or maritime forest. This unit provides primary, secondary, and scrub dune habitat and possesses all five PCEs. Its large, contiguous, high-quality habitat allows for natural movements and population expansion. Choctawhatchee beach mice were confirmed present in the unit in 1979 (Humphrey *et al*. 1987), were present at the time of listing, and are still present.

Beach mice have been captured on Stallworth County Park and Stallworth Preserve subdivision, a private development within the unit, and east of the Park (Service 2003a and Yanchis pers comm 2014). The population of Choctawhatchee beach mice inhabiting this unit appears to harbor unique genetic variation and displays a relatively high degree of genetic divergence considering the close proximity of this population to other populations (Wooten and Holler 1999).

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include Park and residential development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the CBM within the area covered under the Habitat Conservation Plan (HCP) for the Stallworth County Preserve (4 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act.

The Grayton Beach Unit (CBM–3) consists of 179 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Grayton Beach State Park, as well as adjacent private lands and inholdings, from 0.3 mi west of the Alligator Lake outlet east to 0.8 miles west of Seagrove Beach and the area from the MHWL north to the seaward extent of human development or maritime forest. This unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3), habitat connectivity (PCE 4) and is essential to the conservation of the species. This unit also provides a relatively natural light regime (PCE 5). Beach mice were not detected in the unit in 1979 (Holler 1992a); however, they were found to be present in 1995 after Hurricane Opal (Moyers *et al.* 1999). While it seems likely that beach mice were present at the time of listing (and may have been present, but not detected, in 1979), the Service does not have data to confirm this assumption. Therefore, the Service considered this unit to be unoccupied at the time of listing. A program to strengthen and reestablish the population began in 1989 and yielded a persistent population at Grayton Beach State Park. A recent translocation of 43 CBM from Topsail State Park to Grayton Beach State Park in 2011 has proven successful as the 2013 follow-up trapping data indicated 93 new CBM at Grayton Beach State Park. According to 2013 track tube data, there is a 69 percent occurrence of beach mouse presence (average) at Grayton Beach State Park (FWC 2013a and FWC 2013b). Beach mice are also known to currently occupy the private lands immediately east of the park.

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include hurricane impacts that may require dune restoration and revegetation, excessive open, unvegetated habitat due to recreational use or storm impacts that may require revegetation, Park development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the Choctawhatchee beach mouse within the area covered under the HCP for the Watercolor development (4 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act.

The Deer Lake Unit (CBM–4) consists of 49 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Deer Lake State Park as well as adjacent private lands from approximately one mile east of the Camp Creek Lake inlet west to approximately 0.5 miles west of the inlet of Deer Lake and the area from the MHWL north to the seaward extent of maritime forest or human development. This unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3), habitat connectivity to adjacent lands (PCE 4), and is essential to the conservation of the species. This unit also provides a relatively natural light regime (PCE 5). Because live-trapping efforts in this area have been limited to incidental trapping, and beach mice were not detected in 1998 (Moyers *et al*. 1999), the Service considered this unit to be unoccupied at the time of listing. CBM were translocated from Topsail Hill Preserve State Park to private lands adjacent to this unit in 2003 and 2005 (Service 2003b, 2005a, 2005b, 2005c, 2005d). Tracking within the adjacent State park lands have indicated expansion of the population into the park. Recent track tube data from 2013 indicates Deer Lake State Park had a 73 percent (average) occurrence rate for monthly CBM presence (FWC 2013a and FWC 2013b).

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the CBM within the area covered under the HCP/Incidental Take Permit (ITP) for Watersound (71 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act (see Application of Section 4(a)(3) and Exclusions Under Section 4(b)(2) of the Act section below). This excluded area is 0.5 miles west of the Camp Creek Lake inlet to 0.5 miles east of the Camp Creek Lake inlet.

The West Crooked Island/ Shell Island Unit (CBM–5) consists of 1,771 acres in Bay County, Florida. This unit encompasses essential features of beach mouse habitat within the boundaries of St. Andrew State Park mainland from 0.1 miles east of Venture Boulevard east to the entrance channel of St. Andrew Sound, Shell Island east of the entrance of St. Andrew Sound east to East Pass, and West Crooked Island southwest of East Bay and east of the entrance channel of St. Andrew Sound, and areas from the MHWL north to the seaward extent of the maritime forest. Shell Island consists of State lands, Tyndall Air Force Base (AFB) lands, and small private inholdings. Choctawhatchee beach mice were known to inhabit the majority of Shell Island in 1987 (Holler 1992b) and were again confirmed present in 1998 (Moyers *et al*. 1999), 2002, and 2003 (Lynn 2003a). Because beach mice inhabited nearly the entire suitable habitat on the island less than two years prior to listing and were reconfirmed after listing, the Service considered this area to be occupied at the time of listing. The West Crooked Island population is the result of a natural expansion of the Shell Island population after the two islands became connected in 1998 and 1999, a result of Hurricanes Opal and Georges (Service 2003b). Shell Island was connected to the mainland prior to the 1930s when a navigation inlet severed the connection on the western end. Beach mice were documented at St. Andrew State Park mainland as late as the 1960s (Bowen 1968), though no records of survey efforts exist again until Humphrey and Barbour (1981) and Meyers (1983) at which time beach mice were not detected. Therefore, it seems likely that this area was not occupied at the time of listing. Current beach mouse population levels at this site are unknown, and live-trapping to document the absence of mice has not been conducted. Similar to the original designation, this Park was designated as critical habitat because it has features essential to the CBM. It is also within the historical range of the mouse. This unit supports the easternmost population of CBM, with the next known population 22 miles to the west.

This unit provides primary, secondary, and scrub dune habitat and possesses all five PCEs. Portions of this unit are managed by the Florida Park Service, while the remaining areas are federally (Tyndall AFB) and privately owned.

Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high residential or recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Figure 12. Critical habitat units designated for the St. Andrew beach mouse.

Table 13. Critical habitat units designated for the St. Andrew beach mouse.

St. Andrew Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. East Crooked Island Unit	649	0	177	826
2. Palm Point Unit	0	0	162	162
3. St. Joseph Peninsula Unit	0	1280	222	1502
Total	649	1280	561	2490

The East Crooked Island Unit (SABM–1) consists of 826 acres in Bay County, Florida. This unit encompasses essential features of beach mouse habitat on East Crooked Island from the entrance of St. Andrew Sound to one mile west of Mexico Beach, and the area from the MHWL to the seaward extent of the maritime forest (not including Raffield Peninsula). Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat and possesses all five PCEs. SABM were known to inhabit the unit in 1986 and 1989 (James 1992), though the population was presumably extirpated after 1989 due to impacts from hurricanes. The East Crooked Island population was reestablished with donors from St. Joseph State Park in 1997. This unit was occupied at the time of listing. Live-trapping in 2002 confirmed occupation of mice (Moyers and Shea 2002, Lynn 2002a, Slaby 2005). Recent track tube data indicates mice are still present in this unit (FWC 2013a and FWC 2013b). This unit maintains connectivity along the island and this unit is essential to provide a donor population following storm events.

The majority of this unit is federally owned (Tyndall AFB), while the remaining habitat is privately owned. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational and military use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The Palm Point Unit (SABM–2) consists of 162 acres of private lands in Gulf County, Florida. This unit encompasses habitat from Palm Point 1.25 miles northwest of the inlet of the Gulf County Canal to the southeastern boundary of St. Joseph Beach and the area from the MHWL to the seaward extent of the maritime forest. SABM were documented in the area by Bowen (1968) and were considered to have been present in this unit at the time of listing. Since SABM beach mouse habitat is limited to only two other areas, protecting this mainland site located within the species' historical range is needed for the subspecies' long-term persistence. As other viable opportunities are limited or nonexistent, this unit is essential to reduce the threats of stochastic events to this subspecies. Furthermore, as this unit is on the mainland, it is somewhat buffered from the effects of storm events. This area provides frontal and scrub dune habitat (PCEs 2 and 3), but may provide limited connectivity between habitats. Threats specific to this unit that may require special management considerations include habitat fragmentation, habitat loss, artificial lighting, presence of free-roaming cats as well as other predators at unnatural levels, and high residential use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The St. Joseph Peninsula Unit (SABM–3) consists of 1,502 acres in Gulf County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of St. Joseph Peninsula State Park (Park) as well as south of the Park to the peninsula's constriction north of Cape San Blas (also known as the "stumphole" region) and area from the MHWL to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat, and provides a relatively contiguous expanse of habitat within the historical range of the SABM. This unit possesses all five PCEs and was occupied at the time of listing. SABM were known to inhabit this unit in 1986 and 1987 (James 1987, 1992, 1995, Gore 1994, Moyers *et al.* 1999, Slaby 2005). In addition, recent trapping and tracking efforts suggest that mice continue to occupy private lands south of the Park (K. Yanchis pers comm., FWS 2012). The Park alone does not provide sufficient habitat to allow for population expansion along the peninsula, which may be necessary for a population anchored by the tip of a historically dynamic peninsula. A continuous presence of beach mice along the peninsula is the species' best defense against local and complete extinctions due to storm events. The population of SABM inhabiting this unit appears to possess unique genetic variation, and displays greater than expected genetic divergence from other populations (Wooten and Holler 1999).

The Florida Park Service manages portions of this unit, while the remaining area is privately owned. Threats specific to this unit that may require special management considerations include artificial lighting, habitat fragmentation and habitat loss, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality. The population inhabiting this unit may also be particularly susceptible to hurricanes due to its location within St. Joseph Bay (the peninsula is a thin barrier peninsula with a north–south orientation).

Life history (All subspecies of beach mice)

Beach mice are differentiated from the inland subspecies by the variety of fur (pelage) patterns on the head, shoulders, and rump. The overall dorsal coloration in coastal subspecies is lighter in color and less extensive than on those of the inland subspecies (Sumner 1926, Bowen 1968). Similarly, beach mouse subspecies can be differentiated from each other by pelage pattern and coloration.

The SEBM averages 5.47 inches in total length (average of 10 individuals = 5.07 inches, with a 2.04-inch tail length (Osgood 1909, Stout 1992). Females are slightly larger than males. These beach mice are slightly darker in appearance than some other subspecies of beach mice, but paler than inland populations of *P. polionotus* (Osgood 1909). SEBM have pale, buffy coloration from the back of their head to their tail, and their underparts are white. The white hairs extend up on their flanks, high on their jaw, and within 0.07 to 0.12 inches of their eyes (Stout 1992). There are no white spots above the eyes as with AIBM (Osgood 1909). Their tail is also buffy above and white below. Juvenile SEBM are more grayish in coloration than adults; otherwise they are similar in appearance (Osgood 1909).

The AIBM averages 5.45 inches in total length (average of 10 individuals); with 2.05 inches mean tail length (James 1992). This subspecies has a very pale, buff-colored head and back with extensive white coloration underneath the sides (Howell 1939). Bowen (1968) noted two distinct rump color pigmentations, one tapered and the other a squared pattern, which extended to the thighs.

The SABM has head and body lengths averaging 2.95 inches, and tail mean lengths averaging 2.05 inches (James 1992). This subspecies has a very pale, buff-colored head and back with extensive white coloration underneath and along the sides (Howell 1939). Bowen (1968) noted two distinct rump color pigmentations, one tapered and the other a squared pattern, which extended to the thighs.

The PKBM is slightly smaller than the other Gulf coast beach mouse subspecies (Bowen 1968). Head and body length ranges from 2.7 to 3.3 inches (Holler 1992b). The pigmentation of PKBM is gray to gray-brown with the underparts white and coloration on the head is less pronounced. The line between pigmented and unpigmented pelage runs dorsally posterior above the eyes and behind the ears. Pigmentation patterns on the rump are either squared or squared superimposed on a tapered pattern (Bowen 1968). There is no tail stripe.

CBM have head and body lengths ranging from 2.7 to 3.5 inches (Holler 1992a). This beach mouse is distinctly more orange-brown to yellow-brown than the other Gulf coast beach mouse subspecies (Bowen 1968). Pigmentation on the head either extends along the dorsal surface of the nose to the tip, or ends posterior to the eyes leaving the cheeks white. A dorsal tail stripe is either present or absent.

Behavior

Peromyscus polionotus is the only member of the genus that digs an extensive burrow. Beach mice are semifossorial, using their complex burrows as a place to rest during the day and between nightly foraging bouts, escape from predators, have and care for young, and hold limited food caches. Burrows of *P. polionotus* generally consist of an entrance tunnel, nest chamber, and escape tunnel. Burrow entrances are usually placed on the sloping side of a dune at the base of a shrub or clump of grass. The nest chamber is formed at the end of the level portion of the entrance tunnel at a depth of 23.6 to 35.4 inches, and the escape tunnel rises from the nest chamber to within 9.8 inches of the surface (Blair 1951). Nests of beach mice are constructed in the nest chamber of their burrows, a spherical cavity about 1.5 to 2.5 inches in diameter. The nest comprises about one-fourth of the size of the cavity and is composed of sea oat roots, stems, leaves and the chaffy parts of the panicles (Ivey 1949). Beach mice have been found to select burrow sites based on a suite of biotic and abiotic features including dune slope, soil compaction, vegetative cover, and height above sea level (Lynn 2000a, Sneckenberger 2001). A shortage of potential burrow sites is considered to be a possible limiting resource.

Reproduction and Demography

Studies on *Peromyscus* species in peninsular Florida suggest that these species may achieve greater densities and undergo more significant population fluctuations than their temperate relatives, partially because of their extended reproductive season (Bigler and Jenkins 1975). Subtropical beach mice can reproduce throughout the year; however, their peak reproductive activity is generally during late summer, fall, and early winter. Extine (1980) reported peak reproductive activity for SEBM on Merritt Island during August and September, based on external characteristics of the adults. This peak in the timing and intensity of reproductive activity was also correlated to the subsequent peak in the proportion of juveniles in the population in early winter (Extine 1980). Peak breeding season for Gulf Coast beach mice is autumn and winter, declining in spring, and falling to low levels in summer (Rave and Holler 1992, Blair 1951). However, pregnant and lactating beach mice have been observed in all seasons (Moyers *et al.* 1999).

Sex ratios in beach mouse populations are generally 1:1 (Extine 1980, Rave and Holler 1992).

Beach mice are believed to be generally monogamous (Smith 1966, Foltz 1981, Lynn 2000a). While a majority of individuals appear to pair for life, paired males may sire extra litters with unpaired females. Beach mice are considered sexually mature at 55 days of age; however some are capable of breeding earlier (Weston 2007). Gestation averages 28 to 30 days (Weston 2007) and the average litter size is four pups (Fleming and Holler 1990). Littering intervals may be as short as 26 days (Bowen 1968).

Apparent survival rate estimates (products of true survival and site fidelity) of beach mice along the Gulf Coasts of Florida and Alabama have demonstrated that their average life span is about nine months (Swilling 2000). Other research indicated that 63 percent of Alabama beach mice lived (or remained in the trapping area) for four months or less, 37 percent lived 5 months or greater and two percent lived 12 to 20 months (Rave and Holler 1992). Less than half (44 percent) of beach mice captured for the first time were recaptured the next season (Holler *et al*. 1997). Greater than 10 percent of mice were recaptured three seasons after first capture; and four to eight percent were recaptured more than one year after initial capture. Beach mice held in captivity have lived three years or more (Blair 1951, Holler 1995).

Habitat and Movement

Beach mice inhabit coastal dune ecosystems on the Atlantic and Gulf Coasts of Florida and the Gulf Coast of Alabama. The dune habitat is generally categorized as: primary dunes (characterized by sea and other grasses), secondary dunes (similar to primary dunes, but also frequently include such plants as woody goldenrod (*Chrysoma pauciflosculosa*), false rosemary (*Conradina canescens*), and interior or scrub dunes (often dominated by scrub oaks and yaupon (*Ilex vomitoria*). Contrary to the early belief that beach mice were restricted to (Howell 1909, 1921, Ivey 1949), or preferred the frontal dunes (Blair 1951, Pournelle and Barrington 1953, Bowen 1968), recent research has shown that scrub habitat serves an invaluable role in the persistence of beach mouse populations (Swilling *et al.* 1998, Sneckenberger 2001). Beach mice occupy scrub dunes on a permanent basis and studies have found no detectable differences between scrub and frontal dunes in beach mouse body mass, home range size, dispersal, reproduction, survival, food quality, and burrow site availability (Swilling *et al.* 1998, Swilling 2000, Sneckenberger 2001). While seasonally abundant, the availability of food resources in the primary and secondary dunes fluctuates (Sneckenberger 2001). In contrast, the scrub habitat provides a more stable level of food resources, which becomes crucial when food is scarce or nonexistent in the primary and secondary dunes. This suggests that access to primary, secondary, and scrub dune habitat is essential to beach mice at the individual level.

The sea oat zone of primary dunes is considered essential habitat of beach mice on the Atlantic Coast (Humphrey and Barbour 1981, Humphrey *et al.* 1987, Stout 1992). The SEBM has also been reported from sandy areas of adjoining coastal strand/scrub vegetation (Extine 1980, Extine and Stout 1987), which refers to a transition zone between the fore dune and the inland plant community (Johnson and Barbour 1990). Beach mouse habitat is heterogeneous, and distributed in patches that occur both parallel and perpendicular to the shoreline (Extine and Stout 1987). Because this habitat occurs in a narrow band along Florida's coast, structure and composition of the vegetative communities that form the habitat can change dramatically over distances of several feet.

Primary dune vegetation described from SEBM habitat includes sea oats, bitter panicgrass, railroad vine, beach morning-glory, saltmeadow cordgrass (*Spartina patens*), lamb'squarters (*Chenopodium album*), saltgrass (*Distichlis spicata*), and camphorweed (Extine 1980). Coastal strand and inland vegetation is more diverse, and can include pricklypear, saw palmetto, wax myrtle, Florida rosemary (*Ceratiola ericoides*), sea grape, and sand pine (*Pinus clausa*) (Extine and Stout 1987). Extine (1980) observed this subspecies as far as 0.62 miles inland on Merritt Island; he concluded that the dune scrub communities he found them in represent only marginal habitat for the SEBM. SEBM have been documented in coastal scrub more than a mile from the beach habitat at Kennedy Space Center/Merritt Island National Wildlife Refuge (NWR) and Cape Canaveral Air Force Station (CCAFS) (Stout *et al*. 2006). Extine (1980) and Extine and Stout (1987) reported that the SEBM showed a preference for areas with clumps of palmetto, sea grape, and expanses of open sand.

Essential habitat of the AIBM is characterized by patches of bare, loose, sandy soil (Humphrey and Frank 1992a). Although they are mainly found in the sea oat zone of the primary zone, they will occur in sandy areas with broomsedge (*Andropogon* sp.) (Service 1993). Ivy (1949) reported AIBM to occur in woody vegetation as far as 500 feet inland. Pournelle and Barrington (1953) found this subspecies in scrub as far as 1,800 feet from the dunes. Because this habitat occurs in a narrow band along Florida's coast, structure and composition of the vegetative communities that form the habitat can change dramatically over distances of only a few feet. Much of the habitat within the range of the AIBM has been converted to condominiums and housing developments. The majority of the high quality habitat, densely occupied by beach mice, remains along the length of both ASP and FMNM, at either end of Anastasia Island.

Two main types of movement have been identified for small mammals: within home-range activity and long-range dispersal. Such movements are influenced by a suite of factors, such as availability of mates, predation risk, and habitat quality. Movement and home range studies have been conducted for most beach mouse subspecies, but are limited to natural habitat (*i.e*., research has been conducted on public lands within contiguous beach mouse habitat, not within a development or in a fragmented landscape). Novak's (1997) study of the home range of CBM on Shell Island indicated males had a mean home range of 1.0 ± 4.1 acres and females had a mean home range of 0.81 ± 2.18 acres. Lynn (2000a) found male and female radio-tagged ABM had a mean home range of 1.68 ± 0.27 acres and 1.73 ± 0.40 acres, respectively. Swilling *et al.* (1998) observed one radio-collared ABM to travel over 328 feet during nightly forays after Hurricane Opal to obtain acorns from the scrub dunes. Using radio telemetry, Lynn (2000a) documented an ABM that traveled one mile within a 30-minute period. Moyers and Shea (2002) trapped a male and female CBM that moved about 637 feet and 2,720 feet in one night, respectively. Gore and Schaefer (1993) documented a marked Santa Rosa beach mouse crossing State Road (SR) 399, a two-lane highway. Lynn and Kovatch (2004) through mark and recapture trapping documented PKBM that crossed SR 292, a two-lane highway and right-of-way (100-feet wide).

Sneckenberger (2001) found significant seasonal differences in the movement of ABM, and suggested that this was a result of seasonal fluctuations in food availability, food quality, and nutritional needs. Smith (2003) found that Santa Rosa beach mice demonstrated an increase in movement as habitat isolation increased suggesting that longer travel distances were needed to obtain necessary resources. Smith also found that Santa Rosa beach mice had a preference for vegetation cover and connectivity, which is likely a behavioral response to increased predation risk in open areas. Thus, while beach mice are able and do travel great distances the travel pathways should have vegetated cover and no large gaps or open areas. Previous connectivity research suggests critical thresholds exist for species persistence in fragmented landscapes (With and Crist 1995). As fragmentation increases and connectivity is lost, species' ability to move through and between habitats is reduced in a nonlinear fashion.

Foraging

Beach mice are nocturnal and forage for food throughout the dune system. Beach mice feed primarily upon seeds and fruits, and appear to forage based on availability and have shown no preferences for particular seeds or fruits (Moyers 1996). Beach mice also eat small invertebrates, especially during late spring and early summer when seeds are scarce (Ehrhart 1978, Moyers 1996). Research suggests that the availability of food resources fluctuates seasonally in Gulf Coast coastal dune habitat, specifically that the frontal dunes appear to have more species of high quality foods, but these sources are primarily grasses and annuals that produce large quantities of small seeds in a short period of time. Foods available in the scrub consist of larger seeds and fruits that are produced throughout a greater length of time and linger in the landscape (Sneckenberger 2001). Nutritional analysis of foods available in each habitat revealed that seeds of plant species in both habitats provide a similar range of nutritional quality.

Population dynamics

Population size

Estimating animal abundance or population size is an important and challenging scientific issue in wildlife biology (Otis *et al.* 1978, Pollock *et al.* 1990). A number of different census methods are available to estimate wildlife populations, each with particular benefits and biases. Beach mouse surveys involve live trapping mark-recapture studies, which is a common method with small mammals. A five-night minimum trapping period has been standard practice since 1987 for Gulf Coast beach mice. As the referenced trapping events were not designed similarly or using a standardized sampling techniques, data should not be compared between subspecies or trapping events, nor should densities (mice per 100 trap nights) be inferred beyond the trapping area during that trapping session.

Population densities of beach mice typically reach peak numbers in the late autumn into spring (Rave and Holler 1992, Holler *et al*. 1997). Peak breeding period occurs in autumn and winter, apparently coinciding with the increased availability of seeds and fruits from the previous growing season. Seasonal and annual variation in size of individual populations may be great (Rave and Holler 1992, Holler *et al.* 1997). Food supplementation studies showed that old field mouse populations increased when foods were abundant; thus, populations of old field mice appear to be food-limited (Smith 1971, Galindo-Leal and Krebs 1998). Similar studies have not been conducted with beach mouse populations.

Gulf Coast Beach Mice

In 1979, Humphrey and Barbour (1981) estimated about 515 CBM existed on Topsail Hill and Shell Island. That estimate was used during the Federal listing of the CBM in 1985. Population estimates on Shell Island from February 1993 to March 1994, ranged from 105 to 338 CBM on a 23-acre study area (Novak 1997). Just prior to Hurricane Opal in 1995, it was estimated that Shell Island supported 800 to 1,200 CBM (Gore 1999). Three years following Hurricane Opal in June 1998, one trapping effort at six different sites on Shell Island resulted in a cumulative population estimate of 195 CBM (164 CBM captured) (Moyers *et al*. 1999). The east portion of the island has been trapped from 2000 to 2003. Population estimates have ranged between 24 and 67 CBM (Lynn 2004b). At Topsail Hill Preserve State Park, trapping conducted in March 2003 and March 2005 yielded a population estimate of 190 to 250 CBM (Service 2003a, Sneckenberger 2005). From late 2006 through 2007 results of tracking tubes surveys at Topsail Hill Preserve State Park suggested that the CBM population was not densely distributed (FWC 2008b). Trapping of four 100-trap transects yielded population estimates of 190, 250, less than 10 (too few to estimate), and 87 in 2003, 2005, 2006, and 2007, respectively (Service 2007a). The track and trapping data together indicate that Topsail Hill Reserve State Park currently does not support a high population of beach mice. In 2003 and again in 2005, a total of 26 mice were translocated from Topsail Hill Preserve State Park to the WaterSound private development adjacent to Deer Lake State Park. Trapping has been sporadic on WaterSound but has yielded population estimates of 5 to 46 individuals in 2003 to 2007 (Moyers 2007). Deer Lake State Park has not been trapped; however, tracks have been observed as recently as 2006 (FWC 2008b). Population estimates from trapping at Grayton Beach State Park (main unit) from 1995 to 2000, ranged from 25 to 116 CBM (Moyers *et al.* 1999, Van Zant 2000). The central unit was trapped for three nights in August 2002; however, no mice were captured (Lynn 2002b). Limited tracking surveys were accomplished in 2003, 2004 and 2005 and beach mouse tracks were observed (Kovatch 2003, Toothacker 2004, FWC 2008b). The western area, although it provides CBM habitat, has not been documented as occupied by CBM (Moyers *et al.* 1999, Van Zant 2000). The population estimates for the WaterColor development for the two years prior to and one year following development ranged from 3 to 7 CBM (St. Joe Company 1999). CBM were last captured in February of 2001 at WaterSound; quarterly trapping has continued on the site through mid-2008 without CBM being captured (St. Joe/Arvida 2003). Auburn University trapped West Crooked Island in October 2000, and the Service trapped the area in 2001 to 2003. The population estimate ranged from a low of 174 to a high of 244 CBM (Lynn 2000b, 2002d, 2002e, 2002f, 2002g, 2003b). The Service estimated the total population of CBM in 2003, to be about 600 to 1,000 beach mice. A recent translocation of 43 CBM from Topsail State Park to Grayton Beach State Park in 2011 has proven successful as the 2013 follow-up trapping data indicated 93 new CBM at Grayton Beach State Park. According to 2013 track tube data, there is a 69 percent occurrence of beach mouse presence (average) at Grayton Beach State Park (FWC 2013a and FWC 2013b). Recent track tube data from 2013 indicates Deer Lake State Park had a 73 percent (average) occurrence rate for monthly CBM presence (FWC 2013a and FWC 2013b).

Since its listing in 1985, PKBM population estimates never reached more than 400 to 500 individuals until 2003. Before Hurricane Ivan (2004) a population estimate of 500 to 800 was divided between two populations - the Johnson Beach Unit of GINS and PKSP (Service 2004). The status of PKBM at Gulf State Park (GSP) is uncertain, likely extirpated in 1999. In October 2005, following the active hurricane seasons of 2004 and 2005, a trapping effort of less than one-third of the habitat available on public lands yielded captures of less than 30 individuals. Tracking data from June 2006 indicated that about 25 and 32 percent of the available habitat was occupied at PKSP and GINS, respectively (Loggins 2007). Trapping at PKSP and GINS in March 2007, was cancelled after one night after the capture of only one mouse (a fatality) and very limited sightings of beach mouse sign (tracks, burrows) (Loggins 2007). With no tracks observed in the tube surveys the PKBM may now be absent from PKSP (FWC 2008b). According to 2009 tracking data, there were no mice occurrences at PKSP until May 2009, then only sporadic occurrences until November 2009 as the occurrence data started to show a slow but steady increase (FWC 2014b). Tracking data from 2010 showed a dramatic increase in PKBM occurrences within PKSP with 20 percent occurrence at the beginning of the year, and 84 percent occurrence at the end of 2010 (FWC 2010c). Trapping in 2010 on PKSP captured 11 individual beach mice (11 total captures) in February and 36 individuals (106 total captures) in May. At that time, information was insufficient to accurately estimate population size. These captures represent the minimum number of mice in the park for those months. Trapping at GINS and PKSP in spring 2010 generally confirmed the population was increasing with PKBM widely distributed at both public lands. Recent data from 2011 showed that 96 percent (81 total traps) of track tubes registered beach mouse tracks, indicating that mice were becoming widespread throughout PKSP (J. Gore pers. comm. 2011, FWC 2012a, and FWC 2014b). The 2012 track tube surveys yielded 99 percent of track tubes with beach mouse tracks at PKSP (D. Greene pers. comm. 2012 and FWC 2012a, FWC 2012b, and FWC 2012c). During 2013, the track tube data indicates 97 percent of track tubes contained PKBM tracks (FWC 2013a and FWC 2013b). At GINS, the number of PKBM has not increased since the initial high levels in winter of 2005-2006 (FWC 2008b). However, population estimates indicate there may be a few hundred PKBM at GINS (Gore 2008). Trapping conducted in April of 2008 was more encouraging with the capture of 35 mice at GINS (S. Sneckenberger pers. comm. 2008). Through 2008-2010 the population continues to expand from GINS to PKSP and beyond. This is the first natural recolonization of a park without the need for a translocation. From 2010 to 2013, the track tube occurrences at GINS have averaged 84 percent, 94 percent, 95 percent, and 94 percent respectively (FWC 2014b, FWC 2012a, FWC 2012b, FWC 2012c, FWC 2013a, and FWC 2013b).

The SABM even at its lowest population probably numbered several hundred individuals (Gore as cited in 63 *FR* 70055). James (1992) estimated that the East Crooked Island subpopulation to be about 150. However, by 1996, SABM were no longer found on East Crooked Island. Following Hurricane Opal in 1995, Mitchell *et al.* (1997) estimated the St. Joe Peninsula State Park population to be between 300 and 500 mice. In November 1997 and January 1998, 19 pairs of St. Andrew beach mice were relocated from St. Joseph Peninsula State Park to East Crooked Island, Tyndall Air Force Base (Moyers *et al.* 1999). Trapping surveys conducted on East Crooked Island in 2000 and 2002 through 2007 indicated that beach mice occupied the entire island (Lynn 2002c, FWC 2008b). Population estimates ranged from 71 to 133 mice (Lynn 2002c). The FWC (2008b) estimates 22 miles of habitat as occupied by SABM throughout the mouse's historical range with population estimates of about 3,000 mice at East Crooked Island and about 1,775 mice in the front dunes at St. Joseph State Park. Data from 2008-2012 on East Crooked Island showed a decrease in SABM, with average track tube occurrences of 97 percent, 97 percent, 96 percent, 87 percent, and 83 percent, respectively (FWC 2014b and FWC 2012a). However, recent data from 2013 indicates 95 percent of track tubes contained SABM tracks (FWC 2013a and FWC 2013b). Surveys conducted from 2008-2012 at Rish Park yielded average track tube occurrence that fluctuated between 79 percent, 91 percent, 76 percent, 79 percent, and 83 percent, respectively (FWC 2014b and FWC 2012a). More recent data in 2013 showed an average of 73 percent of track tubes contained SABM tracks (FWC 2013a and FWC 2013b).

Atlantic Coast Beach Mice

Populations of the SEBM have been estimated to be around 5,000 to 6,000 mice. Recent surveys have confirmed that SEBM are found on the beaches of Canaveral National Seashore, Merritt Island NWR, and CCAFS in Brevard County, all on federally protected lands. In April 2002, a population of SEBM was documented at the Smyrna Dunes Park, at the north end of New Smyrna Beach (Sauzo 2004). Prior to 2006, populations of the SEBM were thought extirpated from both sides of the Sebastian Inlet (Bard 2004). However, during surveys in June 2006, a single mouse was located at the very southern end of the Sebastian Inlet State Park. Mice were also found at Jungle Trail on the Pelican Island National Wildlife Refuge, another area where they where thought extirpated. Additional surveys of other areas south of Brevard County have not located any mice and indicate the distribution of this subspecies in the counties south of Brevard, severely fragmented. SEBM are no longer believed to occur at Jupiter Island, Palm Beach, Lake Worth, Hillsboro Inlet or Hollywood Beach (Service 1999).

Although the distribution of the AIBM has declined significantly, particularly in the northern part of its range, the populations at ASP and FMNM have continued to fluctuate seasonally between two and 90 mice per acre. It is thought that populations should be characterized by a range rather than a static value (Frank and Humphrey 1996). Quarterly surveys of these two sites have shown that the populations have remained stable. Due to the limited dune habitat at the ASP, this population has not been able to maintain a stable population and it is unknown how many mice remain.

Population variability

Beach mouse populations fluctuate on a seasonal and annual basis. Attempts to explain population dynamics have revealed an incomplete understanding of the species and its population cycles. It is clear that beach mice, like all rodents, are known for high reproductive rates and experience extreme highs and lows in population numbers. Depressed beach mouse populations may be associated with tropical storms and drought, perhaps resulting from reduced habitat and food resources. These fluctuations can be a result of reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Blair 1951, Bowen 1968, Smith 1971, Hill 1989, Rave and Holler 1992, Swilling *et al.* 1998, Swilling 2000).

Population stability

Population viability analysis (PVA) is essentially a demographic modeling exercise to predict the likelihood a population will continue to exist over time (Groom and Pascual 1997). The true value in using this analytical approach is not to determine the probability of a species' extinction, but to clarify factors that have the most influence on a species' persistence. From 1996 to 1999, the Service funded Auburn University to develop a PVA for beach mice (Holler *et al*. 1999, Oli *et al.* 2001). Four subpopulations of Gulf Coast beach mice subspecies were modeled. They consisted of two subpopulations of PKBM, one at GINS-Perdido Key Area and one at Florida Point, and two subpopulations of ABM, one at Bon Secour NWR and one at Fort Morgan State Park. They used a stochastic (random) differential equation (Wiener-drift) model, applied to long term demographic data. The model is stochastic because it incorporates the variable effects of the environment upon population change. However, it did not model the effects of hurricanes on the habitat or population of beach mice.

The Oli *et al.* (2001) analyses indicated that all four subpopulations were at risk of extinction, with habitat fragmentation as the most influential factor. The GINS-Perdido Key Area had the highest risk for extinction; the PKBM had a 100 percent chance of reaching one individual (becoming functionally extinct) within 21 (mode) or 45 (median) years. At Florida Point, the PKBM had a low risk of becoming functionally extinct (1.3 percent) within 13 to 20 years. However, following Hurricane Opal in 1995, and subsequent predation pressure, the PKBM population at Florida Point was believed extirpated in 1999. This localized extirpation clearly demonstrates that while PVA's are useful in determining significant factors in species survival, they have limited use in predicting the time to extinction for a given species.

More recently, the Conservation Breeding Specialist Group (Traylor-Holzer 2004, 2005, 2006) was contracted by the Service to conduct a population and habitat viability analysis (PHVA) on ABM using the Vortex population simulation model (Lacy 1993). The goal was to develop an ABM population model and use the model to assess the status of the ABM habitat, and populations and projections for continued existence. The PHVA results projects the ABM to have a 26.8 percent ± 1.0 percent likelihood of extinction over the next 100 years. Much of this risk is due to hurricane impacts on ABM populations and habitat, which can result in population declines. The model suggests that hurricanes are a driving force for ABM populations, both directly and also indirectly as their impacts interact with other factors, including development of higher elevation (scrub) habitat and predation by cats. Due to the similarities in the subspecies and proximal location, it can be inferred that these factors also have a strong influence on the persistence of PKBM populations. When reviewing PHVA results, it is crucial that the actual values for the risk of extinction are not the focus of the interpretation. The true value of a PHVA is the ability to compare management strategies and development scenarios, run sensitivity analyses, and determine the main influence(s) on population persistence.

Similar to the land use arrangement on Perdido Key, the Fort Morgan peninsula (occupied by ABM) consists of three areas of public lands separated by two areas of private lands, which allow for limited (varied) dispersal between the public lands. The current level of dispersal between public lands through private lands is unknown, but is affected by development and habitat degradation. Without dispersal between public lands through private lands, the PHVA results project the ABM to have a 41.2 percent ± 1.1 percent likelihood of extinction. If all privately-owned habitat between the public lands is lost, the likelihood of extinction increases to 46.8 percent ± 1.1 percent. Again, it can be inferred that a similar increase in risk of extinction would occur with the PKBM if dispersal could not occur through private lands.

Despite the similarities in the subspecies, it is important to note that carrying capacity (K), which was found to be a strong influence on the model, would be different in PKBM. For ABM, K was estimated using maximum ABM density estimates (4.5 to 11.6 ABM per acre) and acres of habitat (2,989 acres). As density estimates for PKBM would likely be lower, and remaining PKBM habitat is less than 1,300 acres, the Vortex model for PKBM would likely project a greater likelihood of extinction.

The Service contracted with the Georgia Cooperative Fish and Wildlife Research Unit to critique the PVAs for the ABM accomplished by Oli *et al.* (2001) and Conservation Breeding Specialist Group (Traylor-Holzer 2006). Conroy and Runge (2006) indicated that neither PVA provided reliable estimates of extinction probability for ABM. They recommended that future PVA work should incorporate sampling, temporal, and possibly spatial variance for input variables and should clearly and explicitly express uncertainty in extinction output. Until this can be done, reliable estimates of extinction probability for the ABM (and other beach mouse subspecies) cannot be estimated.

Species that are protected across their ranges have lower probabilities of extinction (Soulé and Wilcox 1980). Beach mouse populations persist naturally through local extirpations due to storm events or the harsh, stochastic nature of coastal ecosystems. Historically, these areas would be recolonized as population densities increase and dispersal occurred from adjacent populated areas. In addition, from a genetic perspective, beach mice recover well from population size reductions (Wooten 1994), given sufficient habitat is available for population expansion after the bottleneck occurs. As human development has fragmented the coastal dune landscape, beach mice can no longer recolonize along these areas as they did in the past (Holliman 1983). As a continuous presence of beach mice or suitable habitat along the coastline is no longer possible and any hurricane can impact the entire range of each subspecies, the probability of beach mice persisting would be enhanced by the presence of contiguous tracts of suitable habitat occupied by multiple independent populations (Shaffer and Stein 2000). The history of the PKBM alone illustrates the need for multiple populations (a now potentially extirpated population was the source of the two remaining populations of the subspecies) (Holler *et al.* 1989, 71 *FR* 60238). While maintaining multiple populations of beach mouse subspecies provides protection from total loss (extinction), especially when migration and relocations are possible (Oli *et al.* 2001), conservation of each subspecies necessitates protection of genetic variability throughout their ranges (Ehrlich 1988).

Preservation of natural populations is therefore crucial, as the loss of a population of beach mice can result in a permanent loss of alleles (Wooten and Holler 1999). This loss of genetic variability cannot be regained through translocations or other efforts.

Status and Distribution

The distribution of all the beach mouse subspecies is significantly reduced from their historical ranges due to modification and destruction of the coastal dune ecosystem inhabit. Habitat loss and alteration was likely a primary cause of the extinction of one subspecies, the Pallid beach mouse, which was endemic to barrier beach between Matanzas and Ponce de Leon inlets in Volusia and Flagler Counties (Humphrey and Barbour 1981).

Atlantic Coast Beach Mice

The distribution of the SEBM has declined significantly, particularly in the southern part of its range. Historically, it was reported to occur along about 174 miles of Florida’s central and southeast Atlantic coast from Ponce (Mosquito) Inlet, Volusia County, to Hollywood Beach, Broward County (Hall 1981). Bangs (1898) reported it as extremely abundant on all the beaches of the east peninsula from Palm Beach at least to Mosquito (Ponce) Inlet. During the 1990s, the SEBM was reported only from Volusia County (Canaveral National Seashore); in Brevard County (Canaveral National Seashore, Kennedy Space Center/Merritt Island NWR, and CCAFS); a few localities in Indian River County (Sebastian Inlet State Park, Treasure Shores Park, and several private properties), and St. Lucie County (Pepper Beach County Park and Fort Pierce Inlet State Park) (Humphrey *et al*. 1987, Robson 1989, Land Planning Group, Inc. 1991, Humphrey and Frank 1992b, Service 1993). The SEBM is geographically isolated from all other subspecies of beach mice.

Populations of the SEBM are still found on the beaches of Canaveral National Seashore, Merritt Island NWR, and CCAFS in Brevard County, all on federally protected lands. In April 2002, a population of SEBM was documented at the Smyrna Dunes Park, at the north end of New Smyrna Beach (Sauzo 2004). Populations from the north side of Sebastian Inlet appear to be extirpated (Bard 2004). SEBM were documented on the south side of Sebastian Inlet in 2006, although none have been found since then.

The status of the species south of Brevard County is currently unknown. The surveys conducted during the mid-1990s indicated the distribution of this subspecies in the counties south of Brevard County was severely limited and fragmented. There are not enough data available to determine population trends for these populations. These surveys revealed that it occurred only in very small numbers where it was found. In Indian River County, the Treasure Shores Park population experienced a significant decline in the 1990s, and it is uncertain whether populations still exist at Turtle Trail or adjacent to the various private properties (Jennings 2004). Trapping efforts documented a decline from an estimated 300 individuals down to numbers in the single digits. In 2006, a population off Jungle Trail at Pelican Island NWR was discovered (Van Zant 2006). No beach mice were found during surveys in St. Lucie County and it is possible that this species is extirpated there. The SEBM no longer occurs at Jupiter Island, Palm Beach, Lake Worth, Hillsboro Inlet or Hollywood Beach (Service 1999).

The primary reason for the significant reduction in the range of the SEBM is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated SEBM habitat in the southern part of its range. This increased urbanization has also increased the recreational use of dunes, and harmed the vegetation essential for dune maintenance. Loss of dune vegetation results in widespread wind and water erosion and reduces the effectiveness of the dune to protect other beach mouse habitat. In addition to this increased urbanization, coastal erosion is responsible for the loss of the dune environment along the Atlantic coast, particularly during tropical storms and hurricanes. The extremely active 2004 hurricane season had a pronounced affect on Florida's Atlantic coast beaches and beach mouse habitat.

The encroachment of residential housing onto the Atlantic coast also increases the likelihood of predation and harassment by free-roaming cats and dogs. A healthy population of SEBM on the north side of Sebastian Inlet State Park in Brevard County was completely extirpated by 1972, presumably by free-roaming cats (Bard 2004). Urbanization of coastal habitat could also lead to potential competition of beach mice with house mice (*Mus musculus*) and introduced rats.

The distribution of the beach mouse is limited due to modification and destruction of its coastal habitats due mostly to developmental pressures. One additional Atlantic coast subspecies, the pallid beach mouse (*P. p. decoloratus*), was formerly reported from two sites in Volusia County, but extensive surveys provide substantial evidence that this subspecies is extinct (Humphrey and Barbour 1981).

The distribution of the AIBM has declined significantly, particularly in the northern part of its range. Historically, it was reported to occur from the vicinity of the Duval-St. Johns County line southward to Matanzas Inlet, St. Johns County, Florida (Humphrey and Frank 1992a). It currently occurs only on Anastasia Island, primarily at the north (ASP) and south (FMNM) ends of the island, although beach mice still occur at low densities in remnant dunes along the entire length of the island (Service 1993). The original distribution consisted of about 50 miles of beach; current populations occupy about 14 miles of beach with possibly only 3 miles supporting viable populations (Service 1993).

In 1992 to 1993, 55 mice (27 females and 28 males) were reintroduced to GMTNERR-Guana River portion of the Reserve (4.0 miles of undeveloped beach) in St. Johns County. In 1993, the population was estimated at 220 mice. Quarterly trapping has been conducted since the reintroduction and mice have not been captured since September 2006. This may be a result of habitat loss or alteration from storms and or habitat conditions.

The primary reason for the significant reduction in the range of the AIBM is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated AIBM habitat in the northern two-thirds of its range. This increased urbanization has also increased the recreational use of dunes, and harmed the vegetation essential for dune maintenance. Loss of dune vegetation results in widespread wind and water erosion and reduces the effectiveness of the dune to protect other beach mouse habitat. In addition to this increased urbanization, coastal erosion is responsible for the loss of the dune environment along the Atlantic coast, particularly during tropical storms and hurricanes. The extremely active 2004 hurricane season had a severe effect on Florida's Atlantic coast beaches and beach mouse habitat.

The encroachment of residential housing onto the Atlantic coast also increases the likelihood of predation by free-roaming cats and dogs. ASP has successfully reduced feral cat populations at the recreation area and has seen a benefit to the beach mice. Urbanization of coastal habitat could also lead to potential competition of beach mice with house mice and introduced rats.

Gulf Coast Beach Mice

PKBM populations have existed since the late 1970s as isolated populations along its historical range (16.9 miles). The effects of Hurricane Frederic (1979) coupled with increased habitat fragmentation due to human development led to the extirpation of all but one population of PKBM. The less than 30 individuals at Gulf State Park (at the westernmost end of Perdido Key) were once the only known existing population of PKBM (Holler *et al*. 1989). Beach mice from this site were used to reestablish PKBM at Gulf Islands National Seashore (GINS) between 1986 and 1988 (Holler *et al.* 1989). Then in 1999 the population at Gulf State Park was considered extirpated (Moyers *et al.* 1999). In 2000, 10 PKBM (five pairs) was relocated from GINS to PKSP. In February of 2001, this relocation was supplemented with an additional 32 PKBM (16 pairs). The PKBM were released on both north and south sides of SR 292 in suitable habitat. Two years of quarterly survey trapping indicated that the relocations of PKBM to PKSP were successful and this was considered an established population (Lynn and Kovatch 2004). PKBM were also trapped on private land between GINS and PKSP in 2004, increasing documentation of current occurrences of the mouse (Lynn 2004a). Based on the similarity of habitat between these areas and the rest of Perdido Key, as well as the continuity of the habitat, the mouse is believed to inhabit other private properties where suitable habitat exists north and south of SR 292. The PKBM is considered to occur on 42 percent of Perdido Key (1,227 acres of 2,949 acres) (**Table 14**).

Table 14. Perdido Key beach mouse habitat on Perdido Key in Florida and Alabama.

Area	Total in AL & FL		Total in Florida		Total in Alabama	
	Acres	Percent	Acres	Percent	Acres	Percent
Perdido Key	2,949	100	2,615	89	334	11
PKBM habitat	**1,292**	100	**1,146**	**88**	148	12
Private lands	1,440	49	1,278	43	162	5
PKBM habitat	**302**	**23**	**270**	**24**	33	3
Public lands	1,509	51	1,337 GINS 1,052 PKSP 285	45	172 GSP 172	6
PKBM habitat	990	76	876 GINS 638 PKSP 238	67	114 GSP 114	9

[1] Data calculated by Service's Panama City, Florida using 2004 Digital Orthophoto Quarter-Quadrangle (DOQQ) aerial photography, 2005 parcel data from Baldwin County, Florida and 2005 parcel data from Escambia County, Florida and revised June 2006.

The listing of PKBM was based on data collected in 1983-84, and at that time the mouse was recovering from the effects of Hurricane Frederick in 1979. Following Hurricane Frederic estimated population numbers based on trapping were 13 PKBM found at one location (Gulf State Park). Just prior to listing, only one PKBM was captured in trapping surveys, this again being at Gulf State Park. Since that time, numbers have fluctuated dramatically based on hurricanes and/or translocation efforts, but were at their highest estimate ever documented just prior to Hurricane Ivan in 2004 at between 500-800 individuals. This was a result of significant partnership efforts and included translocation and habitat restoration on public lands. Even with the destructive hurricanes in 2004 and 2005, current numbers of PKBM, while low (no population estimates are available), are greater than one mouse and mice have been confirmed from two areas (PKSP and GINS). Survey efforts (tracking and trapping) have also been sporadic and inconsistent; therefore, it is difficult to establish long term trend information at this time.

CBM subpopulations currently persist along approximately 15 miles of Gulf of Mexico shoreline consisting of four isolated areas along 11 miles of beachfront within its former range. Another 5 miles outside of the CBM's known historical range has been recently colonized (Lynn, 2000a, 2003a). In the 1950s, the CBM was widespread and abundant at that time according to Bowen (1968). By 1979, Humphrey and Barbour (1981) reported only 40 percent of the original habitat remained undeveloped in noncontiguous areas. They also documented that the CBM had been extirpated from seven of its nine historical localities being restricted to the Topsail Hill area in

Walton County and Shell Island in Bay County. In 1985 when the CBM became federally protected, CBM were still only known from the Topsail Hill area and Shell Island, an area consisting of about 10 miles of coastline (50 *FR* 23872). In 1989, a cooperative interagency effort reintroduced CBM onto the central and west units of Grayton Beach State Park increasing the occupied coastline by another mile (Holler *et al*. 1989). In 1999, with the closing of East Pass and Shell Island connecting to West Crooked Island, CBM increased their range by approximately four miles (Lynn 2000b). CBM are now known to occupy approximately 15 miles of Gulf of Mexico beachfront; 12 of the 15 miles are publicly owned lands.

There are four subpopulations of CBM that exist: 1) Topsail Hill Preserve State Park (and adjacent eastern and western private lands), 2) Shell Island (includes St. Andrew State Park mainland and Shell Island with private inholdings and Tyndall AFB), 3) Grayton Beach (and adjacent eastern private lands), and 4) West Crooked Island. Approximately 96 percent of the lands known to be occupied by CBM are public lands. Translocations to establish a fifth subpopulation of CBM occurred in March of 2003 and 2005. CBM from Topsail Hill Preserve State Park were moved to private lands at Camp Creek/Water Sound in Walton County, Florida (Lynn 2003a, Service 2005a, 2005b, 2005c, 2005d).

Topsail Hill Preserve State Park consists of 1,637 acres of which 262 acres provide CBM habitat; the majority being occupied by CBM. The Florida Park Service prepared a Unit Management Plan for the Preserve that explicitly plans for conservation and protection of CBM habitats (FDEP 2007). Private lands on the east side consist of approximately 9.63 acres. Of that, 7 acres consist of the development known as the Stallworth Preserve. The Service issued an ITP for CBM associated with the Stallworth Preserve HCP in 1995; an amendment to the permit was issued in 1999. The remaining 2.63 acres has been purchased by Walton County with a grant from the Service. Private lands on the west side of the Preserve consist of 24 acres and include Four-Mile Village, a low density single family development, and the Coffeen Nature Preserve managed by the Sierra Club.

Shell Island consists of lands within the St. Andrew State Park, Tyndall AFB, and private lands. The Unit Management Plan for the State Park was completed in 1999. The plan identifies the need for protection and management of the CBM. Tyndall AFB manages their portion of Shell Island under the installation’s Integrated Natural Resources Management Plan. The Service has joined with the State Park and Tyndall AFB since 1995 by providing funding to protect and restore CBM habitats on Shell Island.

The St. Andrew State Park mainland consists of 1,260 acres of which 123 acres are beach mouse habitat. Several tracking efforts looking for signs of CBM on the mainland were made between 1995 and 1998; no evidence was found that indicated the presence of the beach mouse (Moyers 1996, Moyers *et al.* 1999). However, live-trapping to document the absence of the mouse has not been conducted. Reintroduction of this area is considered an action to support recovery of CBM.

The Grayton Beach subpopulation consists of two units in Grayton Beach State Park. The Park is divided into a central and western unit and is currently connected by a narrow band of primary dunes. Total acreage of the Park is 2,236 acres with 153 acres providing suitable CBM habitat. The Unit Management Plan for the Park identified the protection of the CBM as an important component. The Park has requested and received funds from the Service to implement CBM habitat restoration and protection. Portions of private lands (WaterColor and Seaside developments) on the east side of the central unit are occupied by CBM or provide suitable habitat.

West Crooked Island consists of 1,558 acres of which 730 acres provide CBM habitat and remains occupied by CBM (Lynn 2004b). The West Crooked Island subpopulation resulted from its connection to Shell Island in 1998-1999. The construction of the St. Andrew Pass navigation inlet in the early 1930s severed Shell Island from the mainland on its western end. Since then, the original pass, East Pass (or Old Pass) began to close. After passage of Hurricane Opal in 1995, East Pass temporarily closed and reopened; however, after passage of hurricanes Earl and Georges in 1998, the pass closed (Coastal Tech 1999, Middlemas 1999). CBM dispersed onto West Crooked Island from Shell Island colonizing most of the island within two years (Lynn 2004b). East Pass was reopened as a joint venture between Tyndall AFB and Bay County in December of 2001 but has since closed again.

SABM is now known to consist of two subpopulations, East Crooked Island and St. Joseph Peninsula State Park. The majority of the East Crooked Island subpopulation is located on Tyndall AFB and the other on the St. Joseph Peninsula State Park. Other important public lands for the conservation of the mouse would include Eglin Air Force Base lands at Cape San Blas and Billy Joe Rish Park. Private lands adjacent to Tyndall AFB and the State Park are either known to be occupied by SABM or contain habitat. Trapping by St Joe/Arvida on about 111 acres of SABM habitat at East Crooked Island was conducted in 2000, 2001, and 2003. The trapping confirmed existence of SABM on the property (Moyers and Shea 2002). However, trapping their property in St. Joseph Beach did not result in capture of any beach mice (Moyers and Shea 2002). Although SABM is thought to continue to occupy habitat south of St. Joseph Peninsula State Park, only tracking has been conducted to confirm its presence on private lands since the late 1990s. Private lands adjacent to public lands are available for population dispersal and food source during periods of high population and after severe weather events. However, subpopulations on large tracts of private land within the historical range of the subspecies are needed for conservation of the SABM.

Land development has been primarily responsible for the permanent loss of SABM habitat along its approximately 40-mile long historical range. In addition, construction of U.S. highway 98 accelerated the habitat loss from associated development. By the mid 1990's about 12 linear miles were known to be occupied (Gore 1994, 1995), indicating a 68 percent reduction in it historical distribution (63 *FR* 70053). An effort to re-establish the SABM back into its historical range was initiated around the time of listing (Moyers *et al.* 1999); however, the range reduction described above did not take this into account since the success of the reintroduction was not known at the time (63 *FR* 70053). Similar analyses have not been conducted since.

Our best documentation of the species' decline can be seen from trapping or tracking surveys conducted at various times throughout its range. By the mid to late 1980's concerns were raised when trapping efforts failed to result in captures at West Crooked Island (Gore 1987). By 1990 the SABM appeared to only inhabit a small portion (approximately 11 linear miles) of its original range: west end of East Crooked Island and within St. Joseph Peninsula State Park (Gore 1990). SABM's apparent decline continued into the mid-1990's when in 1994, the population on East Crooked Island was "presumed to be extinct" (Wooten and Holler 1999), leaving only one known population on St. Joseph Peninsula (Moyers *et al.* 1999). Subsequent reintroduction efforts in 1997-1998 appeared to have re-established the population on East Crooked Island (Moyers *et al.* 1999).

Recovery Criteria

The Recovery Plan for the SEBM identifies the primary recovery objectives for the subspecies (Service 1993). The SEBM can be considered for delisting if 10 viable, self-sustaining populations can be established throughout a significant portion of its historical range. More specifically, delisting can be considered if the following conditions are met:

1. Viable populations are maintained on the five public land areas where the subspecies currently occurs. Each population should not fluctuate below an effective breeding size of 500 individuals;

2. Five additional viable populations are established throughout the historical range of the subspecies; and

3. These populations should be monitored for at least five years.

The Recovery Plan for the AIBM identifies the primary recovery objectives for the subspecies (Service 1993). The AIBM can be considered for reclassification from endangered to threatened status if five viable, self-sustaining populations can be established. Because the majority of this subspecies' historical range has been permanently destroyed, it is not likely that it can be fully recovered or delisted. For the AIBM to be considered for downlisting to threatened, it is required that those populations at the northern and southern end of Anastasia Island continue to be viable. Each population should support a breeding population of 500 individuals. Two additional viable populations shall be established within the mainland portion of the historical range. All of these populations should be monitored for five years.

The Recovery Plan for the PKBM, CBM, and ABM identifies the primary recovery objectives to be the stabilization of present populations by preventing further habitat deterioration, and the reestablishment of populations in areas where they were extirpated (Service 1987). For each of the subspecies to be considered for downlisting to threatened, it is required that there be a minimum of at least three distinct self-sustaining populations in designated critical habitat with at least 50 percent of the critical habitat being protected and occupied by beach mice (Service 1987).

While this is the currently approved Recovery Plan for the three beach mouse subspecies, studies and research since the Recovery Plan publication provided additional information concerning recovery needs for the subspecies. Protection and enhancement of existing populations and their habitat, plus reestablishment of populations in suitable areas within their historical ranges, are necessary for the subspecies survival and recovery. Core beach mouse populations remain isolated and are vulnerable to natural and anthropogenic factors that may further reduce or degrade habitat and/or directly reduce beach mouse population sizes. Maximizing the number of independent populations is critical to species survival. Protection of a single, isolated, minimally viable population risks the extirpation or extinction of a species as a result of harsh environmental conditions, catastrophic events, or genetic deterioration over several generations (Kautz and Cox 2001). To reduce the risk of extinction through these processes, it is important to establish multiple protected populations across the landscape (Soulé and Simberloff 1986, Wiens 1996). Through the critical habitat designation process we are addressing this by designating five independent units for the subspecies spaced throughout its historical range, depending on the relative fragmentation, size, and health of habitat, as well as availability of areas with beach mouse PCEs.

The Service completed a five-year status review of the CBM and PKBM in August 2007 (Service 2007a, 2007b). For both subspecies the following was recommended: designate a beach mouse recovery coordinator; revise the recovery plan; accomplish viable populations, monitor habitat improvement, corridor persistence and hurricane response; conduct genetic studies and translocations as necessary; participate in education and outreach and complete an emergency response plan.

A Recovery Plan for the SABM was finalized in 2010 and the recovery objectives are to reestablish additional populations, threat minimization or removal, habitat protection and/or restoration, and outreach/education to the public. This recovery plan is up to date and includes current threats to SABM.

In accordance with the Act, Federal agencies (including the Service) consult with the Service for actions that may adversely affect beach mice and their designated habitat. In Florida, consultations have included military missions and operations, beach nourishment and other shoreline protection, and actions related to protection of coastal development (**Table 14**).

Table 15. Previous biological opinions within Florida that have been issued for projects that had adverse impact to the nesting beach mice.

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
GINS Dune Protection (PKBM)	2000	0.01 acre (CH)
Translocation to PKSP (PKBM)	2000	≤ 3 beach mice (source mice from CH; relocation to CH and non-CH in PKSP)
Supplemental translocation to PKSP (PKBM)	2003	≤ 3 beach mice (source mice from CH; relocation to CH and non-CH in PKSP)

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
FEMA Berm Orange Beach, AL (PKBM)	2003	0.14 acre non-CH
Service scientific collecting permit program (PKBM)	2004-2005	1 beach mouse per 400 trap-nights per area (partial CH)
Florencia Development (within Action Area) (PKBM)	2005	3.5 acres (non-CH)
PKSP Re-build (PKBM)	2005	1.99 acres (CH)
FEMA Berm Emergency consultation (within Action Area) (PKBM)	2005	Consultation not complete (non-CH)
GINS road rebuild (PKBM)	2005	1.7 acres (CH)
Magnolia West Development (within Action Area) (PKBM)	2006	5.2 acres (not CH at time of construction, presently CH)
Palazzo Development (PKBM)	2006	0.58 acre (not CH at time of construction, presently CH)
Searinity Development (PKBM)	2006	0.32 acre (not CH at time of construction, presently CH)
Retreat Development (PKBM)	2006	0.21 acre (not CH at time of construction, presently CH)
Bond Residence (PKBM)	2006	0.17 acre (CH)
Three-batch condo (Island Club, Marquesas, Lorelei) (PKBM)	2007	0.95 acres (CH)
Naval Air Station Pensacola Pensacola Pass navigation channel dredging (PKBM)	2007	6.3 miles (CH)
Paradise Island development (PKBM)	2007	0.91 acres (CH)
Calabria condo development (PKBM)	2008	0.33 acres (non-CH)
Escambia County beach nourishment (PKBM)	2008	0.16 acres (partial CH)
Seabreeze Condominiums (PKBM)	2009	0.39 acres
Spanish Key Parking Lot (PKBM)	2009	0.28 acres

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
Perdido Key Fire Station (PKBM)	2010	0.43 acres (CH)
Evans Residence	2012	0.21 acre
Stern Residence	2012	0.07 acre
Whalen Residence	2012	0.18 acre
Carbone Residence	2012	0.74 acre
Lost Key	2012	26.1 acre
Stallworth Preserve Development (CBM)	1995	7 acres (CH)
Navy Panama City Beach site 4 construction (CBM)	2000	0.01 acre (CH)
East Pass Re-opening (CBM)	2001	Temporary, indirect take (CH)
WaterColor and WaterSound Developments (CBM)	2000	7.6 acres (non-CH)
Service scientific collecting permit (CBM)	2004-2005	1 beach mouse per 400 trap-nights per area (partial CH)
FEMA beach berms post hurricane Ivan emergency consultation (CBM)	2005	Consultation not complete (partial CH)
Western Lake Reopening consultation (CBM)	2006	2.7 acres annually for 5 years (CH)
FEMA Statewide post-disaster berm programmatic BO (PKBM, CBM, SABM, AIBM, and SEBM)	2007	75 miles for eroded shoreline(partial CH)
Angelos Development (CBM)	2009	0.42 acres
Bonfire Beach (SABM)	2008	38 acres
Ovation (SABM)	2010	5.41 acres (CH)
Sea Colony Development (AIBM)	1998	0.7 acres (non-CH)
Anastasia State Park beach nourishment (AIBM)	2005	50 linear feet (non-CH)

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
Service scientific collecting permit program (AIBM)	2004-2005	1 beach mouse per 400 trap-nights per area (non-CH)
Rodent Control Program on CCAFS (SEBM)	2002	50 beach mice
Cape Canaveral Air Force borrow source (SEBM)	2007	300 linear feet (non-CH)
Service scientific collecting permit program (SEBM)	2004-2005	1 beach mouse per 400 trap-nights per area (non-CH)
CCAFS Routine Maintenance Programmatic (SEBM)	2008	Temporary loss of habitat during trenching/digging for pipeline installation and repair, roadside mowing, soil remediation, pole placement, wells, soil boring, lines of sight, scrub restoration

Common Threats to Beach Mice in Florida

Habitat Loss or Degradation

Coastal dune ecosystems are continually responding to inlets, tides, waves, erosion and deposition, longshore sediment transport and depletion, and fluctuations in sea level. The location and shape of barrier island beaches perpetually adjusts to these physical forces. Winds move sediment across the dry beach forming dunes and the island interior landscape. The natural communities contain plants and animals that are subject to shoreline erosion and deposition, salt spray, wind, drought conditions, and sandy soils. Vegetative communities include foredunes, primary and secondary dunes, interdunal swales, sand pine scrub, and maritime forests. During storm events, overwash is common and may breach the island at dune gaps or other weak spots, depositing sediments on the interior and backsides of islands, increasing island elevation and accreting the sound shoreline. Breaches may result in new inlets through the island.

The quality of the dune habitat (primary, secondary, and scrub) is an important factor in maintaining and facilitating beach mouse recovery. Habitat manipulation is an old and widely used tool in wildlife management. It is especially useful in improving habitat suitability to increase local populations of a species. For beach mice, improving habitat can enhance the abundance and diversity of food resources, increase the chances of meeting a mate, and reduce competition for food and burrow sites.

Long term trapping data has shown that beach mouse densities are cyclic and fluctuate by order of magnitude on a seasonal and annual basis. These fluctuations can be a result of reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Blair 1951, Bowen 1968, Smith 1971, Hill 1989, Rave and Holler 1992, Swilling *et al.* 1998, Swilling

2000, Sneckenberger 2001). Without suitable habitat sufficient in size to support the natural cyclic nature of beach mouse populations, subspecies are at risk from local extirpation and extinction, and may not attain the densities necessary to persist through storm events and seasonal fluctuations of resources.

Habitat loss and fragmentation associated with residential and commercial real estate development is the primary threat contributing to the endangered status of beach mice (Holler 1992a, 1992b, Humphrey and Frank 1992a). Coastal commercial and residential development has fragmented all the subspecies into disjunct populations. Isolation of habitats by imposing barriers to species movement is an effect of fragmentation that equates to reduction in total habitat (Noss and Csuti 1997). Furthermore, isolation of small populations of beach mice reduces or precludes gene flow between populations and can result in the loss of genetic diversity. Demographic factors such as predation (especially by cats), diseases, and competition with house mice, are intensified in small, isolated populations, which may be rapidly extirpated by these pressures. Especially when coupled with events such as storms, reduced food availability, and/or reduced reproductive success, isolated populations may experience severe declines or extirpation (Caughley and Gunn 1996). The influence these factors have on populations or individuals is largely dependent on the degree of isolation.

The conservation of multiple large, contiguous tracts of habitat is essential to the persistence of beach mice. At present, large parcels of land exist mainly on public lands. Protection, management, and recovery of beach mice on public areas have been complicated by increased recreational use as public lands are rapidly becoming the only natural areas left on the coast. Public lands and their staff are now under pressure to manage for both the recovery of endangered species and recreational use. Where protection of large contiguous tracts of beach mouse habitat along the coast is not possible, establishing multiple independent populations is the best defense against local and complete extinctions due to storms and other stochastic events (Danielson 2005). Protecting multiple populations increases the chance that at least one population within the range of a subspecies will survive episodic storm events and persist while vegetation and dune structure recover.

Habitat connectivity also becomes essential where mice occupy fragmented areas lacking one or more habitat types. If scrub habitat is lacking from a particular tract, adjacent or connected tracts with scrub habitat are necessary for food and burrow sites when resources are scarce in the frontal dunes, and are essential to beach mouse populations during and immediately after hurricanes. Trapping data suggests that beach mice occupying the scrub following hurricanes recolonize the foredune once vegetation and some dune structure have recovered (Swilling *et al*. 1998, Sneckenberger 2001). Similarly, when frontal dune habitat is lacking from a tract and a functional pathway to frontal dune habitat does not exist, beach mice may not be able to attain the resources necessary to expand the population and reach the densities necessary to persist through the harsh summer season or the next storm. Functional pathways may allow for natural behavior such as dispersal and exploratory movements, as well as gene flow to maintain genetic variability of the population within fragmented or isolated areas. To that end, contiguous tracts or functionally connected patches of suitable habitat are essential to the long-term conservation of beach mice.

A lack of suitable burrow sites may be a consequence of habitat degradation. Beach mice use burrows to avoid predators, protect young, store food, and serve as refugia between foraging bouts and during periods of rest. Beach mice have been shown to select burrow sites based on a suite of abiotic and biotic factors. A limitation in one or more factors may result in a shortage of suitable sites and the availability of potential burrow sites in each habitat may vary seasonally. Beach mice tend to construct burrows in areas with greater plant cover, less soil compaction, steep slopes, and higher elevations above sea level (Lynn 2000a, Sneckenberger 2001). These factors are likely important in minimizing energy costs of burrow construction and maintenance while maximizing the benefits of burrow use by making a safe and physiologically efficient refuge. Similar to food resources, this fluctuation in availability of burrow sites suggests that a combination of primary, secondary, and scrub dune habitat is essential to beach mice at the individual level.

Predation

Beach mice have a number of natural predators including coachwhip (*Masticophis flagellum*) corn snakes (*Elaphe guttata guttata*), pygmy rattlesnake (*Sistrurus miliarius*), eastern diamondback rattlesnake (*Crotalus adamanteus*), short-eared owl (*Asio flammeus*), great-horned owl (*Bubo virginianus*), great blue heron (*Ardea herodias*), northern harrier (*Circus cyaneus*), red fox, gray fox, skunk (*Mephitis mephitis*), weasel (*Shallela frenata*), and raccoon (Blair 1951, Bowen 1968, Holler 1992a, Novak 1997, Moyers *et al.* 1999, Van Zant and Wooten 2003). Predation of beach mouse populations that have sufficient recruitment and habitat availability is natural and not a concern. However, predation pressure from natural and non-native predators may result in the extirpation of small, local populations of beach mice.

Free-roaming cats are believed to have a devastating effect on beach mouse persistence (Bowen 1968, Linzey 1978) and are considered to be the main cause of the loss of at least one population of beach mice (Holliman 1983). Cat tracks have been observed in areas of low trapping success for beach mice (Moyers *et al.* 1999). The PHVA for the ABM indicated that if each population had as few as one cat, which ate one mouse a day, rapid extinction would occur in over 99 percent of all iterations (Traylor-Holzer 2005).

In response to increasing depredation of sea turtle nests by coyote, fox, hogs, and raccoon, multi-agency cooperative effort have been initiated and are ongoing throughout Florida, in particular on public lands. These programs also benefit beach mice.

Hurricanes

Hurricanes can severely affect beach mice and their habitat, as tidal surge and wave action overwash habitat, leaving a flat sand surface denuded of vegetation; sand is deposited inland, completely or partially covering vegetation; blowouts between the ocean and bays and lagoons leave patchy landscapes of bare sand; primary dunes are sheared or eroded; and habitat is completely breached, creating channels from the ocean to bays and lagoons. Other effects include direct mortality of individuals, relocation/dispersal, and subsequent effects of habitat alterations (that impact such factors as forage abundance/production and substrate elevation). Habitat impacts can be widespread, encompassing the range of the subspecies.

Until frontal dune topography and vegetation redevelop, scrub habitat maintains beach mice populations and provides the majority of food resources and potential burrow sites (Lynn 2000a, Sneckenberger 2001). While storms temporarily reduce population densities (often severely), this disturbance regime maintains open habitat and retards plant succession, yielding a habitat more suitable for beach mice than one lacking disturbance. The low-nutrient soil of the coastal dune ecosystem often receives a pulse of nutrients from the deposition of vegetative debris along the coastline (Lomascolo and Aide 2001). Therefore, as the primary and secondary dunes recover, beach mice recolonize this habitat readily as food plants develop to take advantage of the newly available nutrients. Recovery times vary depending upon factors such as hurricane characteristics (*i.e.*, severity, amount of associated rain, directional movement of the storm eye, storm speed), successional stage of habitat prior to hurricane, elevation, and restorative actions post hurricane. Depending on these factors, recovery of habitat may take from one to over 40 years.

The impact of hurricanes on plant communities temporarily affects food availability, and hence can limit population densities in impacted habitats soon after storms. Observations indicate that Hurricane Opal (a Category 3 storm in November 1995) caused a decrease in one population of ABM by 30 percent (Swilling *et al.* 1998). However, population densities in scrub habitat typically increased following hurricanes (Swilling *et al.* 1998). Sneckenberger (2001) also found atypical numbers of ABM in scrub following a hurricane. Five months post-storm, “densities (individuals/km) were up to 7.5 times greater in scrub areas than in frontal dune grids.” Impacts of the storm may have been apparent as long as 17 months after the storm when scrub densities remained triple those of frontal dunes (Sneckenberger 2001). Moyers *et al.* (1999) found similar results for CBM at Grayton Beach State Park. When frontal and primary dunes sustained extensive damage during Hurricane Opal in 1995, beach mice were captured behind what remained of primary dune habitat. By 1998, however, primary dunes and the immediate habitat inland appeared to support higher numbers of beach mice.

In addition to the overall change in post Hurricane Opal distribution of ABM, Swilling *et al.* (1998) found the mean percent of newly marked individuals increased from 14 percent for the three trapping periods before the storm to an average of 26.7 percent for the same interval post hurricane. The average for the three trapping periods immediately following was even higher, at 42.7 percent of the individuals captured. Swilling *et al.* (1998) concluded that this increased presence of new individuals reflected increased reproduction. A statistical analysis of the data indicated that the number of females exhibiting signs of reproduction was significantly higher than normal (18.9 percent higher). Moyers *et al.* (1999) also found similar results at Topsail Hill Preserve State Park. Four to five months following Hurricane Opal, all female CBM captured were pregnant or lactating. Trapping six months after the hurricane, Moyers *et al.* (1999) noted that 51.5 percent of captured CBM were new unmarked beach mice.

Although hurricanes can significantly alter beach mouse habitat and population densities in certain habitats, some physical effects may benefit the subspecies. Hurricanes are probably responsible for maintaining coastal dune habitat upon which beach mice depend through repeated cycles of destruction, alteration, and recovery of dune habitat. Holler *et al.* (1999) suggested that hurricanes could function to break up population subgroups and force population mixing. The resultant breeding between members of formerly isolated subgroups increases genetic heterogeneity and could decrease the probability of genetic drift and bottlenecks.

Beachfront Lighting

Artificial lighting increases the risk of predation and influences beach mouse foraging patterns and natural movements as it increases their perceived risk of predation. Foraging activities and other natural behaviors are influenced by many factors. Artificial lighting alters behavior patterns causing beach mice to avoid otherwise suitable habitat and decreases the amount of time they are active (Bird *et al.* 2004).

The presence of vegetative cover reduces predation risk and perceived predation risk of foraging beach mice, and allows for normal movements, activity, and foraging patterns. Foraging in sites with vegetative cover is greater and more efficient than in sites without cover (Bird 2002). Beach mice have also been found to select habitat for increased percent cover of vegetation, and decreased distance between vegetated patches (Smith 2003).

Genetic variability

Selander *et al.* (1971) conducted an electrophoretic study on 30 populations of *P. polionotus*, including populations of beach mouse subspecies. Based on 30 allozyme loci, they estimated that the level of allozyme variation found in beach mouse populations was at least 40 percent lower than the level of variation in nearby inland populations. This work indicates that beach mouse populations already have lower genetic variability before inbreeding, bottleneck events, or founder effects that may occur in a reintroduced population. Lower levels of heterozygosity has been linked to less efficient feeding, fewer demonstrations of social dominance and exploratory behavior, and smaller body size (Smith *et al.* 1975, Garten 1976, Teska *et al.* 1990). Research focused on inbreeding depression in old-field mice (including one beach mouse subspecies), determined that the effects of inbreeding negatively influenced factors such as litter size, number of litters, and juvenile survivorship (Lacy *et al.* 1995).

In 1995, the Service contracted with Auburn to conduct genetic analysis of: 1) post-reestablishment gene structure in PKBM and CBM; 2) microgeographic patterning and its relevance to alternate management approaches for ABM on the Bon Secour NWR; and 3) if feasible, the historical relationship of SABM from Crooked Island relative to CBM from Shell Island and SABM from St. Joseph Peninsula.

Results of the work for CBM found: 1) founder effects were observed in the Grayton Beach State Park population (fixation of alleles common to the donor population and allele frequency shifts); 2) incongruity in number and size of several alleles was observed between Grayton Beach State Park and Shell Island; 3) overall genetic divergence between the donor and reestablished population was moderate; 4) genetic differences between Topsail Hill Preserve State Park and other CBM sites were higher than expected given the spatial proximity; 5) Topsail Hill Preserve State Park appears to be a reservoir for unique variation within the remaining populations of CBM; and 6) the overall relatedness estimated for Grayton Beach State Park suggested that any mating would involve close relatives (Wooten and Holler 1999).

Wooten and Holler (1999) recommended strategies for management of CBM based on genetics. Management of the Grayton Beach State Park population for genetic characteristics appears to be needed; however, additional genetic analyses will be needed. Relocation of CBM to Grayton Beach State Park from Shell Island should be continued.

Results of the work for PKBM found that: 1) founder effect (from Florida Point to GINS) did impact the GINS-Perdido Key Area subpopulation. Loss of rare alleles and allele frequency shifts were noted; 2) a low to moderate level of overall genetic divergence was observed; 3) data suggests that some effects of genetic drift were mediated by continued transfer of individuals; 4) levels of heterozygosity were unexpected given recent history; 5) average levels of relatedness among individuals is high which may portend future inbreeding related problems (however, no evidence of existing inbreeding was observed in the data); and 6) the overall level of microsatellite variation retained in the GINS-Perdido Key Area subpopulation was higher than anticipated. Wooten and Holler (1999) recommended management of PKBM based on genetics by: 1) preserving the natural population to the maximum extent possible since the loss of the Florida Point subpopulation resulted in the permanent loss of alleles; 2) using the GINS-Perdido Key Area subpopulation as a donor for reestablishment of other populations because of the retention of a substantial amount of genetic variation; and 3) reestablishment plans should include transfers between donor and reestablished subpopulations. In addition, translocations should be accomplished in pairs.

Analysis of genetic work focused on SABM indicated that there are two possible genetic histories for Crooked Island beach mice: 1) the last known beach mice from Crooked Island were derived from CBM or 2) the last known beach mouse from Crooked Island were unique from both CBM found on Shell Island or SABM found on St. Joseph peninsula (Van Zant 2003).

Climate Change (refer to page 49)

Analysis of the Species/Critical Habitat Likely to be Affected

Beach mice are currently federally protected because of their low numbers caused by habitat loss with continuing threats to their habitat (including critical habitat for CBM, PKBM, and SABM) and resulting affects from storm and post-storm events. The primary reason for the significant reduction in their range is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated beach mouse habitat. Coastal urbanization has also increased the recreational use of beachfront areas. Dune habitat maintenance is an important component of beach mouse conservation. Providing a healthy and continuous dune system assures mouse population stability. Integral to this is keeping visitors to the beach off the dunes and replanting as necessary when impacts occur or are observed. The extremely active 2004 and 2005 hurricane seasons also had a severe effect on Florida's beaches and beach mouse habitat.

Critical habitat for three (PKBM, CBM, and SABM) of the five subspecies of beach mice has been designated and will be discussed. No critical habitat has been designated for the other two subspecies (SEBM and AIBM). Therefore, the proposed action would have no effect on designated critical habitat for these two subspecies because none is designated.

Generally, sand placement activities or dredged navigation channel material is not placed on existing beach mouse habitat consisting of vegetated dunes. Typical effects from these activities to beach mice and their habitats consist of the staging and storage of equipment, work vehicles, or materials and beach access for sand placement activities or dredged material placement. These effects may result in the permanent and temporary loss, degradation, or fragmentation of beach mouse habitat and changes in essential life history behaviors (dispersal and movement, foraging, seeking mates, breeding, and care of young). Beach mice spend their entire lives within the dune ecosystem and are nocturnal. Sand placement projects may occur at anytime of the year depending on their location and are usually conducted on a 24/7 schedule. The quality of the placed sand could affect the suitability of the beach and dunes to support beach mouse burrow construction and food sources. The effect of the activities covered under the consultation with incorporation of the proposed conservation measures on beach mice overall survival and recovery are considered in this SPBO.

ENVIRONMENTAL BASELINE

Status of the species/Critical Habitat within the Action Area (all subspecies of beach mice)

The action area encompasses the entire range of five subspecies of beach mice, and designated critical habitats of three beach mouse subspecies. Therefore, the previous discussion in "Status of the Species" applies here. The known distribution of the five subspecies of beach mice is a result of cursory surveys and intermittent trapping involving different projects. There has not been a systematic trapping study done in order to determine the status of each subspecies throughout their ranges.

Factors affecting the species environment within the action area

Coastal development

Beach mice were listed as endangered and threatened species primarily because of the fragmentation, adverse alteration, and loss of habitat due to coastal development. The threat of development-related habitat loss continues to increase. Other contributing factors include low population numbers, habitat loss from a variety of reasons (including hurricanes), predation or competition by animals related to human development (cats and house mice), and the existing strength or lack of regulations regarding coastal development.

Hurricanes

Hurricanes were probably responsible for maintaining coastal beach habitat upon which beach mice depend through repeated cycles of destruction, alteration, and recovery of dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain and can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes can impact beach mice either directly (e.g., drowning) or indirectly (e.g., loss of habitat). Depending on their frequency, storms can affect beach mice on either a short-term basis (e.g., temporary loss of habitat) or long term (e.g., loss of food, which in turn may lead to increased juvenile mortality, resulting in a depressed breeding season). How hurricanes affect beach mice also depends on the characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining habitat, frequent or successive severe weather events could compromise the ability of certain populations of beach mice to survive and recover. Beach mice evolved under natural coastal environmental events such as hurricanes. The extensive amount of predevelopment coastal beach and dune habitat allowed beach mice to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to beach mice survival and recovery. On developed beaches, typically little space remains for sandy beaches to become re-established after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their prestorm locations can result in a major loss of habitat for beach mice.

The 2004 hurricane season was the most active storm season in Florida since weather records began in 1851. Hurricanes Charley, Frances, Ivan, and Jeanne, along with Tropical Storm Bonnie, damaged the beach and dune system, upland structures and properties, and infrastructure in the majority of Florida's coastal counties. The cumulative impact of these storms exacerbated erosion conditions throughout the state.

The 2005 hurricane season was a record-breaking season with 27 named storms. Hurricanes Dennis, Katrina, Ophelia, Rita, and Wilma, and Tropical Storms Arlene and Tammy impacted Florida. The cumulative impact of these storms exacerbated erosion conditions in south and northwest Florida.

Beachfront Lighting

Artificial lighting along developed areas of both coastlines continues to cause increase susceptibility to predators, altered foraging and breeding habits which impact beach mouse recovery. While a majority of coastal local governments and counties have adopted beachfront lighting ordinances compliance and enforcement is lacking in some areas. Further, the lighting in areas outside the beachfront ordinance coverage areas continues to be unregulated resulting in urban glow. Even the darker areas of conservation managed lands are subject to surrounding sky glow.

Predation

A major continuing threat to beach mice is predation by free-roaming cats and other nonnative species. The domestic cat is not native to North America and is considered a separate species from its wild ancestral species, *Felis silvestris*. Cats are hunters, retaining this behavior from their ancestors. However, wildlife in the western Hemisphere did not evolve in the presence of a small, abundant predator like the domestic cat, and thus did not develop defenses against them. Cats were introduced to North America a few hundred years ago.

Free-roaming pets prey on small mammals, birds, and other native wildlife. In the U.S., on a nationwide basis, cats kill over a billion small mammals and hundreds of millions of birds each year. Worldwide, cats are second only to habitat destruction in contributing to the extinction of birds. Cats have been documented to take beach mice, sea turtle hatchlings, shorebirds, and migratory birds. A significant issue in the recovery of beach mice is predation by free-ranging pet and feral cats. Beach mice have a number of natural predators including snakes, owls, herons, and raccoons. Predation is part of the natural world. However, predation pressure from both natural and nonnative predators may result in the extirpation of small, local populations of beach mice in a very short time (Bowen 1968, Linzey 1978).

Climate Change

Based on the present level of available information concerning the effects of global climate change on the status of beach mice and its designated critical habitat, the Service acknowledges the potential for changes to occur in the action area, but presently has no basis to evaluate if or how these changes are affecting beach mice or its designated critical habitat nor does our present knowledge allow the Service to project what the future effects from global climate change may be or the magnitude of these potential effects.

EFFECTS OF THE ACTION

Factors to be considered

Aspects of the sand placement and dredged material placement activities will occur within habitat that is used by beach mice year round. The activities include the storage of equipment, work vehicles, or materials and creation, expansion, or use of beach access points for sand placement activities or dredged material placement. The work, depending on the location, may be conducted any time of the year. Most effects would be expected to be temporary. These short-term and temporary impacts could include loss of foraging habitat, altered beach mouse movement and dispersal activities. Long-term and permanent impacts from the sand placement activities such as excavation of dune habitat and degradation could impact beach mice by fragmentation of their habitat including critical habitat for the PKBM, CBM, and SABM.

There are typically different "levels" of access sites needed for a project. The primary access is a "lay-down" yard, where pipe is delivered and stored, and storage trailers, and other equipment and materials are stored. These are typically big paved parking lots, so that the Corps's trucks can access the area to drop off and pick up equipment. There's typically a beach access at that point to get the pipe and equipment onto the beach and that access is usually at least 50-ft wide (pipe sections are typically 40 to 50 feet long). In NW Florida and Alabama, these yards have been approximately eight miles apart.

“Intermediate areas" are used at about the quarter points of the project length. These are used for the fuel tank, welding equipment, and other items or systems that get used a couple of times a day. These locations can vary from two to three miles apart. In addition, there are access points to allow project vehicles and trucks on and off the beach. Based on previous projects it would be expected to have single-vehicle entry points at one-half to one-mile intervals.

Protective, avoidance, and minimization measures have been incorporated into the project plan to avoid or minimize the potential impacts from the sand placement and dredged material placement activities. However, even with these measures, impacts to beach mice are expected to occur from some aspects of the project activities. The activities are expected to directly or indirectly adversely affect beach mice and/or their habitat including designated critical habitat for the PKBM, CBM, and SABM. The work may occur on public and/or private lands.

Proximity of Action: Some aspects of the sand placement and dredged material placement activities would occur directly in beach mouse habitat. The storage or staging of pipe and other equipment, and vehicles, use or creation of beach access points, and placement of pipe, nourishment or dredged material could occur in habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM. Beach mice spend their entire life cycle within the coastal dune system.

Distribution: The storage or staging of pipe and other equipment and vehicles and use of beach access points that could occur in habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM may vary depending on the individual project length and existing beach accesses and non-beach mouse habitat that can be used for storage and staging.

Timing: The timing of the activities would directly and indirectly impact beach mice and their habitat depending on the season. Beach mice reproduce year-round with more mice being produced in the late winter and early spring. Impacts could include but would not be limited to disrupting mice seeking mates, constructing nest burrows, foraging for food, caring for their young, and young mice leaving the nest burrow dispersing into new habitat.

Nature of the Effect: The effects of the activities may include the temporary loss of habitat including the loss of a few beach mice from excavation of habitat for beach access and reduction of beach mouse activity including feeding, reproduction, and movement from loss or alteration of habitat. Activities that decrease the amount or quality of dune habitat or movement could affect beach mice by reducing the amount of available habitat and fragmenting the habitat.

Duration: Time to complete the project construction may vary depending on the project length, weather, and other factors (equipment mobilization and break downs, availability of fuel, lawsuits, etc.). Project work could take as little as a month and as long as a one or two years. Beach mouse habitats would remain disturbed until the project is completed and the habitats are restored. Dune restoration could be complete from 6 to 12 months after the project has been completed. The short generation time of beach mice combined with the time frames provided in this document (projects from 1 month to 2 years, dune restoration 6 to 12 months following project completion) will impact multiple generations of beach mice. The time to complete a project and restore the habitat can be a complete loss of habitat availability and use for multiple generations of beach mice.

Disturbance frequency: Depending on the sand placement activity and dredging project frequency, this could result in impacts to beach mice and their habitats at any time during the year on a minimum cycle of every 2 years. Following initial sand placement, activities could occur every year depending on the project location and erosion events. The actual number of times the sand placement would occur is unknown. Following initial sand placement or dredge material placement, maintenance activities could occur every two to 10 years depending on the project location and situation (erosion, long shore sand transportation, upstream activities, and weather events). Thus, impacts related to the subject activities would be expected to occur no more often than every two to three years. However, while not anticipated, work could occur annually in response to emergency events. The actual number of times the nourishment and dredging material disposal activities is unknown but can be based on previous work.

Disturbance intensity and severity: Depending on the frequency needed to conduct the nourishment and dredged material work and the existence of staging areas and beach access points, effects to the recovery of beach mouse may vary. However, the action area encompasses entire range of each subspecies and the overall intensity of the disturbance is expected to be minimal. The severity is also likely to be slight as few if any mice would be lost and dune habitats can be restored quickly if protected from other impacts (pedestrians and vehicles).

The staging and storage of equipment and materials and beach access points could occur within habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM and could be adjacent to designated critical habitat for the PKBM, CBM, and SABM. Beach mice are permanent inhabitants of the coastal ecosystem conducting all their life cycles in this environment. While the current status of individual beach mouse subspecies is unknown, their general distribution is known.

Analysis for effects of the action

The action area consists of the Atlantic or Gulf beachfront including the wet and dry unvegetated beach, developing foredunes and interdunal swales, and areas that were formerly primary or secondary dunes. Sand placement or dredged material placement work would not occur on existing vegetated primary or secondary dunes. However, construction of or expansion of an existing beach access could be located through scrub, secondary, or primary dunes. Beach mice would generally be found inhabiting stable primary, secondary, and scrub dunes on a permanent basis with other habitats being used periodically on a daily or seasonal basis for feeding and movement. Some of these areas also include critical habitat.

Direct and Indirect Impacts

Direct impacts are effects of the action on the species occurring during project implementation and construction (sand placement or dredged material placement). Direct loss of individual beach mice may occur during the creation or expansion of beach access points when heavy equipment clears the habitat and packs the sand. In general the length of time between project maintenance work is expected to be sufficient for beach mouse habitat to be restored. Thus, it is not anticipated that the nourishment and dredged material placement activities would result in permanent beach mouse habitat destruction (including critical habitat). However, habitat for all the beach mouse subspecies and critical habitat for the PKBM, CBM, and SABM that provides food or cover may be temporarily destroyed or altered from the activities.

Indirect effects are a result of a proposed action that occur later in time and are reasonably certain to occur. The indirect effect of the sand placement and dredged material placement activities would be newly created or expanded existing beach access points that act as barriers to beach mouse movement for foraging, or population expansion or dispersal. Maintaining the connectivity among habitats is vital to persistence of beach mice recovery. Recovery actions needed to assure the connectivity include restoration and maintenance of the dune system following project completion.

For the Service to determine if the project impacts on designated critical habitat would be an adverse modification, the Service shall determine if the impact on the habitat appreciably diminishes the capability of the critical habitat to satisfy essential requirements of beach mice. The long-term maintenance of the beach mouse populations in the project areas could be compromised if the sand placement and dredged material placement activities occur too frequently resulting in a long-term barrier to mice movement. However, our evaluation indicates the impacts to critical habitat should be temporary in nature based on past history of nourishment projects. In addition, the area to be directly affected within the individual subspecies would be a small percentage of the overall critical habitat and would not be expected to reduce the carrying capacity of the recovery unit or appreciably diminish the ability of the PCE’s to provide for the essential functions of the critical habitat units.

Species’ response to a proposed action

This SPBO is based on effects that are anticipated to beach mice (all life stages) as a result of the temporary physical disturbance of beach mice habitat from beach nourishment or dredged material placement and associated activities. Some individual beach mice (all life stages) may be lost during the initial construction or expansion of beach accesses where heavy equipment destroys dune habitat and compacts the sand within the access corridor. Any mice that survive the initial construction may move outside of the disturbed area and construct burrows elsewhere in the vicinity. This will result in increased exposure to predation due to the removal of their burrows.

Following access construction, a bare gap of sand could form a barrier to limit beach mouse movement within the area altering regular movement patterns. The bare areas could not be used for foraging, breeding or sheltering. These impacts are expected to be limited to the construction phase of the project (one month to two years). As the life span of a beach mouse is estimated to be approximately nine months, the loss of individual mice or the temporary loss of habitat could affect several generations of beach mice, but because beach mice can reproduce rapidly with adequate resources, colonization or recolonization of the restored habitat would be expected.

Beach mice have evolved to adapt to catastrophic weather events. Additional factors such as surrounding development pressure and nonnative predators may affect the species' ability to recover from the loss of individuals. However, the temporary loss of the habitat itself is not expected to permanently impact the populations as all beach mouse habitat within the project areas not permanently destroyed would be restored or maintained as part of the conservation measures committed to by the Corps or the Applicant. The temporary nature of the impacts to dune habitats is not expected to alter the function and conservation role of the remaining beach mouse habitat including designated critical habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this SPBO. Future Federal actions that are unrelated to the proposed project are not considered in this opinion and require separate consultation pursuant to section 7 of the Act.

It is reasonably certain to expect that coastal development, human occupancy and recreational use along the Atlantic and Gulf coasts of Florida will increase in the future. Redevelopment along with new developments following the hurricane seasons of 2004 and 2005 are occurring as allowed by local zoning standards. It is unknown how much influence a nourished beach would contribute to the development and recreational use of the shoreline. Any projects that are within endangered or threatened species habitat will require section 7 consultation or section 10(a) (1)(B) permitting from the Service.

In recognizing the importance of coastal barrier islands along the Atlantic and Gulf coasts, Congress passed the Coastal Barrier Resources Act (CBRA) of 1982 and Coastal Barrier Improvement Act in 1991. The purpose of CBRA is "…to minimize the loss of human life, wasteful expenditure of Federal revenues, and the damage to fish, wildlife, and other natural resources associated with the coastal barriers along the Atlantic and Gulf coasts by restricting future Federal expenditures and financial assistance which have the effect of encouraging development of coastal barriers." Congress established the Coastal Barrier Resources System units that apply to the CBRA.

Escambia County is currently in the final permitting stages of a beach nourishment project for Perdido Key. The project would cover approximately 4 miles of beachfront along county and private lands, not including state and Federal lands. The Service completed an endangered species consultation for the project in 2008. The project construction is expected to begin in late 2009-2010. The beach nourishment project is likely to enhance beach mouse habitat by providing an additional buffer to the dune habitats from storm events.

The Pensacola Naval Air Station has proposed to dredge their navigation channel resulting in the need to place eight million cubic yards of dredged material that is beach compatible. Because of cost, Perdido Key is the closest area to receive the material. Receiving areas include the Perdido Key Gulf beachfront (in lieu of the County implementing their project described above), PKSP, and GINS, Escambia County. The project could result in the placement of dredged material on 16 miles of beachfront including private, county, state, and Federal lands. The Navy has received their permits to complete the project. The Service completed an endangered species consultation for the project in 2007. The full project is on hold due to funding. However, the Federal navigation channel in the lower portion of the project area is expected to be maintenance dredged in 2009-2010.

Gulf County is currently completing a beach restoration project on St. Joseph peninsula and St. Joseph Peninsula State Park. The project will cover approximately 7.5 miles of Gulf of Mexico beachfront. The Service completed an endangered species consultation for the project. The project was completed in 2008.

CONCLUSION

Sea Turtles

After reviewing the current status of the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles, the environmental baseline for the action area, the effects of the proposed activities, the "Conservation Measures," and the cumulative effects, it is the Service's biological opinion that work conducted under the Statewide Programmatic action, as proposed, is not likely to jeopardize the continued existence of the loggerhead, green, leatherback, hawksbill or Kemp's ridley sea turtles. Critical habitat has been designated for the NWAO DPS of the loggerhead sea turtle. **Table 4** has the list of the critical habitat units within the project area.

The conservation of the five loggerhead recovery units in the Northwest Atlantic is essential to the recovery of the loggerhead sea turtle. Each individual recovery unit is necessary to conserve genetic and demographic robustness, or other features necessary for long-term sustainability of the entire population. Thus, maintenance of viable nesting in each recovery unit contributes to the overall population. Three of the five loggerhead recovery units in the Northwest Atlantic occur within the action area, the PFRU, the DTRU, and the NGMRU. Sand placement is not expected to occur within the DTRU. The NGMRU averages about 1,000 nests per year. Northwest Florida accounts for 92 percent of this recovery unit in nest numbers (920 nests) and consists of approximately 234 miles of nesting shoreline. Of the available nesting habitat within the NGMRU, with most sand placement projects have a project life of five to seven years and channel maintenance activities occurring every two to three years, on average, sand placement impacts will occur on 8.8 miles of sea turtle nesting shoreline per year. This is based on the average linear feet of beach on which sand placement occurred during nonemergency years from 2001 to 2008.

The PFRU averages 64,513 nests per year. The entire recovery unit occurs within Florida and consists of approximately 595 miles of sandy shoreline (http://www.dep.state.fl.us/beaches/publications/pdf/fl_beach.pdf). Of the available nesting habitat within the PFRU, sand placement activities will occur on 18.9 miles of nesting shoreline per year during nonemergency years. This is based on the average linear feet of beach on which sand placement occurred during non-emergency years from 2001 to 2008.

Generally, green, leatherback, hawksbill, and Kemp's ridley nesting overlaps with or occurs within the beaches where loggerhead sea turtles nest on both the Atlantic and Gulf of Mexico beaches. Thus, for green, leatherback, hawksbill, and Kemp's ridley sea turtles, sand placement activities will affect an average of 27.7 miles of shoreline per year. This is based on the average linear feet of beach on which sand placement occurred during nonemergency years from 2001 to 2008.

For all species of sea turtles, post-hurricane sand placement activities occurred on approximately 205 miles of shoreline for the 2004-2005 period following the emergency events (declared disasters and Congressional Orders). These activities are within the approximately 1,400 miles of available sea turtle nesting habitat in the southeastern U.S.

Research has shown that the principal effect of sand placement on sea turtle reproduction is a reduction in nesting success, and this reduction is most often limited to the first year following project construction. Research has also shown that the impacts of a nourishment project on sea turtle nesting habitat are typically short-term because a nourished beach will be reworked by natural processes in subsequent years, and beach compaction and the frequency of escarpment formation will decline. Although a variety of factors, including some that cannot be controlled, can influence how a nourishment project will perform from an engineering perspective, measures can be implemented to minimize impacts to sea turtles.

Beach Mice

The PKBM, CBM, and SABM occur on both public and private lands throughout their historical ranges. Both the SEBM and the AIBM are located completely on county, state, or federally protected lands, except for a small area in St. Johns County in which the AIBM are found on private lands along the Florida coast.

After reviewing the current status of the species of the SEBM, AIBM, PKBM, CBM, and SABM, the environmental baseline for the action area, the effects of beach nourishment and dredged material placement and associated activities, the "Conservation Measures," and the cumulative effects, it is the Service's biological opinion that the Statewide Programmatic action for these projects, as proposed, is not likely to jeopardize the continued existence of any of the above subspecies of beach mice and is not likely to destroy or adversely modify designated critical habitat for the PKBM, CBM, or SABM.

As discussed in the Effects of the Action section of this SPBO, we would not expect the carrying capacity of beach mouse habitat within the action area to be reduced. Beach mouse habitat will continue to provide for the biological needs of the subspecies as demonstrated below:

1. No permanent loss of beach mouse habitat will occur within the action area from the project construction or maintenance;

2. Temporary impacts to beach mouse habitat will be restored within the action area after project completion; and

3. A full complement of beach mouse habitat will remain within the action area after project completion.

Temporary impacts are expected to be limited to the construction/maintenance phase of the project and habitat restoration period following the project, which could be completed between one month and two years.

While a few beach mice may be lost, beach mice recover well from population size reductions (Wooten 1994) given sufficient habitat is available for population expansion after the bottleneck occurs. Therefore, we do not consider the potential loss of individuals to be significant.

Also, 50 feet of beach mouse critical habitat for each subspecies (PKBM, CBM, and SABM) could be temporarily affected each time a project is completed as a result of the sand placement activities. We would not anticipate that the loss of the critical habitat would alter or affect the remaining critical habitat in the action area for each subspecies (PKBM, CBM, and SABM) to the extent that it would appreciably diminish the habitat’s capability to provide the intended conservation role for the subspecies in the wild.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and shall be implemented by the Corps so that they become binding conditions of any grant or permit issued to the Applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps shall report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF ANTICIPATED TAKE

Sea Turtles

The Service anticipates that no more than 27.7 miles of highly eroded shoreline along the Florida coastline (no more than 8.8 miles within the NGMRU and no more than 18.9 miles within the PFRU) would receive sand placement per year during nonemergency calendar years with a maximum of 102 miles of shoreline (38 miles within the NGMRU and 64 miles of shoreline within the PFRU) receiving sand during or following an emergency event (declared disaster or Congressional Order) as a result of the Statewide Programmatic action. This represents two percent of the entire shoreline per year during a nonemergency year and seven percent of the entire shoreline during an emergency year. Over the last 10 years, one Congressional Order occurred due to emergency events in the 2004-2005 period. The increased sand placement on 102 miles of shoreline is expected to occur once in a 10-year period due to emergency events. Incidental take of sea turtles will be difficult to detect for the following reasons:

1. Turtles nest primarily at night and all nests are not located because
    a. Natural factors, such as rainfall, wind, and tides may obscure crawls; and
    b. Human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program;

2. The total number of hatchlings per undiscovered nest is unknown;

3. The reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown;

4. An unknown number of females may avoid the project beach and be forced to nest in a less than optimal area;

5. Lights may misdirect an unknown number of hatchlings and cause death; and

6. Escarpments may form and prevent an unknown number of females from accessing a suitable nesting site.

However, the level of take of these species due to disturbance and sand placement on suitable turtle nesting beach habitat can be anticipated because (1) turtles will continue to nest within the project site during and following sand placement; (2) sand placement activities will likely occur during a portion of the nesting season; (3) sand placement activities will modify the incubation substrate, beach slope, and sand compaction; and (4) artificial lighting will deter or misdirect nesting females and hatchlings during and following sand placement.

Take is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the project areas; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the projects; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the sand placement areas or on adjacent beaches during sand placement or construction activities; (5) misdirection of nesting and hatchling turtles on beaches adjacent to the sand placement or construction area as a result of project lighting including the ambient lighting from dredges; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

According to Schroeder (1994), there is an average survey error of seven percent; therefore, there is the possibility that some nests within the Action Area may be misidentified as false crawls and missed. However, due to implementation of the sea turtle protection measures, we anticipate that the take will not exceed seven percent of the nesting average in the action area. This number is not the level of take anticipated because the exact number cannot be predicted nor can the level of incidental take be monitored.

Beach Mouse

The Service has reviewed the biological information and other information relevant to this action. Based on this review, incidental take is anticipated from the sand placement activities may occur any time of the year within a ten-year period. The Service anticipates incidental take of beach mice would be difficult to detect for the following reasons: (1) an unknown number of beach mice may be injured, crushed or buried during beach access construction work and remain entombed in the sand; (2) beach mice are nocturnal, are small, and finding a dead or injured body is unlikely because of predation, and (3) changes in beach mouse essential life behaviors may not be detectable in standardized monitoring surveys.

For projects that occur within beach mouse habitat it is anticipated that no more than 50 linear feet of beach mouse habitat could be affected per sand placement activity for beach access within a subspecies range statewide as a result of the sand placement activities.

The incidental take is expected to be in the form of: (1) harm or harassment to all beach mice occupying the created or expanded beach access points; (2) harassment of beach mice from disturbance of foraging opportunities within the access areas during the construction period; (3) harassment of beach mice from temporary loss of foraging and burrow habitat; and (4) harassment of beach mice from temporary restriction of movement across access areas.

EFFECT OF THE TAKE

Sea Turtles

In the SPBO, the Service determined that the level of anticipated take is not likely to result in jeopardy to the loggerhead, green, leatherback, hawksbill or Kemp's ridley sea turtles. Loggerhead critical habitat has been designated in the project area. Based on the Corps incorporation of the conservation measures into the project, the Service concurs that the project may affect but is not likely to adversely affect nor adversely modify NWAO loggerhead critical habitat in the terrestrial environment. The Corps will consult with the NMFS on any impacts to critical habitat in the marine environment.

Incidental take of loggerhead nesting and hatchling sea turtles and sea turtle nests is anticipated to occur during project construction and during the life of the project. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU and 18.9 miles of shoreline per year within the PFRU during a nonemergency year. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where groin maintenance is located but is not expected to exceed 102 miles of shoreline (38 miles of shoreline per year within the northwest portion of Florida for the NGMRU and 64 miles of shoreline per year within the PFRU) during an emergency (declared disasters or Congressional Orders) year. The increased sand placement of 102 miles of shoreline is expected to occur once in a 10-year period due to emergency events.

Incidental take of green, leatherback, hawksbill and Kemp's ridley nesting and hatchling sea turtles and sea turtle nests is anticipated to occur during project construction and during the life of the project or while placed sand remains on the beach. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 27.7 miles (8.8 miles within the northwest portion of Florida and 18.9 miles within the northeast, south and west portion of Florida) of shoreline per year during a nonemergency year. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 102 miles of shoreline (38 miles of shoreline per year within the northwest portion of

Florida for the NGMRU and 64 miles of shoreline per year within the PFRU) during an emergency (declared disasters or Congressional Orders) year.

Beach Mouse

In the SPBO, the Service determined that this level of anticipated take is not likely to result in jeopardy to AIBM, SEBM, PKBM, CBM, and SABM or in adverse modification or destruction of designated critical habitat for the PKBM, CBM, or SABM. Critical habitat for the SEBM and AIBM has not been designated; therefore, the project will not result in destruction or adverse modification of critical habitat for these subspecies.

Incidental take of SEBM, AIBM, PKBM, CBM, and SABM is anticipated to occur at beach access locations for the sand placement activities. Take will occur during project construction where beach access points are expanded or created and where equipment is staged or stored within beach mouse habitat along approximately 50 feet of vegetated dunes for beach access.

REASONABLE AND PRUDENT MEASURES

The Service has determined that the following reasonable and prudent measures are necessary and appropriate to minimize take of the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles; SEBM, AIBM, CBM, PKBM, and SABM in the action area for the following activities:

A. Sand placement from beach nourishment, sand bypass, and sand back pass activities;

B. Sand placement from navigation channel maintenance; and

C. Groin and jetty repair or replacement.

If the Corps is unable to comply with the Reasonable and Prudent Measures and Terms and Conditions, the Corps as the construction agent or regulatory authority may:

1. Inform the Service why the term and condition is not reasonable and prudent for the specific project or activity and request exception under the SPBO or
2. Initiate consultation with the Service for the specific project or activity. The Service may respond by either of the following:
    a. Allowing an exception to the terms and conditions under the SPBO or
    b. Recommending or accepting initiation of consultation (if initiated by the Corps) for the specific project or activity.

Post construction requirements are listed in Reasonable and Prudent measures, A11, A12, A13, and A14. These post construction requirements may besubject to congressional authorization and the allocation of funds. Florida State statutes apply. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps must reinitiate consultation.

REASONABLE AND PRUDENT MEASURES for:

A. Projects that include sand placement from beach nourishment, sand bypass, and sand back pass activities primarily for shore protection (these projects are usually larger scaled) shall include the following measures:

A1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice shall be implemented in the Corps federally authorized project or regulated activity.

A2. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence and beach mouse burrow construction shall be used for sand placement.

A3. Sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching, to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation. In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties, sand placement shall not occur from May 1 through October 31. In St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte counties, sand placement shall not occur from June 1 through September 30. This time frame does not include Venice Beach and which has low density nesting. In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte (except Manasota Key), Sarasota (except Manasota Key), Manatee, Hillsborough, Pinellas, Franklin (except St. George Island), Gulf (except St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas), Bay, Walton, Okaloosa, Santa Rosa, and Escambia counties, Florida, sand placement may occur during the sea turtle nesting season.

A4. All derelict material or other debris shall be removed from the beach prior to any sand placement.

A5. The beach profile template for the sand placement project shall be designed to mimic, the native beach berm elevation and beach slopes landward and seaward of the equilibrated berm crest.

A6. If a dune system is already part of the project design, the placement and design of the dune shall emulate the natural dune system to the maximum extent possible, including the dune configuration and shape.

A7. Predator-proof trash receptacles shall be installed and maintained at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice.

A8. A meeting between representatives of the Applicant’s or Corps, Service, FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on this project.

A9. If the beach nourishment project will be conducted during the sea turtle nesting season, surveys for nesting sea turtles must be conducted by the FWC-authorized Marine Turtle Permit Holder. Surveys for early and late nesting sea turtles shall be conducted where appropriate.

A10. If nests are constructed in the area of proposed sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

A11. A post construction survey(s) of all artificial lighting visible from the project beach shall be completed by the Applicant or Corps.

A12. The Applicant or Corps shall ensure that daily nesting surveys are conducted by the FWC Marine Turtle Permit Holder for two nesting seasons following construction if the new sand still remains on the beach.

A13. Sand compaction shall be monitored and tilling shall be conducted if needed to reduce the likelihood of impacting sea turtle nesting and hatching activities.

A14. Escarpment formation shall be monitored and leveling shall be conducted if needed to reduce the likelihood of impacting nesting and hatchling sea turtles.

A15. Construction equipment and materials including pipes shall be stored off the beach in a manner that will minimize impacts to nesting and hatchling sea turtles and beach mice.

A16. Lighting associated with the project construction including on the dredge shall be minimized to reduce the possibility of disrupting and disorienting nesting and hatchling sea turtles and nocturnal activities of beach mice.

A17. During the sea turtle nesting season, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length if a FWC permit holder is present) between dusk and the time of completion the following day’s nesting survey to reduce the impact to emerging sea turtles and burial of new nests.

A18. All vegetation planting shall be designed and conducted to minimize impacts to sea turtles and beach mice.

A19. Beach mouse habitat shall be avoided to the maximum extent possible when selecting sites for access corridors, storage and staging of equipment.

A20. Equipment and construction materials shall not be stored near the seaward dune toe in areas of occupied beach mouse habitat. This area is highly utilized by beach mice.

A21. Existing vegetated habitat at beach access points and travel corridors shall be protected to the maximum extent possible to ensure vehicles and equipment transport stay within the access corridor.

A22. Expanded or newly created beach access points shall be restored following construction.

A23. A report describing the actions taken shall be submitted to the Service following completion of the proposed work.

A24. The Service and the FWC shall be notified if a sea turtle adult, hatchling, or egg, or beach mouse is harmed or destroyed as a direct or indirect result of the project.

TERMS AND CONDITIONS

All conservation measures described in the Corps' Programmatic Biological Assessment are hereby incorporated by reference as Terms and Conditions within this document pursuant to 50 CFR §402.14(I) with the addition of the following Terms and Conditions. In order to be exempt from the prohibitions of section 9 of the Act, the Corps shall comply with the following Terms and Conditions, which implement the Reasonable and Prudent Measures, described above and outline reporting/monitoring requirements.

These Terms and Conditions are nondiscretionary.

Post construction requirements are listed in Terms and Conditions A11, A12, A13, and A14. These post construction requirements may be subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Terms and Conditions, the Corps must reinitiate consultation.

TERMS AND CONDITIONS for:

A. Projects that include sand placement from beach nourishment, sand bypass, and sand back pass activities primarily for shore protection shall include the following conditions:

All beaches

A1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice listed on pages 9 and 10 of the SPBO shall be implemented in the Corps federally authorized project or regulated activity.

A2. Beach-compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). If a variance is requested from FDEP, the Service must be contacted to discuss whether the project falls outside of the SPBO. A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

A3. Sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

  a. Sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties shall be started after October 31 and be completed before May 1. During the May 1 through October 31 period, no construction equipment or pipes may be placed and/or stored on the beach.

  b. Sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties may occur during the sea turtle nesting season except on publicly owned conservation lands such as state parks and areas where such work is prohibited by the managing agency or under applicable local land use codes (see exceptions in A3.c below).

  c. For higher density nesting beaches in Gulf and Franklin counties sand placement shall not occur during the main part of the nesting season (June 1 through September 30). On Manasota Key located in Sarasota and Charlotte counties (excluding Venice Beach), sand placement shall not occur during the main part of the nesting season (May 1 through October 31). These beaches include St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, and St. George Island in Franklin County.

The Service shall be contacted for coordination, on a project-by-project basis, if sand placement is needed on publicly owned conservation lands and in these higher density nesting beaches in Gulf and Franklin Counties and on Manasota Key in Sarasota and Charlotte counties during the above exclusionary period. The Service will determine whether work (1) may proceed in accordance with the Terms and Conditions; (2) may proceed in accordance with the Terms and Conditions and other requirements as developed by the Service; or (3) would require an individual emergency consultation.

Land managers on publicly owned conservation lands must be involved in the project coordination.

A4. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach to the maximum extent possible prior to any sand placement in accordance with the dates in A3. If debris removal activities take place during shorebird breeding or peak sea turtle nesting season (**Tables 17 and 18**), the work shall be conducted during daylight hours only and shall not commence until completion of daily seabird, shorebird or marine turtle surveys each day.

A5. The beach profile template for the sand placement project shall be designed to mimic, the native beach berm elevation and beach slopes landward and seaward of the equilibrated berm crest. Prior to drafting the plans and specifications for a beach nourishment project, the Corps must meet with the Service, FWC, and FDEP to discuss the beach profile surveys, dune formation (specifically on high density green turtle nesting beaches), and the sea turtle monitoring reports from previous placement events. The meeting will be used to discuss modifications to the beach profile based on the post-construction monitoring data.

Beach profile may vary depending on location, shoreline dynamics, nature of the fill material, and other factors. If a native beach berm elevation is not possible, due to the beach width, impacts to nearshore hardbottom, or other considerations, as discussed during the meeting, the alternative template shall include features to minimize impacts to sea turtle nesting success and the potential for ponding and escarpment formation for that beach. For all high density green turtle nesting beaches (http://ocean.floridamarine.org/SeaTurtleNesting/), the formation of a dune, either through direct creation or natural accretion, will be included in the project design. Dunes and other construction features must be within the scope of the Congressionally-authorized project, if it is a civil works project, and constructible without impacting other resources. If a recommended dune is not possible, the Corps will contact the Service to see if consultation needs to be reinitiated or discuss features incorporated with the profile that will enhance the existing dune. Dune features included in the profile design (or project) shall have a slope of 1.5:1 followed by a gradual slope of 4:1 for approximately 20 feet seaward on a high erosion beach (**Figure 13)** or a 4:1 slope (**Figure 14**) on a low erosion beach. The Corps must explore options to include a dune system in the project design for existing authorized projects and new non-Federal projects. If another slope is proposed for use, the Corps shall consult the Service. The seaward toe of the dune should be at least 20 feet from the waterline.

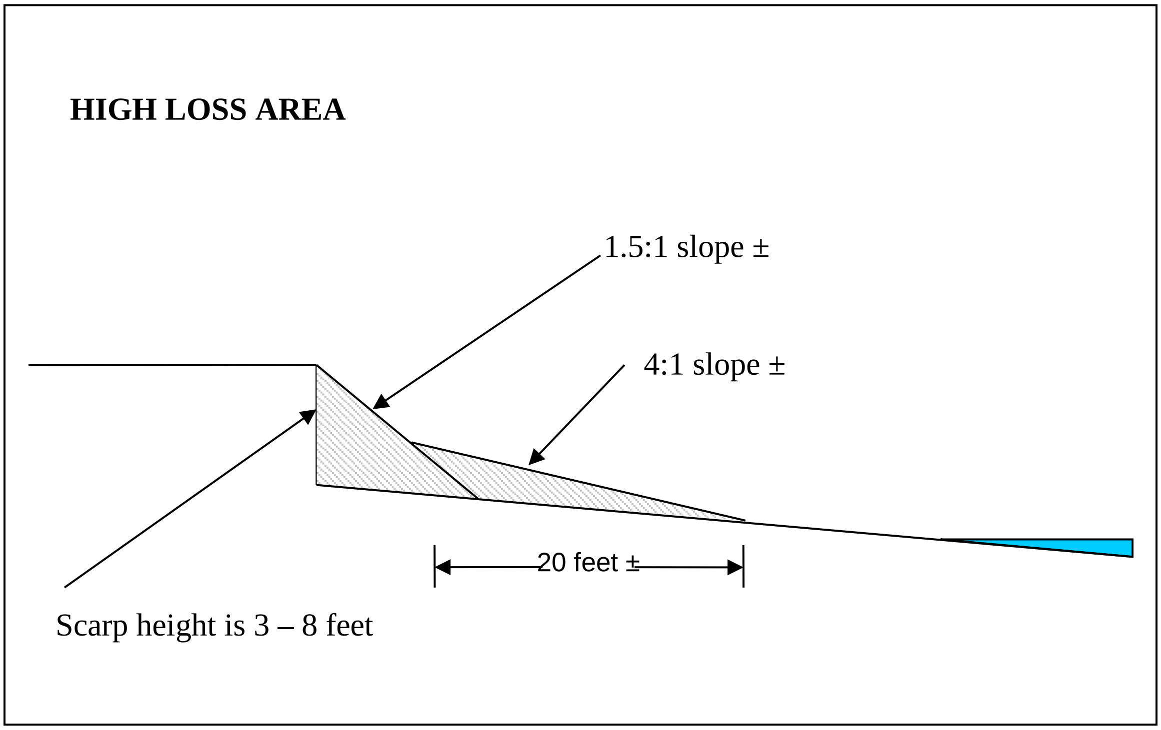

Figure 13. Recommended slope on a high erosion beach for sand placement projects that include the creation of a dune.

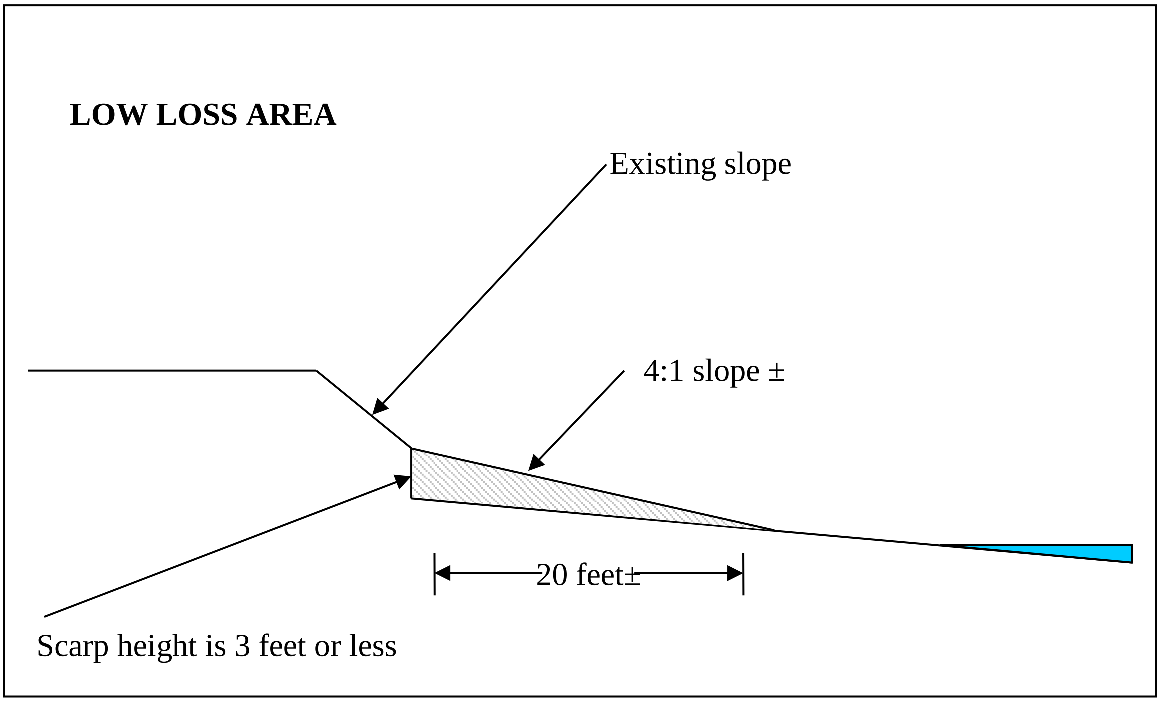

Figure 14. Recommended slope on a low erosion beach for sand placement projects that include the creation of a dune.

A6. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix F**). The Corps shall provide predator-proof trash receptacles for the construction workers. The Corps shall brief workers on the importance of not littering and keeping the project area trash and debris free.

A7. A meeting between representatives of the Corps (including the Corps project manager and/or the managing contractor), the Service, the FWC, the FWC Marine Turtle Permit Holder, and other species surveyors, as appropriate, shall be held prior to the commencement of work on projects. At least 10 business days advance notice shall be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle and beach mouse protection measures as well as additional guidelines when construction occurs during the sea turtle nesting season, and will include the following

  a. Staging locations, storing equipment including fuel stations
  b. Coordination with the Marine Turtle Permit Holder on nesting surveys and any nighttime work
  c. Pipeline placement (between 5 to 10 feet from dune)
  d. Minimizing driving
  e. Egg relocation- permit holder and location (must be approved by FWC)
  f. Free-roaming cat observation (for projects in or near beach mouse habitat)
  g. Follow up lighting surveys - dates and inspector
  h. Follow up coordination during construction and post construction
  i. Coordination on construction lighting including dredge lighting and travel within and adjacent to the work area
  j. Direction of the project including progression of sand placement along the beach
  k. Late season nests present in project area (if any)
  l. Plans for compaction monitoring or tilling
  m. Plans for escarpment surveys

At the preconstruction meeting, the Corps shall also provide the Service with specific anticipated shoreline lengths and anticipated duration using the form on the following web link: http://www.fws.gov/northflorida/SeaTurtles/Docs/Corp%20of%20Engineers%20Sea%20Turtle%20Permit%20Information.pdf. Only the following information should be filled out: Corps Permit Number, FWS Log Number, Project Location, Construction Activity, Duration of Protect, and Actual Take (linear feet of beach). This form shall be emailed to the Service at seaturtle@fws.gov. This form is in addition to the annual report listed below.

Sea Turtle Protection

A8. Daily early morning surveys for sea turtle nests shall be required and continue throughout the season as outlined in **Tables 16 and 17 (Nesting Season Monitoring)** if construction occurs during the nesting and hatching season. Any known nests recorded just prior to the beginning of Nesting Season Monitoring must be relocated if it will be impacted by the construction activity or marked and avoided if feasible.

Table 16. Beach Sand Placement and Sea Turtle Nest Monitoring/Relocation Windows, Brevard through Broward Counties, Coast of Florida.

Region	**Nest Laying Season**	**Hatching Season Ends (Last day requiring prior monitoring/relocation)**	**Beach Placement Window**	**Early Season Relocation***	**Late Season Relocation****	**Nesting Season Monitoring (monitoring throughout season)**
Brevard, Indian River, St. Lucie, and Broward Counties	25 Feb - 11 Nov	15 Jan	1 Nov - 30 Apr	1 Mar - 30 Apr In Brevard, Indian River, St. Lucie, & Broward counties nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded	65 days prior to Jan 15 (11 Nov) (or 65 days prior to start of construction **)	1 Mar - 11 Nov ***
Martin and Palm Beach Counties	12 Feb – 17 Nov	21 Jan	1 Nov - 30 Apr	1 Mar - 30 Apr In Martin and Palm Beach Counties, nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded	65 days prior to 21 Jan (17 Nov) (or 65 days prior to start of construction**)	1 Mar - 17 Nov***

** Relocation can only begin after FWC authorizes nest relocation in accordance with Florida Statute 379.2431 (1).

*** (For late season monitoring: 7 days without a nest, can stop monitoring once electronic mail concurrence is received from FWS or FWC).

Table 17. Beach Sand Placement and Sea Turtle Nest Monitoring/Relocation Windows, Outside of Brevard through Broward Counties, Coast of Florida.

Region	Nest Laying Season	Hatching Season Ends (Last day requiring prior monitoring/ relocation)	Beach Placement Window	Nesting Season Monitoring and Relocation (monitoring throughout season)
Nassau, Duval, Flagler, St. Johns, and Volusia Counties	2 Apr. – 24 Oct	28 Dec	All Year	15 Apr – 24 Oct ***
Miami-Dade County	11 Feb – 25 Sep	29 Nov	All Year	1 Mar – 25 Sep***
Gulf County (St. Joseph Peninsula State Park, St. Joseph peninsula, Cape San Blas) & Franklin County (St. George Isl)	1 May - 4 Sep	13 Nov	1 Oct - 31 May	1 May – 4 Sep***
All other beaches in Gulf and Franklin Counties, and Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties	2 May – 16 Sep	24 Nov	All Year	1 May - 16 Sep***
Sarasota and Charlotte Counties (Manasota Key)	24 Apr – 7 Sep	11 Nov	1 Nov - 30 Apr (except Venice beach)	15 Apr – 7 Sep***
All other beaches in Sarasota and Charlotte Counties	24 Apr – 12 Sep	16 Nov	All Year	15 Apr – 12 Sep***
Pinellas, Hillsborough, Manatee, Lee, Collier, and Monroe Counties	20 Apr – 19 Sep	23 Nov	All Year	15 Apr – 19 Sep***

*** (For late season monitoring: 7 days without a nest, can stop monitoring once electronic mail concurrence is received from FWS or FWC).

A9. If nests are constructed in the area of anticipated sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation as outlined in a through f. If nests are laid on the dune outside of the immediate sand placement area, the Corps must contact the Service to discuss whether relocation or mark and avoidance is required. Any known nests recorded just prior to the beginning of Nesting Season Monitoring must be relocated if it will be impacted by the construction activity or marked and avoided if feasible.

a. For sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties that occur during the earlier part of the nesting season (see Table 14) through April 30, daily early morning surveys shall begin March 1 and continue through the end of the beach placement window, with egg relocation continuing only until completion of fill placement. Eggs shall be relocated per the following requirements (i through iii below). For sand placement projects that occur during the period from November 1 through the end of hatching season (see Table 16), daily early morning sea turtle nesting surveys shall be conducted 65 days prior to project initiation and continue through November 11, and eggs shall be relocated per the requirements listed in (a)i through (a)iii. The Corps must contact the Service if there are any nests still incubating after November 30.

i. Nesting surveys and egg relocations will only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at mtp@myfwc.com for information on the permit holder in the project area. Relocation cannot begin until the Corps has a copy of the FWC permit authorizing relocation for construction purposes at that particular sand placement project. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones).

ii. Only those nests that may be affected by sand placement activities will be relocated. Nest relocation shall not occur upon completion of the project. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, predation, or be subject to artificial lighting. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests.

iii. Nests deposited within areas where construction activities have ceased or will not occur for 65 days or nests laid in the nourished berm prior to tilling shall be marked and left in situ unless other factors threaten the success of the nest. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity will occur within this area nor will any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

Daytime surveys shall be conducted for leatherback sea turtle nests beginning March 1. Nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded within the project area through April 30 or until completion of the project (whichever is earliest). Nightly nesting surveys shall be conducted from 9 p.m. until 6 a.m. The project area shall be surveyed at 1-hour intervals (since leatherbacks require at least 1.5 hours to complete nesting, this will ensure all nesting leatherbacks are encountered) and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

b. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties that occur during the period of sea turtle nest laying (**see Table 17**), daily early morning (before 9 a.m.) surveys and egg relocation shall be conducted. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin, Gulf, Sarasota, and Charlotte Counties in A10.d. below).

c. For Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, nesting surveys shall be initiated 70 days prior to sand placement activities (incubation periods are longer in these counties) or by nesting season monitoring (see Table 17) whichever is later. Nesting surveys shall continue through the end of nesting season monitoring (see Table 17) with relocation only through the end of fill placement. Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin and Gulf Counties in A10.d. below).

d. For St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte Counties, sand placement activities shall occur only during the Beach Placement Window indicated in Table 17 (except on Venice Beach), outside the period of peak sea turtle egg laying and egg hatching for this area. If nests are laid in the early part of the nesting season monitoring during the beach placement window in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

e. For Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by the beginning of the nesting season monitoring indicated in Table 17 whichever is later. Nesting surveys shall continue through the end of nesting season monitoring (see Table 17), with egg relocation continuing only through the end of fill placement. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Sarasota and Charlotte Counties in A10.d. above).

f. For Miami-Dade County, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by the beginning of the nesting season monitoring indicated in Table 17, whichever is later. Nesting surveys shall continue through the end of the nesting season monitoring and egg relocation shall continue through the end of sand placement. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii

g. For Volusia, Flagler, St. Johns, Duval, and Nassau Counties, nesting surveys shall be initiated 65 days prior to sand placement activities or by the beginning of the nesting season monitoring indicated in Table 17, whichever is later. Nesting surveys shall continue through the end of nesting season monitoring indicated in Table 17 and egg relocation shall continue through the end of sand placement. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

A10. Two surveys shall be conducted of all lighting visible from the beach placement area by the Applicant or Corps, using standard techniques for such a survey (**Appendix C**), in the year following construction. The first survey shall be conducted between May 1 and May 15 and a fill out FWS Sea Turtle Lighting Survey Form (**Appendix D**) and send electronically to seaturtle@fws.gov. The second survey shall be conducted between July 15 and August 1. A summary report of the surveys, including any actions taken, shall be submitted to the Service by December 31 of the year in which surveys are conducted. After the annual report is completed, a meeting shall be set up with the Applicant, county or municipality, FWC, Corps, and the Service to discuss the survey report, as well as any documented sea turtle disorientations in or adjacent to the project area. If the project is completed during the nesting season and prior to May 1, the Corps may conduct the lighting surveys during the year of construction.

A11. Daily nesting surveys shall be conducted for two nesting seasons following construction in accordance with **Table 18** and reported in accordance with **Table 20** by the Corps or the Applicant if placed material still remains on the beach. Post construction year-one surveys shall record the number of nests, nesting success, reproductive success, disorientations, and lost nests due to erosion and/or inundation. Post construction year-two surveys shall only need to record nest numbers, nesting success, and disorientations (**Table 20**). This information will be used to periodically assess the cumulative effects of these projects on sea turtle nesting and hatchling production and monitor suitability of post construction beaches for nesting.

Table 18. Post-Construction Sea Turtle Monitoring.

Region	**Nest Laying Season**	**Years 1 and 2 Post-Construction Monitoring**
Brevard, Indian River, St. Lucie, and Broward Counties Martin and Palm Beach Counties	25 Feb – 11 Nov 12 Feb – 17 Nov	Daily surveys: 1 Mar - 31 Oct (for late season: 15 days without a nests, can stop monitoring-email FWS and FWC to stop
Nassau, Duval, and St. Johns, Counties	2 Apr. – 24 Oct.	Daily surveys: 1 May – 30 Sep
Flagler and Volusia Counties	2 Apr. – 24 Oct.	Daily surveys: 15 Apr- 15 Oct
Miami-Dade County	11 Feb – 25 Sep	Daily surveys: 1 Apr – 30 Sep
Gulf County (St. Joseph Peninsula State Park, St. Joseph peninsula, Cape San Blas) and Franklin County (St. George Island) All other beaches in Gulf and Franklin Counties, and Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties	1 May – 4 Sep 2 May – 16 Sep	Daily surveys: 1 May – 31 Aug
Sarasota and Charlotte Counties (Manasota Key) All other beaches in Sarasota and Charlotte Counties Pinellas, Hillsborough, Manatee, Lee, Collier, and Monroe Counties	24 Apr – 7 Sep 24 Apr – 12 Sep 20 Apr – 19 Sep	Daily surveys: 15 Apr –15 Sep

A12. Sand compaction shall be monitored in the area of sand placement immediately after completion of the project and prior to the dates in **Table 19** for 3 subsequent years.

Table 19. Dates for Compaction Monitoring and Escarpment Surveys by County.

County where project occurs	**Date**
Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Miami-Dade, and Monroe	Work must be completed by Mar 1
Miami-Dade, Monroe	Work must be completed by April 1
Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf, Franklin, Volusia, Flagler, St. Johns, Duval, Nassau, Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier	Work must be completed by Apr 15

If tilling is needed, the area shall be tilled to a depth of 36 inches. Each pass of the tilling equipment shall be overlapped to allow more thorough and even tilling. All tilling activity shall be completed at least once prior to the nesting season. An electronic copy of the results of the compaction monitoring shall be submitted electronically to seaturtle@fws.gov prior to any tilling actions being taken or if a request not to till is made based on compaction results. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post construction compaction levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach.

(NOTE: If tilling occurs during shorebird nesting season (February 15-August 31), shorebirds surveys prior to tilling are required per the Migratory Bird Treaty Act. See Appendix E for shorebird conditions recommended by FWC.

a. Compaction sampling stations shall be located at 500-foot intervals along the sand placement template. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high water line (normal wrack line).

b. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates at each depth). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final six averaged compaction values.

c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the appropriate date listed in **Table 19**.

d. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

e. Tilling shall occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3 square foot buffer around the vegetated areas.

A13. Visual weekly surveys for escarpments along the project area shall be made immediately after completion of the sand placement and within 30 days prior to the start dates for Nesting Season Monitoring in **Table 19** for 3 subsequent years if sand in the project area still remains on the dry beach.

Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by the dates listed in **Table 19**. Any escarpment removal shall be reported by location in the annual report. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. If during weekly escarpment surveys, it is found that subsequent reformation of escarpments interferes with sea turtle nesting or that they exceed 18 inches in height for a distance of 100 feet during the nesting and hatching season, the Service shall be contacted immediately to determine the appropriate action to be taken. If it is determined by the Service or FWC that that escarpment leveling is required during the nesting or hatching season the Service, in coordination with the FWC, will provide a brief written authorization within 5 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be sent electronically to seaturtle@fws.gov. A summary is required even when no action has been taken (**Table 3**).

A14. Staging areas for construction equipment shall be located off the beach during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see table 14) and peak nesting season (May 1 through October 31) for the remaining counties. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach shall be located as far landward as possible without compromising the integrity of the dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune if the width of the beach allows. Temporary storage of pipes shall be off the beach to the maximum extent possible. If the pipes are stored on the beach, they shall be placed in a manner that will minimize the impact to nesting habitat and shall not compromise the integrity of the dune systems. If the pipes placed parallel to the dune cannot be placed between 5 to 10 feet away from the toe of the dune during nesting and hatching season, the Corps must reinitiate consultation with the Service as this represents adverse effects not addressed in this SPBO. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season.

A15. Direct lighting of the beach and nearshore waters shall be limited to the immediate construction area during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 14) and peak nesting season (May 1 through October 31) for the remaining counties, and shall comply with safety requirements. A light management plan for the dredge and the work site shall be submitted for approval by the Service and FWC prior to the pre-construction meeting. In accordance with this plan, lighting on all equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing on dredge and land-based lights and be large enough to block light from all lamps from being transmitted outside the construction area or to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 15**).

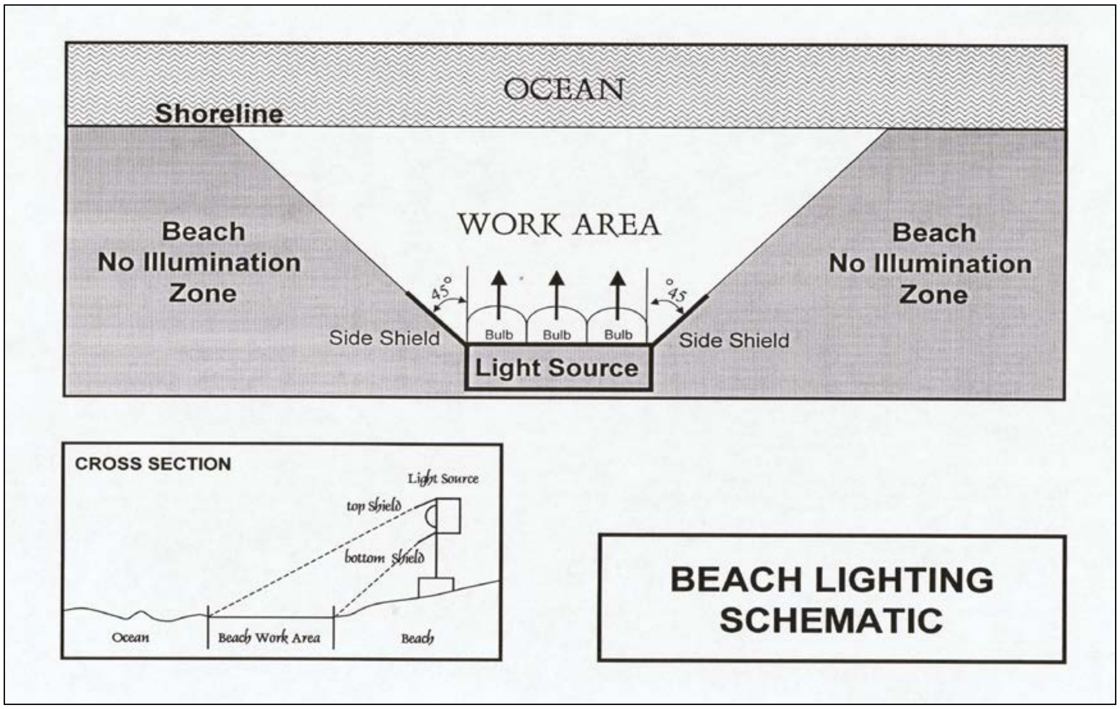

Figure 15. Beach lighting schematic.

A16. During the early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 14) and peak nesting season (May 1 through October 31) for the remaining counties, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length) along the shoreline between dusk and dawn of the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle surveyor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500 feet is not feasible for the project, an agreed upon distance will be decided on during the preconstruction meeting. Once the beach has been cleared and the necessary nest relocations have been completed, the Corps will be allowed to proceed with the placement of fill during daylight hours until dusk at which time the 500-foot length (or other agreed upon length) limitation shall apply. If any nesting turtles are sighted on the beach within the immediate construction area, activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has relocated the nest.

<u>Dune Planting</u>

A17. All vegetation planting shall be designed and conducted to minimize impacts to sea turtles and beach mice. Dune vegetation planting may occur during the sea turtle nesting season under the following conditions.

a. Daily early morning sea turtle nesting surveys (before 9 a.m.) shall be conducted during the Nest Laying period for all counties in Florida where sea turtle nesting occurs (see Tables 16 and 17). Nesting surveys shall only be conducted by personnel with prior experience and training in nesting surveys. Surveyors shall have a valid FWC permit. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (all times). No dune planting activity shall occur until after the daily turtle survey and nest conservation and protection efforts have been completed. Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys;

b. Any nests deposited in the dune planting area not requiring relocation for conservation purposes shall be left in place. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 3-foot radius around the nest. No planting or other activity shall occur within this area nor will any activities be allowed that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the planting activity;

c. If a nest is disturbed or uncovered during planting activity, the Corps, or the Applicant shall cease all work and immediately contact the project turtle permit holder. If a nest(s) cannot be safely avoided during planting, all activity within 10 feet of a nest shall be delayed until hatching and emerging success monitoring of the nest is completed;

d. All dune planting activities shall be conducted by hand and only during daylight hours;

e. All dune vegetation shall consist of coastal dune species native to the local area; (*i.e.*, native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material for the plant size;

f. No use of heavy equipment shall occur on the dunes or seaward for planting purposes. A lightweight (all-terrain type) vehicle, with tire pressures of 10 psi or less may be used for this purpose; and

g. Irrigation equipment, if needed, shall be authorized under a FDEP permit.

Beach Mouse Protection

A18. Beach mouse habitat shall be avoided when selecting sites for equipment, pipes, vehicle storage and staging to the maximum extent possible. Suitable beach mouse habitat constitutes the primary dunes (characterized by sea oats and other grasses), secondary dunes (similar to primary dunes, but also frequently includes such plants as woody goldenrod, false rosemary), and interior or scrub dunes.

A19. Equipment placement or storage shall be excluded in the area between 5 to 10 feet seaward of the existing dune toe or 10 percent of the beach width (for projects occurring on narrow eroded beach segments) seaward of the dune toe in areas of occupied beach mouse habitat (**Figure 16**). The toe of the dune is where the slope breaks at the seaward foot of the dune. If the pipes placed parallel to the dune cannot be placed between 5 to 10 feet away from the toe of the dune as required during sea turtle nesting and hatching season, the Corps must reinitiate consultation with the Service as this represents adverse effects not addressed in this SPBO.

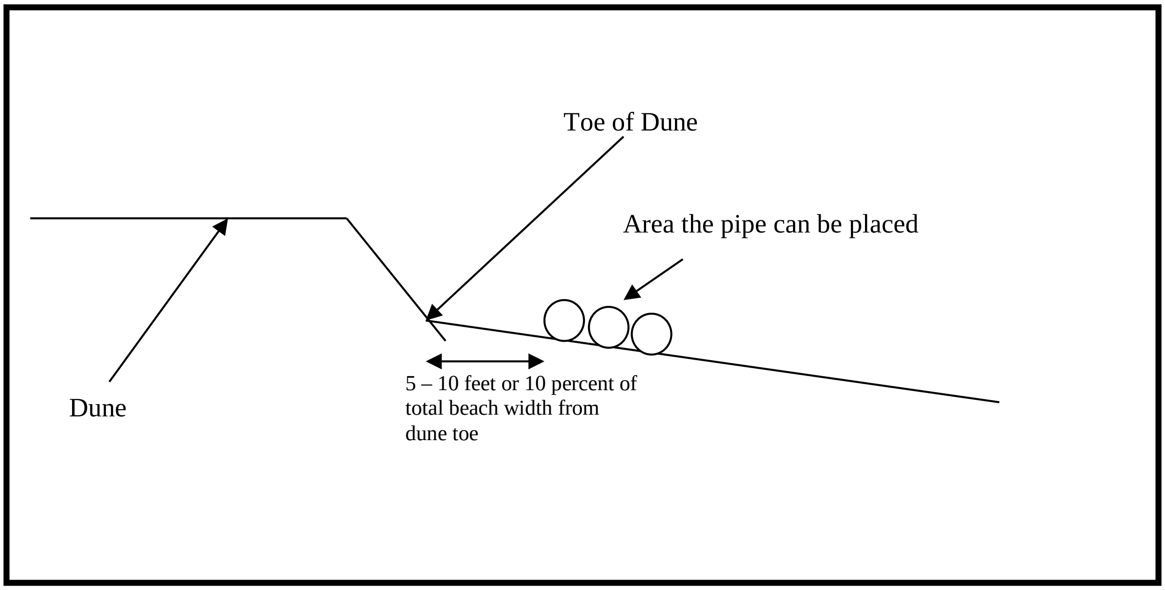

Figure 16. Equipment placement for projects occurring in beach mouse occupied habitat.

A20. Existing beach access points shall be used for vehicle and equipment beach access to the maximum extent possible. These access points shall be delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be fully restored to the preconstruction conditions following project completion. Parking areas for construction crews shall be located as close as possible to the work sites, but outside of vegetated dune areas to minimize impacts to existing habitat and transporting workers along the beachfront.

A21. The location of new or expanded existing beach access corridors for vehicles and equipment within beach mouse habitat consisting of vegetated dunes shall be spaced no closer than every four miles. The distribution of access areas will result in the least number of access areas within beach mouse habitat as possible and delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be (1) no more than 25 feet wide for vehicles and (2) no more than 50 feet wide for equipment. Expanded or new beach access points that impact vegetated dunes shall be restored within 3 months following project completion. Habitat restoration shall consist of restoring the dune to preconstruction conditions with planting of at least three species of appropriate native dune vegetation (*i.e.*, native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Seedlings shall be at least one inch square with a 2.5-inch pot. Planting shall be on 18-inch centers throughout the created dune; however, 24-inch centers may be acceptable depending on the area to be planted. Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material, as appropriate, for the plant size. No sand stabilizer material (coconut matting or other material) shall be used in the dune restoration. The plants may be watered without installing an irrigation system. In order for the restoration to be considered successful, 80 percent of the total planted vegetation shall be documented to survive six months following planting of vegetation. If the habitat restoration is unsuccessful, the area shall be replanted following coordination with the Service.

Reporting

A22. A report with the following shall be submitted to the Service electronically (seaturtle@fws.gov) by December 31 after completion of construction.

- **i. A summary of the information listed in Table 20 for construction**
- **ii. A summary of the information listed in Table 21 for post-construction**

Table 20. Information to include in the report following the project completion.

All projects	**Project location (include Florida DEP R-monuments and latitude and longitude coordinates)**
	Project description (include linear feet of beach, actual fill template, access points, and borrow areas)
	Dates of actual construction activities
	Names and qualifications of personnel involved in sea turtle nesting surveys and relocation activities (separate the nests surveys for nourished and non-nourished areas)
	Descriptions and locations of sites where nests were relocated
Beach mice	**Acreage of new or widened access areas affected in beach mouse habitat**
	Vegetation completed for new or widened access areas
	Success rate of vegetation of restoration

Table 21. Sea turtle monitoring following sand placement activity.

Date	Duration	Variable	Criterion
Nesting Success	Year of in season construction, two years post construction if placed sand remains on beach and variable does not meet criterion based on previous year	Number of nests and non-nesting events	40 percent or greater
Hatching success	Year of in season construction and one year post construction if placed sand remains on beach and variable does not meet success criterion based on previous year	Number of hatchlings by species to hatch from egg	60 percent or greater (a statistically valid number of loggerhead and green nests, and all leatherback nests)
Emergence Success	Year of in season construction and one year post construction if placed sand remains on beach and variable does not meet success criterion based on previous year	Number of hatchlings by species to emerge from nest onto beach	80 percent or greater (a statistically valid number of loggerhead and green nests, and all leatherback nests)
Disorientations	Year of in season construction and two years post construction if placed sand remains on the beach	Number of nests and individuals that misorient or disorient	http://myfwc.com/media/418153/Seaturtle_Guidelines_A_LDIR_Directions.pdf
Lighting Surveys	Two surveys the year following construction, one survey between May 1 and May 15 and second survey between July 15 and August 1	Number, location and photographs of lights visible from nourished berm, corrective actions and notifications made	Lighting survey and meeting resulting with plan for reduction in lights visible from nourished berm within one to two month period
Compaction	Three seasons following construction. Not required if the beach is tilled prior to nesting season each year placed sand remains on beach	Shear resistance	Less than 500 psi
Escarpment Surveys	Weekly during nesting season for three years each year placed sand remains on the beach	Number of scarps 18 inches or greater extending for more than 100 feet that persist for more than 2 weeks	Successful remediation of all persistent scarps as needed

If nesting and reproductive (hatching and emergence) success is less than the criteria in the table above, the Corps and the Service must discuss during the annual meeting to review additional conditions prior to the next sand placement on this beach.

A23. In the event a sea turtle nest is excavated during construction activities, the project turtle permit holder responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

Upon locating a dead or injured sea turtle adult, hatchling, egg, or beach mouse that may have been harmed or destroyed as a direct or indirect result of the project, the Corps, Applicant shall be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922) and the appropriate Service Field Office immediately (**Table 3**).

Care shall be taken in handling injured sea turtles, eggs or beach mice to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

REASONABLE AND PRUDENT MEASURES for:

B. Projects that are navigation maintenance dredging with beach placement, swash zone placement, and submerged littoral zone placement (not including near shore placement for shore protection) shall include the following measures:

Historically, these sand placement events as a result of a navigation maintenance dredging project with no local sponsor are smaller scaled, conducted at closer time intervals, and the sand often does not remain on the beach for an extended period of time.

Post construction requirements are listed in Reasonable and Prudent Measures B10 and B11. These post construction requirements may be subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps must reinitiate consultation.

B1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice shall be implemented in the Corps federally authorized project or regulated activity.

B2. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence and beach mouse burrow construction shall be used for sand placement.

B3. For dredged material placement on the beach, sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation. In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties, dredged material placement shall not occur from May 1 through October 31. In St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County dredged material placement shall not occur from June 1 through September 30. On Manasota Key in Sarasota and Charlotte Counties, dredged material placement shall not occur from May 1 through October 31 (except Venice Beach). In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte (except Manasota Key), Sarasota (except Manasota Key), Manatee, Hillsborough, Pinellas, Franklin (except St. George Island), Gulf (except St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape Sand Blas), Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, sand placement may occur during the sea turtle nesting season (**Table 16 and Table 17**).

B4. For dredged material placement in the swash zone or submerged littoral zone during the nesting season, sand placement will be conducted at or below MLLW line.

B5. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach prior to any dredged material placement to the maximum extent possible.

B6. The Corps shall continue to work with FDEP, FWC, and the Service to create a sea turtle friendly beach profile for placement of material during construction.

B7. Predator-proof trash receptacles shall be installed and maintained at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix F**).

B8. A meeting between representatives of the Corps, Service, FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on this project.

B9. If the beach nourishment project will be conducted during the sea turtle nesting season, surveys for nesting sea turtles must be conducted. Surveys for early and late nesting sea turtles shall be conducted where appropriate. If nests are constructed in the proposed area of sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

B10. Sand compaction shall be monitored and tilling shall be conducted if needed to reduce the likelihood of impacting sea turtle nesting and hatching activities. Not required for dredged material placement in the swash and littoral zone.

B11. Escarpment formation shall be monitored and leveling shall be conducted if needed to reduce the likelihood of impacting nesting and hatchling sea turtles. Not required for dredged material placement in the swash and littoral zone.

B12. Construction equipment and materials shall be stored in a manner that will minimize impacts to nesting and hatchling sea turtles and beach mice.

B13. Lighting associated with the project construction shall be minimized to reduce the possibility of disrupting and disorienting nesting and hatchling sea turtles and nocturnal activities of beach mice.

B14. During the sea turtle nesting season, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length if a FWC sea turtle permit holder is present) between dusk and the time of completion of the following day's nesting survey to reduce the impact to emerging sea turtles and burial of new nests.

B15. Beach mouse habitat shall be avoided when selecting sites for storage and staging of equipment to the maximum extent possible.

B16. Equipment and construction materials shall not be stored near the seaward dune toe in areas of occupied beach mouse habitat. This area is highly utilized by beach mice.

B17. Existing vegetated habitat at beach access points and along shoreline travel corridors shall be protected to the maximum extent possible to ensure vehicles and equipment transport stay within the access and travel corridors.

B18. Expanded or newly created beach access points shall be restored.

B19. A report describing the actions taken shall be submitted to the Service work for each year when the activity has occurred.

B20. The Service and the FWC shall be notified if a sea turtle adult, hatchling, or egg, or beach mouse is harmed or destroyed as a direct or indirect result of the project.

TERMS AND CONDITIONS for:

B. Projects that are navigation maintenance dredging with beach placement, swash zone placement, and submerged littoral zone placement of Corps civil works project shall include the following measures:

Historically, these sand placement events as a result of a navigation maintenance dredging project with no local sponsor are smaller scaled, conducted at closer time intervals, and the sand often does not remain on the beach for an extended period of time.

Post construction requirements are listed in Terms and Conditions B10 and B11. These post construction requirements may be subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Terms and Conditions, the Corps must reinitiate consultation.

All beaches

B1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice listed on pages 9 and 10 of the SPBO shall be implemented in the Corps federally authorized project or regulated activity.

B2. Beach compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

B3. Dredged material placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

   a. Dredged material placement in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties shall occur only during the beach placement window indicated in Table 16. construction equipment or pipes may be placed and/or stored on the beach only during the beach placement window indicated in Table 16.

   b. Dredged material placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties may occur during the sea turtle nesting season except on publicly owned conservation lands such as state parks and areas where such work is prohibited by the managing agency or under applicable local land use codes (see exceptions in B3.c. below).

   c. For higher density nesting beaches in Gulf and Franklin counties dredged material placement shall not occur during the main part of the nesting season June 1 through September 31. On Manasota Key in Sarasota and Charlotte Counties, dredged material placement shall not occur during the main part of the nesting season (May 1 through October 31). This timeframe does not include Venice Beach due to the low density nesting. These beaches include St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte Counties. See Table 17 for the Beach Placement Windows.

d. For dredged material placement in the swash zone (at or below the MHWL) or submerged littoral zone during the sea turtle nesting season (**Tables 16and 17**), the Corps shall contact the Service for coordination.

The Service shall be contacted for coordination, on a project-by-project basis, if sand placement is needed on publicly owned conservation lands and in these higher density nesting beaches in Gulf and Franklin Counties and on Manasota Key in Sarasota and Charlotte Counties during the above exclusionary period. The Service will determine whether work (1) may proceed in accordance with the Terms and Conditions; (2) proceed in accordance with the Terms and Conditions and other requirements as developed by the Service; or (3) would require that an individual emergency consultation be conducted.

B4. For dredged material placement in the swash zone or submerged littoral zone during the nesting and hatching season, sand placement will be conducted at or below the MLLW line. The swash zone is that region between the upper limit of wave run-up (approximately one-foot above MHW) and the lower limit of wave run-out (approximately one-foot below MLW). Material will not be placed so that it is exposed above the water during low tide during the nesting and hatching season. The Corps must consult with NMFS on impacts to hatchlings that emerge from those nests adjacent to the inwater construction area. The Service will discuss with the Corps and NMFS additional measures that could include caging nests close to the emergence date.

B5. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach prior to any dredged material placement to the maximum extent possible. If debris removal activities take place during the peak sea turtle nesting season (**Tables 16 and 17**), the work shall be conducted during daylight hours only and shall not commence until completion of the sea turtle nesting survey each day.

B6. The Corps shall continue to work with FDEP, FWC and the Service in conducting the second phase of testing on the sea turtle friendly profile during project construction. This includes exploring options to include a dune system in the project design for existing authorized projects and new non-federal projects and how the existing sand placement template may be modified.

B7. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix F**). The Corps shall provide predator-proof trash receptacles for the construction workers. All workers shall be briefed on the importance of not littering and keeping the project area trash and debris free.

B8. A meeting between representatives of the Corps, the Service, the FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on projects. At least 10 business days advance notice shall be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle and beach mouse protection measures as well as additional guidelines when construction occurs during the sea turtle nesting season, such as storing equipment, minimizing driving, free-roaming cat observation, and reporting within the work area, as well as follow up meetings during construction (**Table 3**).

<u>Sea Turtle Protection</u>

B9. Daily early morning surveys for sea turtle nests shall be required as outlined in a through f. If nests are constructed in the area of sand proposed placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation (**Tables 614 and 17**).

a. For sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties that occur during earlier part of the nest laying season through April 30, daily early morning surveys shall be conducted for sea turtle nests shall begin with the start of the nesting season monitoring (see Table 16) and continue through the end of the beach placement window, with egg relocation continuing only until completion of fill placement. Eggs shall be relocated per the following requirements. For sand placement projects that occur during the period from November 1 through the end of hatching season (see Table 16), daily early morning sea turtle nesting surveys shall be conducted 65 days prior to project initiation and continue through the end of the nest laying season indicated in Table 16, and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

i. Nesting surveys and egg relocations will only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at (561) 575-5407 for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones).

ii. Only those nests that may be affected by sand placement activities will be relocated. Nest relocation shall not occur upon completion of the project. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, or subject to artificial lighting. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests.

iii. Nests deposited within areas where construction activities have ceased or will not occur for 65 days or nests laid in the nourished area prior to tilling shall be marked and left in situ unless other factors threaten the success of the nest. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity will occur within this area nor will any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

During the period from March 1 through April 30, daytime surveys shall be conducted for leatherback sea turtle nests beginning March 1. Nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded within the project or adjacent beach area through April 30 or until completion of the project (whichever is earliest). Nightly nesting surveys shall be conducted from 9 p.m. until 6 a.m. The project area shall be surveyed at 1-hour intervals (since leatherbacks require at least 1.5 hours to complete nesting, this will ensure all nesting leatherbacks are encountered) and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

b. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties that occur during the nest laying period (**Table 17**), daily early morning (before 9 a.m.) surveys shall be conducted. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin, Gulf, Sarasota, and Charlotte Counties in B9.d. below).

c. For Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, nesting surveys shall be initiated 70 days prior to sand placement activities (incubation periods are longer in these counties) or at the beginning of nesting season monitoring (see Table 17) whichever is later. Nesting surveys shall continue through the end of the nest laying season (see Table 17). Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin and Gulf Counties in B9.d. below).

d. For St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County sand placement activities shall occur only during the Beach Placement Window indicated in Table 17. For Manasota Key in Sarasota and Charlotte Counties (except Venice Beach), sand placement activities shall during the Beach Placement Window indicted in Table 15, the period of peak sea turtle egg laying and egg hatching for this area. If nests laid in the early part of the nest laying season during the beach placement window in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii below.

e. For Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by April 15, whichever is later. Nesting surveys shall continue through September 15. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Sarasota and Charlotte Counties in B9.d. above).

f. For Miami-Dade County, nesting surveys shall be initiated 65 days prior to dredged material placement activities or by the beginning of the nesting season monitoring indicated in Table 17, whichever is later. Nesting surveys shall continue through the end of the nest laying season or the end of sand placement whichever comes first. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

g. For Volusia, Flagler, St. Johns, Duval, and Nassau Counties, nesting surveys shall be initiated 65 days prior to dredged material placement activities or by the beginning of nest laying season (**Table 17**) whichever is later. Nesting surveys shall continue through the nesting season monitoring period (**Table 15).** If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

B10. Sand compaction shall be monitored in the area of dredged material placement immediately after completion of the project and prior to the dates in **Table 19** for 3 subsequent years. Not required for dredged material placement in the swash and littoral zone.

If tilling is needed, the area shall be tilled to a depth of 36 inches. Each pass of the tilling equipment shall be overlapped to allow more thorough and even tilling. All tilling activity shall be completed at least once prior to the nesting season. An electronic copy of the results of the compaction monitoring shall be submitted seaturtle@fws.gov prior to any tilling actions being taken. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post construction compaction levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach.(NOTE: If tilling occurs during shorebird nesting season (February 15-August 31), shorebirds surveys prior to tilling are required per the Migratory Bird Treaty Act (http://myfwc.com/docs/Conservation/FBCI_BNB_SeaTurtleMonitors.pdf)

a. Compaction sampling stations shall be located at 500-foot intervals along the sand placement template. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high water line (normal wrack line).

b. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final six averaged compaction values.

c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the appropriate date listed in **Table 19**.

d. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

e. Tilling shall occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3 square foot buffer around the vegetated areas.

B11. Visual weekly surveys for escarpments along the project area shall be made immediately after completion of the dredged material placement and within 30 days prior to the start dates for Nesting Season Monitoring in **Table 19** for 3 subsequent years if sand in the project area still remains on the dry beach. Not required for dredged material placement in the swash and littoral zone.

Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by the dates listed above. Any escarpment removal shall be reported by location. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. The Service shall be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined by the Service, in coordination with the FWC, that escarpment leveling is required during the nesting or hatching season, the Service will provide a brief written authorization within 30 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be submitted electronic to seaturtle@fws.gov.

B12. If available, staging areas for construction equipment shall be located off the beach during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 16) and peak nesting season (May 1 through October 31) for the remaining counties. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach shall be located as far landward as possible without compromising the integrity of the dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune if the width of the beach allows. Temporary storage of pipes shall be off the beach to the maximum extent possible. If the pipes are stored on the beach, they shall be placed in a manner that will minimize the impact to nesting habitat and shall not compromise the integrity of the dune systems. If the pipes that are placed parallel to the dune cannot be placed between 5 to 10 feet away from the toe of the dune during nesting and hatching season, the Corps must reinitiate consultation with the Service as this represents take that was not considered in the SPBO. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season.

B13. Direct lighting of the beach and nearshore waters shall be limited to the immediate construction area during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 14) and peak nesting season (May 1 through October 31) for the remaining counties, and shall comply with safety requirements. Lighting on all equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area and to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 15**).

B14. During the period during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 16) and peak nesting season (May 1 through October 31) for the remaining counties, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length if FWC sea turtle permit holder is present) along the shoreline between dusk and dawn of the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle surveyor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500 feet is not feasible for the project, an agreed upon distance will be decided on during the preconstruction meeting. Once the beach has been cleared and the necessary nest relocations have been completed, the Corps will be allowed to proceed with the placement of fill during daylight hours until dusk at which time the 500-foot length (or other agreed upon length) limitation shall apply. If any nesting turtles are sighted on the beach within the immediate construction area, activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has relocated the nest.

Beach Mouse Protection

B15. Beach mouse habitat shall be avoided when selecting sites for equipment, pipes, vehicle storage and staging, and beach travel corridors to the maximum extent possible. Suitable beach mouse habitat constitutes the primary dunes (characterized by sea oats and other grasses), secondary dunes (similar to primary dunes, but also frequently includes such plants as woody goldenrod, false rosemary), and interior or scrub dunes.

B16. Equipment placement or storage shall be excluded in the area between 5 to 10 feet seaward of the existing dune toe or 10 percent of the beach width (for projects occurring on narrow eroded beach segments) seaward of the dune toe in areas of occupied beach mouse habitat (**Figure 16**). The toe of the dune is where the slope breaks at the seaward foot of the dune.

B17. Existing beach access points shall be used for vehicle and equipment beach access to the maximum extent possible. These access points shall be delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The topography at the access points shall be fully restored to preconstruction conditions following project completion. Parking areas for construction crews shall be located as close as possible to the work sites, but outside of vegetated dune areas to minimize impacts to existing habitat and transporting workers along the beachfront.

B18. The location of new or expanded existing beach access corridors for vehicles and equipment within beach mouse habitat consisting of vegetated dunes shall be no closer than every four miles. The distribution of access areas will result in the least number of access areas within beach mouse habitat as possible and delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be (1) no more than 25 feet wide for vehicles and (2) no more than 50 feet wide for equipment. Expanded or new beach access points that impact vegetated dunes shall be restored within 3 months following project completion. Habitat restoration shall consist of restoring the dune to preconstruction conditions with planting of at least three species of appropriate native dune vegetation (*i.e.*, native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Seedlings shall be at least 1 inch square with a 2.5-inch pot. Planting shall be on 18-inch centers throughout the created dune; however, 24-inch centers may be acceptable depending on the area to be planted. Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material, as appropriate, for the plant size. No sand stabilizer material (coconut matting or other material) shall be used in the dune restoration. The plants may be watered without installing an irrigation system. In order for the restoration to be considered successful, 80 percent of the total planted vegetation shall be documented to survive six months following planting of vegetation. If the habitat restoration is unsuccessful, the area shall be replanted following coordination with the Service.

Reporting

B19. An excel sheet with the information listed in **Table 20** shall be submitted to the Service electronically seaturtle@fws.gov by December 31 of the year following construction. A report with the information from Terms and Conditions B10 and B11 shall be submitted to the Service by December 31 of the year for 3 years following construction.

B20. In the event a sea turtle nest is excavated during construction activities, the project turtle permit holder responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

Upon locating a dead or injured sea turtle adult, hatchling, egg, or beach mouse that may have been harmed or destroyed as a direct or indirect result of the project, the Corps, Applicant shall be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922) and the appropriate Service Field Office immediately (**Table 3**).

Care shall be taken in handling injured sea turtles, eggs or beach mice to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

REASONABLE AND PRUDENT MEASURES for:

C. Projects that include groin or jetty repair or replacement within the existing footprint shall include the following measures:

In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties:

C1. Groin or jetty repair or replacement projects shall not occur during the period of peak sea turtle egg laying and egg hatching (May 1 through October 31), to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

C2. Maintenance of groin or jetty projects conducted during the early (February 1 through April 30) and late sea turtle nesting season (November 1 through November 30) shall adhere to the following conditions:

  a. Install a barrier around the perimeter of the groin or jetty repair or replacement work area sufficient to prevent adult and hatchling sea turtles from accessing the project site.

  b. For projects conducted during the early and late sea turtle nesting season, construction equipment and materials shall be stored in a manner that will minimize impacts to sea turtles to the maximum extent possible.

  c. For projects conducted during the early and late sea turtle nesting season, no work may occur at night.

In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties:

C3. For maintenance of groin or jetty projects, conducted during the sea turtle nesting season.

  a. Daily surveys shall be conducted by sea turtle permit holders. Nests laid adjacent to the work area shall be marked by flag and rope for avoidance.

  b. A barrier shall be installed around the perimeter of the groin or jetty maintenance work area sufficient to prevent adult and hatchling sea turtles from accessing the project site.

  c. Construction equipment and materials shall be stored in a manner that will minimize impacts to sea turtles and beach mice to the maximum extent possible.

  d. No work shall occur at night.

In All Counties:

C4. If any safety lighting associated with the project is required, the Corps must coordinate with the Service. All safety lighting must be minimized to reduce the possibility of disrupting and disorienting nesting or hatchling sea turtles and nocturnal activities of beach mice. All lights shall be downward directed, full cut-off and fully shielded, and shall utilize long wavelength (greater than 590 nm) light sources.

C5. If entrapment of sea turtle hatchlings occurs in the groin or jetty system, the Corps shall meet with the Service to discuss a possible solution prior to the next nesting season.

C6. A report describing the projects conducted during the year and actions taken to implement the Reasonable and Prudent Measures and Terms and Conditions of this incidental take statement shall be submitted to the Service.

TERMS AND CONDITIONS for:

C. Projects that include groin or jetty repair or replacement within the existing footprint shall include the following conditions:

In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties:

C1. Groin or jetty repair or replacement projects shall be started after October 31 and be completed before May 1.

C2. For groin or jetty repair or replacement projects conducted during the early (before April 30) and/or late (after November 1) sea turtle nesting season (see Table 16):

a. A barrier (e.g., hay bales, silt screens) sufficient to prevent adult and hatchling sea turtles from accessing the project site shall be installed in a 100-foot buffer around the perimeter of the project site. The barrier shall be placed parallel to shore, at mean high water (MHW), as close to the groin or jetty as feasible, particularly during the period from sunset to sunrise. The Corps must contact the Service if there are any existing nests within the 100-foot buffer area.

b. On-beach access to the construction site shall be restricted to the wet sand below MHW to the maximum extent possible. Travel corridors on the beach to the MHWL shall be delineated. If the project is conducted during the early (before April 30) and/or late (after November 1) sea turtle nesting season (see Table 16), daily morning surveys shall be conducted within the travel corridor. If nests are laid within the travel corridor, the travel corridor must be re-routed to avoid the nest. If re-routing is not possible, these nests shall be relocated per the requirements listed in A9 (a)i through (a)iii.

c. Staging areas for construction equipment shall be located off the beach to the maximum extent possible.

d. No construction shall be conducted at night.

e. Daily early morning surveys for sea turtle nests shall be required as outlined in e(i) and e (ii). All nests laid in the vicinity of the project area shall be marked for avoidance per the requirements specified below:

   i. Nesting surveys and nest marking will only be conducted by persons with prior experience and training in these activities and who are authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at mtp@myfwc.com for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones). The Corps shall not initiate work until daily notice has been received from the sea turtle permit holder that the morning survey has been completed. Surveys shall be performed in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

   ii. Nests deposited within the project area and access areas shall be left in place and marked for avoidance unless other factors threaten the success of the nest (nest laid below debris line marking the typical high tide, erosion). The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. The actual location of the clutch will be determined and nests will be marked. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 10-foot radius around the nest. No activity shall occur within this area nor will any activity occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and that the nest has not been disturbed by the project activity. Nest relocation is only allowed if nests laid within the travel corridor (beach access to MHWL) cannot be rerouted to avoid the nest.

In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties:

C3. For groin or jetty repair or replacement projects conducted during the sea turtle nesting season (see Table 17):

a. Daily early morning surveys shall be conducted within the travel corridor.

b. A barrier (e.g., hay bales, silt screens) sufficient to prevent adult and hatchling sea turtles from accessing the project site shall be installed in a 100-foot buffer around the perimeter of the project site. The barrier shall be placed parallel to shore, at MHW, as close to the groin or jetty as feasible during the period from sunset to sunrise.

c. On-beach access to the construction site shall be restricted to the wet sand below MHW to the maximum extent possible. Travel corridors on the beach to the MHWL will be delineated. Nests laid within the travel corridor that would impede traffic will be relocated per the requirements listed in A9(a)i through (a)iii.. Nests laid in adjacent areas will be marked and avoided per the requirements listed in C(2)(e) i through iii. Staging areas for construction equipment shall be located off the beach to the maximum extent possible.

d. No nighttime construction may occur during the nesting season.

e. Material stockpiled on the beach shall only occur within the 200-foot barrier (100-foot area on either side). Construction activities shall not occur in any location prior to completion of the necessary sea turtle protection measures outlined below. If any nesting turtles are sighted on the beach, construction activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has marked the nest. All activities shall avoid the marked nest areas.

C4. All nests laid adjacent to the project area shall be marked for avoidance per the following requirements:

a. Nesting surveys and nest marking will only be conducted by persons with prior experience and training in these activities and who are authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC’s Imperiled Species Management Section in Tequesta at mtp@myfwc.com for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones). The Corps shall not initiate work until daily notice has been received from the sea turtle permit holder that the morning survey has been completed. Surveys shall be performed in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

i. Nests deposited within the project area and access areas shall be left in place and marked for avoidance unless other factors threaten the success of the nest (nest laid below debris line marking the typical high tide, erosion). The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. The actual location of the clutch will be determined and nests will be marked. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 10-foot radius around the nest. No activity shall occur within this area nor will any activity occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and that the nest has not been disturbed by the project activity. Nest relocation is only allowed if nests laid within the travel corridor (beach access to MHWL) cannot be rerouted to avoid the nest.

In All Counties:

C5. To the maximum extent possible within the travel corridor, all ruts shall be filled or leveled to the natural beach profile prior to completion of daily construction.

C6. Exterior lighting shall not be permanently installed in association with the project. Temporary lighting of the construction area during the sea turtle nesting season shall be reduced to the minimum standard required by OSHA for general construction areas. Lighting on all equipment including offshore equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water’s surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for general construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area and to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 15**).

C7. If entrapment of sea turtle hatchlings occurs in the groin or jetty system during construction, the Corps shall contact the Service immediately.

C8. A report describing the work conducted during the year and actions taken to implement the Reasonable and Prudent Measures and Terms and Conditions of this incidental take statement shall be submitted to the Service electronically to seaturtle@fws.gov by December 31 of each year when the activity has occurred. This report will include the following information:

Table 22. Information to include in the report following the project completion.

All projects	Project location (include Florida DEP R-monuments and latitude and longitude coordinates)
	Project description
	Dates of actual construction activities
	Names and qualifications of personnel involved in sea turtle nesting surveys and mark and avoid activities
	Nesting survey, mark and avoid activities, and nest relocation results

The Service believes that incidental take will be limited to the 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU (38 miles during an emergency year) and 18.9 miles of shoreline within the PFRU (64 miles during an emergency year) of beach that have been identified for sand placement. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that no more than the following types of incidental take will result from the proposed action: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the project areas; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the projects; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the sand placement areas or on adjacent beaches during and after sand placement or construction activities; (5) misdirection of nesting and hatchling turtles on beaches adjacent to the sand placement or construction area as a result of project lighting including the ambient lighting from dredges; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service. The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than a 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU (38 miles during an emergency year) and 18.9 miles of shoreline within the PFRU (64 miles during an emergency year) of sand on the of beach that have been identified for sand placement. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties, construction activities should be planned to take place outside the main part of the sea turtle nesting and hatching season (May 1 through October 31).
2. Work cooperatively with the Service, FWC, County or Municipality, to reduce sea turtle disorientations in the sand placement areas. After the annual report is completed, a meeting shall be set up with the Applicant, county or municipality, FWC, Corps, and the Service to discuss the survey report, as well as any documented sea turtle disorientations in or adjacent to the project area.
3. Work cooperatively with the Service to mimic the native beach berm elevation and beach slopes landward and seaward of the equilibrated berm crest. For all high density green turtle nesting beaches (http://ocean.floridamarine.org/SeaTurtleNesting/), the formation of a dune, either through direct creation or natural accretion, will be included in the project design. Prior to drafting the plans and specifications for a beach nourishment project, the Corps must meet with the Service, FWC, and FDEP to discuss the beach profile surveys, dune formation (specifically on high density green turtle nesting beaches), and the sea turtle monitoring reports from previous placement events.
4. If public driving is allowed on the project beach, and if the Corps has the authority, we recommend it exercise its discretionary authority to require the local sponsor or Applicant to have authorization from the Service for incidental take of sea turtles, their nests, and hatchlings and beach mice, as appropriate, due to such driving or provide written documentation from the Service that no incidental take authorization is required. If required, the incidental take authorization for driving on the beach should be obtained prior to any subsequent sand placement events.
5. Beach nourishment should not occur on publicly owned conservation lands during the sea turtle nesting season.
6. All created dunes should be planted with at least three species of appropriate native salt-resistant dune vegetation. Examples along the Atlantic coast include: bitter panicgrass, sea oats (grown from local genetic stock), beach morning-glory, or railroad vine. Examples along the Northwest Florida coast includes: bitter panicgrass, little bluestem (Schizachyrium scoparium), sea oats (grown from local genetic stock), beach morning-glory, or railroad vine. Examples along the Southwest Florida coast include: sea oats (grown from local genetic stock), bitter panicgrass, beach morning-glory, and railroad vine.
7. If the project area is within a local municipality that has not adopted a lighting ordinance, and lighting is shown to be an issue on a nourished beach, and if the Corps has the authority, we recommend it exercise its discretionary authority to require an ordinance be adopted prior to any subsequent sand placement event.

8. To increase public awareness about sea turtles and beach mice, informational signs should be placed at beach access points where appropriate. The signs should explain the importance of the beach to sea turtles and beach mice.
9. If the Corps has the authority, we recommend it exercise its discretionary authority to require predator control programs (including education of pet owners and cat colony supporters) should be implemented that target free-roaming cats.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. Reinitiation of formal consultation is also required ten years after the issuance of this SPBO. In instances where the amount or extent of incidental take is exceeded, any operations causing such take shall cease pending reinitiation.

The above findings and recommendations constitute the report of the Service. If you have any questions about this SPBO, please contact Ann Marie Lauritsen of this office at (904) 525-0661, Richard Zane of the Panama City Field Office at (850) 769-0552, or Jeffrey Howe of the South Florida Field Office at (772) 562-3909.

Sincerely,

Donald R. [illegible]

for Larry Williams
State Supervisor

cc:
FWC, Lake City, Florida (Melissa Tucker)
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FWC, Lake City, Florida (Terry Doonan)
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Service, Panama City, Florida, (Patricia Kelly, Lisa Lehnhoff)
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Service, Vero Beach, Florida (Jeffrey Howe)

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Appendix A

PREVIOUS FORMAL CONSULTATIONS/BIOLOGICAL OPINIONS WITHIN FLORIDA THAT HAVE BEEN ISSUED FOR ALL PROJECTS THAT HAD ADVERSE IMPACTS TO THE SEA TURTLES ON THE NESTING BEACH

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
STATEWIDE	Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Monroe, Miami-Dade, Collier, Lee, Charlotte, Sarasota, Manatee, Pinellas, Pasco, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, Escambia	FEMA Emergency Beach Berm Repair	2007-F-0430		Repair of 5-year beach berms post-disaster	75 miles
JAX FIELD OFFICE						
1991	Brevard	Lighting at Cape Canaveral Air Force and Patrick Air Force Station	4-1-91-028	Lighting at both installations	Sea turtle lighting	75 disoriented loggerhead nests; 2 green turtles nests at CCAFS and 2 loggerhead nests at PAFB
1993	Brevard	Beach nourishment on Cape Canaveral	4-1-93-073C		Beach nourishment	2 miles
1995	Brevard	Inlet Bypass on Brevard County Beach at Cape Canaveral		R-1 to R-14	Inlet bypass	
1996	Brevard	Canaveral Port Authority Dredge and Beach Disposal		R-34 to R-38	Dredge and beach restoration	
1998	Brevard	Inlet bypass on Brevard County Beach at Cape Canaveral		R-1 to R-14		
2000	Brevard	Amended Lighting at Cape Canaveral Air Force and Patrick Air Force Station	00-0545	Lighting at both installations	Sea turtle lighting	2 percent hatchling and nesting female disorientations at each installation.
2001	Brevard	Brevard County Shore Protection Project (North Reach)		R-5 to R-12 and R-13 to R-54.5	Beach nourishment	9.4 miles
2001	Brevard	Patrick Air Force Base Beach Restoration		R-53 to R-70	Beach nourishment	

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
2002	Brevard	Brevard County Shore Protection Project (South Reach)		R-123.5 to R-139	Beach nourishment	3.02 miles
2002	Brevard	Brevard County Shore Protection Project (North Reach)		R-4 to R-20	Beach nourishment	
2002	Brevard	Permanent Sand Tightening of North Jetty at Canaveral Harbor	02-1090	North jetty at Canaveral Inlet	Sand tightening and extension of existing jetty	500 feet
2003	Brevard	Brevard County Shore Protection Project (South Reach)		R-118.3 to R-123.5		0.94 mile
2004	Brevard	Canaveral Harbor Federal Sand Bypass and Beach Placement	04-0077	R-14 to R-20	Inlet bypass and beach nourishment	18,600 linear feet
2005	Brevard	Brevard County Shore Protection Project (North and South Reach)	05-0443	R-5 to R-20 and R-21 to R-54.5 and R-118 to R-139	Beach nourishment	13.2 miles
2005	Brevard	Brevard County FEMA Berm and Dune Restoration	05-1054	R-75 to R-118	Dune repair	12 miles
2005	Brevard	Patrick Air Force Base Beach Restoration	05-0258	R-54.5 to R-75.3	Beach nourishment	
2005	Brevard	Sloped Geotexile Revetment Armoring Structures	05-0454	5 tubes along north and south Melbourne beach	Protec tube installation	4,600 linear feet
2006	Brevard	Brevard County FEMA Berm and Dune Restoration	41910-2006-F-0189	R-75 to R-118	Dune repair	12 miles
2006	Brevard	Amended Lighting at Cape Canaveral Air Force and Patrick Air Force Station	41910-2006-F-0841		Sea turtle lighting	3 percent hatchling and nesting female disorientations at each installation
15 Feb 2008	Brevard	Patrick Air Force Base Dune Restoration	41910-2008-F-0150	R-65 to R-70	Dune restoration	6,000 linear feet
25 Jan 2008	Brevard	Brevard County's Dune Restoration	41910-2008-F-0189	R-75 to R-118 and R-138 to R-202	Dune restoration	140,000 cy along 3,000 linear feet
2009	Brevard	Brevard County's Dune Restoration	41910-2009-F-0125	R 75.4 to R 118.3 and R-139 to R-213	Dune restoration	22 miles
2009	Brevard	Mid Reach		R-75 to R119	Beach berm repair (permanent)	40,748 linear feet
2009	Brevard	South Beach		R-139 to R-215	Beach berm repair (permanent)	70,385 linear feet

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
2009	Brevard	Patrick Air Force Base Dune Restoration and Beach Nourishment	41910-2009-F-0336	R-36 to R-75, R-53 to R-65	Sand placement	8,500 linear feet for dune restoration and 11,235 linear feet for beach nourishment.
2009	Brevard	Brevard Dune Restoration	41910-2009-F-0125	R-75.4 to R-118.3, R-139 to R-213	Dune restoration	Periodically on no more than 22 miles.
2009	Brevard	Mid Reach Shore Protection	41910-2008-F-0547	R-119 to R-75.4	Sand placement	7.7 linear miles
2009	Brevard	Canaveral Harbor Sand Bypass	41910-2008-F-0547	Canaveral Harbor	Sand bypass	18,600 linear no more than every 2 years
2009	Brevard	Kennedy Space Center Lighting	41910-2009-F-0306			3% of all hatchling disorientation events
2009	Brevard	South Beach Renourishment	41910-2009-F-0327			7.8 miles
1991	Duval	Duval County Beach Erosion Control		R-44 to R-52.5	Beach nourishment	9,000 linear feet
1996	Duval	Duval County Beach Erosion Control		R-47 to R-80	Beach nourishment	5 miles
2003	Duval	Duval County Beach Erosion Control		R-72 to R-80	Beach nourishment	
2005	Duval	Duval County Beach Erosion Control	05-1544	R-43 to R-53 and R-57 to R-80	Beach nourishment	5.7 miles
2010	Duval	Duval County Hurricane and Storm Damage Reduction	2010-CPA-0045	V-501 to R-80	Beach nourishment	52,800 linear feet
2005	Flagler	Road Stabilization from SR A1A	41910-2006-IE-0173		Seawall	140 linear feet
2009	Flager	State Road (SR) A1A Shoreline Stabilization	41910-2007-F-0495	200 feet south of South 28th Street to 980 feet south of Osprey Point Drive	Sand placement, revetments, and seawalls	5.2 miles = length of take; 3,000 linear feet of anticipated incidental take
2005	Hillsborough	Egmont Key Nourishment	05-1845	R-2 to R-10	Beach nourishment	8,000 linear feet
1993	Manatee	Anna Maria Island Beach Restoration		R-2 to R-36	Beach nourishment	4.7 miles
1997	Manatee	Dredge Material Disposal and Longboat Key Beach Restoration		R-48 to R-51	Dredge and beach nourishment	
2002	Manatee	Anna Maria Island Beach Restoration		R-7 to R-10 and R-12 to R-36	Beach nourishment	5.2 miles
2005	Manatee	Anna Maria Island Shore Protection Project	41910-2006-F-0079	R-7 to R-10	Beach nourishment	3,000 linear feet

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2005	Manatee	Anna Maria Island Emergency Beach Restoration	05-1227	R-2 to R-41	Beach nourishment	4.2 miles
2005	Manatee	Town of Longboat Key Beach Renourishment	4-1-04-TR-4529	R-44.5 to R-46	Beach nourishment	0.34 mile
2007	Manatee	Longboat Key Groin Installation	41910-2007-F-0521		Groin installation	2,210 linear feet
2009	Manatee	Anna Maria Island Beach Nourishment	41910-2008-F-456	R-7 to R-10, R-35 +790 feet and R-41 +365 feet	Sand placement	8,000 linear feet
2010	Manatee	Longboat Key North End Nourishment	41910-2010-F-0301			4,015 linear feet of beach
1994	Nassau	South Amelia Island Beach Restoration		R-60 to R-78	Beach nourishment	
1997	Nassau	Dredging of Sawpit Creek Cut and Beach Disposal		R-73.5 to R-78	Dredge and beach nourishment	2,900 linear feet
2002	Nassau	South Amelia Island Beach Restoration		R-50 to R-80	Beach nourishment	3.4 miles
2002	Nassau	Fernandina Harbor Dredge and Beach Disposal		R-1 to R-9	Dredge and beach nourishment	8,000 linear feet
2004	Nassau	Nassau County Shore Protection Project at Amelia Island	05-1355	R-9 to R-33	Beach nourishment	3.6 miles
2005	Nassau	Nassau County Shore Protection Project at Amelia Island	05-1355	R-11 to R-34	Beach nourishment	4.3 miles
2005	Nassau	Dredging of Sawpit Creek Cut and Beach Disposal	41910-2006-F-0254	R-73.5 to R-78	Dredge and beach nourishment	2,900 linear feet
1988	Pinellas	Sand Key/Redington Beach Restoration		R-99 to R-107	Beach nourishment	
1990	Pinellas	Sand Key/Indian Rocks Beach Restoration		R-72 to R-85	Beach nourishment	
1991	Pinellas	Long Key Beach Restoration		R-144 to R-147	Beach nourishment	0.45 mile
1991	Pinellas	Johns Pass Dredge Material Disposal		R-127 to R-130	Dredge disposal and sand placement	
1992	Pinellas	Sand Key/Redington Beach Restoration		R-99 to R-107	Beach nourishment	
1992	Pinellas	Sand Key/Indian Shore Beach Restoration		R-85 to R-99	Beach nourishment	
1996	Pinellas	Treasure Island Beach Restoration		R-138 to R-142	Beach nourishment	2,500 linear feet
1996	Pinellas	Long Key Beach Restoration		R-144 to R-146	Beach nourishment	0.45 mile

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1998	Pinellas	Sand Key/Belleair Beach Restoration		R-56 to R-66	Beach nourishment	
1999	Pinellas	Sand Key Beach Restoration		R-71 to R-107	Beach nourishment	
2000	Pinellas	Treasure Island Beach Restoration		R-136 to R-141	Beach nourishment	2.0 miles
2000	Pinellas	Terminal Groin at North End of Treasure Island			Groin construction	
2000	Pinellas	Long Key Beach Restoration		R-144 to R-145.6	Beach nourishment	2,800 linear feet
2000	Pinellas	Dredge Material Disposal and Honeymoon Island Beach Restoration		R-10 to R-12	Dredge disposal and sand placement	
2004	Pinellas	Treasure Island Beach Restoration	04-1247	R-136 to R-141	Beach nourishment	5,000 feet
2004	Pinellas	Long Key Beach Restoration	04-1247	R-144 to R-148	Beach nourishment	4,000 linear feet
2005	Pinellas	Sand Key Emergency Renourishment	05-0627	R-56 to R-66 and R-72 to R-106	Beach nourishment	8.6 miles
2006	Pinellas	Treasure Island, Sunset, Long Key, Pass a Grill Emergency Renourishment	41910-2006-F-0480	R-126 to R-146	Beach nourishment	9.5 miles
2006	Pinellas	Dredge Material Disposal and Mullet Key and Fort DeSoto Beach Restoration	41910-2006-F-0692	R-177 to R-179.5 and R-181 to R-183	Dredge disposal and sand placement	4,500 linear feet
2009	Pinellas	Treasure Island Beach Nourishment	41910-2009-F-0250	R-136 to R-141, R-144 to R-148	Sand placement	11,375 linear feet
1997	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D	R-197 to R-209		
2001	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D			
2002	St. Johns	St. Johns County Shore Protection Project at St. Augustine		R-137 to R-152	Beach nourishment	2.5 miles
2003	St. Johns	St. Johns County Shore Protection Project at St. Augustine		R-132 to R-152	Beach nourishment	3.8 miles

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2003	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D	R-197 to R-209	Beach nourishment	
2005	St. Johns	St. Johns County Shore Protection Project at St. Augustine	05-0446	R-137 to R-150	Beach nourishment	2.5 miles
2006	St. Johns		TE091980-0		Beach driving	41.1 linear miles
2007	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	41910-2007-F-0305	R-200 to R-208	Beach nourishment	4,000 linear feet
2009	St. Johns	Beach berm repair		R-201 to R-203, R-207 to R-208	Beach berm repair	7,000 linear feet
2009	St. Johns	Matanzas Inlet Maintenance Dredge and Summer Haven Sand Placement	41910-2009-F-0462	R-200 to R-208	Sand placement	8,000 linear feet
2009	St. Johns	St. Augustine Shore Protection Project	41910-2009-F-0444	600 feet north of R-137 and 600 feet south of R-151	Sand placement	15,280 linear feet
2010	St. Johns	St. Augustine Inlet Dredge and Sand Placement	41910-2010-F-0105			20,000 linear feet
2004	Volusia	Volusia County FEMA Berm	05-1074	R-40 to R-145 and R-161 to R-208	Beach nourishment	
2005	Volusia	Ponce de Leon Dredge and Beach Placement	05-0884	R-143 to R-145	Dredge and sand placement	3,000 linear feet
2005	Volusia		TE811813-11		Beach driving	50 miles
2006	Volusia	New Smyrna/Silver Sands Dune Restoration	05-1007	R-161 to R-175	Beach restoration	5.4 miles
2006	Volusia	Volusia County FEMA Berm	41910-2006-F-0831		Repair of right of way and beach placement	230 linear feet
2007	Volusia	Ponce de Leon Dredge and Beach Placement	41910-2007-F-0109	R-158 to R-175	Dredge and sand placement	3.2 miles
2009	Volusia	Ponce de Leon Inlet Maintenance Dredging and Sand Placement	41910-2009-F-0362	R-143 to R-145	Sand placement	8,000 linear feet
PANAMA CITY FIELD OFFICE						
8 April 1998	Bay	Panama City Beach Beach Nourishment	4-P-97-108	R-4.4 and R-93.2	Beach nourishment new project	16 miles
24 June 1998	Bay	Tyndall AFB Driving on the Beach	4-P-98-020	V-9 (virtual) to R-122	Driving on the beach for military missions	18 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
31 July 1998	Bay	Lake Powell Emergency Opening	4-P-97-089	R- 0.5	Emergency outlet opening	1,500 feet
16 April 1999	Bay	Panama City Beach Beach Nourishment Amendment 1	4-P-97-108	R-0.5 to R-9	Beach nourishment completion	16 miles (no additional take provided from original)
9 March 2000	Bay	Panama City Beach Beach Nourishment Amendment 2	4-P-97-108	R-35 to R-71	Relief from tilling requirement beach nourishment	16 miles (no additional take provided from original)
10 April 2000	Bay	Panama City Beach Beach Nourishment Amendment 3	4-P-97-108	R-35 to R-71	Relief from tilling requirement beach nourishment	16 miles (no additional take provided from original)
18 December 2000	Bay	Panama City Beach Beach Nourishment Amendment 4	4-P-97-108	R-35 to R-71	Relief from tilling depth requirement and compaction testing sample numbers beach nourishment	16 miles (no additional take provided from original)
4 January 2001	Bay	East Pass Re-Opening	4-P-00-211	No R-monuments	Dredging of a closed inlet and dredged material placement on beach	2 miles
29 March 2001	Bay	Panama City Beach Beach Nourishment Amendment 5	4-P-97-108	R-35 to R-71	Relief from tilling depth requirement beach nourishment	16 miles (no additional take provided from original)
7 Sept 2001	Bay	City of Mexico Beach Sand Bypass System	4-P-01-178	Mexico Beach canal	Dredging and spoil disposal	3,700 feet 2.0 acres
14 January 2005	Bay	Panama City Beach Beach Nourishment Amendment 5	4-P-97-108	R-4.4 and R-93.2	Post hurricane restoration	16 miles (no additional take provided from original)
2006	Bay	Tyndall Air Force Base INRMP	4-P-05-240	V-9 (virtual) to R-122	Integrated Natural Resources Management Plan	18 miles
26 March 2006	Bay	Mexico Beach Canal Sand By Pass Amendment 1	4-P-05-281 2007-F-0205	R-127 to R-129	By pass system improvements	5,000 feet
24 May 2007	Bay	Panama City Beach Beach Nourishment Amendment 6	4-P-97-108 2007-TA-0127	R-4.5 to R-30 and R-76 to R-88	New work and post hurricane restoration	31,500 feet of 16 miles total no additional take provided
25 October 2007	Bay	Panama City Beach Nourishment Amendment 8	2008-F-0004	2008 project: R-74 to R-91; Entire project: R-0.5 to R-91	Beach nourishment	17.9 miles
29 Feb 2008	Bay	Panama City Harbor (revised BO)	2008-F-0168	R-97	Navigation channel maintenance dredging and beach placement of dredged material.	500 ft of beachfront at St. Andrew State Park

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
8 June 2009	Bay	Panama City Harbor Navigation Channel Amendment 1	2009-F-0175	R-92 to R-97	Maintenance navigation channel dredging and dredged material placement	0.85 mile
2009	Bay	City of Mexico Beach		R-128.5 to R-138.2	Beach berm repair (emergency)	9,393 linear feet
06 Jan 2010	Bay	Lake Powell Outlet Emergency Opening	2009-F-0226	R-0-A and R-1	Emergency opening of the outlet to the Gulf of Mexico	2,400 feet
7 August 2000	Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf, Franklin	Destin Dome OCS Offshore Oil and Gas Drilling	4-P-00-003	Gulf of Mexico federal waters	Oil and gas offshore exploration	Formal consultation with no take
3 June 2002	Escambia	Pensacola Beach Beach Nourishment	4-P-02-056	R-108 to R-143	Beach nourishment	8.3 miles Loggerhead 14 nests Green 1 nest Leatherback < 1 nest Kemp's ridley <1 nest
9 June 2009	Escambia	Perdido Key Beach Nourishment	2008-F-0059	R-1 to R-34	New beach nourishment	6.5 miles
9 Sept 2010	Escambia	Pensacola Navigation Channel	2009-F-0205; using statewide programmatic 41910-2010-F-0547	R-32 to R-64	Navigation channel maintenance and dredge material disposal	6.3 miles
11 Jan 2010	Escambia	FEMA Perdido Key Upland Berm	Using statewide programmatic 41910-2010-F-0547	R-21.5 to R-31.5	Post Tropical Storm Gustav berm	2.0 miles
8 April 2005	Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf	FEMA Beach Berms Post Hurricane Ivan Emergency Coordination (consultation incomplete)		UK	Emergency beach berms	Walton 20 miles Okaloosa 4.2 miles Mexico Bch 1 mile Panama City Bch UK St Joseph peninsula UK Perdido Key UK Navarre UK
10 May 2004	Franklin	Alligator Point Beach Nourishment	4-P-02-163	R-207 to R-210	Beach nourishment	2,500 feet Loggerhead,: 2 nests, green 1 nest; leatherback 1 nest
17 May 2007	Gulf	St. Joseph Peninsula Beach Nourishment	4-P-07-056 2007-F-0220	R-67 to R-105.5	Beach nourishment	7.5 miles
31 Jan 2008	Gulf	St. Joseph Peninsula Beach Nourishment; Amendment 2	2008-F-0161	R-67 to R-105.5	Beach nourishment – change from work in 2 to 1 season.	7.5 miles; no increase in IT.
2009	Gulf	St. Joseph Peninsula Beach		R-95.3 to R-105.5	Beach berm repair (emergency)	10,300 linear feet

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25 April 2001	Okaloosa	Eglin AFB Porous Groin within Season	4-P-00-207	Eglin AFB Test Sites 1 and 3	Experimental porous groin system	
18 June 2002	Okaloosa	Eglin 737 Sensor Test Site 13-A SRI	4-P-02-088	V-507	Military testing	0.01 acre 0.12 mile
2009	Okaloosa	City of Destin		R-17.37 to R-19	Beach berm repair (emergency)	1,260 linear feet
23 Dec 2009	Okaloosa	East Pass at Destin Navigation Channel	2009-F-0096	R-17 to R-25.5	Navigational channel maintenance	1.7 miles
21 March 2003	Okaloosa Santa Rosa	Eglin Marine Expeditionary Unit Training	4-P-03-052	V-621 to V-501	Military marine training	
9 October 2003	Okaloosa Santa Rosa	Eglin AFB U.S. Army Ranger Los Banos	4-P-03-289	V-502 to V-533	Military army training	7 miles
25 February 2004	Okaloosa, Santa Rosa	Eglin AFB Advance Skills Training	4-P-03-264	R-502 to R-534	Military training	7 miles 70 acres
4 June 2004	Okaloosa Santa Rosa	Eglin AFB Airborne Littoral Reconnaissance Test	4-P-04-225	V-501 to V-514	Military naval testing	0.5 mile 15.2 acres
1 December 2005	Okaloosa Santa Rosa	Eglin Air Force Base Military Mission & Training Santa Rosa Island Programmatic	4-P-05-242	V-621 to V-501	Military missions	17 miles
6 December 2007	Okaloosa Santa Rosa	Eglin AFB Airborne Littoral Reconnaissance Test	2008-F-0056	V-501 to V-514 Test Site A-15	Military naval testing	0.7 acre
3 June 2008	Okaloosa Santa Rosa	Eglin AFB Beach and Dune Restoration	2008-F-0139	V-551 to V-609 excluding non-AF lands and V-512 to V-518	Beach nourishment including dune restoration (new)	5.0 miles
28 August 2008	Okaloosa, Santa Rosa	Eglin Air Force Base Armoring Santa Rosa Island Test Sites A-3, A-6, A-13B	2008-F-061	Test Sites A-3, A-6, A-13B	Storm protection at air force facilities, Santa Rosa island	0.57 miles
21 April 2009	Okaloosa, Santa Rosa	East Pass Destin Navigation Channel	2009-F-0295	V-619.5 to V-621 and R-17	Maintenance navigation channel dredging and dredged material placement	1.6 miles
28 Dec 2009	Okaloosa, Santa Rosa	Eglin Air Force Base protection of Test Sites A-3, A-13, and A-13b	2008-F-061 amendment 1	V-608 and V-512	Sand placement 100% proposed at sites A-3 and 50% of proposed between sites A-13b and A-13.	A-3, = 7,000 feet; between A-13b and A-13.5=5,500-7,000 feet

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28 Dec 2009	Okaloosa, Santa Rosa	Eglin Air Force Base	2008-F-039 amendment 1	V-608 and V-512	Sand placement 100% proposed at sites A-3 and 50% of proposed between sites A-13b and A-13.	A-3, = 7,000 feet; between A-13b and A-13.5=5,500-7,000 feet
26 March 2002	Santa Rosa, Okaloosa, Gulf	Eglin AFB INRMP		V-621 to V-501	Integrated natural resources management program	17 miles
19 July 2005	Santa Rosa	Navarre Beach Nourishment Emergency Coordination (consultation incomplete)	4-P-04-244	R-192.5 to R-213.5	Emergency beach nourishment	4.1 miles
24 Aug 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
30 Aug 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
29 Nov 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
28 August 2008	Santa Rosa	Eglin AFB SRI Armoring at Test Sites	2008-F-0061	V-608, V-551, and V-512	Bulkheads around test sites A-3, A-6, and A-13B	0.57 mile
7 Dec 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
9 October 2009	Santa Rosa	Navarre Beach Restoration Amendment 7	2010-F-0036	R-192 to R-194	Emergency beach restoration	1,800 feet
30 April 2004	Walton, Okaloosa	Walton County-Destin Beach Nourishment	4-P-01-149	R-39 (Okaloosa Co.) to R-21.93 (Walton Co.)	New beach nourishment	6.7 miles Loggerhead: 11 nests; green 1 nests; leatherback & Kemp's ridley: < 1 nests
8 May 2006	Walton	Western Lake Emergency Opening	4-P-01-105	R-72 to R-73	Emergency outlet opening	0.5 miles 3.0 acres
26 October 2007	Walton	Eastern Lake Emergency Opening	2007-F-0627	R-94 to R-95	Emergency opening of coastal dune lake to GOM	0.5 mile

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9 November 2007	Walton	Alligator Lake Emergency Opening	2007-F-0031	R-68 to R-70	Emergency opening of coastal dune lake to GOM	0.5 mile
2 October 2008	Walton	Walton County Beach Nourishment Phase 2	2008-F-060	R-41 to R-67, R-78 to R-98, R-105.5 to R-127	Beach nourishment (new)	13.5 miles
SOUTH FLORIDA FIELD OFFICE						3,390 feet
11 March 2003	Broward	Broward County Shore Protection Project	4-1-99-F-506		Port Everglades dredging and beach nourishment	
4 Dec 2003	Broward	Diplomat Beach Nourishment	4-1-00-F-743		Nourishment and 200 feet of riprap	
25 Aug 2004	Broward	Fishermen's Pier	4-1-04-F-8366		Pier repair	14,910 square feet
18 June 2007	Broward	Hillsboro Inlet Maintenance Dredging and Sand Placement	41420-2006-FA-0896	315 feet of the Inlet and 500 feet of shoreline at R-25.	Inlet dredging and sand nourishment	500 feet
10 Dec 2007	Broward	Town of Hillsboro Beach Pressure Equalizing Modules (PEMs) Pilot Project	41420-2007-F-0859	300 feet north of R-7 to 100 feet south of R-12 1 mile of shoreline	Pilot project to investigate the effectiveness of the PEMs	1 mile
7 Mar 2008	Broward	Broward County Glass Cullet Pilot Project	41420-2007-FA-0599	Centered at R-103	Pilot project to examine the effectiveness of glass cullet as potential beach fill supplement material for shoreline stabilization.	333 feet
28 April 2008	Broward	Town of Hillsboro Truck Haul Beach Nourishment Project	41420-2008-FA-0187	330 feet north and 100 feet south of R-7	Temporary beach nourishment	0.08 mile (430 feet)
3 Sept 2008	Broward	Hillsboro Inlet Maintenance Dredging and Sand Placement	41420-2006-FA-0896	500 feet south of R-25	Inlet dredging and sand placement. This is an amended BO in regard to the original BO completed on 18 June 2007.	500 feet
28 May 2010	Broward	Port Everglades Jetty Repair	41420-2010-CPA-0144	South Jetty	Repair of the south jetty.	0.15 mile

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18 June 2010	Broward	Hillsboro Beach Sand Placement	41420-2008-FA-0187	R-5 +300 to R-12 +450 feet	Beach nourishment	1.35 miles
23 March 2005	Charlotte	Manasota Key Groin Construction	4-1-04-F-8338	R-19 to R-20	Stump Pass dredging (material placed on beach); and groin construction	1,000 feet
29 March 2006	Charlotte	Stump Pass Dredging and Beach Nourishment	4-1-04-F-8338	R-16.5 to R-18	Stump Pass dredging and beach nourishment	1,500 feet
26 April 2010	Charlotte	Stump Pass Dredging and Sand Placement	41420-2008-FA-0425	R-14.4 to R-20 R-22 to R-23 R-29 to R-39	Stump Pass dredging and sand placement	3.5 miles
3 April 2003	Collier	Keewaydin Island Limited Partnership T-Groin Project	4-02-F-1099	R-90 to R-91	Gordon Pass – maintenance dredge; nourish the section of beach where groins are to be constructed; construct three t-groins	1,000 feet
14 March 2005	Collier	Hideaway Beach	4-1-04-F-6342	H-1 to H-5 and H-9 to H-12	Beach nourishment and t-groin construction	1.4 miles
20 Sept 2005	Collier	Collier County Beach Re-Nourishment Project	4-1-04-TR-8709	Segments within R-22 and R-79	Beach nourishment	13.4 miles
14 Nov 2005	Collier	South Marco Island Beach Re-Nourishment	4-1-04-TR-11752	R-144 to G-2	Beach nourishment	0.83 mile
28 August 2008	Collier	Doctor's Pass North Jetty Repair	41420-2008-FA-0432	R-57 plus 500 feet south	Removing the existing 240 feet of existing jetty and constructing a new jetty within generally the same footprint.	0.25 mile
27 October 2009	Collier	Hideaway Beach Erosion Control	41420-2008-FA-0935	H-4 to H-9	Sand placement and construction of six T-head groins.	0.47 mile
18 August 2010	Collier	Gordon Pass Erosion Control Project – Phase 2 (T-head groins)	41420-2008-FA-0765	R-91 to R-92	Construction of two T-head groins.	0.19 mile
28 Oct 2010	Collier	Collier County Truck Haul Sand Placement (Park Shore & Naples Beach)	41420-2010-F-0225	R-45 +600 feet to R-46 +400 feet; R-58A -500 feet to R-58	A truck haul sand placement project	0.37 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
12 Oct 2004	Indian River	Issuance of Permits to Homeowners for Emergency Coastal Armoring	10(a)(1)(B) permit			3,196 feet
28 Feb 2005	Indian River	Indian River County Beach Nourishment - Sectors 3 and 5	4-1-05-F-10922	Gaps between R-21 and R-107	Dune restoration and beach nourishment	5.90 miles dunes 0.8 mile beach
22 Nov 2005	Indian River	Indian River County Beach Nourishment – Sector 7	4-1-05-TR-9179	R-97 to R-108	Beach nourishment	2.2 miles
31 Oct 2006	Indian River	Indian River County Beach Nourishment – Sectors 1 and 2	41420-2006-FA-1491	R-3.5 to R-12	Dune enhancement and beach nourishment	1.62 miles
10 Sept 2007	Indian River	Sebastian Inlet Channel and Sand Trap Dredging, Sectors 1 and 2 Beach Nourishment	41420-2007-F-0864	R-3 to R-12	Sand trap dredging and beach nourishment	1.61 miles
10 October 2008	Indian River	Baytree and Marbrisa Condominium Dune Restoration	41420-2008-FA-0007	200 feet south of R-46 to 200 feet south of R-48	Dune restoration/enhancement	0.38 mile
16 October 2009	Indian River	City of Vero Beach, Outfall Pipe Installation	41420-2009-FA-0255	220 feet north and 930 feet south of R-83	Outfall pipe installation	0.22 mile
2 December 2009	Indian River	Indian River County Beach Nourishment Sector 3	41420-2007-F-0839	Phase 1 = R-32 to R-55 Phase 2 = R-20 to R-32	Beach and dune nourishment	Phase 1 = ~4.4 miles Phase 2 = ~2.3 miles
24 July 2002	Lee	Gasparilla Island Beach Nourishment	4-01-F-765	R-10 to R-26.5 R-25, R-25.5, R-26	Beach nourishment; breakwater construction; and two t-head groins	3.2 miles
19 June 2003	Lee	Bonita Beach Re-nourishment	4-1-02-F-1736		Beach nourishment	3,922 feet
4 March 2005	Lee	Sanibel and Captiva Island Beach Nourishment	4-1-04-F-9180	R-83 to R-109 and R-110 to R-118	Beach nourishment	6.0 miles
14 March 2007	Lee	Gasparilla Island Beach Nourishment (BO amendment)	41420-2007-FA-0509	South of R-26A	Beach nourishment	
27 August 2007	Lee	North Captiva Island Beach Nourishment	41420-2007-FA-1023	R-81 and 208 feet south of R-81A	Beach nourishment	0.23 mile
5 August 2009	Lee	Matanzas Pass Reopening	41420-2009-FA-0132	North end of Estero Island	Channel dredging	0.14 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
21 March 2008	Lee	Blind Pass Reopening	41420-2006-FA-1549	R-109 to R-114	Reopening Blind Pass and then nourishing the shoreline between R-112 and R-114.	0.95 mile
7 Dec 2009	Lee	Sanibel Island Sand Placement	41420-2009-FA-0066	R-174A to Bay 1A	Beach nourishment	0.25 mile
15 Sept 2010	Lee	Big Hickory Island Sand Placement and Groin Construction	41420-2010-CPA-0100	R-222.3 to R-223.8	Beach nourishment and groin construction	0.47 mile
31 Jan 2002	Martin	Jupiter Island	4-1-05-TR-13281	R-75 to R-117	Beach nourishment	6.5 miles
5 Jan 2005	Martin	Martin County Shore Protection Project	4-1-05-F-10476	R-1 to R-25.6	Beach nourishment	4.1 miles
2 Dec 2005	Martin	Jupiter Island Modification	4-1-05-TR-13281	R-76 to R-84 and R-87 to R-11	Beach nourishment	5 miles
2 Feb 2007	Martin	Sailfish Point Marina Channel Dredging and Beach Nourishment	41420-2007-FA-0196	R-36 to R-39	Channel dredging and beach nourishment	0.66 mile
6 October 2009	Martin	Bathtub Beach Park Sand Placement	41420-2009-FA-0110	R-34.5 to R-36	Beach nourishment	0.24 mile
8 June 2010	Martin	Martin County Beach Erosion Control Project	41420-2009-FA-0190	R-1 to R-25	Beach nourishment	~ 4 miles
23 Sept 2005	Miami-Dade	Bal-Harbour T-Groin Reconstruction	4-1-05-12842	R-27 to R-31.5	Groin removal and reconstruction	0.85 mile
11 Oct 2005	Miami-Dade	Bakers Haulover AIW Maintenance Dredging	4-1-04-TR-8700	R-28 to R-32	Dredging and beach nourishment	0.85 mile
7 June 2006	Miami-Dade	Miami-Dade Beach Nourishment	41420-2006-FA-0028	3 segments within R-48.7 and R-61	Beach nourishment	3,716 feet
25 July 2007	Miami-Dade	Miami Beach Nourishment	41420-2006-F-0028	R-67 to R-70	BO modification to June 7, 2006 BO	3,000 feet
5 Nov 2008	Miami-Dade	Baker’s Haulover Dredging and Sand Placement	41420-2008-FA-0729	R-28 to R-32	BO modification to the October 11, 2005 BO. Dredging and sand placement events will be biannual.	4,000 feet
12 Nov 2008	Miami-Dade	DERM Truck Haul Sand Placement	41420-2008-FA-0776	R-27 to R-29 R-7 to R-12 R-43 to R-44+500 feet	Beach nourishment	1.78 miles
25 Nov 2009	Miami-Dade	DERM 27th Street Sand Placement	41420-2009-FA-0045	R-60 to R-61	Beach nourishment	0.19 mile
17 Dec 2009	Miami-Dade	32nd and 63rd Streets Sand Placement	41420-2009-FA-0415	R-37.75 to R-46.25 R-53.7 to R-55.5 R-60 to R-61	Sand placement	2.14 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
31 March 2010	Miami-Dade	55th Street Sand Placement	41420-2009-FA-0046	R-48.7 to R-50.7	Sand placement	0.38 mile
30 April 2010	Miami-Dade	44th Street Sand Placement	41420-2009-FA-0047	R-53.7 to R-55.5	Sand placement	0.34 mile
25 June 2010	Miami-Dade	Bal Harbour Sand Placement	41420-2009-FA-0593	R-29 to R-32	Sand Placement – truck haul	0.60 mile
28 June 2010	Miami-Dade	Sunny Isles BeachSand Placement	41420-2009-FA-0594	R-12 to R-15)	Sand Placement – truck haul	0.58 mile
30 July 2010	Miami-Dade	Miami Beach sand placement	41420-2009-FA-0595	R-45 to R-48 +700 feet	Sand Placement – truck haul	0.78 mile
13 Sept 2010	Miami-Dade	Miami Beach sand placement	41420-2009-FA-0527	R-43 to R-44 + 500 feet	Sand Placement – truck haul	0.26 mile
8 October 2010	Miami-Dade	Sunny Isles Beach Sand Placement	41420-2009-FA-0526	R-7 to R-12	Sand Placement – truck haul	0.95 mile
8 October 2010	Miami-Dade	Bal Harbour Sand Placement	41420-2009-FA-0525	R-27 to R-29	Sand Placement – truck haul	0.38 mile
2009	Monroe	Reclaimed sand placement and sand cleaning (seaweed removal)	41420-2010-F-0006	No R-monuments	Sand placement and cleaning	1,462 linear feet
2009	Monroe	City of Key West (South Beach)	41420-2010-F-0013	No R-monuments	Beach repair (emergency)	235 linear feet
2009	Monroe	City of Key West (Rest Beach)	41420-2010-F-0014	No R-monuments	Beach repair (emergency)	640 linear feet
2009	Monroe	City of Marathon, Sombrero Beach	41420-2010-F-0001	No R-monuments	Beach repair (emergency)	1,380 linear feet
5 March 2010	Monroe	City of Key West – Simonton Beach	41420-2010-FC-0412	Approximately 350 feet ENE of V-416 (latitude 24.562, longitude -81.8054	Emergency beach repair	95 linear feet
5 March 2010	Monroe	City of Key West – Dog Beach	41420-2010-FC-0413	Between V-414 and V-413 (latitude 24.5473, longitude -81.7929	Emergency beach repair	35 linear feet
13 May 2010	Monroe	City of Key West, Smathers Beach	41420-2008-FA-0185	No R-monuments	Sand placement	0.57 mile
27 March 2003	Palm Beach	Palm Beach Harbor M & O	4-1-03-F-139	200 feet south of the south jetty	Jetty sand tightening	200 feet
16 March 2004	Palm Beach	Boca Raton Inlet Sand Bypassing	4-1-04-F-4688	200 feet south of R-223	Inlet sand bypassing and beach nourishment	500 feet
11 Feb 2005	Palm Beach	Palm Beach Shoreline Protection Project - Delray Segment	4-1-05-F-10767	R-175 to R-188	Beach restoration	2.7 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
24 Feb 2005	Palm Beach	Palm Beach Shoreline Protection Project - Ocean Ridge Section	4-1-05-F-10787	R-153 to R-159	Beach nourishment	1.12 miles
11 April 2005	Palm Beach	South Lake Worth Inlet Sand Transfer Plant Reconstruction and Bypassing	4-1-04-F-8640	135 feet south of R-151, to 275 feet south of R-152	STP reconstruction and bypassing	900 feet
5 Dec 2005	Palm Beach	Mid-Town Beach Nourishment Project (Reach 3 & 4)	4-1-00-F-742	R-90.4 to R-101.4	Beach nourishment	2.4 miles
23 Dec 2005	Palm Beach	Palm Beach Harbor M & O	4-1-05-TR-13258	R-76 to R-79	Dredging and beach nourishment	3,450 feet
23 Feb 2006	Palm Beach	Boca Raton Central Beach Nourishment Project	4-1-01-F-1795	R-216 to R-222	Dredge shoal fronting Boca Raton Inlet and beach nourishment	1.3 miles
23 Feb 2006	Palm Beach	Boca Raton South Beach Nourishment Project	41420-2008-FA-0777 Old database number 41-01-F-652	R-223.3 to R-227.9	Dredge shoal fronting Boca Raton Inlet and beach nourishment	Approx. 1 mile
28 April 2006	Palm Beach	Palm Beach Nourishment Project – Reach 8	41420-2006-F-0018	R-125 to R-134	Beach nourishment	2.17 miles
31 July 2006	Palm Beach	Sea Dunes Condominium Seawall	41420-2006-FA-1108		Seawall construction	0.03 acre
15 Dec 2006	Palm Beach	North Ocean Boulevard Rock Revetment	41420-2006-FA-1490	290 feet north of R-84; 1,150 feet south of R-85	Rock revetment construction	0.34 mile
5 Feb 2007	Palm Beach	Palm Beach Sand Transfer Plant Reconstruction	41420-2006-FA-1447	R-76 to R-79	Sand transfer plant reconstruction and discharge pipe extension	0.57 mile
28 March 2007	Palm Beach	Lake Worth Inlet Jetty Repair	41420-2007-FA-0221	200 feet north of R-75 and 200 feet south of R-76	Jetty repair	400 feet
25 May 2007	Palm Beach	Singer Island and South Palm Beach Emergency Dune Restoration	41420-2007-FA-1001	385’ south of R-137 to 500’ north of R-136; 500’south of R-60 to 850’ south of R-65	Dune Restoration	6,135 feet
25 May 2007	Palm Beach	Jupiter Island ICWW Maintenance Dredging and Beach Nourishment	41420-2006-FA-1582	16,000 feet (130,000 cy) of the ICWW dredged; material placed between R-13 and R-19.	Channel dredging and beach nourishment	1.04 miles
20 July 2007	Palm Beach	North Boca Raton Beach Nourishment	41420-2007-FA-0477	T-205 to 181 feet south of R-212	Beach nourishment	1.45 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
9 Nov 2007	Palm Beach	Jupiter Inlet and channel dredging	41420-2006-FA-1582	R-13 to R-17	Dune restoration	~ 4,000 linear feet
14 Nov 2007	Palm Beach	Jupiter Inlet Sand Trap Dredging and Sand Placement	41420-2007-FA-0600	Maintenance dredging of the inlet; beach compatible placed R-13 to R-19	Inlet dredging and beach nourishment	1.02 miles
28 Nov 2007	Palm Beach	Modification to a Sheet Pile and Rubble-Mound T-Head Groin System	41420-2007-FA-0574	500 feet north of R-94 south to R-95	T-groin repair, extension, construction	0.4 mile
5 Feb 2008	Palm Beach	Reach 8 Dune Restoration	41420-2006-F-0018	R-125 to 350 feet south of R-134	Dune restoration	2.17 miles
9 Sept 2008	Palm Beach	Juno Beach Sand Placement	41420-2008-FA-0081	R-26 to R-38	Sand placement	2.45 miles
4 Nov 2008	Palm Beach	Palm Beach Harbor M&O and Sand Placement	41420-2008-FA-0524	R-76 to R-79	Biannual Inlet dredging and sand placement events.	3,450 feet
2009	Palm Beach	Beach berm repair	41420-2010-F-0008	R-60 to R-68	Beach berm repair (permanent work)	6,880 linear feet
2009	Palm Beach	Beach berm repair	41420-2010-F-0009	R-135 to R-138	Beach berm repair (permanent work)	3,590 linear feet
2009	Palm Beach	Beach berm repair	41420-2010-F0010	R-137 to R-138	Beach berm repair (emergency)	125 linear feet
21 June 2010	Palm Beach	Mid-Town Reaches 3 & 4 Sand Placement	41420-2006-F-0011-R001	R-95 to R-100	Beach nourishment	0.95 mile
2 July 2010	Palm Beach	Phipps Ocean Park Reaches 7&8	41420-2010-CPA-0110	R-116 to R-125	Sand Placement	3.4 miles
3 Sept 2010	Palm Beach	Singer Island Breakwater	41420-2008-FA-0019	R-60.5 to R-66	Segmented, submerged breakwater	1.1 miles
19 June 2003	St. Lucie	Fort Pierce Shoreline Protection	4-1-03-F-1867 41420-2006-FA-1575	R-33.8 to R-41	Beach nourishment; berm expansion; and six t-head groins	1.3 miles
9 March 2006	St. Lucie	Blind Creek Restoration and South St. Lucie Emergency Berm Remediation Project	41420-2006-FA-0075	R-98 to R-115 R-88 to R-90	Wetland restoration and beach nourishment	3.6 miles
27 June 2008	St. Lucie	Fort Pierce Shoreline Protection Project	41420-2006-FA-1575	R-34 to R-41	Beach nourishment, berm expansion, and six t-head groins	1.3 miles
25 Aug 2004	Sarasota and Manatee	Longboat Key Beach Nourishment	4-1-04-F-4529	R-46A to R-29.5	Beach nourishment	9.45 miles
4 Oct 2005	Sarasota and Manatee	Longboat Key Beach Nourishment Project – BO Amendment	4-1-04-TR-4529	R-44 to R-44.5 and R-46A to R-44.5	Beach nourishment	0.47 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
20 Oct 2005	Sarasota	South Siesta Key	4-1-05-TR-12691	R-67 to R-77 plus 200 feet	Beach nourishment	2.1 miles
7 Dec 2007 (original BO) 28 July 08 (BO mod)	Sarasota	Lido Key Beach Fill Placement Project	41420-2007-F-0841	R-35.5 to R-44.2 2.27 miles	Beach nourishment with 425,000 cy of fill material.	2.27 miles
13 August 2008	Sarasota	Longboat Key Permeable Adjustable Groins	41420-2007-FA-0205	R-13 to R-13.5	Construction of two permeable adjustable groins.	0.09 mile project area 0.43 mile action area
2009	Sarasota		41420-2010-F-0003	R-77 to midpoint between R-77 and R-76	Beach restoration	700 linear feet
2009	Sarasota	Longboat Key Beach	41420-2010-F-0007	R-13 to R-14 Sarasota County; R-44 to R-5, and R-48.5 to R-49.5 Manatee County	Beach berm repair	951, 1,197, and 1,142 linear feet, respectively

Appendix B

NMFS Consultations

CONSULTATION ACTIVITY	TYPE OF ACTION	DATE SIGNED	ACTION AREA	INCIDENTAL TAKE STATEMENT (ANTICIPATED TAKE)									
				Loggerhead (NWAO & NP DPS)		Green Turtle		Leatherback		Hawksbill		Kemp's Ridley Olive Ridley	
				Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Non-Fishery Consultations													
North Carolina DENR Inshore Gillnet-Incidental Take Permit	Section 10(a)(1)(B)	9/6/13	North Carolina Inshore Waters	1-yr Estimate									
						330	165					98	49
				1-yr Observed									
				24		18		8		8		12	
Removal of Offshore Structures in the Gulf of Mexico Outer Continental Shelf	Oil & Gas	8/28/2006	Gulf of Mexico	6-yr Estimate									
				15*	0	3*	0	3*	0	3*	0	3*	0
Sinking Exercises (SINKEX) in the Western North Atlantic Ocean	Military	9/22/2006	Western North Atlantic Ocean	1-yr Estimate									
				ITS - We do not have information to determine an amount of take. Survey data for the SINKEX location is extremely limited and the densities or abundance of sea turtles within the area is not known. Therefore, we anticipate the extent of take would be within the water column that would be affected by the shock and pressure waves above levels of 12 psi and 182 dB re 1 µ Pa2-sec in the greatest 1/3 octave band. For the largest underwater detonations, the extent includes the volume within 2 nmi of the detonation. Thus, the extent of take includes the “exclusion zone” of the SINKEX.									
Issuance of multiple permits to conduct scientific research on Atlantic sturgeon pursuant to section 10 (a)(1) of the Endangered Species Act of 1973	Section 10(a)(1)(A) for Sturgeon Research	4/2/2012	U.S. Atlantic Coast (from ME to FL)	Anticipated take for the entire research permit (5 years)									
				4*	0	4*	0	4*	0	4*	0	4*	0
National Science Foundation - Marine Seismic Survey in the Central Pacific Ocean	Seismic	11/23/2011	Central Pacific Ocean	Anticipated take for the entire project period									
				ITS - We do not have information to determine an amount of take. Harassment of these sea turtles is expected to occur at received levels of seismic sounds above 166 dB re 1 µPa. Because density estimates of sea turtles in the survey area are unknown, we estimate take as the number of turtles exposed to seismic operations above 166 dB re 1 µPa during the proposed activities. These turtles could be of all ages and life stages in the survey area.									
Navy - Conduct of training in the Virginia Capes, Cherry Point and Jacksonville Range Complexes June 2011 to June 2012	Navy Activities	6/1/2011	Central Pacific Ocean	Anticipated take for the entire project period									
				485	9	311*	3*	20	1	311*	3*	557	5

Appendix C

ASSESSMENTS: DISCERNING PROBLEMS CAUSED BY ARTIFICIAL LIGHTING

LIGHTING INSPECTIONS

WHAT ARE LIGHTING INSPECTIONS?

During a lighting inspection, a complete census is made of the number, types, locations, and custodians of artificial light sources that emit light visible from the beach. The goal of lighting inspections is to locate lighting problems and to identify the property owner, manager, caretaker, or tenant who can modify the lighting or turn it off.

WHICH LIGHTS CAUSE PROBLEMS?

Although the attributes that can make a light source harmful to sea turtles are complex, a simple rule has proven to be useful in identifying problem lighting under a variety of conditions:

An artificial light source is likely to cause problems for sea turtles if light from the source can be seen by an observer standing anywhere on the nesting beach.

If light can be seen by an observer on the beach, then the light is reaching the beach and can affect sea turtles. If any glowing portion of a luminaire (including the lamp, globe, or reflector) is directly visible from the beach, then this source is likely to be a problem for sea turtles. But light may also reach the beach indirectly by reflecting off buildings or trees that are visible from the beach. Bright or numerous sources, especially those directed upward, will illuminate sea mist and low clouds, creating a distinct glow visible from the beach. This “urban skyglow” is common over brightly lighted areas. Although some indirect lighting may be perceived as nonpoint-source light pollution, contributing light sources can be readily identified and include sources that are poorly directed or are directed upward. Indirect lighting can originate far from the beach. Although most of the light that sea turtles can detect can also be seen by humans, observers should realize that some sources, particularly those emitting near-ultraviolet and violet light (e.g., bug-zapper lights, white electric-discharge lighting) will appear brighter to sea turtles than to humans. A human is also considerably taller than a hatchling; however, an observer on the dry beach who crouches to the level of a hatchling may miss some lighting that will affect turtles. Because of the way that some lights are partially hidden by the dune, a standing observer is more likely to see light that is visible to hatchlings and nesting turtles in the swash zone.

HOW SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Lighting inspections to identify problem light sources may be conducted either under the purview of a lighting ordinance or independently. In either case, goals and methods should be similar.

GATHER BACKGROUND INFORMATION

Before walking the beach in search of lighting, it is important to identify the boundaries of the area to be inspected. For inspections that are part of lighting ordinance enforcement efforts, the jurisdictional boundaries of the sponsoring local government should be determined. It will help to have a list that includes the name, owner, and address of each property within inspection area so that custodians of problem lighting can be identified. Plat maps or aerial photographs will help surveyors orient themselves on heavily developed beaches.

PRELIMINARY DAYTIME INSPECTIONS

An advantage to conducting lighting inspections during the day is that surveyors will be better able to judge their exact location than they would be able to at night. Preliminary daytime inspections are especially important on beaches that have restricted access at night. Property owners are also more likely to be available during the day than at night to discuss strategies for dealing with problem lighting at their sites.

A disadvantage to daytime inspections is that fixtures that are not directly visible from the beach will be difficult to identify as problems. Moreover, some light sources that can be seen from the beach in daylight may be kept off at night and thus present no problems. For these reasons, daytime inspections are not a substitute for nighttime inspections. Descriptions of light sources identified during daytime inspections should be detailed enough so that anyone can locate the lighting. In addition to a general description of each luminaire (e.g., HPS floodlight directed seaward at top northeast corner of the building at 123 Ocean Street), photographs or sketches of the lighting may be necessary. Descriptions should also include an assessment of how the specific lighting problem can be resolved (e.g., needs turning off; should be redirected 90° to the east). These detailed descriptions will show property owners exactly which luminaries need what remedy.

NIGHTTIME INSPECTIONS

A nighttime survey shall be conducted of all lighting visible from the beach placement area by the FWC permit holder, using standard techniques for such a survey. During the nighttime lighting surveys, the surveyor shall walk the length of the beach placement area looking for light from artificial sources. During the nighttime lighting surveys, a complete census shall be made of the number, types, locations, and custodians of artificial light sources that emit light visible from the beach. Because problem lighting will be most visible on the darkest nights, lighting inspections are to be conducted when there is no moon visible. Descriptions of light sources identified during the survey should be detailed enough so that anyone can locate the lighting. In addition to a general description of each luminaire (e.g., HPS floodlight directed seaward at top northeast corner of the building at 123 Ocean Street), photographs or sketches of the lighting may be necessary. Descriptions should also include an assessment of how the specific lighting problem can be resolved (e.g., needs turning off; should be redirected 90° to the east, etc.). A summary report of the survey shall be submitted to the Corps, FWC, and the Service.

Surveyors orienting themselves on the beach at night will benefit from notes made during daytime surveys. During nighttime lighting inspections, a surveyor walks the length of the nesting beach looking for light from artificial sources. There are two general categories of artificial lighting that observers are likely to detect:

1. **Direct lighting**. A luminaire is considered to be direct lighting if some glowing element of the luminaire (e.g., the globe, lamp [bulb], reflector) is visible to an observer on the beach. A source not visible from one location may be visible from another farther down the beach. When direct lighting is observed, notes should be made of the number, lamp type (discernable by color; style

of fixture), mounting (pole, porch, *etc.*), and location (street address, apartment number, or pole identification number) of the luminaire(s). If exact locations of problem sources were not determined during preliminary daytime surveys, this should be done during daylight soon after the nighttime survey. Photographing light sources (using long exposure times) is often helpful.

2. **Indirect lighting**. A luminaire is considered to be indirect lighting if it is not visible from the beach but illuminates an object (e.g., building, wall, tree) that is visible from the beach. Any object on the dune that appears to glow is probably being lighted by an indirect source. When possible, notes should be made of the number, lamp type, fixture style, and mounting of an indirect-lighting source. Minimally, notes should be taken that would allow a surveyor to find the lighting during a follow-up daytime inspection (for instance, which building wall is illuminated and from what angle?).

WHEN SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Because problem lighting will be most visible on the darkest nights, lighting inspections are ideally conducted when there is no moon visible. Except for a few nights near the time of the full moon, each night of the month has periods when there is no moon visible. Early-evening lighting inspections (probably the time of night most convenient for inspectors) are best conducted during the period of two to 14 days following the full moon. Although most lighting problems will be visible on moonlit nights, some problems, especially those involving indirect lighting, will be difficult to detect on bright nights.

A set of daytime and nighttime lighting inspections before the nesting season and a minimum of three additional nighttime inspections during the nesting-hatching season are recommended. The first set of day and night inspections should take place just before nesting begins. The hope is that managers, tenants, and owners made aware of lighting problems will alter or replace lights before they can affect sea turtles. A follow-up nighttime lighting inspection should be made approximately two weeks after the first inspection so that remaining problems can be identified. During the nesting-hatching season, lighting problems that seemed to have been remedied may reappear because owners have been forgetful or because ownership has changed. For this reason, two midseason lighting inspections are recommended. The first of these should take place approximately two months after the beginning of the nesting season, which is about when hatchlings begin to emerge from nests. To verify that lighting problems have been resolved, another follow-up inspection should be conducted approximately one week after the first midseason inspection.

WHO SHOULD CONDUCT LIGHTING INSPECTIONS?

Although no specific authority is required to conduct lighting inspections, property managers, tenants, and owners are more likely to be receptive if the individual making recommendations represent a recognized conservation group, research consultant, or government agency. When local ordinances regulate beach lighting, local government code-enforcement agents should conduct lighting inspections and contact the public about resolving problems.

WHAT SHOULD BE DONE WITH INFORMATION FROM LIGHTING INSPECTIONS?

Although lighting surveys serve as a way for conservationists to assess the extent of lighting problems on a particular nesting beach, the principal goal of those conducting lighting inspections should be to ensure that lighting problems are resolved. To resolve lighting problems, property managers, tenants, and owners should be give the information they need to make proper alterations to light sources. This information should include details on the location and description of problem lights, as well as on how the lighting problem can be solved. One should also be prepared to discuss the details of how lighting affects sea turtles. Understanding the nature of the problem will motivate people more than simply being told what to do.

Appendix D
Sea Turtle Lighting Survey Form

Lighting Survey Form

The lighting survey must be conducted to include a landward view from the seaward most extent of the beach profile. The survey must occur after 9 p.m. The survey must follow standard techniques for such a survey and include the number and type of visible lights, location of lights and photo documentation.

Date: ____

Contact information of person conducting the lighting survey: __________________________

____

Location (name of beach): ________________________________

Lighting ordinance (applicable County or Municipality): ________________________________

Compliance Officer name and contact information: ____________________________________

Survey start time: _______

Survey end time: _______

Survey start location (include address or GPS location):______________________

____

____

Survey end location (include address or GPS location): ______________________

____

Date summarizing report sent to the following: marineturtle@myfwc.com, JCPCompliance@dep.state.fl.us, and seaturtle@fws.gov:__________________________________

County or Municipality contact information for follow up meeting with the FWS and FWC:

____

For each light visible from the nesting beach provide the following information:

Location of light (include cross street and nearest beach access)	GPS location of light	Description of light (type and location)	Photo take (YES/ NO)	Notification letter with recommendations sent? (YES/NO)

Location of light (include cross street and nearest beach access)	**GPS location of light**	**Description of light (type and location)**	**Photo take (YES/ NO)**	**Notification letter with recommendations sent? (YES/NO)**

Appendix E

Nesting Seabird and Shorebird Protection Conditions

a. Selection of Bird Monitors. The Permittee or designated representative ("Permittee") shall hire one or more Bird Monitors, depending on the size of the area to be affected, who shall monitor shorebird and seabird (shorebird) activity before, during, and after construction. Bird Monitors shall have proven seabird and shorebird identification skills and avian survey experience. Before hiring any Bird Monitors, the Representative shall provide a list of candidate Bird Monitors with (1) their contact information and (2) a summary of their qualifications, including bird identification skills and avian survey experience, to the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit) and copied to JCPCompliance@dep.state.fl.us for FWC approval before the Permittee hires the Bird Monitor(s).

b. The Bird Monitor(s) shall review and become familiar with the general information on the FWC's Florida Shorebird Database (FSD) website (www.FLShorebirdDatabase.org). They shall use the data-collection protocol and implement data-entry procedures as outlined in that website. An outline of data to be collected, including downloadable field data sheets, is available on the website.

c. Breeding season varies by species. Most species have completed the breeding cycle by September 1, but flightless young may be present through September. The following dates are based on the best available information regarding ranges and habitat use by species for this project: February 15 – September 1.

   Surveys during the breeding season shall begin on the first day of the breeding season or 10 days before any site work begins, whichever is later. Surveys shall be conducted through August 31 or until all breeding activity has concluded, whichever is later.

d. During the breeding season, the Bird Monitor(s) shall survey all potential beach-nesting bird habitats that may be affected by construction or pre-construction activities. The Bird Monitor(s) shall establish one or more shorebird survey routes in the FSD website to cover these areas.

e. During the pre-construction and construction phases of the project, the Bird Monitor(s) shall complete surveys on a daily basis to detect breeding activity and the presence of flightless chicks before (1) equipment is moved to the area, (2) vehicles are operated in the area, or (3) any other activities occur that have the potential to disrupt breeding behavior or cause harm to the birds or their eggs or young. Once construction is completed and all personnel and equipment have been removed from the beach, surveys may be conducted at weekly intervals.

f. The Bird Monitor(s) shall survey the project area by walking and looking for evidence of (1) shorebirds exhibiting breeding behavior, (2) shorebird chicks, or (3) shorebird juveniles, as outlined in the FSD's Breeding Bird Protocol for Shorebirds and Seabirds. The Bird Monitor(s) shall use binoculars for these surveys.

g. If an ATV or other vehicle is needed to cover large project areas, operators shall adhere to the FWC's Best Management Practices for Operating Vehicles on the Beach (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/). Specifically, the vehicle shall be operated at a speed under 6 mph and only on beaches at or below the high-tide line. The Bird Monitor(s) shall stop at no greater than 200-meter intervals to look for breeding activity.

h. Once the Bird Monitor(s) confirms that birds are breeding, as evidenced by the presence of a scrape, eggs, or young, the Bird Monitor(s) shall notify the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit) within 24 hours. The Bird Monitor(s) shall report all breeding activity to the FSD website within one week of data collection.

Seabird and Shorebird Buffer Zones and Travel Corridors

The Bird Monitor(s) shall establish a disturbance-free buffer zone around any location within the project area where shorebirds have been engaged in breeding behavior, including territory defense. The FWC considers a 300-foot-wide buffer to be adequate based on published studies; however, a smaller, site-specific buffer may be established if approved by the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit). All sources of human disturbance (including pedestrians, pets, and vehicles) shall be prohibited in the buffer zone.

a. The Bird Monitor(s) shall keep breeding sites under sufficient surveillance to determine if birds appear agitated or disturbed by construction or other activities in adjacent areas. If birds do appear to be agitated or disturbed by these activities, then the Bird Monitor(s) shall widen of the buffer zone immediately to a sufficient size to protect breeding birds.

b. The Bird Monitor(s) shall ensure that reasonable and traditional pedestrian access is not blocked in situations where breeding birds will tolerate pedestrian traffic. This is generally the case with lateral movement of beach-goers walking parallel to the beach at or below the highest tide line. Pedestrian traffic may also be tolerated when breeding was initiated within 300 feet of an established beach access pathway. The Bird Monitor(s) shall work with the FWC Regional Species Conservation Biologist to determine if pedestrian access can be accommodated without compromising nesting success.

c. The Bird Monitor(s) shall ensure that the perimeters of designated buffer zones are marked with posts, twine, and signs stating "Do Not Enter, Important Nesting Area" or similar language. The signs shall include the name and a phone number of the entity responsible for posting. Posts shall not be higher than 3 feet once installed. "Symbolic fencing" (i.e., twine, string, or rope) shall be placed between all posts and be clearly visible to pedestrians. In areas where marine turtles nest, the ropes shall be at least 2.5 feet above the ground. If pedestrian pathways are approved by the FWC Regional Species Conservation Biologist within the 300-foot buffer zone, these shall be clearly marked. The Bird Monitor(s) shall ensure that the posting is maintained in good repair until breeding is completed or terminated. Although solitary nesters may leave the buffer zone with their chicks, the posted area continues to provide a potential refuge for the family until breeding is complete. Breeding is not considered to be completed until all chicks have fledged.

d. The Bird Monitor(s) shall ensure that no construction activities, pedestrians, moving vehicles, or stockpiled equipment are allowed within the buffer area.

e. The Bird Monitor(s) shall designate and mark travel corridors outside the buffer areas so as not to cause disturbance to breeding birds. Heavy equipment, other vehicles, or pedestrians may go past breeding areas in these corridors. However, other activities such as stopping or turning heavy equipment and vehicles shall be prohibited within the designated travel corridors adjacent to the breeding site.

f. When flightless chicks are present on the beach, the Bird Monitor(s) shall accompany any moving vehicles or equipment to ensure that no chicks are in the path of the moving vehicle and no tracks are left that could trap flightless chicks.

g. The FWC recommends that the Bird Monitor(s) ensure that some activity in the travel corridor is maintained on a daily basis in order to discourage birds from nesting within the travel corridor. These activities shall not be allowed to disturb shorebirds nesting on site or interfere with marine turtle nesting, especially if the corridors are established before construction has started.

h. *Notification.* If the Bird Monitor(s) find that shorebirds are breeding within the project area, he or she shall ensure that an informational bulletin board is placed and maintained in the construction staging area. This bulletin board shall display the location map of the construction site, depict the location(s) of the bird breeding areas, and include a clearly visible warning stating: "NESTING BIRDS ARE PROTECTED BY LAW INCLUDING THE FLORIDA ENDANGERED AND THREATENED SPECIES ACT AND THE STATE AND FEDERAL MIGRATORY BIRD ACTS".

Post-construction Conditions, Monitoring and Reporting

i. Shorebird: If beach cleaning will occur on the nourished beach, a minimum of 30 percent of the biotic material within the wrack line shall be left on the beach post-cleaning at the strand line in a natural configuration to ensure that the nourished beach re-establishes its function as foraging habitat for shorebirds. This shall occur for as long as the placed sand remains on the beach.

Appendix F

EXAMPLES OF PREDATOR PROOF TRASH RECEPTACLES

Example of predator proof trash receptacle at Gulf Islands National Seashore. Lid must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle anchored into the ground so it is not easily turned over.

Example of predator proof trash receptacle at Perdido Key State Park. Metal trash can is stored inside. Cover must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle must be secured or heavy enough so it is not easily turned over.

APPENDIX E5

USFWS PROGRAMMATIC PIPING PLOVER BIOLOGICAL OPINION TERMS AND CONDITIONS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

May 22, 2013

Eric P. Summa
Chief, Environmental Branch (PD-E)
U.S. Army Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Summa:

This document transmits the U.S. Fish and Wildlife Service's (Service) Programmatic Piping Plover Biological Opinion (P^{3}BO) for the effects of U.S. Army Corps of Engineers (Corps) planning and regulatory shore protection activities on the non-breeding piping plover (*Charadrius melodus*) and its designated Critical Habitat in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 et seq.). The current status of the federally listed piping plover is threatened, and the Service designated Critical Habitat for wintering piping plovers on July 10, 2001. This P^{3}BO is for the North Florida Ecological Services Office (NFESO) and the South Florida Ecological Services Office (SFESO) areas of responsibility (AORs). You requested formal consultation by letter of May 7, 2013.

This P^{3}BO is based on the information provided in the Corps May 7, 2013, letter, the Statewide Programmatic Biological Assessment of February 17, 2011, subsequent meetings between Corps and Service personnel, and other sources of information. We have assigned Consultation Code 04EF1000-2013-F-0124 to this consultation. A complete administrative record of this consultation is on file at the NFESO. Each project proposing to utilize this P^{3}BO will undergo an evaluation process by the Corps to determine if it properly fits within this programmatic approach. If it is determined that the minimization measures, Reasonable and Prudent Measures, and Terms and Conditions in the P^{3}BO are applicable to the project, the Service will concur within 30 days and it will be covered by this programmatic consultation. The Corps will consult separately on individual projects that do not fit within this programmatic approach unless the Service grants an exception in accordance with the Incidental Take Statement in the P^{3}BO.

This consultation includes the following proposed activities conducted in the AORs of the NFESO and the SFESO:

1. Operations and maintenance dredging activities of navigational channels and sand placement on the sandy beach and dune (including up to or over hardened structures), the swash zone, and the nearshore regions associated with both shore protection projects and maintenance dredging;
2. Sand placement as an associated authorization of sand extraction from the outer continental shelf by the Bureau of Ocean Energy Management (BOEM);
3. Sand by-passing/back-passing; and
4. Groins and jetty repair, or replacement.

For Civil Works activities, the Corps specified during the consultation process that "fish and wildlife enhancement" activities beyond mitigation of project impacts must be authorized as a project purpose, be authorized as a project feature, or be otherwise approved through Corps headquarters (Engineer Regulation ER 1105-2-100 Appendix G, Amendment #1, 30 June 2004). At the present time, no beach fill placement or shore protection activity in Florida has fish and wildlife enhancement as a project purpose or project feature. Since adding fish and wildlife enhancement as a project purpose or feature is not a budgetary priority [ER 1105-2-100 22 Apr 2000, Appendix C, part C-3b.(3)], the Corps does not expect to receive authorization and funding for it. However, the Corps proposes to implement the following Conservation Measures to reduce impacts on piping plovers for all projects (those in both non-optimal and optimal piping plover habitat) included in this consultation with the potential to affect piping plovers or their critical habitat:

1. Adhere to appropriate seasonal windows to the maximum extent practicable;

2. Implement survey guidelines for non-breeding shorebirds when appropriate. For Corps Civil Works projects, the "surveys" must be limited to the term of the construction unless they are otherwise authorized and funded by Congress;

   [Note: The term of the construction is considered to be the time in which the construction contractor is working on the beach. This usually starts soon after the "notice to proceed" and ends when the contractor finishes placing sand or finishes conducting other shore protection activities on/near the beach.]

3. Pipeline alignment and associated construction activities may be modified to reduce impacts to foraging, sheltering, and roosting;

4. Avoid impacts to the primary constituent elements (PCEs) of piping plover Critical Habitat to the maximum extent practicable;

5. The Corps or Applicant will evaluate the project area prior to consultation for the presence of piping plover PCEs as a basis for making their initial determination of effect;

6. The Corps will work with the Service to develop shore protection design guidelines and/or mitigation measures that can be utilized during future project planning to protect and/or enhance high value piping plover habitat locations (*i.e.*, washover fans). For Corps Civil Works projects, "enhancement" must be limited to the extent authorized and funded as a project feature or project purpose;

7. The Corps will attempt to time the construction of Civil Works sand placement and dredging projects to prevent two adjacent beaches or inlets from being constructed in the same year;

8. The Corps Civil Works program will work with the Florida Department of Environmental Protection (FDEP) to consider the value and context of inlet habitat features (*i.e.*, emergent spits, sand bars, etc.) within each inlet's management plan and adjust future dredging frequencies, to the maximum extent practicable and consistent with applicable law, so that adjacent habitats are made available and total habitat loss would not occur at one time within a given inlet complex; and

9. The Corps Civil Works program will consider placing dredged materials in the nearshore region as an alternative to beach placement to minimize effects to piping plovers and their habitat.

With the implementation of these Conservation Measures, the Corps has determined the proposed activities may affect, but are not likely to adversely affect the piping plover in areas not identified as Optimal Piping Plover Areas. Optimal Piping Plover Areas are defined as having documented use by piping plovers, and they include coastal habitat features that function mostly unimpeded. Optimal Piping Plover Areas include:

1. Designated piping plover Critical Habitat Units (see Appendix A);

2. All Federal, State, and County publicly owned land where coastal processes are allowed to function, mostly unimpeded, that have any of the following features in the Action Area:

    a. Located within 1 mile of an inlet;
    b. Emergent nearshore sand bars;
    c. Washover fans;
    d. Emergent bayside and Ocean/Gulf-side shoals and sand bars;
    e. Bayside mudflats, sand flats, and algal flats; or
    f. Bayside shorelines of bays and lagoons.

[Publicly owned land where coastal processes are allowed to function, mostly unimpeded, generally does not include public lands that are solely state-owned water bottoms, street ends, parking lots, piers, beach accesses, or shoreline developed for commercial or residential purposes. It generally does include public lands consisting of parks, preserves, and natural undeveloped shoreline and dunes.]; and

3. The following additional areas are also considered optimal piping plover habitat (FDEP Range Monuments provided in parentheses):

    a. Charley Pass, south of Critical Habitat Unit FL-23 on North Captiva Island, Lee County (R-75.5 and R-83);
    b. Stump Pass and the beaches adjacent to it, Charlotte County (R-15.5 to R-33);
    c. Palmer Point Park, Sarasota County (R-77 to R-83);

d. St. Lucie Inlet and associated shoals, Martin County (R-42 to R-78);
e. Crandon Park, Miami-Dade County (R-89 to R-101); and
f. Sanibel Island, Lee County (R-109 to R-174).

The Service concurs with this determination as it applies to projects in non-optimal habitat, and the Corps will reinitiate consultation if they are unable to implement the Conservation Measures as described above. No additional consultation is required for projects located in habitat determined to be non-optimal for piping plovers. The attached P^{3}BO addresses projects located in optimal piping plover habitat, as defined above.

As with the Service's Statewide Programmatic Biological Opinion (SPBO), the Corps and the Service will meet annually during the fourth week of August to review the proposed activities, assess new data, identify information needs, and scope methods to address those needs, including, but not limited to, evaluations and monitoring specified in this P^{3}BO, reviewing results, formulating or amending actions that minimize take of listed species, and monitoring the effectiveness of those actions. This programmatic consultation will be reviewed every 5 years. If new information concerning the projects or the piping plover arises, this consultation will be reviewed sooner than 5 years. Reinitiation of formal consultation is required 10 years after the issuance of this P^{3}BO.

We are available to meet with agency representatives to discuss this consultation. If you have any questions, please contact Dawn Jennings at the NFESO (904-731-3103) or Craig Aubrey in the SFESO (772-469-4309).

Sincerely yours,

Larry Williams

Larry Williams
State Supervisor

SHORE PROTECTION ACTIVITIES IN THE GEOGRAPHICAL REGION OF THE NORTH AND SOUTH FLORIDA ECOLOGICAL SERVICES FIELD OFFICES

Programmatic Piping Plover Biological Opinion

May 22, 2013

Prepared by:

U.S. Fish and Wildlife Service

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ACRONYMS AND ABBREVIATIONS

Act	Endangered Species Act
AOR	Area of Responsibility
BOEM	Bureau of Ocean Energy Management
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FWC	Florida Fish and Wildlife Conservation Commission
FR	Federal Register
MBTA	Migratory Bird Treaty Act
NFESO	U.S. Fish and Wildlife Service’s North Florida Ecological Services Office
P^3BO	Programmatic Piping Plover Biological Opinion
PCE	Primary Constituent Elements
Service	U.S. Fish and Wildlife Service
SFESO	U.S. Fish and Wildlife Service’s South Florida Ecological Services Office
SPBO	Statewide Programmatic Biological Opinion
USGS	U.S. Geological Survey

CONSULTATION HISTORY

1980s and 1990s	Beach nourishment projects in Florida began to occur frequently in the late 1980s and early 1990s.
April 19, 2011	The Service issued the original SPBO concerning planning and regulatory sand placement projects in Florida and their effects on nesting sea turtles.
August 22, 2011	The Service issued their revised SPBO. The SPBO did not include take for the non-breeding piping plover or its designated Critical Habitat. Consultation for plovers was conducted on a case-by-case basis.
October 30, 2012	The Service and the Corps held the first annual meeting on the progress of the SPBO. The agencies discussed outstanding piping plover issues, including the proposed terms and conditions. The agencies agreed to conduct a separate re-initiation of consultation for piping plovers limited to peninsular Florida to programmatically address take of piping plovers.
May 7, 2013	The Corps sent a letter to the Service formally requesting a Programmatic Piping Plover Biological Opinion.
Other Collaboration	Numerous telephone conversations and e-mails were conducted between the Corps and the Service concerning the content of the P^{3}BO and initiation of consultation.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action includes activities associated with the placement of compatible sediment on beaches or in the nearshore region of Optimal Piping Plover Areas. Optimal Piping Plover Areas are defined as having documented use by piping plovers, and include coastal habitat features that function mostly unimpeded. Below is a list of currently known Optimal Piping Plover Areas:

1. Designated piping plover Critical Habitat Units (see Appendix A);

2. All Federal, State, and County publicly owned land where coastal processes are allowed to function, mostly unimpeded, that have any of the following features in the Action Area:

    a. Located within 1 mile of an inlet;
    b. Emergent nearshore sand bars;
    c. Washover fans;
    d. Emergent bayside and Ocean/Gulf-side shoals and sand bars;
    e. Bayside mudflats, sand flats, and algal flats; or

    f. Bayside shorelines of bays and lagoons.

[Publicly owned land where coastal processes are allowed to function, mostly unimpeded, generally does not include public lands that are solely State-owned water bottoms, street ends, parking lots, piers, beach accesses, or shoreline developed for commercial or residential purposes. It generally does include public lands consisting of parks, preserves, and natural undeveloped shoreline and dunes.]; and

3. The following additional areas are also considered optimal piping plover habitat (FDEP Range Monuments provided in parentheses):
    a. Charley Pass, south of Critical Habitat Unit FL-23 on North Captiva Island, Lee County (R-75.5 and R-83);
    b. Stump Pass and the beaches adjacent to it, Charlotte County (R-15.5 to R-33);
    c. Palmer Point Park, Sarasota County (R-77 to R-83);
    d. St. Lucie Inlet and associated shoals, Martin County (R-42 to R-78);
    e. Crandon Park, Miami-Dade County (R-89 to R-101); and
    f. Sanibel Island, Lee County (R-109 to R-174).

ACTION AREA

The Action Area includes sandy beaches; emergent bayside and Ocean/Gulf-side shoals and sand bars; bayside mudflats, sand flats, and algal flats; bayside shorelines of bays and lagoons; and emergent nearshore sand bars of the Atlantic Coast (Nassau County to Miami-Dade County) and the Gulf Coast (Monroe County to Taylor County) of Florida (Figures 1 and 2). The proposed action includes the replacement and rehabilitation of groins utilized as design components of beach projects for longer retention time and stabilization of associated sediment placed on the beach. This P^{3}BO includes both Corps Regulatory and Civil Works activities. Both Corps Regulatory and Civil Works activities may include the involvement of other Federal agencies, such as the Department of Defense, BOEM, and the Federal Emergency Management Agency. The activities covered in the P^{3}BO encompass the following:

1. Operations and maintenance dredging activities of navigational channels and sand placement on the sandy beach and dune (including up to or over hardened structures), the swash zone, and the nearshore regions associated with both shore protection projects and maintenance dredging;
2. Sand placement as an associated authorization of sand extraction from the outer continental shelf by the BOEM;
3. Sand by-passing/back-passing; and
4. Groins and jetty repair, or replacement.

The history of shore protection activities throughout the Atlantic and Gulf Coasts of Florida is extensive and consists of a myriad of actions performed by local, State, and Federal entities. Future sand placement actions addressed in this P^{3}BO may include maintenance of these existing projects or beaches that have not experienced a history of sand placement activities. Maintenance dredging activities include dredging of both deep draft harbors and shallow draft inlets when these activities affect optimal piping plover habitat.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/Critical Habitat description

The piping plover is a small, pale sand-colored shorebird, about 7 inches long with a wingspan of about 15 inches (Palmer 1967). Cryptic coloration is a primary defense mechanism for piping plovers where nests, adults, and chicks all blend in with their typical beach surroundings. Piping plovers on wintering and migration grounds respond to intruders (*e.g.*, pedestrian, avian and mammalian) usually by squatting, running, and flushing (flying).

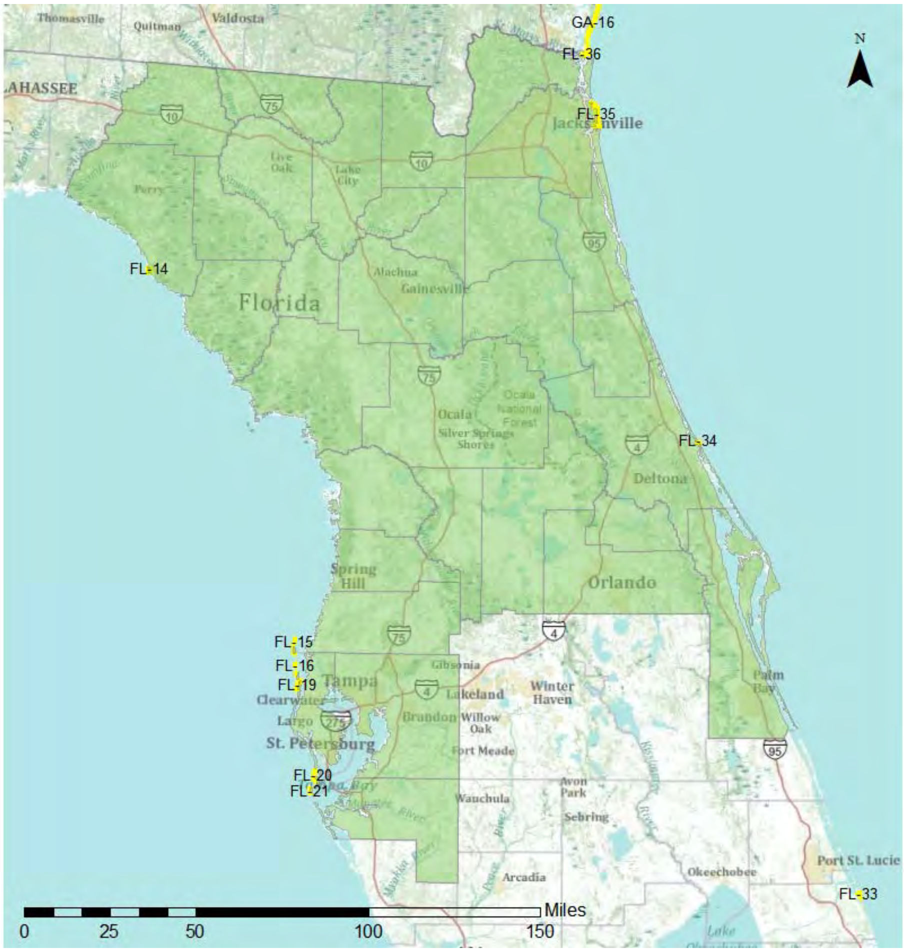

Figure 1 Piping plover designated Critical Habitat in the North Florida Ecological Services Field Office's area of responsibility.

On January 10, 1986, the piping plover was listed as endangered in the Great Lakes watershed and threatened elsewhere within its range, including migratory routes outside of the Great Lakes watershed and wintering grounds (Service 1985). Piping plovers were listed principally because of habitat destruction and degradation, predation, and human disturbance. Protection of the species under the Act reflects the species' precarious status range-wide.

Three separate breeding populations have been identified, each with its own recovery criteria: the northern Great Plains (threatened), the Great Lakes (endangered), and the Atlantic Coast (threatened). The piping plover winters in coastal areas of the U.S. from North Carolina to Texas, and along the coast of eastern Mexico and on Caribbean islands from Barbados to Cuba and the Bahamas (Haig and Elliott-Smith 2004). Piping plovers in the Action Area include individuals from all three breeding populations. Piping plover subspecies are phenotypically indistinguishable, and most studies in the nonbreeding range report results without regard to breeding origin. Although a recent analysis shows strong patterns in the wintering distribution of piping plovers from different breeding populations, partitioning is not complete and major information gaps persist.

Figure 2 Piping plover designated Critical Habitat in the South Florida Ecological Services Field Office's area of responsibility.

The Service has designated Critical Habitat for the piping plover on three occasions. Two of these designations protected different piping plover breeding populations. Critical Habitat for the Great Lakes breeding population was designated May 7, 2001 (66 Federal Register [FR] 22938, Service 2001a), and Critical Habitat for the northern Great Plains breeding population was designated September 11, 2002 (67 FR 57637, Service 2002). The Service designated Critical Habitat for wintering piping plovers on July 10, 2001 (66 FR 36038, Service 2001b). Wintering piping plovers may include individuals from the Great Lakes and northern Great Plains breeding populations as well as birds that nest along the Atlantic Coast. The three separate designations of piping plover Critical Habitat demonstrate diversity of PCEs between the two breeding populations as well as diversity of PCEs between breeding and wintering populations.

Designated wintering piping plover Critical Habitat originally included 142 areas (the rule states 137 units; this is an error) encompassing approximately 1,793 miles of mapped shoreline and 165,211 acres of mapped areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas.

The PCEs for piping plover wintering habitat essential for the conservation of the species are those habitat components that support foraging, roosting, and sheltering, and the physical features necessary for maintaining the natural processes that support these habitat components. The PCEs are found in geographically dynamic coastal areas that support intertidal beaches and flats (between annual low tide and annual high tide), and associated dune systems and flats above annual high tide (Service 2001a). PCEs of wintering piping plover Critical Habitat include sand or mud flats, or both, with no or sparse emergent vegetation. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting piping plovers (Service 2001a). Important components of the beach/dune ecosystem include surf-cast algae, sparsely vegetated back beach and salterns, spits, and washover areas. Washover areas are broad, unvegetated zones, with little or no topographic relief, that are formed and maintained by the action of hurricanes, storm surge, or other extreme wave action. The units designated as Critical Habitat are those areas that have consistent use by piping plovers and that best meet the biological needs of the species. The amount of wintering habitat included in the designation appears sufficient to support future recovered populations, and the existence of this habitat is essential to the conservation of the species. Additional information on each specific unit included in the designation can be found at 66 FR 36038 (Service 2001a).

Life history

Piping plovers live an average of 5 years, although studies have documented birds as old as 11 (Wilcox 1959) and 15 years. Plovers are known to begin breeding as early as 1 year of age (MacIvor 1990; Haig 1992); however, the percentage of birds that breed in their first adult year is unknown. Piping plover breeding activity begins in mid-March when birds begin returning to their nesting areas (Coutu et al. 1990; Cross 1990; Goldin et al. 1990; MacIvor 1990; Hake 1993). Piping plovers generally fledge only a single brood per season, but may re-nest several times if previous nests are lost. The reduction in suitable nesting habitat due to a number of factors is a major threat to the species, likely limiting reproductive success and future recruitment into the population (Service 2009).

Plovers depart their breeding grounds for their wintering grounds between July and late August, but southward migration extends through November. More information about the three breeding populations of piping plovers can be found in the following documents:

a. Piping Plover, Atlantic Coast Population: 1996 Revised Recovery Plan (Service 1996);
b. 2009 Piping Plover (*Charadrius melodus*) 5-Year Review: Summary and Evaluation (Service 2009);
c. 2003 Recovery Plan for the Great Lakes Piping Plover (*Charadrius melodus*) (Service 2003);
d. Questions and Answers about the Northern Great Plains Population of Piping Plover (Service 2002).

Piping plovers use habitats in Florida primarily from July 15 through May 15. Below (2010) surveyed plovers north of Marco Island, Florida, and found plovers color-banded during the surveys to have very high wintering site fidelity. Both spring and fall migration routes of Atlantic Coast breeders are believed to occur primarily within a narrow zone along the Atlantic Coast (Service 1996). The pattern of both fall and spring counts at many Atlantic Coast sites demonstrates that many piping plovers make intermediate stopovers lasting from a few days up to 1 month during their migrations (Noel and Chandler 2005; Stucker and Cuthbert 2006). Some midcontinent breeders travel up or down the Atlantic Coast before or after their overland movements (Stucker and Cuthbert 2006). Use of inland stopovers during migration is also documented (Pompei and Cuthbert 2004). The source breeding population of a given wintering individual cannot be determined in the field unless it has been banded or otherwise marked. Information from observation of color-banded piping plovers indicates that the winter ranges of the breeding populations overlap to a significant degree. While piping plover migration patterns and needs remain poorly understood, and occupancy of a particular habitat may involve shorter periods relative to wintering, information about the energetics of avian migration indicates that this might be a particularly critical time in the species' life cycle.

Review of published records of piping plover sightings throughout North America by Pompei and Cuthbert (2004) found more than 3,400 fall and spring stopover records at 1,196 sites. Published reports indicated piping plovers do not concentrate in large numbers at inland sites and they seem to stop opportunistically. In most cases, reports of birds at inland sites were single individuals.

Piping plovers migrate through and winter in coastal areas of the U.S. from North Carolina to Texas and in portions of Mexico and the Caribbean. Data based on four rangewide mid-winter (late January to early February) population surveys, conducted at 5-year intervals starting in 1991, show that total numbers have fluctuated over time, with some areas experiencing increases and others decreases. Regional and local fluctuations may reflect the quantity and quality of suitable foraging and roosting habitat, which vary over time in response to natural coastal formation processes as well as anthropogenic habitat changes (*e.g.*, inlet relocation, dredging of shoals and spits). Fluctuations may also represent localized weather conditions (especially wind) during surveys, or unequal survey coverage. For example, airboats facilitated first-time surveys of several central Texas sites in 2006 (Elliott-Smith et al. 2009). Similarly, the increase in the 2006 numbers in the Bahamas is attributed to greatly increased census efforts; the extent of additional habitat not surveyed remains undetermined (Elliott-Smith et al. 2009). Changes in wintering numbers may also be influenced by growth or decline in the particular breeding populations that concentrate their wintering distribution in a given area. Opportunities to locate previously unidentified wintering sites are concentrated in the Caribbean and Mexico (Elliott-Smith et al. 2009). Further surveys and assessment of seasonally emergent habitats (*e.g.,* seagrass beds, mudflats, oyster reefs) within bays lying between the mainland and barrier islands in Texas are also needed.

Midwinter surveys may underestimate the abundance of nonbreeding piping plovers using a site or region during other months. In late September 2007, 104 piping plovers were counted at the south end of Ocracoke Island, North Carolina (National Park Service 2007), where none were seen during the 2006 International Piping Plover Winter Census (Elliott-Smith et al. 2009). Noel et al. (2007) observed up to 100 piping plovers during peak migration at Little St. Simons Island, Georgia, where approximately 40 piping plovers wintered in 2003 to 2005. Differences among fall, winter, and spring counts in South Carolina were less pronounced, but inter-year fluctuations (*e.g.,* 108 piping plovers in spring 2007 versus 174 piping plovers in spring 2008) at 28 sites were striking (Maddock et al. 2009). Even as far south as the Florida Panhandle, monthly counts at Phipps Preserve in Franklin County ranged from a midwinter low of 4 piping plovers in December 2006, to peak counts of 47 in October 2006 and March 2007 (Smith 2007). Pinkston (2004) observed much heavier use of Texas Gulf Coast (ocean-facing) beaches between early September and mid-October (approximately 16 birds per mile) than during December to March (approximately 2 birds per mile).

Local movements of non-breeding piping plovers may also affect abundance estimates. At Deveaux Bank, one of South Carolina's most important piping plover sites, 5 counts at approximately 10-day intervals between August 27 and October 7, 2006, oscillated from 28 to 14 to 29 to 18 to 26 (Maddock et al. 2009). Noel and Chandler (2008) detected banded Great Lakes piping plovers known to be wintering on their Georgia study site in 73.8 ± 8.1 percent of surveys over 3 years.

Abundance estimates for non-breeding piping plovers may also be affected by the number of surveyor visits to the site. Preliminary analysis of detection rates by Maddock et al. (2009) found 87 percent detection during the midwinter period on core sites surveyed three times a month during fall and spring and one time per month during winter, compared with 42 percent detection on sites surveyed three times per year (Cohen 2009).

Gratto-Trevor et al. (2009) found strong patterns (but no exclusive partitioning) in winter distribution of uniquely banded piping plovers from four breeding populations (Figure 3).

All eastern Canada and 94 percent of Great Lakes birds wintered from North Carolina to southwest Florida. However, eastern Canada birds were more heavily concentrated in North Carolina, and a larger proportion of Great Lakes piping plovers were found in South Carolina and Georgia. Northern Great Plains populations were primarily seen farther west and south, especially on the Texas Gulf Coast. Although the great majority of Prairie Canada individuals were observed in Texas, particularly southern Texas, individuals from the U.S. Great Plains were more widely distributed on the Gulf Coast from Florida to Texas.

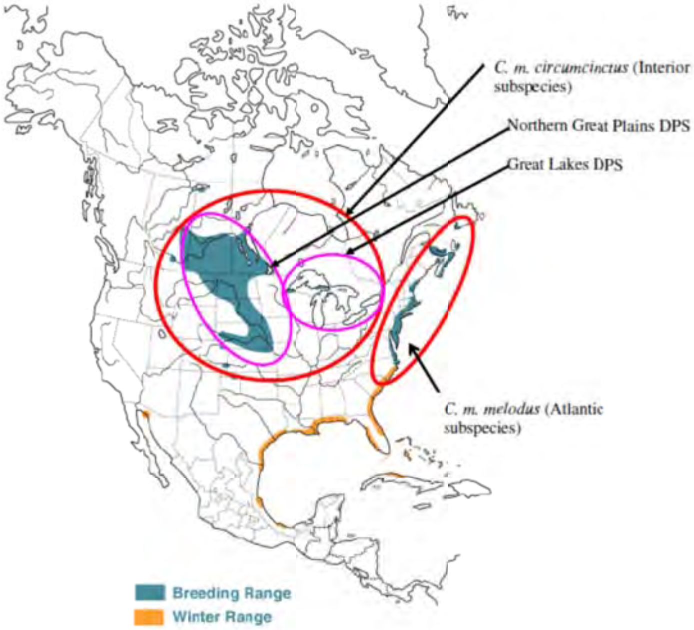

Figure 3 Distribution and range of *C. m. melodus:* Great Lakes DPS of *C. m. circumcinctus*, Northern Great Plains DPS of *C. m. circumcinctus* (base map from Elliott-Smith and Haig 2004 by permission of Birds of North America Online, http://bna.birds.cornell.edu/bna, maintained by the Cornell Lab of Ornithology). Note that this map is a conceptual presentation of subspecies and DPS ranges, and is not intended to convey precise boundaries.

The findings of Gratto-Trevor et al. (2009) provide evidence of differences in the wintering distribution of piping plovers from these four breeding areas. However, the distribution of birds by breeding origin during migration remains largely unknown. Other major information gaps include the wintering locations of the U.S. Atlantic Coast breeding population (banding of U.S. Atlantic Coast piping plovers has been extremely limited) and the breeding origin of piping plovers wintering on Caribbean islands and in much of Mexico.

Banded piping plovers from the Great Lakes, Northern Great Plains, and eastern Canada breeding populations showed similar patterns of seasonal abundance at Little St. Simons Island, Georgia (Noel et al. 2007). However, the number of banded plovers originating from the latter two populations was relatively small at this study area.

This species exhibits a high degree of intra- and interannual wintering site fidelity (Nicholls and Baldassarre 1990a; Drake et al. 2001; Noel and Chandler 2005; Stucker and Cuthbert 2006). Gratto-Trevor et al. (2009) reported that 6 of 259 banded piping plovers observed more than once per winter moved across boundaries of the 7 U.S. regions. Of 216 birds observed in different years, only 8 changed regions between years, and several of these shifts were associated with late summer or early spring migration periods (Gratto-Trevor et al. 2009). Total number of individuals observed on the wintering grounds was 46 for Eastern Canada, 150 for the U.S. Great Lakes, 169 for the U.S. Great Plains, and 356 for Prairie Canada.

Local movements are more common. In South Carolina, Maddock et al. (2009) documented many cross-inlet movements by wintering banded piping plovers as well as occasional movements of up to 11.2 miles by approximately 10 percent of the banded population. Larger movements within South Carolina were seen during fall and spring migration. Similarly, eight banded piping plovers that were observed in two locations during 2006 and 2007 surveys in Louisiana and Texas were all in close proximity to their original location (Maddock 2008).

In 2001, 2,389 piping plovers were located during a winter census, accounting for only 40 percent of the known breeding birds recorded during a breeding census (Ferland and Haig 2002). About 89 percent of birds that are known to winter in the U.S. do so along the Gulf Coast (Texas to Florida), while 8 percent winter along the Atlantic Coast (North Carolina to Florida).

The status of piping plovers on winter and migration grounds is difficult to assess, but threats to piping plover habitat used during winter and migration identified by the Service during its designation of Critical Habitat continue to affect the species. Unregulated motorized and pedestrian recreational use, inlet and shoreline stabilization projects, beach maintenance and nourishment, and pollution affect most winter and migration areas. Conservation efforts at some locations have likely resulted in the enhancement of wintering habitat.

The 2004 and 2005 hurricane seasons affected a substantial amount of habitat along the Gulf Coast. Habitats such as those along Gulf Islands National Seashore have benefited from increased washover events which created optimal habitat conditions for piping plovers. Conversely, hard shoreline structures are put into place following storms throughout the species range to prevent such shoreline migration (see *Factors Affecting the Species Habitat within the Action Area*). Four hurricanes between 2002 and 2005 are often cited in reference to rapid erosion of the Chandeleur Islands, a chain of low-lying islands in Louisiana where the 1991 International Piping Plover Census tallied more than 350 piping plovers. Comparison of imagery taken 3 years before and several days after Hurricane Katrina found that the Chandeleur Islands lost 82 percent of their surface area (Sallenger et al. in review), and a review of aerial photography prior to the 2006 Census suggested little piping plover habitat remained (Elliott-Smith et al. 2009). However, Sallenger et al. (in review) noted that habitat changes in the Chandeleurs stem not only from the effects of these storms, but rather from the combined effects of the storms, long-term (greater than 1,000 years) diminishing sand supply, and sea-level rise relative to the land.

The Service is aware of the following site specific conditions that affect the status of several habitats piping plover use while wintering and migrating, including Critical Habitat Units. In Texas, one Critical Habitat Unit was afforded greater protection due to the acquisition of adjacent upland properties by the local Audubon chapter. In another unit in Texas, vehicles were removed from a portion of the beach decreasing the likelihood of automobile disturbance to plovers. Exotic plant removal is occurring in another Critical Habitat Unit in South Florida. The Service and other government agencies remain in a contractual agreement with the U.S. Department of Agriculture for predator control within limited coastal areas in the Florida panhandle, including portions of some Critical Habitat Units. Continued removal of potential terrestrial predators is likely to enhance survivorship of wintering and migrating piping plovers. In North Carolina, one Critical Habitat Unit was afforded greater protection when the local Audubon chapter agreed to manage the area specifically for piping plovers and other shorebirds following the relocation of a nearby inlet channel.

Biogeography and Habitat Preferences

Wintering piping plovers prefer coastal habitats that include sand spits, islets (small islands), tidal flats, shoals (usually flood tidal deltas), and sandbars that are often associated with inlets (Harrington 2008). Sandy mud flats, ephemeral pools, and overwash areas are also considered primary foraging habitats. These substrate types have a richer infauna than the foreshore of high energy beaches and often attract large numbers of shorebirds (Cohen et al. 2008). Wintering plovers are dependent on a mosaic of habitat patches and move among these patches depending on local weather and tidal conditions (Nicholls and Baldassarre 1990a).

Recent study results in North Carolina, South Carolina, and Florida, complement information from earlier investigations in Texas and Alabama (summarized in the 1996 Atlantic Coast and 2003 Great Lakes Recovery Plans) regarding habitat use patterns of piping plovers in their coastal migration and wintering range. As documented in Gulf Coast studies, nonbreeding piping plovers in North Carolina primarily used sound (bay or bayshore) beaches and sound islands for foraging and ocean beaches for roosting, preening, and being alert (Cohen et al. 2008). The probability of piping plovers being present on the sound islands increased with increasing exposure of the intertidal area (Cohen et al. 2008). Maddock et al. (2009) observed shifts to roosting habitats and behaviors during high-tide periods in South Carolina.

LeDee et al. (2008) conducted a remote analysis of piping plover wintering sites, measuring 11 ecological parameters to determine their correlation to piping plover presence. Piping plover abundance was negatively correlated with urban area and total road length, and positively correlated with inter-tidal area, presence on the mainland (as opposed to the peninsula/island feature), and total inter-tidal and beach area (LeDee et al. 2008).

Recent geographic analysis of piping plover distribution on the upper Texas coast noted major concentration areas at the mouths of rivers, washover passes (low, sparsely vegetated barrier island habitats created and maintained by temporary, storm-driven water channels), and major bay systems (Arvin 2008). Earlier studies in Texas have drawn attention to washover passes, which are commonly used by piping plovers during periods of high bayshore tides and during the spring migration period (Zonick 1997; Zonick 2000). Elliott-Smith et al. (2009) reported piping plover concentrations on exposed seagrass beds and oyster reefs during seasonal low water periods in 2006.

Of all the states and provinces in North America, Florida is most intimately linked with the sea. Florida's 1,200-mile coastline (exclusive of the Keys) is easily the longest in the continental U.S. Of the 1,200 miles, 745 miles are sandy and mostly in the form of barrier islands. The coastline is dynamic and constantly changing as a result of waves, wind, tides, currents, sea-level change, and storms. The entire state lies within the coastal plain, with a maximum elevation of about 400 feet, and no part is more than 60 miles from the Atlantic Ocean or the Gulf of Mexico.

The east coast of Florida consists of a dynamic shoreline, with a relatively sloped berm, coarse-grained sand, and moderate to high surf (Witherington 1986). West-central Florida beaches are considered to be low energy beaches with a gradual offshore slope and fine-grained, quartz sand beaches. The dynamics of the Florida shoreline are shaped by the occurrence of storm surges and seas from tropical storms that occur mainly during August through early October. The East coast may also experience erosion from late September through March due to nor'easters. Gulf beaches are largely protected from severe nor'easters. The impacts of these two types of storms may vary from event to event and year to year.

Coasts with greater tidal ranges are more buffered against storm surges than are those with low tidal ranges, except when the storm strikes during high tide. Mean tidal ranges decrease southward along the Atlantic coast from a mean of 7 feet at the Florida-Georgia line to less than 2 feet in Palm Beach County. The mean tidal range along the Gulf Coast is less than 3 feet (microtidal) except in the extreme south where it ranges from 3 to 4 feet. Because of its lower elevation and lower wave energy regime, the West Coast of the peninsula is subject to greater changes during storm events than is the east coast.

Foraging/Food Habits

Behavioral observations of piping plovers on the wintering grounds suggest that they spend the majority of their time foraging (Nicholls and Baldassarre 1990a; Drake 1999a, 1999b). Plovers forage on moist substrate features such as intertidal portions of ocean beaches, washover areas, mudflats, sand flats, algal flats, shoals, wrack lines, sparse vegetation, and shorelines of coastal ponds, lagoons, and ephemeral pools, and adjacent salt marshes (Gibbs 1986; Zivojnovich and Baldassarre 1987; Nicholls 1989; Coutu et al. 1990; Nicholls and Baldassarre 1990a; Nicholls and Baldassarre 1990b; Hoopes 1993; Loegering 1992; Goldin 1993; Elias-Gerken 1994; Wilkinson and Spinks 1994; Zonick 1997; Service 2001a). Studies have shown that the relative importance of various feeding habitat types may vary by site (Gibbs 1986; Coutu et al. 1990; McConnaughey et al. 1990; Loegering 1992; Goldin 1993; Hoopes 1993). Feeding activities may occur during all hours of the day and night (Staine and Burger 1994; Zonick 1997), and at all stages in the tidal cycle (Goldin 1993; Hoopes 1993). Wintering plovers primarily feed on invertebrates such as polychaete marine worms, various crustaceans, fly larvae, beetles, and occasionally bivalve mollusks found on top of the soil or just beneath the surface (Bent 1929; Cairns 1977; Nicholls 1989; Zonick and Ryan 1996).

As observed in Texas studies, Lott et al. (2009) identified bay beaches (bay shorelines as opposed to ocean-facing beaches) as the most common landform used by foraging piping plovers in southwest Florida. However in northwest Florida, Smith (2007) reported landform use by foraging piping plovers about equally divided between Gulf of Mexico (ocean-facing) and bay beaches. Exposed intertidal areas were the dominant foraging substrate in South Carolina (accounting for 94 percent of observed foraging piping plovers; Maddock et al. 2009) and in northwest Florida (96 percent of foraging observations; Smith 2007). In southwest Florida, Lott et al. (2009) found approximately 75 percent of foraging piping plovers on intertidal substrates.

Home Range

Plovers seem to exhibit strong site fidelity to nonbreeding areas. Plovers vary their habitat use, and it is suggested heterogeneous habitats may be more important than specific habitat features for plovers (Drake et al. 2001; Nicholls and Baldassarre 1990b). Mean home range size (95 percent of locations) for 49 radio-tagged piping plovers in southern Texas in 1997 through 1998 was 3,113 acres, mean core area (50 percent of locations) was 717 acres, and the mean linear distance moved between successive locations (1.97 ± 0.04 days apart) averaged across seasons, was 2.1 miles (Drake 1999a; Drake et al. 2001). Seven radio-tagged piping plovers used a 4,967-acre area (100 percent minimum convex polygon) at Oregon Inlet in 2005 and 2006, and piping plover activity was concentrated in 12 areas totaling 544 acres (Cohen et al. 2008). Noel and Chandler (2008) observed high fidelity of banded piping plovers along a 0.62 and 2.8 mile section of beach on Little St. Simons Island, Georgia.

Life Cycle

Piping plovers spend up to 10 months of their life cycle on their migration and at wintering grounds, generally July 15 through as late as May 15. Piping plover migration routes and habitats overlap breeding and wintering habitats, and, unless banded, migrants passing through a site usually are indistinguishable from breeding or wintering piping plovers. Migration stopovers by banded piping plovers from the Great Lakes have been documented in New Jersey, Maryland, Virginia, and North Carolina (Stucker and Cuthbert 2006). Migrating breeders from eastern Canada have been observed in Massachusetts, New Jersey, New York, and North Carolina (Amirault et al. 2005). As many as 85 staging piping plovers have been tallied at various sites in the Atlantic breeding range (Perkins 2008), but the composition (*e.g.*, adults that nested nearby and their fledged young of the year versus migrants moving to or from sites farther north), stopover duration, and local movements are unknown. In general, distance between stopover locations and duration of stopovers throughout the coastal migration range remains poorly understood.

Predators and Competitors

Plovers face predation by avian and mammalian predators that are present year-round on the wintering grounds. There are minimal studies on the impacts of predation on migrating or wintering piping plovers, and investigations into effects of predation on nonbreeding piping plovers falls under the Great Lakes recovery plan. Predator control on their wintering and migration grounds is considered to be a low priority at this time, except for the threat of disturbance to roosting and feeding piping plovers posed by dogs off leash (Service 2009). Plovers must compete with other shorebirds for suitable foraging and roosting habitat.

Disease Factors

Neither the final listing rule nor the recovery plans state that disease is an issue for the species, and no plan assigns recovery actions to this threat factor. The Piping Plover 5-Year Review: Summary and Evaluation provides additional information on the limited concern of avian influenza and West Nile virus on the species (Service 2009).

Roosting

Several studies identified wrack (organic material including seaweed, seashells, driftwood, and other materials deposited on beaches by tidal action) as an important component of roosting habitat for nonbreeding piping plovers. Lott et al. (2009) found greater than 90 percent of roosting piping plovers in southwest Florida in old wrack with the remainder roosting on dry sand. In South Carolina, 18 and 45 percent of roosting piping plovers were in fresh and old wrack, respectively. The remainder of roosting birds used intertidal habitat (22 percent), backshore (defined as the zone of dry sand, shell, cobble and beach debris from the mean high water line up to the toe of the dune; 8 percent), washover (2 percent), and ephemeral pools (1 percent) (Maddock et al. 2009). Thirty percent of roosting piping plovers in northwest Florida were observed in wrack substrates with 49 percent on dry sand and 20 percent using intertidal habitat (Smith 2007). In Texas, seagrass debris (bayshore wrack) was an important feature of piping plover roosting sites (Drake 1999a). Mean abundance of two other plover species in California, including the listed western snowy plover, was positively correlated with an abundance of wrack during the nonbreeding season (Dugan et al. 2003).

Seven years of surveys, two to three times per month, along 8 miles of Gulf of Mexico (ocean-facing) beach in Gulf County, Florida, cumulatively documented nearly the entire area used at various times by roosting or foraging piping plovers. Birds were reported using the midbeach to the intertidal zone. Numbers ranged from 0 to 39 birds on any given survey day (Eells unpublished data).

Atlantic Coast and Florida studies highlighted the importance of inlets for nonbreeding piping plovers. Almost 90 percent of roosting piping plovers at ten coastal sites in southwest Florida were on inlet shorelines (Lott et al. 2009). Piping plovers were among seven shorebird species found more often than expected ($p = 0.0004$; Wilcoxon Test Scores) at inlet locations versus noninlet locations in an evaluation of 361 International Shorebird Survey sites from North Carolina to Florida (Harrington 2008).

Population dynamics

Population Size

The International Piping Plover Breeding Census is conducted throughout the breeding grounds every 5 years by the Great Lakes/Northern Great Plains Recovery Team of the U.S. Geological Survey (USGS). The census is the largest known, complete avian species census, and is coordinated by Elise Elliott Smith and various state and provincial coordinators. It is designed to determine species abundance and distribution throughout its annual cycle. The last survey in 2006 documented 3,497 breeding pairs, with a total of 8,065 birds throughout Canada and the U.S. A more recent 2010 Atlantic Coast breeding piping plover population estimate was 1,782 pairs, which was more than double the 1986 estimate of 790 pairs. This was determined to be a net increase of 86 percent between 1989 and 2010 (Service 2011). An associated winter census documented a total of 454 piping plovers in Florida (Elliott-Smith et al. 2009). For the Gulf Coast of Florida, the surveys documented 321 piping plovers at 117 sites covering approximately 522 miles of suitable habitat (Elliott-Smith et al 2009). A total of 133 plovers were observed along the Atlantic Coast during the 2009 survey, and Northwest Florida numbers for the 2006 International Piping Plover Census were 111, with an increased survey effort from previous years. This represents an increase from the 53 piping plovers sighted in the 2001 effort. More information on the results of past International Piping Plover Censuses and an analysis of the data is found in the 2009 Service’s Piping Plover 5-Year Review: Summary and Evaluation (Service 2009) and in the report published by the USGS (Elliott-Smith et al. 2009). In addition, bird populations throughout Florida are monitored by volunteers and The Conservancy of Southwest Florida. Launched in 2002 by the Cornell Lab of Ornithology and National Audubon Society, eBird provides data concerning bird abundance and distribution at a variety of spatial and temporal scales. eBird is sponsored in part by several Service programs, research groups, non-government offices, and the University of the Virgin Islands. From January through November 2012, 703 reports of piping plovers were documented in the Action Area by eBird members. Although multiple observations of the same bird may have been documented, these reports included observations totaling 3,466 individuals; 240 reports with observations of 752 individuals located in the NFESO AOR, and 337 reports with observations of 2,032 individuals located in the SFESO AOR.

Population Variability

The pattern of population growth among the recovery units along the Atlantic Coast was uneven, and was accompanied by periodic declines in both overall and regional populations (Service 2011). Although there is some indication of recovery in the Atlantic Coast population, any optimism should be tempered by observed geographic and temporal variability in population growth.

Population Stability

The most consistent finding in the various population viability analyses conducted for piping plovers (Ryan et al. 1993; Melvin and Gibbs 1996; Plissner and Haig 2000; Wemmer et al. 2001; Larson et al. 2002; Amirault et al. 2005; Calvert et al. 2006; Brault 2007) indicates even small declines in adult and juvenile survival rates will cause increases in extinction risk. A banding study conducted between 1998 and 2004 in Atlantic Canada concluded lower return rates of juvenile (first year) birds to the breeding grounds than was documented for Massachusetts (Melvin and Gibbs 1996), Maryland (Loegering 1992), and Virginia (Cross 1996) breeding populations in the mid-1980s and very early 1990s. This is consistent with failure of the Atlantic Canada population to increase in abundance despite high productivity (relative to other breeding populations) and extremely low rates of dispersal to the U.S. over the last 15 plus years (Amirault et al. 2005). This suggests maximizing productivity does not ensure population increases. However, other studies suggest that survivability is good at wintering sites (Drake et al. 2001). Please see the Piping Plover 5-Year Review: Summary and Evaluation for additional information on survival rates at wintering habitats (Service 2009).

Status and distribution

Reasons for Listing

The 1985 final rule stated the number of piping plovers on the Gulf of Mexico coastal wintering grounds might be declining as indicated by preliminary analysis of the Christmas Bird Count data. Independent counts of piping plovers on the Alabama coast indicated a decline in numbers between the 1950s and early 1980s. At the time of listing, the Texas Parks and Wildlife Department stated 30 percent of wintering habitat in Texas had been lost over the previous 20 years. The final rule also stated, in addition to extensive breeding area problems, the loss and modification of wintering habitat was a significant threat to the piping plover.

Threats to Piping Plovers

The Piping Plover 5-Year Review: Summary and Evaluation (Service 2009) provides an analysis of threats to piping plovers in their migration and wintering range. The threats identified in this document that were of primary concern included the loss and modification of wintering habitat (including shoreline development, beach maintenance and nourishment, inlet dredging, and the construction of jetties and groins).

The Piping Plover 5-Year Review: Summary and Evaluation noted that overutilization for commercial, recreational, scientific, or educational purposes was not a current threat to piping plovers on their wintering and migration grounds. Disease was identified as being only a minor threat. The impacts of predation on nonbreeding populations are largely undocumented, but they remain a potential threat. However, the Service considers predator control on piping plover wintering and migration grounds to be a low priority at this time (Service 2009).

Neither the final listing rule nor the recovery plans state disease is an issue for piping plover, and no plan assigns recovery actions to this threat factor. Based on information available to date, West Nile virus and avian influenza are a minor threat to piping plovers (Service 2009).

Habitat loss and degradation on winter and migration grounds from shoreline and inlet stabilization efforts, both within and outside of designated Critical Habitat, remains a serious threat to all piping plover populations. In some areas, beaches that abut private property are needed by wintering and migrating piping plovers. However, residential and commercial developments that typically occur along private beaches may pose significant challenges for efforts to maintain natural coastal processes. The threat of habitat loss and degradation, combined with the threat of sea-level rise associated with climate change, raise serious concerns regarding the ability of private beaches to support piping plovers over the long term.

Future actions taken on private beaches will determine whether piping plovers continue to use these beaches or whether the recovery of piping plovers will principally depend on public property. As Lott et al. (2009) concludes, “The combination of development and shoreline protection seems to limit distribution of non-breeding piping plovers in Florida. If mitigation or habitat restoration efforts on barrier islands fronting private property are not sufficient to allow plover use of some of these areas, the burden for plover conservation will fall almost entirely on public land managers.”

While public lands may not be at risk of habitat loss from private development, significant threats to piping plover habitat remain on many municipal, State, and federally owned properties. These public lands may be managed with competing missions that include conservation of imperiled species, but this goal frequently ranks below providing recreational enjoyment to the public, readiness training for the military, or energy development projects.

Public lands remain the primary places where natural coastal dynamics are allowed. Of recent concern are requests to undertake beach nourishment actions to protect coastal roads or military infrastructure on public lands. If project design does not minimize impediments to shoreline overwash which are necessary to help replenish bayside tidal flat sediments and elevations, significant bayside habitat may become vegetated or inundated, thereby exacerbating the loss of preferred piping plover habitat. Conversely, if beach fill on public lands is applied in a way that allows for “normal” system overwash processes, and sediment is added back to the system, projects may be less injurious to barrier island species that depend on natural coastal dynamics.

Maintaining wrack for food and cover in areas used by piping plovers may help offset effects that result from habitat degradation due to sand placement associated with berm and beach nourishment projects and ensuing human disturbance. Leaving wrack on private beaches may improve use by piping plovers, especially during migration when habitat fragmentation may have a greater effect on the species. In addition, using recreation management techniques, Great Lakes recovery action 2.14 may minimize the effects of habitat loss. Addressing off-road vehicles and pet disturbance may increase the suitability of existing piping plover habitat.

The dredging and mining of sediment from inlet complexes threatens the piping plover on its wintering grounds through habitat loss and degradation. The maintenance of deep draft navigation channels by dredging can alter the natural coastal processes on inlet shorelines of nearby barrier islands (Service 2012). Forty-four percent of the tidal inlets within the U.S. wintering range of the piping plover have been or continue to be dredged, primarily for navigational purposes. The dredging of navigation channels or relocation of inlet channels for erosion-control purposes contributes to the cumulative effects of inlet habitat modification by removing or redistributing the local and regional sediment supply. Dredging can occur on an annual basis or every 2 to 3 years, resulting in continual perturbations and modifications to inlets and their adjacent shoreline habitats (Service 2012).

As sand sources for beach nourishment projects have become more limited, ebb tidal shoals are being utilized as borrow areas more frequently. Exposed ebb and flood tidal shoals and sandbars are prime roosting and foraging habitats for piping plovers. In general, these shoals are only accessible by boat and tend to receive less human recreational use than nearby mainland beaches. This mining of material from inlet shoals for use as beach fill is not equivalent to the natural sediment bypassing due to the virtually instantaneous movement of sand. In a natural system, the sand would gradually and continuously move through the inlet system, providing a greater opportunity for emergent shoals to form (Service 2012).

The Deepwater Horizon oil spill, which started April 20, 2010, discharged into the Gulf of Mexico through July 15, 2010. According to government estimates, the leak released between 100 and 200 million gallons of oil into the Gulf. The U.S. Coast Guard estimates that more than 50 million gallons of oil have been removed from the Gulf, or roughly a quarter of the spill amount. Additional effects to natural resources may be attributed to the 1.84 million gallons of dispersant applied to the spill. As of July 2010, approximately 625 miles of Gulf Coast shoreline was oiled (approximately 360 miles in Louisiana, 105 miles in Mississippi, 66 miles in Alabama and 94 miles in Florida) (Joint Information Center 2010). These numbers reflect a daily snapshot of shoreline that experienced effects from oil; however, they do not include cumulative effects to date, or shoreline that has already been cleaned.

Piping plovers have continued to winter within the Gulf of Mexico shorelines. Researchers have and continue to document oiled piping plovers stemming from this spill. Oiling of designated piping plover Critical Habitat has been documented. Affects to the species and its habitat are expected, but their extent remains difficult to predict. The U.S. Coast Guard, the states, and responsible parties from the Unified Command, with advice from Federal and State natural resource agencies, initiated protective and cleanup efforts per prepared contingency plans to deal with petroleum and other hazardous chemical spills for each state's coastline. The contingency plans identify sensitive habitats, including all federally listed species' habitats, which receive a higher priority for response actions. Those plans allow for immediate habitat protective measures for cleanup activities in response to large contaminant spills. While such plans usually ameliorate the threat to piping plovers, it is yet unknown how much improvement will result in this case given the breadth of the effects associated with the Deepwater Horizon incident.

Based on all available data prior to the Deepwater Horizon oil spill, the risk of effects from contamination to piping plovers and their habitat was recognized, but the safety contingency plans were considered adequate to alleviate most of these concerns. The Deepwater Horizon incident has brought heightened awareness of the intensity and extent of impacts to fish and wildlife habitat from large-scale releases. In addition to potential direct habitat degradation from oiling of intertidal habitats and retraction of stranded boom, effects to piping plovers may occur from the increased human presence associated with boom deployment and retraction, cleanup activities, wildlife response, and damage assessment crews working along shorelines. Research studies are documenting the potential expanse of effects to the piping plover.

Analysis of the species/Critical Habitat likely to be affected

The proposed action has the potential to adversely affect wintering and migrating piping plovers and their habitat from all three breeding populations that may use the Action Area. The Atlantic Coast and Great Plains breeding populations of piping plover are listed as threatened, while the Great Lakes breeding population is listed as endangered. Therefore, this P^3BO considers the potential effects of this project on this species and its designated Critical Habitat.

The July 10, 2001, FR notice designated approximately 27,328 acres (corresponding to approximately 47 miles of beach) as Critical Habitat for wintering piping plovers in peninsular Florida. There are no Corps civil works shore protection projects located in designated Critical Habitat. There are five Corps civil works navigation projects that typically place dredged material in Critical Habitat Units: King’s Bay (Unit FL-36), Ponce Inlet (Unit FL-34), St. Lucie Inlet (Unit FL-33), Matanzas Pass (Unit FL-25), and Tampa Harbor (Unit FL-21). Maintenance dredging at these navigational channels typically occurs on 1 to 5 year intervals. These five units account for 1,749 acres (10 miles) of the 23,709 acres of total designated Critical Habitat in the Action Area (or 7.4 percent). These and other Critical Habitat Units may also be affected by non-Civil Works projects under Corps regulatory authority.

This P^3BO does not rely on the regulatory definition of “destruction or adverse modification” of Critical Habitat at 50 C.F.R. 402.02. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to Critical Habitat.

ENVIRONMENTAL BASELINE

Status of the species/Critical Habitat within the Action Area

As mentioned in Section II(C)1, the 2006 International Piping Plover Census surveys documented 321 wintering piping plovers at 117 sites covering approximately 522 miles of suitable habitat along the Gulf Coast of Florida, and an additional 133 plovers along the Atlantic Coast (Elliott-Smith et al 2009). In addition, bird populations throughout Florida are monitored by volunteers and The Conservancy of Southwest Florida. Launched in 2002, by the Cornell Lab of Ornithology and National Audubon Society, eBird provides data concerning bird abundance and distribution at a variety of spatial and temporal scales. eBird is sponsored in part by several

Service programs, research groups, non-government offices, and the University of the Virgin Islands. From January through November 2012, 703 reports of piping plovers were documented in the Action Area by eBird members. These reports included observations totaling 3,466 individuals; 240 reports with observations of 752 individuals located in the NFESO AOR, and 337 reports with observations of 2,032 individuals located in the SFESO AOR. It is important to note many of these observations may be multiple observations of the same specimen; therefore, these numbers do not represent a population estimate.

The Action Area encompasses 11 Critical Habitat Units in the NFESO's AOR (Figure 1), and an additional 11 Critical Habitat Units in the SFESO's AOR (Figure 2). The descriptions of the Critical Habitat Units associated with the proposed action vary, but generally include land from mean lower low water to where densely vegetated habitat or developed structures, not used by piping plovers, begin and where the PCEs no longer occur. The PCEs consist of intertidal flats including sand or mud flats with no or very sparse emergent vegetation. In addition, adjacent unvegetated or sparely vegetated sand, mud, or algal flats above high tide are important.

Factors affecting the species environment within the Action Area

Coastal development

Shoreline development throughout the wintering range poses a threat to all populations of piping plovers. Beach maintenance and nourishment, inlet dredging, and artificial structures, such as jetties and groins, can eliminate wintering areas and alter sedimentation patterns leading to the loss of nearby habitat. Structural development along the shoreline or manipulation of natural inlets upsets the dynamic processes and results in habitat loss or degradation (Melvin et al. 1991). Increased coastal development brings other recreational disturbances that are known to prevent bird usage of an area, including human disturbance, predation or disturbance by domestic animals, beach raking and cleaning, and habitat degradation by off-road vehicles (Service 2009).

Recreational management techniques, such as vehicle restrictions, pet restrictions, and symbolic fencing (usually sign posts and string) of roosting and feeding habitats, can help to address anthropogenic disturbances to wintering plovers. Educational materials, such as informational signs or brochures, can also provide valuable information to assist the public in understanding the need for conservation measures. Although these measures can be effective, they are not implemented consistently throughout the State.

Accelerated sea-level rise

Potential effects of sea-level rise on coastal beaches vary regionally due to subsidence or uplift as well as the geological character of the coast and nearshore (Service 2009). Low elevations and proximity to the coast make all nonbreeding coastal piping plover foraging and roosting habitats vulnerable to the effects of rising sea-level. Furthermore, areas with small astronomical tidal ranges (*e.g.*, portions of the Gulf Coast where intertidal range is less than 3.3 feet) are the most vulnerable to loss of intertidal wetlands and flats induced by sea-level rise (EPA 2009).

Inundation of piping plover habitat by rising seas could lead to permanent loss of habitat that lies immediately seaward of numerous structures or roads, especially if those shorelines are also armored with hardened structures. Without development or armoring, low undeveloped islands can migrate toward the mainland, pushed by the overwashing of sand eroding from the seaward side and being re-deposited in the bay (Scavia et al. 2002). Overwash and sand migration are impeded on developed portions of islands. Instead, as sea-level increases, the ocean-facing beach erodes and the resulting sand is deposited offshore. The buildings and the sand dunes then prevent sand from washing back toward the lagoons, and the lagoon side becomes increasingly submerged during extreme high tides (Scavia et al. 2002), diminishing both barrier beach shorebird habitat and protection for mainland developments.

A number of groups have met to discuss climate change and its potential impacts to Florida. In 2007, Governor Charlie Crist hosted “Serve to Preserve: A Florida Summit on Global Climate Change.” To combat climate change, this summit focused on methods for reducing emissions to avoid contributing to climate change. It did not address efforts to limit coastal development or to encourage more natural coastal processes. Based on the present level of available information concerning the effects of global climate change on the status of the piping plover and its designated Critical Habitat, the Service acknowledges the potential for changes to occur in the Action Area.

Sand placement activities

Sand placement projects have the potential to alter piping plover habitat, including the PCEs of Critical Habitat. Beach nourishment can create a beach seaward of existing hard stabilization or heavy development, where the beach has been lost due to erosion and/or sea-level rise, restoring associated ecosystem functions. Although dredge and fill projects that place sand on beaches or dunes may restore lost or degraded habitat, these projects may degrade habitat by altering the natural sediment composition and depressing the invertebrate base in some areas. This hinders habitat migration with sea-level rise, and replaces the natural dune beach nearshore system with artificial geomorphology (Service 2012). Lott et al. (2009) found a strong negative correlation between sand placement projects and the presence of plovers on the Gulf Coast of Florida; however, he noted that additional research was needed to clarify whether the cause was the sand placement project or the tendency for these projects to be located on highly developed shorelines. Harrington (2008) noted the need for a better understanding of the potential effects of inlet-related projects, such as jetties, on bird habitats.

In areas where the shoreline is highly eroded, sand placement activities can improve piping plover foraging and roosting habitat (National Research Council 1995). Sand placement activities add sand to the sediment budget, increasing the beach width and providing a sand source for emergent nearshore features to form. Although there is some research related to the management of beach nourishment projects to better maintain the habitat for piping plovers, much of this research is focused on beaches in the northern U.S. where breeding occurs (Melvin et al. 1991; Houghton 2005; Maslo et al. 2010). In their wintering grounds, increasing beach width is an important aspect of beach nourishment projects in highly developed, eroding areas. The timing of the project is also important in preventing impacts to piping plovers as a result of sand placement activities.

EFFECTS OF THE ACTION

This section is an analysis of the beneficial, direct, and indirect effects of the proposed actions on wintering piping plovers within the Action Area. The analysis includes effects of interrelated and interdependent activities. An interrelated activity is an activity that is part of a proposed action and depends on the proposed activity. An interdependent activity is an activity that has no independent utility apart from the action.

Factors to be considered

The proposed projects will occur within habitat that is used by wintering piping plovers. Since piping plovers can be present on these beaches for up to 10 months per year, construction is likely to occur while the species is utilizing these beaches and associated habitats. Short-term and temporary impacts to piping plover activities could result from project work occurring on the beach that flushes birds from roosting or foraging habitat. Long-term impacts could include a hindrance in the ability of wintering plovers to recuperate from their migratory flight from their breeding grounds, survive on their wintering areas, or to build fat reserves in preparation for migration back to their breeding grounds. Long-term impacts may also result from changes in the physical characteristics of the beach from the placement of the sand.

Proximity of the action

Maintenance dredging of navigational inlets occurs throughout the state in both Federal and non-Federal channels. Sand placement activities (resulting from both shore protection projects and placement of dredged materials as a result of maintenance dredging activities) would occur within and adjacent to wintering piping plover foraging and roosting habitats. Groin and jetty repair or replacement would occur adjacent to inlets, or along beach habitats where they may be used to stabilize the beach and limit erosion.

Distribution

Sand placement activities that may impact piping plover roosting and foraging would occur along both the Gulf of Mexico and the Atlantic Ocean coasts. The Service expects the proposed construction activities could directly and indirectly affect the availability of habitat for migrating and wintering piping plovers to roost and forage. The proposed construction activities are also expected to cause piping plovers usage of Critical Habitat Units located within the Action Area to temporarily decrease.

Timing

The timing of maintenance dredging, sand placement, and groin/jetty repairs or replacement activities may occur during or outside of the migration and wintering period for piping plovers (July 15 to May 15). For projects occurring outside of the migration and wintering period, the Service expects indirect effects to occur later in time.

Nature of the effect

Although the Service expects direct short-term effects from disturbance during project construction, it is anticipated the action will also result in direct, and indirect, long term effects to piping plovers and Critical Habitat. The Service expects there may be morphological changes to piping plover habitat, including roosting and foraging habitat, and to Critical Habitat within the Action Area. Activities that affect or alter the use of optimal habitat, Critical Habitat, or increase disturbance to the species may decrease the survival and recovery potential of the piping plover. Effects to piping plovers and their habitat as a result of groin and jetty repair or replacement will primarily be due to construction ingress and egress when construction is required to be conducted from land. In addition, construction materials and equipment may need to be stockpiled on the beach. These effects would be more likely to be experienced with repair or replacement of groin structures that are located in shallower water, as the majority of work done to jetties is conducted from the water or from the crest of the structure (Martin 2013).

Duration

Time to complete the project construction varies depending on the project size, weather, and other factors (equipment mobilization and break downs, availability of fuel, lawsuits, etc.). According to Corps estimations, project work could take as little as 1 month and as long as 2 years. Piping plover habitats would remain disturbed until the project is completed and the habitats are restored. Beach restoration projects would typically be complete in 6 to 12 months. The direct effects would be expected to be short-term in duration, until the benthic community reestablishes within the new beach profile. Indirect effects from the activity, including those related to altered sand transport systems, may continue to occur as long as sand remains on the beach.

The effects of the proposed action are of a temporary quantitative and qualitative nature. The habitat will be temporarily unavailable to wintering plovers during the construction period, and the quality of the habitat will be reduced for several months following project activities. Dredging in inlets where emergent shoals have formed would result in a loss of optimal piping plover habitat, which may or may not reform in the same quality or quantity in the future. Dredging inlets, repairing and replacing groins or jetties, or sand placement during months when piping plovers are present causes disturbance that disrupts the birds' foraging efficiency and hinders their ability to build fat reserves over the winter and in preparation for migration, as well as their recuperation from migratory flights (Service 2009). The mean linear distance moved by wintering plovers from their core area is estimated to be approximately 2.1 miles (Drake et al.

2001), suggesting they could be negatively impacted by temporary disturbances anywhere in their core habitat area. The PCEs associated with designated Critical Habitat would be temporarily adversely affected during and following sand placement, but may also experience some positive benefits from the increase in available beach and its associated new wrack.

Disturbance frequency

The frequency of maintenance dredging activities varies greatly, and can be as often as annually or semiannually at some inlets that experience high rates of shoaling, or as infrequently as once every 7 years at inlets that do not experience high rates of shoaling. Sand placement activities as a result of shore protection activities typically occur once every 5 to 7 years. Dredging and sand placement can occur at any time during the year based on availability of funding, other applicable species' windows, and the availability of dredges to conduct the work.

The disturbance frequency related to groin and jetty repair and replacement varies greatly based on the original construction methodology, the construction materials, and the conditions under which the structure is placed. Most structures in Florida are constructed with Florida limerock or granite (preferred). Granite structures can last 50 years or more without requiring maintenance, while limerock structures may require maintenance on a slightly more frequent basis due to their lower densities. On average, hard structures are designed to require only minor repairs (such as replacing dislocated rock) that would only be expected approximately every 20 years (Martin 2013).

Disturbance severity

The Action Area encompasses a large percentage of the wintering range of the piping plover; however, the overall intensity of the disturbance is expected to be minimal. The intensity of the effect on piping plover habitat may vary depending on the frequency of the sand placement activities, the existence of staging areas, and the location of the beach access points. The severity is also likely to be slight, as plovers located within the Action Area are expected to move outside of the construction zone due to disturbance; therefore, no plovers are expected to be directly taken as a result of this action.

Analyses for effects of the action

The Action Area encompasses peninsular Florida within the AORs of the NFESO and the SFESO on both the Atlantic and Gulf coasts of Florida. It consists mostly of designated piping plover Critical Habitat Units and publicly owned land that exhibits the following features: located within 1 mile of an inlet; emergent nearshore sand bars; washover fans; emergent bayside and Ocean/Gulf-side shoals and sand bars; bayside mudflats, sand flats, and algal flats; or bayside shorelines of bays and lagoons.

Direct effects

Sand placement projects that utilize beach compatible material from either an appropriate borrow site or from the authorized Federal channel, have the potential to elevate the beach berm and widen the beach, providing storm protection and increasing recreational space. The construction window (*i.e.,* sand placement, dredging, groin and jetty repair/replacement) for each event is likely to extend through a portion of at least one piping plover migration and winter season. If material is placed on the beach, heavy machinery and equipment (*e.g.,* trucks and bulldozers operating on Action Area beaches, the placement of the dredge pipeline, and sand placement) may adversely affect migrating and wintering piping plovers in the Action Area by disturbing and disrupting normal activities such as roosting and feeding, and possibly forcing birds to expend valuable energy reserves to seek available habitat in adjacent areas along the shoreline. Sand placement may occur in and adjacent to habitat that appears suitable for roosting and foraging piping plovers, or that will become more optimal with time. Short-term and temporary construction effects to piping plovers will occur if the birds are roosting and feeding in the area during a migration stopover. The deposition of sand may temporarily deplete the intertidal food base along the shoreline and temporarily disturb roosting birds during project construction.

For some highly eroded beaches, sand placement will have a beneficial effect on the habitat's ability to support wintering piping plovers. Narrow beaches that do not support a productive wrack line may see an improvement in foraging habitat available to piping plovers following sand placement. The addition of sand to the sediment budget may also increase a sand-starved beach's likelihood of developing habitat features valued by piping plovers, including washover fans and emergent nearshore sand bars.

Maintenance dredging of shallow-draft inlets can occasionally require the removal of emergent shoals that may have formed at the location of the Federally-authorized channel from the migration of the channel over time. In these cases, the dredging activities would result in a complete take of that habitat. However, this take could be either temporary or more permanent in nature depending upon the location of future shoaling within the inlet.

Groins and jetties are shore-perpendicular structures that are designed to trap sand that would otherwise be transported by longshore currents. Jetties are defined as structures placed to keep sand from flowing into channels (Kaufman and Pilkey 1979; Komar 1983). In preventing normal sand transport, these structures accrete updrift beaches while causing accelerated beach erosion downdrift of the structures (Komar 1983; Pilkey et al. 1984). As sand fills the area updrift from the groin or jetty, some littoral drift and sand deposition on adjacent downdrift beaches may occur due to spillover. However, these groins and jetties often force the stream of sand into deeper offshore water, where it is lost from the system (Kaufman and Pilkey 1979). The greatest changes in beach profile near groins and jetties are observed close to the structures, but effects eventually may extend many miles along the coast (Komar 1983). The proposed activities associated with this P^{3}BO only include the repair and replacement of existing groins and jetties. Since the primary effects associated with groins and jetties are associated with their alteration of sand movement, the effects would not change with the proposed action. Temporary adverse effects to the piping plover from disruption in the immediate vicinity of the project would occur during construction.

Indirect effects

Indirect effects are a result of a proposed action that occur later in time and are reasonably certain to occur. During sand placement, suffocation of invertebrate species will occur and degrade the suitability of the habitat for foraging. The effects to the benthic communities and the indirect effects to the piping plover will occur even if sand placement activities occur outside the piping plover migration and wintering seasons. Timeframes projected for benthic recruitment and re-establishment following sand placement are between 6 months and 2 years. Tilling to loosen compacted sand, sometimes required following beach nourishment to minimize effects to nesting sea turtles, may affect wrack that has accumulated on the beach. However, tilling is usually conducted above the wrack line. This may affect feeding and roosting habitat for piping plovers since they often use wrack for cover and foraging.

Natural, undeveloped barrier islands need storms and overwash to maintain the physical and biological environments they support (Young et al. 2006). Sand placement may limit washover fans from developing, which could accelerate the successional state of sand flats such that they will likely become vegetated within a few years (Leatherman 1988). This may reduce an area’s value to foraging and roosting piping plovers. The piping plover’s rapid response to habitats formed by washovers from the hurricanes in 2004 and 2005 in the Florida panhandle at Gulf Islands National Seashore and Eglin Air Force Base’s Santa Rosa Island, and similar observations of their preferences for overwash habitats at Phipps Preserve and Lanark Reef in Franklin County, Florida, and elsewhere in their range, demonstrate the importance of these habitats for wintering and migrating piping plovers.

Restoration of beaches through sand placement may increase recreational pressures within the project area. Recreational activities, including increased pedestrian use, have the potential to adversely affect piping plovers through disturbance and through increased presence of predators, including both domestic animals and feral animals attracted by the presence of people and their trash. Long-term effects could include a decrease in piping plover use of habitat due to increased disturbance levels.

Pilkey and Dixon (1996) stated beach replenishment frequently leads to more development in greater density within shorefront communities that are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also noted the very existence of a beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new and updated facilities substantially increased tourism there (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as much larger buildings that accommodated more beach users replaced older buildings. Overall, shoreline management creates an upward spiral of initial protective measures resulting in more expensive development, which leads to the need for more and larger protective measures. Greater development may also support larger populations of mammalian predators, such as foxes and raccoons, than undeveloped areas. Optimal habitat for the piping plover often occurs on publicly owned lands where human development may be limited; however, development of roads, bridges, and recreational facilities may be subject to scenarios similar to those described above.

Species' response to the proposed action

The Service bases this P^3BO on anticipated direct and indirect effects to piping plovers (wintering and migrating) and their Critical Habitat as a result of dredging, sand placement on beaches, and groin and jetty repair/replacement, which may prevent the maintenance or formation of habitat that piping plovers consider optimal for foraging and roosting. Heavy machinery and equipment (*e.g.*, trucks and bulldozers operating on project area beaches, the placement of the dredge pipeline along the beach, and sand disposal) may adversely affect migrating and wintering piping plovers in the project area by disturbance and disruption of normal activities such as roosting and forging, and possibly forcing piping plovers to expend valuable energy reserves to seek available habitat elsewhere. In addition, foraging in suboptimal habitat by migrating and wintering piping plovers may reduce the fitness of individuals. Furthermore, increased and continual disturbance within optimal habitat, including Critical Habitat Units, could have effects on all three breeding populations of piping plovers.

Cumulative effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the Action Area considered in this Biological Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

It is reasonably certain coastal development, human occupancy, and recreational use along the Atlantic and Gulf coasts of Florida will increase in the future. However, areas identified as optimal piping plover habitat are not as likely to be affected by coastal development and human occupancy, since they are primarily protected areas that are relatively undeveloped compared to other beaches in Florida. Optimal Piping Plover Areas may still experience heavy recreational use. It is unknown how much influence beach nourishment will contribute to the development and recreational use of the shoreline. Most activities affecting designated piping plover Critical Habitat would require Federal permits or funding. The Service is unable to identify any specific activities that would be considered cumulative effects.

CONCLUSION

There are 2,340 miles of sandy shoreline available (although not necessarily suitable) throughout the piping plover wintering range within the conterminous U.S. The primary effects of the proposed activities are to piping plover foraging and roosting habitat, and these effects are typically limited to the first year following project construction. Beach wrack and the benthic community are often reestablished between 6 months and 1 year following project construction.

In the long-term, sand placement activities will add sediment to the system that could otherwise be removed as part of inlet maintenance, and increase the availability of suitable habitat for the species.

After reviewing the current status of the northern Great Plains, Great Lakes, and Atlantic Coast wintering piping plover populations, the environmental baseline for Action Area, the effects of the proposed activities, the Conservation Measures proposed by the Corps, and the cumulative effects, it is the Service's biological opinion that implementation of these actions, as proposed, is not likely to jeopardize the continued existence of the piping plover.

In addition, after reviewing the current status of the affected species, the environmental baseline for the Action Area, the effects of the proposed activities, and the cumulative effects, it is the Service's biological opinion the action, as proposed, will not adversely modify designated critical habitat for the reason given below.

Although some Critical Habitat Units may be impacted by project activities, these would most frequently be units or portions of units that are highly eroded and where habitat for piping plovers has become degraded. In these instances, the adverse effects of project activities would be offset over time by beneficial effects associated with the restoration of beaches. In all cases, neither the negative nor the positive effects of beach nourishment are likely to be permanent due to the dynamic nature of shoreline processes. Project activities would not affect a Critical Habitat Unit to the extent that, over time, the unit would be unable to serve its intended purposes. Therefore, any loss of habitat would not have a significant effect on the species' persistence or on the function of these Critical Habitat Units as a whole.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be implemented by the Corps so they become binding conditions of any permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the Terms and

Conditions or, (2) fails to adhere to the Terms and Conditions of the incidental take statement through enforceable terms that are added to the permit, the protective coverage of section 7(o)(2) may lapse. In order to monitor the effects of incidental take, the Corps must report the progress of the action and its effects on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

It is difficult for the Service to estimate the exact number of piping plovers that could be migrating through or wintering within the Action Area at any one point in time and place during project construction. Disturbance to suitable habitat resulting from both dredging and sand placement activities within the Action Area would affect the ability of an undetermined number of piping plovers to find suitable foraging and roosting habitat during the migrating and wintering periods of any given year. Because the number of piping plovers that would be affected by projects cannot be determined, the Service will use the annual disturbance in shoreline miles as a surrogate for take.

The FDEP's Critically Eroded Beaches in Florida report identified 204.2 miles of critically eroded beaches on the Atlantic Coast of Florida, and an additional 102.3 miles of critically eroded beaches on the Gulf Coast of Florida in the Action Area (FDEP 2012). FDEP's definition of "critically eroded" requires upland development, recreation, wildlife habitat, or important cultural resources to be threatened. Due to the threat to upland interests, it is anticipated that beaches identified by FDEP to be critically eroding would be the most likely to be affected by the proposed action. Of the 204.2 miles of critically eroded beaches on the Atlantic Coast, approximately 49.4 miles are located on public lands primarily managed for conservation purposes; on the Gulf Coast, approximately 14.7 miles of the 102.3 miles of critically eroded beaches are located on public lands, for a total of 64.1 miles in the Action Area that are most likely to be affected. We acknowledge some additional public lands that are not defined as critically eroded and not included in the estimate above may also be affected. However, not all public lands have habitat elements that support migrating or wintering piping plover on a regular basis; therefore, some public lands included in the estimate above are not optimal piping plover habitat.

The July 10, 2001, FR notice designated approximately 27,328 acres, corresponding to approximately 47 miles of beach, as Critical Habitat for wintering piping plovers in peninsular Florida. Most designated Critical Habitat is publicly owned (see Appendix A) and the Critical Habitat most likely to be disturbed would fall under the critically eroded, publicly owned category, part of the estimated 64.1 miles of beach cited above.

An additional 15.0 miles of beach in six units are defined as optimal piping plover habitat, but not located on publically-owned lands or Critical Habitat Units. Over time, most or all of these areas may be subject to project-related disturbance. Therefore, the total shoreline (optimal piping plover habitat) estimated to be effected by the proposed action is 79.1 miles, rounded for our purposes to 80 miles. It is estimated approximately 10 percent or less of the total 80 miles of potentially affected optimal habitat would be impacted in any given year (or approximately 8 miles). In years following emergency events, the impacted area is expected to increase to approximately 25 percent or less of the total mileage, or 20 miles of shoreline. Over the past 10 years, two Congressional Orders occurred due to emergency events (2004-2005 hurricane season, and the 2012 hurricane season). The increased sand placement activities due to emergency events are anticipated to occur once in a 7-year period. This estimate is considered to be conservative, as many of the lands identified as optimal piping plover habitat are undeveloped. Since upland development is generally not threatened in these areas, the cost of placing sand on these shorelines is not justified.

Sand placement resulting from maintenance dredging projects is the most likely activity to affect these areas due to the preference to keep sand within the littoral system. It is expected the exact mileage of shoreline affected by the proposed action will vary from year to year. Maintenance dredging and sand placement activities may result in an unspecified number of piping plovers occupying these areas to be taken in the form of harm (*e.g.*, death, injury) and harassment as a result of this action.

EFFECT OF THE TAKE

In this P^3BO, the Service determined the proposed project is not likely to result in jeopardy to the piping plover.

REASONABLE AND PRUDENT MEASURES

The Service has determined the following Reasonable and Prudent Measures are necessary and appropriate to minimize take of the piping plover in the Action Area. If the Corps is unable to comply with the Reasonable and Prudent Measures and Terms and Conditions, the Corps as the construction agent or regulatory authority may:

1. Inform the Service why the Term and Condition is not reasonable and prudent for the specific project or activity and request exception under the P^3BO; or

2. Initiate consultation with the Service for the specific project or activity.

The Service may respond by either of the following:

1. Allowing an exception to the Terms and Conditions under the P^3BO; or

2. Recommending or accepting initiation of consultation (if initiated by the Corps) for the specific project or activity.

The post construction survey requirements are described in Reasonable and Prudent Measure #5 and Term and Condition #8. These requirements are subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps will notify the Service when initiating consultation for the project.

1. All sand placed on the beach or in the nearshore shall be compatible with the existing beach and will maintain the general character and functionality of the existing beach.

2. The Corps or the Applicant will notify the Service of the commencement of projects that utilize this P^{3}BO for the purposes of tracking incidental take of the species.

3. The Corps shall protect habitat features considered preferred by plovers outside of the project footprint in accordance with Terms and Conditions 3, 4, 5, and 6.

4. The Corps will facilitate awareness of piping plover habitat by educating the public on ways to minimize disruption to the species.

5. The Corps, the Applicant, or the local sponsor shall provide the mechanisms necessary to monitor impacts to piping plovers within the Action Area.

6. The Corps shall facilitate an annual meeting with the Service to assess the effectiveness of the protection and minimization measures outlined in this P^{3}BO.

TERMS AND CONDITIONS

1. Beach compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

2. The Corps or the Permittee must provide the following information to the Service Field Supervisor of the appropriate Field Office at least 10 business days prior to the commencement of work:

    a. Project location (include FDEP Range Monuments and latitude and longitude coordinates);
    b. Project description (include linear feet of beach, actual fill template, access points, and borrow areas);
    c. Date of commencement and anticipated duration of construction; and
    d. Names and qualifications of personnel involved in piping plover surveys.

3. Prior to construction, the Corps shall delineate preferred piping plover habitat (intertidal portions of ocean beaches, ephemeral pools, washover areas, wrack lines) adjacent to or outside of the project footprint that might be impacted by construction activities. Obvious identifiers shall be used (for example, pink flagging on metal poles) to clearly mark the beginning and end points to prevent accidental impacts to use areas.

4. Piping plover habitat delineated adjacent to or outside of the project footprint shall be avoided to the maximum extent practicable when staging equipment, establishing travel corridors, and aligning pipeline.

5. Driving on the beach for construction shall be limited to the minimum necessary within the designated travel corridor, which will be established just above or just below the primary “wrack” line.

6. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of piping plovers. Workers shall be briefed on the importance of not littering and keeping the project area trash and debris free. See Appendix B for examples of suitable receptacles.

7. Educational signs shall be installed at public access points within the project area with emphasis on the importance of the beach habitat and wrack for piping plovers. When the project area has a pet or dog regulation, the provisions of the regulation shall be included on the educational signs.

8. For one full piping plover migration and winter season (beginning July 15 to May 15) prior to construction, and 2 years following each dredging and sand placement event, bi-monthly (twice-monthly) surveys for piping plovers shall be conducted in the beach fill and in any other intertidal or shoreline areas within or affected by the project. If a full season is not available, at least 5 consecutive months with three surveys per month spaced at least 9 days apart are required. During emergency projects, the surveys will begin as soon as possible prior to, and up to implementing the project. Piping plover identification, especially when in non-breeding plumage, can be difficult. If pre-construction monitoring is not practicable, it will be so indicated in the notification to the Service (see Term and Condition #2 above) and the Service will decide whether to require a separate individual consultation. See introductory paragraph to Reasonable and Prudent Measures earlier in this document.

9. The person(s) conducting the survey must demonstrate the qualifications and ability to identify shorebird species and be able to provide the information listed below.
The following will be collected, mapped, and reported:

a. Date, location, time of day, weather, and tide cycle when survey was conducted;
b. Latitude and longitude of observed piping plover locations (decimal degrees preferred);
c. Any color bands observed on piping plovers;
d. Behavior of piping plovers (*e.g.*, foraging, roosting, preening, bathing, flying, aggression, walking);
e. Landscape features(s) where piping plovers are located (*e.g.*, inlet spit, tidal creeks, shoals, lagoon shoreline);
f. Habitat features(s) used by piping plovers when observed (*e.g.*, intertidal, fresh wrack, old wrack, dune, mid-beach, vegetation);
g. Substrata used by piping plovers (*e.g.*, sand, mud/sand, mud, algal mat);
h. The amount and type of recreational use (*e.g.*, people, dogs on or off leash, vehicles, kite-boarders); and
i. All other shorebirds/waterbirds seen within the survey area.

All information shall be provided in an Excel spreadsheet. Monitoring results shall be submitted (datasheets, maps, database) on standard electronic media (*e.g.*, CD, DVD) to the appropriate Field Office by July 31 of each year in which monitoring is completed. If an appropriate web based reporting system becomes available, it would be used in lieu of hard copy/media.

[NOTE: As a condition to a permit from the FDEP, the bird monitor may also be required to report shorebird data to the Florida Fish and Wildlife Conservation Commission (FWC) https://public.myfwc.com/crossdoi/shorebirds/SigninExploreData.aspx.]

10. The Corps shall meet with the Service and the FWC (and BOEM as appropriate) annually to discuss the effectiveness of the avoidance measures and additional measures to include for future projects. The agencies will also review the projects utilizing this P^{3}BO the previous year to ensure that the reporting requirements for calculating the extent of take are adequate. This meeting will also explore:

    a. The possibility of using dredged materials to enhance potential or existing piping plover habitat within and adjacent to the project area;
    b. Methods for funding beneficial use opportunities for dredged materials that are not least-cost disposal to benefit piping plovers and their habitat;
    c. The development of shore protection design guidelines that can be utilized during future project planning to protect and/or enhance piping plover habitat; and
    d. Incorporating artificial lagoons or ephemeral pools into project designs adjacent to inlets where sand placement is proposed.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or Critical Habitat, to help implement recovery plans, or to develop information.

1. The Corps will facilitate a meeting between the Applicant or the local sponsor, the FWC, and the Service to discuss steps for the long-term protection of wrack within the project area; and

2. The Service encourages continued investigation into opportunities for increasing monitoring for Civil Works operations and maintenance projects.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

The amount or extent of incidental take for piping plovers will be considered exceeded if sand is placed on more than 8 miles of optimal piping plover shoreline during a nonemergency year, and a maximum of 20 miles of optimal piping plover shoreline during or following an emergency event (declared disaster or Congressional Order) as a result of this programmatic action. If the anticipated level of incidental take is exceeded during the course of this action, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or Critical Habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or Critical Habitat not considered in this opinion; or (4) a new species is listed or Critical Habitat designated that may be affected by the action. Reinitiation of formal consultation is also required 10 years after the issuance of this P^3BO. In instances where the amount or extent of incidental take is exceeded, any operations causing such take shall cease pending reinitiation.

MIGRATORY BIRD TREATY ACT

Migratory Bird Treaty Act (MBTA) for all Projects:

Comply with the FWC's standard shorebird protection guidelines to protect against impacts to nesting shorebirds during implementation of these projects on the Gulf Coast during the periods from February 15-August 31 or on the Atlantic Coast from April 1- August 31. All sand placement events could impact nesting shorebirds protected under the MBTA.

***The MBTA implements various treaties and conventions between the U.S., Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the provisions of the MBTA it is unlawful by any means or manner to pursue, hunt, take, capture or kill any migratory bird except as permitted by regulations issued by the Service. The term "take" is not defined in the MBTA, but the Service has defined it by regulation to mean to pursue, hunt, shoot, wound, kill, trap, capture or collect any migratory bird, or any part, nest or egg or any migratory bird covered by the conventions or to attempt those activities.

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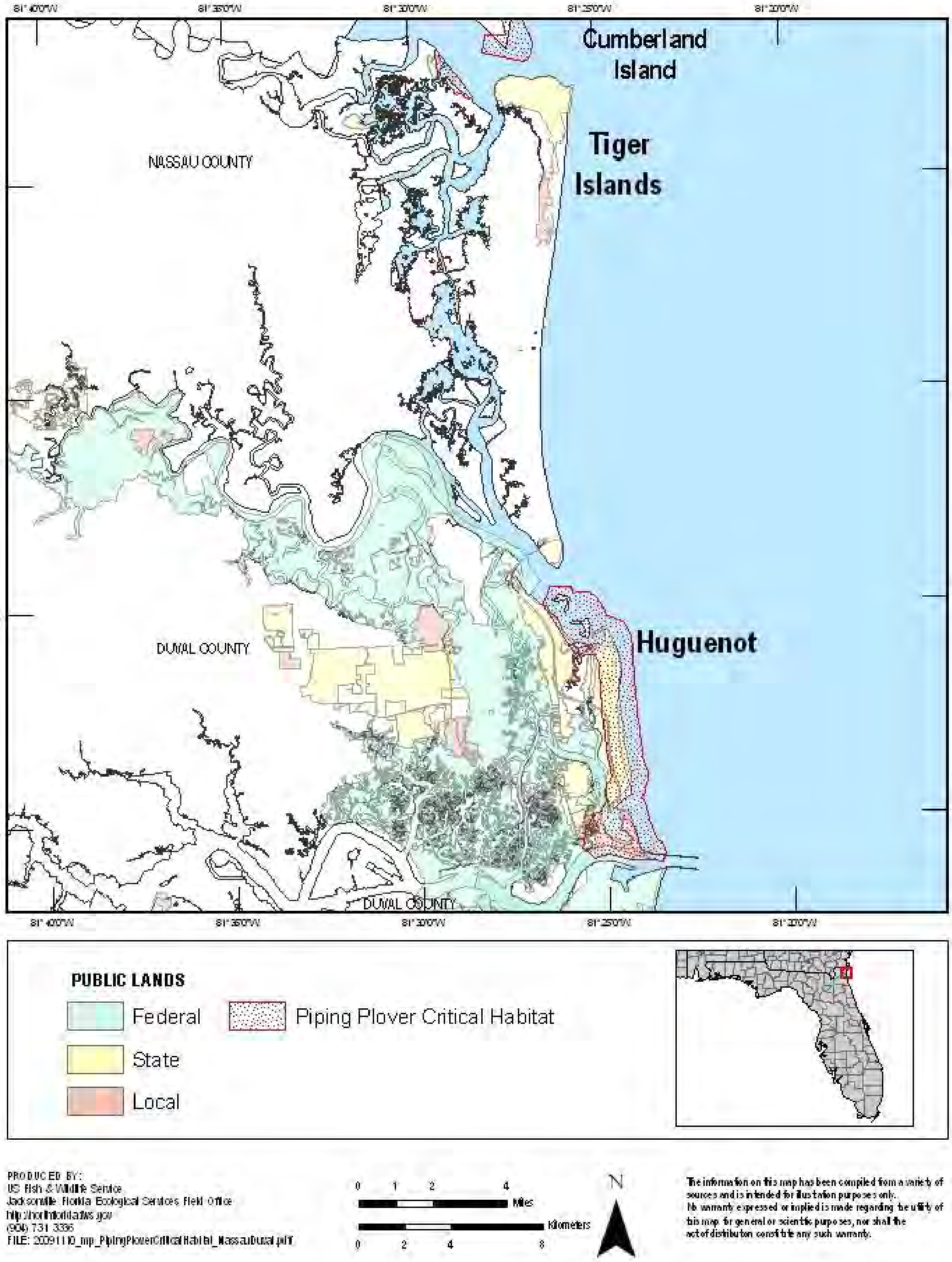
APPENDIX A: PIPING PLOVER CRITICAL HABITAT UNITS IN THE ACTION AREA

U.S. Fish & Wildlife Service

PIPING PLOVER CRITICAL HABITAT



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US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
http://northflorida.fws.gov
(904) 731 3336
FILE: 20091110_mp_PipingPloverCriticalHabitat_NassauDuval.pdf

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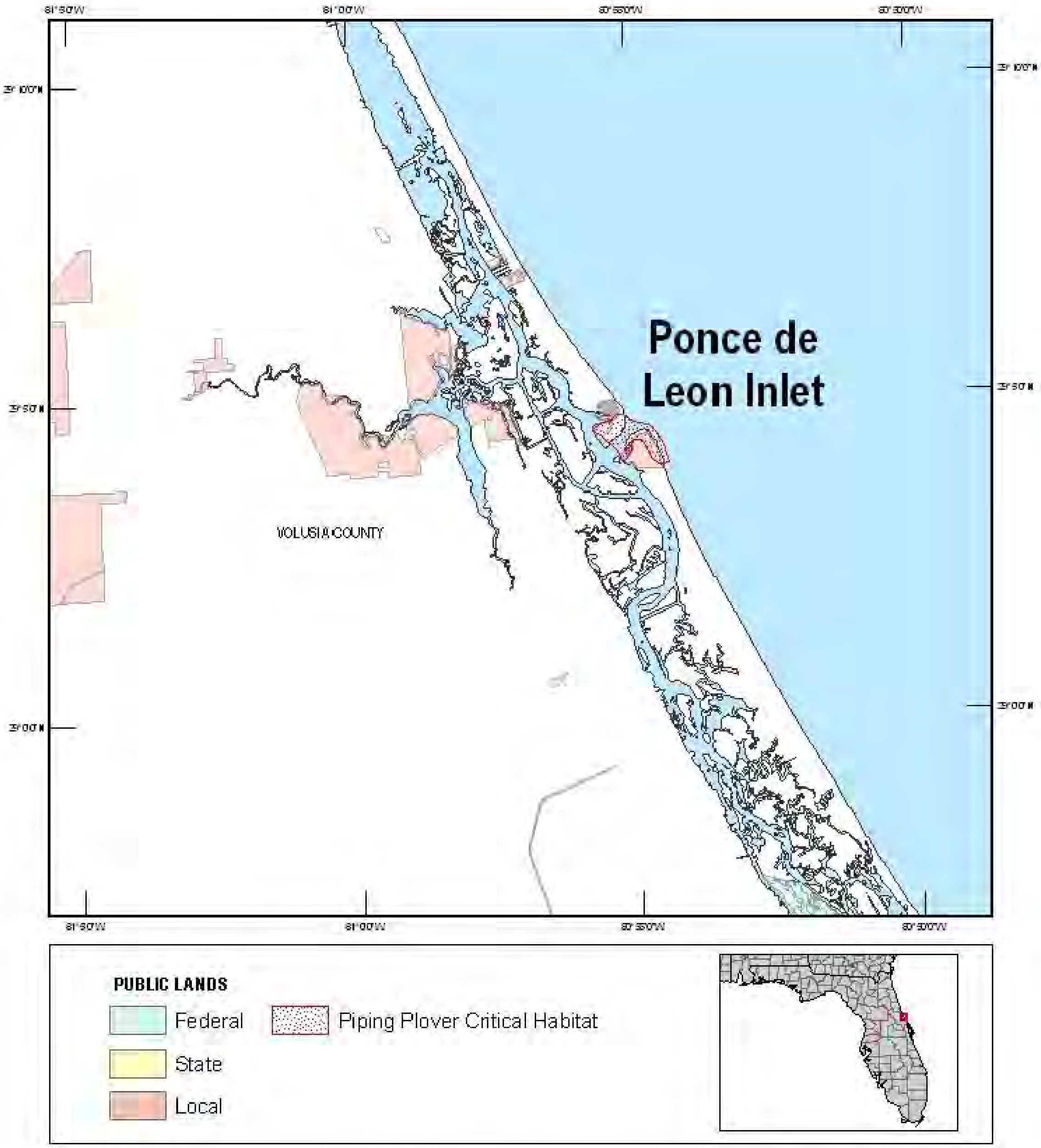
U.S. Fish & Wildlife Service

PIPING PLOVER CRITICAL HABITAT



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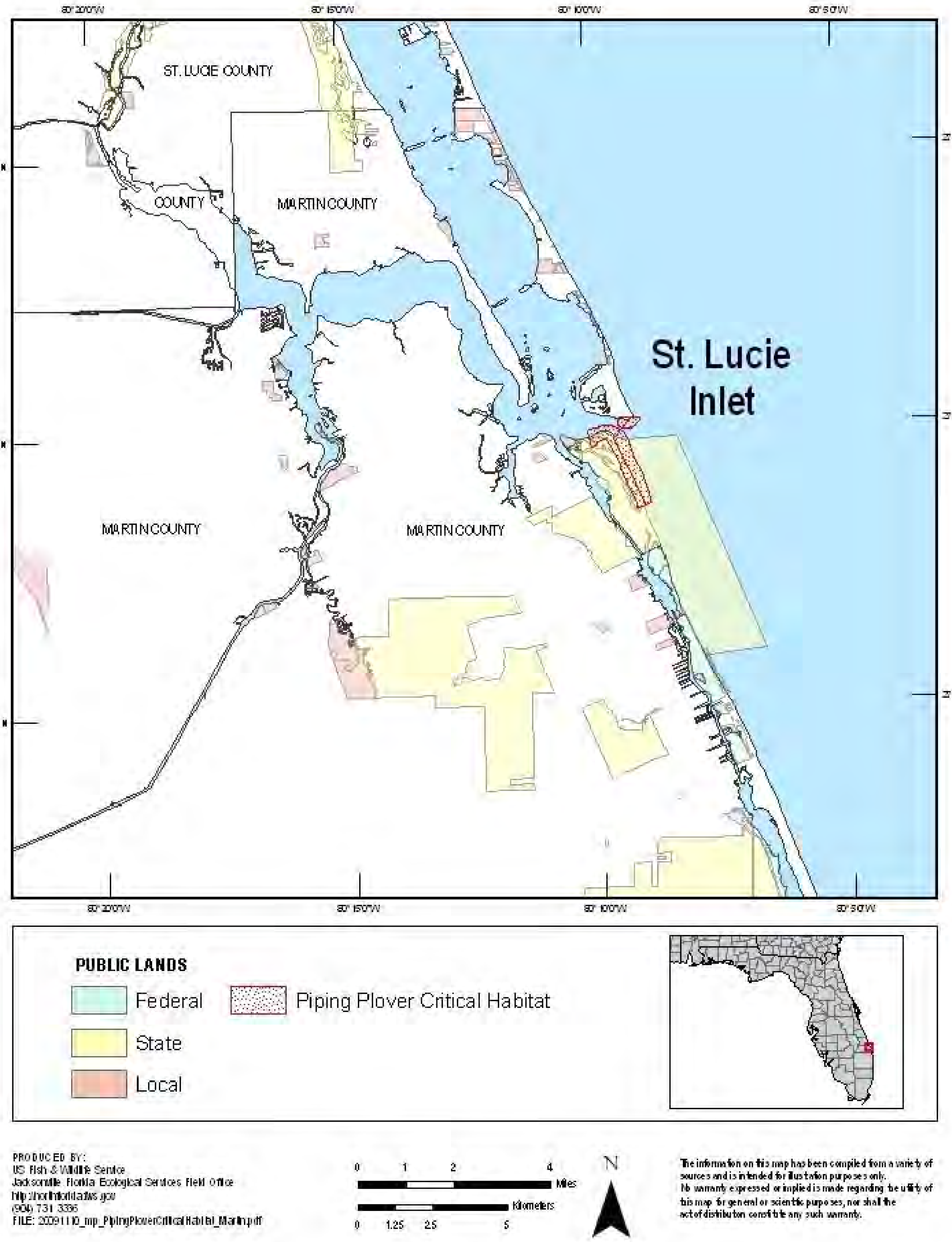
PIPING PLOVER CRITICAL HABITAT



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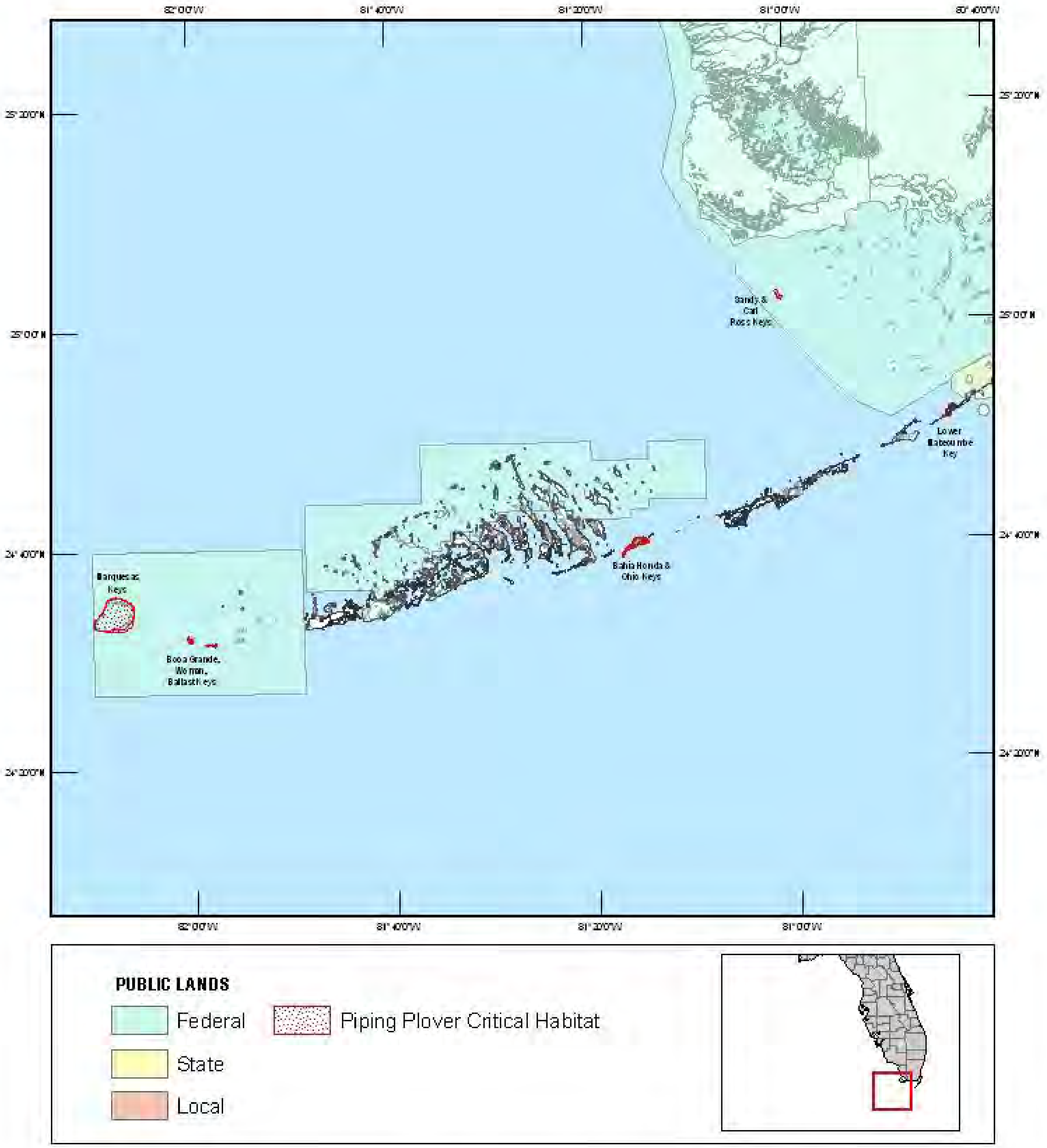

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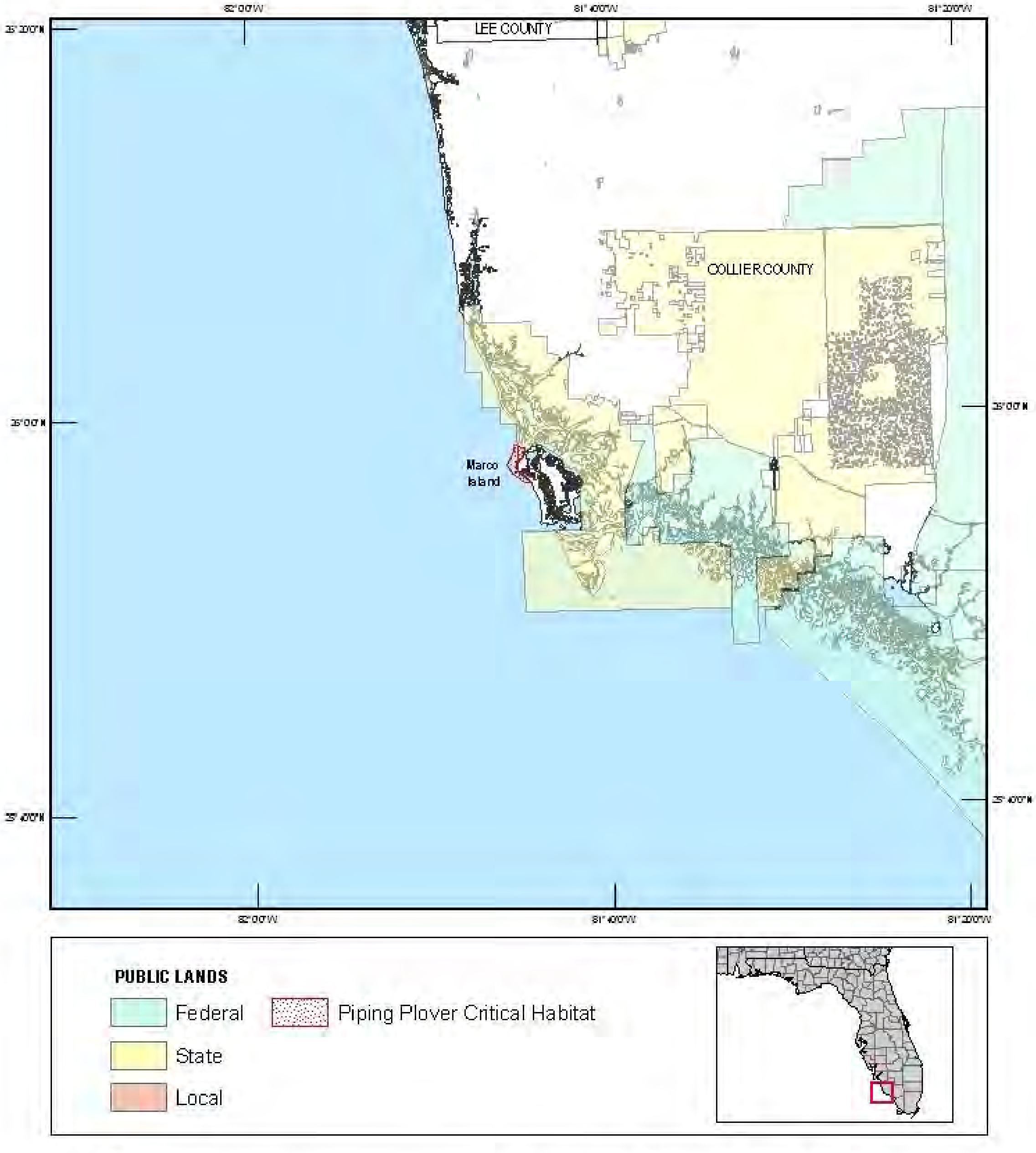

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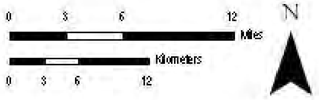

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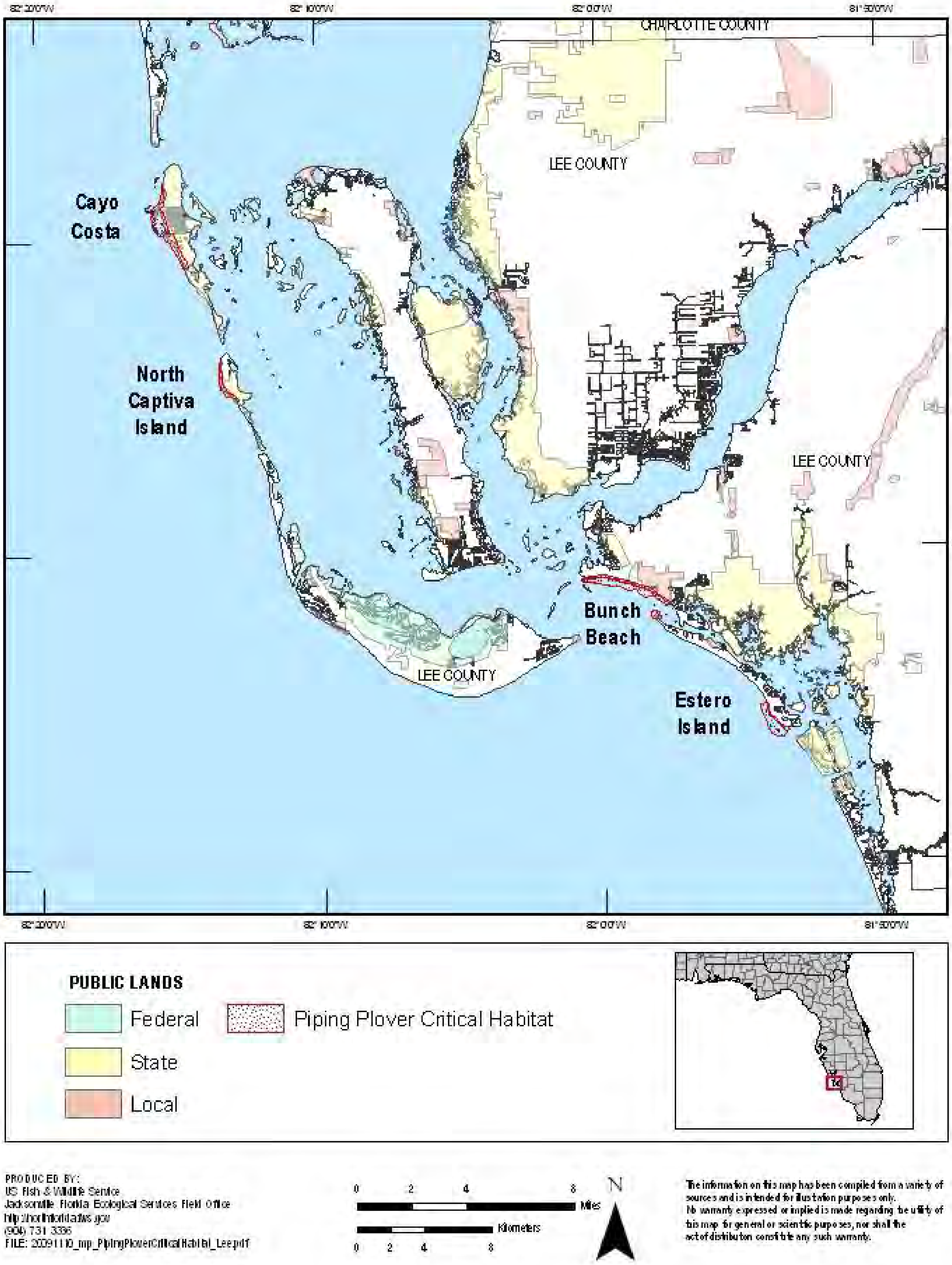

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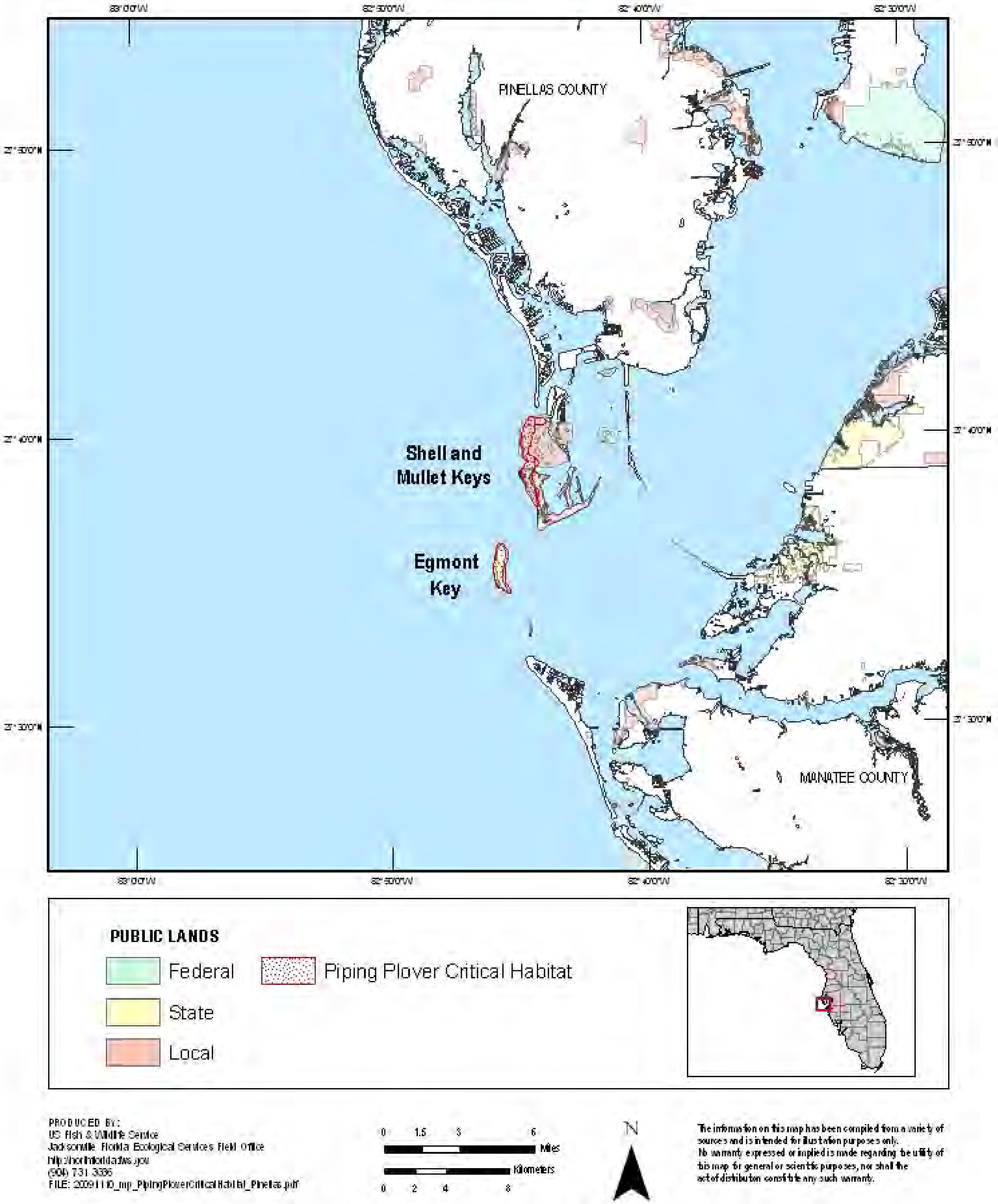

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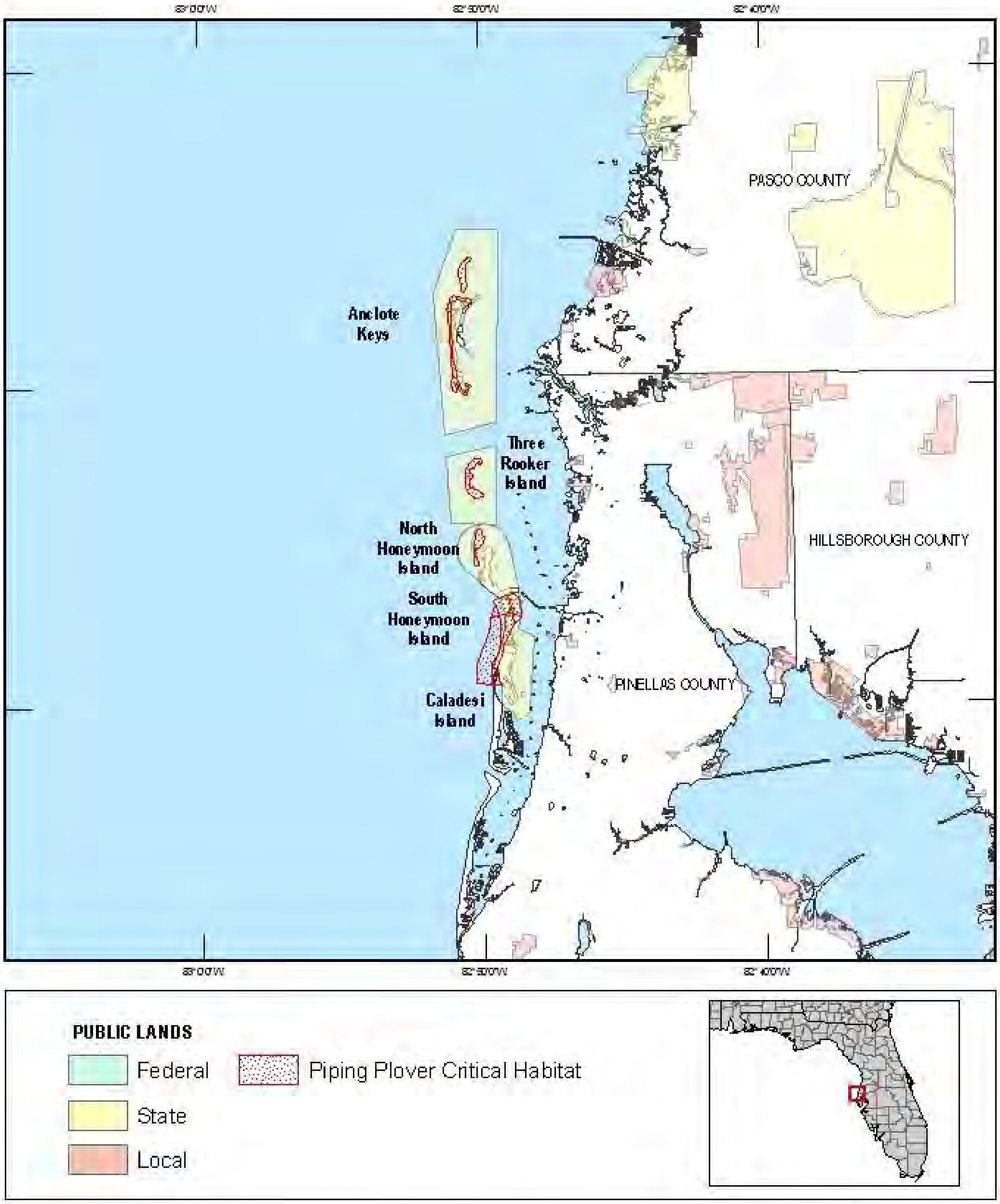

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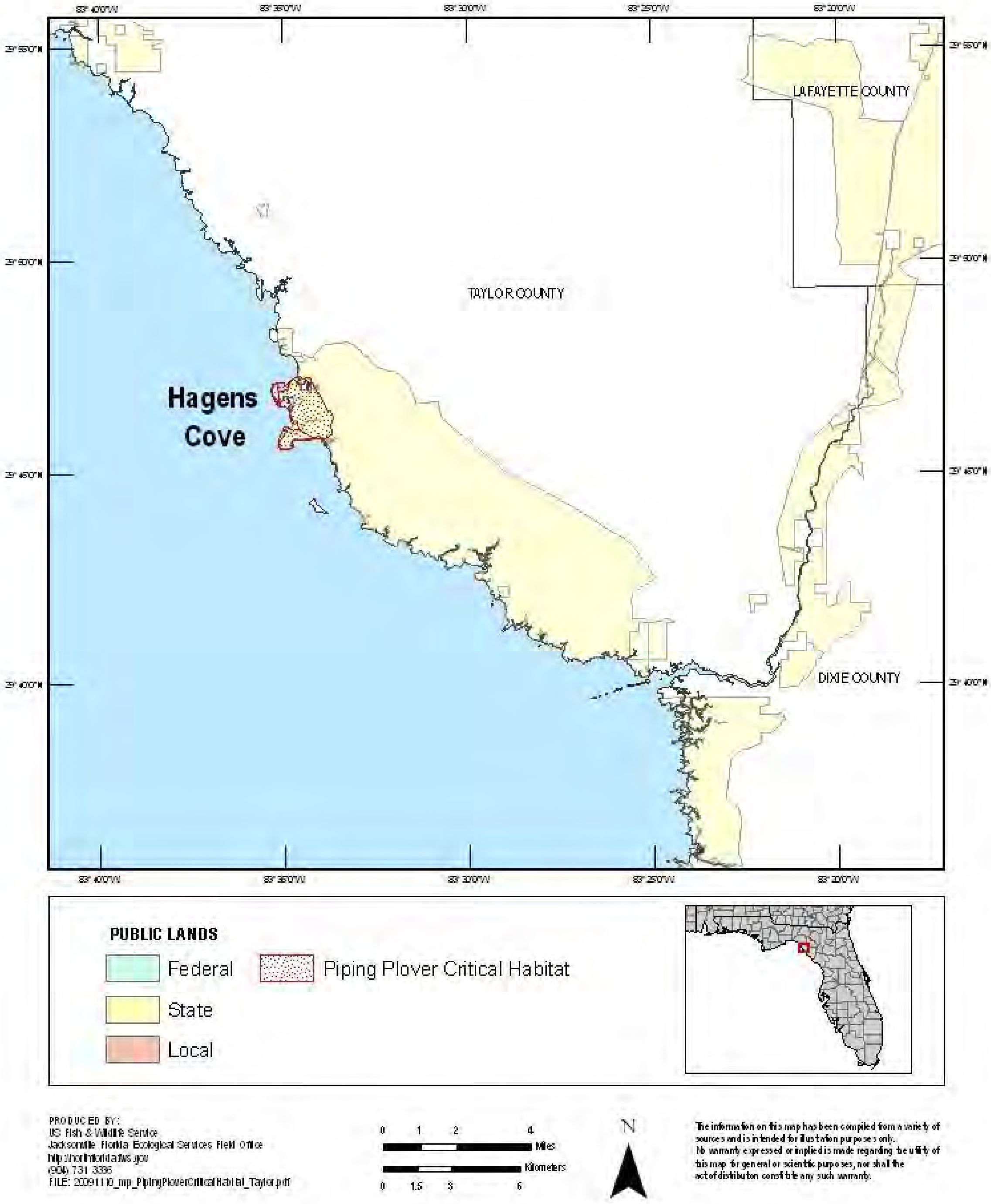

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APPENDIX B: EXAMPLE PREDATOR PROOF TRASH RECEPTACLES

Example of predator proof trash receptacle at Gulf Islands National Seashore. Lid must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle anchored into the ground so it is not easily turned over.

Example of predator proof trash receptacle at Perdido Key State Park. Metal trash can is stored inside. Cover must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle that is secured and heavy enough not to easily be turned over.

APPENDIX E6

NMFS GULF REGIONAL BIOLOGICAL OPINION TERMS AND CONDITIONS

APPENDIX E6

NMFS GULF REGIONAL BIOLOGICAL OPINION – TERMS AND CONDITIONS

4) In the present Opinion, the COE Districts are authorized to request waivers from the relocation trawling requirement (which may be delivered and responded to by both agencies via electronic mail) for projects where the COE Districts do not feel relocation trawling is feasible, necessary or warranted.

5) The Districts are required to fund the cost of tissue sampling and genetic analyses of tissue samples from turtles taken during projects in their respective Districts.

The following terms and conditions implement the reasonable and prudent measures discussed above:

Terms and Conditions

Hopper Dredging: Hopper dredging activities in Gulf of Mexico waters from the Mexico-Texas border to Key West, Florida up to one mile into rivers shall be completed, whenever possible, between December 1 and March 31, when sea turtle abundance is lowest throughout Gulf coastal waters. Hopper dredging of Key West channels is covered by the existing August 25, 1995, RBO to the COE's SAD. The COE shall discuss with NOAA Fisheries why a particular project cannot be done within the December 1-March 31 "window."

2. *Non-hopper Type Dredging*: Pipeline or hydraulic dredges, because they are not known to take turtles, must be used whenever possible between April 1 and November 30 in Gulf of Mexico waters up to one mile into rivers. This should be considered particularly in channels such as those associated with Galveston Bay and Mississippi River - Gulf Outlet (MR-GO), where lethal takes of endangered Kemp's ridleys have been documented during summer months, and Aransas Pass, where large numbers of loggerheads may be found during summer months. In the MR-GO, incidental takes and sightings of threatened loggerhead sea turtles have historically been highest during April and October.

3. *Annual Reports*: The annual summary report, discussed below (#9), must give a complete explanation of why alternative dredges (dredges other than hopper dredges) were not used for maintenance dredging of channels between April and November.

4. *Observers*: The COE shall arrange for NOAA Fisheries-approved observers to be aboard the hopper dredges to monitor the hopper spoil, screening, and dragheads for sea turtles and Gulf sturgeon and their remains.

   a. Brazos Santiago Pass east to Key West, Florida: Observer coverage sufficient for 100% monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges year-round from Brazos Santiago Pass to (not including) Key West, Florida between April 1 and November 30, and whenever surface water temperatures are 11°C or greater.

   b. Observer coverage of hopper dredging of sand mining areas shall ensure 50% monitoring (i.e., one observer).

   c. Observers are not required at any time in Mississippi River - Southwest Pass (MR-SWP).

5. *Operational Procedures*: During periods in which hopper dredges are operating and NOAA Fisheries-approved observers are *not* required, (as delineated in #4 above), the appropriate COE District must:

a. Advise inspectors, operators and vessel captains about the prohibitions on taking, harming, or harassing sea turtles

b. Instruct the captain of the hopper dredge to avoid any turtles and whales encountered while traveling between the dredge site and offshore disposal area, and to immediately contact the COE if sea turtles or whales are seen in the vicinity.

c. Notify NOAA Fisheries if sea turtles are observed in the dredging area, to coordinate further precautions to avoid impacts to turtles.

d. Notify NOAA Fisheries immediately by phone (727/570-5312) or fax (727/570-5517) if a sea turtle or Gulf sturgeon is taken by the dredge.

6. *Screening*: When sea turtle observers are required on hopper dredges, 100% inflow screening of dredged material is required and 100% overflow screening is recommended. If conditions prevent 100% inflow screening, inflow screening may be reduced gradually, as further detailed in the following paragraph, but 100% overflow screening is then required. NOAA Fisheries must be consulted <u>prior</u> to the reductions in screening and an explanation must be included in the dredging report.

a. Screen Size: The hopper's inflow screens should have 4-inch by 4-inch screening. If the COE, in consultation with observers and the draghead operator, determines that the draghead is clogging and reducing production substantially, the screens may be modified sequentially: mesh size may be increased to 6-inch by 6-inch, then 9-inch by 9-inch, then 12-inch by 12-inch openings. Clogging should be greatly reduced with these flexible options; however, further clogging may compel removal of the screening altogether, in which case <u>effective</u> 100% overflow screening is mandatory. The COE shall notify NOAA Fisheries <u>beforehand</u> if inflow screening is going to be reduced or eliminated, and provide details of how effective overflow screening will be achieved.

b. Need for Flexible, Graduated Screens: NOAA Fisheries believes that this flexible, graduated-screen option is necessary, since the need to constantly clear the inflow screens will increase the time it takes to complete the project and therefore increase the exposure of sea turtles to the risk of impingement or entrainment. Additionally, there are increased risks to sea turtles in the water column when the inflow is halted to clear screens, since this results in clogged intake pipes, which may have to be lifted from the bottom to discharge the clay by applying suction.

c. Exemption - MR-SWP: Screening is not required at any time in MR-SWP.

7 *Dredging Pumps*: Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads are not firmly on the bottom, to prevent impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations when the draghead frequently comes off the bottom and can suck in turtles resting in the shallow depressions between the high spots the draghead is trimming off.

8. *Sea Turtle Deflecting Draghead*: A state-of-the-art rigid deflector draghead must be used on all hopper dredges in all Gulf of Mexico channels and sand mining sites at all times of the year except that the rigid deflector draghead is not required in MR-SWP at any time of the year.

9. *Dredge Take Reporting*: Observer reports of incidental take by hopper dredges must be faxed to NOAA Fisheries' Southeast Regional Office (727-570-5517) by onboard endangered species observers within 24 hours of any sea turtle, Gulf sturgeon, or other listed species take observed.

A preliminary report summarizing the results of the hopper dredging and any documented sea turtle or Gulf sturgeon takes must be submitted to NOAA Fisheries within 30 working days of completion of any dredging project. Reports shall contain information on project location (specific channel/area dredged), start-up and completion dates, cubic yards of material dredged, problems encountered, incidental takes and sightings of protected species, mitigative actions taken (if relocation trawling, the number and species of turtles relocated), screening type (inflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information the COE deems relevant.

An annual report (based on fiscal year) must be submitted to NOAA Fisheries summarizing hopper dredging projects and documented incidental takes.

10. *Sea Turtle Strandings*: The COE Project Manager or designated representative shall notify the Sea Turtle Stranding and Salvage Network (STSSN) state representative (contact information available at: http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp) of the start-up and completion of hopper dredging operations and bed-leveler dredging operations and ask to be notified of any sea turtle/sturgeon strandings in the project area that, in the estimation of STSSN personnel, bear signs of potential draghead impingement or entrainment, or interaction with a bed-leveling type dredge.

Information on any such strandings shall be reported in writing within 30 days of project end to NOAA Fisheries' Southeast Regional Office. Because of different possible explanations for, and subjectivity in the interpretation of potential causes of strandings, these strandings will not normally be counted against the COE's take limit; however, if compelling STSSN observer reports and evidence indicate that a turtle was killed by a hopper dredge or a bed-leveling type dredge, that take will be deducted from the ITS' anticipated take level for that COE District where the take occurred.

11 *Reporting - Strandings*: Each COE District shall provide NOAA Fisheries' Southeast Regional Office with an annual report detailing incidents, with photographs when available, of stranded sea turtles and Gulf sturgeon that bear indications of draghead impingement or entrainment. This reporting requirement may be included in the end-of-year report required in Term and Condition No. 9, above.

12. *District Annual Relocation Trawling Report*: Each COE District shall provide NOAA Fisheries' Southeast Regional Office with end-of-project reports within 30 days of completion of relocation trawling projects, and an annual report summarizing relocation trawling efforts and results within their District. The annual report requirement may be included in the end-of-year report required in Term and Condition # 9, above.

Conditions Requiring Relocation Trawling: Handling of sea turtles captured during relocation trawling in association with hopper dredging projects in Gulf of Mexico navigation channels and sand mining areas shall be conducted by NOAA Fisheries-approved endangered species observers. Relocation trawling shall be undertaken by the COE at all projects where <u>any</u> of the following conditions are met; however, other ongoing projects not meeting these conditions are not required to conduct relocation trawling:

a. Two or more turtles are taken in a 24-hour period in the project.

b. Four or more turtles are taken in the project.

c. 75% of a District's sea turtle species quota for a particular species has previously been met.

14. *Relocation Trawling Waiver*: For individual projects the affected COE District may request by letter to NOAA Fisheries a waiver of part or all of the relocation trawling requirements. NOAA Fisheries will consider these requests and decide favorably if the evidence is compelling.

15. *Relocation Trawling - Annual Take Limits*: This Opinion authorizes the annual (by fiscal year) take of 300 sea turtles (of one species or combination of species) and eight Gulf sturgeon by duly-permitted, NOAA Fisheries-approved observers in association with all relocation trawling conducted or contracted by the four Gulf of Mexico COE Districts to temporarily reduce or assess the abundance of these listed species during (and in the 0-3 days immediately preceding) a hopper dredging project in order to reduce the possibility of lethal hopper dredge interactions, subject to the following conditions:

a. *Trawl Time*: Trawl tow-time duration shall not exceed 42 minutes (doors in - doors out) and trawl speeds shall not exceed 3.5 knots.

b. *Handling During Trawling*: Sea turtles and sturgeon captured pursuant to relocation trawling shall be handled in a manner designed to ensure their safety and viability, and shall be released over the side of the vessel, away from the propeller, and only after ensuring that the vessel's propeller is in the neutral, or disengaged, position (i.e., not rotating). Resuscitation guidelines are attached (Appendix IV).

c. *Captured Turtle Holding Conditions*: Captured turtles shall be kept moist, and shaded whenever possible, until they are released.

d. *Weight and Size Measurements*: All turtles shall be measured (standard carapace measurements including body depth) and tagged, and weighed when safely possible, prior to release; Gulf sturgeon shall be measured (fork length and total length) and–when safely possible–tagged, weighed, and a tissue sample taken prior to release. Any external tags shall be noted and data recorded into the observers log. Only NOAA Fisheries-approved observers or observer candidates in training under the direct supervision of a NOAA Fisheries-approved observer shall conduct the tagging/measuring/weighing/tissue sampling operations.

e. *Take and Release Time During Trawling - Turtles*: Turtles shall be kept no longer than 12 hours prior to release and shall be released not less than three nautical miles (nmi) from the dredge site. If two or more released turtles are later recaptured, subsequent turtle captures shall be released not less than five nmi away. If it can be done safely, turtles may be transferred onto another vessel for transport to the release area to enable the relocation trawler to keep sweeping the dredge site without interruption.

f. *Take and Release Time During Trawling - Gulf Sturgeon*: Gulf sturgeon shall be released immediately after capture, away from the dredge site or into already dredged areas, unless the trawl vessel is equipped with a suitable (not less than: 2 ft high by 2 ft wide by 8 ft long), well-aerated seawater holding tank where a maximum of one sturgeon may be held for not longer than 30 minutes before it must be released or relocated away from the dredge site.

g. *Injuries and Incidental Take Quota*: Any protected species injured or killed during or as a consequence of relocation trawling shall count toward the appropriate COE District's incidental take quota. Minor skin abrasions resulting from trawl capture are considered non-injurious. Injured sea turtles shall be immediately transported to the nearest sea turtle rehabilitation facility.

h. *Flipper Tagging*: All sea turtles captured by relocation trawling shall be flipper-tagged prior to release with external tags which shall be obtained prior to the project from the University of Florida's Archie Carr Center for Sea Turtle Research. This Opinion serves as the permitting authority for any NOAA Fisheries-approved endangered species observer aboard these relocation trawlers to flipper-tag with external tags (e.g., Inconel tags) captured sea turtles. Columbus crabs or other organisms living on external sea turtle surfaces may also be sampled and removed under this authority.

i. *Gulf Sturgeon Tagging*: Tagging of live-captured Gulf sturgeon may also be done under the permitting authority of this Opinion; however, it may be done only by personnel with prior fish tagging experience or training, and is limited to external tagging only, unless the observer holds a valid sturgeon research permit (obtained pursuant to section 10 of the ESA, from the NOAA Fisheries' Office of Protected Resources, Permits Division) authorizing sampling, either as the permit holder, or as designated agent of the permit holder.

j. *PIT-Tag Scanning*: All sea turtles captured by relocation trawling (or dredges) shall be thoroughly scanned for the presence of PIT tags prior to release using a scanner powerful enough to read dual frequencies (125 and 134 kHz) and read tags deeply embedded deep in muscle tissue (e.g., manufactured by Biomark or Avid). Turtles which scans show have been previously PIT tagged shall never-the-less be externally flipper tagged. The data collected (PIT tag scan data and external tagging data) shall be submitted to NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 working days to Lisa.Belskis@noaa.gov.

k. *CMTTP:* External flipper tag and PIT tag data generated and collected by relocation trawlers shall also be submitted to the Cooperative Marine Turtle Tagging Program (CMTTP), on the appropriate CMTTP form, at the University of Florida's Archie Carr Center for Sea Turtle Research.

l. *Tissue Sampling*: All live or dead sea turtles captured by relocation trawling or dredging shall be tissue-sampled prior to release, according to the protocols described in Appendix II or Appendix III of this Opinion. Tissue samples shall be sent within 60 days of capture to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 working days to Lisa.Belskis@noaa.gov. This Opinion serves as the permitting authority for any NOAA Fisheries-approved endangered species observers aboard relocation trawlers or hopper dredges to tissue-sample live- or dead-captured sea turtles, without the need for a section 10 permit.

m. *Cost Sharing of Genetic Analysis*: The COE's Gulf of Mexico Districts shall combine to provide a one-time payment of $10,000 to NOAA Fisheries to share the cost of NOAA-Fisheries' analysis of 300 tissue samples taken during COE hopper dredging/trawling operations in the Gulf of Mexico. This cost is currently estimated by NOAA Fisheries to be about $100-150 per sample, or $30,000-$45,000. COE funds shall be provided to NOAA Fisheries' Southwest Fisheries Center's Dr. Peter Dutton as a part of a Memorandum of Understanding (MOU) to be developed between Dr. Dutton and the COE's combined Gulf of Mexico Districts and Divisions within six months of the issuance of this Opinion.

n. *PIT Tagging:* PIT tagging is not required or authorized for, and shall not be conducted by, ESOs who do not have 1) section 10 permits authorizing said activity and 2) prior training or experience in said activity; however, if the ESO has received prior training in PIT tagging procedures and is also authorized to conduct said activity by a section 10 permit, then the ESO **must** PIT tag the animal prior to release (in addition to the standard external flipper tagging). PIT tagging must then be performed in accordance with the protocol detailed at NOAA Fisheries' Southeast Science Center's webpage: http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. (See Appendix C on SEC's "Fisheries Observers" webpage). PIT tags used must be sterile, individually wrapped tags to prevent disease transmission. PIT tags should be 125 kHz, glass-encapsulated tags - the smallest ones made. Note: If scanning reveals a PIT tag and it was not difficult to find, then **do not** insert another PIT tag; simply record the tag number and location, and frequency, if known. If for some reason the tag is difficult to detect (e.g., tag is embedded deep in muscle, or is a 400 mHz tag), then insert one in the other shoulder.

o. *Other Sampling Procedures*: All other tagging and external or internal sampling procedures (e.g., PIT tagging, blood letting, laparoscopies, anal and gastric lavages, mounting satellite or radio transmitters, etc.) performed on live sea turtles or live sturgeon are **not permitted under this Opinion unless** the observer holds a valid sea turtle or sturgeon research permit (obtained pursuant to section 10 of the ESA, from the NOAA Fisheries' Office of Protected Resources, Permits Division) authorizing the activity, either as the permit holder, or as designated agent of the permit holder.

p. *Handling Fibropapillomatose Turtles*: Observers handling sea turtles infected with fibropapilloma tumors shall either: 1) clean all equipment that comes in contact with the turtle (tagging equipment, tape measures, etc.) with mild bleach solution, between the processing of each turtle or 2) maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors or lesions. Tissue/tumor samples shall be sent within 60 days of capture to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 working days to Lisa.Belskis@noaa.gov. This Opinion serves as the permitting authority for all NOAA Fisheries-approved endangered species observers aboard a relocation trawler or hopper dredge to tissue-sample fibropapilloma-infected sea turtles without the need for a section 10 permit.

16. *Hardground Buffer Zones*: All dredging in sand mining areas will be designed to ensure that dredging will not occur within a minimum of 400 feet from any significant hardground areas or bottom structures that serve as attractants to sea turtles for foraging or shelter. NOAA Fisheries considers (for the purposes of this Opinion only) a significant hardground in a project area to be one that, over a horizontal distance of 150 feet, has an average elevation above the sand of 1.5 feet or greater, and has algae growing on it. The COE Districts shall ensure that sand mining sites within their Districts are adequately mapped to enable the dredge to stay at least 400 feet from these areas. If the COE is uncertain as to what constitutes significance, it shall consult with NOAA

Fisheries' Habitat Conservation Division and NOAA Fisheries' Protected Resources Division for clarification and guidance.

17. *Training - Personnel on Hopper Dredges*: The respective COE Districts must ensure that all contracted personnel involved in operating hopper dredges (whether privately-funded or federally-funded projects) receive thorough training on measures of dredge operation that will minimize takes of sea turtles. It shall be the goal of each hopper dredging operation to establish operating procedures that are consistent with those that have been used successfully during hopper dredging in other regions of the coastal United States, and which have proven effective in reducing turtle/dredge interactions. Therefore, COE Engineering Research and Development Center experts or other persons with expertise in this matter shall be involved both in dredge operation training, and installation, adjustment, and monitoring of the rigid deflector draghead assembly.

18. *Dredge Lighting*: From May 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within three nmi of sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or OSHA requirements. All non-essential lighting on the dredge and pumpout barge shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to minimize illumination of the water to reduce potential disorientation effects on female sea turtles approaching the nesting beaches and sea turtle hatchlings making their way seaward from their natal beaches.

10.0 Conservation Recommendations

Pursuant to section 7(a)(1) of the ESA, the following conservation recommendations are made to assist the COE in contributing to the conservation of sea turtles and Gulf sturgeon by further reducing or eliminating adverse impacts that result from hopper dredging.

Channel Conditions and Seasonal Abundance Studies: Channel-specific studies should be undertaken to identify seasonal relative abundance of sea turtles and Gulf sturgeon within Gulf of Mexico channels. The December 1 through March 31 dredging window and associated observer requirements listed above may be adjusted (after consultation and authorization by NOAA Fisheries) on a channel-specific basis, if (a) the COE can provide sufficient scientific evidence that sea turtles and Gulf sturgeon are not present or that levels of abundance are extremely low during other months of the year, or (b) the COE can identify seawater temperature regimes that ensure extremely low abundance of sea turtles or Gulf sturgeon in coastal waters, and can monitor water temperatures in a real-time manner. Surveys may indicate that some channels do not support significant turtle populations, and hopper dredging in these channels may be unrestricted on a year-round basis, as in the case of MR-SWP. To date, sea turtle deflector draghead efficiency has not reached the point where seasonal restrictions can be lifted.

2. *Draghead Modifications and Bed Leveling Studies*: The New Orleans, Galveston, Mobile, and Jacksonville Districts should supplement the efforts of SAD and WES to develop modifications to existing dredges to reduce or eliminate take of sea turtles, and develop methods to minimize sea turtle take during "cleanup" operations when the draghead maintains only intermittent contact with the bottom. Some method to level the "peaks and valleys" created by dredging would reduce the amount of time dragheads are off the bottom.

3. *Draghead Evaluation Studies and Protocol*: Additional research, development, and improved performance is needed before the V-shaped rigid deflector draghead can replace seasonal restrictions as a method of reducing sea turtle captures during hopper dredging activities. Development of a more effective deflector draghead or other entrainment-deterring device (or combination of devices, including use of acoustic deterrents) could potentially reduce the need for sea turtle relocation or result in expansion of the winter dredging window. NOAA Fisheries should be consulted regarding the development of a protocol for draghead evaluation tests. NOAA Fisheries recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts coordinate with ERDC, SAD, the Association of Dredge Contractors of America, and dredge operators (Manson, Bean-Stuyvesant, Great Lakes, Natco, etc.) regarding additional reasonable measures they may take to further reduce the likelihood of sea turtle and Gulf sturgeon takes.

4. *Continuous Improvements in Monitoring and Detecting Takes*: The COE should seek continuous improvements in detecting takes and should determine, through research and development, a better method for monitoring and estimating sea turtle and Gulf sturgeon takes by hopper dredge. Observation of overflow and inflow screening is only partially effective and provides only partial estimates of total sea turtle and Gulf sturgeon mortality.

   Overflow Screening: The COE should encourage dredging companies to develop or modify existing overflow screening methods on their company's dredge vessels for maximum effectiveness of screening and monitoring. Horizontal overflow screening is preferable to vertical overflow screening because NOAA Fisheries considers that horizontal overflow screening is significantly more effective at detecting evidence of protected species entrainment than vertical overflow screening.

   Preferential Consideration for Horizontal Overflow Screening: The COE should give preferential consideration to hopper dredges with horizontal overflow screening when awarding hopper dredging contracts for areas where new materials, large amounts of debris, or clay may be encountered, or have historically been encountered. Excessive inflow screen clogging may in some instances necessitate removal of inflow screening, at which point effective overflow screening becomes more important.

5. *Section 10 Research Permits and Relocation Trawling*: NOAA Fisheries recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts, either singly or combined, apply to NOAA Fisheries for an ESA section 10 research permit to conduct endangered species research on species incidentally captured during relocation trawling. For example, satellite tagging of captured turtles could enable the COE Districts to gain important knowledge on sea turtle seasonal distribution and presence in navigation channels and sand mining sites and also, as mandated by section 7(a)(1) of the ESA, to utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of listed species. SERO shall assist the COE Districts with the permit application process.

6. *Draghead Improvements - Water Ports*: NOAA Fisheries recommends that the COE's Gulf of Mexico Districts require or at least recommend to dredge operators that all dragheads on hopper dredges contracted by the COE for dredging projects be eventually outfitted with water ports located in the *top* of the dragheads to help prevent the dragheads from becoming plugged with sediments. When the dragheads become plugged with sediments, the dragheads are often raised off the bottom (by the dredge operator) with the suction pumps on in order to take in enough water to help clear clogs in the dragarm pipeline, which increases the likelihood that sea turtles in the

vicinity of the draghead will be taken by the dredge. Water ports located in the top of the dragheads would relieve the necessity of raising the draghead off the bottom to perform such an action, and reduce the chance of incidental take of sea turtles.

NOAA Fisheries supports and recommends the implementation of proposals by ERDC and SAD personnel for various draghead modifications to address scenarios where turtles may be entrained during hopper dredging (Dickerson and Clausner 2003). These include: a) an adjustable visor; b) water jets for flaps to prevent plugging and thus reduce the requirement to lift the draghead off the bottom; and c) a valve arrangement (which mimics the function of a "Hoffer" valve used on cutterhead type dredges to allow additional water to be brought in when the suction line is plugging) that will provide a very large amount of water into the suction pipe thereby significantly reducing flow through the visor when the draghead is lifted off the bottom, reducing the potential to take a turtle.

7 *Economic Incentives for No Turtle Takes*: The COE should consider devising and implementing some method of significant economic incentives to hopper dredge operators such as financial reimbursement based on their satisfactory completion of dredging operations, or *X* number of cubic yards of material moved, or hours of dredging performed, *without taking turtles*. This may encourage dredging companies to research and develop 'turtle friendly' dredging methods; more effective, deflector dragheads; pre-deflectors; top-located water ports on dragarms, etc.

8. *Sedimentation Limits to Protect Resources (Hardbottoms/Reefs)*: NOAA Fisheries recommends water column sediment load deposition rates of no more than 200 mg/cm^2/day, averaged over a 7-day period, to protect coral reefs and hard bottom communities from dredging-associated turbidity impacts to listed species foraging habitat.

9. *Boca Grande Pass - Conditions*: If the COE's Jacksonville District decides to renew dredging permits for the Boca Grande Pass, NOAA Fisheries recommends that the District conduct or sponsor a Gulf sturgeon study, including gillnetting and tagging utilizing ultrasonic and radio transmitters, and mtDNA sampling, to help determine the genetic origins, relative and seasonal abundance, distribution and utilization of estuarine and marine habitat by Gulf sturgeon within Charlotte Harbor estuary and Charlotte Harbor Entrance Channel, and shall report to NOAA Fisheries biannually on the progress and final results of said study.

10. *Relocation Trawling - Guidelines*: Within six months of the issuance of this Opinion, the COE's Gulf of Mexico Districts, in coordination with COE's SAD, shall develop relocation trawling guidelines to ensure safe handling and standardized data gathering techniques for sea turtles and Gulf sturgeon by COE contractors, and forward copies to NOAA Fisheries' Protected Resources Division.

Sodium Vapor Lights on Offshore Equipment: On offshore equipment (i.e., hopper dredges, pumpout barges) shielded low pressure sodium vapor lights are highly recommended for lights that cannot be eliminated.

11.0 Reinitiation of Consultation

Requirements for Reinitiation of Consultation: Reinitiation of formal consultation is required if (a) the amount or extent of taking specified in the incidental take statement is exceeded, (b) new information reveals effects of the action that may affect listed species or critical habitat when designated in a manner or

BID ATTACHMENT 4, PLAN SET / DRAWINGS

NOTE - This attachment is uploaded as a separate document on the Procurement page of the County website with the solicitation document and available for download.

SECTION D, SAMPLE CONSTRUCTION AGREEMENT WITH GENERAL CONDITIONS OF THE CONSTRUCTION AGREEMENT AND AGREEMENT EXHIBITS

CONSTRUCTION AGREEMENT

for

STIPULATED SUM

between

MANATEE COUNTY (AS OWNER)

and

______________________________ (AS CONTRACTOR)

CONSTRUCTION AGREEMENT FOR
STIPULATED SUM
[PROJECT NAME]

THIS AGREEMENT ("Agreement") is made and entered into by and between Manatee County, a political subdivision of the State of Florida, referred to herein as "Owner", and the firm of **_______________**, incorporated in the State of **______** and registered and licensed to do business in the State of Florida (license #________), referred to herein as "Contractor."

WHEREAS, the Owner intends to construct **[PROJECT DESCRIPTION]**, the aforementioned improvements being hereinafter referred to and defined as the "Project"; and

WHEREAS, in response to Owner's Invitation for Bid No. **_______** (the "IFB"), Contractor has submitted its Bid (the "Contractor's Bid") to provide the aforementioned construction services.

NOW THEREFORE, the Owner and the Contractor, in consideration of the mutual covenants hereinafter set forth, the sufficiency of which is hereby acknowledged, agree as follows:

1. Contract Documents. The Contract Documents consist of this Agreement and attached Exhibits, the attached General Conditions of the Construction Agreement, Supplementary Conditions (if any), Special Conditions (if any), Drawings (the titles of which are attached hereto as Exhibit A), Specifications (the titles of which are attached hereto as Exhibit B), Addenda issued prior to execution of this Agreement, the Invitation for Bid (including any Instructions to Bidders, Scope of Work, Bid Summary, Supplements, and Technical Specifications), any interpretations issued pursuant to the Invitation for Bid, the Contractor's Bid, permits, notice of intent to award, Notice to Proceed, purchase order(s), any other documents listed in this Agreement, and Modifications [to include written Amendment(s), Change Order(s), Work Directive Change(s) and Field Directive(s)] issued after execution of this Agreement. These form the Agreement, and are as fully a part of the Agreement as if attached or repeated herein. This Agreement represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. No other documents shall be considered Contract Documents.

2. Work. The Contractor shall fully execute the Work described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

3. Date of Commencement and Substantial Completion.

A. Date of Commencement. The date of commencement of the Work shall be the date fixed in a Notice to Proceed issued by the Owner.

B. Contract Time. The Contract Time shall be measured from the date of commencement.

C. Substantial Completion. The Contractor shall achieve Substantial Completion of the entire Work not later than ___ days from the date of commencement, or as follows:

Portion of Work	**Substantial Completion Date**

subject to adjustments of this Contract Time as provided in the Contract Documents.

Time is of the essence in the Contract Documents and all obligations thereunder. If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time and as otherwise required by the Contract Documents (to include not only the entire Work but any portion of the Work as set forth above), the Owner shall be entitled to retain or recover from the Contractor, as liquidated damages and not as a penalty, the sum of $_____ per calendar day, commencing upon the first day following expiration of the Contract Time and continuing until the actual date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable estimate of damages the Owner will incur because of delayed completion of the Work. The Owner may deduct liquidated damages as described in this paragraph from any unpaid amounts then or thereafter due the Contractor under this Agreement. Any liquidated damages not so deducted from any unpaid amounts due the Contractor shall be payable to the Owner at the demand of the Owner, together with interest from the date of the demand at the maximum allowable rate.

4. Contract Sum.

A. Payment. The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ______________ Dollars and Zero Cents ($____________), subject to additions and deductions as provided in the Contract Documents.

B. Alternates. The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner. *(State the numbers or other identification of accepted alternates. If decisions on other alternates are to be made by the Owner subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)*

C. Unit Prices. Unit prices, if any, are reflected in the Contractor's Bid.

5. Payments.

A. Progress Payments.

(1) Based upon Applications for Payment submitted to the Architect/Engineer by the Contractor and Certificates for Payment issued by the Architect/Engineer, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

(2) The period covered by each Application for Payment shall be one calendar month ending on the last day of the month.

(3) Payments shall be made by Owner in accordance with the requirements of Section 218.735, Florida Statutes.

(4) Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect/Engineer may require. This schedule, unless objected to by the Owner or Architect/Engineer, shall be used as a basis for reviewing the Contractor's Applications for Payment.

(5) Applications for Payment shall indicate the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

(6) Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

i. Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of five percent (5.00%). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 3.3.B. of the General Conditions;

ii. Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), supported by paid receipts, less retainage of five percent (5.00%);

iii. Subtract the aggregate of previous payments made by the Owner; and

iv. Subtract amounts, if any, for which the Architect/Engineer has withheld or nullified an Application for Payment, in whole or in part as provided in Section 3.3.C. of the General Conditions.

(7) The progress payment amount determined in accordance with Section 5.A(6) shall be further modified under the following circumstances:

i. Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect/Engineer shall determine for incomplete Work, retainage applicable to such work and unsettled claims.

ii. Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 3.2.B. of the General Conditions.

(8) Reduction or limitation of retainage, if any, shall be as follows:

Notwithstanding the foregoing, upon completion of at least 50% of the Work, as determined by the Architect/Engineer and Owner, the Owner may, with the concurrence of the Architect/Engineer, reduce to two and one-half percent (2.5%) the amount of retainage withheld from each subsequent progress payment.

(9) Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

B. Final Payment. Final Payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when:

(1) The Contractor has fully performed the Work except for the Contractor's responsibility to correct Work as provided in Section 2.4.C. of the General Conditions, and to satisfy other requirements, if any, which extend beyond final payment; and

(2) A final Application for Payment has been approved by the Architect/Engineer.

6. Termination or Suspension.

A. Termination. The Agreement may be terminated by the Owner or the Contractor as provided in Article XIV of the General Conditions.

B. Suspension by Owner. The Work may be suspended by the Owner as provided in Article XIV of the General Conditions.

7. Other Provisions.

A. Substantial Completion Defined. Substantial Completion shall be defined as provided in Article I of the General Conditions. In the event a temporary certificate of occupancy or completion is issued establishing Substantial Completion, the Contractor shall diligently pursue the issuance of a permanent certificate of occupancy or completion.

B. Project Meetings. There shall be a project meeting, at the jobsite or other location acceptable to the parties, on a regularly scheduled basis. The meeting will be attended by a representative of the Contractor, Architect/Engineer and Owner. These representatives shall be authorized to make decisions that are not otherwise contrary to the requirements of this Agreement.

C. Weather. Any rainfall, temperatures below 32 degrees Fahrenheit or winds greater than 25 m.p.h. which actually prevents Work on a given day, shall be considered lost time and an additional day added to the Contract Time, provided no work could be done on site, and provided written notice has been submitted to the Owner by the Contractor documenting same.

D. Shop Drawings; Critical Submittals. In consideration of the impact of timely review of submittals and shop drawings on the overall progress of the Work, it is hereby agreed that the Owner shall cause his agents and design professionals to accomplish the review of any particular "critical" submittals and/or shop drawings and return same to the Contractor within fourteen (14) days.

E. Applications for Payment. Applications for Payment shall be submitted once monthly at regular intervals and shall include detailed documentation of all costs incurred.

F. Punch List. Within 30 days after obtainment of Substantial Completion, the Owner shall generate a "punch list" of all work items requiring remedial attention by the Contractor. Within 5 days thereafter the Architect/Engineer shall assign a fair value to the punch list items, which sum shall be deducted from the next scheduled progress payment to the Contractor. Upon satisfactory completion of the punch list items, as certified by the Architect/Engineer, the previously deducted sum shall be paid to the Contractor.

G. Closeout documentation. Within 30 days after obtainment of Substantial Completion and before final payment, Contractor shall gather and deliver to Owner all warranty documentation, all manufacturer's product and warranty literature, all manuals (including parts and technical manuals), all schematics and handbooks, and all as-built drawings.

H. Governing Provisions; Conflicts. In the event of a conflict between this Agreement and the Specifications or as between the General Conditions and the Specifications, the Specifications shall govern.

I. E-Verify. The Contractor's employment of unauthorized aliens is a violation of Section 274(e) of the Federal Immigration and Employment Act. The Contractor shall utilize the U.S. Department of Homeland Security E-Verify system to verify the employment eligibility of all new employees hired during the term of this Agreement, and shall require the same verification procedure of all Subcontractors.

8. Insurance and Bonding. If and to the extent required by the Invitation for Bid documents, the Contractor shall furnish insurance coverage for (but not necessarily limited to) workers' compensation, commercial general liability, auto liability, excess liability, and builder's risk. The Contractor shall furnish to the Owner all appropriate policies and Certificate(s) of Insurance. The Contractor shall also post a Payment and Performance Bond for the Contract Sum, within ten (__) days following notification of intent to award, and otherwise in accordance with the Invitation for Bid documents.

9. Independent Contractor. The Contractor acknowledges that it is functioning as an independent contractor in performing under the terms of this Agreement, and it is not acting as an employee of the Owner.

10. Entire Agreement. This Agreement (inclusive of the Contract Documents incorporated herein by reference) represents the full agreement of the parties.

11. Amendments; Waivers; Assignment.

A. <u>Amendments</u>. This Agreement may be amended only pursuant to an instrument in writing that has been jointly executed by authorized representatives of the parties hereto.

B. <u>Waivers</u>. Neither this Agreement nor any portion of it may be modified or waived orally. However, each party (through its governing body or properly authorized officer) shall have the right, but not the obligation, to waive, on a case-by-case basis, any right or condition herein reserved or intended for the benefit or protection of such party without being deemed or considered to have waived such right or condition for any other case, situation, or circumstance and without being deemed or considered to have waived any other right or condition. No such waiver shall be effective unless made in writing with an express and specific statement of the intent of such governing body or officer to provide such waiver.

C. <u>Assignment</u>. The rights and obligations of either party to this Agreement may be assigned to a third party only pursuant to a written amendment hereto.

12. Validity. Each of the Owner and Contractor represents and warrants to the other its respective authority to enter into this Agreement.

13. Covenant to Defend. Neither the validity of this Agreement nor the validity of any portion hereof may be challenged by any party hereto, and each party hereto hereby waives any right to initiate any such challenge. Furthermore, if this Agreement or any portion hereof is challenged by a third party in any judicial, administrative, or appellate proceeding (each party hereby covenanting with the other party not to initiate, encourage, foster, promote, cooperate with, or acquiesce to such challenge), the parties hereto collectively and individually agree, at their individual sole cost and expense, to defend in good faith its validity through a final judicial determination or other resolution, unless all parties mutually agree in writing not to defend such challenge or not to appeal any decision invalidating this Agreement or any portion thereof.

14. Disclaimer of Third-Party Beneficiaries; Successors and Assigns. This Agreement is solely for the benefit of the parties hereto, and no right, privilege, or cause of action shall by reason hereof accrue upon, to, or for the benefit of any third party. Nothing in this Agreement is intended or shall be construed to confer upon or give any person, corporation, partnership, trust, private entity, agency, or other governmental entity any right, privilege, remedy, or claim under or by reason of this Agreement or any provisions or conditions hereof. This Agreement shall be binding upon, and its benefits and advantages shall inure to, the successors and assigns of the parties hereto.

15. Construction.

A. Headings and Captions. The headings and captions of articles, sections, and paragraphs used in this Agreement are for convenience of reference only and are not intended to define or limit their contents, nor are they to affect the construction of or be taken into consideration in interpreting this Agreement.

B. Legal References. All references to statutory sections or chapters shall be construed to include subsequent amendments to such provisions, and to refer to the successor provision of any such provision. References to "applicable law" and "general law" shall be construed to include provisions of local, state and federal law, whether established by legislative action, administrative rule or regulation, or judicial decision.

16. Severability. The provisions of this Agreement are declared by the parties hereto to be severable. In the event any term or provision of this Agreement shall be held invalid by a court of competent jurisdiction, such invalid term or provision should not affect the validity of any other term or provision hereof; and all such terms and provisions hereof shall be enforceable to the fullest extent permitted by law as if such invalid term or provision had never been part of this Agreement; provided, however, if any term or provision of this Agreement is held to be invalid due to the scope or extent thereof, then, to the extent permitted by law, such term or provision shall be automatically deemed modified in order that it may be enforced to the maximum scope and extent permitted by law.

17. Governing Law; Venue. This Agreement shall be governed by the laws of the State of Florida. Venue for any petition for writ of certiorari or other court action allowed by this Agreement shall be in the Circuit Court of the Twelfth Judicial Circuit in and for Manatee County, Florida.

18. Attorney's Fees and Costs. In any claim dispute procedure or litigation arising from this Agreement, each party hereto shall be solely responsible for paying its attorney's fees and costs.

19. Notices. All notices, comments, consents, objections, approvals, waivers, and elections under this Agreement shall be in writing and shall be given only by hand delivery for which a receipt is obtained, or certified mail, prepaid with confirmation of delivery requested, or by electronic mail with delivery confirmation. All such communications shall be addressed to the applicable addressees set forth below or as any party may otherwise designate in the manner prescribed herein.

To the Owner: ________________________________
____
____
____
Email: __________________________

To the Contractor:

____
____

____
____
Email: __________________________

Notices, comments, consents, objections, approvals, waivers, and elections shall be deemed given when received by the party for whom such communication is intended at such party's address herein specified, or such other physical address or email address as such party may have substituted by notice to the other.

20. Public Records Law. The Contractor shall comply with the Florida Public Records Act (Chapter 119, Florida Statutes), and shall:

A. Keep and maintain public records required by the Owner to perform the services called for in this Agreement.
B. Upon request from the Owner's custodian of public records, provide the Owner with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes or as otherwise provided by law.
C. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of this Agreement and following completion of this Agreement if the Contractor does not transfer the records to the Owner.
D. Upon completion of this Agreement, transfer, at no cost, to the Owner all public records in possession of the Contractor or keep and maintain such public records. If the Contractor transfers all public records to the Owner upon completion of the Agreement, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of the Agreement, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the Owner, upon request from the Owner's custodian of public records, in a format that is compatible with the information technology systems of the Owner.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS AGREEMENT, CONTACT THE OWNER'S CUSTODIAN OF PUBLIC RECORDS AT 941-748-4501, EXT. 5845; DEBBIE.SCACCIANOCE@MYMANATEE.ORG; POST OFFICE BOX 1000, BRADENTON, FLORIDA 34206.

21. Exhibits. Exhibits to this Agreement are as follows:

Exhibit A—Title(s) of Drawings

Exhibit B—Title(s) of Specifications

Exhibit C—Affidavit of No Conflict

Exhibit D—Certificate(s) of Insurance

Exhibit E—Payment and Performance Bond

Exhibit F—Standard Forms
- 1—Application for Payment
- 2—Certificate of Substantial Completion
- 3—Final Reconciliation / Warranty / Affidavit
- 4—Change Order

WHEREFORE, the parties hereto have executed this Agreement as of the date last executed below.

____
Name of Contractor

By: ___________________________

Printed Name: __________________

Title: __________________________

Date: __________________________

MANATEE COUNTY, a political subdivision
of the State of Florida

By: ___________________________

Printed Name: __________________

Title: __________________________

Date: __________________________

GENERAL CONDITIONS

of the

CONSTRUCTION AGREEMENT

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GENERAL CONDITIONS
ARTICLE I
DEFINITIONS

1.1 Definitions. For purposes of the Contract Documents, the following terms shall have the following meanings.

A. Acceptance: The acceptance of the Project into the Owner's operating public infrastructure.

B. Application for Payment: The form approved and accepted by the Owner, which is to be used by Contractor in requesting progress payments or final payment and which is to include such supporting documentation as is required by the Contract Documents.

C. Architect/Engineer: ______________________, a _________________ corporation or limited liability company, registered and licensed to do business in the State of Florida, OR ______________________, an employee of Owner.

D. Change Order: A written order signed by the Owner, the Architect/Engineer and the Contractor authorizing a change in the Project Plans and/or Specifications and, if necessary, a corresponding adjustment in the Contract Sum and/or Contract Time, pursuant to Article V.

E. Construction Services: The Construction Services to be provided by Contractor pursuant to Section 2.4, in accordance with the terms and provisions of the Contract Documents.

F. Construction Team: The working team established pursuant to Section 2.1.B.

G. Contract Sum: The total compensation to be paid to the Contractor for Construction Services rendered pursuant to the Contract Documents, as set forth in Contractor's Bid (or Guaranteed Maximum Price Addendum), unless adjusted in accordance with the terms of the Contract Documents

H. Contract Time: The time period during which all Construction Services are to be completed pursuant to the Contract Documents, to be set forth in the Project Schedule.

I. Contractor's Personnel: The Contractor's key personnel designated by Contractor.

J. Days: Calendar days except when specified differently. When time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or legal holiday, such day will be omitted from the computation.

K. Defective: When modifying the term "Work", referring to Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or that does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or that has been damaged prior to Owner's approval of final payment (unless responsibility for the protection thereof has been assumed by Owner).

L. Field Directive: A written order issued by Owner which orders minor changes in the Work not involving a change in Contract Time, to be paid from the Owner's contingency funds.

M. Final Completion Date: The date upon which the Project is fully constructed and all Work required on the Project and Project Site is fully performed as verified in writing by the Owner.

N. Float Time: The time available in the Project Schedule during which an unexpected activity can be completed without delaying Substantial Completion of the Work.

O. Force Majeure: Those conditions constituting excuse from performance as described in and subject to the conditions described in Article XII.

P. Notice to Proceed: Written notice by Owner (after execution of Contract) to Contractor fixing the date on which the Contract Time will commence to run and on which Contractor shall start to perform the Work.

Q. Owner: Manatee County, a political subdivision of the State of Florida.

R. Owner's Project Representative: The individual designated by Owner to perform those functions set forth in Section 7.8.

S. Payment and Performance Bond: The Payment and Performance Bond security posted pursuant to Section 2.4.Y to guarantee payment and performance by the Contractor of its obligations hereunder.

T. Permitting Authority: Any applicable governmental authority acting in its governmental and regulatory capacity which is required to issue or grant any permit, certificate, license or other approval which is required as a condition precedent to the commencement or approved of the Work, or any part thereof, including the building permit.

U. Procurement Ordinance: The Manatee County Procurement Code, Chapter 2-26 of the Manatee County Code of Laws, as amended from time to time.

V. Progress Report: A report to Owner that includes all information required pursuant to the Contract Documents and submitted in accordance with Section 2.4.EE, hereof.

W. Project: The total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by Owner and by separate contractors. For the purposes of the Contract Documents, the term Project shall include all areas of proposed improvements and all areas which may reasonably be judged to have an impact on the Project.

X. Project Costs: The costs incurred by the Contractor to plan, construct and equip the Project and included within, and paid as a component of, the Contract Sum.

Y. Project Manager: Subject to the prior written consent of Owner, the individual designated to receive notices on behalf of the Contractor, or such other individual designated by the Contractor, from time to time, pursuant to written notice in accordance with the Contract Documents.

Z. Project Plans and Specifications: The one hundred percent (100%) construction drawings and specifications prepared by the Architect/Engineer, and any changes, supplements, amendments or additions thereto approved by the Owner, which shall also include any construction drawings and final specifications required for the repair or construction of the Project, as provided herein.

AA. Project Schedule: The schedule and sequence of events for the commencement, progression and completion of the Project, developed pursuant to Section 2.3., as such schedule may be amended as provided herein.

BB. Project Site: The site depicted in the Project Plans and Specifications, inclusive of all rights of way, temporary construction easements or licensed or leased sovereign lands.

CC. Subcontractor: Any individual (other than a direct employee of the Contractor) or organization retained by Contractor to plan, construct or equip the Project pursuant to Article IV.

DD. Substantial Completion and Substantially Complete: The stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use; provided, however, that as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy or completion and other permits, approvals, licenses, and other documents from any governmental authority which are necessary for the beneficial occupancy of the Project or any designated portion thereof.

EE. Substantial Completion Date: The date on which the Project or designated portion thereof is deemed to be Substantially Complete, as evidenced by receipt of (i) the Architect/Engineer's certificate of Substantial Completion, (ii) written Acceptance of the Project by the Owner, and (iii) approvals of any other authority as may be necessary or otherwise required.

FF. Substitute: Materials or equipment offered by the Contractor as an alternative to that set forth in the Project Plans and Specifications, where (i) the Project Plans and Specifications do not authorize an "approved equal", or (ii) the Owner, in its reasonable discretion, determines that a pre-authorized "approved equal" will result in a substantial change to the Work because of cost, quality or other difference in comparison to the materials or equipment specified.

GG. Unit Price Work: Work to be paid for on the basis of unit prices.

HH. Work: The term “Work” means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor’s obligations. The Work may constitute the whole or a part of the Project.

II. Work Directive Change: A written directive to Contractor, issued on or after the effective date of the Agreement pursuant to Section 5.8 and signed by Owner’s Project Representative, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed or responding to emergencies.

ARTICLE II
RELATIONSHIP AND RESPONSIBILITIES

2.1 Relationship between Contractor and Owner. The Contractor accepts the relationship of trust and confidence established with Owner pursuant to the Contract Documents. The Contractor shall furnish its best skill and judgment and cooperate with Owner and Owner’s Project Representative in furthering the interests of the Owner. The Contractor agrees to provide the professional services required to complete the Project consistent with the Owner’s direction and the terms of the Contract Documents. All services provided hereunder by Contractor, either directly or through Subcontractors, shall be provided in accordance with sound construction practices and applicable professional construction standards.

A. Purpose. The purpose of the Contract Documents is to provide for the provision of construction services for the Project on the Project Site by the Contractor, and construction of the Project by the Contractor in accordance with the Project Plans and Specifications. The further purpose of the Contract Documents is to define and delineate the responsibilities and obligations of the parties to the Contract Documents and to express the desire of all such parties to cooperate to accomplish the purposes and expectations of the Contract Documents.

B. Construction Team. The Contractor, Owner and Architect/Engineer shall be called the “Construction Team” and shall work together as a team commencing upon full execution of the Contract Documents through Substantial Completion. As provided in Section 2.2, the Contractor and Architect/Engineer shall work jointly through completion and shall be available thereafter should additional services be required. The Contractor shall provide leadership to the Construction Team on all matters relating to construction. The Contractor understands, acknowledges and agrees that the Architect/Engineer shall provide leadership to the Construction Team on all matters relating to design.

C. Owner’s Reliance on Bid (or Guaranteed Maximum Price Addendum). The Contractor acknowledges that the representations, statements, information and pricing contained in its Bid (or Guaranteed Maximum Price Addendum) have been relied upon by the Owner and have resulted in the award of this Project to the Contractor.

2.2 General Contractor Responsibilities. In addition to the other responsibilities set forth herein, the Contractor shall have the following responsibilities pursuant to the Contract Documents:

A. Personnel. The Contractor represents that it has secured, or shall secure, all personnel necessary to perform the Work, none of whom shall be employees of the Owner. Primary liaison between the Contractor and the Owner shall be through the Owner's Project Representative and Contractor's Project Manager. All of the services required herein shall be performed by the Contractor or under the Contractor's supervision, and all personnel engaged in the Work shall be fully qualified and shall be authorized or permitted under law to perform such services.

B. Cooperation with Architect/Engineer. The Contractor's services shall be provided in conjunction with the services of the Architect/Engineer. In the performance of professional services, the Contractor acknowledges that time is critical for Project delivery. The Contractor acknowledges that timely construction utilizing the services of an Architect/Engineer and a Contractor requires maximum cooperation between all parties.

C. Timely Performance. The Contractor shall perform all services as expeditiously as is consistent with professional skill and care and the orderly progress of the Work, in accordance with the Project Schedule. Verification of estimated Project Schedule goals will be made as requested by the Owner.

D. Duty to Defend Work. In the event of any dispute between the Owner and any Permitting Authority that relates to the quality, completeness or professional workmanship of the Contractor's services or Work, the Contractor shall, at its sole cost and expense, cooperate with the Owner to defend the quality and workmanship of the Contractor's services and Work.

E. Trade and Industry Terminology. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result will be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe Work, materials, or equipment, such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or laws or regulations in effect at the time of opening of Bids (or at the time of execution of the Guaranteed Maximum Price Addendum), except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of Owner or Contractor, or any of their agents or employees from those set forth in the Contract Documents. Computed dimensions shall govern over scaled dimensions.

2.3 Project Schedule. The Contractor, within ten (10) days after being awarded the Agreement, shall prepare and submit for the Owner's and Architect/Engineer's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of Work.

A. The Project Schedule shall show a breakdown of all tasks to be performed, and their relationship in achieving the completion of each phase of Work, subject to review of Owner and Architect/Engineer and approval or rejection by Owner. The Project Schedule shall show, at a minimum, the approximate dates on which each segment of the Work is expected to be started and finished, the proposed traffic flows during each month, the anticipated earnings by the Contractor for each month and the approximate number of crews and equipment to be used. The Project Schedule shall include all phases of procurement, approval of shop drawings, proposed Change Orders in progress, schedules for Change Orders, and performance testing requirements. The Project Schedule shall include a construction commencement date and Project Substantial Completion Date, which dates shall accommodate known or reasonably anticipated geographic, atmospheric and weather conditions.

B. The Project Schedule shall serve as the framework for the subsequent development of all detailed schedules. The Project Schedule shall be used to verify Contractor performance and to allow the Owner's Project Representative to monitor the Contractor's efforts.

C. The Project Schedule may be adjusted by the Contractor pursuant to Article V. The Owner shall have the right to reschedule Work provided such rescheduling is in accord with the remainder of terms of the Contract Documents.

D. The Contractor shall prepare a submittal schedule, promptly after being awarded the Agreement and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect/Engineer's approval. The Architect/Engineer's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect/Engineer reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

E. The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect/Engineer.

2.4 Construction Services. The Contractor shall provide the following Construction Services:

A. Construction of Project. The Contractor shall work from the receipt of a Notice to Proceed through the Substantial Completion of the Project in accordance with the terms of the Contract Documents to manage the construction of the Project. The Construction Services provided by the Contractor to construct the Project shall include without limitation (1) all services necessary and commensurate with established construction standards, and (2) all services described in the Invitation for Bid (or Request for Proposal) and the Bid (or Guaranteed Maximum Price Addendum).

B. Notice to Proceed. A Notice to Proceed may be given at any time within thirty (30) days after the effective date of the Agreement. Contractor shall start to perform the Work on the date specified in the Notice to Proceed, but no Work shall be done at the site prior to the issuance of the Notice to Proceed.

C. Quality of Work. If at any time the labor used or to be used appears to the Owner as insufficient or improper for securing the quality of Work required or the required rate of progress, the Owner may order the Contractor to increase its efficiency or to improve the character of its Work, and the Contractor shall conform to such an order. Any such order shall not entitle Contractor to any additional compensation or any increase in Contract Time. The failure of the Owner to demand any increase of such efficiency or any improvement shall not release the Contractor from its obligation to secure the quality of Work or the rate of progress necessary to complete the Work within the limits imposed by the Contract Documents. The Owner may require the Contractor to remove such personnel as the Owner deems incompetent, careless, insubordinate or otherwise objectionable, or whose continued employment on the Project is deemed to be contrary to the Owner's interest. The Contractor shall provide good quality workmanship and shall promptly correct construction defects without additional compensation. Acceptance of the Work by the Owner shall not relieve the Contractor of the responsibility for subsequent correction of any construction defects.

D. Materials. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by Architect/Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instruction of the applicable supplier except as otherwise provided in the Contract Documents.

E. Accountability for Work. The Contractor shall be solely accountable for its Work, including plans review and complete submittals. The Contractor shall be solely responsible for means, methods, techniques, sequences and procedures of construction. If a specific means, method, technique, sequence or procedure of construction is required by the Contract Documents, the Contractor may utilize an alternative means, method, technique, sequence or procedure acceptable to the Architect/Engineer if the Contractor submits sufficient information to allow the Architect/Engineer to determine that the alternative is equivalent to that required by the Contract Documents.

F. Contract Sum. The Contractor shall construct the Project so that the Project can be built for a cost not to exceed the Contract Sum.

G. Governing Specifications. In the absence of specified Owner design standards or guidelines, the Architect/Engineer shall use, and the Contractor shall comply with, the most recent version of the applicable FDOT or AASHTO design standards. In general, the Project shall be constructed by the Contractor in accordance with applicable industry standards. The Contractor shall be responsible for utilizing and maintaining current knowledge of any laws, ordinances, codes, rules, regulations, standards, guidelines, special conditions, specifications or other mandates relevant to the Project or the services to be performed.

H. Adherence to Project Schedule. The development and equipping of the Project shall be undertaken and completed in accordance with the Project Schedule, and within the Contract Time described therein.

I. Superintendent. The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project Site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

(1) The Contractor, as soon as practicable after award of the Agreement, shall furnish in writing to the Owner through the Architect/Engineer the name and qualifications of the proposed superintendent. The Architect/Engineer may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect/Engineer has reasonable objection to the proposed superintendent or (2) that the Architect/Engineer requires additional time to review. Failure of the Architect/Engineer to reply within 14 days shall constitute notice of no reasonable objection.

(2) The Contractor shall not employ a proposed superintendent to whom the Owner or Architect/Engineer has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not be unreasonably withheld or delayed.

J. Work Hours. Contractor shall provide competent, suitable qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the site. Except in connection with the safety or protection of persons or the Work or property at the site or adjacent thereto and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed during regular working hours, and Contractor shall not permit overtime work or the performance of Work on a Saturday, Sunday or legal holiday without Owner's written consent given after prior notice to Architect/Engineer (at least seventy-two (72) hours in advance).

K. Overtime-Related Costs. Contractor shall pay for all additional Architect/Engineer charges, inspection costs and Owner staff time for any overtime work which may be authorized. Such additional charges shall be an obligation of Contractor and no extra payment shall be made by Owner because such overtime work. At Owner's option, such overtime costs may be deducted from Contractor's monthly payment request or Contractor's retainage prior to release of final payment. Contractor's obligation to pay all overtime-related costs shall not apply if Contractor is directed by Owner to work overtime solely for Owner's convenience.

L. Insurance, Overhead and Utilities. Unless otherwise specified, Contractor shall furnish and assume full responsibility for all bonds, insurance, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

M. Cleanliness. The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor’s tools, construction equipment, machinery and surplus materials from and about the Project Site. Contractor shall restore to original conditions all property not designated for alteration by the Contract Documents If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from Contractor.

N. Loading. Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

O. Safety and Protection. Contractor shall comply with all applicable federal, state and local safety regulations. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of and shall provide the necessary protection to prevent damage, injury or loss to:

(1) All employees on the Work and other persons and organizations who may be affected thereby;

(2) All the Work and materials and equipment to be incorporated therein, whether in storage on or off the Project Site; and

(3) Other property at the Project Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and underground facilities not designated for removal, relocation or replacement during construction.

Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss, and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall provide and maintain all passageways, guard fences, lights and other facilities for the protection required by public authority or local conditions. Contractor shall provide reasonable maintenance of traffic for the public and preservation of the Owner’s business, taking into full consideration all local conditions. Contractor's duties and responsibilities for safety and protection with regard to the Work shall continue until such time as all the Work is completed.

P. Emergencies. In emergencies affecting the safety or protection of persons or the Work or property at the Project Site or adjacent thereto, Contractor, without special instruction or authorization from Architect/Engineer or Owner, shall act to prevent threatened damage, injury or loss. Contractor shall give Owner prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If Owner determines that a change in the Project is required because of the action taken in response to an emergency, a Work Directive Change or Change Order will be issued to document the consequences of the changes or variation.

Q. Substitutes. For Substitutes not included with the Bid (or Guaranteed Maximum Price Addendum), but submitted after the effective date of the Agreement (or

Guaranteed Maximum Price Addendum), Contractor shall make written application to Architect/Engineer for acceptance thereof, certifying that the proposed Substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The application will also contain an itemized estimate of all costs and delays or schedule impacts that will result directly or indirectly from review, acceptance and provision of such Substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by the Architect/Engineer in evaluating the proposed Substitute. Architect/Engineer may require Contractor to furnish at Contractor's expense, additional data about the proposed Substitute. In rendering a decision, Owner, Architect/Engineer and Contractor shall have access to any available Float Time in the Project Schedule. If Substitute materials or equipment not included as part of the Bid (or Guaranteed Maximum Price Addendum), but proposed after the effective date of the Agreement, are accepted and are less costly than the originally specified materials or equipment, then the net difference in cost shall be credited to the Owner and an appropriate Change Order executed to adjust the Contract Sum.

(1) Architect/Engineer will be allowed a reasonable time within which to evaluate each proposed Substitute. Architect/Engineer will be the sole judge of acceptability and no Substitute will be ordered, installed or utilized without Architect/Engineer's prior written acceptance which will be evidenced by either a Change Order or an approved shop drawing. Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any Substitute.

(2) Contractor shall reimburse Owner for the charges of Architect/Engineer and Architect/Engineer's Consultants for evaluating each proposed Substitute submitted after the effective date of the Agreement and all costs resulting from any delays in the Work while the Substitute was undergoing review.

R. Surveys and Stakes. The Contractor shall furnish, as part of the Contract Sum, all labor, stakes, surveys, batter boards for structures, grade lines and other materials and supplies and shall set construction stakes and batter boards for establishing lines, position of structures, slopes and other controlling points necessary for the proper prosecution of the Work. Where rights-of-way, easements, property lines or any other conditions which make the lay-out of the Project or parts of the Project critical are involved, the Contractor shall employ a competent surveyor who is registered in the State of Florida for lay-out and staking. These stakes and marks shall constitute the field control by and in accord with which the Contractor shall govern and execute the Work. The Contractor shall be held responsible for the preservation of all stakes and marks and if for any reason any of the stakes or marks or batter boards become destroyed or disturbed, they shall be immediately and accurately replaced by the Contractor.

S. Suitability of Project Site. The Contractor has, by careful examination, satisfied itself as to the nature and location of the Work and all other matters which can in any way affect the Work, including, but not limited to details pertaining to borings, as shown on the drawings. Such boring information is not guaranteed to be more than a general indication of the materials likely to be found adjacent to holes bored at the Project Site, approximately at the locations indicated. The Contractor has examined boring data, where available, made its own interpretation of the subsurface conditions and other preliminary data, and has based its Bid (or Guaranteed Maximum Price Addendum) on its own opinion of the conditions likely to be encountered. Except as specifically provided in Sections 2.4.U., 5.4 and 5.5, no extra compensation or extension of time will be considered for any Project Site conditions that existed at the time of bidding (or at the time of execution of the Guaranteed Maximum Price Addendum). No verbal agreement or conversation with any officer, agent or employee of the Owner, before or after the execution of the Agreement, shall affect or modify any of the terms or obligations herein contained.

T. <u>Project Specification Errors</u>. If the Contractor, during the Work, finds that the drawings, specifications or other Contract Documents cannot be followed, the Contractor shall immediately inform the Owner in writing, and the Owner shall promptly check the accuracy of the information. Any Work done after such discovery, until any necessary changes are authorized, will be done at the Contractor's sole risk of non-payment and delay.

U. <u>Remediation of Contamination</u>. Owner and Contractor recognize that remediation of subsurface conditions may be necessary due to potential hazardous materials contamination. Because the presence or extent of any contamination is not known, Contractor shall include no cost in the Contract Sum, and no time in the Project Schedule, for cost or delays that might result from any necessary remediation. The Project Schedule will provide a period of time between demolition activities and the start of the next activity to commence any remediation if needed. Contractor shall use all reasonable efforts in scheduling the Project to minimize the likelihood that remediation delays construction. Any hazardous materials remediation Work which Contractor agrees to perform shall be done pursuant to a Change Order or amendment consistent with the following:

(1) The dates of Substantial Completion shall be equitably adjusted based on delays, if any, incurred in connection with remediation efforts.

(2) Contractor, and any Subcontractors which have mobilized on the Project Site, shall be paid for demonstrated costs of overhead operations at the Project Site during any period of delay of more than seven (7) days, except to the extent that Work proceeds concurrently with remediation. The categories of costs to be reimbursed are limited to those reasonably incurred at the jobsite during the delay period (such as trailers or offices, telephones, faxes, and the like); equipment dedicated to the Project and located at the Project Site; salaries and associated costs of personnel dedicated to the Project to the extent that they do not perform work on other projects; and other jobsite costs that are reasonable and which are incurred during the delay period. Subcontractors and suppliers which have not mobilized are limited to the costs set forth in Section 2.4.U(3).

(3) Contractor and any Subcontractor or supplier on the Project who is eligible for compensation shall be paid any demonstrated costs of escalation in materials or labor, and reasonable costs of off-site storage of materials identified to the Project, arising because of any delay of more than seven (7) days. Such Contractor, Subcontractors and suppliers are obligated to take all reasonable steps to mitigate escalation costs, such as through early purchase of materials.

(4) Contractor, for itself and all Subcontractors and suppliers on the Project, hereby agrees that the extension of time for delays under Section 2.4.U(1), and payment of the costs identified in Sections 2.4.U(2) and/or Section 2.4.U(3), are the sole remedies for costs and delays described in this Section, and waives all claims and demands for extended home office overhead (including, but not limited to, "Eichleay" claims), lost profit or lost opportunities, and any special, indirect, or consequential damages arising as a result of delays described in this Section. The Contract Sum shall be adjusted to reflect payment of allowable costs.

(5) If any delay described in this section causes the time or cost for the Project to exceed the Contract Time or the Contact Sum, then the Owner may terminate the Agreement pursuant to Section 14.2.

(6) Contractor and any Subcontractor or supplier seeking additional costs under this Section 2.4.U. shall promptly submit estimates or any costs as requested by Owner, and detailed back-up for all costs when payment is sought or whenever reasonably requested by Owner. All costs are auditable, at Owner's discretion. Bid, estimate and pricing information reasonably related to any request for additional compensation will be provided promptly upon request.

(7) Contractor shall include provisions in its subcontracts and purchase orders consistent with this Section.

V. Interfacing.

(1) The Contractor shall take such measures as are necessary to ensure proper construction and delivery of the Project, including but not limited to providing that all procurement of long-lead items, the separate construction subcontractors, and the general conditions items are performed without duplication or overlap to maintain completion of all Work on schedule. Particular attention shall be given to provide that each Subcontractor bid package clearly identifies the Work included in that particular separate subcontract, its scheduling for start and completion, and its relationship to other separate contractors.

(2) Without assuming any design responsibilities of the Architect/Engineer, the Contractor shall include in the Progress Reports required under this Section 2.4 comments on overlap with any other separate subcontracts, omissions, lack of correlation between drawings, and any other deficiencies noted, in order that the Architect/Engineer may arrange for necessary corrections.

W. Job Site Facilities. The Contractor shall arrange for all job site facilities required and necessary to enable the Contractor and Architect/Engineer to perform their respective duties and to accommodate any representatives of the Owner which the Owner may choose to have present on the Project Site.

X. Weather Protection. The Contractor shall provide temporary enclosures of building areas to assure orderly progress of the Work during periods when extreme weather conditions are likely to be experienced. The Contractor shall also be responsible for providing weather protection for Work in progress and for materials stored on the Project Site. A contingency plan shall be prepared upon request of the Owner for weather conditions that may affect the construction.

Y. Payment and Performance Bond. Prior to the construction commencement date, the Contractor shall obtain, for the benefit of and directed to the Owner, a Payment and Performance Bond satisfying the requirements of Section 255.05, Florida Statutes, covering the faithful performance by the Contractor of its obligations under the Contract Documents, including but not limited to the construction of the Project on the Project Site and the payment of all obligations arising thereunder, including all payments to Subcontractors, laborers, and materialmen. The surety selected by the Contractor to provide the Payment and Performance Bond shall be approved by the Owner prior to the issuance of such Bond, which approval shall not be unreasonably withheld or delayed provided that the surety is rated A or better by Best's Key Guide, latest edition. For Changes in the Work that result in an increase in the Contract Sum, Owner reserves the right to require the Contractor to secure and deliver additive riders to the Payment and Performance Bond.

Z. Construction Phase; Building Permit, Code Inspections. Unless otherwise provided, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work.

(1) Building Permit. The Owner and Architect/Engineer shall provide such information to any Permitting Authority as is necessary to obtain approval from the Permitting Authority to commence construction prior to beginning construction. The Contractor shall pull any required building permit, and shall be responsible for delivering and posting the building permit at the Project Site prior to the commencement of construction. The cost of the building permit is included in the Contract Sum. The Owner and Architect/Engineer shall fully cooperate with the Contractor when and where necessary.

(2) Code Inspections. The Project requires detailed code compliance inspection during construction in disciplines determined by any Permitting Authority. These disciplines normally include, but are not necessarily limited to, structural, mechanical, electrical, plumbing, general building and fire. The Contractor shall notify the appropriate inspector(s) and the Architect/Engineer, no less than 24 hours in advance, when the Work is ready for inspection and before the Work is covered up. All inspections shall be made for conformance with the applicable ordinances and building codes. Costs for all re-inspections of Work found defective and subsequently repaired shall not be included as Project Costs and shall be borne by the Contractor or as provided in the contract between Contractor and Subcontractor.

(3) Contractor's Personnel. The Contractor shall maintain sufficient off-site support staff and competent full-time staff at the Project Site authorized to act on behalf of the Contractor to coordinate, inspect, and provide general direction of the Work and progress of the Subcontractors. At all times during the performance of the Work, the Owner shall have the right to demand replacement of Contractor Personnel to whom the Owner has reasonable objection, without liability to the Contractor.

(4) Lines of Authority. To provide general direction of the Work, the Contractor shall establish and maintain lines of authority for its personnel and shall provide this information to the Owner and all other affected parties, such as the code inspectors of any Permitting Authority, the Subcontractors, and the Architect/Engineer. The Owner and Architect/Engineer may attend meetings between the Contractor and his Subcontractors; however, such attendance is optional and shall not diminish either the authority or responsibility of the Contractor to administer the subcontracts.

AA. Quality Control. The Contractor shall develop and maintain a program, acceptable to the Owner and Architect/Engineer, to assure quality control of the construction. The Contractor shall be responsible for and supervise the Work of all Subcontractors, providing instructions to each when their Work does not conform to the requirements of the Project Plans and Specifications, and the Contractor shall continue to coordinate the Work of each Subcontractor to ensure that corrections are made in a timely manner so as to not affect the efficient progress of the Work. Should a disagreement occur between the Contractor and the Architect/Engineer over the acceptability of the Work, the Owner, at its sole discretion and in addition to any other remedies provided herein, shall have the right to determine the acceptability, provided that such determination is consistent with standards for construction projects of this type and generally accepted industry standards for workmanship in the State of Florida.

BB. Management of Subcontractors. All Subcontractors shall be compensated in accordance with Article IV. The Contractor shall solely control the Subcontractors. The Contractor shall negotiate all Change Orders and Field Orders with all affected Subcontractors and shall review the costs and advise the Owner and Architect/Engineer of their validity and reasonableness, acting in the Owner's best interest. When there is an imminent threat to health and safety, and Owner's Project Representative concurrence is impractical, the Contractor shall act immediately to remove the threats to health and safety and shall subsequently fully inform Owner of all such action taken. The Contractor shall also carefully review all shop drawings and then forward the same to the Architect/Engineer for review and actions. The Architect/Engineer will transmit them back to the Contractor, who will then issue the shop drawings to the affected Subcontractor for fabrication or revision. The Contractor shall maintain a suspense control system to promote expeditious handling. The Contractor shall request the Architect/Engineer to make interpretations of the drawings or specifications requested of him by the Subcontractors and shall maintain a business system to promote timely response. The Contractor shall inform the Architect/Engineer which shop drawings or requests for clarification have the greatest urgency, to enable the Architect/Engineer to prioritize requests coming from the Contractor. The Contractor shall advise the Owner and Architect/Engineer when timely response is not occurring on any of the above.

CC. Job Requirements.

(1) The Contractor shall provide each of the following as a part of its services hereunder:

(a) Maintain a log of daily activities, including manpower records, equipment on site, weather, delays, major decisions, etc;

(b) Maintain a roster of companies on the Project with names and telephone numbers of key personnel;

(c) Establish and enforce job rules governing parking, clean-up, use of facilities, and worker discipline;

(d) Provide labor relations management and equal opportunity employment for a harmonious, productive Project;

(e) Provide and administer a safety program for the Project and monitor for subcontractor compliance without relieving them of responsibilities to perform Work in accordance with best acceptable practice;

(f) Provide a quality control program as provided under Section 2.4.C above;

(g) Provide miscellaneous office supplies that support the construction efforts which are consumed by its own forces;

(h) Provide for travel to and from its home office to the Project Site and to those other places within Manatee County as required by the Project;

(i) Verify that tests, equipment, and system start-ups and operating and maintenance instructions are conducted as required and in the presence of the required personnel and provide adequate records of same to the Architect/Engineer;

(j) Maintain at the job site orderly files for correspondence, reports of job conferences, shop drawings and sample submissions, reproductions of original Contract Documents including all addenda, change orders, field orders, additional drawings issued after execution of the Agreement, Owner/Architect/Engineer's clarifications and interpretations of the Contract Documents, Progress Reports, as-built drawings, and other project related documents;

(k) Keep a diary or log book, recording hours on the job site, weather conditions, data relative to questions of extras or deductions; list of visiting officials and representatives or manufacturers, fabricators, suppliers and distributors; daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures, and provide copies of same to Owner/Architect/Engineer;

(l) Record names, addresses and telephone numbers of all Contractors, Subcontractors and major suppliers of materials and equipment;

(m) Furnish Owner/Architect/Engineer periodic reports, as required, of progress of the Work and Contractor's compliance with the approved progress schedule and schedule of shop drawing submissions;

(n) Consult with Owner/Architect/Engineer in advance of scheduling major tests, inspections or start of important phases of the Work;

(o) Verify, during the course of the Work, that certificates, maintenance and operations manuals and other data required to be assembled and furnished are applicable to the items actually installed, and deliver same to Owner/Architect/Engineer for review prior to final Acceptance of the Work; and

(p) Cooperate with Owner in the administration of grants.

(2) The Contractor shall provide personnel and equipment, or shall arrange for separate Subcontractors to provide each of the following as a Project Cost:

(a) Services of independent testing laboratories, and provide the necessary testing of materials to ensure conformance to contract requirements; and

(b) Printing and distribution of all required bidding documents and shop drawings, including the sets required by Permitting Authority inspectors.

DD. As-Built Drawings. The Contractor shall continuously review as-built drawings and mark up progress prints to provide as much accuracy as possible. Prior to, and as a requirement for authorizing final payment to the Contractor due hereunder, the Contractor shall provide to the Owner an original set of marked-up, as-built Project Plans and Specifications and an electronic format of those records showing the location and dimensions of the Project as constructed, which documents shall be certified as being correct by the Contractor and the Architect/Engineer. Final as-built drawings shall be signed and sealed by a registered Florida surveyor.

EE. Progress Reports. The Contractor shall forward to the Owner, as soon as practicable after the first day of each month, a summary report of the progress of the various parts of the Work, to include those parts of the Work in fabrication and in the field, stating the existing status, estimated time of completion and cause of delay, if any. Together with the summary report, the Contractor shall submit any necessary revisions to the original schedule for the Owner's review and approval. In addition, more detailed schedules may be required by the Owner for daily traffic control.

FF. Contractor's Warranty. The Contractor warrants to the Owner and Architect/Engineer that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements will be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect/Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

(1) Contractor shall use its best efforts and due diligence to ensure that during the warranty period, those entities or individuals who have provided direct warranties to the Owner as required by the Contract Documents perform all required warranty Work in a timely manner and at the sole cost and expense of such warranty providers. Any such cost or expense not paid by the warranty providers shall be paid by the Contractor, to include any costs and attorney's fees incurred in warranty-related litigation between Contractor and any Subcontractors.

(2) The Contractor shall secure guarantees and warranties of Subcontractors, equipment suppliers and materialmen, and assemble and deliver same to the Owner in a manner that will facilitate their maximum enforcement and assure their meaningful implementation. The Contractor shall collect and deliver to the Owner any specific written guaranties or warranties given by others as required by subcontracts.

(3) At the Owner's request, the Contractor shall conduct, jointly with the Owner and the Architect/Engineer, no more than two (2) warranty inspections within three (3) years after the Substantial Completion Date.

GG. Apprentices. If Contractor employs apprentices, their performance of Work shall be governed by and shall comply with the provisions of Chapter 446, Florida Statutes.

HH. Schedule of Values. Unit prices shall be established for this Agreement by the submission of a schedule of values within ten (10) days of receipt of the Notice to Proceed. The schedule shall include quantities and prices of items equaling the Contract Sum and will subdivide the Work into components in sufficient detail to serve as the basis for progress payments during construction. Such prices shall include an appropriate amount of overhead and profit applicable to each item of Work. Upon request of the County, the Contractor shall support the values with data which will substantiate their correctness.

II. Other Contracts. The Owner reserves the right to let other contracts in connection with this Work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and execution of their work, and promptly connect and coordinate the Work with theirs.

ARTICLE III
COMPENSATION

3.1 Compensation. The Contract Sum constitutes the total compensation (subject to authorized adjustments) payable to Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at Contractor’s expense without change in the Contract Sum.

A. Adjustments. The Contract Sum may only be changed by Change Order or by a written amendment. Any claim for an increase or decrease in the Contract Sum shall be based on written notice delivered by the party making the claim to the other party. Notice of the amount of the claim with supporting data shall be delivered within fifteen (15) days from the beginning of such occurrence and shall be accompanied by claimant's written statement that the amount claimed covers all amounts to which the claimant is entitled as a result of the occurrence of said event. Failure to deliver a claim within the requisite 15-day period shall constitute a waiver of the right to pursue said claim.

B. Valuation. The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Contract Sum shall be determined in one of the following ways (at Owner’s discretion):

(1) In the case of Unit Price Work, in accordance with Section 3.1.C, below; or

(2) By mutual acceptance of a lump sum; or

(3) On the basis of the cost of the Work, plus a negotiated Contractor's fee for overhead and profit. Contractor shall submit an itemized cost breakdown together with supporting data.

C. Unit Price Work. The unit price of an item of Unit Price Work shall be subject to re-evaluation and adjustment pursuant to a requested Change Order under the following conditions:

(1) If the total cost of a particular item of Unit Price Work amounts to 5% or more of the Contract Sum and the variation in the quantity of the particular item of Unit Price Work performed by Contractor differs by more than 15% from the estimated quantity of such item indicated in the Agreement; and

(2) If there is no corresponding adjustment with respect to any other item of Work; and

(i) If Contractor believes that it has incurred additional expense as a result thereof; or

(ii) If Owner believes that the quantity variation entitles it to an adjustment in the unit price; or

(iii) If the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed.

3.2 Schedule of Compensation. All payments for services and material under the Contract Documents shall be made in accordance with the following provisions.

A. Periodic Payments for Services. The Contractor shall be entitled to receive payment for Construction Services rendered pursuant to Section 2.4 in periodic payments which shall reflect a fair apportionment of cost and schedule of values of services furnished prior to payment, subject to the provisions of this Section.

B. Payment for Materials and Equipment. In addition to the periodic payments authorized hereunder, payments may be made for material and equipment not incorporated in the Work but delivered and suitably stored at the Project Site, or another location, subject to prior approval and acceptance by the Owner on each occasion.

C. Credit toward Contract Sum. All payments for Construction Services made hereunder shall be credited toward the payment of the Contract Sum as Contractor's sole compensation for the construction of the Project.

3.3 Invoice and Payment. All payments for services and materials under the Contract Documents shall be invoiced and paid in accordance with the following provisions.

A. Invoices. The Contractor shall submit to the Owner periodic invoices for payment, in a form acceptable to the Owner, which shall include a sworn statement certifying that, to the best of the Contractor's knowledge, information and belief, the construction has progressed to the point indicated, the quality of the Work covered by the invoice is in accord with the Project Plans and Specifications, and the Contractor is entitled to payment in the amount requested, along with the cost reports required pursuant to Article II, showing in detail all monies paid out, Project Costs accumulated, or Project Cost incurred during the previous period. This data shall be attached to the invoice.

B. Additional Information; Processing of Invoices. Should an invoiced amount appear to exceed the Work effort believed to be completed, the Owner may, prior to processing of the invoice for payment, require the Contractor to submit satisfactory evidence to support the invoice. All Progress Reports and invoices shall be delivered to the attention of the Owner's Project Representative. Invoices not properly prepared (mathematical errors, billing not reflecting actual Work done, no signature, etc.) shall be returned to the Contractor for correction.

C. Architect/Engineer's Approval. Payment for Work completed shall be subject to the Architect/Engineer approving the payment requested by the Contractor and certifying the amount thereof that has been properly incurred and is then due and payable to the Contractor, and identifying with specificity any amount that has not been properly incurred and that should not be paid.

D. Warrants of Contractor with Respect to Payments. The Contractor warrants that (1) upon payment of any retainage, materials and equipment covered by a partial payment request will pass to Owner either by incorporation in construction or upon receipt of payment by the Contractor, whichever occurs first; (2) Work, materials and equipment covered by previous partial payment requests shall be free and clear of liens, claims, security interests, or encumbrances; and (3) no Work, materials or equipment covered by a partial payment request which has been acquired by the Contractor or any other person performing Work at the Project Site, or furnishing materials or equipment for the Project, shall be subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or any other person.

E. All Compensation Included. Contractor's compensation includes full payment for services set forth in the Contract Documents, including but not limited to overhead, profit, salaries or other compensation of Contractor's officers, partners and/or employees, general operating expenses incurred by Contractor and relating to this Project, including the cost of management, supervision and data processing staff, job office equipment and supplies, and other similar items.

ARTICLE IV
SUBCONTRACTORS

4.1 Subcontracts. At the Owner's request, the Contractor shall provide Owner's Project Representative with copies of all proposed and final subcontracts, including the general and supplementary conditions thereof.

A. Subcontracts Generally. All subcontracts shall: (1) require each Subcontractor to be bound to Contractor to the same extent Contractor is bound to Owner by the terms of the Contract Documents, as those terms may apply to the portion of the Work to be performed by the Subcontractor, (2) provide for the assignment of the subcontracts from Contractor to Owner at the election of Owner, upon termination of Contractor, (3) provide that Owner will be an additional indemnified party of the subcontract, (4) provide that Owner will be an additional insured on all insurance policies required to be provided by the Subcontractor, except workers' compensation, (5) assign all warranties directly to Owner, and (6) identify Owner as an intended third-party beneficiary of the subcontract.

(1) A Subcontractor is a person or entity who has a direct contract with Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

(2) A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

B. No Damages for Delay. Except when otherwise expressly agreed to by Owner in writing, all subcontracts shall provide:

> "LIMITATION OF REMEDIES – NO DAMAGES FOR DELAY. The Subcontractor's exclusive remedy for delays in the performance of the contract caused by events beyond its control, including delays claimed to be caused by the Owner or Architect/Engineer or attributable to the Owner or Architect/Engineer and including claims based on breach of contract or negligence, shall be an extension of its contract time and shall in no way involve any monetary claim."

Each subcontract shall require that any claims by the Subcontractor for delay must be submitted to the Contractor within the time and in the manner in which the Contractor must submit such claims to the Owner, and that failure to comply with the conditions for giving notice and submitting claims shall result in the waiver of such claims.

C. Subcontractual Relations. The Contractor shall require each Subcontractor to assume all the obligations and responsibilities which the Contractor owes the Owner pursuant to the Contract Documents, by the parties to the extent of the Work to be performed by the Subcontractor. Said obligations shall be made in writing and shall preserve and protect the rights of the Owner and Architect/Engineer, with respect to the Work to be performed by the Subcontractor, so that the subcontracting thereof will not prejudice such rights. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with its sub-subcontractors.

D. Insurance; Acts and Omissions. Insurance requirements for Subcontractors shall be no more stringent than those requirements imposed on the Contractor by the Owner. The Contractor shall be responsible to the Owner for the acts and omissions of its employees, agents, Subcontractors, their agents and employees, and all other persons performing any of the Work or supplying materials under a contract to the Contractor.

4.2 Relationship and Responsibilities. Except as specifically set forth herein with respect to direct materials acquisitions by Owner, nothing contained in the Contract Documents or in any Contract Document does or shall create any contractual relation between the Owner or Architect/Engineer and any Subcontractor. Specifically, the Contractor is not acting as an agent of the Owner with respect to any Subcontractor. The utilization of any Subcontractor shall not relieve Contractor from any liability or responsibility to Owner, or obligate Owner to the payment of any compensation to the Subcontractor or additional compensation to the Contractor.

4.3 Payments to Subcontractors; Monthly Statements. The Contractor shall be responsible for paying all Subcontractors from the payments made by the Owner to Contractor pursuant to Article III, subject to the following provisions:

A. Payment. The Contractor shall, no later than ten (10) days after receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's Work, pay to each Subcontractor the amount to which the Subcontractor is entitled in accordance with the terms of the Contractor's contract with such Subcontractor. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to sub-Subcontractors in a similar manner. After receipt of payment from Owner, if the need should arise to withhold payments to Subcontractors for any reason, as solely determined by Contractor, the Contractor shall promptly restore such monies to the Owner, adjusting subsequent pay requests and Project bookkeeping as required.

B. Final Payment of Subcontractors. The final payment of retainage to Subcontractors shall not be made until the Project has been inspected by the Architect/Engineer or other person designated by the Owner for that purpose, and until both the Architect/Engineer and the Contractor have issued a written certificate that the Project has been constructed in accordance with the Project Plans and Specifications and approved Change Orders. Before issuance of final payment to any Subcontractor without any retainage, the Subcontractor shall submit satisfactory evidence that all payrolls, material bills, and other indebtedness connected with the Project have been paid or otherwise satisfied, warranty information is complete, as-built markups have been submitted, and instruction for the Owner's operating and maintenance personnel is complete. Final payment may be made to certain select Subcontractors whose Work is satisfactorily completed prior to the completion of the Project, but only upon approval of the Owner's Project Representative.

4.4 Responsibility for Subcontractors. As provided in Section 2.4.BB, Contractor shall be fully responsible to Owner for all acts and omissions of the Subcontractors, suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect Contract with Contractor just as Contractor is responsible for Contractor's own acts and omissions.

4.5 Contingent Assignment of Subcontracts. Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that:

(1) assignment is effective only after termination of the Contract by the Owner for cause pursuant to Article XIV and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and

(2) assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Agreement.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract. Upon such assignment, if the Work has been suspended for more than thirty (30) days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension. Upon such assignment to the Owner, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE V
CHANGES IN WORK

5.1 General. Changes in the Work may be accomplished after execution of the Agreement, and without invalidating the Agreement, by Change Order, Work Directive Change or order for a minor change in the Work, subject to the limitations stated in this Article V and elsewhere in the Contract Documents. A Change Order shall be based upon agreement among the Owner, Contractor and Architect/Engineer; a Work Directive Change requires agreement by the Owner and Architect/Engineer and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect/Engineer alone. Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Work Directive Change or order for a minor change in the Work.

5.2 Minor Changes in the Work. The Owner or Architect/Engineer shall have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such change will be effected by written order signed by the Architect/Engineer and shall be binding on the Owner and Contractor. The Contractor shall abide by and perform such minor changes. Such changes shall be effected by a Field Directive or a Work Directive Change. Documentation of changes shall be determined by the Construction Team, and displayed monthly in the Progress Reports. Because such changes shall not affect the Contract Sum to be paid to the Contractor, they shall not require a Change Order pursuant to Section 5.6.

5.3 Emergencies. In any emergency affecting the safety of persons or property, the Contractor shall act at its discretion to prevent threatened damage, injury, or loss. Any increase in the Contract Sum or extension of time claimed by the Contractor because of emergency Work shall be determined as provided in Section 5.6. However, whenever practicable, the Contractor shall obtain verbal concurrence of the Owner's Project Representative and Architect/Engineer where the act will or may affect the Contract Sum or Contract Time.

5.4 Concealed Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect/Engineer before conditions are disturbed and in no event later than ten (10) days after first observance of the conditions. The Architect/Engineer will promptly investigate such conditions and, if the Architect/Engineer determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect/Engineer determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect/Engineer shall promptly notify the Owner and Contractor in writing, stating the reasons. If the Contractor disputes the Architect/Engineer's determination or recommendation, the Contractor may proceed as provided in Article VIII. If the Owner disputes the Architect/Engineer's determination or recommendation, the Owner may appeal directly to the Purchasing Official and shall thereafter follow the process set forth in Section 8.5.

5.5 Hazardous Materials. In the event the Contractor encounters on the Project Site material reasonably believed to be hazardous, petroleum or petroleum related products, or other hazardous or toxic substances, except as provided in Section 2.4.U, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and the

Architect/Engineer in writing. The Work in the affected area shall not thereafter be resumed except by Change Order or written amendment, if in fact the material or substance has not been rendered harmless. The Work in the affected area shall be resumed when the Project Site has been rendered harmless, in accordance with the final determination by the Architect/Engineer or other appropriate professional employed by Owner. The Contractor shall not be required to perform without its consent any Work relating to hazardous materials, petroleum or petroleum related products, or other hazardous or toxic substances. In the event the Contractor encounters on the Project Site materials believed in good faith to be hazardous or contaminated material, and the presence of such hazardous or contaminated material was not known and planned for at the time the Contractor submitted its Bid (or Guaranteed Maximum Price proposal), and it is necessary for the Contractor to stop Work in the area affected and delays Work for more than a seven (7) day period, adjustments to the Contract Sum and/or Contract Time shall be made in accordance with this Article V.

5.6 Change Orders; Adjustments to Contract Sum.

A. Change Orders Generally. The increase or decrease in the Contract Sum resulting from a change authorized pursuant to the Contract Documents shall be determined:

(1) By mutual acceptance of a lump sum amount properly itemized and supported by sufficient substantiating data, to permit evaluation by the Architect/Engineer and Owner; or

(2) By unit prices stated in the Agreement or subsequently agreed upon; or

(3) By any other method mutually agreeable to Owner and Contractor.

If Owner and Contractor are unable to agree upon increases or decreases in the Contract Sum and the Architect/Engineer certifies that the work needs to be commenced prior to any such agreement, the Contractor, provided it receives a written Change Order signed by or on behalf of the Owner, shall promptly proceed with the Work involved. The cost of such Work shall then be determined on the basis of the reasonable expenditures of those performing the Work attributed to the change. However, in the event a Change Order is issued under these conditions, the Owner, through the Architect/Engineer, will establish an estimated cost of the Work and the Contractor shall not perform any Work whose cost exceeds that estimated without prior written approval by the Owner. In such case, the Contractor shall keep and present in such form as the Owner may prescribe an itemized accounting, together with appropriate supporting data of the increase in overall costs of the Project. The amount of any decrease in the Contract Sum to be allowed by the Contractor to the Owner for any deletion or change which results in a net decrease in costs will be the amount of the actual net decrease.

5.7 Owner-Initiated Changes. Without invalidating the Agreement and without notice to any Surety, Owner may, at any time, order additions, deletions or revisions in the Work. These will be authorized by a written amendment, a Field Directive, a Change Order, or a Work Directive Change, as the case may be. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the

Contract Documents (except as otherwise specifically provided). A Work Directive Change may not change the Contract Sum or the Contract Time; but is evidence that the parties expect that the change directed or documented by a Work Directive Change will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Sum or Contract Time.

5.8 Unauthorized Work. Contractor shall not be entitled to an increase in the Contract Sum or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents.

5.9 Defective Work. Owner and Contractor shall execute appropriate Change Orders (or written amendments) covering changes in the Work which are ordered by Owner, or which may be required because of acceptance of defective Work, without adjustment to the Contract Sum.

5.10 Estimates for Changes. At any time Architect/Engineer may request a quotation from Contractor for a proposed change in the Work. Within twenty-one (21) calendar days after receipt, Contractor shall submit a written and detailed proposal for an increase or decrease in the Contract Sum or Contract Time for the proposed change. Architect/Engineer shall have twenty-one (21) calendar days after receipt of the detailed proposal to respond in writing. The proposal shall include an itemized estimate of all costs and time for performance that will result directly or indirectly from the proposed change. Unless otherwise directed, itemized estimates shall be in sufficient detail to reasonably permit an analysis by Architect/Engineer of all material, labor, equipment, subcontracts, overhead costs and fees, and shall cover all Work involved in the change, whether such Work was deleted, added, changed or impacted. Notwithstanding the request for quotation, Contractor shall carry on the Work and maintain the progress schedule. Delays in the submittal of the written and detailed proposal will be considered non-prejudicial.

5.11 Form of Proposed Changes. The form of all submittals, notices, Change Orders and other documents permitted or required to be used or transmitted under the Contract Documents shall be determined by the Owner. Standard Owner forms shall be utilized.

5.12 Changes to Contract Time. The Contract Time may only be changed pursuant to a Change Order or a written amendment to the Contract Documents. Any claim for an extension or shortening of the Contract Time shall be based on written notice delivered by the party making the claim to the other party. Notice of the extent of the claim with supporting data shall be delivered within fifteen (15) days from detection or beginning of such occurrence and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled to because of the occurrence of said event. The Contract time will be extended in an amount equal to time lost due to delays beyond the control of Contractor. Such delays shall include, but not be limited to, acts or neglect by Owner or others performing additional Work; or to fires, floods, epidemics, abnormal weather conditions or acts of God. Failure to deliver a written notice of claim within the requisite 15-day period shall constitute a waiver of the right to pursue said claim.

ARTICLE VI
ROLE OF ARCHITECT/ENGINEER

6.1 General.

A. Retaining. The Owner shall retain an Architect/Engineer (whether an individual or an entity) lawfully licensed to practice in Florida. That person or entity is identified as the Architect/Engineer in the Agreement and is referred to throughout the Contract Documents as if singular in number.

B. Duties. Duties, responsibilities and limitations of authority of the Architect/Engineer as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner and Architect/Engineer. Consent shall not be unreasonably withheld.

C. Termination. If the employment of the Architect/Engineer is terminated, the Owner shall employ a successor Architect/Engineer as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect/Engineer.

6.2 Administration. The Architect/Engineer will provide administration of the Agreement as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect/Engineer approves the final Application for Payment. The Architect/Engineer will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

A. Site Visits. The Architect/Engineer will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work complete, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. Unless specifically instructed by Owner, the Architect/Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect/Engineer will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

B. Reporting. Based on the site visits, the Architect/Engineer will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect/Engineer will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect/Engineer will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

6.3 Interpretation of Project Plans and Specifications. The Architect/Engineer will be the interpreter of the requirements of the Project Plans and Specifications. Upon receipt of comments or objections by Contractor or Owner, the Architect/Engineer will make decisions on all claims, disputes, or other matters pertaining to the interpretation of the Project Plans and Specifications.

6.4 Rejection of Non-Conforming Work. Upon consultation with Owner, the Architect/Engineer shall have the authority to reject Work which does not conform to the Project Plans and Specifications.

6.5 Correction of Work. The Contractor shall promptly correct all Work rejected by the Architect/Engineer for being defective or as failing to conform to the Project Plans and Specifications, whether observed before or after the Substantial Completion Date and whether or not fabricated, installed, or completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for Architect/Engineer's additional services made necessary thereby.

6.6 Timely Performance of Architect/Engineer. The Contractor shall identify which requests for information or response from the Architect/Engineer have the greatest urgency and those items which require prioritizing in response by the Architect/Engineer. The Contractor shall also identify the preferred time period for response and shall request a response time which is reasonably and demonstrably related to the needs of the Project and Contractor. If Architect/Engineer claims that Contractor's expectations for a response are unreasonable, Owner shall require Architect/Engineer to communicate such claim to Contractor in writing together with the specific time necessary to respond and the date upon which such response will be made. If Contractor believes that Architect/Engineer is not providing timely services or responses, Contractor shall notify Owner of same in writing not less than two (2) weeks before Contractor believes performance or response time from Architect/Engineer is required without risk of delaying the Project.

ARTICLE VII
OWNER'S RIGHTS AND RESPONSIBILITIES

7.1 Project Site; Title. The Owner shall provide the lands upon which the Work under the Contract Documents is to be done, except that the Contractor shall provide all necessary additional land required for the erection of temporary construction facilities and storage of his materials, together with right of access to same. The Owner hereby represents to the Contractor that it currently has and will maintain up through and including the Substantial Completion Date, good title to all of the real property constituting the Project Site. Owner agrees to resolve, at its expense, any disputes relating to the ownership and use of the Project Site which might arise during construction.

7.2 Project Plans and Specifications; Architect/Engineer. The parties hereto acknowledge and agree that Owner has previously entered into an agreement with Architect/Engineer. Pursuant to the terms of such agreement, the Architect/Engineer, as an agent and representative of Owner, is responsible for the preparation of Project Plans and Specifications which consist of drawings, specifications, and other documents setting forth in detail the requirements for the construction of the Project. All such Project Plans and Specifications shall be provided either by Owner or the Architect/Engineer, and Contractor shall be under no obligation to provide same and shall be entitled to rely upon the accuracy and completeness of the Project Plans and Specifications provided by the Architect/Engineer and all preliminary drawings prepared in connection therewith. The Contractor will be furnished a reproducible set of all drawings and specifications reasonably necessary for the performance of Contractor's services hereunder and otherwise ready for printing. The Contractor shall be notified of any written modification in the agreement between Owner and Architect/Engineer.

7.3 Surveys; Soil Tests and Other Project Site Information. Owner shall be responsible for providing a legal description and certified land survey of the Project Site in a form and content and with such specificity as may be required by the Architect/Engineer and Contractor to perform their services. To the extent deemed necessary by Owner and Architect/Engineer, and solely at Owner's expense, Owner may engage the services of a geotechnical consultant to perform test borings and other underground soils testing as may be deemed necessary by the Architect/Engineer or the Contractor. Contractor shall not be obligated to provide such surveys or soil tests and shall be entitled to rely upon the accuracy and completeness of the information provided; subject, however, to the provisions of Section 2.4.S hereof. Owner shall provide Contractor, as soon as reasonably possible following the execution of the Contract Documents, all surveys or other survey information in its possession describing the physical characteristics of the Project Site, together with soils reports, subsurface investigations, utility locations, deed restrictions, easements, and legal descriptions then in its possession or control. Upon receipt of all surveys, soils tests, and other Project Site information, Contractor shall promptly advise Owner of any inadequacies in such information and of the need for any additional surveys, soils or subsoil tests. In performing this Work, Contractor shall use the standard of care of experienced contractors and will use its best efforts timely to identify all problems or omissions. Owner shall not be responsible for any delay or damages to the Contractor for any visible or disclosed site conditions or disclosed deficiencies in the Project Site which should have been identified by Contractor and corrected by Owner prior to the execution of the Contract Documents.

7.4 Information; Communication; Coordination. The Owner's Project Representative shall examine any documents or requests for information submitted by the Contractor and shall advise Contractor of Owner's decisions pertaining thereto within a reasonable period of time to avoid unreasonable delay in the progress of the Contractor's services. Contractor shall indicate if any such documents or requests warrant priority consideration. However, decisions pertaining to approval of the Project Schedule as it relates to the date of Substantial Completion, the Project Cost, Contractor's compensation, approving or changing the Contract Sum shall only be effective when approved by Owner in the form of a written Change Order or amendment to the Contract Documents. Owner reserves the right to designate a different Owner's Project Representative provided Contractor is notified in writing of any such change. Owner and Architect/Engineer may communicate with Subcontractors, materialmen, laborers, or suppliers engaged to perform services on the Project, but only for informational purposes. Neither the Owner nor the Architect/Engineer shall attempt to direct the Work of or otherwise interfere with any Subcontractor, materialman, laborer, or supplier, or otherwise interfere with the Work of the Contractor. Owner shall furnish the data required of Owner under the Contract Documents promptly.

7.5 Governmental Body. The Contractor recognizes that the Owner is a governmental body with certain procedural requirements to be satisfied. The Contractor has and will make reasonable allowance in its performance of services for such additional time as may be required for approvals and decisions by the Owner and any other necessary government agency.

7.6 Pre-Completion Acceptance. The Owner shall have the right to take possession of and use any completed portions of the Work, although the time for completing the entire Work or such portions may not have expired, but such taking possession and use shall not be deemed an acceptance of any Work not completed in accordance with the Contract Documents.

7.7 Ownership and Use of Drawings, Specifications and Other Instruments of Service.

(1) The Architect/Engineer and the Architect/Engineer's consultants shall be deemed the authors and owners of their respective instruments of service, including the Project Plans and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the instruments of service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be constructed as publication in derogation of the Architect/Engineer's or Architect/Engineer's consultants' reserved rights.

(2) The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the drawings and specifications provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Project Plans and Specifications or other instruments of service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the drawings or specifications on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect/Engineer and the Architect/Engineer's consultants.

7.8 Owner's Project Representative. Owner's Project Representative is Owner's Agent, who will act as directed by and under the supervision of the Owner, and who will confer with Owner/Architect/Engineer regarding his actions. The Owner's Project Representative's dealings in matters pertaining to the on-site Work shall, in general, be only with the Owner/Architect/Engineer and Contractor and dealings with Subcontractors shall only be through or with the full knowledge of Contractor.

A. <u>Responsibilities</u>. Except as otherwise instructed in writing by Owner, the Owner's Project Representative will:

(1) Attend preconstruction conferences; arrange a schedule of progress meetings and other job conferences as required in consultation with Owner/Architect/Engineer and notify those expected to attend in advance; and attend meetings and maintain and circulate copies of minutes thereof;

(2) Serve as Owner/Architect/Engineer's liaison with Contractor, working principally through Contractor's superintendent, to assist in understanding the intent of the Contract Documents. As requested by Owner/Architect/Engineer, assist in obtaining additional details or information when required at the job site for proper execution of the Work;

(3) Report to Owner/Architect/Engineer whenever he believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents;

(4) Accompany visiting inspectors representing public or other agencies having jurisdiction over the project; record the outcome of these inspections and report to Owner/Architect/Engineer;

(5) Review applications for payment with Contractor for compliance with the established procedure for their submission and forward them with recommendations to Owner/Architect/Engineer; and

(6) Perform those duties as set forth elsewhere within the Contract Documents.

B. Limitations. Except upon written instructions of Owner, Owner's Project Representative shall not:

(1) Authorize any deviation from the Contract Documents or approve any substitute materials or equipment;

(2) Exceed limitations on Owner/Architect/Engineer's authority as set forth in the Contract Documents;

(3) Undertake any of the responsibilities of Contractor, Subcontractors or Contractor's superintendent, or expedite the Work;

(4) Advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents;

(5) Advise on or issue directions as to safety precautions and programs in connection with the Work;

(6) Authorize Owner to occupy the project in whole or in part; or

(7) Participate in specialized field or laboratory tests.

ARTICLE VIII
RESOLUTION OF DISAGREEMENTS; CLAIMS FOR COMPENSATION

8.1 Owner to Decide Disputes. The Owner shall reasonably decide all questions and disputes (with the exception of matters pertaining to the interpretation of the Project Plans and Specifications which shall be resolved by the Architect/Engineer pursuant to Section 6.3) that may arise in the execution and fulfillment of the services provided for under the Contract Documents, in accordance with the Procurement Ordinance.

8.2 Finality. The decision of the Owner upon all claims, questions, disputes and conflicts shall be final and conclusive, and shall be binding upon all parties to the Contract Documents, subject to judicial review as provided in Section 8.5 below.

8.3 No Damages for Delay. If at any time Contractor is delayed in the performance of Contractor's responsibilities under the Contract Documents as the result of a default or failure to perform in a timely manner by Owner or Owner's agents or employees, Contractor shall not be entitled to any damages except for compensation specifically authorized in Article III. Contractor's sole remedy will be a right to extend the time for performance. Nothing herein shall preclude Contractor from any available remedy against any responsible party other than Owner. Contractor shall be responsible for liquidated damages for delay if otherwise provided for in the Contract Documents.

8.4 Permitted Claims Procedure. Where authorized or permitted under the Contract Documents, all claims for additional compensation by Contractor, extensions of time affecting the Substantial Completion Date, for payment by the Owner of costs, damages or losses due to casualty, Force Majeure, Project Site conditions or otherwise, shall be governed by the following:

(1) All claims must be submitted as a request for Change Order in the manner as provided in Article V.

(2) The Contractor must submit a notice of claim to Owner's Project Representative and to the Architect/Engineer within fifteen (15) days of the beginning of such occurrence. Failure to submit a claim within the requisite 15-day period shall constitute a waiver of the right to pursue said claim.

(3) Within twenty (20) days of submitting its notice of claim, the Contractor shall submit to the Owner's Project Representative its request for Change Order, which shall include a written statement of all details of the claim, including a description of the Work affected.

(4) After receipt of a request for Change Order, the Owner's Project Representative, in consultation with the Architect/Engineer, shall deliver to the Contractor, within twenty (20) days after receipt of request, its written response to the claim.

(5) In the event the Owner and Contractor are unable to agree on the terms of a Change Order, the Owner shall have the option to instruct the Contractor to proceed with the Work. In that event, the Owner shall pay for those parts of the Work, the scope and price of which are not in dispute. The balance of the disputed items in the order to proceed will be resolved after completion of the Work, based upon completed actual cost.

(6) The rendering of a decision by Owner with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment) will be a condition precedent to any exercise by Owner or Contractor of such right or remedies as either may otherwise have under the Contract Documents or by laws or regulations in respect of any such claim, dispute or other matter.

8.5 Contract Claims and Disputes. After completion of the process set forth in Section 8.4 above, any unresolved dispute under this Agreement shall be decided by the Purchasing Official in accordance with Section 2-26-63 of the Manatee County Code of Laws, subject to an administrative hearing process as provided in Section 2-26-64. The decision of the hearing officer in accordance with Section 2-26-64 of the Manatee County Code of Laws shall be the final and conclusive decision subject to exclusive judicial review in circuit court by a petition for certiorari.

8.6 Claims for Consequential Damages. The Contractor and Owner waive claims against each other for consequential damages arising out of or relating to this Agreement. This mutual waiver includes:

(1) damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons, unless any of such damages or losses are covered by insurance placed by the Contractor; and

(2) damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article XIV. Nothing contained in this Section 8.6 shall be deemed to preclude assessment of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

ARTICLE IX
INDEMNITY

9.1 Indemnity.

A. Indemnification Generally. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect/Engineer, Architect/Engineer's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor or anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 9.1.

B. Indemnification; Enforcement Actions. The Contractor's duty to indemnify and hold harmless the Owner in Section 9.1 above shall extend to fines, penalties and costs incurred by the Owner as related to any enforcement action taken by local, state, regional or federal regulatory entities. The Owner may deduct any of such fines, penalties and costs as described in this Section from any unpaid amounts then or thereafter due the Contractor under the Contract Documents. Any of such fines, penalties and costs not so deducted from any unpaid amounts due the Contractor shall be payable to the Owner at the demand of the Owner, together with interest from the date of the demand at the maximum allowable rate.

C. Claims by Employees. In claims against any person or entity indemnified under this Section 9.1 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 9.1.A. shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

9.2 Duty to Defend. The Contractor shall defend the Owner in any action, lawsuit, mediation or arbitration arising from the alleged negligence, recklessness or intentionally wrongful conduct of the Contractor and other persons employed or utilized by the Contractor in the performance of the Work. Notwithstanding any other provisions within this Article IX, so long as Contractor, through its own counsel, performs its obligation to defend the Owner pursuant to this Section, Contractor shall not be required to pay the Owner's costs associated with the Owner's participation in the defense.

ARTICLE X
ACCOUNTING RECORDS; OWNERSHIP OF DOCUMENTS

10.1 Accounting Records. Records of expenses pertaining to all services performed shall be kept in accordance with generally accepted accounting principles and procedures.

10.2 Inspection and Audit. The Contractor's records shall be open to inspection and subject to examination, audit, and/or reproduction during normal working hours by the Owner's agent or authorized representative to the extent necessary to adequately permit evaluation and verification of any invoices, payments or claims submitted by the Contractor or any of its payees during the performance of the Work. These records shall include, but not be limited to, accounting records, written policies and procedures, Subcontractor files (including proposals of successful and unsuccessful bidders), original estimates, estimating worksheets, correspondence, Change Order files (including documentation covering negotiated settlements), and any other supporting evidence necessary to substantiate charges related to the Contract Documents. They shall also include, but not be limited to, those records necessary to evaluate and verify direct and indirect costs (including overhead allocations) as they may apply to costs associated with the Contract Documents. For such audits, inspections, examinations and evaluations, the Owner's agent or authorized representative shall have access to said records from the effective date of the

Contract Documents, for the duration of Work, and until three (3) years after the date of final payment by the Owner to the Contractor pursuant to the Contract Documents.

10.3 Access. The Owner's agent or authorized representative shall have access to the Contractor's facilities and all necessary records to conduct audits in compliance with this Article. The Owner's agent or authorized representative shall give the Contractor reasonable advance notice of intended inspections, examinations, and/or audits.

10.4 Ownership of Documents. Upon obtainment of Substantial Completion or termination of the Agreement, all records, documents, tracings, plans, specifications, maps, evaluations, reports, transcripts and other technical data, other than working papers, prepared or developed by the Contractor shall be delivered to and become the property of the Owner. The Contractor at its own expense may retain copies for its files and internal use.

ARTICLE XI
PUBLIC CONTRACT LAWS

11.1 Equal Opportunity Employment.

A. Employment. The Contractor shall not discriminate against any employee or applicant for employment because of race, creed, sex, color, national origin, disability or age, and will take affirmative action to ensure that all employees and applicants are afforded equal employment opportunities without discrimination because of race, creed, sex, color, national origin, disability or age. Such action will be taken with reference to, but shall not be limited to, recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff or termination, rates of training or retraining, including apprenticeship and on-the-job training.

B. Participation. No person shall, on the grounds of race, creed, sex, color, national origin, disability or age, be excluded from participation in, be denied the proceeds of, or be subject to discrimination in the performance of the Agreement.

11.2 Immigration Reform and Control Act of 1986. Contractor acknowledges that it is responsible for complying with the provisions of the Immigration Reform and Control Act of 1986, located at 8 U.S.C. Section 1324, et seq., and regulations relating thereto. Failure to comply with the above statutory provisions shall be considered a material breach and shall be grounds for immediate termination of this Agreement.

11.3 No Conflict of Interest. The Contractor warrants that it has not employed or retained any company or person, other than a bona fide employee working solely for the Contractor to solicit or secure this Agreement, and that it has not paid or agreed to pay any person, company, corporation, individual, or firm other than a bona fide employee working solely for the Contractor, any fee, commission, percentage, gift or any other consideration, contingent upon or resulting from the award or making of this Agreement.

A. No Interest in Business Activity. By accepting award of this Agreement, the Contractor, which shall include its directors, officers and employees, represents that it presently has no interest in and shall acquire no interest in any business or activity which would conflict in any manner with the performance of services required hereunder, including without limitation as described in the Contractor's own professional ethical requirements. An interest in a business or activity which shall be deemed a conflict includes but is not limited to direct financial interest in any of the material and equipment manufacturers, suppliers, distributors, or contractors who will be eligible to supply material and equipment for the Project for which the Contractor is furnishing its services required hereunder.

B. No Appearance of Conflict. The Contractor shall not knowingly engage in any contractual or professional obligations that create an appearance of a conflict of interest with respect to the services provided pursuant to the Agreement. The Contractor has provided the Affidavit of No Conflict, incorporated into the Contract Documents as Exhibit "C", as a material inducement for Owner entering the Agreement. If, in the sole discretion of the County Administrator or designee, a conflict of interest is deemed to exist or arise during the term of this Agreement, the County Administrator or designee may cancel this Agreement, effective upon the date so stated in a written notice of cancellation, without penalty to the Owner.

11.4 Truth in Negotiations. By execution of the Contract Documents, the Contractor certifies to truth-in-negotiations and that wage rates and other factual unit costs supporting the compensation are accurate, complete and current at the time of contracting. Further, the original Contract Sum and any additions thereto shall be adjusted to exclude any significant sums where the Owner determines the Contract Sum was increased due to inaccurate, incomplete or non-current wage rates and other factual unit costs. Such adjustments must be made within one (1) year after final payment to the Contractor.

11.5 Public Entity Crimes. The Contractor is directed to the Florida Public Entity Crimes Act, Section 287.133, Florida Statutes, specifically section 2(a), and the Owner's requirement that the Contractor comply with it in all respects prior to and during the term of the Agreement.

ARTICLE XII
FORCE MAJEURE, FIRE OR OTHER CASUALTY

12.1 Force Majeure.

A. Unavoidable Delays. Delays in any performance by any party contemplated or required hereunder due to fire, flood, sinkhole, earthquake or hurricane, acts of God, unavailability of materials, equipment or fuel, war, declaration of hostilities, revolt, civil strife, altercation or commotion, strike, labor dispute, or epidemic, archaeological excavation, lack of or failure of transportation facilities, or any law, order, proclamation, regulation, or ordinance of any government or any subdivision thereof, or for any other similar cause to those enumerated, beyond the reasonable control and which with due diligence could not have been reasonably anticipated, shall be deemed to be events of Force Majeure and any such delays shall be excused. In the event such party is delayed in the performance of any Work or obligation pursuant to the Contract Documents for any of the events of Force Majeure stated in this Section 12.1, the date for performance required or contemplated by the Contract Documents shall be extended by the number of calendar days such party is actually delayed.

B. Concurrent Contractor Delays. If a delay is caused for any reason provided in Section 12.1.A.and during the same time period a delay is caused by Contractor, the date for performance shall be extended as provided in 12.1.A. but only to the extent the time is or was concurrent.

C. Notice; Mitigation. The party seeking excuse for nonperformance based on Force Majeure shall give written notice to the Owner, if with respect to the Contractor, or to the Contractor if with respect to the Owner, specifying its actual or anticipated duration. Each party seeking excuse from nonperformance based on Force Majeure shall use its best efforts to rectify any condition causing a delay and will cooperate with the other party, except that neither party shall be obligated to incur any unreasonable additional costs and expenses to overcome any loss of time that has resulted.

12.2 Casualty; Actions by Owner and Contractor. During the construction period, if the Project or any part thereof shall have been damaged or destroyed, in whole or in part, the Contractor shall promptly make proof of loss; and Owner and Contractor shall proceed promptly to collect, or cause to be collected, all valid claims which may have arisen against insurers or others based upon such damage or destruction. The Contractor shall diligently assess the damages or destruction and shall prepare an estimate of the cost, expenses, and other charges, including normal and ordinary compensation to the Contractor, necessary for reconstruction of the Project substantially in accordance with the Project Plans and Specifications. Within fifteen (15) days following satisfaction of the express conditions described in subsections (1), (2) and (3) below, the Contractor covenants and agrees diligently to commence reconstruction and to complete the reconstruction or repair of any loss or damage by fire or other casualty to the Project to substantially the same size, floor area, cubic content, and general appearance as prior to such loss or damage:

(1) Receipt by the Owner or the trustee of the proceeds derived from collection of all valid claims against insurers or others based upon such damage or destruction, and receipt of other sums from any source such that the funds necessary to pay the Project Cost and any additions to the Project Cost necessitated for repair or reconstruction are available;

(2) Written agreement executed by the Contractor and the Owner, by amendment to the Contract Documents or otherwise, authorizing and approving the repair or reconstruction and any additions to the Project Cost necessitated thereby, including any required adjustment to the Contract Sum; and

(3) Final approval by the Owner of the Project Plans and Specifications for such repair or reconstruction and issuance of any required building permit.

12.3 Approval of Plans and Specifications. The Owner agrees to approve the plans and specifications for such reconstruction or repair if the reconstruction or repair contemplated by such plans and specifications is economically feasible, and will restore the Project, or the damaged portion thereof, to substantially the same condition as prior to such loss or damage, and such plans and specifications conform to the applicable laws, ordinances, codes, and regulations. The Owner agrees that all proceeds of any applicable insurance or other proceeds received by the Owner or the Contractor as a result of such loss or damage shall be used for payment of the costs, expenses, and other charges of the reconstruction or repair of the Project.

12.4 Notice of Loss or Damage. The Contractor shall promptly give the Owner written notice of any significant damage or destruction to the Project, defined as loss or damage which it is contemplated by Contractor will increase the Contract Sum or extend the Substantial Completion Date, stating the date on which such damage or destruction occurred, the then expectations of Contractor as to the effect of such damage or destruction on the use of the Project, and the then proposed schedule, if any, for repair or reconstruction of the Project. Loss or damage which the Contractor determines will not affect the Contract Sum or Substantial Completion Date will be reported to Owner and Architect/Engineer immediately, and associated corrective actions will be undertaken without delay.

ARTICLE XIII
REPRESENTATIONS, WARRANTIES AND COVENANTS

13.1 Representations and Warranties of Contractor. The Contractor represents and warrants to the Owner each of the following.

A. The Contractor is a construction company, organized under the laws of the State of _______________, authorized to transact business in the State of Florida, with ____________________ as the primary qualifying agent. Contractor has all requisite power and authority to carry on its business as now conducted, to own or hold its properties, and to enter into and perform its obligations hereunder and under each instrument to which it is or will be a party, and is in good standing in the State of Florida.

B. Each Contract Document to which the Contractor is or will be a party constitutes, or when entered into will constitute, a legal, valid, and binding obligation of the Contractor enforceable against the Contractor in accordance with the terms thereof, except as such enforceability may be limited by applicable bankruptcy, insolvency, or similar laws from time to time in effect which affect creditors' rights generally and subject to usual equitable principles in the event that equitable remedies are involved.

C. There are no pending or, to the knowledge of the Contractor, threatened actions or proceedings before any court or administrative agency, within or without the State of Florida, against the Contractor or any partner, officer, or agent of the Contractor which question the validity of any document contemplated hereunder, or which are likely in any case, or in the aggregate, to materially adversely affect the consummation of the transactions contemplated hereunder, or materially adversely affect the financial condition of the Contractor.

D. The Contractor has filed or caused to be filed all federal, state, local, or foreign tax returns, if any, which were required to be filed by the Contractor, and has paid, or caused to be paid, all taxes shown to be due and payable on such returns or on any assessments levied against the Contractor.

E. Neither Contractor nor any agent or person employed or retained by Contractor has acted fraudulently or in bad faith or in violation of any statute or law in the procurement of this Agreement.

F. The Contractor shall timely fulfill or cause to be fulfilled all of the terms and conditions expressed herein which are within the control of the Contractor or which are the responsibility of the Contractor to fulfill. The Contractor shall be solely responsible for the means and methods of construction.

G. It is recognized that neither the Architect/Engineer, the Contractor, nor the Owner has control over the cost of labor, materials, or equipment, over a Subcontractor's methods of determining bid prices, or over competitive bidding, market, or negotiating conditions.

H. During the term of the Contract Documents, and the period of time that the obligations of the Contractor under the Contract Documents shall be in effect, the Contractor shall cause to occur and to continue to be in effect those instruments, documents, certificates, and events contemplated by the Contract Documents that are applicable to, and the responsibility of, the Contractor.

I. The Contractor shall assist and cooperate with the Owner and shall accomplish the construction of the Project in accordance with the Contract Documents and the Project Plans and Specifications, and will not knowingly violate any laws, ordinances, rules, regulations, or orders that are or will be applicable thereto.

J. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective, and that Owner, representatives of Owner, and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspecting and testing. Contractor shall give Architect/Engineer timely notice of readiness of the Work for all required approvals and shall assume full responsibility, including costs, in obtaining required tests, inspections, and approval certifications and/or acceptance, unless otherwise stated by Owner.

K. If any Work (including Work of others) that is to be inspected, tested, or approved is covered without written concurrence of Architect/Engineer, it must, if requested by Architect/Engineer, be uncovered for observation. Such uncovering shall be at Contractor's expense unless Contractor has given Architect/Engineer timely notice of Contractor's intention to cover the same and Architect/Engineer has not acted with reasonable promptness in response to such notice. Neither observations by Architect/Engineer nor inspections, tests, or approvals by others shall relieve Contractor from Contractor's obligations to perform the Work in accordance with the Contract Documents.

L. If the Work is defective, or Contractor fails to supply sufficient skilled workers, or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof and terminate payments to the Contractor until the cause for such order has been eliminated. Contractor shall bear all direct, indirect and consequential costs for satisfactory reconstruction or removal and replacement with non-defective Work, including, but not limited to fees and charges of Architect/Engineers, attorneys and other professionals and any additional expenses experienced by Owner due to delays to other

Contractors performing additional Work and an appropriate deductive change order shall be issued. Contractor shall further bear the responsibility for maintaining the schedule and shall not be entitled to an extension of the Contract Time or the recovery of delay damages due to correcting or removing defective Work.

M. If Contractor fails within seven (7) days after written notice to correct defective Work, or fails to perform the Work in accordance with the Contract Documents, or fails to comply with any other provision of the Contract Documents, Owner may correct and remedy any such deficiency to the extent necessary to complete corrective and remedial action. Owner may temporarily exclude Contractor from all or part of the site, temporarily take possession of all or part of the Work, Contractor's tools, construction equipment and machinery at the site or for which Owner has paid Contractor but which are stored elsewhere, all for such duration as is reasonably necessary to correct the deficiency. All direct and indirect costs of Owner in exercising such rights and remedies will be charged against Contractor in an amount approved as to reasonableness by Architect/Engineer and a Change Order will be issued incorporating the necessary revisions.

N. If within three (3) years after the Substantial Completion Date or such longer period of time as may be prescribed by laws or regulations or by the terms of any applicable special guarantee required by the Contract Documents, any Work is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions, either correct such defective Work or, if it has been rejected by Owner, remove it from the site and replace it with non-defective Work. If Contractor does not promptly comply with the terms of such instruction, Owner may have the defective Work corrected/removed and all direct, indirect and consequential costs of such removal and replacement will be paid by Contractor. Failing payment by the Contractor and notwithstanding any other provisions of the Contract Documents to the contrary, Owner shall have the right to bring a direct action in the Circuit Court to recover such costs.

13.2 Representations of the Owner. To the extent permitted by law, the Owner represents to the Contractor that each of the following statements is presently true and accurate:

A. The Owner is a validly existing political subdivision of the State of Florida.

B. The Owner has all requisite corporate or governmental power and authority to carry on its business as now conducted and to perform its obligations under the Contract Documents and each Contract Document contemplated hereunder to which it is or will be a party.

C. The Contract Documents and each Contract Document contemplated hereby to which the Owner is or will be a party has been duly authorized by all necessary action on the part of, and has been or will be duly executed and delivered by, the Owner, and neither the execution and delivery thereof nor compliance with the terms and provisions thereof or hereof: (a) requires the approval and consent of any other person or party, except such as have been duly obtained or as are specifically noted herein; (b) contravenes any existing law, judgment, governmental rule, regulation or order applicable to or binding on the Owner; or (c) contravenes or results in any breach of, default under, or result in the creation of any lien or encumbrance upon the Owner under any indenture, mortgage, deed of trust, bank loan, or credit agreement, the charter, ordinances, resolutions, or any other agreement or instrument to which the Owner is a party, specifically including any covenants of any bonds, notes, or other forms of indebtedness of the Owner outstanding on the date of the Contract Documents.

D. The Contract Documents and each document contemplated hereby to which the Owner is or will be a party constitutes, or when entered into will constitute, a legal, valid, and binding obligation of the Owner enforceable against the Owner in accordance with the terms thereof, except as such enforceability may be limited by applicable bankruptcy, insolvency, or similar laws from time to time in effect which affect creditors' rights generally, and subject to usual equitable principles in the event that equitable remedies are involved.

E. There are no pending or, to the knowledge of the Owner, threatened actions or proceedings before any court or administrative agency against the Owner which question the validity of the Contract Documents or any document contemplated hereunder, or which are likely in any case or in the aggregate to materially adversely affect the consummation of the transactions contemplated hereunder or the financial or corporate condition of the Owner.

F. The Owner shall use due diligence to timely fulfill or cause to be fulfilled all of the conditions expressed in the Contract Documents which are within the control of the Owner or which are the responsibility of the Owner to fulfill.

G. During the pendency of the Work and while the obligations of the Owner under the Contract Documents shall be in effect, the Owner shall cause to occur and to continue to be in effect and take such action as may be necessary to enforce those instruments, documents, certificates and events contemplated by the Contract Documents that are applicable to and the responsibility of the Owner.

H. The Owner shall assist and cooperate with the Contractor in accomplishing the construction of the Project in accordance with the Contract Documents and the Project Plans and Specifications, and will not knowingly violate any laws, ordinances, rules, regulations, orders, contracts, or agreements that are or will be applicable thereto or, to the extent permitted by law, enact or adopt any resolution, rule, regulation, or order, or approve or enter into any contract or agreement, including issuing any bonds, notes, or other forms of indebtedness, that will result in the Contract Documents or any part thereof, or any other instrument contemplated by and material to the timely and effective performance of a party's obligations hereunder, to be in violation thereof.

ARTICLE XIV
TERMINATION AND SUSPENSION

14.1 Termination for Cause by Owner. This Agreement may be terminated by Owner upon written notice to the Contractor should Contractor fail substantially to perform a material obligation in accordance with the terms of the Contract Documents through no fault of the Owner. In the event Owner terminates for cause and it is later determined by a court of competent jurisdiction that such termination for cause was not justified, then in such event such termination for cause shall automatically be converted to a termination without cause pursuant to Section 14.2.

A. Nonperformance. If the Contractor fails to timely perform any of its obligations under the Contract Documents, including any obligation the Contractor assumes to perform Work with its own forces, or if it persistently or repeatedly refuses or fails, except in case for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or fails, without being excused, to maintain an established schedule (failure to maintain schedule shall be defined as any activity that falls thirty (30) days or more behind schedule) which has been adopted by the Construction Team, or it fails to make prompt payment to Subcontractors for materials or labor, or disregards laws, rules, ordinances, regulations, or orders of any public authority having jurisdiction, or otherwise is guilty of substantial violations of the Agreement the Owner may, after seven (7) days written notice, during which period the Contractor fails to perform such obligation, make good such deficiencies and perform such actions. The Contract Sum shall be reduced by the cost to the Owner of making good such deficiencies, and the Contractor's compensation shall be reduced by an amount required to manage the making good of such deficiencies. Provided, however, nothing contained herein shall limit or preclude Owner from pursuing additional damages from Contractor because of its breach.

B. <u>Insolvency</u>. If the Contractor is adjudged bankrupt, or if it makes a general assignment for the benefit of its creditors, or if a receiver is appointed because its insolvency, then the Owner may, without prejudice to any other right or remedy, and after giving the Contractor and its surety, if any, fourteen (14) days written notice, and during which period the Contractor fails to cure the violation, terminate the Agreement. In such case, the Contractor shall not be entitled to receive any further payment. Owner shall be entitled to recover all costs and damages arising because of failure of Contractor to perform as provided in the Contract Documents, as well as reasonable termination expenses, and costs and damages incurred by the Owner may be deducted from any payments left owing the Contractor.

C. <u>Illegality</u>. Owner may terminate the Agreement if Contractor disregards laws or regulations of any public body having jurisdiction.

D. <u>Rights of Owner</u>. The Owner may, after giving Contractor (and the surety, if there is one) seven (7) days written notice, terminate the services of Contractor for cause; exclude Contractor from the Project Site and take possession of the Work and of all Contractor's tools, construction equipment and machinery at the Project Site and use the same to the full extent they could be used (without liability to Contractor for trespass or conversion); incorporate in the Work all materials and equipment stored at the Project Site or for which Owner has paid Contractor but which are stored elsewhere, and finish the Work as Owner may deem expedient. In such case, Contractor shall not be entitled to receive any further payment beyond an amount equal to the value of material and equipment not incorporated in the Work, but delivered and suitably stored, less the aggregate of payments previously made. If the direct and indirect costs of completing the Work exceed the unpaid balance of the Contract Sum, Contractor shall pay the difference to Owner. Such costs incurred by Owner shall be verified by Owner in writing; but in finishing the Work, Owner shall not be required to obtain the lowest quote for the Work performed. Contractor's obligations to pay the difference between such costs and such unpaid balance shall survive termination of the Agreement. In such event and notwithstanding any other provisions of the Contract Documents to the contrary, Owner shall be entitled to bring a direct action in the Circuit Court to recover such costs.

14.2 Termination without Cause by Owner. The Owner, through its County Administrator or designee, shall have the right to terminate the Agreement, in whole or in part, without cause upon sixty (60) calendar days' written notice to the Contractor. In the event of such termination for convenience, the Owner shall compensate Contractor for payments due through the date of termination, and one subsequent payment to cover costs of Work performed through the date of termination, subject to the terms and conditions of Section 3.1. The Contractor shall not be entitled to any other further recovery against the Owner, including, but not limited to, anticipated fees or profit on Work not required to be performed, or consequential damages or costs resulting from such termination.

A. <u>Release of Contractor</u>. As a condition of Owner's termination rights provided for in this subsection, Contractor shall be released and discharged from all obligations arising by, through, or under the terms of the Contract Documents, and the Payment and Performance Bond shall be released. Owner shall assume and become responsible for the reasonable value of Work performed by Subcontractors prior to termination plus reasonable direct close-out costs, but in no event shall Subcontractors be entitled to unabsorbed overhead, anticipatory profits, or damages for early termination.

B. <u>Waiver of Protest</u>. Contractor hereby waives any right to protest the exercise by Owner of its rights under this Section that may apply under the Procurement Ordinance.

14.3 Suspension without Cause. Owner may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than ninety (90) days by written notice to Contractor, which will fix the date on which Work will be resumed. Contractor shall be allowed an increase in the Contract Sum or an extension of the Contract Time, or both, directly attributable to any suspension if Contractor makes an approved claim therefor.

14.4 Termination Based Upon Abandonment, Casualty or Force Majeure. If, after the construction commencement date (i) Contractor abandons the Project (which for purposes of this paragraph shall mean the cessation of all construction and other activities relating to the Project, excluding those which are necessary to wind down or otherwise terminate all outstanding obligations with respect to the Project, and no recommencement of same within one hundred twenty (120) days following the date of cessation), or (ii) the Project is stopped for a period of thirty (30) consecutive days due to an instance of Force Majeure or the result of a casualty resulting in a loss that cannot be corrected or restored within one hundred twenty (120) days (excluding the time required to assess the damage and complete the steps contemplated under Section 12.2), the Owner shall have the right to terminate the Agreement and pay the Contractor its compensation earned or accrued to date.

14.5 Vacation of Project Site; Delivery of Documents. Upon termination by Owner pursuant to Section 14.2 or 14.4, Contractor shall withdraw its employees and its equipment, if any, from the Project Site on the effective date of the termination as specified in the notice of termination (which effective date shall not be less than two (2) working days after the date of delivery of the notice), regardless of any claim the Contractor may or may not have against the Owner. Upon termination, the Contractor shall deliver to the Owner all original papers, records, documents, drawings, models and other material set forth and described in the Contract Documents.

14.6 Termination by the Contractor. If, through no act or fault of Contractor, the

Work is suspended for a period of more than ninety (90) consecutive days by Owner or under an order of court or other public authority, or Owner fails to act on any Application for Payment or fails to pay Contractor any sum finally determined to be due; then Contractor may, upon fourteen (14) days written notice to Owner terminate the Agreement and recover from Owner payment for all Work executed, any expense sustained plus reasonable termination expenses. In lieu of terminating the Agreement, if Owner has failed to act on any Application for Payment or Owner has failed to make any payment as aforesaid, Contractor may upon fourteen (14) days written notice to Owner stop the Work until payment of all amounts then due.

Exhibit A

Title(s) of Drawings

Exhibit B

Title(s) of Specifications

Exhibit C

Affidavit of No Conflict

Exhibit D

Contractor’s Certificate(s) of Insurance

Exhibit E

Contractor’s Payment and Performance Bond

Exhibit F

Standard Forms