

**Physical and Biological Monitoring Program  
FOR DADE COUNTY BEACH SUSTAINABILITY PROJECT**

Submitted by  
Miami-Dade County Department of Environmental Resources Management

To:  
Florida Department of Environmental Protection,  
Bureau of Beaches and Coastal Systems  
Tallahassee, FL

As partial fulfillment of provisions of the  
U.S. ARMY CORPS OF ENGINEERS PLANS AND SPECIFICATIONS  
For project DACW17-02-R-0031

and Special Conditions of  
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP)  
Joint Coastal Permit # 0080982-001-JC

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## DESCRIPTION OF MONITORING COMPONENTS

**I.0. BIOLOGICAL MONITORING.** Due to the presences of extensive hardbottom reefs that occur along the 1200 m path of the pipeline corridor and hardbottom reefs in the general region of the “operational box” (region where off-loading of sand from the barge/dredge into the sand slurry pipeline will occur), a biological monitoring plan is required to determine and document the extent to which benthic resources in the project area may be impacted by project related activities. The FDEP permit provides for placement of a sand-slurry pipeline across the hardbottom area locally known as “First Reef”. The pipeline will be placed in a defined and permitted, 50 ft wide corridor. Specific impacts are expected from placement of the sand-slurry pipeline along the bottom. Additionally, there is a potential for impacts associated with equipment failures, turbidity and secondary impacts (i.e., shading, movement) associated with the slurry pipeline and fill placement. The present monitoring plan contains components to address impact assessment of the placement, residence and removal of the sand-slurry pipeline, as well as components to allow assessment of secondary impacts that may occur. Although specific steps will be taken to add in the documentation of the direct impacts of the pipeline, the overall plan has been developed to address both primary and secondary impacts to the hardbottom resources of the area.

Proximity of the reefs to the operational box ranges between 70 and 207 feet.

**I.1. MONITORING DESIGN:** The biological monitoring will utilize a BACI (Before-After-Control-Impact) design (Underwood, 1996<sup>1</sup>). This design establishes monitoring stations within an area of probable impact, and in areas of similar habitat outside the region of possible impact, as comparisons sites. The inclusion of the “comparison” locations allows for correction of differences noted in the pre/post evaluations, for variations or differences that were not specifically associated with the project (i.e. ‘system wide impacts such as storm effects, regional habitat disruptions, etc.).

**I.2. MONITORING STATIONS:** Stations will be established in each of the habitat ‘types’ that are known to occur along the pipeline corridor or within the potential regions of secondary impacts (e.g., high relief reef, low relief reef, sand inundated hardbottom). With the exception of the initial physical impact assessment from placement of the pipeline, each pipeline station will be comprised of three 20 m line transects. Each transect will be documented and assessed using video monitoring techniques and protocols outlined in the Florida Marine Research Institute’s “Standard Operating Procedures Field and Laboratory Operations: Florida Keys National Marine Sanctuary Coral Reef/Hardground Monitoring Project (October 2002 Revision)”. A minimum of 10 biological monitoring stations will be established for this project. The station siting will be determined prior to the placement of the pipeline. The location of all stations will be documented using differential Global Positioning System (GPS) equipment. Station density is relative to the proportion of the potential impact area covered by the habitat type. Stations will be located based on the hardground reef lines and known local habitat types so that the selected sites will represent the anticipated area with the highest probability of impact. Stationing will be as follows:

**A. Pipeline – primary impact assessment:** In addition to the actions outlined in Section V of this plan, the regions along the pipeline corridor selected where it is determined that stations will be established for evaluation of primary and secondary impact assessment (see I.2.B), a 20 ft. wide ‘band’ (10ft. north and 10ft south of the pre-placement centerline for the pipeline) of the bottom will be video documented prior to and within 3 weeks of removal of the pipeline. The video documentation will be

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<sup>1</sup> Underwood, A.J., 1996. On Beyond BACI: Sampling Designs that might reliably detect environmental disturbances. *IN: Detecting Ecological Impacts Concepts and Applications in Coastal Habitats*. R.J. Schmitt, and C.W. Osenberg EDS. Associated Press. New York, NY. pp 151-178.

conducted with sufficient resolution to allow post-removal assessment of the bottom within the region of the pipeline.

- B. *Pipeline Corridor and Adjacent Habitat areas of concern – primary and secondary impact assessment*: At each station, one transect will be established on each side of the pipeline, within 2 feet of the pipeline. In addition, a comparison transect will be located north of the pipeline, outside of the permitted pipeline corridor, in region of similar habitat. Station density along the pipeline corridor will be:
1. Pipeline Corridor High Relief Reef Area (east end of pipeline corridor). Two stations.
  2. Pipeline Corridor Low Relief Reef Area: Four stations (comprise greatest majority of the pipeline corridor).
  3. Pipeline Corridor Sand inundated Reef Area (west side of pipeline corridor): Two stations.
  4. Nearshore Sand inundated Reef area: one station
    - a. The hardbottom community located approximately 250 m from the shoreline, east of R41
  5. Operational Box area: one station
    - a. Two transects and two controls

I.3. MONITORING FREQUENCY: The sampling frequency for each monitoring task is summarized in Table 1. Each site will be visited semiannually for complete quantitative or qualitative videographic surveys.

- A. Quantitative assessments will be conducted minimally once prior (controls only) to, once immediately after completion of project construction and every annually thereafter for a minimum of three years.
- B. Qualitative assessments will be conducted Six months after the post construction quantitative survey, and annually thereafter until the completion of the monitoring program.

## **II. WATER QUALITY MONITORING:**

II.A. Water Quality Sampling Regime and Procedures. Profiles of the water column will be conducted in 3 m depth increments (i.e., surface, 3 m, 6 m, 9 m, etc.), from the surface to the bottom for the parameters listed below. Sampling will be conducted quarterly (Table 1) at the operational box as well as North and South of the operational box concurrent with the sediment stations (Figure 1). A single sampling assemblage consisting of a multi-sensor array, light sensor and water sampling tube, will be lowered into the water to insure simultaneous sampling of measured parameters and collection of water samples for laboratory analysis.

A. Water quality Parameters:

1. Light levels will be measured using a Li-Cor® dual sensor array (one surface, one underwater sensor). Surface and at-depth photon flux densities will be recorded with a Li-Cor® LI-1000 datalogger. Light measurement units will be  $\mu\text{E}/\text{m}^2/\text{s}$  (of PAR).
  2. Turbidity levels will be determined on samples collected during the Water Quality Profiling (minimally for the surface, mid depth and bottom samples). Samples will be read on a laboratory calibrated Hach® portable turbidity meter (or equivalent) and recorded in NTU's (Nephelometric Turbidity Units).
  3. Temperature, pH, salinity, dissolved oxygen and oxidation-reduction potential will be measured using a Hydrolab® "Surveyor-IV" multi-sensor data logger.
  4. Nutrient levels (ammonia nitrogen, inorganic nitrogen [NO<sub>x</sub>], and total phosphate (TP) will be determined for the top, mid-level and bottom samples. Analysis will be conducted using approved methods by the D.E.R.M. laboratory, a NELAC certified laboratory (NELAC ID# E46126).
- B. Water Quality Stations will be established in each habitat area where biological monitoring stations have been established. Thus, 5 stations will be established in the regions identified in Section 1.2.B

### III. SEDIMENTATION AND SEDIMENT MONITORING.

III.1 *SEDIMENT DEPOSITION RATES* The comparative rates of sediment deposition on hard-bottoms has been associated with potential increased sedimentation in the region of the 'borrow area'. As a 'borrow area' is not planned these sites are not required. However two areas of concern exist: Nearshore sand inundated hardgrounds (identified in I.2.B.4) and the reefs adjacent to the operational box sites will be assessed on a quarterly basis. Relative sediment deposition rates will be measured via sediment traps located at the reef edge proximal to the operational box. Minimally triplicate traps will be used to estimate the relative sediment "fallout" from the water column at each station. The traps will sample 0.5 m above the reef bottom.

A. Sediment Sampling Stations: (Figure 1)

1. On the edge of the reef to the east of the operational box.
2. On the edge of the reef to the west of the operational box .
3. On the nearshore sand inundated hardground community.
4. On the 'control' station for the nearshore sand inundated hardground community
5. On the low relief hardground.
6. On the high relief hardground.

B. Sediment Sampling Periodicity. Arrays will be collected as described below to determine deposition rates. Rates will be expressed in milligrams sediment per square-centimeter per day ( $\text{mg}/\text{cm}^2/\text{day}$ ).

1. During Construction.
  - a. During periods when no indications of sediment stress or excessive sediment is evident on the hardgrounds, samples will be collected quarterly. If weekly reef sediment depth surveys (See section III.2) reveal accumulating or excessive sediment levels, sediment arrays will be collected every other week (biweekly) until the sediment levels return to acceptable levels.
  - b. During periods with any level of sediment stress, samples will be collected biweekly.
2. Pre-/Post-Construction. Samples will be collected quarterly (Table 1).

III.2 *REEF SEDIMENT DEPTH/ACCUMULATION*. The depth of sediment on the reef areas will be measured at, and adjacent to the fixed sediment deposition stations. Reef sediment depth measures will be recorded at fixed stations and from random measures taken in the area around the sediment deposition arrays.

A. At each monitoring site the sediment depth will be assessed by 'random measures' and 'fixed station measures'. The random measures will be averaged and, along with the fixed station measures, compared to previous sampling levels to determine accumulation rates.

1. Random Measures. At each sediment deposition station, 15 random measures of the sediment depth will be taken on the reef surface during each assessment in the immediate area of the fixed station (measurements will exclude crevasses, depressions and gullies). Measures will be made with a ruler graduated in mm. Measures will be recorded to the nearest millimeter. Sampling will occur, minimally on a quarterly basis.
2. Fixed Station Measures. At each sediment deposition station, a stainless steel pin will be placed 1m away from the sediment sampler. A measure of sediment depth will be taken at the base of the each pin. Measures will be made with a ruler graduated in mm. Measurements will be recorded to the nearest mm. Sampling will occur on a quarterly basis in conjunction with the 'change-out' of the sediment accumulation samplers.

B. During the construction phase each operational box station will be visited minimally on a weekly basis. If indications of sediment stress are observed in the area, (See Sections III.3 and III.4), assessments

of sediment levels will be conducted no less than 2 times a week until the sediment levels return to acceptable levels.

**III.3 INDICATORS OF IMPENDING OR IMMINENT SEDIMENT IMPACTS.** Possible or imminent sediment impacts refer to identification of conditions or observations that indicate benthic organisms are being, or have been stressed by factors other than natural events. Thus, indications of possible impact will be based on comparative observations between operational box/pipeline locations and the "control" or comparison sites. In the event that an indication(s) of pending or imminent impact to benthic community components are documented during the construction surveys, the FDEP and the ACOE will be notified immediately of the possibility of violation of sediment levels on the reefs. Notification will be by phone, radio or fax, and followed by a written report to be submitted within 24 hours, or on the next work day if the indicators are noted on a weekend or holiday. Indicators of possible of imminent impact include but are not limited to:

- A. Standing sediment on hard corals, soft corals, sponge or other organisms that is not removed by normal currents or wave action.
- B. Excessive mucus on hard corals, without indications of bleaching.
- C. Excessively extruded polyps (e.g., sediment removal process).
- D. Mottling of color of benthic organisms (soft corals, algae, sponges, etc).

**III.4 SEDIMENTATION VIOLATIONS.** In the event that irreversible impacts (i.e., organism or organism tissue death) to benthic community components are documented during the construction phase surveys, the FDEP and the ACOE will be notified immediately of the possibility of a violation of sediment levels on the reefs and impact to the benthic reef community. Notification will be by phone, radio or fax, and followed by a written report to be submitted within 24 hours, or on the next working day. Should a violation be noted on a weekend or holiday, DERM will attempt to notify the ACOE Project Engineer and the FDEP "on-call" officer (if one is so designated). If no FDEP, "on-call" officer is designated, then notification will be given as soon as possible on the next business day. A violation will be defined as a significant build-up of sediment sufficient to cause any one or more of the following conditions:

- A. A frequency of observed bleaching (partial or complete) of hard coral colonies, significantly above the level found at the control stations.
- B. Excessive mucus produced by hard corals to remove sediment from their surface, resulting in binding of sediments and transport of bound sediments off the coral's surface and subsequent accumulation of the sediments at the base of the coral head. Such accumulations have been seen to initiate a "self burial" process, causing death of the lower tissue of the coral head.
- C. Covering of benthic community components (i.e., sponge, algae) by sediment for sufficient time or sufficient sediment so as to note death or degradation (i.e., bleaching, pigmentation changes) of the underlying organisms.

If a violation is found, DERM will initiate an assessment to determine the extent of impact to biological communities. DERM will monitor the sediment level after a violation, minimally twice a week to determine the point in time when the sediment level has decreased to within 0.5 cm from initial datum.

Any biological impact assessment will focus around the information in hand from DERM's biological monitoring Stations. Other sites can be added if it appears that the impact is significantly greater in areas distant to the existing biological stations.

#### **IV. VISUAL SURVEYS OF HABITATS ADJACENT TO THE OPERATIONAL BOX DURING THE CONSTRUCTION PHASE.**

##### *IV.1. VISUAL SURVEYS OF HARDBOTTOM REEFS ADJACENT TO THE OPERATIONAL BOX.*

Visual assessment of the condition and status of the benthic community has been found to be the best method for eliminating or minimizing impact to the hardground reef community. Visual surveys of hardground adjacent to the operational box and the western reef edge will be conducted minimally on a weekly basis during periods of active construction. During the survey, a qualified biologist using scuba, will visually inspect the hardground areas that are adjacent to the operational box and the western edge of first reef. The biologist will note the general level of sediment and watch for indications of sediment impact, as described above (Sec. III.3 & III.4).

- A. At least one of the weekly surveys will be conducted by a DERM biologist with a degree in Marine Biology or related field and minimum of 5 years experience in impact characterization and assessment. The second weekly survey will be conducted by a qualified DERM biologist with knowledge and experience in marine organism identification and benthic monitoring of the offshore reef areas.
- B. Surveys of the hardground areas will be incorporated into the sedimentation monitoring as described in Section II of this plan.

#### **V. DREDGE SLURRY PIPELINE CORRIDOR HARD CORAL PROTECTION AND IMPACT ASSESSMENT.**

*V.1 HARD CORAL PROTECTION MEASURES.* DERM will implement protection measures prior to and during the placement of the slurry pipeline to reduce hard coral and benthic impact associated with the pipeline placement. These measures will include:

- A. Marking of the Pipeline Corridor. The southern boundaries of the pipeline corridors will be marked prior to pipeline placement with 6-8" Styrofoam buoys. A Differential Global Positioning System (DGPS) will be used to determine the corridor's location and buoy placement.
  - 1. The corridor will be marked using subsurface buoys attached to previously established durable fixtures placed on the substrate during a previous project (0126527-001-JC).
  - 2. Marked Styrofoam buoys will be affixed to the fixtures and stay in place during the positioning and deployment of the pipeline.
  - 3. Pre-pipeline placement video as outlined in section I.2.A of this document.
- B. Coral head Relocation. The pipeline corridor was surveyed by DERM during a previous project (0126527-001-JC) in order to determine the feasibility of relocating hard coral colonies within the pipeline corridor. All hard coral colonies greater than 0.75 m in it's greatest dimension, that could feasibly be moved without causing damage to the colony, were relocated to an area outside and adjacent to the pipeline corridor. All scleractinian coral colonies over 0.25 m in it's greatest dimension that can feasibly be moved without causing damage to the colony will be relocated before pipeline placement to the areas outside and adjacent to the corridor.
- C. Marking of Large Coral Heads. All large hard coral heads ( $\geq 1.0$  m diameter) that exist within the corridor will be marked with a distinctive buoy (e.g. colored) prior to positioning of the pipeline. This will allow visualization of the line of minimal impact to the contractor, to assist in minimizing impact to coral heads.
  - 1. The position of each marked coral head has been previously recorded using DGPS.
  - 2. When possible (i.e., the size and structure of the coral head permit), the coral head may be moved to provide a clearer path for the pipeline. It should be noted, however, that surveys

performed during previous projects indicate the great majority of large coral heads within the corridor are considered non-movable, due to the coral head shape (i.e., flat, totally adherent plate form) or poor structural integrity (the mass of the coral head is highly bio-eroded).

3. DERM will work as closely as possible with the contractor to insure the pipeline is placed in such a manner to minimize impact and avoid marked large coral heads.
- D. Stabilizing Coral Heads. After placement of the pipeline and within 30 days after removal of the pipeline the region will be surveyed and all impacted coral heads, as well as all possible coral heads in jeopardy (i.e., within the shadow of the pipeline after placement) will be moved to an adjacent area, away from the influence of the pipeline. All impacts due to pipeline placement and removal shall be repaired within 6 months after the completion of the project.
1. Fractured coral heads will be stabilized using either Portland cement or Liquid- Rock<sup>®</sup> epoxy. Coral heads will be stabilized in as natural a position as possible.
  2. Threatened coral heads will be chiseled from the substrate, when feasible (See IV.C.2. for criteria) and moved to an area outside the pipeline corridor and stabilized.

V.2 *PIPELINE CORAL IMPACT ASSESSMENT.* The actual impact from the placement of the pipeline will be determined by pre- and post-placement surveys of the pipeline corridors. Quantitative surveys of the corridor have been conducted to document pre-project conditions. The post-construction surveys will be conducted within 30 days after the removal of the pipeline. The damage assessment will be conducted as follows:

- A. The contractor will mark the true location of the pipeline with temporary buoys, placed sufficiently to allow divers to swim the length of the pipeline (no greater than 100 m apart). Buoys are to remain after removal of the pipeline.
1. The contractor will notify DERM within 24 hours of the completion of placement of the pipeline location buoys.
  2. DERM will document the condition of the corridor after pipeline placement via videotape.
    - a. Underwater video surveys will be conducted the first business day that weather and staff availability allow, after pipeline placement. Surveys will be performed along both sides of the pipeline at a distance of less than or equal to ( $\leq$ ) 2 feet away from the pipeline and 1 ½ feet from the bottom.
  3. After the pipeline has been removed from the reef, DERM will survey the damage path along the pipeline's length to determine the actual area of impact.
    - a. The width of the path will be considered the area within which the limestone "bedrock" has been cleared and exposed, and/or benthic organisms directly in the path or adjacent to the pipeline are crushed, fractured, abraded, heavily bleached or otherwise damaged.
    - b. Impact to organisms and areas of benthic damage will be quantified by direct measurement. Quantification will include:
      1. Measurement of all fractured, abraded, bleached or otherwise impacted hard corals.
      2. Count of all damaged (abraded, broken, loose) soft corals.
      3. Measurement of fractured, scarified, abraded or otherwise damaged substrate, where encrusting or low-profile organisms were growing.
    - c. Impact from the pipeline will be the total sum of impacts to hard coral, soft corals and bedrock. The calculated area of damage and subsequently used to calculate mitigation requirements.
    - d. The pipeline corridor will be documented by underwater videotape as outlined in section I.2.A.
      1. Still photography will be used in the event of mechanical or other problems with the underwater video camera system.

V.3 *MONITORING OF IMPACTED HARD CORALS.* All hard corals impacted or relocated in association with the pipeline placement will be monitored for a three year period following construction. The monitoring will utilize a photogrammetric technique, with ground truthing to document percent survivorship of the individual coral head. The relocation sites will be monitored at 3 months, 6 months and on a semiannual basis for the remainder of the monitoring period (table 1).

- A. Photogrammetric Technique. Coral heads will be photographed with a Nikon 990 digital camera in an Ikelite underwater housing, at a fixed distance from the coral head. All corals will be photographed with a scaled framer. All coral relocation/restoration areas will be mapped and all corals numbered to allow tracking of the coral head over time.
- B. Ground-Truthing. Each coral head will be measured (major and minor axis) at the time of photographing.
- C. Comparison stations adjacent to the relocation/restoration sites will be established to provide information as to the "natural" change in the hard coral cover. The documented changes in measurements of the coral heads (over time) will be compared to measurements made of the coral heads at the comparison stations.

V.4 *MITIGATION FOR PIPELINE IMPACTS.* As the placement of the pipeline is anticipated to impact hardground reef, mitigation for the impacts will be conducted as approved by DEP. Prefabricated concrete and limestone modules will be placed with a corresponding artificial reef habitat creation-to-impact ratio of 1:1, or other type of mitigation approved by DEP will be applied. The area of credit for the artificial reef modules will be the footprint of the module or other mitigation devise. Actual level of impact to be mitigated will be determined through the evaluation conducted during the post construction pipeline survey. These modules or other type of mitigation are to be constructed within 1 year of completion of the beach nourishment. Biological monitoring of the mitigation will be appropriate for the design and will be addressed in the Mitigation Proposal.

## **VI. BEACH FILL COMPACTION AND SEDIMENT ANALYSIS.**

VI.1. *COMPACTION MONITORING.* Compaction monitoring of the in-place beach fill will be conducted within one week of final grading of the beach fill, and annually thereafter for three years. A cone penetrometer, equivalent to that used by Nelson (1988) will be used for each assessment. Based on the results of the penetrometer analysis, the beach areas will be tilled to a depth of 24 inches prior to the start of the turtle nesting season and after consultation with the FDEP and the U.S. Fish and Wildlife Service, when the tilling criteria given in Section V.B. are present.

- A. Penetrometer analysis of the beach fill areas will be conducted along lines perpendicular to the shoreline, at 500 foot intervals, throughout the length of the beach fill segments.
  - 1. Two stations per line will be established with the first station one-third the distance between the dune (or seawall) and the mean high water line, and the second station two-thirds the distance between the dune (or seawall) and the mean high water line.
  - 2. Triplicate readings will be made at three depths (6, 12 and 18 inches) at each station.
- B. Tilling Criteria. Tilling of the beach fill will occur at the following times:
  - 1. Along the entire length of filled beach as soon as possible following completion of the placement and grading of fill material, and
  - 2. Prior to initiation of the sea turtle nesting season, but only along those segments of the beach where adjacent sampling lines have cone penetrometer readings exceeding 500 "cone penetrometer units", at the same depth.

## VII. SEA TURTLE MONITORING.

The Sea Turtle monitoring may be subcontracted during construction by the selected contractor, however, Dade County D.E.R.M. will ensure that Sea Turtle Monitoring is conducted in a manner which meets the criteria and conditions established in the above referenced permits and existing FDEP Protected Species permit. A summary of the Marine Turtle Monitoring Requirements, is presented in Table 2.

VII.1 *NEST RELOCATION AND DAILY BEACH SURVEYS FOR NESTING ACTIVITIES.* If the beach nourishment project will be conducted during the marine turtle nesting season (May 1 through November 1), daily early morning surveys for sea turtle nests shall occur beginning May 1 or 65 days prior to project initiation (whichever is later), and continue through September 30 for the initial nesting season following the completion of construction and for a minimum of three additional nesting seasons. The project area will be surveyed each morning to check for sea turtle nesting activity. These activities will be conducted by an individual approved and permitted by the Florida Fish & Wildlife Conservation Commission (FFWCC) for such activities. As per special condition in the FWC Protected Species Permit for Miami-Dade County beaches, all nests found on Miami-Dade County beaches (excepting Golden Beach) are relocated into a protective hatchery. Mr. Jim Hoover (Miami-Dade Parks and Recreation Dept.- Haulover Park) is the FWC permitted sea turtle monitor for all of Dade County (excluding Virginia Key) and manages the county's sea turtle hatchery and nest relocation program.

- A. All nest surveys and egg relocations shall only be conducted by personnel with prior experience and training in these activities and who is duly authorized to conduct such activities through a valid permit issued by the Fish and Wildlife Conservation Commission (FWC), pursuant to Florida Administrative Code 68E-1.
- B. Relocations will be conducted prior to 9 AM each day. Construction activity shall not occur in any location prior to the completion of necessary sea turtle protection measures.
  1. Relative to relocations required in association with FDEP Permit #0080982-001-JC, (Dade County Beach Sustainability) nests that must be relocated on either the 'Test Beach' or the associated 'Comparison Beach' areas will be placed in on-beach hatcheries
- C. Report on all nesting activity and marine turtle protection measures taken after construction shall be provided for the initial nesting season following the completion of construction and for a minimum of three additional nesting seasons. Monitoring shall include daily surveys and additional measures for sea turtle protection authorized by the Department. Reports shall be submitted to the Department prior to the initiation of the 'nesting period' (e.g., May 1), for the previous 12 month period, and shall include daily report sheets showing all activity including nesting success rates, hatching success of all relocated nests, dates of construction, and names of all personnel involved in nest surveys and relocation. All such personnel shall be qualified as noted above.
- D. During the 3 years following each fill placement event, the permittee shall measure sand compaction in the area of restoration in accordance with a protocol agreed to by the FWC, the Department, the U.S. Fish & Wildlife Service, and the applicant to determine. At a minimum, the protocol provided under a and b below shall be followed. If required, the area shall be tilled to a depth of 24 inches. All tilling activity must be completed prior to May 1. An annual summary of compaction surveys and the actions taken shall be submitted to the FWC. If the project is completed during the nesting season, tilling shall not occur in areas where nests have been left in place or relocated unless authorized by the U.S. Fish and Wildlife Service in an Incidental Take Statement. A report on the results of compaction monitoring shall be submitted to the FWC prior to any tilling actions being taken. This condition shall be evaluated

annually and may be modified if necessary to address sand compaction problems identified during the previous year.

1. 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).
2. 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 lay 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.
3. If the average value for any depth exceeds 500 psi for any two or more adjacent stations, then that area shall be tilled prior to April 15. 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 FWC shall be required 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.

VII.2 *ESCARPMENTS*. Visual surveys for escarpments along the beach fill area shall be made immediately after completion of the beach nourishment project and prior to May 1 for the following three years if placed sand still remains on the beach. All scarps shall be leveled or the beach profile shall be reconfigured to minimize scarp formation. In addition, weekly surveys of the project area shall be conducted during the two nesting seasons following completion of fill placement as follows.

1. The number of escarpments and their location relative to DNR-DEP reference monuments shall be recorded during each weekly survey and reported relative to the length of the beach surveyed (e.g., 50% scarps). Notations on the height of these escarpments shall be included (0 to 2 feet, 2 to 4 feet, and 4 feet or higher) as well as the maximum height of all escarpments.
2. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled to the natural beach contour by April 15. Any escarpment removal shall be reported relative to R-monument.
3. If weekly surveys during the marine turtle nesting season document subsequent reformation of escarpments that exceed 18 inches in height for a distance of 100 feet, the FWC shall be contacted immediately to determine the appropriate action to be taken. Upon notification, the permittee shall level escarpments in accordance with mechanical methods prescribed by the FWC.
4. In the event a sea turtle nest is excavated during scarp remediation activities, all work shall cease in that area immediately and the permitted person responsible for egg relocation for the project should be notified so the eggs can be moved to a suitable relocation site.

VII.3 *NOTIFICATION*. Upon locating a dead, injured, or sick endangered or threatened sea turtle specimen, initial notification must be made to the FWC at 1-888-404-FWCC. Care should be

taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

## **VIII. HYDROGRAPHIC MONITORING PLAN.**

VIII.1. *SCOPE OF THE PLAN:* This is presented to document Miami-Dade County's comprehensive, long-term monitoring plan for assessment of the performance of the Dade County Beach Erosion Control and Hurricane Surge Protection Project, inclusive of the 10.5 miles of Beach restored from 1975 to 1982, 2.5 miles of Sunny Isles Beach restored in 1988 and segments of Key Biscayne (approximately from reference monument DA-R7 through DA-R113).

### *VIII.2. MONITORING PLAN OBJECTIVES:*

- A. Insure a spatially and temporally consistent beach survey program on an annual basis over the full length of the Dade County Beach Erosion Control and Hurricane Surge Protection Project.
- B. Establish a comprehensive beach profile database which will provide for easy data access and will be compatible with all existing State and federal agency database and GIS applications.
- C. Provide greater flexibility than the current project-specific survey schedule to allow for the assessment of acute erosion events due to storms or other causes.

### *VIII.3. MONITORING PLAN COMPONENTS:*

- A. Annual Project Surveys. This component will consist of project-wide profile surveys at approximately 1000 ft intervals extending from the north Dade County line to the southern tip of Key Biscayne, inclusive of Golden Beach, Fisher Island and Virginia Key (Reference monuments R1 - R113). Survey profiles will be referenced to specific monuments (i.e., Range 0+00 = monument location). The profiles will extend from a position landward of the monument sufficient to include existing dune features or other topographic features located on the beach proper out to a distance of 2,500 feet seaward, or closure, whichever is greater. Elevations will be determined minimally at 25 ft intervals along the full length of the profile. In addition, digital georectified (GIS compatible) aerial photography of the County coastline will be provided biannually.
- B. Project Specific Monitoring of Alternate Test Beach Sites. New nourishment sites along the project length will have additional interim surveys, which will be conducted midway between the annual surveys for a period of 2 years, to better assess fill adjustment and project performance.
- C. Aerial Photography. Miami Dade County conducts digital rectified aerial photography of the county every other year. Dade County will submit copies of digital aerial photography on Compact Disks after each flight.
- D. Surveys will be conducted to assess the erosional effects of major storms or other acute erosion events. The timing and extent of these surveys will be determined jointly by Dade County, FDEP and the Corps of Engineers. These surveys would serve to complement, not duplicate any storm effects assessments that may be underway by other state, federal or local agencies.
- E. Erosion Triggers and Mitigation of Adverse Impacts. Prior to the Department issuing a Notice to Proceed, the county shall provide a plan proposing criteria by which potential adverse shoreline impacts shall be evaluated and mitigated, including specific thresholds which will trigger mitigation of adverse impacts. The mitigation plan shall include time frames for evaluating impacts, along with specific mitigation actions.

## **IX. REPORTING OF MONITORING DATA AND RESULTS**

**IX.1 *BIOLOGICAL MONITORING AND SEDIMENTATION RATES.*** Dade County DERM will submit annual descriptive summary reports of the biological monitoring conducted for that period. Such reports will provide:

- A. Date and personnel conducting the monitoring.
- B. A descriptive summary of the monitoring conducted.
- C. Any deviations from the prescribed monitoring program.
- D. Available reduced data for semi-annual or quarterly monitoring.
- E. Any data not previously submitted for prior reporting periods.

**IX.2 *SEDIMENT ACCUMULATION AND SEDIMENT COMPACTION.*** Reports of the visual surveys and observed sediment levels on the hardbottom areas adjacent to the operational box will be submitted on a bi-weekly basis during the construction phase of the project. The report will include:

- A. Date, time and personnel conducting the survey,
- B. A descriptive summary of the sediment conditions on the hardbottom adjacent to the operational box and the general health status of the benthic communities in the region as it relates to sedimentation.
- C. A map of the operational box and adjacent hardbottoms showing:
  - 1. The location of the fixed sediment stations and the areas of hardbottom surveyed.
  - 2. Location and depth of any elevated levels of sediment on the hardbottom.

If indications of impacts (as described in Section III. above) are documented, the FDEP will be notified immediately by phone or fax, and a report will be forwarded within 24 hours.

**IX.3 *PIPELINE IMPACT ASSESSMENT.*** A report on the impact to the reefs in association with the pipeline placement will be forwarded to the FDEP within three months after completion of completion of the corridor assessment. The report will contain:

- A. Number and area (by species) of hard corals impacted.
- B. Number and area of hard corals relocated due to proximity to the pipeline (i.e., shading).
- C. Number of soft corals impacted.
- D. Area of substrate impacted.
- E. Comparison of actual area of impact to pre-project estimates.
- F. Calculation of needed mitigation.

**IX.4 *BEACH FILL COMPACTION.*** Measures of the beach fill compaction will be submitted with the descriptive summary report for the biological monitoring.

### **IX.6 *SEA TURTLE MONITORING.***

Reports detailing activities relative to the Sea Turtle monitoring and nest relocation activities will be forwarded to the FDEP:

- A. Within 60 days of the completion of construction.
- B. By December 31 of each year following construction.

### **IX.7 *HYDROGRAPHIC PROFILES.***

- A. Annual Reports. An annual report assessing the performance of the project over the prior year will be provided. The report will provide a discussion of erosion/accretion trends documented by the survey program for the entire project with a specific emphasis on recently nourished areas. Specific problem areas will be identified and possible solutions discussed.
- B. Storm Monitoring Reports. A report detailing and analyzing the results from Post-Storm hydrographic monitoring conducted during the previous year will be submitted with the annual reports.
- C. Data Format. Data will be provided to FDEP on 3.5" High Density diskettes or compact disc within 14 days of the completion of survey activities and data compilation. Data will be submitted in accordance with the FDEP "Procedures for submittal of Beach Monitoring Data" as revised on August 13, 1999.
- D. Table 3 provides the timeline for the scheduling of all hydrographic surveys (County Annual and project specific permit required monitoring), for all projects presently existing or under contract. Timing of projects under contract or construction (i.e., the Alternate Test Beach Project).

Table 1. Biological, water quality, sediment and impacted/relocated **Preferred Experience** hard coral monitoring sampling periodicity, conducted in association with the Alternate Test Beach project.<sup>1</sup>

| Projected Timeline (Month/Year) <sup>2</sup> | PC-Q#               | Video | G-T | Light Profile | Turb. | Water Quality | Sed. Meas. | Sand Compact | HC Impact Mon. |
|--|---------------------|-------|-----|---------------|-------|---------------|------------|--------------|----------------|
| 3/03 – 5/03                                  | Pre-Const.          | X     | X   | X             | X     | X             | X          | X            |                |
| 6/03 – 2/04                                  | Const.              |       |     | X             | X     | X             | X          |              |                |
| 3/04 – 5/04                                  | Post-Const. (PC-Q1) | X     | X   | X             | X     | X             | X          | X            | X              |
| 6/04 – 8/04                                  | PC-Q2               |       |     | X             | X     | X             | X          |              | X              |
| 9/04–11/04                                   | PC-Q3               | X     |     | X             | X     | X             | X          | X            |                |
| 12/04- 2/05                                  | PC-Q4               |       |     | X             | X     | X             | X          |              | X              |
| 3/05 – 5/05                                  | PC-Q5               | X     | X   | X             | X     | X             | X          | X            |                |
| 6/05 – 8/05                                  | PC-Q6               |       |     | X             | X     | X             | X          |              | X              |
| 9/05–11/05                                   | PC-Q7               | X     |     | X             | X     | X             | X          | X            |                |
| 12/05- 2/06                                  | PC-Q8               |       |     | X             | X     | X             | X          |              | X              |
| 3/06 – 5/06                                  | PC-Q9               | X     | X   | X             | X     | X             | X          | X            |                |
| 6/06 – 8/06                                  | PC-Q10              |       |     | X             | X     | X             | X          |              | X              |
| 9/06-11/06                                   | PC-Q11              | X     |     | X             | X     | X             | X          | X            |                |
| 12/06–2/07                                   | PC-Q12              |       |     | X             | X     | X             | X          |              | X              |

- 1 Video = Benthic community station videography; G-T = Ground-truthing of videography; Sed. Meas. = Sedimentation deposition rate analysis and Sediment depth measures; Sand Comp. = Penetrometer compaction measures; Turb. = Turbidity; PC-Q# = Post-Construction quarter number.
- 2 The present timeline is tentatively based on a USACE contract award in March of 3/03. Should the award date be delayed, the timeline will be adjusted to compensate for the delay

Tilling of beach fill will be conducted on an "as needed" basis, when indicated by the compaction tests and prior to the beginning of the sea turtle nesting season, or with consultation with the FDEP and the U.S. Fish & Wildlife Service at other times as deemed necessary and appropriate.

Table 2. Summary of marine turtle monitoring required during construction year and for two additional nesting seasons.

**Marine Turtle Monitoring for Beach Restoration Projects**

The following monitoring is required. Reports summarizing the nesting should be submitted to the Tequesta office with a copy to the Tallahassee office by January 15 of the subsequent year. Data for nesting activity shall be collected on the test beach and on two (2) adjacent control beaches. Control beaches shall be similar to the test beach with respect to profile and slope, background light levels, and human activity. Information from test and control areas should be reported separately, and should include numbers of nests lost to erosion or washed out.

| Characteristic       | Parameter                    | Measurement   | Variable   |
|----------------------|------------------------------|---|--|
| Nesting Success      | False crawls - number        | Visual assessment of all false crawls                                 | Number and location of false crawls in test and control areas: any interaction of the turtle with obstructions, such as groins, seawalls, or scarps, should be noted.  |
|                      | False crawl – type           | Length and categorization of the stage at which nesting was abandoned | Number in each of the following categories: emergence-no digging, preliminary body pit, abandoned egg chamber. The length of each false crawl shall also be measured, and distance to the apex of the crawl noted. GPS coordinates shall be collected at the apex of each false crawl.   |
|                      | Nests                        | Number, crawl length, position on the profile                         | The number of marine turtle nests in test and control areas should be noted. The location of all marine turtle nests shall be marked on map of project, and approximate distance to sea walls or scarps measured using a meter tape. GPS coordinates shall be collected at each nest. Any abnormal cavity morphologies should be reported as well as whether turtle touched groins, seawalls, or scarps during nest excavation |
|                      |                              | Lost Nests  | The number of nests lost to inundation, erosion or the number with lost markers that could not be found  |
| Reproductive Success | Emergence & hatching success | Standard survey protocol  | Numbers of the following: unhatched eggs, depredated nests and eggs, live pipped eggs, dead pipped eggs, live hatchlings in nest, dead hatchlings in nest, hatchlings emerged, disoriented hatchlings, depredated hatchlings   |



RE: FDEP Per. # 0080982-001-JC



Figure 1: Miami Beach Test Beach Pipeline Corridor,  
Operational Box and Sediment Stations

