Broward County Shore, Segment III, Protection Project,
FDEP Permit #0163435-001-JC
FDEP Permit #0163435-009-JC
FDEP Permit #0226688-001-JC
USACE Permit 1999-5545 (IP-SLN)
Sand Quality Control and Quality Assurance Plan

A. Introduction and Background The purpose of the sand quality control (QC) and quality assurance (QA) Plan, required by paragraph 62B-41.008(1)(k)(4b) FAC, is to ensure that the sediment from the permitted borrow areas will meet the standard in paragraph 62B-41.007 (2) (j) FAC. In-depth geotechnical investigations for the project have verified that the sediment located within the spatial limits of the permitted borrow areas meets State requirements subject to rock and rubble separation operations. The QC Plan for the subject project will outline the requirements placed on the selected Contractor so that they perform all work within the horizontal and vertical limits of the permitted borrow area, that rock and rubble separation occurs, and that the Contractor takes appropriate remedial actions, if necessary. The Quality Assurance plan outlines the steps taken by the permittee (County) and its Engineer to observe, sample, and test the placed sediments to assure compliance with the permit. These plans are described below.

B. Quality Control Plan The contract documents will incorporate the following technical requirements that address the location of dredging, rock and rubble separation, sediment quality monitoring on the beach, and remedial actions if necessary. The County and its Engineer will enforce these contract requirements during the prosecution of work.

1. Electronic Positioning and Dredge Depth Monitoring Equipment. The Contractor shall continuously operate electronic positioning equipment approved by the Engineer to monitor the hopper dredge drag arm location(s) and depth(s). A Differential Global Positioning System (DGPS) or equivalent shall be used to determine the horizontal position and shall be interfaced with an appropriate depth measuring device to determine the drag arm depth(s). The horizontal positioning equipment shall maintain an accuracy of +/- 3 feet. The drag arm depth positioning device shall maintain a vertical accuracy of +/- 0.1 feet with continuous applicable tidal corrections measured at the project site. The real-time tide corrections shall be made at an interval not to exceed fifteen (15) minutes. The use of predicted tides to make corrections is not allowed.

2. Dredge Location Control. The Contractor is required to operate the electronic positioning equipment continuously and plot the position of the hopper dredge drag arms. Such fixes, and the accompanying plots, shall be furnished to the Engineer daily as part of the Daily Reports. The electronic positioning equipment shall be installed on the dredge so as to monitor, as closely as possible, the actual location of the drag arms. The location of the master antenna on the dredge and the distance and direction from the master antenna to the drag arms shall be reported on the Daily Reports. A printout of

the drag arm positions in State Plane coordinates and the drag arm depths corrected for tide elevation and referenced to NGVD and time shall be maintained. A computer file (in ASCII format) of the position data shall be emailed to the Engineer at the end of every dredge cycle. The Contractor will also operate a real time telemetry system of his positioning for County and Engineer review. No dredging shall take place outside of the borrow area limits (horizontal and vertical limits) as shown on the drawings.

3. Rock and Rubble Separation. The Contractor shall separate all debris, rock, and rubble greater than ¾ inches in diameter on the hopper dredge. Separation shall include the use of a grizzly with a ¾ inch spacing. All separated debris, rock, and rubble shall be disposed of in one of the two deepwater disposal areas (artificial reefs) in accordance with the Permits.

4. Contingency Plan. The Contractor shall be responsible for establishing such control as may be necessary to insure that the allowable excavation depths and spatial limits are not exceeded. If rock, rubble, or other unsuitable material is encountered in the borrow area, or if excessive turbidity is produced, the location of the dredging shall be immediately changed by the Contractor. Should undesirable sediments continue to be encountered, the Contractor shall cease excavation, and move the dredge to another location within the permitted borrow area. If this occurs, the Contractor will be required to notify the County and the Engineer immediately. Any rock, rubble, or debris greater than ¾ inch in diameter deposited on the beach shall be removed from the site of the work and disposed of in areas provided by and at the expense of the Contractor.

5. Other Excavation Requirements. The Contractor shall excavate within the borrow areas in a uniform and continuous manner in the directions required by the Plans. If directed by the Engineer, the Contractor shall change the location and/or depth of excavation with the borrow limits.

6. Vibracore Logs and Grain Size Data. The Contractor will be provided all descriptions of sediment vibracore borings collected within the borrow site and will assert that he is aware of the quality of the sediment as described in the sediment vibracore logs. These logs and grain size data will be presented in the construction specifications.

7. Contractor's QC Plan. The contract documents require the Contractor to produce and follow a quality control plan that is reviewed by the County and Engineer prior to the pre-construction conference. The plan covers all of the Contractors operations including dredging and sand placement. The plan is the Contractor's means and methods of assuring himself that the work is in conformance with the plans, specifications and permits. Results of the Contractor's efforts will be recorded in his daily quality control report.

C. Quality Assurance Plan

Broward County and the Engineer will enforce the construction contract and FDEP permits related to sediment quality and quantity. In order to do so, the following steps will followed:

1. The Engineer has proposed to the County the level of construction observation required to reasonably assure that the Contractor's work will be in conformance with the required contract and permit conditions. Construction observation will be performed 7 days a week, 12 hours a day. Most inspection will be during daylight hours, however, random nighttime observations will be made.

2. The Engineer shall provide onsite observation by an individual with training or experience in beach nourishment and construction inspection and testing, and that is knowledgeable of the project design and permit conditions. The project engineer, a qualified coastal engineer, shall actively manage the field observer.

3. The project Quality Control Plan to be implemented by the Contractor shall be discussed as a matter of importance at the pre-construction meeting. The Contractor shall be required to acknowledge the goals and intent of the above described QC Plan in writing prior to the issuance of a Notice to Proceed.

4. 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.

5. The Engineer, and his duly authorized representative, shall be continuously on call during the period of construction for purposes of making decisions regarding issues that involve QC Plan compliance.

6. A coastal engineer shall personally observe fill placement operations weekly. Communications will take place between the Engineer and his on site inspector daily.

7. Any addendum or change order to the Contract between the County and the Contractor shall be evaluated to determine whether or not the change in scope will potentially affect the above described QC Plan.

8. To assure that the fill material placed on the beach is in compliance with the standard in paragraph 62B-41.007 (2) (j) FAC, the Project Engineer or his duly authorized representative, on behalf of the County, shall conduct assessments of the sediment as follows:

    a. Sediment samples will be collected and logged from each hopper dredge load placed on the beach. Each sample will be archived with the date, time, and location of the sample and from which borrow area the sand came from. The sample will be visually compared to the acceptable sand criteria. If determined necessary by the

Engineer, in consultation with County, quantitative assessments of the sand will be conducted for grain size, shell content, carbonate content, and Munsell color. A record of these sand evaluations will be provided with the Engineer's daily inspection reports. All samples will be stored until project completion.

b. If at any time during construction excessive amounts of rubble are encountered, the actions outlined in the Contingency Plan of the Quality Control Plan shall be enacted.

c. Initial approval of an Acceptance Section shall take into consideration the possible presence of non-specification material. Should the aerial extent of any non-specification material be greater than 10,000 square feet, then the material shall be removed from the beach fill or remediated. Additional fill shall be placed, as required, to meet the construction template requirements.

d. It is expected that newly placed beach fill will be darker than the existing materials. Due consideration for the future lightening of the placed sediments will be given by the County and the Engineer.

e. The Engineer will collect a representative sand sample from along every third FDEP beach profile line and test the sand sample for compliance. The County will submit sediment testing results to the FDEP following beach construction. In the unlikely event that a section of beach contains sediment that is not in compliance with paragraph 62B-41.007 (2) (j) FAC, then the FDEP will be notified. Notification will indicate the volume, aerial extent and location of any unacceptable beach areas and remediation planned. The County will remediate the beach or may direct the contractor to do so. The results of any remediation will be reported to FDEP following construction. Remediation may include but shall not be limited to

    (1) Excavating the non-specification material and mixing it with specification material to achieve a sand mixture that complies with the sediment criteria.

    (2) Excavating the non-specification material, transporting the material to an upland location, and replacing the material with sand that complies with the sediment criteria.

D. Sand Criteria

The Broward project involves the dredging of 5 offshore borrow area and removal of one shoal within the Port Everglades navigation channel. The permits direct Broward County to dredge the borrow areas on a rotating basis and place the sand on J.U. Lloyd, Hollywood, and Hallandale beaches. The Port Everglades shoal sand may also be placed on Segment III beaches. This unique dredge scheme will result in variability in the sediment characteristics along the beach. The sediment characteristics that will be sampled at the FDEP profile lines should only be compared to the borrow area that the sand originated from.

The borrow areas will be hopper dredged which will remove layers of sediment. This will result in horizontal mixing of the sediments within each borrow area, and limit vertical mixing of sediments within each borrow area. Sediments placed into the hopper dredge and then pumped to the beach will generally be homogeneous for that load. Sorting of the pumped sediments will still occur as a result of depositional processes and the degree of bulldozing occurring. The expected sediment characteristics are described in Table 1.

Table 1

Expected Sediment Characteristics

Borrow Area	Range of Mean Grain Sizes (mm)	Silt/Clay Content %	Munsell Color	Range of Calcium Carbonate Contents %
I	0.28 to 0.62	<2.2%	5Y-4/1 or lighter	48 to 69
II	0.27 to 0.55	<2.0%	5Y-4/1 or lighter	57 to 69
III	0.21 to 0.98	<5.0%	5Y-4/1 or lighter	79 to 94
IV	0.25 to 0.55	<3.0%	5Y-4/1 or lighter and 5Y-5/2 or lighter	56 to 71
VI	0.35 to 0.46	<2.0%	5Y-4/1 or lighter	72 to 73
Port Everglades Shoal	0.16 to 0.50	<3.2%	10YR [(1)]	unknown [(2)]

[(1)] Limited observations of the USACE vibracores was performed (see permit application for details).

[(2)] No quantitative calcium carbonate testing of the USACE vibracores was performed.