APPENDIX E – SEAGRASS MITIGATION PLAN

SEAGRASS MITIGATION PLAN
PORT MANATEE NAVIGATION AND BERTH IMPROVEMENTS

DEP File No. 0129291-002-EI
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INTRODUCTION

Manatee County Port Authority (MCPA) was issued Conceptual Environmental Resource Permit (ERP) number 0129291-001-EC December 10, 1999 by the Florida Department of Environmental Protection (DEP), for navigation and berth improvements to Port Manatee. The Conceptual ERP covers Port improvements and required mitigation, including mitigation for impacts to seagrasses. The Corps of Engineers permit for the project (COE file no. 199801210 (IP-MN)) is pending.

At the time of preparation of this document (June 2000), MCPA is applying for an Individual ERP (DEP file no. 0129291-002-EI) for the required seagrass mitigation. This Seagrass Mitigation Plan, submitted in response to DEP's Request for Additional Information (RAI) dated February 11, 2000, modified in response to DEP's RAI dated May 2, 2000, and modified June 21, 2000 and July 5, 2000, defines the seagrass-protection management plan; the methodology to be used for site preparation, harvesting and planting of seagrasses; and the criteria to be met for mitigation success, including monitoring and remedial action details. The proposed seagrass mitigation is shown in the updated permit application drawings submitted July 5, 2000.

This document makes numerous references to impact areas A and B and seagrass mitigation sites 1 through 9. These designations refer to the accompanying permit application drawings submitted July 5, 2000.

MANAGEMENT PLAN

Seagrasses and manatees will be protected in the project area through implementation of this management plan. The plan protects seagrasses and manatees by providing for the following elements:

- Public education on the importance and methods of protecting these resources
- A program of public involvement in protection of the resources
- Establishment of a marked and monitored seagrass and manatee protection zone
- Restrictions on potentially detrimental boating activities within the zone, which are first encouraged through public involvement, then enforced, if necessary.

This plan has been designed to be consistent with the June 1998 Position Paper prepared by the Manatee Protection Strategies Task Force. Some sections may be more stringent than the recommendations of the task force, but the goals as set forth in the plan are consistent with the Position Paper.

Port staff has met with the managers of several local marine management and preserve areas. Their guidance and help is reflected in this Plan.

A work session (workshop) of the Manatee County Port Authority was held on 14 August 1998. The workshop was duly announced and published in the local press. Attendance included Port staff, Port Authority members, local citizens, and at least two local environmental groups. The Protection Plan was presented and discussed at the workshop. In the workshop, Port staff was authorized to proceed with the development of the Plan, as well as the development of any related Ordinances and Enforcement Contracts.

The concept of this Plan is based on other successful plans, including the Cockroach Bay Users' Group (CBUG) plan, and the Pinellas County Plan. These plans rely on public education and volunteer citizen monitoring and public interface, for increased likelihood of compliance. They have been demonstrated to be more effective than the strictly regulation- and enforcement-based approach. Information on these plans is attached to the previously submitted May 1999 Mitigation Plan (DEP file no. 129291-001-EC).

This Plan shall establish a management area adjacent to Port Manatee (as delineated in the permit application drawings) to provide for the preservation, recovery and expansion of marine habitats, including mitigation as required by permit. The intent of this Plan will be accomplished by minimizing the damage to marine habitats from prop-scarring by internal combustion engines through restricting the areas where these engines may be used; by posting and monitoring the management areas; and by providing a public education program (at the Piney Point boat ramp, which is to be improved).

MANAGEMENT AREA

This plan applies to a 480-acre management area with areal limits specified by a legal description and shown on the attached permit application drawings. The legal description is published in a recently adopted Manatee County ordinance amending a previous ordinance to specify the areal limits of the management area and provide for enforcement of boating restrictions within the management area. In general, the legal description describes the in-water boundaries and closes the near-triangle through land, then includes submerged lands within the near-triangular area except ship channels and basins servicing Port Manatee and the boat channel into Piney Point boat ramp. The management area boundaries are shown in the attached permit application drawings.

The entire management area will be marked by the Manatee County Port Authority in accordance with The Uniform State Waterway Marking System. Details on the marking are contained in the Florida Uniform Waterway Marking Application submitted to the Office of Enforcement Planning and Policy Coordination, Ms. Tara Alford, DEP. A copy of the map submitted with the application is attached. The legal description and associated drawing are included in the attached copy of the recently-adopted ordinance.

PUBLIC EDUCATION

The Manatee County Port Authority will establish an education program to provide for the distribution of information to citizens, and in particular to the boating public, similar to the "Boater's Guide to Cockroach Bay" brochures which are available at the boat ramp in Cockroach Bay.

The program will provide information on the following:

- Value of the natural resources (including seagrasses and manatees)
- Summary of the management plan
- Areal limits of the management area
- Management area boundary markers
- Boating restrictions within the management area
- Applicable laws, regulations and ordinances

Education will be provided to the public by the Port Authority in the following forms:

- Signage at the boat ramp and at strategic locations at the boundaries of the management area
- Marking of the boundaries
- Brochures available at the boat ramp and other strategic outlets
- Public workshops
- Coordination and support for user group activities, similar to the CBUG program

BOAT RAMP

Currently, the boating public regularly launches their boats at Piney Point. The launch area is unimproved, except for remnants of the old ferry channel dredged for landing of a ferry that ran back and forth between Piney Point and Pinellas Point before the original Skyway Bridge was built. There is no paved ramp at Piney Point. As part of the management plan, this boat launch area will be closed during seagrass planting activities, and then improved and reopened to the public. The boat ramp improvements are not part of the pending seagrass mitigation permit application (DEP file no. 0129291-002-EI).

Improvements will include the following:

- Construction of a boat ramp and accompanying dock
- Construction of a paved parking area
- Dredging of an access channel
- Installation of channel markers
- Installation of educational signage and brochure-dissemination facilities

The channel markers will help prevent accidental damage to marine resources. The educational features will also help prevent damage to marine resources; and the other improvements will foster good will, an essential element of the partnering strategy. The capacity of the ramp and parking will not be designed to exceed the current capacity without prior approval from the Corps of Engineers. This is a measure suggested by the U.S. Fish and Wildlife Service.

BOATING RESTRICTIONS

Boating in the management area will be restricted as specified in the attached ordinances. In general, power boats are not permitted to operate under power in the management area. Outboard engines must be tilted out of the water.

The restrictions may be modified in the future – after seagrass planting and establishment – to provide for navigation under power at idle speed in certain marked areas.

ORDINANCE

The Manatee County Commission recently adopted an ordinance amending the Manatee County ordinance related to boating restrictions. The amendment identifies the areal limits of the management area and provides for enforcement of the management-area boating restrictions specified in this plan. Copies of the original ordinance and amendment are attached.

Penalties

Violations of posted boating restrictions will be punishable as provided by the adopted Ordinance.

Enforcement

Manatee County Sheriff is empowered and responsible for enforcement of the Manatee County ordinances. The Port Authority has reached an agreement with the Sheriff that provides for patrolling of the management area by the Sheriff's deputies. The Sheriff will patrol the management area during critical phases of the seagrass mitigation planting, specified by the Port Authority. At other times, Port Authority staff, dedicated and assigned to the task, will patrol the management area. Except when deemed necessary, the area will not be patrolled at night.

Exemptions

Any governmental employee or officer or authorized agent thereof, while performing duties pursuant to this Plan or other pertinent law, are exempted from boating restriction zones. However, reasonable efforts must be made by these individuals to avoid damage to aquatic habitat.

MONITORING AND MAINTENANCE

Monitoring efforts will consist of record keeping on boating activity by enforcement personnel, and periodic evaluation of the effectiveness of management policies based on examination of seagrass monitoring aerials for evidence of any prop-scarring. See the section "Success Assessment

Methodology" for details on the seagrass monitoring. The Plan will be modified as deemed necessary based on review of the monitoring data.

If monitoring efforts reveal that the management plan isn't working, tougher regulation and enforcement will be considered. This is specified only as a backup plan. It is anticipated that the primary proposal has a higher likelihood of success, based on past success of similar plans, after which this proposal is modeled.

AUTHORITY

This Plan will be adopted by the Manatee County Port Authority in accordance with the Laws of Florida, any pertinent Ordinances, and the Manatee County Land Development Code (as amended, if necessary).

IMPLEMENTATION

The Port Authority will be responsible for funding and implementation of the management plan. The Port Authority may subcontract parts of the implementation, without relinquishing responsibility.

HARVESTING AND PLANTING METHODOLOGY

Two types of seagrass planting will be performed as part of the seagrass mitigation program – planting of donor seagrass material (donor planting) and transplanting of seagrasses from impact areas A and B (transplanting). The donor-planting work is designed so as not to require permits other than a Plant Material Collection and Transport permit. The Port Authority began donor planting in seagrass mitigation sites 1, 2, 3 and 8 beginning April 3, 2000, as coordinated with the Department and the Corps of Engineers.

The transplanting work involves transplanting of seagrasses from areas to be impacted by dredging for construction of Port Manatee navigation improvements into mitigation sites, some of which require prior site-preparation earthwork.

The seagrass harvesting and planting activities described in this section are part of a seagrass mitigation program that also involves management of the seagrass resources in the project area, as well as the aforementioned site preparation earthwork. The management plan is detailed in a separate section.

DONOR PLANTING

The donor-planting program is intended to supplement the seagrass protection and planting program. It is designed to minimize the need to remove seagrasses from existing seagrass beds, except in a previously scientifically documented manner that allows the donor seagrass beds to recover to the undisturbed condition within one year of the time of harvesting of donor material (Fonseca et al. 1998).

Sources of Seagrass Material

Seagrasses will be collected either bare-root or in the form of plugs from approved donor sites outside the approved impact sites, only as permitted by an applicable Plant Material Collection and Transport permit from the Department's Bureau of Invasive Plant Management or Southwest District Office.

Additionally, seagrasses that are either naturally dislodged from their meadows by wind, waves and feeding activities of manatees, or artificially dislodged by boating activities, will be used as a source of planting material. Both of these latter planting materials usually wash ashore and die. This material will be collected in the form of drift material on the surface of the water and wrack in the drift line on the shores of Tampa Bay. The material will consist of intact live short shoots and rhizomes of all of the three common species of seagrasses in Tampa Bay (turtlegrass, shoalgrass and manatee grass).

Seagrasses may be transplanted directly to mitigation areas, or cultivated in separate nurseries and later planted in the mitigation areas, to augment other plantings and contribute to the generation of success criteria and credits.

Harvesting Methods

Donor material will be harvested manually in a way to avoid significant excavation and redeposition of sediment in accordance with the applicable Plant Material Collection and Transport permit. Drift and wrack material will be collected manually, using nets or rakes or similar equipment.

Planting Locations

The planting areas are mitigation sites 1, 2, 3 and 8, shown in the permit application drawings. These methods may also be used to augment transplanting at sites 4 through 7 after permit approval and site-preparation earthwork.

The pre-permit planting areas are selected portions of the eight transplant sites. The total area of the eight transplant sites is 142 acres. The selected portions of the eight transplant sites are Sites 1, 2, 3 and 8 only and have a total area of 118 acres or approximately 83% of the total area proposed for all seagrass mitigation activities.

Sites 1, 2 and 3, which currently exist as coalesced prop scars, make up 11.2 acres of this total 118.2 acres. The remaining 107 acres (Site 8) are prop-scarred seagrasses.

Planting Methods

Two planting methods are to be used for the donor planting – mechanical planting by Jim Anderson, using his patented planting machine (Jim's Environmental Boat (JEB)) and system; and manual planting, using the proven staple method.

Both sources may be used for each planting method. Material from donor sites will likely be the primary source for mechanical planting, with drift and wrack material the primary source for manual planting.

The work that began on April 3, 2000 will consist of mechanical planting of donor material in parts of sites 1, 2 and 3, and hand planting of drift and wrack material in separate discrete parts of sites 2 and 3.

Areas to be planted will be marked in advance by Manatee County Port Authority and its Consultants.

The mechanical planting with Jim Anderson's patented machine and system will be conducted using previously proven methods. In general terms, the machine is a floating vessel with two large-diameter wheels on an articulating suspension system that allows the boat to float on the surface and the wheels to roll on the bottom. The wheels are such a large diameter that they extend above the water surface when rolling on the bottom. Specially designed devices protrude from the wheels in such a manner that they penetrate the bottom as the wheels roll. The devices are designed to accept manually installed bare-root plugs as the devices pass over the top of the wheel, out of the water, as the wheel rolls. When the device penetrates the bottom, the plugs are automatically planted with short shoots exposed, but all roots and rhizomes buried. The machine is also used to inject growth enhancing nutrient formula into the bottom in the planting area. Injection of nutrient formula will be performed in this case.

The manual planting will involve bundling of the drift and wrack material into bare-root planting units with a minimum of three short shoots attached to viable rhizomes, for turtlegrass and manatee grass, or five to seven short shoots attached to viable rhizomes, for shoalgrass. The material will be stored in floating pens, on site, then attached to metal or wooden staples and manually planted following the methodology of Fonseca et al. (1998) (Pages 114-115). Substrate preparation will consist of forming a depression in the sediment to allow the planting unit to fit flush with the surface of the sediment.

Spacing of units will be approximately three feet on center, or less.

The donor planting at mitigation site 8, which is 107 acres of prop scarred seagrass beds, will involve protection of these seagrass beds from additional scarring, and repair of the prop scars by planting shoalgrass, either mechanically, manually, or both, as described here.

TRANSPLANTING

Sources of Seagrass Material

All seagrass in the area to be dredged for the proposed Port navigation improvements (areas A and B) will be salvaged and transplanted before they would be dredged. They will be transplanted to selected portions of the eight transplant sites (the selected areas total 34.47 acres) identified in the attached permit application drawings. Current estimates of the quantities of seagrasses in the dredge area are 2.60 acres of turtlegrass (Thalassia testudinum), 2.93 acres of shoalgrass (Halodule wrightii) and 0.41 acre of a mixture of the two.

Additionally, shoalgrass within approximately 2.2 acres of Bay bottom will be temporarily impacted for construction of channels connecting seagrass mitigation site 7 to the Bay. Rather than being removed, stored, and replaced after excavation, the seagrasses in these areas will be moved to approved mitigation sites with the areas replanted after excavation. The source of material for replanting will be either floaters from the transplanting process or drift and wrack material collected in Tampa Bay. Procedures used will be as described in the Donor Planting section.

Planting Locations and Mitigation Design

All seagrasses in areas A and B to be dredged will be transplanted. This design provides a multitude of planting opportunities for mitigation of the impacts to ensure that impacts can be mitigated. All or part of the mitigation site preparation and planting will be performed as necessary to achieve the specified mitigation credits, at a minimum. The required credits are specified in "Success Assessment Methodology."

All turtlegrass in areas A and B to be dredged will be transplanted to mitigation sites 1, 2 and 3. Sites 1, 2 and 3, totaling 11.2 acres, are anticipated to have been planted with donor material, as described above, prior to the turtlegrass transplanting. Turtlegrass will be planted in combined units or mega-units to the maximum extent practicable. Planned mega-unit placement is shown in the attached permit application drawings. Adjustments in placement will be made at the time of transplanting to avoid or minimize impact to successful donor plantings and volunteers in the mitigation sites.

With this proposed approach, the turtlegrass units can be placed in any unvegetated gaps remaining from the donor planting, and the site will be largely vegetatively stabilized before the turtlegrass transplanting takes place. This should eliminate the potential problem of sand migration due to currents that has been raised as possibly reducing the likelihood of survival of transplanted turtlegrass in the area.

All shoalgrass will be transplanted to any combination of mitigation sites 4 – 7, all of which will require prior engineered site-preparation modifications, and site 8, as needed.

Mitigation sites 4, 5 and 6 involve engineered physical modifications to render them optimally suitable to support seagrasses. Sites 4 and 6 involve construction of minor protective features of natural material to reduce wave action and the potential for moving sand to bury or dislodge planting units and excavation of areas higher than –1 ft. NGVD to –1 ft. NGVD. Site 5 involves excavation of part of the sand spit that is impeding flushing of the area and would be expected to completely isolate the area over time, if not addressed.

Mitigation site 7 involves excavation of the site to –1 ft. NGVD, and excavation of connection channels to the Bay.

Construction activities at the above referenced sites will impact existing seagrasses. For example, excavation of the connection channels from site 7 out to the –1 ft. NGVD contour impacts 2.2 acres of Bay bottom. Rather than being removed, stored, and replaced after excavation, the seagrasses in these areas will be moved to approved mitigation sites with the areas replanted after excavation. The source of material for replanting will be either floaters from the transplanting process or drift and wrack material collected in Tampa Bay. Procedures used will be as described in the Donor Planting section.

The layout of sites 4, 5 and 6 has been designed to minimize incidental impacts. Incidental impact areas will be restored by bare root and plugs planting of seagrasses in the impact area. The source of material will be either floaters from the transplanting process or drift and wrack material collected in Tampa Bay. Procedures used will be as described in the Donor Planting section.

The minimum size of transplanted turtlegrass plug units will be 8 inches in diameter with a depth sufficient to recover all of the rhizomes (anticipated to be 9-12 inches). This unit, when planted on 1 meter (3.3 feet) centers in the Florida Keys had 98% survival after 3 years and began coalescence after 18 months (Lewis 1987). Larger units may be moved if equipment allows, subject to Department approval as set forth in the "Harvesting Methods" section.

The transplanted turtlegrass units will be combined at the transplant site to form larger installed units (mega-units) to the maximum extent practicable by placing the individual excavated plugs adjacent to one another with minimal or no unvegetated space between them. All loose floating turtlegrass planting material with intact short shoots and rhizomes uprooted by the harvesting operation will be collected. According to the concept of "compressed succession," this material will be combined with other floating materials and planted as bare-root planting units with a minimum of three short shoots with intact rhizomes within existing patches of shoalgrass resulting from the donor planting.

The minimum size of transplanted shoalgrass plug units will be 3 inches X 3 inches. Spacing of units will be 1 foot, center to center, or 9 inches between sides of peat pot units or larger sod units. All loose floating shoalgrass planting material with intact short shoots and rhizomes uprooted by the harvesting operation will be collected. This material will be combined into bare-root planting units of five to seven short shoots and planted on the same spacing as the peat pot units. Larger units may be moved if equipment allows, subject to Department approval as set forth in the "Harvesting Methods" section. Mixed species units will utilize the method most appropriate for the dominant species.

Site Preparation Earthwork

Excavation for site preparation will be conducted either using traditional mechanical means or hydraulically. Traditional mechanical means would involve excavation by crane-operated clam bucket or backhoe.

At site 7, access for mechanical excavation will be gained by way of adjacent uplands. Depending on the structural capacity of the existing material, rigid mats or fill pads limited to uplands and impact areas may be utilized for access of equipment. Hydraulic dredging of site 7 would be accomplished by accessing the area from the bay with activity limited to impact areas. Dredging would be accomplished using a small shallow-draft dredge – approximately 8" diameter suction pipe, and 1' draft – or possibly using a system with a manually operated suction head connected by flexible hose to the pump, which would either be floating or on land. In the case of hydraulic dredging at site 7, material would be pumped directly to the Port Authority's existing upland bermed spoil containment facility, or pumped into sealed trucks with water discharged from the trucks and returned to the surface water and the material trucked to the spoil containment facility. In the case of pumping directly to the spoil containment facility, the route of the discharge line, which is shown on the attached permit application drawings, is the route taken for dredging of the Peanut Lake system. Hydraulic dredging will only be possible when tide height is sufficient to float the dredge.

One or more of the same methods will be utilized for excavation of sites 4, 5, and 6. Access for mechanical excavation will be gained from the adjacent uplands at Piney Point. Access for hydraulic dredging will be gained from the northwest at sites 4 and 6 and from the south at site 5, through the adjacent unvegetated areas. In the case of pumping directly to the spoil containment facility, the route of the discharge line, which is shown in the attached permit application drawings, is the route taken for previous maintenance dredging operations. Hydraulic dredging with a contained floating plant will only be possible when tide height is sufficient to float the dredge.

The small protective features to be constructed at sites 4, 5 and 6 were incorporated at the suggestion of Dr. Mark Fonseca, NOAA Center for Coastal Fisheries and Habitat Research, in his letter to Robin Lewis, Lewis Environmental Services, dated February 14, 2000. The core material will be constructed with coarse, clean sand from the Port Authority's dredged material containment facility. Cap material will be washed shell from a local source.

Harvesting Methods

It is important for timely completion of the project that the transplanting take place as soon and as quickly as is practicable. The quantity of seagrasses to be transplanted may justify development of new high-production-rate transplanting

methods. High production rate can be achieved by maximizing the size of sod units that can be transplanted. This approach also increases the likelihood of mitigation success – larger transplant units are generally considered more likely to survive than smaller ones. The Port Authority is committed to exploring the development of an effective system for transplanting the seagrasses in the dredge area. The development process has involved a design charette, transplanting work bidding, separate transplanting work negotiations with contractors, and conceptual design dialogue with top contractors and design professionals in the field.

Based on this process, multiple alternative methods are specified for harvesting of the seagrasses to be transplanted, in addition to two proven methods. One or more of the methods may be utilized.

The proven methods (see Fonseca et al., 1998) are:

- Plug method
- Peat pot method

The alternative methods are:

- Box core method
- Large-scale box core method
- Modified tree spade method
- Side cut method

The two proven methods (plug method and peat pot method) will be used if no suitable alternative is developed. The alternative methods have been defined based on adaptation of proven methods and years of experience, primarily for increasing production rates, considering the large quantities of seagrasses to be transplanted. These alternative methods are subject to Department approval, after demonstration of effectiveness. The required demonstration will involve actual transplanting of seagrass material from the impact areas as a test. A minimum of two weeks survival of the test transplant will be required to demonstrate effectiveness. If no alternative method is found by the Department to be effective, then transplanting will be performed using the plug and/or peat pot methods.

Plug Method

Plugs of seagrass with sediment would be harvested using a core tube following the methodology of Fonseca et al. (1998) (Page 113).

Peat Pot Method (shoalgrass only)

Plugs of seagrass with sediment would be harvested using a sod plugger and extruded into peat pots following the methodology of Fonseca et al. (1998) (Pages 115-122).

Box Core Method

The box core method of seagrass excavation is a versatile method. The use of this type of coring device has been successfully employed in a wide variety of oceanographic applications for many years. The idea has been adapted for this project and a modified version of the marine box core device has been designed for shallow water seagrass sod excavation. The benefits of this device include, but are not limited to: the ability to remove variable depth sod plugs, the ability to cut all of the seagrass in a given area because of the square shape of the cut, the use of known technology for the design of the coring device, and the ability to harvest rows of sod in an organized matrix using the "spudtrack" system.

The general layout of the box core system for seagrass involves a three-track system. The first track is a vertical channel that accepts a set of wheels, which allows the coring device to travel in a vertical fashion only. This movement is utilized to lower the device to the bottom and force the box blade into the sediment. The second track system allows the entire coring device to travel in a horizontal fashion along the longitudinal centerline of the cutting vessel which is held in position with a set of spud poles. The cutting vessel will be designed in a catamaran configuration so that the coring device may be mounted in the center between the two hulls. The second track system allows the coring device to travel longitudinally on the cutting vessel. The cutter will remove a core at the stern of the cutting vessel and then progressively move forward in "one-box" increments, while taking seagrass sods and depositing them in trays, until the coring device is at the bow of the cutting vessel. When the coring device is at the bow of the cutting vessel, it will be forced into the sediment and will remain there while the cutting vessel is moved forward for the next set of seagrass plugs. In order to keep the cutting vessel tracking in a straight line, the spud poles will also be on a third set of longitudinal tracks along the sides of the vessel. This will allow the vessel to be moved forward and repositioned without losing track of where the next core is to be cut, and without losing track of the azimuth of the cutting vessel.

The box core method is based on the same concept as the sod plugger used for the peat pot method, identified above. The difference is that the mechanism for deployment allows for the handling of much larger sods. The size and depth of the plugs would be established by field calibration runs.

Large-scale Box Core Method

A large open-bottomed box (perhaps 10 ft. X 30 ft.) is lowered onto the bottom, where its weight assists in driving it into the sandy soil. Some vibration and/or small movements of the box may be necessary to help it penetrate the 10 or more inches required. The box may be divided into "egg crate" sections.

When the desired depth is reached, the bottom is closed and sealed, and the box is raised against the flotation of a barge or barges. The bottom closure mechanism will be an adaptation of the closure from a smaller standard box corer.

While in the raised position and with the box remaining filled with the sand and seagrass, the entire assembly is towed to the planting area.

Modified Tree Spade Method

An adaptation of a standard hydraulic tree spade that is used by landscapers may be developed. The standard tree spade uses a closing four-blade system to cut the tree roots loose and remove the tree from the ground. This device is normally mounted on the back end of a truck, so that it may then be used to transport the tree to a new location where it is to be planted. A similar device may be used for the removal, transport and replanting of seagrass. The system would be mounted on a floating platform such as a small barge and would be capable of removing moderately sized seagrass plugs. When the seagrass plug has been removed, then it would be placed on a transport vessel and moved to the replanting site.

Side Cut Method

A box with a closed bottom and one side open is pulled horizontally through the sediment. The open side of the box is advanced into the sediment using power equipment mounted on a spudded barge. Depth of cut is controlled by manually adjusting the angle of the tool. Once the box is full, the open side is closed and a removable tray is lifted out and replaced with a new tray. The full tray is transported to the planting site.

Other

Any other method would require a description of similar detail and be subject to Department approval of the concept as well as Department approval after demonstration of effectiveness.

Planting Methods

As for harvesting methods, multiple alternative methods are specified for planting of the seagrasses to be transplanted, in addition to two proven methods. One or more of the methods may be utilized.

The proven methods (see Fonseca et al., 1998) are:

- Plug method
- Peat pot method

The alternative methods are:

- Box core method
- Large-scale box core method
- Modified tree spade method
- Side cut method
- Plow method

The first two methods (plug method and peat pot method) are proven methods (see Fonseca et al., 1998). The alternative methods have been defined based on adaptation of proven methods and years of experience, primarily for increasing production rates, considering the large quantities of seagrasses to be transplanted. These alternative methods are subject to Department approval, after demonstration of effectiveness. The required demonstration will involve actual transplanting of seagrass material from the impact areas as a test. A minimum of two weeks survival of the test transplant will be required to demonstrate effectiveness. If no alternative method is found by the Department to be effective, then transplanting will be performed using the plug and/or peat pot methods.

Substrate preparation of all transplant sites will consist of excavating a hole in the sediment to allow the transplant unit to fit flush with the surface of the sediment when it is installed.

Plug Method

Units harvested by the plug method would be transported and planted using the core tube used for extraction following the methodology of Fonseca et al. (1998) (Page 113).

Peat Pot Method

Peat pots containing seagrass plugs with sediment harvested by the peat pot method would be planted following the methodology of Fonseca et al. (1998) (Pages 115-122).

Box Core Method

The plow system listed below would be used for planting of the seagrass plug harvested by the box core method.

Large-scale Box Core Method

The unit harvested by the large-scale box core method will be carefully located over the planting location, and the harvesting operation reversed. The units are lowered, inside the closed box, into a small graded area. Mounded material around the perimeter of the graded area is then filled in around the tool before extraction of the tool. The bottom closure is opened, and the box, now open-bottomed, is raised, leaving its deposit at the new site.

Modified Tree Spade Method

Seagrass plugs harvested by the modified tree spade method will be planted by either thrusting the tree spade into the bottom or by using the plow system described below.

Side Cut Method

The plow system described below would be used for planting of the seagrass plug harvested by the side cut method.

Plow Method

The plow form is a planting system that would be used to replant seagrass plugs that were harvested by any sod removal method except the large-scale box core method. When a seagrass sod plug has been removed, it will need to be replanted flush with the surrounding bottom. The challenge with this task lies in the fact that the soil that is excavated from a planting hole will tend to fall back into the hole before the seagrass sod can be planted. The plow form planting

system will address that problem and will serve as a guide for planting sod in rows at predetermined spacing intervals.

The plow form system will consist of a long form that will be slowly pulled through a planting area by a winch or other means. Approximate measurements of the plow form will be twenty-five feet long by three feet wide by eighteen inches tall. As the plow form is pulled through the soil, it will cut a path with a pointed bow and spread the displaced soil in a thin layer to the sides of the plow. The depth of the path that is cut will be variable and will range from ten to twelve inches. As the soil is moved to the sides of the plow, the long sides will hold the soil back and prevent it from falling back into the excavated trench. At this point, a row of sods may be lowered into the form. Once the sods are in place, the plow form will be moved forward and another group of sods will be lowered into place. The plow form system will be open on the back end so that as it is incrementally moved forward, the newly placed sods will be undisturbed. When the plow form has passed completely away from the newly planted sods, the soil on the sides will fall back in place against the sides of the sod plugs.

This system lends itself to linear patterns of planting the sea grass plugs. One of the major advantages of this system lies in the fact that the soil that is displaced for planting the plugs is not removed from the site. Rather, it is spread out evenly between the rows of newly planted sea grass plugs.

Other

Any other method would require a description of similar detail and be subject to Department approval of the concept as well as Department approval after demonstration of success.

SEQUENCE OF WORK

The planting of seagrass began April 3, 2000 and may take place year-round. Transplanting of turtlegrass from the impact areas into mitigation sites 1, 2 and 3 is scheduled to begin as soon as possible after permit issuance. Site preparation modifications are scheduled to begin at some or all of sites 4, 5, 6, and 7 as soon as possible after permit issuance. Transplanting of shoalgrass from the impact areas to prepared sites is scheduled to begin as soon as possible after completion of the necessary site preparation modifications.

The seagrass may be moved at any time of year. Reviewers of this program (particularly David Crewz, FDEP and Mark Fonseca, NMFS) have indicated that later plantings (into October) are acceptable, and aside from storm damage, may survive better due to reduced bioturbation from rays.

SUCCESS ASSESSMENT METHODOLOGY

This success assessment methodology defines what constitutes successful seagrass mitigation. It applies to impacts to seagrasses in areas A and B (shown in the permit application drawings) due to Port navigation improvements. Temporary incidental seagrass impacts related to mitigation site preparation earthwork are not to be mitigated according to this methodology. Handling of temporary incidental impacts is addressed in the Transplanting section, under Planting Locations and Mitigation Design.

This methodology is intended to be consistent with input provided by Dr. Mark Fonseca, NOAA Center for Coastal Fisheries and Habitat Research, in his letter to Robin Lewis, Lewis Environmental Services, dated February 14, 2000.

SUMMARY

Impacts are to be mitigated according to the mitigation requirements and credit system set forth herein. Impacts are not allowed until the seagrasses are successfully transplanted and expanding. To gage whether seagrasses have been restored in mitigation areas, coverages will be compared to background coverages in the project area. Statistical sampling will be used to estimate coverages for comparison. Mitigation will be monitored until the required credits are provided and until the Department agrees that monitoring is no longer necessary to gage successful establishment of the mitigation plantings. If the mitigation is not successful, remedial action will be taken to ensure success. Reasonable assurance of success is provided by advance transplanting, the mitigation ratios, over-design of mitigation opportunities, and a remedial action plan.

MITIGATION REQUIREMENTS

Seagrasses are to be transplanted before they are impacted. Impacts are not to begin until transplanting success has been achieved and demonstrated. Impacts are to be mitigated through achievement of 12.7 mitigation credits.

TRANSPLANTING SUCCESS CRITERIA

Seagrass transplanting will be deemed successful when the following criteria are met:

All seagrasses in the impact area (all or part of Areas A and B) must have been transplanted out of the impact area prior to dredging; and

The amount of seagrass in the mitigation area must be equivalent to the amount to be impacted, and those seagrasses must be expanding. Measurement of equivalent area and expansion are addressed in the Success Assessment Methodology – Measurement – Mitigation section of this document.

MITIGATION CREDIT SYSTEM

The following vehicles are available for obtaining mitigation credits:

- At Seagrass Mitigation Sites 1 through 3, credit is obtained for successful restoration of seagrass cover, at a ratio of one credit per five acres of restoration within the site.
- At Seagrass Mitigation Sites 4 through 7, credit is obtained for successful restoration of seagrass cover, at a ratio of one credit per two acres of restoration within the site.
- At Site 8, credit is obtained for 30% seagrass recovery from prop scarring, at a ratio of one credit per fifteen acres of area within the site in which prop scars are 30% recovered.
- At Site 9, which includes approximately 188 acres of shallow water within the Manatee/Seagrass Management Area, mitigation credit is available for lift in these areas after management and protection. Lift and mitigation ratios are subject to Department approval.

Measurement of restoration and 30% recovery are addressed in the Success Assessment Methodology – Measurement – Mitigation section of this document.

MEASUREMENT

Impact area is to be measured for determination of the amount of seagrass to be impacted in the Transplanting Success Criteria section, above. Background percent coverages are to be measured at reference sites of existing undisturbed seagrass meadows of each type in the project area to define coverage that constitutes restoration in mitigation areas. Percent coverages are to be measured in the mitigation planting areas before planting and over time after planting for comparison to reference sites of the same type for determination of

whether Transplanting Success Criteria have been met, and whether restoration has been achieved.

Calibration

To account for the inherent variability of percent coverage in the project area, a calibration procedure was employed to choose the appropriate quadrat size and sampling intensity for shoalgrass. The calibration procedure was carried out on March 25, 2000 on a reference bed of shoalgrass (due east of the southern tip of the spoil island) under conditions of high turbidity and intermediate tidal height. A parallel procedure will be carried for turtlegrass later in the growing season when that grass has recovered from winter dormancy. It should be noted that, given the pre-growing-season timing of the sampling (late March 2000), the variances may be elevated relative to when the beds are at their peak, thus these measures are likely over-estimates.

Estimation of percent cover was calibrated by first determining an appropriate quadrat size. Three quadrat sizes, 25 cm x 25 cm (small), 50 cm x 50 cm (medium) and 100 cm x 100 cm (large) quadrats, all being subdivided into 100 equal-area cells, were used. The procedure was to randomly place the quadrat on the grass bed and to count the number of cells containing vegetation. The procedure was used to generate 151, 256 and 42 estimates taken for the small, medium and large quadrats respectively. A one-way ANOVA failed to find a difference between quadrat sizes ($F=2.01$, $df=2,246$) while the Duncan's Multiple Range Test (though unneeded) showed that the estimates from the small and medium quadrats are indistinguishable from one another and are distinct from the estimates derived from the large quadrat ($\alpha=0.05$). It was the subjective evaluation of the field staff that the large size tended to overestimate the percent cover, a conclusion supported by these analyses. Based on the statistical results and the subjective evaluation of the research staff , the medium (50 cm x 50 cm) quadrat was selected as being optimal in terms of ease of manipulation in the field and in terms of a superior match to the perceived 'grain' size of shoalgrass.

After the appropriate quadrat size was selected, the next concern was to estimate an appropriate number of samples needed to control Type II error in subsequent statistical analyses. This was accomplished by subjecting the estimates derived from the medium quadrat size (256 observations) to a mean variance analysis (Kershaw, 1973). For a fixed sample size (ranging from 3 to 100 observations), 100 sets of that sample size were chosen at random from the total number available and a mean and variance over those 100 sets was calculated. Oscillatory behavior of both mean and variance statistics for percent cover estimates became minimal after 20 samples. However an examination of the relative deviation of the variance of a fixed sample size from the overall mean variance revealed that there were marked oscillations up to 40 samples. Based

on these data, an appropriate sample size that minimizes variation would be approximately 40 to 50 samples.

Underlying the parameter described above is the need to locate randomly selected points in the experimental units (both reference and transplant) and to estimate navigation error when moving to those points. During actual quantification sessions, a series of randomly determined points in each defined experiment and natural bed unit are to be generated from GIS maps. To estimate the navigation accuracy of the field staff, a mock area approximating that of a cell in the grid to be superimposed on the experimental units (approximately 20 m x 20 m) was defined by temporary poles set in the corners of the square. A set of five locations were selected, and those locations were then estimated and marked. The deviation from desired and actual locations were then calculated and averaged 0.91m. We can thus project a navigational error of approximately 1m between the pre-selected random locations and the actual locations sampled under field conditions.

Impact Area

The area of seagrass coverage will be remapped by the applicant and its consultants, in cooperation with the Department, at or about the end of June, 2000.

The applicant's biological consultant will identify the seagrass meadows in the impact area by underwater visual observation and mark the boundaries with PVC pipe markers extending vertically into the bottom and above the water surface, placed at enough points along the boundary of the existing seagrass meadows to adequately represent the boundary for purposes of area calculation. The observation and marking will be accomplished with the involvement of Department personnel at a level of involvement agreed upon with the Department. Once the Department agrees that all seagrass meadow areas have been marked, a registered professional land surveyor will survey the locations of all the markers for purposes of mapping the limits of seagrasses in the impact area. The mapping will be provided to the Department in hard copy and electronic format with latitude and longitude coordinates of the markers/boundary points and calculated areas of each type of seagrass observed.

The survey will be used for the estimate of the area of seagrass to be impacted, on which the Transplanting Success Criteria will be based. Since the improvements will likely be phased, the impact area on which the Transplanting Success Criteria are based, for any given phase, may be only a part of Areas A and B shown in the permit application sketches. Transplanting will not begin before completion of the survey. Any seagrasses volunteering in the impact area after the survey may be used as donor material, and will not be included in the

"amount of seagrass to be impacted," addressed in the Transplanting Success Criteria.

Background

The calibrated quadrats and sampling techniques will be used to measure percent coverages at reference sites (the same quadrats will be used for the mitigation planting areas, as well).

Twelve reference sites, three in natural undisturbed turtlegrass meadows, three in natural undisturbed shoalgrass meadows, three in natural undisturbed manatee grass (Syringodium filiforme) and three in unvegetated areas within existing natural seagrass will be established in the project area. Percent coverages for the various types of seagrass will be measured as described for the mitigation areas. The reference sites will be subject to inspection and approval by the regulatory agencies.

Mitigation

Percent coverage will be measured in the mitigation and reference areas before planting and over time after planting, using an appropriately sized quadrat and an appropriate number of samples as specified in the calibration procedure.

For purposes of measuring compliance with the Transplanting Success Criteria, equivalent amounts will be determined based on an adjustment of the mitigation area to account for the fact that the density of seagrass in the mitigation area may not yet have reached the density of the natural background areas. In other words, if seagrasses in the mitigation area are not as dense as natural seagrass meadows, more area is required. Seagrasses could be less dense in the mitigation area, for example, if the seagrasses were not planted as densely as they occur in natural meadows. The adjustment will be made based on percent coverage, to produce an equivalent area at the background percent coverage. For example, 6 acres of mitigation area with 50% of background coverage of surviving and expanding seagrass is required for authorization to dredge an area that had 3 acres of seagrass before transplanting, based on the impact area survey. Since an equivalent amount of seagrass is required in the mitigation area, supplemental planting of seagrass from offsite is necessary to make up for any loss of transplanted seagrass. Seagrass in the mitigation area from any source will be included in the measurement of equivalent area for purposes of achieving Transplanting Success Criteria. Allowable sources include seagrasses transplanted from impact areas, supplemental donor plantings from offsite, expansion of planted seagrasses within the mitigation area, expansion of adjacent natural beds into the mitigation area, and natural recruitment. Additionally, prop-scar recovery in mitigation site 8 will contribute to the

achievement of Transplanting Success Criteria at the rate of one acre of equivalent area per one mitigation credit achieved.

Expansion will be demonstrated by an increase in percent coverage.

Restoration, for purposes of defining seagrass mitigation credit, refers to a condition in which the seagrass in a mitigation site has achieved a coalesced coverage of seagrass with a percent coverage that falls within the range of normal variation of that measured in the applicable seagrass reference sites when subjected to a statistical test.

30% recovery, for purposes of defining seagrass mitigation credit at Site 8, refers to a condition in which 30% of the original seagrass coverage deficit due to prop scars is restored, as defined above. Measurement of prop scar areas for determination of whether 30% recovery has been achieved will be accomplished using aerials. A direct comparison will be made between the September 30, 1999 and later rectified true color vertical aerial photographs, using an electronic scanning program to calculate actual percent coverage in prop scars.

Underwater still and video photography will be used, in addition to the "before planting" sampling described above, to establish the absence of seagrass in the proposed planting and transplanting areas and to establish the existence of prop scars in Site 8.

The monitoring program may require some modification as a result of the actual on-the-ground mitigation work, to be determined based on the Time-Zero monitoring.

Monitoring Schedule

Baseline monitoring to establish the "before planting" condition began April 3, 2000. This includes sampling and underwater still and video photography to establish the absence of seagrass in the proposed planting and transplanting areas and to establish the existence of prop scars in Site 8. Initial sampling of the reference sites will also take place at this time. Additional reference site monitoring will take place as above ground biomass increases.

The initial "Time Zero" monitoring and first data set is scheduled to take place July 2-3, 2000.

Rectified vertical color aerial photography will be taken in September 2000 (aerials have been taken September 1999 and April 2000), and annually thereafter, at a minimum. Field data collection will be scheduled in conjunction with the aerial photography. The monitoring of a mitigation area will last until after the required credits have been achieved, and until it is mutually agreed that

monitoring is no longer necessary to gage successful establishment of the mitigation plantings.

Monitoring Reports

Annual Progress and Mitigation Success Reports indicating the status of the project will be submitted to the DEP Office of Beaches and Coastal Systems, 3900 Commonwealth Boulevard, Mail Station 300, Tallahassee, Florida 32399-3000 and the DEP Southwest District Office, Submerged Lands and Environmental Resources Program, 3804 Coconut Palm Drive, Tampa, Florida 33619, and to the Corps of Engineers, Jacksonville District, West Permits Branch. The cover page will indicate the permit number, project name and the permittee name. The first annual progress report will be submitted one year from the date of permit issuance, and reports will continue to be submitted until all work authorized by the permit has been completed. The report will include the following information:

- Date that the permitted activity was begun or is anticipated to begin.

- Brief description of the extent of work (i.e. dredging, planting, monitoring, management, maintenance) completed since the previous report or since the permit was issued. Indicate on copies of the permit drawings those areas where work has been completed.

- Brief description of the extent of work (i.e. dredging, planting, monitoring, management, maintenance) anticipated in the next year. Indicate on copies of the permit drawings those areas where it is anticipated that work will be done.

- The progress of the permitted mitigation program. The reports will include: site maps; aerial photographs and those taken from the permanent stations, some of which must be in the vegetation sampling areas; a description of problems encountered and solutions undertaken; results data and discussion; work proposed for the next year; and recommendations. The monitoring report will provide qualitative and quantitative depictions of the sites that are representative of the conditions within each entire site.

- This report will include on the first page, just below the title, the certification of the following statement by the individual who supervised preparation of the report: "This report represents a true and accurate description of the activities conducted during the year covered by this report."

- Annual statistical reports will describe as appropriate for each restoration and enhancement area those parameters quantified as success indicators.

- Data for any nuisance species present will be tabulated separately from the remaining data.

Reports will be submitted annually within 60 days of data acquisition until a determination of successful seagrass restoration or enhancement has been made.

The Port Authority will notify the Department and the Corps of Engineers whenever the Port Authority believes the mitigation or a portion thereof is successful, for confirmation of acceptance. This notice will be sent to the DEP Office of Beaches and Coastal Systems, 3900 Commonwealth Boulevard, Mail Station 300, Tallahassee, Florida 32399-3000, with a copy sent to the DEP Southwest District Office, Submerged Lands and Environmental Resources Program, 3804 Coconut Palm Drive, Tampa, Florida 33619. This notice will also be sent to US Army Corps of Engineers, Jacksonville District, West Permits Branch.

The notice will include a copy of the most recent Annual Progress and Mitigation Success Report and a narrative describing how the reported data support the contention that the mitigation criteria have been met. The Port Authority will afford Agency personnel the opportunity to schedule and conduct enough on-site inspections of the mitigation sites to determine whether the criteria are met.

REMEDIAL ACTION

Remedial action will be performed at the Department's or the Corps of Engineers Regulatory Division's option if, after a mitigation area's second growing season, the agency staff determines, based on visual inspection and review of the monitoring reports, that the mitigation effort is not successful due to failure of the seagrasses in the mitigation area to expand at a rate that would result in the generation of mitigation credits within 5 years after planting. If remedial action is required, a remedial action plan will be prepared and submitted to the Department for review and approval. The plan may include additional planting activities or an alternative means of mitigation. The plan will include an analysis of the cause of the condition necessitating remedial action (i.e. elevation, siltation, bioturbation, algal blooms, etc.), and specify remedial action deemed necessary to address those situations. The remedial action plan will propose a schedule for implementation and completion of all of the provisions of the plan. Upon approval, the plan will be implemented according to the approved schedule. The plan will present methods and proposals to be reviewed and approved by the Agency. It will be provided within 60 days of the Agency's notification of failure determination. Implementation of the plan of corrective action will commence within 90 days of written approval by the Department or the Corps of Engineers Regulatory Division, unless otherwise agreed upon.

The following are descriptions of potential remedial action to be taken in the event of failure according to certain scenarios. The failure scenarios are selected based on concerns expressed by commentors involved in the permit application process. If a portion of the seagrass mitigation fails as described in the following scenarios and remedial action is necessary as specified in this section, the Port Authority will perform other parts of the permitted mitigation or propose to develop a remedial action plan based on the following.

- First failure scenario – loss of seagrass due to bioturbation (stingrays). If planted seagrasses are lost and the cause is determined to be a result of bioturbation, or disturbance by stingrays, the Port Authority will submit a remedial action plan to replant, as necessary, and install and maintain protective structures over the planted seagrasses until the seagrasses are established.

- Second failure scenario – loss of seagrasses at sites 1, 2 and 3 due to excessive current velocity. In this case, the Port Authority will submit a remedial action plan to replant and install and maintain current attenuation structures until seagrasses are established.

- Third failure scenario – loss of seagrasses in sites 1, 2 and 3 due to excessive currents after establishment and removal of current attenuation structures. In this case, the Port Authority will submit a remedial action plan to include planting of an alternative site, involving prior excavation if necessary, subject to Department approval. Scrapedown of a portion of the spoil island may be considered.

- Fourth failure scenario – loss of seagrasses at site 7 due to inadequate flushing. In this case, the Port Authority will submit a remedial action plan to alter or remove the remainder of the mangrove fringe between site 7 and the Bay, scraping the area down to –1 ft. NGVD, and replant seagrasses.

REASONABLE ASSURANCE

The seagrass mitigation project has been designed to generate mitigation credits in excess of the credits required to mitigate the impacts. A remedial action plan is provided that ensures success. The mitigation ratios ensure that seagrass values are replaced in excess of impacts. These features provide the necessary reasonable assurances.

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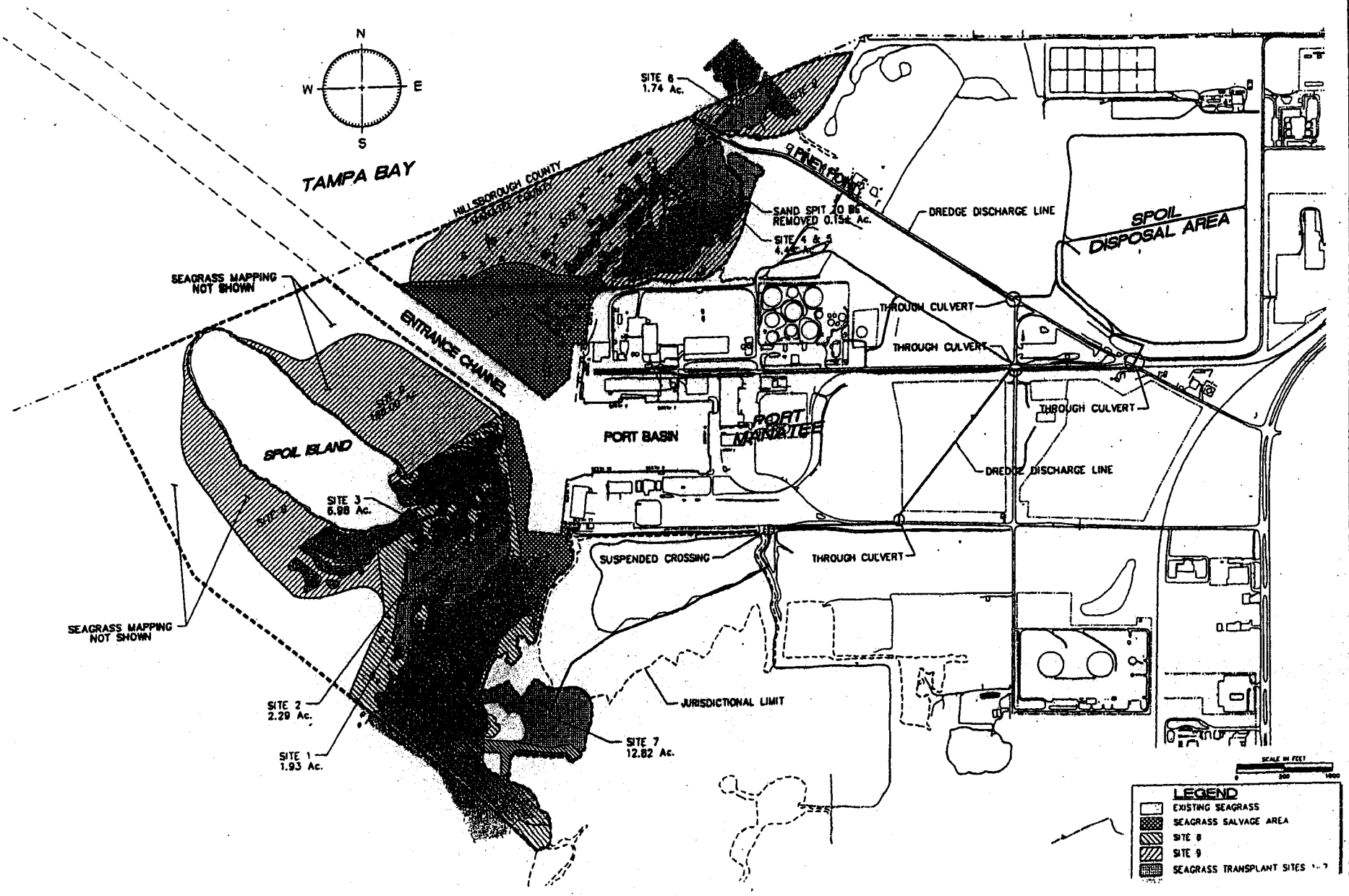

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SEAGRASS MITIGATION

MANATEE COUNTY PORT AUTHORITY

PORT MANATEE, MANATEE COUNTY, FLORIDA

GEE & JENSEN

Engineers • Architects • Planners, Inc.

JOB No.