E C O L O G I C A L   R E V I E W

Pass Chaland to Grand Bayou Pass Barrier Shoreline Restoration
CWPPRA Priority Project List 11
(State No. BA-35)

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This document reflects the project design as of the 95% Design Review meeting, incorporates all comments and recommendations received following the meeting, and is current as of November 21, 2005.

95% Ecological Review

Pass Chaland to Grand Bayou Pass Barrier Shoreline Restoration

In August 2000, the Louisiana Department of Natural Resources (LDNR) initiated the Ecological Review to improve the likelihood of restoration project success. This is a process whereby each restoration project's biotic benefits, goals, and strategies are evaluated prior to granting construction authorization. This evaluation utilizes monitoring and engineering information, as well as applicable scientific literature to assess whether or not, and to what degree, the proposed project features will cause the desired ecological response.

I. Introduction

The Pass Chaland to Grand Bayou Pass Barrier Shoreline Restoration (BA-35) project is located in Plaquemines Parish, Louisiana approximately fifty miles south of New Orleans. Part of the Plaquemines' barrier shoreline, the proposed project is bordered by Bayou Huertes to the west, Grand Bayou Pass on the east, Bay Joe Wise to the north, and the Gulf of Mexico to the south (Figure 1). The Pass Chaland to Grand Bayou Pass shoreline, better known as the Bay Joe Wise barrier island, is approximately 3.5 miles in length. The project area is 353 acres, 44 acres of which are land. The purpose of this project is to rebuild and nourish this particular stretch of barrier shoreline.

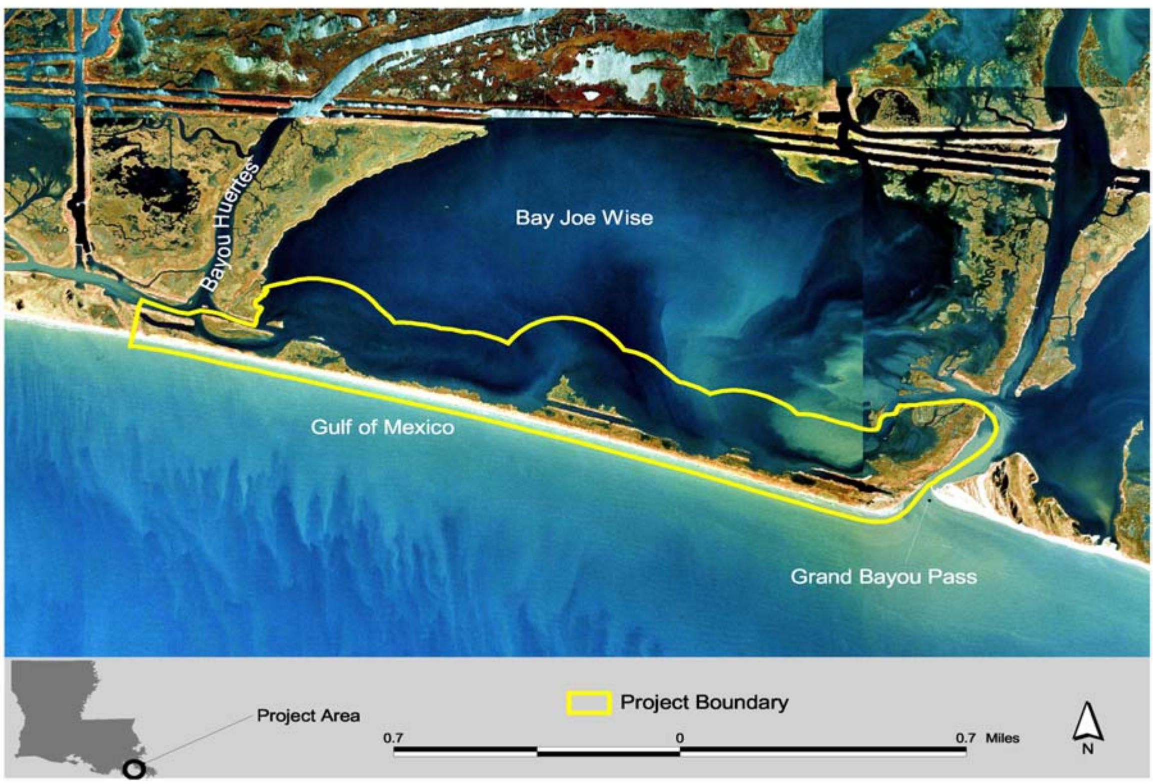

Figure 1. Pass Chaland to Grand Bayou Pass Barrier Shoreline Restoration Project (BA-35) boundary.

This proposed project was developed out of the comprehensive Barataria Shoreline Complex Project that had as an objective restoring the Plaquemines island chain from Quatre Bayou Pass to Grand Bayou Pass and Pelican Island. The Complex Project was simplified into two less complicated projects: Pass La Mer to Chaland Pass and Pelican Island (BA-38) and Pass Chaland to Grand Bayou Pass Barrier Shoreline Restoration (BA-35) (Figure 2). The originally approved project boundary for BA-35 stretched from Chaland Pass to Grand Bayou Pass but was reduced from the original Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) approved Priority Project List 10 boundary to encompass the area just west of Bayou Huertes on the western boundary up to Grand Bayou Pass on the east.

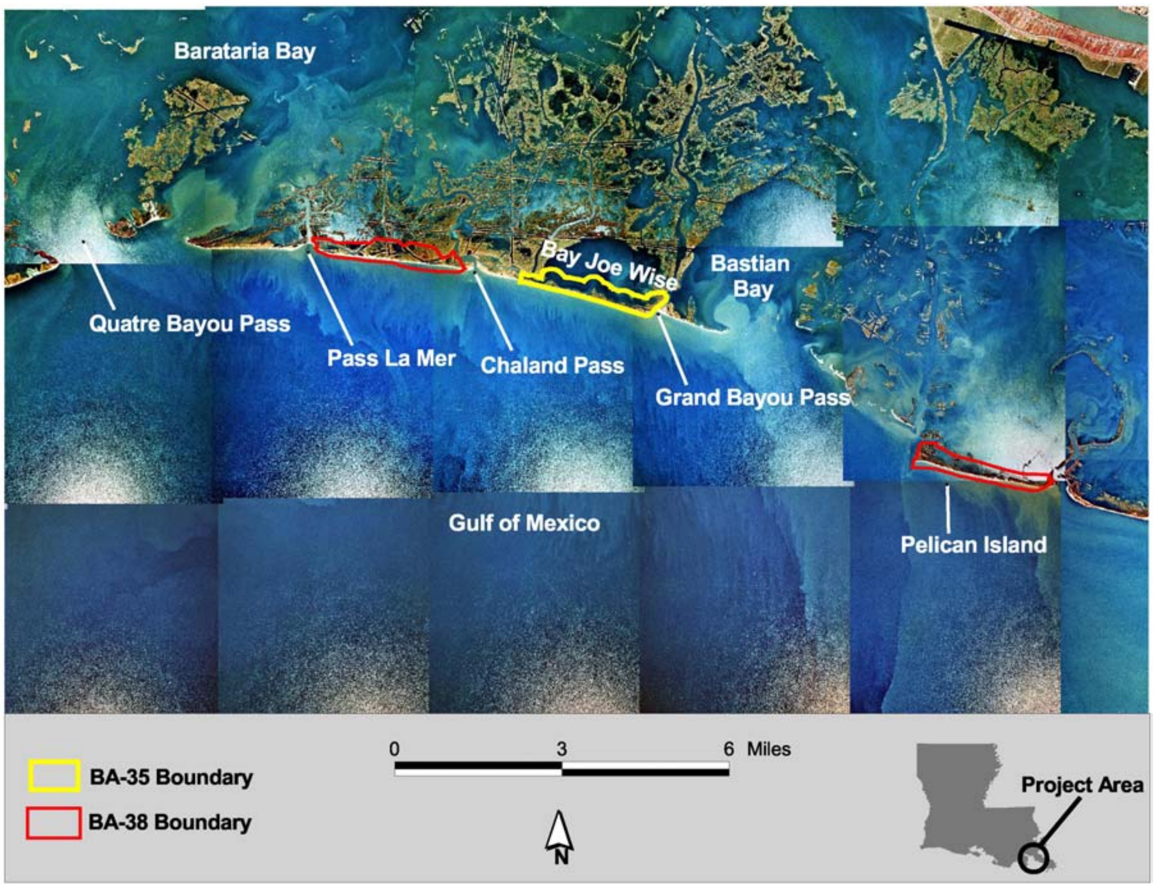

Figure 2. Individual project boundaries of the CWPPRA approved Barataria Complex Project.

The Williams' et al. (1992) atlas of shoreline change since 1880 details the retreat of barrier islands in Louisiana through graphical depictions of island transgression and bay and gulf-side loss rates. Cheniere Ronquille between Quatre Bayou Pass and Grand Bayou Pass experienced an average gulf shoreline change rate of 17.2 feet per year from 1988 to 2002 (Beall et al 2004). The entire island chain has sustained substantial losses on the bay and gulf sides due to pipeline canal construction and marine- and wind-induced shoreline erosion, respectively (National Marine Fisheries Service [NMFS] 2001). High rates of relative sea level rise (estimated at approximately 1 foot over the 20 year project life), a diminishing sediment supply, and storms have also influenced area loss rates. Several hurricanes have recently impacted the Plaquemines island chain: Andrew (1992), Danny (1997), Isidore (2002), and Katrina (2005). During the last 100 years, Louisiana's barrier islands have naturally decreased in land mass by approximately

40% (Monteferrante and Mendelssohn 1982). In some locations, erosion of Louisiana barrier islands exceeds 65 feet per year (Penland and Boyd 1981). The Barataria/Plaquemines area is one of the most rapidly disappearing areas in Louisiana, experiencing a loss rate of over 73 acres per year since 1988 (Coastal Research Laboratory [CRL], 2000). If this loss rate were applied over time, the short-term prediction for island disappearance would be year 2014 (CRL 2000).

Coast 2050 has identified the restoration of the barrier shoreline as a Region 2 ecosystem strategy that will maintain the integrity of the estuarine system (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation Restoration Authority [LCWCRTF & WCRA 1998]).

II. Goal Statement

- Create 226 acres of back-barrier marsh platform that will sustain an elevation between mean higher high water (+1.6 feet NAVD-88) and mean lower low water (+0.4 feet NAVD-88) for the majority of the 20-year project life.
- Maintain 171 acres of marsh habitat by the end of the 20-year project life representing a 161 acre net increase from the projected future without project (Table 1).
- Ensure approximately one quarter of the marsh platform would have 80% vegetative cover after the first complete post-planting growing season and that the entire marsh platform would have 80% vegetative cover after three complete post-planting growing seasons.
- Prevent breaching of the barrier shoreline throughout the 20-year project life.
- Optimize tidal linkage to created marsh platform.

Table 1. Acreage target comparison for BA-35 (NMFS 2001).

Target Year	Future Without Project (Acres of marsh)	Future With Project (Acres of marsh)
TY0	21	21
TY1 (as built)	20	247
TY3	18	232
TY10	15	209
TY20	10	171

III. Strategy Statement

- Deposit dredged marsh-compatible material into the back-bay area at elevation +2.6 feet NAVD-88 and 1000 feet wide.
- Construct a dune with an elevation of +7.0 feet NAVD-88 and a crest width of 50 feet.
- Use a phased planting approach to identify optimal planting conditions prior to

vegetation establishment through vegetation plantings.

- Create tidal features (e.g., 10,000 feet of tidal creeks and two 1-acre tidal ponds) and ensure tidal exchange (i.e., degrade containment dikes) post-construction.

IV. Strategy-Goal Relationship

Project goals are to be achieved through the successful establishment of marsh vegetation on dredged material used to fill in the proposed 1,000 foot marsh platform area that would extend from the existing headland shoreline bayward into Bay Joe Wise. A dune placed atop the existing land surface will help to reduce the impacts of storm surges thus decreasing erosion along the island.

V. Project Feature Evaluation

Alternative Discussion

Five design alternatives were designed and modeled by Coastal Engineering Consultants, Inc. (CEC) with help from SJB Group, Inc. (SJB) to determine the best possible scenario for restoring the Bay Joe Wise headland. The alternatives tested include a no-action alternative or future without project (FWOP), a marsh only alternative, a marsh and beach alternative, and two alternatives consisting of marsh, beach, and dune components. Table 2 provides a comparison of the alternative components and a graphical representation (Figures 3-6) of the four alternatives follows the text descriptions of each.

Table 2. Comparison of the design components of Alternatives 2, 3, 4, and 5.

Alternative	Marsh Dimensions	Beach Width	Construction Berm	Dune Dimensions	Project Footprint
1	N/A	N/A	N/A	N/A	N/A
2	+2.6 feet NAVD-88 and 800 feet wide	N/A	N/A	N/A	~800 feet
3	+2.6 feet NAVD-88 and 800 feet wide	~ 230 feet	+5.0 feet NAVD-88 and 70 feet wide	+7.0 feet NAVD-88 and 50 feet wide	~1,325 feet
4	+2.6 feet NAVD-88 and 800 feet wide	~ 300 feet	+4.0 feet NAVD-88 and 360 feet wide	N/A	~1,300 feet
5	+2.6 feet NAVD-88 and 1,000 feet wide	~ 300 feet	+5.0 feet NAVD-88 and 100 feet wide	+7.0 feet NAVD-88 and 50 feet wide	~1,500 feet

Alternative 1, the no-action alternative will allow comparison of future area conditions vs. the potential of alternatives 2-5.

Alternative 2 consists of construction of only a marsh platform. The platform would be approximately 250 acres beginning at the existing dune and extending into Bay Joe Wise (net marsh acres protected or created = 170). The net marsh acres for all alternatives are from CEC and SJB 2004. This alternative would address the marsh creation goal but would not address or accomplish other project goals and objectives, such as the prevention of breaching and increasing the overall elevation of the island (Figure 3).

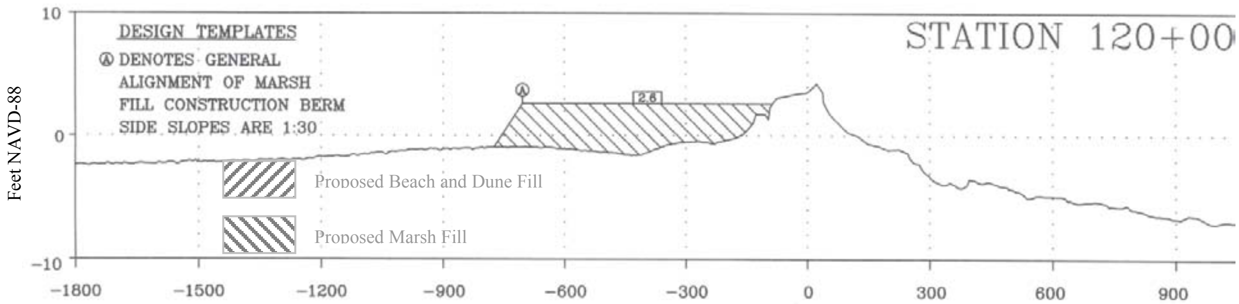

Figure 3. Alternative 2 – Design Template (CEC and SJB 2004)

Alternative 3 involves the construction of a marsh platform, a beach front, and a dune with the dune and beach components seaward of the existing island. The marsh component of this alternative will be constructed to the same dimensions as Alternative 2. In addition, a 50 foot wide dune constructed to +7.0 feet NAVD-88, a 70 foot wide construction berm constructed to +5.0 feet NAVD-88 seaward of the dune, and a 65 acre beach fill with an average width of 230 feet (net marsh acres protected or created = 210) will be incorporated into the design (Figure 4).

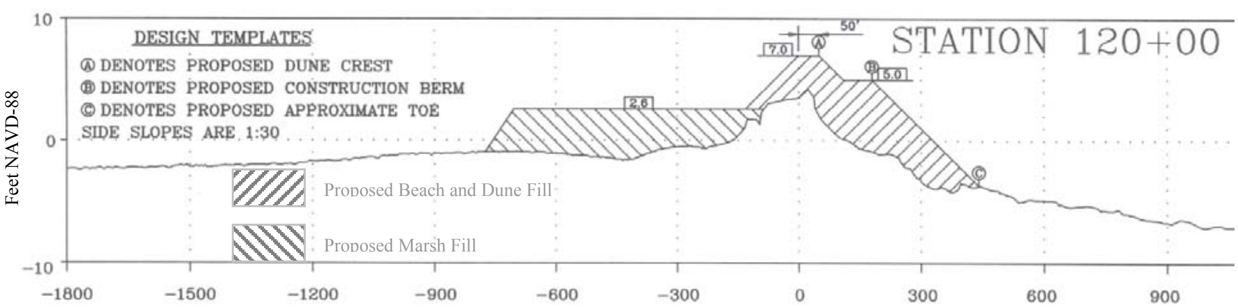

Figure 4. Alternative 3 – Design Template (CEC and SJB 2004)

Alternative 4 consists of constructing a marsh platform with a construction berm over the existing berm that slopes off seaward to a beach. The same marsh criteria as Alternatives 2 and 3 applies with the construction berm built at +4.0 feet NAVD-88 and 360 foot wide (net acres protected or created = 225) (Figure 5).

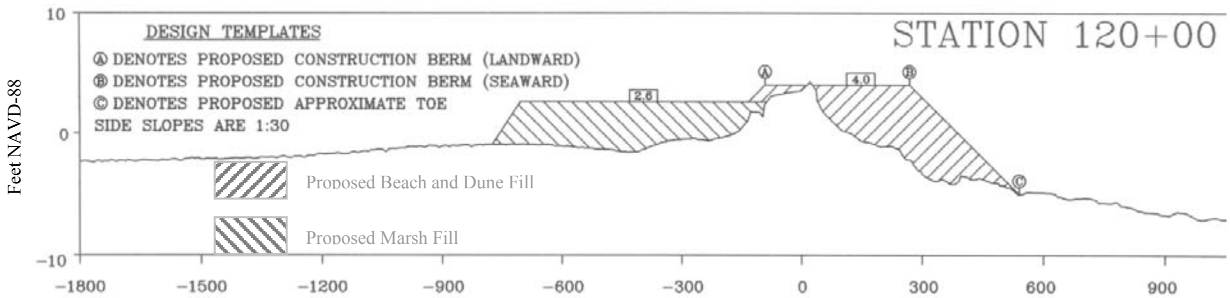

Figure 5. Alternative 4 – Design Template (CEC and SJB 2004)

Alternative 5 consists of a marsh platform, a beach, and a dune platform with the dune and beach constructed over the existing landform and extending bayward into Bay Joe Wise. The template dimensions are a 335 acre marsh platform, a 50 foot wide dune constructed at +7.0 feet NAVD-88, and a 100 foot wide construction berm (totaling 50 acres) at +5.0 feet NAVD-88 just seaward of the dune (net acres protected or created = 210) (Figure 6). This alternative also includes the construction of a secondary channel to replace an existing channel linkage that would be filled in due to creation of a larger marsh creation platform.

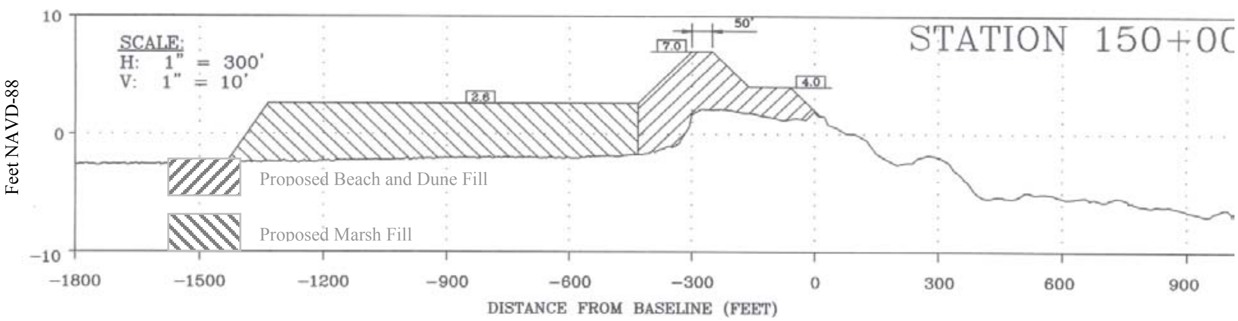

Figure 6. Alternative 5 – Design Template (CEC and SJB 2004)

Model Discussion

CEC utilized the Storm-Induced Beach Change Model (SBEACH), which predicts cross-shore sediment transport (longshore transport is not accounted for in this model) to model how the dune and beach components would react to design storms of 5, 10, and 20-year return. The computational tool is adequate to determine whether the design dunes will provide the desired benefit.

According to SBEACH, Alternative 1 will continue to lower in elevation and erode at current or potentially increased rates. Alternative 2 received significant damage in all design storm scenarios due to a lack of dune protection. Alternative 3 had a sufficiently designed dune height and width to abate significant damage to the dune and marsh features in the 5-year return storm scenario, but experienced appreciable amounts of dune lowering (down to +5.0 feet NAVD-88) and suffered considerable amounts of overwash in the 10 and 20-year return storm scenarios. Alternative 4 experienced, due to lack of a dune component, significant overwash during the 5-year return storm scenario so it was assumed that greater problems would occur in the 10 and 20-year scenarios. Alternative 5 did not suffer any significant damage during the 5-year storm scenario but did experience lowering in the 10 and 20-year storm scenarios.

Alternatives with the beach component built seaward experienced higher levels of beach erosion possibly due to the natural restructuring of the material. The alternatives (3 and 5) that restored the dunes to higher initial elevations (+7.0 feet NAVD-88) provided the marsh with far better protection against more regular storms (i.e., 5-year return interval). Although the dunes in these alternatives received higher damage in the 10 and 20-year return storm scenarios, the dune should remain intact to provide protection to the marsh platform and prevent breaching for longer into the 20-year project life. The resultant +5.0 feet NAVD-88 elevation of the dunes post 10 and 20-year storm will however allow significant overwash. The preferred alternatives as modeled by SBEACH are Alternatives 3 and 5.

According to the Advanced Circulation Model for Oceanic Coastal and Estuarine Waters (ADCIRC) run by CEC to test the impacts of proposed features on the tidal hydrology of the area, marsh designs for Alternatives 2, 3, and 4 constrict circulation on the western inlet of Bay Joe Wise due to the expanse of the marsh creation platform component. However, over time, the marsh platform will adjust and subside to compensate for the pinching. Alternative 5, which contains an even larger marsh component than any of the other 3 restoration alternatives, avoids impact to circulation because its design incorporates a secondary channel to maintain existing hydrologic conditions. The secondary channel thought to only be necessary in Alternative 5 would actually be beneficial to all alternatives (CEC and SJB 2004). Alternative 5 was determined to be the most suitable design following an analysis of the ADCIRC model output.

Alternative 5 (marsh, dune, and beach – landward) was determined to be the most feasible option for restoring and prolonging the Bay Joe Wise Headland based on SBEACH and ADCIRC model results and a criterion (i.e., constructability, cost, accomplish objective, and created acreage) developed for the technical, environmental, and fiscal evaluations of the project. This alternative performed extremely well in all design storm scenarios and maintained sufficient circulation even though it contained a larger marsh creation component. The marsh platform will be approximately 1,000 feet wide and will provide a substantial catchment area for over-washed material that will occur during storms. The secondary channel would negatively impact approximately 8.3 acres of existing marsh because an existing channel will be filled to accommodate the larger marsh platform of Alternative 5. The additionally created marsh acres from the marsh component of Alternative 5 should offset any negative impacts of constructing this alternative. Prior to demobilization, approximately 10,000 feet of tidal creeks will be constructed along with two 1-acre tidal ponds to mimic natural tidal hydrology.

<u>Geotechnical Evaluation</u>

A geophysical and geotechnical survey consisting of seismic sub-bottom profiling, side scan sonar mapping, magnetometer profiling, echo sounding, vibracore sampling, and sediment sample analysis was performed by Alpine Ocean Seismic Survey, Inc. (Alpine), SJB and CEC. The purpose of the surveying was to locate potential borrow areas, pipelines, wells, and other obstructions in the area that could pose problems with dredging practices necessary to construct the project features. Quatre Bayou Pass (located approximately 15 miles west of the project area) was identified as a logical area for construction sediment because of its proximity to the project area and the amount of suitable material available (CEC and SJB 2004). It is estimated that over 3.3 million cubic yards of clay, silt, or sand material will be necessary to construct each of the design Alternatives. It has been estimated that 3.7 million cubic yards of suitable material are available in the borrow area to construct all the components of the project (CEC and SJB 2004).

Depth of Closure

The depth of closure (DOC), defined by CEC and SJB as the seaward limit of active sand transport, was determined by comparing soil profiles to empirical solutions and values reported in the literature, and diver observations made in the field. This active area of sand transport is usually in the region where the beach toe interfaces with the mud bottom of gulf floor profiles. Based on the above analyses, the DOC was calculated to be approximately -10.5 feet NAVD-88. The island should not experience any negative impacts from dredging since the Quatre Bayou Pass borrow area is located significantly far enough offshore (15 foot depth contour) and away from (~8.5 miles) the project area.

Settlement Analysis

Settlement curves for the marsh platform and all berms were computed to determine how long the marsh platform would remain in the intertidal range and to determine how long the berms would protect the platform from wave surges during the dewatering and adjustment period following construction. The curves show that a platform constructed to +2.6 feet NAVD-88 would settle to an elevation below mean higher high water (+1.6 NAVD-88) but remain above mean lower low water (+0.4 feet NAVD-88) until the end of the 20-year project life (Figure 7). The intertidal range is also between those two elevations. The containment berms for the marsh platform will be constructed to +4.5 feet NAVD-88 to allow the appropriate time for the marsh platform to dewater. If necessary the berms will be degraded at a later date to enhance tidal linkage.

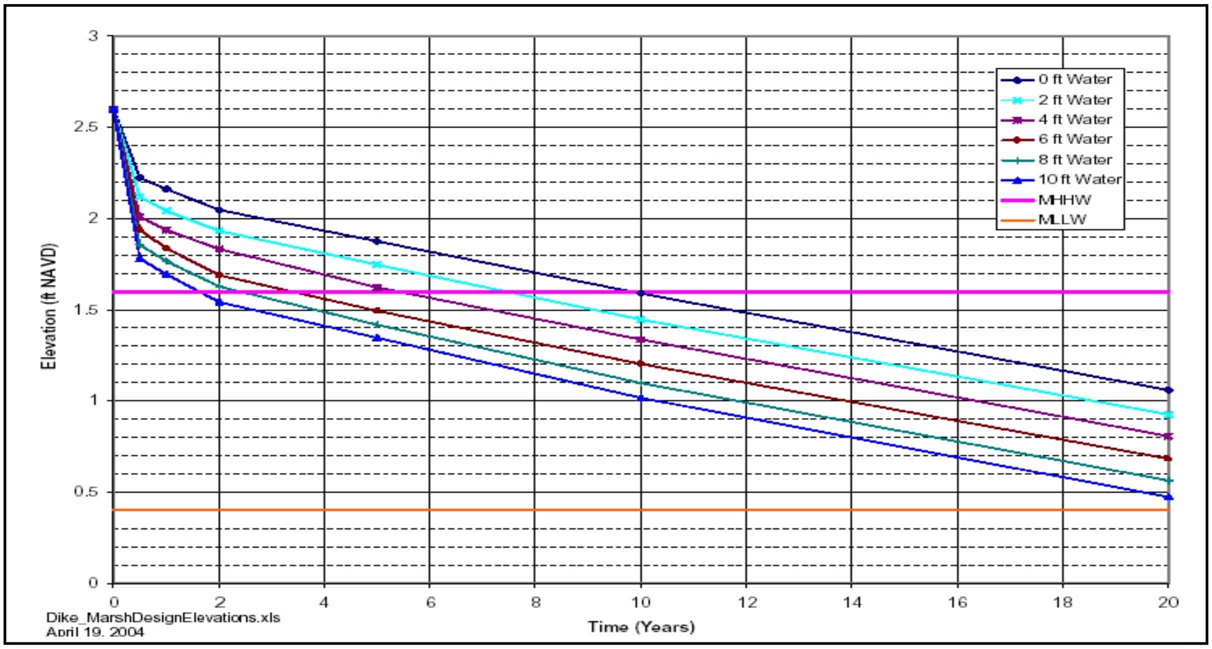

Figure 7. Marsh platform settlement curves from construction completion (TYO toTY20) of the project life (CEC and SJB 2004). The legend contains water depths where the marsh platform would be constructed.

The accepted measure of a slope's stability is its "safety factor" or minimum factor of safety (FSmin), which is the ratio of the forces or moments tending to prevent failure (primarily soil strength) to those that cause failure (primarily soil and surcharge weights plus seepage forces) (Soil Testing Engineers, Inc. 2001). The FSmin equals 1.3 for a tidally influenced area like this one. The higher the safety factor, the less likely the berm will fail. In the 4 foot water depths, for example, it would be safer to construct a dike with 1(V):8(H) side slopes and 1 foot of freeboard than it would be to construct the same sloped dike with 4 feet of freeboard. The additional weight of material necessary to construct 3 extra feet of containment decreases confidence in the side slopes to hold up under the added weight. Constructing lower berms would decrease the possibility of slope failure but may not provide adequate containment, whereas a similarly-sloped dike with more freeboard would have a lower safety factor and would be more likely to have slope failure but would less likely be overtopped.

<u>Sand-fencing</u>

The Barrier Island Comprehensive Monitoring Program (BICM) recommends installing sand-fencing 4 feet high with 50% porosity (i.e., ratio of area of open space to total projected area) placed shore-parallel along the entire length of the dune to capture wind-blown sand and to help build and stabilize mounds (Lee and Khalil, In Press). Monitoring results of previously constructed projects have shown the effectiveness of sand-fences to stabilize dunes and trap wind-blown sand (Mendelssohn et al. 1991).

<u>Vegetation</u>

The dune will be vegetated with *Spartina patens* (marshhay cordgrass) and *Panicum amarum* (bitter panicum) with a density equivalent of 4-inch trade containers on 10-foot centers. The United States Department of Agriculture (USDA) recommended the use of both *S. patens* and *P. amarum* in dune restoration projects (USDA 1992). These plants should stabilize sand particles when used in conjunction with sand fencing. However, it should be noted that prior attempts to incorporate vegetative plantings into the construction phase of a project's design have not yielded favorable results. Therefore the LDNR, Coastal Engineering Division has developed a protocol to increase the likelihood of success. This protocol entails 1) implementation of plantings a year after construction to allow adequate dewatering and adjustment of the placed material, 2) a review of past planting plans and specifications, and 3) an evaluation of species used in past projects. Revisions made to improve the next project's design (e.g., diversifying plant types, installing dune plants sooner, and using larger/wider marsh platform plantings) will be based on the ability to accurately pinpoint past vegetation planting problems (Kenneth Bahlinger, LDNR, Personal Communication, April 2005).

VI. Assessment of Goal Attainability:

The Assessment of Goal Attainability focuses on the likelihood that the proposed project features (i.e., the dune and marsh platform creation, sand fencing, and vegetation plantings) will yield the desired ecological response. This section details the findings from a review of scientific literature and monitoring results of projects similar in scope to the Pass Chaland to Grand Bayou Pass Barrier Shoreline Restoration project.

Dune and Marsh Platform Building

Beach nourishment, or fill, generally can be defined as the artificial addition of suitable quality sediment to an island area that has a sediment deficiency in order to rebuild and maintain that area at a width that provides storm protection and a re-creation area (Campbell and Spadone 1982). According to the Louisiana Gulf Shoreline Restoration Report (Campbell and Benedet 2003), the basic design for beach nourishment should place enough sediment in the island system to produce a volumetrically stable and sediment-rich barrier complex. The most important parameter when developing an optimal design is to compensate for the amount of sediment typically lost naturally by the system. An initial increase in volume placed should be incorporated to minimize those losses and reduce impacts to the existing island. The alternatives as designed by CPE have incorporated an advanced fill section in an attempt to protect the design fill section.

The height of artificial dunes has been a controversial subject. Some believe that dune height should mimic the natural surroundings and allow for overwash of the islands. Penland et al. (2003) recommends building dunes at an elevation that mimics natural barrier island conditions (+3.0 to +6.0 feet NAVD-88) to facilitate an increase in biodiversity. Others believe that dune height should be significantly higher than natural dunes to protect infrastructure and prevent overwash during storm events (Campbell and Benedet 2003). Dune height should be a function of specific project goals. If the goal of the project is to prevent overwash, higher dunes should be utilized, but if the goal is just to prevent breaching, the goal may be accomplished with lower, wider dunes.

There are several recently constructed CWPPRA barrier island projects that have included the design and implementation of dune and marsh platforms. However, it is difficult to evaluate these projects due to the fact that environmental monitoring data are limited. In fact, lack of pre- and post-construction monitoring and engineering data has been identified as a significant problem with past attempts to assess the effectiveness of other beach nourishment projects (Davison et al. 1992). For comparison purposes, a list of constructed CWPPRA projects along the Isle Dernieres barrier island chain and their respective design parameters are given, listed below:

- Isle Dernieres Restoration East Island (TE-20)
  - Marsh platform constructed to an elevation of +4.0 feet NGVD-29 and 800 feet wide
  - Dune elevation of +8 feet NAVD-88 with a dune width of 300 to 500 feet
  - Construction completed in July 1999

- Isle Dernieres Restoration Trinity Island (TE-24)
  - Marsh platform constructed to an elevation of +4.0 feet NGVD-29 and 800 feet wide
  - Dune elevation of +8.0 feet NAVD-88 with a dune width of 300 feet
  - Construction completed in July 1999

- East Timbalier Island Sediment Restoration - Phase 1 (TE-25)
  - Marsh platform constructed to an elevation of +3.0 feet NGVD-29 and 500 feet wide
  - Dune elevation of +5.0 feet NAVD-88 and dune width of 200 feet
  - Construction was completed in May 2001

- Whiskey Island Restoration (TE-27)
  - Dune and Marsh elevations ranging from +3.0 to +4.0 feet NAVD-88 with a width of 300 to 500 feet
  - Construction completed in July 1999

- Timbalier Island Dune and Marsh Creation (TE-40)
  - Marsh platform constructed to an elevation of +1.4 feet NAVD-88 and 800 feet wide
  - Dune elevation of +8.0 feet NAVD-88 and a dune width of 400 feet
  - Currently under construction

These are just a few examples of projects similar to the Pass Chaland to Grand Bayou Pass Barrier Shoreline Restoration project that should provide input on the effectiveness of restoration techniques involving dune, beach, and marsh platforms to restore barrier islands. The varying feature designs should also provide an algorithm to test the effectiveness of each design to meet the specified goals of these and future projects.

Vegetation Plantings and Sand Fencing

Factors that may affect vegetation planting projects include soil characteristics, wave fetch, herbivore threats, and many other site-specific conditions (Bahlinger 1995).

The following studies support the use of vegetation plantings in barrier island restoration projects, when used in combination with sand-fencing:

- Mendelssohn et al. (1991) demonstrated the success of effectively building dunes in low sediment supply systems such as the Bay Joe Wise area, by combining vegetation plantings with sand-fencing to decrease wind velocity along the dune. The three species of plants used in the study were *Panicum amarum* (bitter panicum), *Uniola paniculata* (sea oats), and *Paspalum vaginatum* (seashore paspalum). Mendelssohn et al. also concluded that straight fences with spurs were initially more successful at accumulating sand and promoting dune height than other alignments and that the only way to maintain a healthy, well-vegetated dune on Louisiana transgressive barrier islands appeared to be through beach nourishment, dune building, and vegetative stabilization.

- In 1992, LDNR performed a restoration study on vegetation plantings which incorporated the use of *Spartina patens* (marshhay cordgrass) planted at Trinity Island, one of the four islands in the Isles Dernieres chain. By 1994, the transplanted *S. patens* along with other native vegetation such as *Salicornia virginica* (salicornia), *Baccharis halimifolia* (baccharis), *Avicennia germinans* (black mangrove), and *Solidago sempervirens* (seaside goldenrod) spread to assist in stabilizing the island (Bahlinger 1995).

Table 3 lists vegetation planting projects that have been constructed on barrier islands and funded through CWPPRA. Results from these projects suggest that the timing and scheduling of the planting is critical. Sand-fences should be installed immediately after construction to minimize immediate losses due to post-construction material adjustment and provide a protective barrier for the plantings. Based on the best professional judgment of those involved with these projects, the deposited material should be allowed to settle and dewater, prior to vegetation establishment, for approximately one complete growing season in order to minimize plant establishment in topographical depressions. Barrier Island projects constructed in Coastal Louisiana that have included vegetation and sand-fencing have generally been able to better maintain target elevations, thus improving their ability to abate storms.

Table 3. Vegetation Plantings Implemented as Part of CWPPRA Barrier Island Restoration Projects.

Project Name	Date Planted	Date Monitored	Species Planted	# of Plants	Planting Plots	Monitoring Results
Vegetative Planting of Dredged Material Disposal on Grand Terre Island (BA-28)	May 2001	2003	*Spartina alterniflora*	35,000 plugs	Dredge Spoil Area	84.57% mean cover at 100% of the bay stations monitored.
			A. germinans	600 tube containers	Dredge Spoil Area	0.1% mean cover at 7% of the dune stations monitored. 4.5% mean cover at 50% of the bay station monitored.
			S. patens	3,100 four-inch containers	Dredge Spoil Area	39% mean cover at 43% of the dune stations monitored.
			P. amarum	3,100 four-inch containers	Dredge Spoil Area	31% mean cover at 64% of the dune stations monitored.
			Spartina spartinae	3,100 four-inch containers	Dredge Spoil Area	No cover in stations monitored.
Eastern Isles Dernieres, East	July 1999	2003	*P. amarum*	N/A	Spur Plots	24% mean cover at 64.65% of the spur stations monitored. 18.33% mean cover at 42.86% of

Project Name	Date Planted	Date Monitored	Species Planted	# of Plants	Planting Plots	Monitoring Results
Island (TE-20)						the unplanted stations monitored. No cover in bay stations monitored.
			S. patens	N/A	Spur Plots	0.55% mean cover at 28.57% of the unplanted stations monitored. No cover in spur stations.
			S. alterniflora	N/A	Bay Plots	No cover in bay stations monitored.
Eastern Isles Dernieres, Trinity Island (TE-24)	July 1999	2003	*P. amarum*	N/A	Dune and Spur Plots	20% mean cover at 7.69% of the dune stations monitored. 18% mean cover at the 30.77% of the bay stations monitored. 27.50% mean cover at 50% of the spur stations monitored. 11.75% mean cover at 36.36% of the unplanted stations monitored.
			S. patens	N/A	Dune Plots	76% mean cover at 7.69% of the dune stations monitored. 27.10% mean cover at 76.92% of the bay stations monitored. 7.5% mean cover at 16.67 of the spur stations monitored. 2% mean cover at 9.09% of the unplanted stations monitored.
			S. alterniflora	N/A	Bay Plots	No cover in bay stations monitored.
Whiskey Island Restoration (TE-27)	July 1999	2003	*P. amarum*	N/A	Dune and Spur Plots	46.70% mean cover at 25% of the spur stations monitored. 6.55% mean cover at 18.18% of the unplanted stations monitored. No cover in dune stations monitored.
			S. patens	N/A	Dune Plots	25% mean cover at 25% of the spur stations monitored. 5.67% mean cover at 27.27% of the unplanted stations monitored. No cover in dune stations monitored.
			S. alterniflora	N/A	Bay Plots	32.50% mean cover at 33.33% of the bay stations monitored. 0.10% at 9.09% of the unplanted stations monitored. Was not planted on dune.
Timbalier Island Planting Demonstration (TE-18)	1996	1999	*S. patens*	N/A	Dune	22% mean cover at 100% of the bayside stations monitored. 7% mean cover at 100% of the gulfside dune stations monitored.
			P. amarum	N/A	Dune	16% mean cover at 100% of the bayside dune stations monitored. 9% cover at 100% of the gulfside dune stations monitored.

*Notes: The percent cover numbers are representative of the amount of each species present during the monitoring event at a percentage of the available monitoring stations. To calculate the mean cover percentages for the entire set of stations multiply the mean cover percent by the percent of stations where the species was present.

Tidal Creeks

The sustainability of any created or managed marshes requires that the marsh substrate build vertically at a rate at least equal to local rates of relative sea-level rise. In coastal salt marshes, natural processes of sediment deposition are the dominant means by which this is achieved (Frey and Basan 1985). Studies of marshes where impaired tidal hydrology has been restored show that the recovery of a salt marsh's functionality (e.g., fish utilization) is dependent upon the degree of flooding depth, duration, and frequency (Burdick et al. 1997). While marsh elevation in the tidal frame is the essential control of these hydroperiod parameters, sedimentation rates in newly re-flooded intertidal areas are the critical determinant of elevation as well as being important in the long-term sustainability of the systems (Reed et al. 1999). Haltiner et al. (1997) however, has documented that poor designing of tidal creeks in a marsh created with dredged material, in combination with a low marsh elevation, resulted in erosion rather than sedimentation in parts of the marsh system. Incorporation of tidal creeks in marsh restoration projects is a necessity if those estuarine areas are to return from a declined state back to their natural state. Although, further research should be conducted and care taken to ensure proper design and implementation, the design of the selected marsh alternative platform should be sufficient to maintain the marsh at an intertidal level and thus allow for a functional tidal creek system.

Summary and Conclusions:

The purpose of the Pass Chaland to Grand Bayou Pass Barrier Shoreline Restoration project is to rebuild and nourish the Bay Joe Wise Headland. High rates of relative sea level rise, the lack of a sediment supply, and repeated storm impacts have left the headland in a critical state. The headland has also sustained substantial losses due to petroleum industry activity and wind-induced shoreline erosion on both the bay and gulf shorelines. The proposed project suggests restoring the headland by creating marsh, dune platform, and a beach over the existing land and into the bay behind the headland.

Coastal Engineering Consultants, Inc. used hydrodynamic models to mimic island hydrology, evaluate design alternatives, and determine the effects of dredging sand from borrow areas to determine the best means of restoring the Bay Joe Wise Headland from Chaland Pass to Grand Bayou Pass. SBEACH and ADCIRC were used to test the five design alternatives' effectiveness at abating three hypothetical storm scenarios (5-, 10-, and 20- year return storms). The response of the design alternatives to the storm scenarios was used to predict the best alternative to restore and maintain the island. The models showed that the dune and beach features of Alternative 5 were the most successful at dampening the impacts of higher intensity storms, protecting the marsh platform, and maintaining tidal circulation.

A review of both published and unpublished literature of previously constructed restoration projects similar in nature and design to the Pass Chaland to Grand Bayou Pass Barrier Shoreline Restoration project were used to confirm the efficiency of dune, marsh, and beaches as barrier island restoration features. Monitoring results for projects of this nature have limited documented data to suggest each feature's effectiveness but they do provide vegetation and sand fence findings that show fences and vegetation plantings are a major component for successfully stabilizing dunes constructed for the purpose of restoring barrier islands.

To better mimic the processes of naturally occurring islands in estuarine systems, tidal creeks and ponds have been incorporated into the design of the project. Tidal creeks and ponds can return the tidal hydrology to pre-construction conditions. The actual method of construction (pre- or post-construction) will be left up to the contractor. The lack of quality data comparing the two construction methods is the reason the project team chose to leave construction to the contractors.

The LDNR concludes that island restoration may be possible if adequate abatement of impacts (due to wave surges created by hurricanes and tropical storms) can be achieved via dune, marsh, and beach creation. Historically, these events have been the main causes of land loss in the area. Constructing the selected design alternative should provide a platform for overwash and transgression to help maintain Bay Joe Wise; however, due to the lack of monitoring information available on most of the constructed island projects, it is difficult to reach a conclusive opinion on the effectiveness of beach restoration projects. This project and constructed projects similar in design provide a prime opportunity to study island restoration techniques and better design future barrier islands projects.

VII. Recommendations

Based on the investigations of similar restoration projects and a review of engineering principles, the proposed strategies of the Pass Chaland to Grand Bayou Pass Barrier Shoreline Restoration project will likely achieve most of the desired ecological goals. Upon thorough analysis of the recommendations presented by SJB and CEC in the Preliminary Design Report and 95% Design Review Submittals, the LDNR project team maintains its concurrence with the selection of Alternative 5. Since the 30% Design Review, the design team increased the total volume of material placed to offset the negative impacts of Hurricane Katrina, which impacted the island in August of 2005 and caused the loss of existing supratidal material and increases in the widths of existing breaches. The current level of design warrants continued progress towards Phase II funding.

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Appendix A

PELICAN ISLAND
AND
PASS CHALAND TO PASS LA MER (BA-38)
VEGETATION PLANTINGS
7 OCTOBER 2003

DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT

Preliminary Planting Schedule

Pelican Island

Dune Planting: Based on 15,000 l.f. dune, approximately 210-280 feet wide with two parallel sand fences on the dune.

Bitter Panicum	60,000	4" Containers, 20 Rows
Gulf Cordgrass	10,500	4" Containers, 3.5 Rows
Spartina patens	3,000	4" Containers, 1 Row
Sea Oats	1,500	Gallon, .5 Row

Marsh Planting: Based on 220 acres of created marsh, with tidal creek features.

Spartina alterniflora	190,000	Plugs, Rows 10' apart, plants 5' o.c.
Matrimony Vine	6,000	4" Container, Planted at foot of dune
Mangrove	3,000	Tube, Planted at higher areas

Pass Chaland to Pass La Mer

Dune Planting: Based on 15,000 l.f. dune, approximately 210-280 feet wide with two parallel sand fences on the dune.

Bitter Panicum	60,000	4" Containers, 20 Rows
Gulf Cordgrass	10,500	4" Containers, 3.5 Rows
Spartina patens	3,000	4" Containers, 1 Row
Sea Oats	1,500	Gallon, .5 Row

Marsh Planting: Based on 248 acres of created marsh, with tidal creek features.

Spartina alterniflora	215,000	Plugs, Rows 10' apart, plants 5' o.c.
Matrimony Vine	6,000	4" Container, Planted at foot of dune
Mangrove	3,000	Tube, Planted at higher areas