MRGO ECOSYSTEM RESTORATION PLAN FEASIBILITY STUDY

COMMUNICATION

FROM

THE ASSISTANT SECRETARY OF THE ARMY, CIVIL WORKS, THE DEPARTMENT OF DEFENSE

TRANSMITTING

MRGO ECOSYSTEM RESTORATION PLAN FEASIBILITY STUDY

PART 2 OF 7



DECEMBER 19, 2013.—Referred to the Committee on Transportation and Infrastructure and ordered to be printed

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U.S. GOVERNMENT PRINTING OFFICE

87–144 WASHINGTON : 2013

AUTHENTICATED
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APPENDIX

A

MRGO Ecosystem Restoration Plan
Final Scoping Report

May 2009



US Army Corps
of Engineers ®
New Orleans District

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I. Introduction

The Mississippi River Gulf Outlet (MRGO) was authorized by Congress in 1956 as a Federal navigation channel to provide a shorter route between the Port of New Orleans and the Gulf of Mexico. The MRGO navigation channel has not been maintained since the storm, and in 2006 the U.S. Army Corps of Engineers (USACE) was ordered by Congress to study the possibility of de-authorizing deep-draft navigation on the portion of the MRGO between the Gulf Intracoastal Waterway (GIWW) and the Gulf of Mexico. The USACE Chief of Engineers issued an MRGO Deep-Draft De-Authorization Report dated January 29, 2008, which recommended de-authorization and construction of a rock closure structure in the vicinity of the Bayou La Loutre ridge in St. Bernard Parish, LA. On June 5, 2008, Congress officially de-authorized the MRGO from the GIWW to the Gulf, and authorized the MRGO closure and the development of an Ecosystem Restoration Plan in accordance with the Water Resources Development Act (WRDA) of 2007, Section 7013.

USACE is conducting a feasibility study as part of a comprehensive Ecosystem Restoration Plan to restore and maintain estuarine habitat affected by the MRGO navigation channel. The feasibility study will supplement the MRGO Deep-Draft De-Authorization Report. The study will be fully funded by the Federal government. In conjunction with the Ecosystem Restoration Plan, an environmental impact statement (EIS) is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969. A notice of intent to prepare an EIS was published in the Federal Register on October 2, 2008. A notice of study initiation and request for Cooperating Agencies was mailed out to respective Federal and State agencies on October 23, 2008. A scoping meeting announcement was mailed in mid October 2008 to all individuals, organizations, and agencies believed to have an interest in the EIS. Two public meetings were conducted: one in Chalmette, Louisiana, on November 3, 2008 and a second in Waveland, Mississippi, on November 6, 2008.

This Scoping Report outlines the project background and scoping process to date, and summarizes the key issues identified by members of the public during the initial scoping period, which began on October 2, 2008. Comments received after November 20, 2008, are not included in this report; however, they are considered in the development of the restoration plan and analysis of the environmental impact statement. An analysis of the comments identified 18 themes that are detailed in Section IV. The top five themes represent 52 percent of the comments received by November 20:

1. Sediment diversions are needed to help restore marshes/wetlands.
2. Restore the ecosystem to a pre-disturbance/historical condition.
3. Restoring the first line of hurricane defense for public safety is a priority.
4. Focus on restoring the flow of water (hydrology).
5. Implement/incorporate existing plans.

II. Background

The MRGO provided a shortened shipping route between the Port of New Orleans and the Gulf of Mexico for nearly 45 years. On June 5, 2008, the MRGO was de-authorized between the Gulf of Mexico and the GIWW, and a rock closure structure was approved for construction in the vicinity of Bayou La Loutre in St. Bernard Parish, LA.

The feasibility study area is a tidally influenced coastal ecosystem potentially affected by the MRGO channel. The study area generally includes portions of southeast Louisiana and southwest Mississippi. In Louisiana, the study area includes the Lake Pontchartrain Basin, Breton Sound Basin its bordering wetlands and barrier islands. In Mississippi, the study area includes portions of western Mississippi Sound, its bordering wetlands, and barrier islands.

The feasibility study will evaluate the following issues:

- Decreased fresh water, sediment, and nutrient inputs
- Hydrologic modifications
- Saltwater intrusion
- Wetland loss
- Ridge habitat degradation and destruction
- Retreating and eroding barrier islands
- Shoreline erosion
- Subsidence
- Sea level rise
- Altered circulation and water quality
- Habitat changes
- Loss of shallow ponds

The feasibility study will investigate the following opportunities for ecosystem restoration to address the issues defined above:

- Freshwater, sediment, and nutrient introduction
- Wetland protection, restoration, and creation
- Shoreline protection
- Bank stabilization
- Ridge protection and restoration
- Barrier island protection and restoration
- Water control (gates, weirs, sills, plugs, fill areas, etc.)
- Use of native vegetation

- Natural features with benefits for storm surge damage reduction
- Modifications of MRGO project features (authorized or de-authorized)
- Modifications to other authorized projects in the area

III. Scoping

NEPA affords all persons, organizations, and government agencies the right to review and comment on proposed major Federal actions that are evaluated by a NEPA document. This is known as the "Scoping Process." The scoping process is the initial step in the preparation of the EIS. The scoping process is an early and open process to help determine the scope of issues to address and identify the significant issues related to the proposed action. Therefore, the scoping process will help identify (1) the range of actions (project, procedural changes), (2) alternatives—both those to be rigorously explored and evaluated and those that may be eliminated, and (3) the range of environmental resources considered in the evaluation of potential environmental impacts.

A project kick-off meeting and two public scoping meetings were organized and hosted in accordance with NEPA to gather input from interested parties, agencies, and the public for the development of the MRGO Ecosystem Restoration Plan and EIS, and to introduce the plan development efforts. A project kick-off meeting was held with State and Federal resource agencies on October 8, 2008. Public scoping meetings were conducted on November 3, 2008, in Chalmette, Louisiana, and November 6, 2008 in Waveland, Mississippi. The purpose of the scoping meetings was to help identify the major issues and relevant resources that would be considered in the draft EIS being prepared for the MRGO restoration study. A total of 89 people attended the two meetings. Comments were received and recorded at the meetings, and via e-mail and other communication channels provided by USACE. There were 322 comments received and recorded as of November 20.

IV. Scoping Meetings

A. Public Notification

The public was notified of both meetings using the following communication mechanisms (included in Appendix A):

- A Notice of Intent published in the Federal Register on October 2, 2008.
- A display ad was placed in the *Times-Picayune, St. Bernard Voice, Baton Rouge Advocate, Bay St. Louis Sea Echo,* and *Biloxi Gulfport Sun Herald.* The ads ran as follows: October 30 and November 1 in the *Times-Picayune*, October 31 in the *St. Bernard Voice*, November 1 in the *Baton Rouge Advocate*, November 2 in the *Biloxi Gulfport Sun Herald,* and November 5 in the *Bay St. Louis Sea Coast Echo.*
- A Public Notice was mailed and/or e-mailed to the NEPA mailing list, which was comprised of the MRGO mailing list and stakeholder list.
- A meeting notice was placed on the MRGO and St. Bernard Parish Web sites.
- A media advisory was sent to local Louisiana, Mississippi and regional media outlets.

B. Meeting Process

The Chalmette meeting was conducted according to the following agenda:

Open house	6:00 p.m. – 7:00 p.m.
Opening remarks	7:00 p.m. – 7:15 p.m.
Small group sessions	7:15 p.m. – 8:15 p.m.
Group reports	8:15 p.m. – 8:50 p.m.
Wrap-up	8:50 p.m. – 9:00 p.m.

The Waveland meeting followed a similar format; however one larger discussion took place. Participants were provided with information packets that included a handout explaining the scoping meeting process, facts sheets, and feedback forms. These are included in Appendix B.

During the open house, participants were provided the opportunity to circulate and review a series of poster and map stations to learn more about the USACE effort, the issues in the study area, and the possible solutions, as well as the NEPA process. The posters presented during the open house are included in Appendix B. Subject matter experts were on hand at each station to answer questions and clarify information on the posters and handouts.

Opening remarks were made by community and USACE representatives. During opening remarks, the scoping process was explained to attendees who were advised that comments would become part of the record of the meeting. At the more heavily attended Chalmette meeting, participants were invited to break into smaller facilitated discussion groups where they could freely voice their concerns and, specifically, communicate their suggestions for the feasibility study. Maps were provided for those who wanted to pinpoint project areas and mark them with their suggested restoration ideas. Once meeting participants reconvened, facilitators from each group session reported the key points raised in each session.

USACE representatives wrapped up the meeting by thanking participants for their attendance and contributions and encouraging them to submit comments for inclusion in the Scoping Report by November 20, 2008, via the following means:

Send e-mail comments to: MRGOreply@usace.army.mil
Visit the project Web site at: http://mrgo.usace.army.mil

Mail comments to:
MRGO Ecosystem Restoration
EIS Manager
CEMVN-PM-RS
P.O. Box 60267
New Orleans, LA 70160-0267

Overnight comments to:

MRGO Ecosystem Restoration
EIS Manager
CEMVN-PM-RS
7400 Leake Avenue
New Orleans, LA 70118-3651

C. Meeting Venues

The meetings took place at the following locations:

Monday, November 3, 2008
C.F. Rowley School
49 Madison Avenue
Chalmette, LA 70043

Thursday, November 6, 2008
Leo Seal Community Center
529 Highway 90
Waveland, MS 39576

D. Meeting Attendance

Meeting attendance was compiled from the registration cards provided at each meeting. At least two individuals with recorded comments did not provide registration cards. The Chalmette meeting was more heavily attended than the Waveland meeting, which was most likely due to the fact that the study area is more concentrated in the Chalmette area, so more local interest was generated. Table 1 shows a summary of meeting attendance.

Table 1. Summary of Meeting Attendance

	Chalmette (November 3)	Waveland (November 6)	Total	Percentage
Private Citizen	28	3	31	35%
Industry	13	3	16	18%
Citizens' Group	9	0	9	10%
NGO	9	0	9	10%
Local Government	9	0	9	10%
State Government	4	3	7	8%
Education	6	0	6	7%
Federal Government	1	1	2	2%
Total:	***79***	***10***	***89***	***100%***

Private citizens accounted for 35 percent of the attendance. Participants who did not enter an organization group on the registration card were categorized as 'private citizen.' Citizens' groups included neighborhood and homeowners' associations such as the Holy Cross Neighborhood Association and Eden Isle Homeowners. These two stakeholder groups represented 45 percent of the participants. Industry was the second most represented group at both meetings, with environmental engineering firms listed most frequently.

The government category represented mostly local and State government. There were seven representatives of the St. Bernard Parish Government at the Chalmette meeting. The Louisiana Office of Coastal Protection and Restoration was represented at both meetings. The single Federal government representative at Chalmette was from the Coast Guard, and a representative of the U.S. Fish and Wildlife Service attended the Waveland meeting.

Non-government organizations (NGOs) represented included University of New Orleans-Chart and the Sierra Club.

V. Comments

The following methods were available for the meeting participants and other members of the public to submit their comments on the MRGO ERP Process:

- *Postage-paid comment cards* were made available at each public meeting for attendees to submit their comments either at the meeting or at a later time by mail (examples are provided in Appendix B).
- *An oral comment station* was set up at each meeting for attendees to provide their comments to a transcriber.
- *Scribes* were located at each station during the Open House to capture comments and ideas
- *Facilitators and scribes* were present during the meeting breakout sessions to record the issues identified by meeting attendees.
- Written comments could be *e-mailed* to Sandra.E.Stiles@usace.army.mil, the Environmental Manager for the study and preparation of the EIS.
- *Two feedback forms* were available at the scoping meetings: an evaluation form and an environmental resources ranking form.

Table 2. Number of Comments by Mode

Comment Mode	Number of Comments
Comment cards *(11 received)*	24
Oral comment station	0
Comments from stations during open house *(40 recorded)*	65
Breakout sessions *(166 recorded)*	169
e-mail *(6 received)*	28*
Feedback forms *(4 received)*	4
Comments from meeting transcripts	23
Letter *(4 received)*	9
Total:	***322***

Within the six e-mails received, there were 28 unique distinct comments and 880 form e-mails. One form e-mail was received, but submitted 880 times by different respondents. Since all of the form e-mails contained the same language the form e-mail was counted as a single.

The majority of comments were received during the open house and break-out sessions during the Chalmette meeting. Other comments were received during the Waveland meeting, which are documented in the meeting transcripts. Written comments were received on comment cards and feedback forms, and are included in Appendix D.

Comments from the meeting transcripts are included in Appendix D. These comments were captured primarily for the Waveland meeting, since a general discussion was held in Waveland instead of breakout sessions. The Chalmette meeting transcript included recaps of the breakout sessions given by the facilitators. The notes from each session were compared to the transcript. In nine instances the facilitator presented a point that had not been clearly captured, so the comment from the transcript was used.

Copies of the source documents containing written comments from comment cards and feedback forms are included in Appendix C. E-mails and letters received from individuals, government agencies, and NGO's are also included in Appendix C. Attachments submitted with correspondence will be made available for review on a CD addendum to this report.

The full set of comments is included in Appendix E. A review of the verbatim text of the comments, contained in Appendix E, provides more detailed insight into the commenter's ideas and concerns with respect to the MRGO Ecosystem Restoration Plan.

A. Methodology for Reviewing and Summarizing Comments

For this report, a comment is defined as a distinct assertion, point, or opinion relating to the study or study area. Therefore, an individual could have multiple comments per submittal. For example, one person's e-mail message may contain several comments. This preliminary report considered all comments received by 11:59 p.m. CST on Thursday, November 20, 2008. The comments were organized according to comment mode (Appendix D) and presented in an MS Access database report format (Appendix E). In addition to comments received at the scoping meetings, this report includes comments received via individual e-mail, form e-mail, letter, and comments posted as public comment on the National Register.

Comments were evaluated for recurring themes in order to gain an understanding of the key issues to be addressed in the draft EIS. The theme categories are broad and encompassing in order to summarize the major issues that were identified. Eighteen recurring themes were identified. All comments were categorized into one or more themes, and no comment was assigned to more than three themes. For example, the comment "Get a dredge

out there and start putting back the islands that have disappeared" is classified as *Theme 7: Dredging should be considered as a method to restore natural areas* and *Theme 11: Restore barrier islands.* It should also be noted that the number of comments in Table 3 below, is greater than the total number of comments in Table 2 because some comments are associated with more than one theme and therefore are counted more than once in Table 3. The recurring themes and their percentage of occurrence are shown in Table 3.

Table 3. Themes by Percentage of Occurrence

Ranking	Theme	Number of Comments	Percent Occurrence
1.	Restore wetlands/introduce sediment/diversions	52	13.7%
2.	Restore ecosystem to historical conditions	43	12.8%
3.	Restore natural features for storm risk reduction.	42	11.1%
4.	Restore natural hydrology	33	8.7%
5.	Implement/incorporate existing plans	30	7.9%
6.	Expedite restoration projects	26	6.9%
7.	Restore barrier islands (Chandeleur, Breton, etc.)	22	5.8%
8.	Socio-economic impacts	20	5.3%
9.	Address saltwater intrusion/habitat concerns	21	5.5%
10.	Restore natural ridges and land bridges	17	4.5%
11.	Dredging should be considered as a method to restore natural areas	15	4.0%
12.	Address land loss	12	3.2%
13.	Implement the proposed Violet Diversion/repair Violet Siphon	10	2.6%
14.	Use structural methods/controls to close MRGO	9	2.4%
15.	Rebuild levees and walls in the region (Verret to Ysclosky)	9	2.4%
16.	Use resources as efficiently as possible	8	2.1%
17.	Use jetty rock for shoreline protection	7	1.8%
18.	Opportunities for mitigation need to be identified	3	0.8%
	Total:	***379****	***100%***

*Note: The number of occurrences is greater than the total number of comments received because a given comment can be associated with more than one theme. The percentages are based on dividing the number of occurrences of a given theme by the total number of occurrence and multiplying by 100.

There are 16 instances in which the entire comment appears to be relevant, but does not fall easily into the identified themes. These comments bear individual note and are listed as a separate category in Appendix E. For example, "*A participant noted that dredged material from the IHNC lock is contaminated and should not be used for ecosystem restoration purposes. (Contaminated material will not be used for ecosystem restoration.)*"

Of the comments received, some were regarding the Corps' process and the scoping meeting itself. These were not considered in the analysis. Other comments are focused on the MRGO de-authorization or closure structure. These comments are addressed in the MRGO Deep Draft De-Authorization Report, which can be found on the MRGO Web site.

Another group of comments addressed the USACE meeting or planning process. Examples *include "Thank you for your consideration and for accepting these comments. I hope I can count on your support of these common sense suggestions."* and *"Don't keep proving that left to the Corps, that nothing gets done."*

The top five recurring themes account for 52 percent of the comments and are more fully developed below.

Restore wetlands/introduce sediment/diversions.

Of the 379 occurrences, 13.7 percent suggested that sediment diversions are needed for restoration of the marshes and wetlands. Comments specifically mention the Biloxi Marsh and the Central Wetlands. Sediment from the Mississippi River was suggested as a source by several attendees. "*Mississippi River sediment should be routed to marsh restoration.*" One commenter asked why more marshes aren't planned, such as in the White Ditch area. The subject matter expert explained that there are limited areas for borrowing marsh material.

Several comments indicated that sediment must be moved and managed, and not just fresh water. (e.g., *"Ensure that the diversion projects actually moved sediment and not just freshwater and that the sediment is managed so it doesn't all go to one place, but it goes to where it needs to go to restore the marshes,"* and *"Must capture the bottom water instead of just the effluent."*)

The use of spillways was mentioned as being necessary to build the marshland. (e.g., "*Spillways only way to re-build Marsh along with sediment,"* and "*Spillways build marshland."*)

An individual suggested to "*Pump material into the wetlands using huge hopper dredges such as the WB Fairway (59,000 m3) to restore the wetlands."*

Restore ecosystem to historical conditions.

The next most dominant theme, which appeared in 12.8 percent of the comments, emphasized the need to restore the ecosystem to the state that existed prior to the MRGO. As stated by one person, "*Restoration goal should be to make area like before Corps built MRGO.*" One commenter suggested, "*Use aerial documentation of pre-MRGO to establish baseline of restoration."* Comments of record received from American Rivers and the U.S. Fish and Wildlife Service reiterated the need to restore the ecosystem to pre-MRGO conditions.

Of the 48 comments regarding the ecosystem, 50 percent specifically mention cypress trees or forests. There was also concern about invasive plants caused by the ecosystem imbalance, such as water hyacinths, widgeon grass, and salvia.

Restore natural features for storm risk reduction.

Prioritizing public safety by restoring the first line of hurricane defense appeared in 11.1 percent of the comments, almost as frequently as the top two occurring themes. As one comment indicated, "*public safety is priority #1.*" Almost all of the comments reflected the opinion that the barrier islands were the first line of defense. The barrier islands were mentioned specifically seven times. Other lines of defense mentioned include marshes and wetlands, vegetation, reefs, and the total ecosystem. Comments indicated that levees were the third line of defense.

More specifically, from one of the breakout groups: *"Several times it was brought up that we need to address the first line of defense at the south end of the basin and in the Chandeleur Islands area. In that area they talk specifically about drop armoring, marsh creation."*

Restore natural hydrology.

Hydrology appeared in 8.7 percent of the comments. This was sometimes stated succinctly, as in "*restore natural hydrology,*" but more frequently appeared in combination with other themes, such as maintaining proper freshwater and salinity levels. One individual saw this as a priority: "*If I had to choose an issue, I would say get more fresh water back into the marshes – addressing saltwater intrusion should be the priority for the Corps.*"

Suggestions included: *"slow down the water as it flows into the channel—mud should be dropped at the end of the MRGO*"; "*fill the canal that runs parallel to the channel with rock in order to truly solve the problem because the flow of water will be diverted into that canal when the channel is closed*"; and *"freshwater diversions should be pulsed so that the salinity of the water is not affected to a point where it's detrimental to the area."*

There were also some concerns, questions, and proposals for the use of treated wastewater for diversions.

Implement/incorporate existing plans.

Participants indicated in 7.9 percent of theme occurrences that they were anxious for the existing plans to be implemented or incorporated. Typical of the comments grouped under this theme were, "*I believe we should be taking the plans that already exist, prioritizing our steps and putting the plan into action.*"

Also included in this theme were comments indicating the need for a comprehensive approach, such as, "*a comprehensive systemic approach is needed, rather than the project-by-project approach they are currently seeing.*"

Of the top themes, this would be the most negative in tone, since some of the comments indicated a level of frustration typified by statements such as, *"Studies have been done already, why not just refer to them?"*

B. Environmental Resources Ranking Form

USACE provided environmental resources forms at the meeting. These forms listed the environmental resources typically evaluated in NEPA documents. An example of this form is included in Appendix B. Attendees were asked to rank each resource in order of importance from 1 to 11, with 1 being the most important, and 11 being the least important. A space was provided for additional items if participants felt inclined to provide further input.

There were six forms received, and the results are summarized in Table 4 in Appendix D. Based on the response rate for this form, this data is not being used to effect the decision process.

C. Form e-mails

Hundreds of e-mails were also received in the format of "form e-mails." The form e-mail was created and made available through the following Web site:
http://action.healthygulf.org/t/6826/campaign.jsp?campaign_KEY=26195

USACE Environmental Manager Sandra Stiles received 880 of these form e-mails with individual names and addresses. The e-mails were received beginning on November 9, 2008, and continued through November 20, 2008, with the bulk of the emails arriving on November 12, 2008. A copy of the form e-mail is included in Appendix D.

A complete list of signatories is provided in Appendix D of this report. The form e-mails received contained the same language, and therefore counted as a single occurrence and assigned themes accordingly for the purpose of this analysis.

VI. Additional Opportunities for Public Input

The official deadline for receipt of comments for preliminary scoping was November 20, 2008. USACE New Orleans District will consider and continue to receive comments after this date as part of its ongoing planning activities that are scheduled for completion in January 2010. Additionally, the draft EIS document will be available for public review and comment for a 45-day period that is currently scheduled for June 2010.

APPENDIX A

MEETING NOTIFCATIONS

restoration components into a single, comprehensive strategy.

DATES: In order to be considered in the Draft EIS (DEIS), comments and suggestions should be received no later than 30 days after publication of this notice in the **Federal Register**.

ADDRESSES: Send written comments to U.S. Army Corps of Engineers, Honolulu District, ATTN: Cindy S. Barger, Project Manager, Civil and Public Works Branch (CEPOH–PP–C), Room 311, Building 230, Fort Shafter, HI 96858–5440.

FOR FURTHER INFORMATION CONTACT: Questions or comments concerning the proposed action should be addressed to Ms. Cindy S. Barger, Project Manager, U.S. Army Corps of Engineers, Honolulu District, Civil and Public Works Branch, Building 230, Fort Shafter, HI 96858–5440, Telephone: (808) 438–6940, E-mail: *Cindy.S.Barger@poh01.usace.army.mil*, or Mr. Carty Chang, Project Planning and Management Branch Chief, State of Hawaii Department of Land and Natural Resources, Engineering Division, 1151 Punchbowl Street, Room 221, Honolulu, HI 96813, telephone (808) 587–0227, E-mail: *carty.s.chang@hawaii.gov*.

SUPPLEMENTARY INFORMATION: A preliminary assessment of this federally funded action indicates that the project may cause significant impacts on the environment. As a result, it has been determined that the preparation and review of an Environmental Impact Statement (EIS) is needed for this project. The EIS and Feasibility Study for the Ala Wai Canal Project are being conducted concurrently. The EIS will evaluate potential impacts to the natural, physical, and human environment as a result of implementing any of the proposed alternatives that are developed by this project.

This project will be implemented under Section 209 of the Flood Control Act of 1962 (Pub. L. 87–874), for the purpose of flood mitigation and ecosystem restoration in the Ala Wai Canal Watershed, which consists of the sub-watersheds of Makiki, Manoa, Palolo, and Waikiki. The USACE will work with the affected community and the sponsoring local organization, the State of Hawaii Department of Land and Natural Resources, to develop an acceptable plan to address the flood and ecosystem problems.

The 11,069-acre Ala Wai Canal Watershed is located in the southern portion of the island of Oahu. The Watershed is highly urbanized, with approximately 1,746 structures within the designated 100-year floodplain. There is a high potential for massive flood damage to the densely populated and economically critical area of Waikiki and the adjacent neighborhoods of McCully and Moiliili. Additionally, flooding frequently occurs in lower Makiki and recently in the central Manoa Valley, causing damages to businesses, homes, and academic facilities. There is also significant environmental degradation of the streams and waterways, including heavy sedimentation, poor water quality, lack of habitat for native species, and a prevalence of alien species.

Goals of the Ala Wai Canal Project are to (1) Protect the entire Ala Wai Canal Watershed from the 100-year flood event, (2) improve the migratory pathway for native amphidromous species, (3) reduce sediment buildup in the streams and Ala Wai Canal, (4) enhance the physical quality of existing aquatic habitat for native species, and (5) improve water quality. Anticipated significant issues identified to date and to be addressed in the EIS include: (1) Impacts on flooding, (2) impacts on stream hydraulics, (3) impacts on fish and wildlife resources and habitats, (4) impacts on recreation and recreational facilities, and (5) other impacts identified by the Public, agencies, or USACE studies.

A full range of possible programs and actions will be considered in order to meet the project goals. Currently under consideration are dredging, detention basins, flood walls, debris basins and other debris management actions, bridge modification, flood-proofing structures within the flood plain, diversion of flood waters, flood warning systems, widening of channels, acquisition of properties within the floodplain, maintenance easements, and a drainage district. Ecosystem restoration measures currently under consideration include low-flow channels, creating more natural stream channels, constructed wetlands, trash separators, sediment interceptors, daylighting the stream, increasing or decreasing shade as necessary, reducing the pig population, and stream bank stabilization. As hydrologic, hydraulic, and biological analyses are performed and stakeholder consultations are conducted, additional concepts may be developed.

Evaluation of all of the alternatives will take into account minimization of adverse impacts to social resources, economics, aesthetics, recreation, historic and cultural resources, and native species habitat. Flood hazard reduction alternatives will additionally take into account a cost-benefit analysis and ability to complement ecosystem restoration measures. Evaluation of the ecosystem restoration alternatives will be based on the areas of habitat they create, improve, or provide access to, as well as their ability to complement flood hazard reduction measures.

A DEIS will be prepared and circulated for review by agencies and the public. The USACE and DLNR invite participation and consultation of agencies and individuals that have special expertise, legal jurisdiction, or interest in the preparation of the DEIS. The DLNR will be issuing a state-level Environmental Impact Statement Preparation Notice (EISPN) pursuant to Hawaii Revised Statutes (HRS) Chapter 343. All written and verbal comments received in response to this Notice of Intent and the State EISPN will be considered when determining the scope of the EIS. To the extent practicable, NEPA and HRS 343 requirements will be coordinated in the preparation of the EIS document.

A public scoping meeting will be held on Tuesday, October 21, 2008 at the Washington Middle School Cafeteria at 1633 South King Street, Honolulu, HI 96826, from 6:30 p.m. until 8:30 p.m. to determine the scope of analysis of the proposed action. The scoping meeting will also be announced in local media. Interested parties are encouraged to express their views during the scoping process and throughout the development of the alternatives and EIS. To be most helpful, comments should clearly describe specific environmental topics or issues which the commenter believes the document should address. Further information on the proposed action or the scoping meeting may be obtained from Cindy S. Barger, Project Manager, at (see **ADDRESSES**). The DEIS should be available for public review in early 2010, subject to the receipt of federal funding.

Brenda S. Bowen,

Army Federal Register Liaison Officer.

[FR Doc. E8–23221 Filed 10–1–08; 8:45 am]

BILLING CODE 3710–NN–P

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Intent To Prepare a Draft Environmental Impact Statement for the Mississippi River-Gulf Outlet Ecosystem Restoration Feasibility Study

AGENCY: Department of the Army, U.S. Army Corps of Engineers, DoD.

ACTION: Notice of intent.

SUMMARY: The Corps of Engineers (Corps) intends to prepare an

Environmental Impact Statement (EIS) for the Mississippi River-Gulf Outlet (MRGO) Ecosystem Restoration Feasibility Study within the Middle and Lower Pontchartrain Basin and areas of southern Mississippi. The Corps will evaluate a full range of comprehensive restoration measures to restore important estuarine components and ecosystem processes within the areas affected by the MRGO navigation channel and assess the impacts associated with implementing the plan. The MRGO was authorized by Congress in 1956 as a Federal navigation channel to provide a direct route between the Port of New Orleans and the Gulf of Mexico. Construction began in 1958 and was completed in 1968 to authorized dimensions (36-foot depth by 500-foot width: 38-foot depth by 600-foot bottom width in Bar Channel). Construction of the MRGO channel created a direct deep water link between the Inner Harbor Navigation Canal and the Gulf of Mexico allowing higher salinity waters to enter Lake Borgne and Lake Pontchartrain estuaries. Construction resulted in direct wetland losses, damages to the Bayou LaLoutre Ridge and alteration of the adjacent landscape and hydrology by placement of dredge material adjacent to the channel in upland confined disposal facilities. Since Hurricane Katrina made landfall in 2005, the MRGO navigation channel has not been maintained. A June closure plan and accompanying Legislative EIS and Record of Decision titled "Integrated Final Report to Congress and Legislative Environmental Impact Statement for the Mississippi River-Gulf Outlet Deep-Draft De-Authorization Study" was signed on June 5, 2008, officially deauthorizing the MRGO navigation channel (from the Gulf of Mexico to Mile 60 at the southern bank of the Gulf Intracoastal Waterway) and authorizing construction of a closure structure at the south ridge of Bayou LaLoutre in St. Bernard Parish, Louisiana and development of plan to restore the areas affected by the MRGO Navigation channel.

DATES: See **SUPPLEMENTARY INFORMATION** section for scoping meeting dates.

FOR FURTHER INFORMATION CONTACT: Questions concerning the Draft Environmental Impact Statement (DEIS) should be addressed to Ms. Sandra Stiles at U.S. Army Corps of Engineers, CEMVNPM–RS, P.O. Box 60267, New Orleans, LA 70160–0267, phone (504) 862–1583, fax number (504) 862–2088 or by e-mail at *sandra.e.stiles@usace.army.mil.*

SUPPLEMENTARY INFORMATION:

1. *Authority:* Water Resources Development Act of 2007 Sections 7012 and 7013 authorized the Corps to develop a comprehensive closure and restoration plan, at full Federal expense, to de-authorize deep-draft navigation on the MRGO, Louisiana, extending from the Gulf of Mexico to the Gulf Intracoastal Waterway (GIWW) and develop a restoration plan.

2. *Proposed Action.* The Corps will develop a comprehensive ecosystem restoration plan to restore the areas affected by the MRGO navigation channel to include: (1) Physically modifying the MRGO channel and restoring areas affected by the channel; (2) restoring natural ecosystem features to reduce damage from storm surge; (3) measures preventing saltwater intrusion into the waterway; (4) measures protecting, restoring or increasing wetlands to prevent saltwater intrusion or storm surge; (5) measures reducing risk of storm damage to communities by preventing or reducing wetland losses or restoring wetlands in areas affected by navigation, oil and gas and other manmade channels; (6) diversions to restore the Lake Borgne Ecosystem.

3. *Alternatives.* Restoration measures being considered include physical modification and restoration of the MRGO navigation channel, freshwater, sediment and nutrient introduction; shoreline protection and bank stabilization; restoration and protection of natural ridges; barrier island protection and restoration; wetland protection, creation and restoration; water control measures (gates, weirs, sills, plugs, etc.); measures to increase native vegetation; restoration of natural features to reduce storm surge. Once restoration measures are identified, alternative plans will be developed through various combinations of restoration measures that best meet the study goals and objectives and are determined to be cost-effective, environmentally acceptable and technically feasible. Some measures may also be recommended for implementation under other authorities.

4. *Public Involvement.* Stakeholder and public involvement for this proposed action is integral to the project. Interested parties, concerned citizens, and other State and Federal agencies, private and not-for-profit or non-governmental organizations are strongly encouraged to participate in the development of the proposed action. Stakeholder and public meetings would be held throughout project development. Meeting announcements would be made as information becomes available.

5. *Public Scoping Meeting.* Scoping is the process utilized for determining the range of alternatives and significant issues to be addressed in the EIS. For this study, a letter will be mailed to all parties believed to have an interest in the analysis. The letter will notify interested parties of public scoping meetings that will be held in the local area and request their input on alternatives and issues to be evaluated. Notices will also be mailed to local news media. All interested parties are invited to comment at this time, and anyone interested in this study should request inclusion in the study mailing list. A public scoping meeting will be held November 3, 2008 from 6–9 p.m. in Chalmette, Louisiana and November 6, 2008 from 6–9 p.m. in Waveland, Mississippi. The exact location and address for the meetings will be announced through local media channels. Additional meetings could be held, depending upon public interest and if it is determined that further public coordination is warranted.

6. *Significant Issues.* The tentative list of important resources and issues that will be evaluated in the EIS include but are not limited to tidal wetlands (marshes and swamps), barrier islands, aquatic resources, commercial and recreational fisheries, wildlife resources, essential fish habitat, water quality, air quality, threatened and endangered species and critical habitat, recreation resources, and cultural resources. Socioeconomic items to be evaluated in the EIS include navigation; flood protection; business and industrial activity; oil and gas pipelines; employment; land use; property values; public/community facilities and services; tax revenues; population, community and regional growth; transportation; housing; community cohesion; environmental justice, aesthetics and noise.

7. *Environmental Consultation and Review.* The U.S. Fish and Wildlife Service (USFWS) will assist in documenting existing conditions and assessing effects of project alternatives through the Fish and Wildlife Coordination Act consultation procedures. The USFWS will provide a Fish and Wildlife Coordination Act report. Consultation will be accomplished with the USFWS and the National Marine Fisheries Service (NMFS) concerning threatened and endangered species and their critical habitat. The NMFS will be consulted regarding the effects of this proposed action on Essential Fish Habitat. The draft EIS or a notice of its availability will be distributed to all interested

agencies, organizations, and individuals.

8. *Estimated Date of Availability.* The earliest that the DEIS is expected to be available is March of 2010.

Dated: September 23, 2008.

Alvin B. Lee,

Colonel, U.S. Army, District Engineer.

[FR Doc. E8–23219 Filed 10–1–08; 8:45 am]

BILLING CODE 3710–84–P

DEPARTMENT OF DEFENSE

Department of the Navy

Notice of Closed Meeting of the Chief of Naval Operations Executive Panel

AGENCY: Department of the Navy, DoD.

ACTION: Notice.

SUMMARY: The Chief of Naval Operations (CNO) Executive Panel will report on the findings and recommendations of the Subcommittee on Africa to the Chief of Naval Operations. The matters to be discussed during the meeting have been divided into the following four categories: threats to U.S. security and interests in Africa; political, economic, and security assessments of key African nations and institutions; U.S. Navy security cooperation and engagement strategies; and a conclusion/summary of the classified discussions.

Each topic under each of these headings is classified either secret or confidential, which makes this information exempt from open meeting disclosure pursuant to 5 U.S.C. Section 552b(c)(1).

DATES: The meeting will be held on October 27, 2008, from 9:30 a.m. to 11:30 a.m.

ADDRESSES: The meeting will be held at the Center for Naval Analysis Boardroom, 4825 Mark Center Drive, Alexandria, VA 22311.

FOR FURTHER INFORMATION CONTACT: CDR David Di Tallo, CNO Executive Panel, 4825 Mark Center Drive, Alexandria, VA 22311, telephone: 703–681–4908.

SUPPLEMENTARY INFORMATION: Pursuant to the provisions of the Federal Advisory Committee Act, as amended (5 U.S.C. App.), these matters constitute classified information that is specifically authorized by Executive Order to be kept secret in the interest of national defense and are, in fact, properly classified pursuant to such Executive Order. Accordingly, the Secretary of the Navy has determined in writing that the public interest requires that all sessions of this meeting be closed to the public because they will be concerned with matters listed in section 552b(c)(1) of title 5, United States Code.

Individuals or interested groups interested may submit written statements for consideration by the Chief of Naval Operations Executive Panel at any time or in response to the agenda of a scheduled meeting. All requests must be submitted to the Designated Federal Officer at the address detailed below.

If the written statement is in response to the agenda mentioned in this meeting notice then the statement, if it is to be considered by the Panel for this meeting, must be received at least five days prior to the meeting in question.

The Designated Federal Officer will review all timely submissions with the Chief of Naval Operations Executive Panel Chairperson, and ensure they are provided to members of the Chief of Naval Operations Executive Panel before the meeting that is the subject of this notice.

To contact the Designated Federal Officer, write to Executive Director, CNO Executive Panel (N00K), 4825 Mark Center Drive, 2nd Floor, Alexandria, VA 22311–1846.

Dated: September 26, 2008.

T.M. Cruz,

Lieutenant Commander, Judge Advocate General's Corps, U.S. Navy, Federal Register Liaison Officer.

[FR Doc. E8–23227 Filed 10–1–08; 8:45 am]

BILLING CODE 3810–FF–P

DEPARTMENT OF EDUCATION

Notice of Proposed Information Collection Requests

AGENCY: Department of Education.

SUMMARY: The Acting Director, Information Collection Clearance Division, Regulatory Information Management Services, Office of Management, invites comments on the proposed information collection requests as required by the Paperwork Reduction Act of 1995.

DATES: Interested persons are invited to submit comments on or before December1, 2008.

SUPPLEMENTARY INFORMATION: Section 3506 of the Paperwork Reduction Act of 1995 (44 U.S.C. Chapter 35) requires that the Office of Management and Budget (OMB) provide interested Federal agencies and the public an early opportunity to comment on information collection requests. OMB may amend or waive the requirement for public consultation to the extent that public participation in the approval process would defeat the purpose of the information collection, violate State or Federal law, or substantially interfere with any agency's ability to perform its statutory obligations. The Acting Director, Information Collection Clearance Division, Regulatory Information Management Services, Office of Management, publishes that notice containing proposed information collection requests prior to submission of these requests to OMB. Each proposed information collection, grouped by office, contains the following: (1) Type of review requested, e.g. new, revision, extension, existing or reinstatement; (2) Title; (3) Summary of the collection; (4) Description of the need for, and proposed use of, the information; (5) Respondents and frequency of collection; and (6) Reporting and/or Recordkeeping burden. OMB invites public comment.

The Department of Education is especially interested in public comment addressing the following issues: (1) is this collection necessary to the proper functions of the Department; (2) will this information be processed and used in a timely manner; (3) is the estimate of burden accurate; (4) how might the Department enhance the quality, utility, and clarity of the information to be collected; and (5) how might the Department minimize the burden of this collection on the respondents, including through the use of information technology.

Dated: September 26, 2008.

Sheila Carey,

Acting Director, Information Collection Clearance Division, Regulatory Information Management Services, Office of Management.

Federal Student Aid

Type of Review: Extension.

Title: Application for Approval to Participate in the Federal Student Financial Aid Programs.

Frequency: On Occasion; Prior to expiration of eligibility.

Affected Public: Businesses or other for-profit; Not-for-profit institutions; State, Local, or Tribal Gov't, SEAs or LEAs.

Reporting and Recordkeeping Hour Burden:

Responses: 4,485.

Burden Hours: 21,181.

Abstract: The Higher Education Act of 1965 (HEA), as amended requires postsecondary institutions to complete and submit this application as a condition of eligibility for any of the Title IV student financial assistance programs and for the other postsecondary programs authorized by the HEA. The institution must submit the form (1) initially when it first seeks to become eligible for the Title IV programs; (2) when its program

Public Scoping Meetings

MRGO Ecosystem Restoration Feasibility Study

The U.S. Army Corps of Engineers is hosting pubic scoping meetings to gather public input on the MRGO Ecosystem Restoration Feasibility Study.

The Corps is conducting a study that will result in a comprehensive ecosystem restoration plan aimed at restoring and maintaining habitat areas affected by the MRGO navigation channel.

Please join members of the Corps' study team to learn more about the study, the issues associated with the restoration activities, and the possible solutions under consideration to address these issues.

Meeting Agenda

Open House	6:00 p.m. – 7:00 p.m.
Introductions	7:00 p.m. – 7:15 p.m.
Small Break-out Groups	7:15 p.m. – 8:15 p.m.
Group Reports	8:15 p.m. – 8:50 p.m.
Wrap-up	8:50 p.m. – 9:00 p.m.

Chalmette, LA – Monday, November 3, 2008
C.F. Rowley School
49 Madison Avenue

Waveland, MS – Thursday, November 6, 2008
Leo Seal Community Center
529 Highway 90

Written comments may also be submitted through November 20, 2008 to:

e-mail: MRGO reply@usace.army.mil

Web site: http://www.mrgo.usace.army.mil

Field Code Changed

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Mail: MRGO Ecosystem Restoration EIS Manager, CEMVN-PM-RS
P.O. Box 60267
New Orleans, LA 70160-0267

Overnight: MRGO Ecosystem Restoration EIS Manager, CEMVN-PM-RS
7400 Leake Avenue
New Orleans, LA 70118-3651

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

Planning, Programs and
Project Management Division
Environmental Planning
And Compliance Branch

October 16, 2008

Public Notice

EIS Meeting Announcement
November 2008

MRGO Ecosystem Restoration Plan Feasibility Study & Environmental Impact Statement (EIS)

The U.S. Army Corps of Engineers, New Orleans District (CEMVN) is hosting a public scoping meeting to solicit input on the MRGO Ecosystem Restoration Study proposal to restore the areas affected by the MRGO navigation channel. Participants are encouraged to stop by anytime between 6:00 and 9:00 p.m, visit the information tables, and discuss the project with Corps personnel. Ideas and issues brought from this meeting will be incorporated in the study process.

Public Action Requested
Public scoping meetings are planned for the following dates and locations (maps attached):

November 3, 2008: C.F. Rowley School, 49 Madison Avenue, Chalmette, LA.
Meeting in school cafeteria.

November 6, 2008: Leo Seal Community Center, 529 Highway 90, Waveland, MS

An "open house" period is scheduled for 6:00 p.m. to 7:00 p.m. The meetings will begin at 7:00 pm with a brief introduction and presentation of the study process. Attendees will then break into small groups for discussion and comments. At 8:15 p.m. attendees will regroup to discuss the outcome of their smaller group discussions. The CEMVN invites public input concerning the following scoping focus questions:

1. ***What are the most important issues, resources, benefits and impacts that should be considered in the EIS?***

2. ***Are there any other restoration features or modifications to the restoration features identified that should be considered in the EIS?***

In addition to comments received at the meeting, comments will also be accepted by letter or email. Comments must be postmarked no later than November 20, 2008 to be included in the

Scoping Report, however your comments and ideas are welcome throughout the alternative formulation and selection process.

Scoping Process
The public meeting is part of the scoping process in compliance with the National Environmental Policy Act. (NEPA. The NEPA provides for an early and open public process for determining the scope of issues, resources, impacts, and alternatives to be addressed in the EIS

Scoping Report
A Scoping Report will be prepared following the "scoping" process. The report will include a listing of the important issues and concerns raised, an evaluation of those issues and concerns, and recommendations of the substantive issues and concern identified as warranting coverage in the draft EIS. A transcript of the meetings will be furnished with the report.

Study Purpose
The purpose of the study is to develop a comprehensive ecosystem restoration plan, at full Federal expense, to restore the areas affected by the MRGO navigation channel as required by Section 7013 of WRDA 2007. Recommendations resulting from the development of the comprehensive ecosystem restoration plan would be integrated with the LCA Program and specific projects authorized under Sections 7003 and 7006 of WRDA 2007, with the LACPR technical report, and with other similar programs and studies. The study would comport with the Chief of Engineer's "Actions for Change" calling for effectively implementing comprehensive systems approaches to water resources problems. The study would comply with NEPA and with ER-1105-2-100 (Planning Guidance Notebook). The MRGO Ecosystem Restoration Plan would include recommendations that are cost effective, environmentally acceptable and technically feasible and that the Secretary of the Army can carry out.

Study Authority
WRDA 2007 Section 7013 (P.L. 110-114 effective Nov. 8, 2007)

INCLUSIONS — At a minimum, the report … shall include—

- a plan to physically modify the Mississippi River-Gulf Outlet and restore the areas affected by the navigation channel;
- a plan to restore natural features of the ecosystem that will reduce or prevent damage from storm surge;
- a plan to prevent the intrusion of saltwater into the waterway;
- efforts to integrate the recommendations of the report with the [LCA] …and the [LACPR] analysis and design …; and
- consideration of—
  - use of native vegetation; and
  - diversions of fresh water to restore the Lake Borgne ecosystem.

CONSTRUCTION — The Secretary shall carry out a plan to...restore and protect the ecosystem substantially in accordance with the plan required ..., if the Secretary determines that the project is cost-effective, environmentally acceptable, and technically feasible.

Need for Action

A comprehensive ecosystem restoration plan is necessary to restore the estuarine environment in the Middle and Lower Pontchartrain Basin and other surrounding coastal waterbodies and habitat in southeastern Louisiana affected by the MRGO navigation channel The primary environmental concerns associated with the construction, operation, and maintenance of the channel include increases in salinity, coastal habitat changes, and land losses. Construction of the channel created a direct deep water link between the Inner Harbor Navigation Canal (IHNC) and the Gulf of Mexico allowing higher salinity water to enter the surrounding Lake Borgne and Lake Pontchartrain estuaries on incoming tidal cycles. Construction of the channel resulted in direct wetland losses and damages to the Bayou La Loutre Ridge. Placement of dredged material excavated during construction converted adjacent wetlands to dredge disposal areas and changed project area hydrology. Vessel use of the channel resulted in bank erosion along the channel. A comprehensive ecosystem restoration plan is needed to address the effects of the construction operation, and maintenance of MRGO in concert with the anticipated effects of the de-authorization and rock closure of the channel.

Study Focus

Resources/Issues to be Addressed

The tentative list of resources and issues to be evaluated in the EIS includes wetlands (marshes and swamps), aquatic resources, commercial and recreational fisheries, wildlife resources, essential fish habitat, water quality, air quality, threatened and endangered species, recreation resources, and cultural resources. Socioeconomic items to be evaluated include hurricane and flood protection, business and industrial activity, employment, land use, public/community facilities and services, population, community and regional growth, transportation, and community cohesion.

Potential Restoration Measures

The study will investigate several types of ecosystem restoration measures such as freshwater, sediment and nutrient introduction, wetland protection, restoration and creation, shoreline protection, bank stabilization, ridge protection and restoration, barrier island protection and restoration, water control measures (gates, weirs, sills, plugs, fill areas), modification of MRGO project features (authorized and de-authorized), use of native vegetation, natural features with benefits for storm surge damage reduction, and modifications to authorized projects.

For Further Information

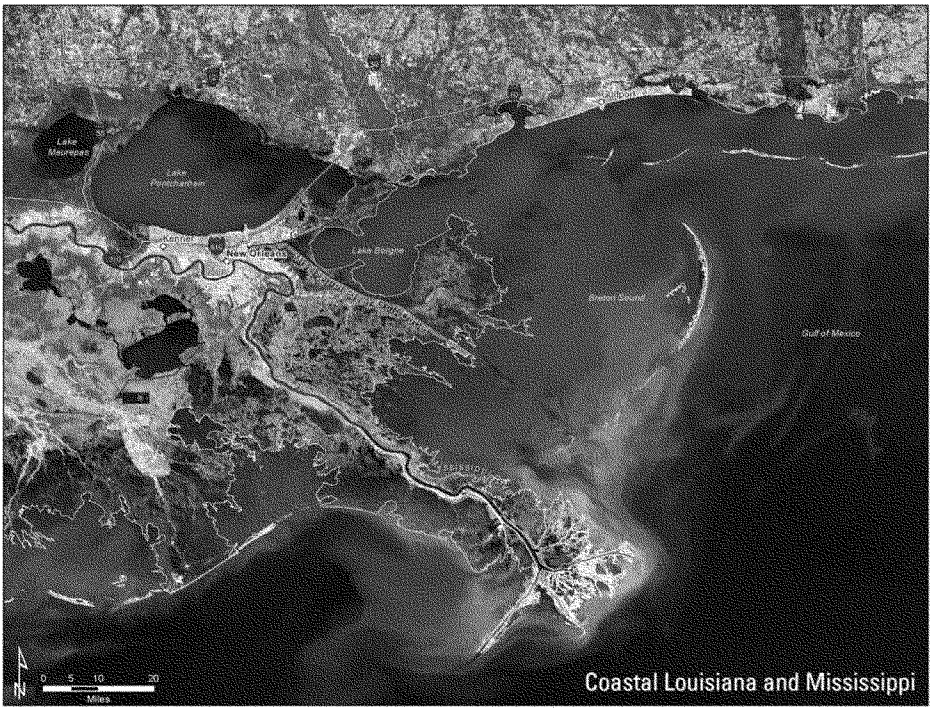
Interested parties are encouraged to express their concerns at any time during the study process.

Scoping comments and questions regarding the draft EIS should be addressed to Ms. Sandra Stiles, CEMVN-PM-RS, PO Box 60267, New Orleans, LA 70160-0267 or at telephone number (504) 862-1583. Ms. Stiles may be reached by fax at (504) 862-2088, or via e-mail at sandra.e.stiles@usace.army.mil.

Sincerely,

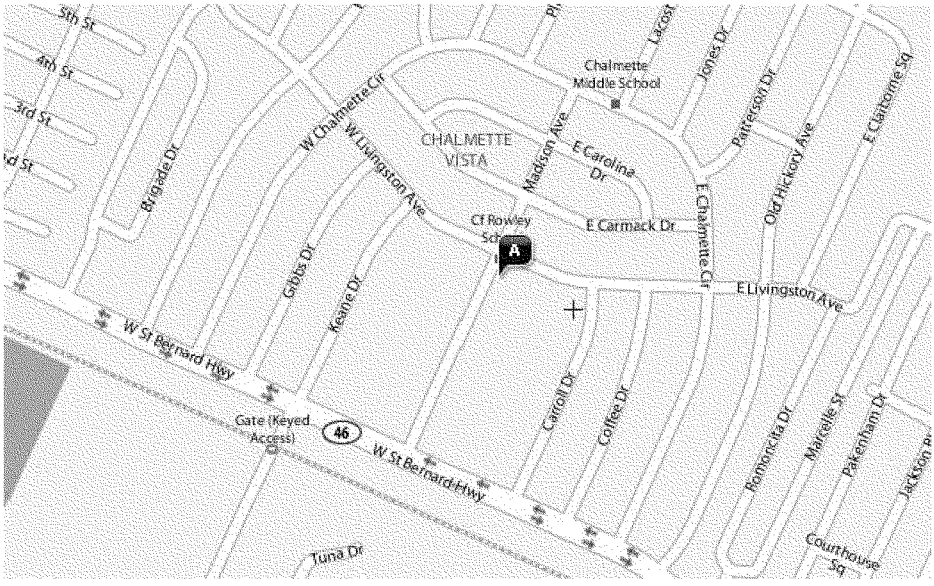
For Elizabeth Wiggins
Chief, Environmental Planning
and Compliance Branch

Enclosure


Lake Maurepas
Lake Pontchartrain
Lake Borgne
Breton Sound
Gulf of Mexico
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Miles
Coastal Louisiana and Mississippi

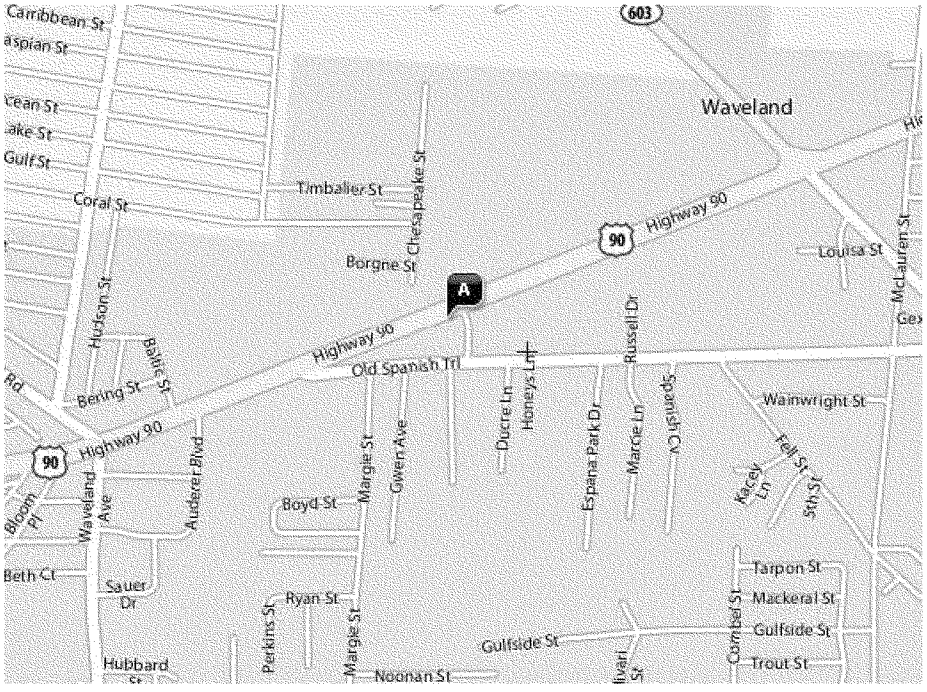
Monday, 3 November 2008

C.F. Rowley School, 49 Madison Avenue, Chalmette, LA
meeting is in school cafeteria, 6:00 p.m. to 9:00 p.m.



MEETING NOTES: _____

Thursday, 6 November 2008
Leo Seal Community Center, 529 Highway 90, Waveland, MS
6:00 p.m. to 9:00 p.m.



MEETING NOTES: _____

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US Army Corps
of Engineers
New Orleans District

Public Notice

Public Scoping Meeting Announcement
November 2008

MRGO Ecosystem Restoration Plan Feasibility Study & Environmental Impact Statement (EIS)

The U.S. Army Corps of Engineers, New Orleans District (CEMVN) is hosting a public scoping meeting to solicit input on the MRGO Ecosystem Restoration Study proposal to restore the areas affected by the MRGO navigation channel. Participants are encouraged to stop by anytime between 6:00 and 9:00 p.m, visit the information tables, and discuss the project with Corps personnel. Ideas and issues brought from this meeting will be incorporated in the study process.

Public Action Requested
Public scoping meetings are planned for the following dates and locations (maps attached):

November 3, 2008: C.F. Rowley School, 49 Madison Avenue, Chalmette, LA.
Meeting in school cafeteria.

November 6, 2008: Leo Seal Community Center, 529 Highway 90, Waveland, MS

An "open house" period is scheduled for 6:00 p.m. to 7:00 p.m. The meetings will begin at 7:00 pm with a brief introduction and presentation of the study process. Attendees will then break into small groups for discussion and comments. At 8:15 p.m. attendees will regroup to discuss the outcome of their smaller group discussions. The CEMVN invites public input concerning the following scoping focus questions:

1. ***What are the most important issues, resources, benefits and impacts that should be considered in the EIS?***

2. ***Are there any other restoration features or modifications to the restoration features identified that should be considered in the EIS?***

In addition to comments received at the meeting, comments will also be accepted by letter or email. Comments must be postmarked no later than November 20, 2008 to be included in the Scoping Report, however your comments and ideas are welcome throughout the alternative formulation and selection process.

Scoping Process
The public meeting is part of the scoping process in compliance with the National Environmental Policy Act. (NEPA. The NEPA provides for an early and open public process for determining the scope of issues, resources, impacts, and alternatives to be addressed in the EIS

Scoping Report
A Scoping Report will be prepared following the "scoping" process. The report will include a listing of the important issues and concerns raised, an evaluation of those issues and concerns, and recommendations of the substantive issues and concern identified as warranting coverage in the draft EIS. A transcript of the meetings will be furnished with the report.

Study Purpose
The purpose of the study is to develop a comprehensive ecosystem restoration plan, at full Federal expense, to restore the areas affected by the MRGO navigation channel as required by Section 7013 of WRDA 2007. Recommendations resulting from the development of the comprehensive ecosystem restoration plan would be integrated with the LCA Program and specific projects authorized under Sections 7003 and 7006 of WRDA 2007, with the LACPR technical report, and with other similar programs and studies. The study would comport with the Chief of Engineer's "Actions for Change" calling for effectively implementing comprehensive systems approaches to water resources problems. The study would comply with NEPA and with ER-1105-2-100 (Planning Guidance Notebook). The MRGO Ecosystem Restoration Plan would include recommendations that are cost effective, environmentally acceptable and technically feasible and that the Secretary of the Army can carry out.

Study Authority
WRDA 2007 Section 7013 (P.L. 110-114 effective Nov. 8, 2007)

INCLUSIONS — At a minimum, the report ... shall include—
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    - use of native vegetation; and
    - diversions of fresh water to restore the Lake Borgne ecosystem.

CONSTRUCTION — The Secretary shall carry out a plan to...restore and protect the ecosystem substantially in accordance with the plan required ..., if the Secretary determines that the project is cost-effective, environmentally acceptable, and technically feasible.

Need for Action
A comprehensive ecosystem restoration plan is necessary to restore the estuarine environment in the Middle and Lower Pontchartrain Basin and other surrounding coastal waterbodies and habitat in southeastern Louisiana affected by the MRGO navigation channel The primary environmental concerns associated with the construction, operation, and maintenance of the channel include increases in salinity, coastal habitat changes, and land losses. Construction of the channel created a direct deep water link between the Inner Harbor Navigation Canal (IHNC) and the Gulf of Mexico allowing higher salinity water to enter the surrounding Lake Borgne and Lake Pontchartrain estuaries on incoming tidal cycles. Construction of the channel resulted in direct wetland losses and damages to the Bayou La

Loutre Ridge. Placement of dredged material excavated during construction converted adjacent wetlands to dredge disposal areas and changed project area hydrology. Vessel use of the channel resulted in bank erosion along the channel. A comprehensive ecosystem restoration plan is needed to address the effects of the construction operation, and maintenance of MRGO in concert with the anticipated effects of the de-authorization and rock closure of the channel.

Study Focus

Resources/Issues to be Addressed
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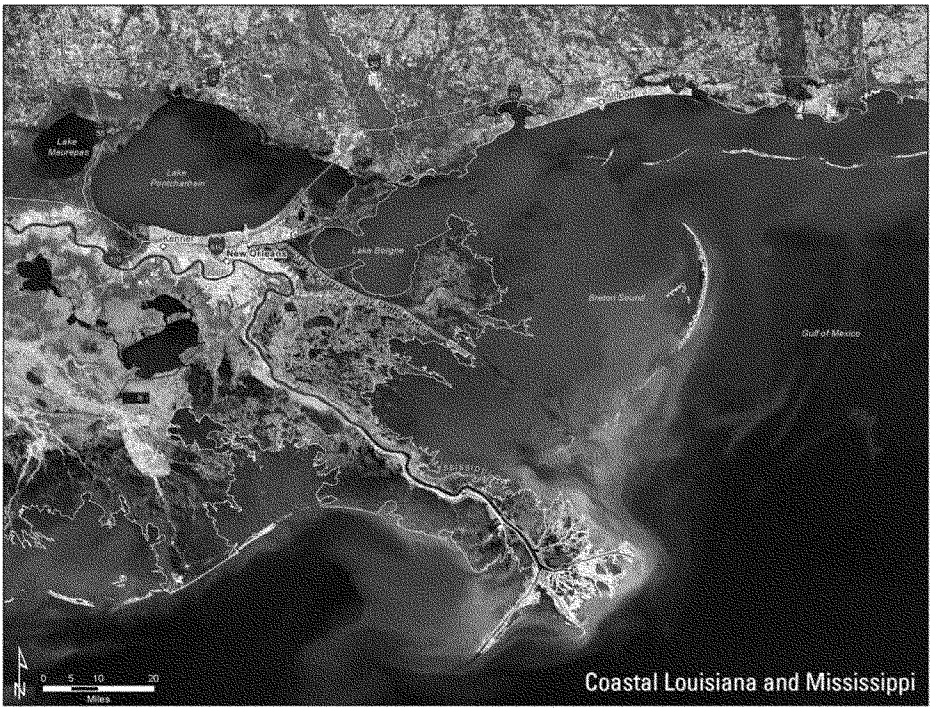
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The study will investigate several types of ecosystem restoration measures such as freshwater, sediment and nutrient introduction, wetland protection, restoration and creation, shoreline protection, bank stabilization, ridge protection and restoration, barrier island protection and restoration, water control measures (gates, weirs, sills, plugs, fill areas), modification of MRGO project features (authorized and de-authorized), use of native vegetation, natural features with benefits for storm surge damage reduction, and modifications to authorized projects.

For Further Information

Interested parties are encouraged to express their concerns at any time during the study process.

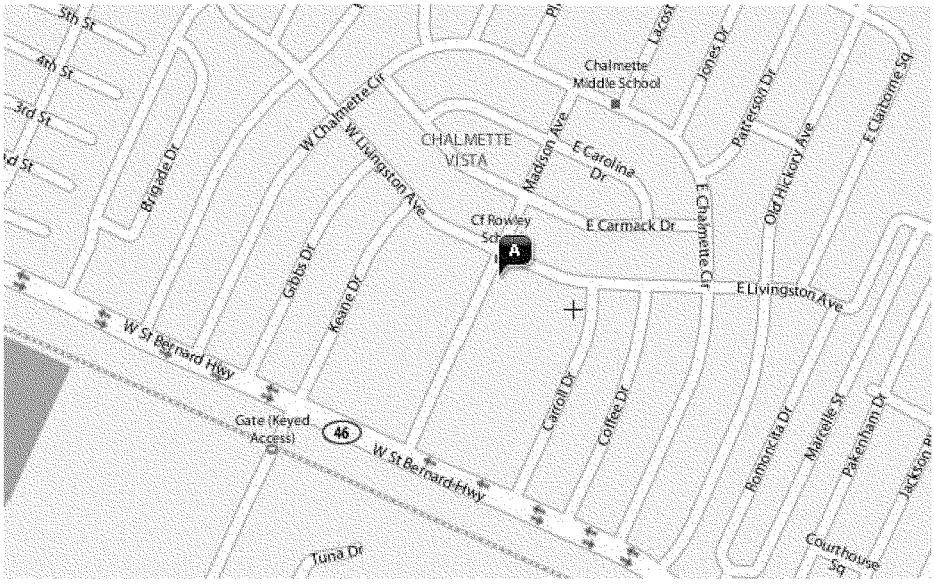
Scoping comments and questions regarding the draft EIS should be addressed to Ms. Sandra Stiles, CEMVN-PM-RS, PO Box 60267, New Orleans, LA 70160-0267 or at telephone number (504) 862-1583. Ms. Stiles may be reached by fax at (504) 862-2088, or via e-mail at sandra.e.stiles@usace.army.mil.

Questions regarding the study should be addressed to the Senior Project Manager Mr. Gregory Miller, CEMVN-PM-OR, PO Box 60267, New Orleans, LA 70160-0267, or telephone number (504) 862-2310. Mr. Miller may be reached via e-mail at gregory.b.miller@usace.army.mil.


Lake Maurepas
Lake Pontchartrain
Lake Borgne
Breton Sound
Gulf of Mexico
0 5 10 20
Miles
Coastal Louisiana and Mississippi

Monday, 3 November 2008

C.F. Rowley School, 49 Madison Avenue, Chalmette, LA
meeting is in school cafeteria, 6:00 p.m. to 9:00 p.m.



MEETING NOTES: _____

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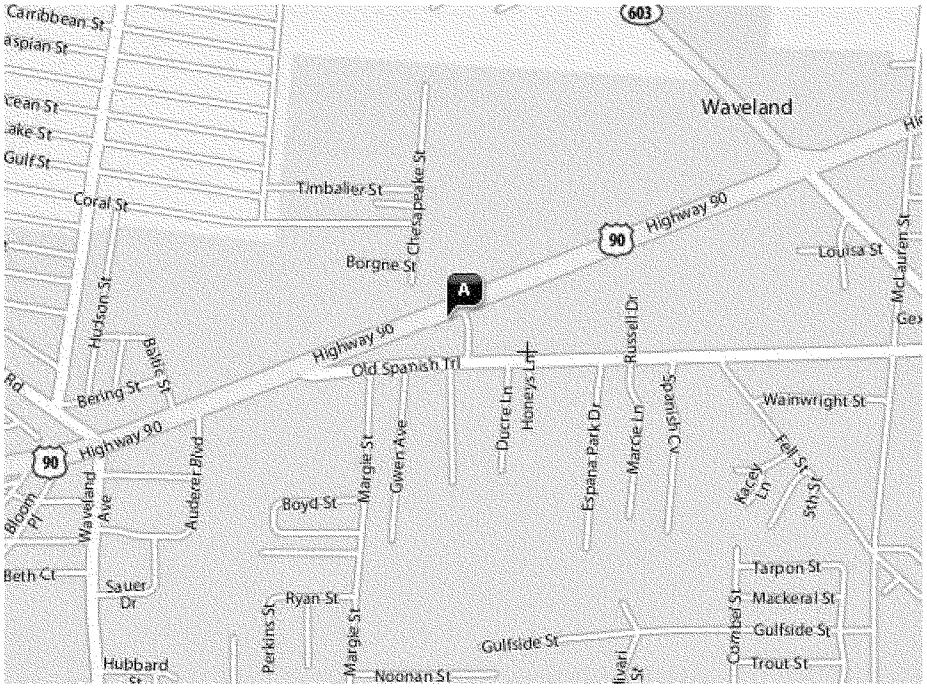
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Thursday, 6 November 2008
Leo Seal Community Center, 529 Highway 90, Waveland, MS
6:00 p.m. to 9:00 p.m.



MEETING NOTES: _____

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DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

November 20, 2009

Planning, Programs and
Project Management Division
Environmental Planning
And Compliance Branch

Public Notice

EIS Meeting Announcement
November 2008

MRGO Ecosystem Restoration Plan Feasibility Study & Environmental Impact Statement (EIS)

The U.S. Army Corps of Engineers, New Orleans District (CEMVN) is hosting a public scoping meeting to solicit input on the MRGO Ecosystem Restoration Study proposal to restore the areas affected by the MRGO navigation channel. Participants are encouraged to stop by anytime between 6:00 and 9:00 p.m, visit the information tables, and discuss the project with Corps personnel. Ideas and issues brought from this meeting will be incorporated in the study process.

Public Action Requested
Public scoping meetings are planned for the following dates and locations (maps attached):

November 3, 2008: C.F. Rowley School, 49 Madison Avenue, Chalmette, LA.
Meeting in school cafeteria.

November 6, 2008: Leo Seal Community Center, 529 Highway 90, Waveland, MS

An "open house" period is scheduled for 6:00 p.m. to 7:00 p.m. The meetings will begin at 7:00 pm with a brief introduction and presentation of the study process. Attendees will then break into small groups for discussion and comments. At 8:15 p.m. attendees will regroup to discuss the outcome of their smaller group discussions. The CEMVN invites public input concerning the following scoping focus questions:

1. ***What are the most important issues, resources, benefits and impacts that should be considered in the EIS?***

2. ***Are there any other restoration features or modifications to the restoration features identified that should be considered in the EIS?***

In addition to comments received at the meeting, comments will also be accepted by letter or email. Comments must be postmarked no later than November 20, 2008 to be included in the

Scoping Report, however your comments and ideas are welcome throughout the alternative formulation and selection process.

Scoping Process
The public meeting is part of the scoping process in compliance with the National Environmental Policy Act. (NEPA. The NEPA provides for an early and open public process for determining the scope of issues, resources, impacts, and alternatives to be addressed in the EIS

Scoping Report
A Scoping Report will be prepared following the "scoping" process. The report will include a listing of the important issues and concerns raised, an evaluation of those issues and concerns, and recommendations of the substantive issues and concern identified as warranting coverage in the draft EIS. A transcript of the meetings will be furnished with the report.

Study Purpose
The purpose of the study is to develop a comprehensive ecosystem restoration plan, at full Federal expense, to restore the areas affected by the MRGO navigation channel as required by Section 7013 of WRDA 2007. Recommendations resulting from the development of the comprehensive ecosystem restoration plan would be integrated with the LCA Program and specific projects authorized under Sections 7003 and 7006 of WRDA 2007, with the LACPR technical report, and with other similar programs and studies. The study would comport with the Chief of Engineer's "Actions for Change" calling for effectively implementing comprehensive systems approaches to water resources problems. The study would comply with NEPA and with ER-1105-2-100 (Planning Guidance Notebook). The MRGO Ecosystem Restoration Plan would include recommendations that are cost effective, environmentally acceptable and technically feasible and that the Secretary of the Army can carry out.

Study Authority
WRDA 2007 Section 7013 (P.L. 110-114 effective Nov. 8, 2007)

INCLUSIONS — At a minimum, the report … shall include—

- a plan to physically modify the Mississippi River-Gulf Outlet and restore the areas affected by the navigation channel;
- a plan to restore natural features of the ecosystem that will reduce or prevent damage from storm surge;
- a plan to prevent the intrusion of saltwater into the waterway;
- efforts to integrate the recommendations of the report with the [LCA] …and the [LACPR] analysis and design …; and
- consideration of—
    - use of native vegetation; and
    - diversions of fresh water to restore the Lake Borgne ecosystem.

CONSTRUCTION — The Secretary shall carry out a plan to...restore and protect the ecosystem substantially in accordance with the plan required ..., if the Secretary determines that the project is cost-effective, environmentally acceptable, and technically feasible.

Need for Action

A comprehensive ecosystem restoration plan is necessary to restore the estuarine environment in the Middle and Lower Pontchartrain Basin and other surrounding coastal waterbodies and habitat in southeastern Louisiana affected by the MRGO navigation channel The primary environmental concerns associated with the construction, operation, and maintenance of the channel include increases in salinity, coastal habitat changes, and land losses. Construction of the channel created a direct deep water link between the Inner Harbor Navigation Canal (IHNC) and the Gulf of Mexico allowing higher salinity water to enter the surrounding Lake Borgne and Lake Pontchartrain estuaries on incoming tidal cycles. Construction of the channel resulted in direct wetland losses and damages to the Bayou La Loutre Ridge. Placement of dredged material excavated during construction converted adjacent wetlands to dredge disposal areas and changed project area hydrology. Vessel use of the channel resulted in bank erosion along the channel. A comprehensive ecosystem restoration plan is needed to address the effects of the construction operation, and maintenance of MRGO in concert with the anticipated effects of the de-authorization and rock closure of the channel.

Study Focus

Resources/Issues to be Addressed

The tentative list of resources and issues to be evaluated in the EIS includes wetlands (marshes and swamps), aquatic resources, commercial and recreational fisheries, wildlife resources, essential fish habitat, water quality, air quality, threatened and endangered species, recreation resources, and cultural resources. Socioeconomic items to be evaluated include hurricane and flood protection, business and industrial activity, employment, land use, public/community facilities and services, population, community and regional growth, transportation, and community cohesion.

Potential Restoration Measures

The study will investigate several types of ecosystem restoration measures such as freshwater, sediment and nutrient introduction, wetland protection, restoration and creation, shoreline protection, bank stabilization, ridge protection and restoration, barrier island protection and restoration, water control measures (gates, weirs, sills, plugs, fill areas), modification of MRGO project features (authorized and de-authorized), use of native vegetation, natural features with benefits for storm surge damage reduction, and modifications to authorized projects.

For Further Information

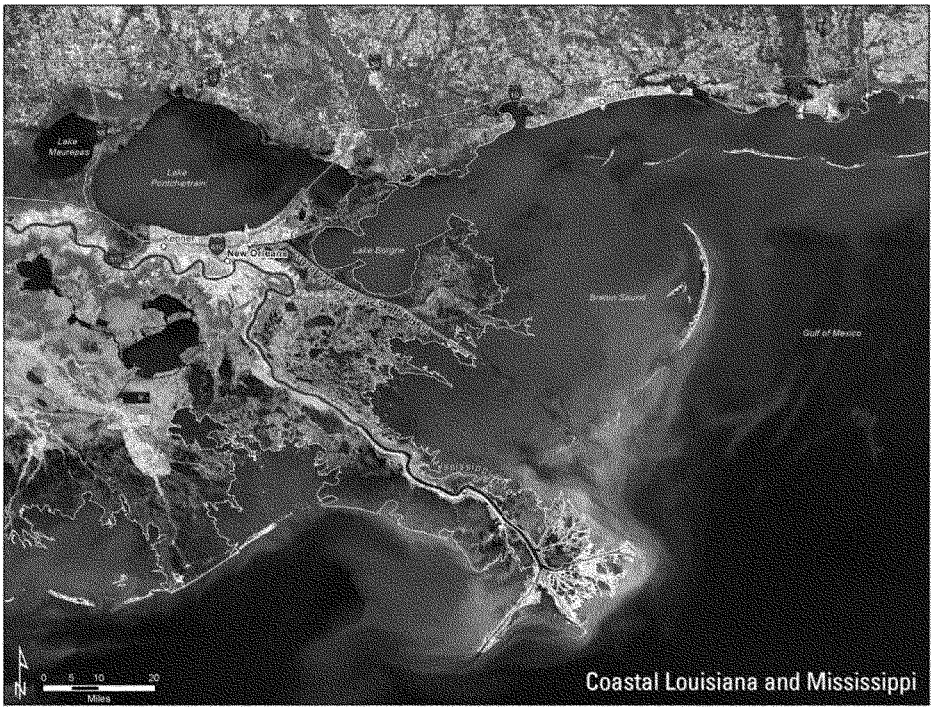
Interested parties are encouraged to express their concerns at any time during the study process.

Scoping comments and questions regarding the draft EIS should be addressed to Ms. Sandra Stiles, CEMVN-PM-RS, PO Box 60267, New Orleans, LA 70160-0267 or at telephone number (504) 862-1583. Ms. Stiles may be reached by fax at (504) 862-2088, or via e-mail at sandra.e.stiles@usace.army.mil.

Sincerely,

Elizabeth Wiggins
Chief, Environmental Planning
and Compliance Branch

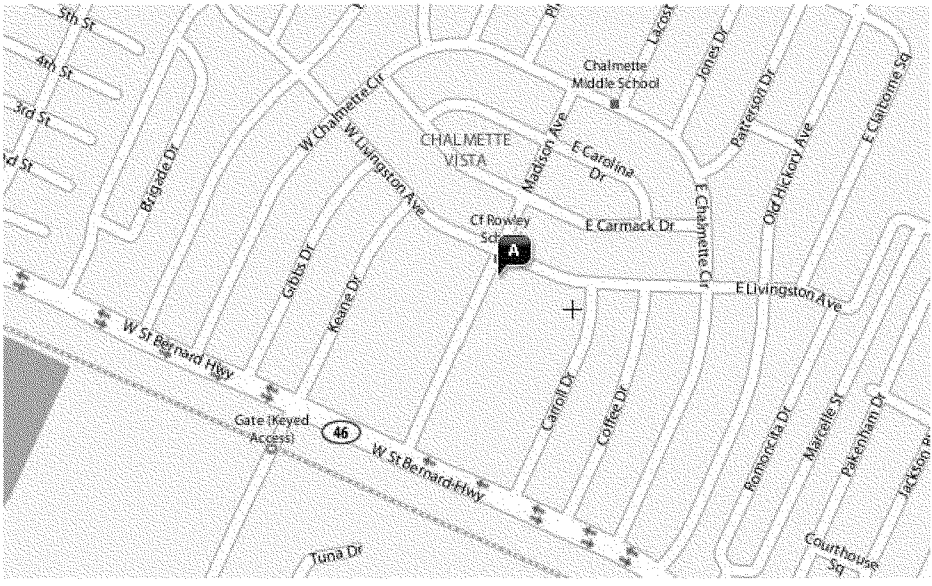
Enclosure


Lake Maurepas
Lake Pontchartrain
Lake Borgne
New Orleans
Breton Sound
Gulf of Mexico
Mississippi River
N
0 5 10 20
Miles
Coastal Louisiana and Mississippi

Monday, 3 November 2008

C.F. Rowley School, 49 Madison Avenue, Chalmette, LA

meeting is in school cafeteria, 6:00 p.m. to 9:00 p.m.



MEETING NOTES: _____

Thursday, 6 November 2008
Leo Seal Community Center, 529 Highway 90, Waveland, MS
6:00 p.m. to 9:00 p.m.



MEETING NOTES: _____

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APPENDIX B

MEETING MATERIALS



Welcome to the

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study

Open House and Public Scoping Meeting

Tonight, you will have an opportunity to meet with U.S. Army Corps of Engineers representatives and other team members, learn about the study, and most importantly, tell us what you think are key considerations to be examined in the study.

6:00 p.m. – 7:00 p.m. We invite you to visit a series of stations, staffed by team members, who can provide information on topics including:

- Ecosystem restoration study and milestones
- National Environmental Policy Act process and ways to submit comments
- Study area issues and opportunities
- MRGO de-authorization and closure project

7:00 p.m. – 7:15 p.m. Opening remarks

7:15 p.m. – 8:15 p.m. During small group discussions, you are invited to provide us with your thoughts on issues in the study area and associated solutions to address them.

8:15 p.m. – 9:00 p.m. All attendees are encouraged to reconvene to learn about the ideas that were discussed during the small group sessions.

US Army Corps of Engineers ®
New Orleans District

We value your input and appreciate your participation!

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study

Study Overview









The U.S. Army Corps of Engineers will submit a detailed ecosystem restoration plan to Congress to supplement the MRGO de-authorization study. The Corps is working closely with the Louisiana Coastal Protection and Restoration Authority (CPRA), other federal and state resource agencies and the public in the planning process.

The MRGO Ecosystem Restoration Plan Feasibility Study goals are to:

- Develop a comprehensive plan to restore the areas affected by the MRGO channel
- Develop cost-effective, environmentally acceptable, and technically feasible recommendations
- Recommend modifications as appropriate to federally authorized water resources projects to contribute to ecosystem restoration in the area
- Plan in a collaborative environment involving customers and stakeholders
- Contribute to national ecosystem restoration by increasing the net quantity and/or quality of desired ecosystem resources in the study area

The comprehensive plan may include:

- Physical modification of the MRGO and restoration of the areas affected by the navigation channel
- Restoring natural features of the ecosystem
- Preventing the intrusion of saltwater into the waterway
- Integrating the recommendations of the report with the Louisiana Coastal Area Program and the LACPR Initiative
- Consideration of using native vegetation and diversions of freshwater to restore the Lake Borgne ecosystem
- Measures to reduce the risk of storm damage to the greater New Orleans metropolitan area by restoring the surrounding wetlands through measures to begin to reverse wetland losses in areas affected by navigation, oil and gas, and other channels
- Measures or structures necessary to protect, restore or increase wetlands, to prevent saltwater intrusion and/or storm surge damage



US Army Corps of Engineers
New Orleans District

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study



Study Area Opportunities

The study team will investigate the following measures that address the issues associated with ecosystem restoration. Other opportunities may be identified during the scoping process:

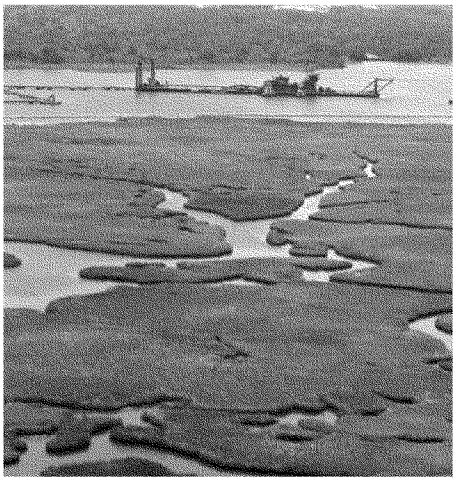
- Fresh water, sediment, and nutrient introduction
- Wetland protection, restoration, and creation
- Shoreline protection
- Bank stabilization
- Ridge protection and restoration
- Barrier island protection and restoration
- Water control measures (gates, weirs, sills, plugs, fill areas, etc.)
- Use of native vegetation
- Natural features with benefits for storm surge damage reduction
- Modification of MRGO project features (authorized and de-authorized)
- Modifications to other authorized projects in the area

US Army Corps of Engineers
New Orleans District

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study

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New Orleans District

NEPA PUBLIC SCOPING MEETING GUIDE



The National Environmental Policy Act of 1969 (NEPA) established a national policy to protect the environment by requiring Environmental Impact Statements for major federal actions having a significant effect on the environment.

This evening's scoping meeting, conducted under NEPA authority, gives the public an opportunity to provide input for the development of the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan authorized in the Water Resources Development Act of 2007.

The U.S. Army Corps of Engineers, in cooperation with federal and state resource agencies, is developing a comprehensive ecosystem restoration plan aimed at restoring and maintaining the areas affected by the now de-authorized MRGO navigation channel. This effort will produce a plan for comprehensive ecosystem measures to be implemented in conjunction with the physical closure of the MRGO channel.

Tonight, you will learn about this effort, project area issues, as well as possible restoration solutions.

Agenda

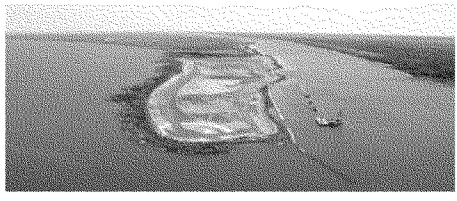
Open house	6:00 p.m. – 7:00 p.m.
Opening remarks	7:00 p.m. – 7:15 p.m.
Small group sessions	7:15 p.m. – 8:15 p.m.
Group reports	8:15 p.m. – 8:50 p.m.
Wrap-up	8:50 p.m. – 9:00 p.m.

Discussion Guidelines

- Facilitators will gather comments throughout the open house as well as during the sessions following the opening remarks
- Please be courteous to others during the small group discussion sessions
- All written and oral comments will be given equal consideration during the scoping process

Written comments may be submitted until November 20, 2008:

E-mail comments to:	MRGOreply@usace.army.mil
Visit the project Web site at:	http://mrgo.usace.army.mil
Mail comments to:	MRGO Ecosystem Restoration EIS Manager CEMVN-PM-RS P.O. Box 60267 New Orleans, LA 70160-0267
Overnight comments to:	MRGO Ecosystem Restoration EIS Manager CEMVN-PM-RS 7400 Leake Avenue New Orleans, LA 70118-3651



US Army Corps of Engineers
New Orleans District

Media Advisory

FOR IMMEDIATE RELEASE

Contact: Corps of Engineers - Julie Morgan, 504-862-2911
St. Bernard Parish – Karen Bazile, 504-874-0980

October 28, 2008

MRGO Restoration Plan Public Scoping Meeting set for November 3
Opportunity for the public to provide input for plan development

WHAT: The U.S. Army Corps of Engineers is hosting a scoping meeting to gather public input for the development of the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan authorized in the Water Resources Development Act of 2007. The meetings are conducted under the authority of the National Environmental Policy Act and serve as an introduction of plan development efforts for the interested public.

WHEN: Monday, November 3, 2008
6:00 – 9:00 p.m.

WHERE: C.F. Rowley School
49 Madison Avenue
Chalmette, LA 70043

PURPOSE: The Corps of Engineers is developing a comprehensive ecosystem restoration plan aimed at restoring and maintaining the areas affected by the now de-authorized MRGO navigation channel. This plan represents follow-on actions to be implemented after the physical closure of the MRGO channel. Scoping meeting participants will learn about this effort, the issues associated with wetland restoration activities, as well as the possible solutions.

Subject matter experts will be available for interviews from 5:30 – 6:00 p.m. prior to both meetings.

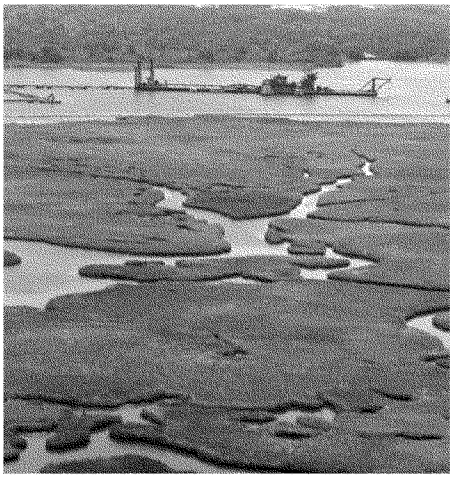
For more information, please visit the project Web site at http://mrgo.usace.army.mil

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US Army Corps of Engineers
New Orleans District

Discussion Guide / NEPA Process / Ways to Submit Comments

USACE MRGO ECOSYSTEM RESTORATION PLAN FEASIBILITY STUDY



The National Environmental Policy Act of 1969 (NEPA) established a national policy to protect the environment by requiring Environmental Impact Statements for major federal actions having a significant effect on the environment.

This evening's scoping meeting, conducted under NEPA authority, gives the public an opportunity to provide input for the development of the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan authorized in the Water Resources Development Act of 2007.

The U.S. Army Corps of Engineers is developing a comprehensive ecosystem restoration plan aimed at restoring and maintaining the areas affected by the now de-authorized MRGO navigation channel. This plan represents the follow-on actions to be implemented after the physical closure of the MRGO channel.

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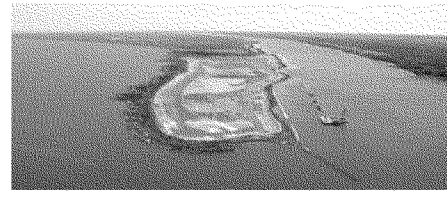
Open House	6:00 p.m. – 7:00 p.m.
Project Overview	7:00 p.m. – 7:15 p.m.
Small Group Discussion	7:15 p.m. – 8:15 p.m.
Group Reports	8:15 p.m. – 8:50 p.m.
Wrap-up	8:50 p.m. – 9:00 p.m.

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Visit the project Web site at:	http://www.mrgo.usace.army.mil
Mail comments to:	MRGO Ecosystem Restoration EIS Manager CEM-PM-RS P.O. Box 60267 New Orleans, LA 70160-0267
Overnight comments to:	MRGO Ecosystem Restoration EIS Manager CEM-PM-RS 7400 Leake Avenue New Orleans, LA 70118-3651



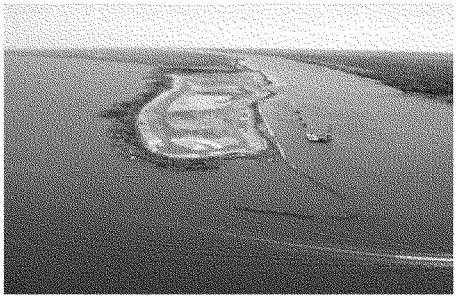
US Army Corps of Engineers
New Orleans District

FACT SHEET

MRGO Ecosystem Restoration Plan Feasibility Study

The Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan will be developed by the U.S. Army Corps of Engineers as a supplement to the MRGO Deep-Draft De-authorization Report to Congress. The Corps is conducting a Feasibility Study, which will result in a comprehensive Ecosystem Restoration Plan (Plan) to restore and maintain estuarine habitat areas affected by the MRGO navigation channel. Section 7013 of the Water Resources Development Act (WRDA) of 2007 authorizes development of the plan. The study will be fully funded by the Federal government.

Background



For nearly 45 years, the MRGO provided a shortened shipping route between the Port of New Orleans and the Gulf of Mexico. On June 5, 2008, the MRGO was de-authorized between the Gulf of Mexico and the Gulf Intracoastal Waterway (GIWW), and a rock closure structure was approved for construction in the vicinity of Bayou La Loutre in St. Bernard Parish, Louisiana.

Study Area

The study area is a tidally influenced coastal ecosystem affected by the MRGO channel. Generally, the study area includes portions of southeast Louisiana and southwest Mississippi. In Louisiana, the study area includes the Lake Pontchartrain Basin. In Mississippi, the study area includes portions of western Mississippi Sound, its bordering wetlands and barrier islands.

Issues and Opportunities

The study will evaluate the following issues:

- Decreased fresh water, sediment and nutrient inputs
- Hydrologic modifications
- Saltwater intrusion
- Wetland loss
- Ridge habitat degradation and destruction
- Retreating and eroding barrier islands
- Bank and shoreline erosion
- Human development susceptible to storm surge
- Subsidence
- Sea level rise
- Altered circulation and water quality
- Habitat changes
- Loss of shallow ponds

The study will investigate the following opportunities for ecosystem restoration measures:

- Freshwater, sediment, and nutrient introduction
- Wetland protection, restoration, and creation
- Shoreline protection
- Bank stabilization
- Ridge protection and restoration
- Barrier island protection and restoration
- Water control (gates, weirs, sills, plugs, fill areas, etc.)
- Modifying MRGO Project features
- Use of native vegetation
- Natural features for storm surge damage reduction
- Modifications to authorized projects

Planning Process

The Corps uses a six-step planning process to provide a rational basis for selecting and recommending projects for implementation. This multiple-step process will result in an efficient, effective, complete, and acceptable plan that benefits the entire study area.

Step 1 – Identifying problems, needs and opportunities
Define study area issues and identify opportunities to address problems and needs.

Step 2 – Inventorying and forecasting conditions
Develop an inventory of conditions as they exist now and a forecast of future conditions without the implementation of any additional ecosystem restoration projects. The study team will look at a 50-year period for this forecast. This phase will verify existing data, including wetlands loss rates, and will develop additional data as necessary.

Step 3 – Formulating alternative plans
Using input from the National Environmental Policy Act (NEPA) public scoping process, formulate a range of alternatives to address or contribute to solving study area issues. Following public input, alternatives will be screened through a set of evaluation criteria, and the best performing alternatives will be evaluated in detail.

Step 4 – Evaluating alternative plans
To identify the alternatives that would likely result in the greatest ecosystem restoration benefits, the study will evaluate each alternative by forecasting future conditions if that alternative were implemented. Beneficial and adverse effects of each alternative will be characterized by magnitude, location, timing, cost, and duration. The study will consider the degree to which each alternative complies with environmental restoration and protection requirements and consistency with other coastal restoration initiatives.

Step 5 – Comparing alternative plans
Alternatives, including the "no action" alternative as defined by NEPA, are compared to one another according to the net environmental effects and the cost of implementing each alternative. The alternatives are systematically ranked based on this comparison.

Step 6 – Selecting a plan
An Ecosystem Restoration Plan will be recommended based on the Feasibility Study results. The Plan must meet planning objectives and reasonably maximize environmental benefits relative to costs. The recommended plan must also be shown to be cost effective, environmentally acceptable, and technically feasible.

Major Study Milestones

Publish Notice of Intent in Federal Register	Oct 2008
Public Scoping Meetings	Nov 2008
Screen Initial Array of Alternatives/ Define Final Array	Dec 2008
Complete Preliminary Conceptual Design of Final Array	Mar 2009
Evaluate and Compare Final Array	Jul 2009
Identify Tentatively Selected Plan	Aug 2009
Complete Engineering & Design of Tentatively Selected Plan	Nov 2009
Cost Estimates Complete for Tentatively Selected Plan	Dec 2009
Draft Report and EIS Complete	Jan 2010
Internal Reviews Complete	Mar 2010
Publish Notice of Availability for Draft Report and EIS	May 2010
Public Meeting to Present Draft	May 2010
Public Review/Comment Period (45 days)	Jun 2010
Final Report/EIS Complete	TBD
Internal Reviews Complete	TBD
Publish Final Report and EIS	TBD
Period of Availability (30 days)	TBD
Chief of Engineers Signs Report	TBD
Headquarters Transmits Report to Assistant Secretary of the Army for Civil Works (ASA(CW))	TBD
Office of Management & Budget Provides Comments to ASA(CW)	TBD
ASA(CW) Signs Record of Decision	TBD

Opportunities for Public Input

The Corps will engage stakeholders throughout the study process and will provide several opportunities for public involvement as the MRGO Ecosystem Restoration Plan is developed. Stakeholders for the MRGO Ecosystem Restoration Plan include: federal and state resource agencies, local governments, business interests, commercial fishing interests, landowners, residents, environmental organizations, and the general public. Coordination efforts conducted during the study will include:

- Multi-agency project delivery team meetings
- Multi-agency habitat evaluation team meetings
- General public meetings
- Public comment periods
- Interactive project Web site
- Media opportunities (newsletters and press releases)
- Stakeholder visits, e-mails, and phone calls
- Stakeholder forums
- Inter-agency and public NEPA coordination

Funding

The Corps is undertaking the MRGO Ecosystem Restoration Plan Feasibility Study at full Federal expense. Up to $5 million will be utilized from the MRGO Operation and Maintenance appropriation provided under Public Law 109-148 and Public Law 109-234. In order to implement any restoration efforts Congress must appropriate additional funds.

For More Information

Anyone seeking additional information on the MRGO Ecosystem Restoration Plan Feasibility Study can visit the MRGO Web site at ***http://mrgo.usace.army.mil.***

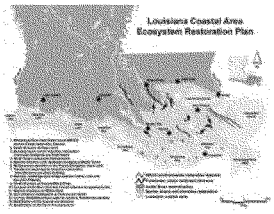
US Army Corps of Engineers
New Orleans District

FACT SHEET

Building on Experience: Related Efforts

While the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Feasibility Study will focus on areas impacted by the ship channel, the study team will be examining other Corps of Engineers studies from the last 25 years.

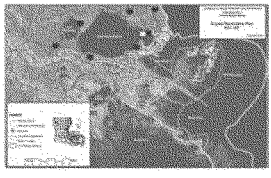
The Corps is experienced in coastal and estuarine habitat restoration. In fact, four major completed studies will provide information to the MRGO Restoration Study. They include, the Louisiana Coastal Area Ecosystem Restoration Plan (LCA), the Louisiana Coastal Protection and Restoration (LACPR) effort, the Mississippi Coastal Improvements Project (MsCIP), and the MRGO Deep Draft De-authorization (MRGO-3D) Report).



Louisiana Coastal Area (LCA) Ecosystem Restoration Plan

The LCA study was initiated in 2001 by the Corps of Engineers and the State of Louisiana to address Louisiana's severe coastal land loss problems. The goal is to achieve and sustain a coastal ecosystem that can support and protect the environment, economy and culture of southern Louisiana and thus contribute to the economy and well-being of the nation.

The LCA Plan includes programmatic authorization of five near-term critical projects and programmatic authorization is requested for a Science and Technology Program as well as associated demonstration projects, beneficial use of dredged material and studies to modify existing water control structures.



Louisiana Coastal Protection and Restoration (LACPR) Effort

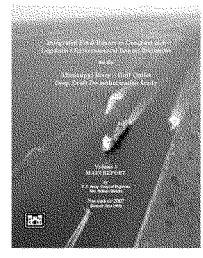
The LACPR effort brings together a team from the Corps of Engineers and Louisiana's Coastal Protection and Restoration Authority with support from national, international, academic and government experts. The Corps is developing a suite of alternative solutions for protecting and restoring the coast, a range of interrelated human and environmental factors and improved hydrologic modeling methodologies – a more detailed view of how water moves and is distributed both normally and during hurricanes.

The LACPR team has achieved several technical breakthroughs that continue to lay groundwork for future analysis and decision making. A key approach is applying modeling that identifies residual storm surge risks, in addition to the measure of protection anticipated



Mississippi Coastal Improvements Program (MsCIP)

This is a technical evaluation coordinated with the state of Mississippi, federal agencies and stakeholders to determine hurricane risk reduction and environmental restoration measures for coastal Mississippi. The water resources mission areas of hurricane risk reduction, flood control, interior drainage, navigation and ecosystem restoration are integrated into the research and provide groundwork that will assist in the development of potential elements of the MRGO Ecosystem Restoration Feasibility Study.



MRGO Deep Draft De-authorization (MRGO 3D) Report

The study team will incorporate existing conditions documented in the MRGO Deep Draft De-authorization Report, as well as examine the public and agency comments submitted regarding coastal restoration.

US Army Corps of Engineers
New Orleans District

FACT SHEET

MRGO Closure and Coastal Restoration



What is the MRGO?

The Mississippi River Gulf Outlet (MRGO) is a former Federal navigation channel authorized by Congress in 1956 to provide a short route between the Port of New Orleans and the Gulf of Mexico. The MRGO was authorized as a 36-foot deep, 500-foot bottom width waterway extending from the Inner Harbor Navigation Canal (IHNC) to the 38-foot depth contour in the Gulf of Mexico. Construction of the channel began in 1958 and was completed in 1968.

MRGO Deep-Draft De-authorization

In 2005, Hurricane Katrina made landfall in the project area causing wide-spread damage and destruction. The MRGO navigation channel has not been maintained since the storm. In 2006, the Corps began a study to de-authorize deep-draft navigation on the portion of the MRGO between the Gulf Intracoastal Waterway (GIWW) and the Gulf of Mexico. The de-authorization study resulted in a Report of the Chief of Engineers, signed January 29, 2008, recommending de-authorization of all navigation between the GIWW and the Gulf, and calling for a rock closure structure to be constructed in the vicinity of the Bayou La Loutre ridge in St. Bernard Parish, LA. This report was transmitted to Congress on June 5, 2008, thus officially de-authorizing the channel and bringing 40 years of shipping in the MRGO to a close.

The closure structure will be 950 feet long, 12 feet wide and rise 7 feet above the water's surface. Approximately 433,500 tons of rock will be used to construct the closure (making it heavier than Empire State Building, which weighs 365,000 tons).

What's Ahead?

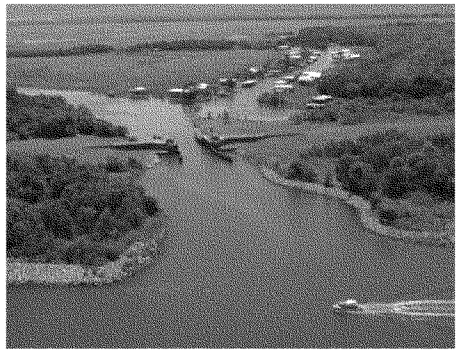
Now that the channel is officially de-authorized, the Corps is able to proceed with construction of the closure structure and disposition of un-needed channel features such as aids to navigation and excess real estate easements. The channel closure process must proceed through the steps listed below:

The USACE and the State of Louisiana Must Sign a Memo of Agreement

Before the closure structure can be constructed, the Corps and the State of Louisiana must execute an agreement defining project responsibilities. The State of Louisiana Coastal Protection and Restoration Authority (CPRA) pledged to assume responsibility as the non-Federal sponsor for the project. The total closure structure will be designed and constructed at 100 percent Federal expense; however, the State will be responsible for acquiring lands and rights-of-way (LERRDs) and for performing any operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) after construction is complete.

Real Estate Acquisition

Under the Authorized Plan LERRDs must be provided by the non-Federal sponsor. Two parcels of land must be acquired along the banks of the MRGO for the construction





of over-bank tie-ins. Land acquisition must be complete before the construction contract can be awarded.

IHNC Lock Repair

Historically, the MRGO served as a bypass route around the Inner Harbor Navigation Canal Lock during lock outages and repairs. In order to ensure that the viability of the GIWW is maintained, the IHNC Lock will be repaired. The IHNC Lock is a critical link for GIWW traffic. Because this structure is 80 years old, maintenance will be performed before the closure of the MRGO to ensure continuing passage for GIWW traffic. Repairs on the lock will be complete in October 2008. This action reflects the use of a systems approach to manage Corps water resources projects.

Building the Closure Structure

Construction will begin when a contract is awarded and a notice to proceed is issued to the contractor. Construction includes mobilization, procurement of materials, placement of materials, and de-mobilization. The job is estimated to take approximately six months following the notice to proceed. USACE is committed to completing the job by June 2009. Once construction is complete, the closure structure will be transferred to the State of Louisiana for OMRR&R.

State Assumes Maintenance of the Closure Structure

After construction of the closure structure is complete, the State of Louisiana will assume operation, maintenance, repair, replacement, and rehabilitation of the closure structure. The State will be presented with a manual that will contain vital information for the ongoing operation and maintenance over the 50-year life of the project. The manual will detail measures for the safe and efficient functioning of the project and its proper care and effectiveness.

Final Close-Out of the De-Authorized Channel

There are several actions needed to close out the de-authorized channel. Because the original channel and easements were specific to the MRGO deep-draft navigation project, these rights must be relinquished back to the appropriate underlying landowners. In addition, because the de-authorized portion of the channel will cease to be a Federally maintained waterway, the U.S. Coast Guard will remove and/or modify aids to navigation, such as buoys and beacons, and issue notices to mariners concerning the de-authorization and closure.

Coastal Restoration Planning for the MRGO Area

In addition, to fulfill the requirements of the WRDA 2007, the Corps is developing an ecosystem restoration plan for the area. Continuing the collaborative planning employed



for the de-authorization report, the Corps will work with stakeholders to evaluate and recommend coastal restoration measures. Potential plan features may include marsh creation, shoreline protection, barrier island restoration, and Mississippi River freshwater diversions. A draft plan is expected in December 2009. As the MRGO closure and restoration planning moves forward, the Corps will continue to keep stakeholders and the public informed.

For More Information

To learn more about the MRGO, please visit http://mrgo.usace.army.mil

MRGO Ecosystem Restoration Study
Potential Issues List

Below is a list of potential issues that are typically evaluated in National Environmental Policy Act (NEPA) documents. Please let us know what issues are most important to you. We are asking that you ***rank each issues category in order of importance from 1 to 11, with 1 being the most important, and 11 being the least important.*** *This information will help the U.S. Army Corps of Engineers evaluate the issues as part of MRGO Ecosystem Restoration Study.*

*Name (optional):*_____

HUMAN ENVIRONMENT

☐ Social Effects
- Population Changes
- Residential Displacements
- Landscape and Visual Changes
- Travel Route Changes

☐ Community Services Effects
- School Districts
- Parks and Recreation Facilities
- Emergency Services
- Churches and Cemeteries
- Land Use Changes

☐ Economic Effects
- Property Value Changes
- Property and Sales Tax Changes
- Business Traffic Changes
- Business Displacements

☐ Cultural Resources Effects
- Historic Architectural Resources
- Archeological Sites
- National Register Properties
- Tribal Reservation or Treaty Lands
- Historic Public Sites

NATURAL ENVIRONMENT

☐ Water Resources Effects
- Wild and Scenic Rivers
- Groundwater Quality
- Surface Water Quality (salinity, turbidity)

☐ Biological Resources Effects
- Natural Vegetation
- Wildlife Habitats
- Fisheries
- Aquatic/Marine Habitats
- Threatened or Endangered Species
- Essential Fish Habitat
- Wetland Habitat

NATURAL ENVIRONMENT (cont'd)

☐ Geological Resources Effects
- Coastal Zone
- Coastal Barrier
- Prime and Unique Farmlands
- Minerals Resources
- Topography and Erosion

☐ Recreational Resources Effects
- Parks and Preserves
- Wildlife Management Areas
- National and State Forests
- Boat Launch Sites
- Private Hunting Leases

OTHER ISSUES

☐ Effects to Compatibility with Existing Plans
- Local/State Comprehensive Plans/Goals
- Federal Agency Plans/Goals

☐ Utilities Services Effects
- Residential Disruption (electrical, water, sewer)
- Facility Relocation

☐ Temporary Construction Effects
- Air Quality/Nuisance Dust
- Noise and Vibration
- Travel Route Changes
- Storing of Equipment/Material

☐ Additional Issues (*please specify*)
- _____
- _____
- _____
- _____

L

MRGO Ecosystem Restoration Study
Potential Issues List

Below is a list of potential issues that are typically evaluated in National Environmental Policy Act (NEPA) documents. Please let us know what issues are most important to you. We are asking that you ***rank each issues category in order of importance from 1 to 11, with 1 being the most important, and 11 being the least important.*** *This information will help the U.S. Army Corps of Engineers evaluate the issues as part of MRGO Ecosystem Restoration Study.*

*Name (optional):*_____

☐ **HUMAN ENVIRONMENT**

☐ Social Effects
- Population Changes
- Residential Displacements
- Landscape and Visual Changes
- Travel Route Changes

☐ Community Services Effects
- School Districts
- Parks and Recreation Facilities
- Emergency Services
- Churches and Cemeteries
- Land Use Changes

☐ Economic Effects
- Property Value Changes
- Property and Sales Tax Changes
- Business Traffic Changes
- Business Displacements

☐ Cultural Resources Effects
- Historic Architectural Resources
- Archeological Sites
- National Register Properties
- Tribal Reservation or Treaty Lands
- Historic Public Sites

☐ **NATURAL ENVIRONMENT**

☐ Water Resources Effects
- Wild and Scenic Rivers
- Groundwater Quality
- Surface Water Quality (salinity, turbidity)

☐ Biological Resources Effects
- Natural Vegetation
- Wildlife Habitats
- Fisheries
- Aquatic/Marine Habitats
- Threatened or Endangered Species
- Essential Fish Habitat
- Wetland Habitat

☐ **NATURAL ENVIRONMENT (cont'd)**

☐ Geological Resources Effects
- Coastal Zone
- Coastal Barrier
- Prime and Unique Farmlands
- Minerals Resources
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☐ Recreational Resources Effects
- Parks and Preserves
- Wildlife Management Areas
- National and State Forests
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☐ **OTHER ISSUES**

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- Federal Agency Plans/Goals

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- Facility Relocation

☐ Temporary Construction Effects
- Air Quality/Nuisance Dust
- Noise and Vibration
- Travel Route Changes
- Storing of Equipment/Material

☐ Additional Issues (*please specify*)
- _____
- _____
- _____
- _____

M

MRGO Ecosystem Restoration Study
Environmental Resources

Below is a list of environmental resources that are typically evaluated in National Environmental Policy Act (NEPA) documents. Please let us know what environmental resources within the study area are most important to you. ***We ask that you rank each category in order of importance from 1 to 11, with 1 being the most important and 11 being the least important.***

*Name (optional):*_____

HUMAN ENVIRONMENT

☐ Social Effects
- Population Changes
- Residential Displacements
- Landscape and Visual Changes
- Travel Route Changes

☐ Community Services Effects
- School Districts
- Parks and Recreation Facilities
- Emergency Services
- Churches and Cemeteries
- Land Use Changes

☐ Economic Effects
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- Property and Sales Tax Changes
- Business Traffic Changes
- Business Displacements

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- Archeological Sites
- National Register Properties
- Tribal Reservation or Treaty Lands
- Historic Public Sites

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- Groundwater Quality
- Surface Water Quality (salinity, turbidity)

☐ Biological Resources Effects
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- Wildlife Habitats
- Fisheries
- Aquatic/Marine Habitats
- Threatened or Endangered Species
- Essential Fish Habitat
- Wetland Habitat

NATURAL ENVIRONMENT (cont'd)

☐ Geological Resources Effects
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- Coastal Barrier
- Prime and Unique Farmlands
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- Topography and Erosion

☐ Recreational Resources Effects
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- Wildlife Management Areas
- National and State Forests
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- Federal Agency Plans/Goals

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- Air Quality/Nuisance Dust
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- Storing of Equipment/Material

Additional Issues (*please specify*)
- _____
- _____
- _____
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L

MRGO Ecosystem Restoration Study
Environmental Resources

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- Aquatic/Marine Habitats
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- Wetland Habitat

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- Noise and Vibration
- Travel Route Changes
- Storing of Equipment/Material

Additional Issues (*please specify*)
- _____
- _____
- _____
- _____

M

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study
Public Scoping Meetings Request for Comment

Comments _____

_____

_____

_____

_____

_____ _____

Name Affiliation

_____ _____

Street Phone

_____ _____

City, State, Zip E-mail

I attended the meeting in: ☐ LA ☐ MS

DEPARTMENT OF THE ARMY
OFFICIAL BUSINESS



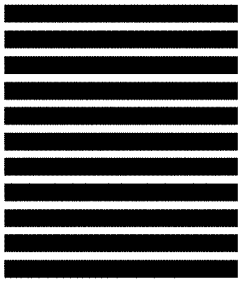
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U.S. Army Corps of Engineers, New Orleans District
c/o Environmental Manager, Sandra Stiles
CEMVN-PM-RS
P.O. Box 60267
New Orleans, LA 70160-0267





The U.S. Army Corps of Engineers is hosting two scoping meetings to gather public input for the development of the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan authorized in the Water Resources Development Act of 2007. The meetings are conducted under the authority of the National Environmental Policy Act and serve as an introduction of plan development efforts for the interested public.

The Corps of Engineers is developing a comprehensive ecosystem restoration plan aimed at restoring and maintaining the areas affected by the now de-authorized MRGO navigation channel. This plan represents the follow-on actions to be implemented after the physical closure of the MRGO channel.

Please join members of the plan development team to learn more about this effort, the issues associated with wetland restoration activities, and the possible solutions.

Meeting Agenda

Open house	6:00 p.m. – 7:00 p.m.
Opening remarks	7:00 p.m. – 7:15 p.m.
Small group sessions	7:15 p.m. – 8:15 p.m.
Group reports	8:15 p.m. – 8:50 p.m.
Wrap-up	8:50 p.m. – 9:00 p.m.

Chalmette, LA – Monday, November 3, 2008
C.F. Rowley School
49 Madison Avenue, Chalmette, LA 70043

Waveland, MS – Thursday, November 6, 2008
Leo Seal Community Center
529 Highway 90, Waveland, MS 39576

US Army Corps of Engineers ®

The public is invited to submit comments until November 20, 2008:

Send e-mail comments to: MRGOreply@usace.army.mil

Visit the project Web site at: http://mrgo.usace.army.mil

Mail comments to:
MRGO Ecosystem Restoration EIS Manager
CEMVN-PM-R
P.O. Box 60267
New Orleans, LA 70160-0267

Overnight comments to:
MRGO Ecosystem Restoration EIS Manager,
CEMVN-PM-R
7400 Leake Ave
New Orleans, LA 70118-3651

For additional information please call 504-862-2587, 8 a.m. to 5 p.m., M-F. For special needs, please call 24 hours in advance of the meeting.

FIRST NAME	LAST NAME	ORGANIZATION	ADDRESS 1	ADDRESS	CITY	ST
Melissa	Samet	American Rivers	6 School Street	Suite 200	Fairfax	CA
Johnny	Antill	Antill Pipeline Construction				
Maurice	Bandy	ARCADIS				
Joy	Day	ARCADIS				
Ronald	Dunn	ARCADIS				
Wybren	Epema	ARCADIS				
Tony	Ferruccio	ARCADIS				
Dennis	Kamber	ARCADIS				
Mary Ann	Lewis	ARCADIS				
Mike	Lorino	Associated Branch Pilots	3813 N. Causeway Blvd.		Metairie	LA
Matt	Holzhalb	AWD				
Ken	Duffy	BEM Systems, Inc.	8550 United Plaza	Suite 702	Baton Rouge	LA
Will	Rudolf	Biloxi Marsh Lands				
Joe	Suhayda	Biloxi Marsh Lands				
Randy	Moertle	Biloxi Marsh Lands Corp.	1008 Mar Drive		Lockport	LA
Dale	Biggers	Boh Bros Construction Co	P. O. Drawer 53266		New Orleans	LA
Fred	Fuchs	Boh Bros Construction Co				
Jeff	Quebedeaux	Boh Bros Construction Co				
Jodi	Satches	Bolinger Shipyards, Inc.				
Larry	Brown	Bollinger				
David	Marmillion	Bollinger				
Billy	Marchal	Bring NO Back Commission	279 Audubon Blvd.		New Orleans	LA
Russell	Young	Burk-Kleinpeter, Inc.	4176 Canal Street		New Orleans	LA
Jim	King	Buzzi Unicem	14900 Intracoastal Drive		New Orleans	LA
Robert	Holston	Buzzi Unicem USA	14900 Intracoastal Drive		New Orleans	LA
Merritt	Lane	Canal Barge				
Steve	Price	CDM Camp Dresse McKee	1515 Poydras Street		New Orleans	LA
Ray	Sick	Cenac Towing				
Channing	Hayden	CH&A				
Bil	Rankine	Citgo Petroleum				
Wynecta	Fisher	City of NO	1340 Poydras Street, Suite 1000		New Orleans	LA
Keith	Colvin	Coalition to Restore Coastal LA				
Steven	Peuronni	Coalition to Restore Coastal LA				
Natalie	Snider	Coalition to Restore Coastal LA	6160 Perkins Road	Suite 225	Baton Rouge	LA
Matt	Olson	Common Ground	1415 Franklin Avenue			
Norwyn	Johnson	CPRA-IPT				

Robert	Mendoza	Department of Public Works - City of New Orlean	1300 Perdido Street	Room 6W0	New Orleans	LA
Charlie	Melancon	District Representative 3rd District	8201 Judge Perez Dr.	Suite 208	Chalmette	LA
Jean	Cowan	DNR				
Shannon	Haynes	DNR				
Chris	Williams	DNR				
Bren	Haase	DNR - Coastal Restoration Division				
Honora	Buras	DNR/CRD				####
Allan	Colley	Dupuy Storage				
Paul	Harrison	Environmental Defense	1875 Connecticut Avenue NV	Suite 600	Washington	DC
Geraldine	Cox	FEMA				
Melissa	Crane	FEMA				
Karl	Gonzales	GNOBFA / Gulf South Marine				
King	Milling	Gov's Commission				
Len	Bahr	Gov's Office of Coastal Affairs				
Sean	Duffy	GSMA Gulf States Maritime Assoc.	3939 Causeway Blvd.	Suite 102	Metairie	LA
Steve	Kolian	GSRC				
Raymond	Butler	Gulf Intracoastal Canal Assoc.	2010 Butler Drive		Friendswood	TX
Cynthia	Sarthou	Gulf Restoration Network	P. O. Box 2245		New Orleans	LA
Aaron	Viles	Gulf Restoration Network / Gulf Coast Recovery				
Eric	Webb	Gulf South Research Corporation	8081 GSRI Avenue		Baton Rouge	LA
Rob	Vining	HNTB				
Bob	Ivarson	HNTB Corp				
Bill	Creten	Infrastructure Alt	960 W. Rivercenter	Suite B	Comstock Park	MI
Patrick	Morten	Ingram Barge				
David	Riddell	International Shipholding				
Kevin	Wild	International Shipholding				
David	Kearney	Kearney Companies	4000 France Road Parkway		New Orleans	LA
Mike	Kearney	Kearney Companies	4000 France Road Parkway		New Orleans	LA
Barry	Kohl	LA Audubon and Sierra				
Heather	Finley	LA Dept. of Wildlife & Fisheries				
David	Brown	LA Environmental Action Network	P. O. Box 66323		Baton Rouge	LA
Johnny	Bradberry	LADOTD	P.O. Box 94245		Baton Rouge	LA
Clyde	Martin	LADOTD	P.O. Box 94245		Baton Rouge	LA
James	McMenis	LADOTD				
David	Miller	LADOTD	8900 Jimmy Wedell Drive		Baton Rouge	LA
John R.	Monzon	LADOTD				
Ed	Preau	LADOTD	P.O. Box 94245		Baton Rouge	LA

Dustin	White	LADOTD	9800 Jimmy Weddell Drive		Baton Rouge	LA
Clyde	Martin, Jr. P.E	LADOTD Director Hurricane & Flood Protection P	8900 Jimmy Wedell		Baton Rouge	LA
Robert	Turner	Lake Borgne Basin Levee District	2713 Tidewater Drive		Slidell	LA
Carlton	Dufrechou	Lake Pont. Basin Foundation	6316 Fontainbleau		New Orleans	LA
John	Lopez	Lake Pontchartrain Basin Foundation	31378 River Pines Dr.		Springfield	LA
Joseph	LeBlanc	LDNR	617 N. 3rd St.	10th Floor	Baton Rouge	LA
Tom	Forbes	LNA Ind. Canal				
George	Boddie	LNNR/ Coastal Engineering	CERM Building Ste. 309	2045 Lake	New Orleans	LA
Sydney	Coffee	Louisiana Coastal Protection & Restoration Auth	Capitol Annex	1051 N. 3r	Baton Rouge	LA
Scott	Angelle	Louisiana Department of Natural Resources	P.O. Box 94396		Baton Rouge	LA
John W.	Day	Louisiana State University	11843 Port Hudson Pride Rd.		Zachary	LA
Randy	Lanctot	Louisiana Wildlife Federation	337 Acadian Thruway		Baton Rouge	LA
Cherrie	Felder	Lower Mississppi River Waterways Assn.	3801 Causeway Blvd.	Suite 310	Metairie	LA
Bob	Thomas	Loyola University				
Paul	Kemp	LSU				
Hasaan	Mashriqui	LSU				
Mark	Schexnayder	LSU Ag Center				
James	Murphy	MARAD	500 Poydras Street	#1223	New Orleans	LA
Ray	Nagin	Mayor of New Orleans	1300 Perdido Street	Suite 2E10	New Orleans	LA
Spencer	Murphy	N. O. Business Council				
Patrick	Scheuermann	NASA				
April	Gromnicki	National Audubon Society				
Paul	Kemp	National Audubon Society				
Susan	Kaderka	National Wildlife Federation				
Maura	Wood					
Cindy	Brown	Nature Conservancy				
Mark	Blanchard	New Orleans Cold Storage				
Danae	Columbus	NO City Council				
Cynthia	Willard-Lewis	NO City Council Dist E	City Hall, Room 2W60	1300 Perdi	New Orleans	LA
Richard	Hartman	NOAA	c/o Louisiana State University		Baton Rouge	LA
Patrick	Williams	NOAA				
George	Duffy	NSA				
Stevan	Spencer	Orleans Levee District	6920 Franklin Ave.		New Orleans	LA
Oakland	Adams	PB	1215 Prytania Street	Suite 405	New Orleans	LA
Les	Thomas	PBSJ				
Joseph	Caccheria	Port of New Orleans	P.O. Box 60046		New Orleans	LA
Pat	Gallway	Port of New Orleans	P.O. Box 60046		New Orleans	LA

Deborah	Keller	Port of New Orleans	P.O. Box 60046		New Orleans	LA
Gary	LaGrange	Port of NO	P.O. Box 60046		New Orleans	LA
Harold	Wilbert	Port of NO				
Bob	Amos	Port Solutions	2 Canal Street	Suite 2344	New Orleans	LA
Ken	Odinet	Rep. Dist 103 - State Representative	6535 Burgundy Street		Arabi	LA
P. D.	Hill	Rhodia Eco Services				
Vickie	Duffourc	SCI / Jeff Parish	615 4th Street		Westwego	LA
Darryl	Malek-Wiley	Sierra Club	618 Adams Street		New Orleans	LA
John	Barry	SLFPA-E				
Timothy	Doddy	SLFPAE - Southeast Louisiana Flood Protection	203 Plauche Court		Harahan	LA
Nathan	Krause	SOLUTIA	3000 Old Chemstrand Road		Cantonment	FL
Thomas C.	Jackson	Southeast Louisiana Flood Protection Authority-E	203 Plauche Court		Harahan	LA
Joel	Dupre	Southern Scrap				
Fred	Everhardt, Jr.	St. Bernard Parish Council	8201 W. Judge Perez Drive		Chalmette	LA
Kenny	Henderson		8201 W. Judge Perez Drive		Chalmette	LA
Craig	Taffaro	St. Bernard Parish President	8201 W. Judge Perez Drive		Chalmette	LA
Ray	Lauga, Jr.	St. Bernard Parish Council	8201 W. Judge Perez Drive		Chalmette	LA
George	Cavignac	St. Bernard Parish Council	8201 W. Judge Perez Drive		Chalmette	LA
Dean	Goodin	Tetra Tech				
Bruce	Thompson	Thompson Equipment / BNOB Commission				
Ashton	Harper	Threefold Consultants				
Justin	Crossie	U.S. Senator Vitter Office				
Austin	Allen	University of Colorado				
Robert	Surles	University of Colorado				
C.	Taniguchi	University of Colorado				
Mark	Hester	University of New Orleans				
Shea	Penland	University of New Orleans				
Paul	Keddy	University of Southeastern Louisiana				
Shirley	Laska	UNO - CHART	UNO		New Orleans	LA
Ioannis	Georgiou	UNO - Pontchartrain Institute				
Douglas	Blakemore	USCG New Orleans				
Robert	Keister	USCG New Orleans				
Steve	Keel	USCG Sector New Orleans	1615 Poydras Street	Suite 700	New Orleans	LA
Angela	Trahan	USFWS				
Natalie	Hanna	USRM				
Edmond	Redd	Vulcan Materials				
John P.	Laguens		9844.Cypresswood Dr.	Apt. 1404	Houston	TX

Leo	Richardson	Lake Catherine Civic Association	107 Stella Street		Metairie	LA

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MSCIP Contact Request Form

Received	Barrier	Enviro	NewD	NewP	NonSTR	PressR	STR	Upcoming
27-Jul	x	x	x	x	x	x	x	x
31-Jul	x	x	x	x	x	x	x	x
31-Jul	x	x	x	x	x	x	x	x
1-Aug	x	x	x	x	x	x	x	x
10-Aug	x	x	x	x	x	x	x	x
13-Aug	x	x	x	x	x	x	x	x
17-Aug	x	x	x	x	x	x	x	x
21-Aug	x	x	x	x	x	x	x	x
4-Sep	x	x	x	x	x	x	x	x
7-Sep						x		x
11-Sep	x	x	x	x	x	x	x	x
12-Sep	x	x	x	x	x	x	x	x
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13-Sep			x	x		x	x	x
13-Sep	x			x		x		x
13-Sep	x	x	x	x	x	x	x	x
13-Sep	x	x	x	x	x	x	x	x
14-Sep	x	x	x	x	x	x	x	x
14-Sep	x	x	x	x	x	x	x	x
14-Sep	x	x	x	x	x	x	x	x
14-Sep	x	x				x	x	
15-Sep	x	x	x	x	x	x	x	x

18-Sep	x	x	x	x	x	x	x	x
18-Sep	x	x	x	x	x	x	x	x
18-Sep	x	x	x	x	x	x	x	x
18-Sep	x	x	x	x	x	x	x	x
18-Sep	x	x	x	x	x	x	x	x
18-Sep	x	x	x	x	x	x	x	x
18-Sep	x	x	x	x	x	x	x	x
18-Sep	x	x	x	x	x	x	x	x
18-Sep	x	x	x	x	x	x	x	x
19-Sep	x	x	x	x	x	x	x	x
19-Sep	x	x	x	x	x	x	x	x
20-Sep	x	x	x	x	x	x	x	x
21-Sep	x	x	x	x	x	x	x	x
21-Sep	x	x	x	x	x	x	x	x
21-Sep	x	x	x	x	x	x	x	x
21-Sep	x	x	x	x	x	x	x	x
23-Sep	x	x	x	x	x	x	x	x
23-Sep	x	x	x	x	x	x	x	x
24-Sep	x	x	x	x	x	x	x	x
25-Sep			x	x	x	x	x	x
25-Sep			x	x	x	x	x	x
27-Sep	x	x	x	x	x	x	x	x
27-Sep	x	x	x	x	x	x	x	x
28-Sep	x	x	x	x	x	x	x	x
28-Sep	x	x	x	x	x	x	x	x
1-Oct	x	x	x	x	x	x	x	x
2-Oct	x	x	x	x	x	x	x	x
3-Oct	x	x	x	x	x	x	x	x
3-Oct	x	x	x	x	x	x	x	x
7-Oct				x		x	x	x
7-Oct				x	x	x	x	x
8-Oct				x	x	x	x	x
23-Oct	x	x	x	x	x	x	x	x
24-Oct	x	x	x	x		x		x
24-Oct	x	x	x	x	x	x	x	x
4-Nov			x			x		x
5-Nov			x	x			x	x
5-Nov	x	x	x	x	x	x	x	x

11-Nov	x	x	x	x	x	x	x	x
18-Nov	x	x	x	x	x	x	x	x
18-Nov	x	x					x	
20-Nov	x	x	x	x	x	x	x	x
25-Nov	x	x	x	x	x	x	x	x
26-Nov			x			x		x
5-Dec		x	x			x		x
5-Dec			x	x	x	x	x	x
7-Dec					x	x	x	
7-Dec	x	x	x	x	x	x	x	x
10-Dec	x	x	x	x	x	x	x	x
18-Dec					x	x	x	
27-Dec	x	x	x	x	x	x	x	x
28-Dec	x	x			x	x	x	x
2-Jan	x	x		x	x	x	x	x
2-Jan						x		x
4-Jan	x	x		x	x	x	x	
5-Jan		x	x	x		x	x	x
7-Jan		x	x	x		x		x
15-Jan		x				x		x
20-Jan		x				x	x	x
20-Jan	x	x	x	x	x	x	x	x
21-Jan	x	x	x	x	x	x	x	x
21-Jan	x	x	x	x	x	x	x	x
21-Jan	x	x	x	x	x	x	x	x
22-Jan			x	x	x	x	x	x

21-Mar	x	x	x	x		x	x	
2-Apr	x	x	x	x	x	x	x	x
3-Apr	x		x	x	x	x	x	
17-Apr			x			x		
21-Apr	x	x	x	x	x	x	x	x
23-Apr	x	x		x		x		
15-May	x	x	x	x	x	x	x	x
15-May	x	x	x	x	x	x	x	x
27-May	x	x	x	x	x	x	x	x
27-May	x	x	x	x	x	x	x	x
1-Jun	x	x	x	x	x	x	x	x

22-Sep	x	x	x	x	x	x	x	x

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	Madison	WI	53703	608-204-5950
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Vest	Falkner	MS	38629	662-837-8778
Suite 110	Hattiesburg	MS	39402	601-296-1173
	Hattiesburg	MS	30404	601-264-5550
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	Bay St. Louis	MS	39520	228-463-9593
	Bay St. Louis	MS	39520	228-342-6680
	Bay St. Louis	MS	39520	
	Diamondhead	MS	39525	228-216-7012
	Lumberton	MS	39455	601-270-9890
	Bay St. Louis	MS	39520	
Room 232	nnis Space Cer	MS	39529	228-688-3888
ail	Kiln		39556	228-255-9871
	Bay St. Louis	MS	39520	228-222-8277
	Bay St. Louis	MS	39520	228-342-3699
	Pass Christian	MS	39571	
	Diamondhead	MS	39525	228-229-4749
	Long Beach	MS	39560	228-822-9434
	Warrensburg	MO	64093	660-422-9267
	Senoria	GA	30276	770-599-8122
Lot 2	Bay St. Louis	MS	39520	
	Pearlington	MS	39572	228-533-7945
071 Birch Dr	Pearlington	MS	39572	228-533-7348
	Bay St. Louis	MS	39520	
	South San Fra	CA	94080	
	Long Beach	MS	39560	228-344-8727

	Bay St. Louis	MS	39520	228-861-1860
	Pascagoula	MS	39567-	228-623-2276
	Kenner	LA	70065	504-466-0760
				228-216-7621
	Gautier	MS	39553	
	Bay St. Louis	MS	39520	504-495-3901
	Gretna	LA	70056	504-628-3069
	Ponchatoula	LA	70454	985-386-2068
⁄e	New Orleans	LA	70118	504-891-5092
	Long Beach	MS	39560	228-424-2519
	Biloxi	MS	39530	228-374-3001
	Mandevile	LA	70471	
	Bay St. Louis	MS	39520	504-491-0002
	Waveland	MS	39576	228-469-0429
	Bay St. Louis	MS	39520	
	Bay St. Louis	MS	39520	
	Gulfport	MS	39506	228-224-4004
	Pass Christian	MS	39571	
	Vicksburg	MS	39181	601-634-5841
	Ocean Springs	MS	39564	228-872-9929
	Bay St. Louis	MS	39520	228-467-1726
	Floresville	TX	78114	830-393-3090
	Metarie	LA	70003	504-304-2954
	Biloxi	MS	39535	228-860-4099
t	Bay St. Louis	MS	39520	
ıad	Gulfport	MS	39521	228-328-9191
e	Pass Christian	MS	39571	
Drive	Ocean Springs	MS	39564	
	Bay St. Louis	MS	39520	228-463-0002
‹oad	Pass Christian	MS	39507	228-863-9703
e	Pass Christian	MS	39507	
e	Pass Christian	MS	39571	
lin	Madisonville	LA	70447	985-867-8846
	Ocean Springs	MS	39564	228-818-9198
e	Cedar Hill	TX	75104	972-293-0809

e	Ocean Springs	MS	39564	228-872-0248
ıey Drive	Ocean Springs	MS	39564	228-818-3302
th	Charlevoix	MI	49720	231-675-6228
ːt	Ocean Springs	MS	39564	228-818-2962
	Oak Ridge	TN	37830	865-272-3051
⁞ 201	Ft. Walton Bea	FL	32548	850-301-0179 x 112
	Bay St. Louis	MS	39520	504-582-8187
:	Ocean Springs	MS	39564	228-875-1567
Road	Ocean Springs	MS	39564	580-540-4166
2D	Stennis	MS	39529	228-688-2345
	Magnolia Sprir	AL	36555	251-747-5756
⁋312	Denver	CO	80211	720-201-2300
	Bay St. Louis	MS	39520	985-626-6350
cle	Biloxi	MS	39531	404-909-1782
⁄e	Bay St. Louis	MS	39520	830-393-3090
ɐet	Metairie	LA	70001	504-455-5495
ıue	Memphis	TN	38104	901-722-9385
	Bay St. Louis	MS	39520	228-263-0561
d, A-9	Kenner	LA	70065	504-469-7645
	Bay St. Louis	MS	39520	
	Pass Christian	MS	39571	
	Poplarville	MS	39470	601-772-9074
	Gautier	MS	39552	228-217-6971
d Suite L	Kenner	LA	70065	504-443-5009
	Mossport	MS	39561	228-217-6971
⁝ive	Metarie	LA	70003	
re	Canton	MS	39046	601-500-2002
	Bay St. Louis	MS	39520	
	Cullowhee	NC	28723	
Box 2430	Pensacola	FL	32513	573-366-3423
⊣ill Road	Kiln	MS	39556	
⁄e	Vicksburg	MS	39183	601-638-0275
	Pass Christian	MS	39571	228-669-9446
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COUNCIL MEMBER
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N - "GENE" BELLISARO
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COUNCIL MEMBER
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DISTRICT 12
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470 HICKORY DR.
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N - "JERRY" COOGAN
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N - "JOE" FRAUGHT
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COUNCIL MEMBER
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N - "KEN" WILT
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ALDERMAN
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N - "PRESTON" WATTS
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COUNCIL MEMBER
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N - "RAY" CANADA
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COUNCIL MEMBER
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N - "RICHARD" NAVARRA
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COUNCIL MEMBER
14087 MANINA LN.
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N - "RONNIE" BANKSTON
DISTRICT 6
COUNCIL MEMBER
43229 SWEET PEA LN.
HAMMOND, LA 70401

N - "SCOTTY" MARTONE
VILLAGE OF PORT VINCENT
ALDERMAN
19338 GOURDON LANE
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73RD REPRESENTATIVE DISTRICT
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N - "STEVE" STEFANCIK
DISTRICT 11
COUNCIL MEMBER
107 ROYAL DR.
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N - "TIM" BOUNDS
TOWN OF MADISONVILLE
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CITY OF HARAHAN
COUNCIL MEMBER
30 WEST IMPERIAL DR.
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COUNCIL MEMBER
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92ND REPRESENTATIVE DISTRICT
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N - "TOMMY" MARTINEZ
ASCENSION
PARISH PRESIDENT
13367 HWY. 431
ST. AMANT, LA 70774

N - "TONY" LIGI
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79TH REPRESENTATIVE DISTRICT
5216 SENAC DR.
METAIRIE, LA 70003

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91ST REPRESENTATIVE DISTRICT
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ST. TAMMANY PARISH
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COUNCIL MEMBER
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N - ALBERT "BUDDY" MINCEY
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BUILDING OFFICIAL
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HAMMOND, LA 70403

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MAYOR
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PRESIDENT
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214 PAMELA PLACE
THIBODAUX, LA 70301-6314

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PADUCAH, KY 42002-0992

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LEAGUE OF WOMEN VOTERS - ST. TAMMANY
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N - BARBARA GIBSON
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N - BERRY BROTHERS GEN CONTRACTORS
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N - CEMVD-RB-T
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MR. WILLIAM J. ASHY
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DISTRICT 8
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STATE REPRESENTATIVE
80TH REPRESENTATIVE DISTRICT
2016 PERSIMMON AVE.
METAIRIE, LA 70001

N - JOYCE CORE
CLERK
FOLSOM, VILLAGE OF
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FOLSOM, LA 70437

N - JUAN LAFONTA
STATE REPRESENTATIVE
96TH REPRESENTATIVE DISTRICT
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NEW ORLEANS, LA 70122

N - JUDY BUCKLEY
433 JEWEL ST.
NEW ORLEANS, LA 70124

N - JULIA M. HIGGINBOTHAM
TOWN OF LIVINGSTON
ALDERMAN
19930 GEORGIA ST.
LIVINGSTON, LA 70754

N - JULIE QUINN
STATE SENATOR
6TH SENATORIAL DISTRICT
419 NORTHLINE
METAIRIE, LA 70005

N - JUNE DELAUNE
FLOODPLAIN ADMINISTRATOR
ASCENSION PARISH
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GONZALES, LA 70737-1659

N - KANSAS CITY SOUTHERN
RAILWAY COMPANY
P.O. BOX 219335
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STATE REPRESENTATIVE
93RD REPRESENTATIVE DISTRICT
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NEW ORLEANS, LA 70130

N - KAREN ST. GERMAIN
STATE REPRESENTATIVE
60TH REPRESENTATIVE DISTRICT
3413 HWY. 70
PIERRE PART, LA 70339

N - KATHLEEN ABELS
TOWN OF KILLIAN
MAYOR
28420 RIDGE LN.
SPRINGFIELD, LA 70462

N - KATHY PITRE
LAFOURCHE TELEPHONE CO INC
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N - KEITH CHIRO
PERMIT OFFICER
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COUNCIL MEMBER
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COVINGTON, LA 70433

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DISTRICT 3, TOWN OF AMITE CITY
COUNCIL MEMBER
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AMITE, LA 70422

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COUNCIL MEMBER
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ALDERMAN
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DISTRICT 4
COUNCIL MEMBER
704 TOM DR.
DENHAM SPRINGS, LA 70726

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VILLAGE OF FOLSOM
MAYOR
12428 HAY HOLLOW RD.
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DISTRICT D, CITY OF COVINGTON
COUNCIL MEMBER
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DISTRICT 5
COUNCIL MEMBER
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CITY OF HAMMOND
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MR. VICTOR L. ROY III
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EXE. DIRECTOR: GERALD SPOHRER
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200 E THOMAS ST
HAMMOND, LA 70401-3316

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LAFAYETTE, LA 70502

N - WHITE CASTLE TIMES
1114 BELLEVIEW DRIVE-P.O. BOX 589
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CLERK
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APPENDIX C

MEETING TRANSCRIPTS

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11 MRGO ECOSYSTEM RESTORATION PLAN DEVELOPMENT
12 PUBLIC SCOPING MEETING TAKEN AT THE LEO SEAL
13 COMMUNITY CENTER, 529 HIGHWAY 90, WAVELAND,
14 MISSISSIPPI 39576 ON THE 6TH DAY OF NOVEMBER,
15 2008 COMMENCING AT 6:00 P.M.
16
17
18
19 REPORTED BY:
20 RACHEL TORRES-REGIS, CCR, RPR
21 CERTIFIED COURT REPORTER
22
23
24

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MR. HUNTER:

At this point we would like to start the opening remarks session. If everybody can find a seat and we'll get started. I would like to welcome everyone out tonight to our scoping meeting on the Mississippi River Gulf Outlet EIS, Ecosystem Restoration Study. My name is Tom Hunter and I will be the facilitator throughout this evening's activities, and what we would like to do right now, I would like to introduce Dr. Walker with the Department of Marine Resources, and he has a few opening comments that he would like to share with everyone.

DR. WALKER:

Thank you, sir. Thank y'all

for being here. I'm going to try to take just a few minutes to

maybe get a little bit of a historical perspective to some of the stuff that was going on before and sort of guide us here tonight. I know this meeting is focused on MRGO primarily, but the MRGO issue is part of a broader issue of restoration of Louisiana and Mississippi coastal wetlands and freshwater diversions from Mississippi to Louisiana.

The freshwater diversion work started probably 25 years ago. It was actually -- and Mississippi's need and Mississippi's request to Congress back then was to divert enough freshwater from Louisiana to return Mississippi's oyster growing areas to historical salinity regimes. The salinity has been slowly increasing in

these areas in part because the
Mississippi River has not been

contributing as much water on an
annual basis to Mississippi as it
historically did, so we were
trying to get some additional
waters released from the river.
Back in those days we try to do
it through Bonnet Carre which
would route most -- that water
through Lake Pontchartrain, and
one point in time Congress
actually appropriated enough
money to actually carry this
project out and Mississippi and
Louisiana were in the process of
coming up with their magic when
the deal kind of fell apart
because of potential negative
impacts to the Lake Pontchartrain
area, so since then we have been
working with the State of
Louisiana to explore other areas
to divert water from. One of

which is Violet Canal that we'll
-- I guess we will be talking
about a little bit tonight. So

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our hope is -- well, our hope is
multi-fold. One, we would like
to get freshwater for Mississippi
from Louisiana because it would
help -- it will help
Mississippi's oyster industry,
but at the same time Mississippi
is very supportive of all of the
restoration efforts that are
going on in Louisiana. We work
with my counterparts in Louisiana
and in Louisiana Governor's
office, we work with them in
Washington to support their
efforts in Congress to provide
funding for this -- for the
Louisiana Restoration Program
because bottom line is the
Louisiana coastal wetlands are
very important to Mississippi.
Hurricane Katrina is an example.
Hurricane Katrina was a level

five hurricane when it came
across the barrier islands
offshore from Louisiana,

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Mississippi and across those
marshes in mid-southeast
Louisiana and those islands
reduced Hurricane Katrina to a
category three by the time it
actually came ashore right along
the Mississippi/Louisiana line,
and as bad as it was in our
state, it could have been a lot
worse, would have been a lot
worse had it not been for those
-- our governor likes to call
them speed bumps out there to
slow those things down as we
cross them, and so the Louisiana
marshes are continuing to
disappear, have been doing that
for many years, a couple of
decades, and it's going to take a
while to get that trend turned
around and get it going back the

way it used to be when the river
would flood on an annual basis
and nourish those areas, and
we're very supportive of that.

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We hope that there would be some
freshwater diversion perhaps most
of it come through Violet. There
is another possibility of getting
some of it through Bonnet Carre
that would nourish another part
of Louisiana marshes and still
provide the water we need to
Mississippi, so I thank you again
for taking time to come tonight.
I hope you get your questions
answered. If you have any of me
before I get done, I will take
them right now. If not, I'm
going to sit down and turn this
over to Greg. Greg.

MR. MILLER:

Thank you. It's nice to be
up here in Mississippi. We --
first of all, my name is Greg
Miller. I'm the senior project

manager for the MRGO Ecosystem Restoration. As Bill mentioned, we have a lot of different aspects of this and it's one of

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the reasons we wanted to spend some time over here this evening.

For the last, oh, well, over three years we have been over here and had folks from the Corps that came over and helped with some of the initial recovery efforts here in coastal Mississippi. You guys suffered as much of a tragedy as you saw happening to the coast of Louisiana and so on with Katrina, and it's been a pleasure to meet some folks in the work and now that we are getting a little bit further out of the recovery aspect, we are starting to look to the future, and, that is, how do we go about trying to plan and repair the coastline is also

damaged by those storms and damaged previously by other storms. And that's the real forum tonight. As the project manager, I want to make sure that

I get a chance to meet you and I make myself available as well as the members of the team that we brought tonight and we can answer any questions, and more importantly, we can give you any information that you think you need to help us put this study together because our goal is at the end to not only complete the study but to come out with some recommendation, and we can go to Congress and get some projects authorized that address the problems that we see here along the Louisiana coast as well as over here in Mississippi. And as Bill mentioned, it's not a problem that stops at state line, it's something that we see the

wetlands in Louisiana, if you are familiar with the area along the Rigolets and Pearl River, you ride in the boat, you go from one state to another and you don't

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even realize. It's just an important place and means a lot to folks that either live here or they make their living here or they just enjoy coming to these areas to have a vacation, so that is what we're here for tonight is to try to hear from you what is important to you, what are the aspects of the area that you think you ought to take some focus on, and we got a lot of information here. We have a small group, which is some ways a nice thing, so we'll have some time tonight to go through any of the information you see or if you have information yourself you want to give to us that we

haven't put up on any of these posters and maps and such, we really like to hear that from you.

Finally, I will leave you with, one, my phone number. You

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can you reach me at the District of New Orleans at (504)862-2310. I will have some of my cards in the back. Any time you have a question about what we're doing, not only this evening but as we move through this into the future, you give me a call. We have some folks from the Mobile District, the Corps of Engineers has a district that covers part of the Mississippi area, it is actually Mobile, Alabama. They are our partners in this effort and our partners with both the State of Mississippi as well as the State of Louisiana.

We really appreciate you coming and hope we can answer

your questions and help you learn a little bit more about what we are up to tonight. I will turn over now to Ms. Sandra Stiles. She is the environmental manager for the conduct of this study.

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She is going to tell you a little bit about what we're going to run through this evening and then we will get a chance to look at some of these maps in detail. Thank you again for coming. I appreciate it.

MS. STILES:

Good evening. As Greg said, Sandra Stiles. I'm the environmental manager for this study. Meeting the development of the Environmental Impact Statement. We are working with the Mobile District and we have a multi-agency, habitat evaluation team that is participating in this and the Department of Marine

Fisheries from Mississippi here and the Mississippi DEQ as well as Fish and Wildlife Services in Louisiana, Department of Natural Resources, National Marine Fisheries Service, they are all part of the team on this project.

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Tonight's public meeting is a part of the scoping process that is spelled out and a requirement of the National Environmental Policy Act and we are here to just hear from you. This is your night, this is your opportunity to give us your feedback in which you think the issues are in the area and what you think you would like -- what the restoration ideas are, so we want to hear from you, and the scoping process goes all of the way through to the release of the Draft EIS. If you want your comments to be a part of the scoping report, we need to receive them by November

20, but even beyond that up until the draft is released and I think our schedule is for January of 2010 or May 2010 for the release to the public. So up until that point we are interested to hear whatever you have to say. Thank

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you.

MR. HUNTER:

Sandra, thank you. Okay. A couple of housekeeping issues. Number one, if you have not signed in, please do so before you leave tonight. We would like to have a record of everyone who is in attendance. Let's see. We do have a court reporter here. She is actually recording all of the comments that will be made tonight. We also -- everyone that received a packet, in your packet they have a comment card. If you have any comments, please fill that out. That is one

option you have. They have a comment box at the registration table, drop it off there. You will also note that the cards are in itself addressed stamped envelopes, so you can actually fill them out at a later date and drop them in the mail. In the

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packet you also see under the scoping meeting guide they have numerous other ways to correspond to get information on the study and provide comments. They have an e-mail address, they have a website address, they have an address for regular mail as well as for overnight mail. Also, one other item in the packet there is an evaluation form. The evaluation form is actually relevant to the meeting format and content here tonight. If you do have time, we would appreciate if you fill that form out and help us to design these meetings

in the most effective manner possible.

As far as overall agenda, we started out, we had a little open house session, I hope everybody had a chance to look at the different graphics and exhibits that we have, and hopefully you

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were able to talk to Corps representatives about any key issues that you may be interested in. We just included some of the opening remarks, and at this point what we would like to do is move into what we would call I guess a group discussion to talk about specific issues relevant to this Ecosystem Restoration planning initiative.

Let's see, it's right about 7. I would imagine we would go probably between 30 minutes, an hour depending on how many comments we may have. The intent

here is really to get input from you. It is a scoping meeting and that's the primary goal here tonight.

Just a few notes, Number one, please be courteous to everyone here tonight. You may have opposing issues or views, that's no problem, we want to hear

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everybody's comments. Please be courteous. As has been noted a couple of times, we are very early in the process. This is the scoping meeting. This is one of the first meetings relevant to this process. The purpose is to receive input from the people that are here tonight. The focus tonight where we really like to focus effort -- first of all, as I said, we are willing to answer questions relevant to process and issues that you see on the display and exhibits here tonight and we'll do the best we can to

answer any questions that you may have, but the real purpose is really to hear from you relevant to problems and issues associated with the ecosystem that may have been affected by the MRGO, and also to possibly discuss alternative strategies and solutions relevant to the

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restoration of the ecosystem here in the Mississippi Sound area as well as the Chandeleur Sound area, Lake Pontchartrain, lower Lake Pontchartrain basin as well as Breton Sound.

And with that said, what we would like to do is, once again, engage you in bringing up any issues that you may have, any points you would like to discuss regarding the ecosystem problem issues, alternative strategies or things that you would like to discuss here tonight. We have

several Corps representatives here who are technical experts, many of them in certain areas, and they will certainly do their best to answer any questions.

We would love to hear any input you may have. Yes, sir.

AUDIENCE MEMBER:

The border of this -- I can't help but wonder how this project

down here on the canal is going to affect some of the areas that are within the boundary, the distance upstream.

MR. HUNTER:

Okay. I think he is referring to the study area. If you look at the study area, it is fairly expansive and extends all of the way down to the lower section of the Mississippi River and extends up the Mississippi River and takes in the upper portion of the Lake Pontchartrain basin as well as the lower

portion; Lake Borgne, Mississippi Sound, Chandeleur Sound, all of the way down to the Breton Sound, and they have had several meetings to discuss overall study area and potential impacts. Obviously right along here is the Mississippi River Gulf Outlet and that is one of the primary component of this overall study,

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and obviously there were numerous impacts in this area, but based on some of those discussions that the Corps had with different entities, the stakeholders, this was the initial study area that was developed, but we are certainly willing to listen if you have -- if you would like to talk about modifications to that or anything along the other line, we would like to hear your comments.

AUDIENCE MEMBER:

Suggestion, it just seems strange that the study of this project is on the other side of Lake Pontchartrain.

MR. HUNTER:

On the basin of Lake Pontchartrain? Uh --

AUDIENCE MEMBER:

That just -- the study area is so large.

MR. HUNTER:

I understand. When I first looked at it I said the same thing. I live actually in this area over here in the Madisonville area and I know there were several issues regarding saltwater intrusion and impacts that are actually in the Maurepas Swamp and all, and there are some beliefs, I believe, that the impacts of the MRGO may have enhanced the saltwater intrusion, and I think that was brought into discussion. I'm not sure if

anybody else wants to comment on that issue.

MS. STILES:

You are right as far as the MRGO can have potential impacts -- (inaudible)

MR. MILLER:

Sandra, a little louder. We can't hear you.

MS. STILES:

I am sorry. Maybe we can all

get a little closer.

MR. MILLER:

Well, she has to stay right there.

MS. STILES:

Well, okay. Sorry. I will try to talk louder.

The reason we kept a larger area for this area to capture the watershed for middle and lower Pontchartrain, so that is why it's out here some, but there is a belief that the MRGO impacted

the Maurepas, so we wanted to make sure we captured that but we took the larger area as part of the watershed.

MR. HUNTER:

Okay. I think Dr. Walker had mentioned something I thought was of a great interest. Obviously the oyster beds are located here in Mississippi and the Mississippi Sound and there were some concerns that he had, I

guess something that had been going on for quite some period of time obviously increasing in the Mississippi Sound which has been negative relevant to the arch -- along those lines, so there has been an effort to try to introduce some freshwater into that area, and certainly with the MRGO having direct impacts or apparent impacts in this area relevant to saltwater intrusion, it's possible that it may have

impacted that area as well, so that is, again, maybe a relationship between the MRGO and increase the salinity levels, you know, it's one possibility, anyway. And if anybody would like to maybe discuss that in more detail or specific issues regarding the Mississippi Sound, the Biloxi marsh, any ideas relevant to specific problems that they see out in those areas

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or areas where they are seeing significant erosion, land lost, change in the salinity levels, we would certainly like to hear about them, and anybody who maybe has any ideas relevant to strategies or alternatives that they may want us to consider in this EIS process, we certainly would like to hear that as well.

AUDIENCE MEMBER:

The main thing that I have to

say is, all of you, don't eat the raw oysters. I'm not kidding you. My friend -- my friend's son passed away because he ate those raw oysters and they had to send him to a hospital and he had had some type of medication previously, you know, and then they went through it and all, so I have to tell everybody I know because we have so many friends on the Gulf Coast, you know, and the kids go right out there, they

are right about it. They don't want to hear from you, you know. They go right in, so if any of you letting the kids go out and pick up the oysters, tell them bring them home in the shell, don't touch them and then you can look at them and see if you want to keep them or whatever. They are not that bad, I don't suppose, but the way he used it, and I just thought to myself,

boy, I'm going to that meeting and I am going to tell all of those people about the raw oysters. I did, so that's that.

AUDIENCE MEMBER:

A question. We had thousands of these nutria wash up here. Probably those filters probably -- where those nutria washed up, dead nutria. I guess I'm asking how does this affect those nutria? I understood Louisiana is trying to get rid of those nutria

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any way they possibly can. It's probably bad, get rid of them, but how is this supposed to affect that, does anybody know?

MR. HUNTER:

What storm was it, was it off of Ike --

MR. MILLER:

Tom, can you summarize the question because we couldn't hear it and she couldn't hear it

either.

MR. HUNTER:

He had asked in the last storm events, I guess there were a lot of dead nutria that washed up on the beach in the Waveland/ Bay St. Louis area, and he was trying to understand possibly what impact that had or what caused that or something along those lines.

AUDIENCE MEMBER:

Yeah. Or how this might affect those nutria and perhaps

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someone here knows whether that storm actually had an affect on the nutria population or whether, you know, we might got all of the dead ones on our beach, but I doubt it.

MR. HUNTER:

To be honest with you, I'm not familiar with that phenomenon and I really don't know that answer. I don't know if there is

anybody here that would really have any knowledge of that.

MS. STILES:

I don't know. I hadn't heard anything. Gib.

MR. OWEN:

It didn't happen -- I haven't heard of it due to Gustav and Ike, but we had quite a number of them die during Katrina. There is 20, 30 feet of water, they don't have anywhere to go. In this case you had under Ike and Gustav you had eight, nine feet

of water and --

AUDIENCE MEMBER:

This was only a month ago and we got -- they were out there and some poor souls had to pick up these dead animals that had been down a while and drive up and down and smell it from the car, so it was kind of a mess, but I just wondered whether anybody

here knew that this was going to do about those animals or, you know, what had happened to them due to this last episode. That's all I had. Because of that -- but at the same time it probably had something to do with her friend getting all of those bad oysters because there were an awful lot of dead animals out there, a lot of seaweed that all got caught up in the seaweed up there.

MR. HUNTER:

Well, I don't necessarily

have any answer to that. Relative to that, I'm not sure whether anyone does at this point.

AUDIENCE MEMBER:

The little kids catch and picking up the oysters, you know, and his wife was in her kitchen looking out the back door watching him and she said every

time he cracked one of those oysters it scrape inside and he took the oyster and ate it and she said that is enough, she kept saying, that's enough, but it never got to be enough until they put him in an ambulance in the hospital and he passed away.

MR. HUNTER:

Okay.

AUDIENCE MEMBER:

Don't let them eat the oysters, that's all I say.

MR. HUNTER:

I would say at this point

anybody who is here tonight from the public or any agency or anything, one thing we may want to discuss is do y'all have any specific ideas relevant to Ecosystem Restoration, relevant to some type of improvements or strategies or something that y'all may want to see implemented

in this area. That's the question posed to the group.

AUDIENCE MEMBER:

Once again, I can't help but wonder what would happen if we just didn't do that. In other words, just let nature take its course, what will the result be.

MR. OWEN:

That would be one of those study efforts that is done in part of the -- we call it the No-Action Alternative, and that will be looked at in detail in the report.

AUDIENCE MEMBER:

Hasn't been done yet?

MR. OWEN:

No. Not to the extent that it will be done in this report.

MR. HUNTER:

Historically we have some information over here that clearly shows that there had been significant land loss in the

entire coastal Louisiana area and there's been significant land loss, and obviously, I guess, the study, the No-Action Alternative to get some better estimate the type of impacts, whether that will continue or not, but that will be part of the process for the study process. Yes, sir.

AUDIENCE MEMBER:

When you are talking about Ecosystem Restoration, hopefully you are being all inclusive; barrier islands, vegetative wetlands and insofar as restoration of source of silt,

unless you dredge from one place to put it in another, obviously the river system, the Mississippi River is the mother load, many have been a proponent of utilizing river diversions in the sediment loads to restore some of the areas that have been eroding

away or for whatever reasons, but when you talk about the ecosystem, the barriers islands are also extremely important.

MR. HUNTER:

Are there any specific barrier islands that you --

AUDIENCE MEMBER:

All of them. Not -- you know, it has changed, of course, over the years. It's a natural process. They erode as time progresses, but we certainly know they are the first line of defense from hurricanes.

MR. HUNTER:

That would include the

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Chandeleur islands as well as the islands off the Mississippi Gulf Coast.

AUDIENCE MEMBER:

You are talking about total ecosystems, so that's all of them, yeah.

MR. HUNTER:

Okay. I understand. Do you have any specific ideas relevant to how -- I mean, what would be a reasonable process to go through on alternative strategy for that or the freshwater diversion, sediment diversion, anything along that line?

AUDIENCE MEMBER:

Well, I understand a little bit about NEPA and the process, and I say let's go to work and start building and quit studying, but we need it done as quickly as we can. Recognizing that studies have to be made, but, my gosh, some of these studies of this

type have been going on for a number of years.

MR. HUNTER:

Yes, sir.

DR. WALKER:

I would just like to add to that that at this point in time

Mississippi is working with the Mobile District, and I will just say for the record that that was a very inclusive process that the state and the Corps and other federal agencies were at the same table throughout the process to develop that plan. That plan is complete. That plan has been submitted to the Corps of Engineers D.C. office, my understanding it is out of that office and now under review of the Office of Management and Budget or wherever else, and Mississippi is trying very hard to actually have Congress provide the funding that that Corps

report asked for. Congress directed the Corps to do the study and to do the report. Congress directed the Corps to do an interim report. Congress funded the projects in the interim report at $105 million, I

believe, for fifteen or so projects that are presently underway in the State of Mississippi, so it's just logical that eventually the Congress will fund the final report on Mississippi and we hope that will happen sooner than later because we are missing opportunities in Mississippi to do restoration that we're not going to be able to do because the funds aren't there to do them. There are places that are being rebuilt in areas that we would have preferred to purchase and restore to the natural environment of decades ago, and while we still

intend to do that, the longer the delay in providing the funding that the Corps has asked for, the more of missed opportunities. But I'm comfortable that that will happen, so at least in

Mississippi we are pretty far along to be ready to start work when funding is provided, and I think in Louisiana their plan is also a very good plan, and while I agree that some additional study is necessary on some of these diversions, we should be fairly close to moving forward with some of these projects, so I'm just kind of optimistic about the future and where we are going to go here. I think the mood of Congress is to do what is necessary to provide the support to make these projects a reality and to really begin the process of restoring both coastal Louisiana and coastal

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Mississippi.

MR. HUNTER:

Are you familiar with some of the key projects maybe that were included in that plan and had been funded that you could share

with the group.

DR. WALKER:

Well, in Mississippi there is a big part of the Mississippi plan is to restore all of the barrier islands offshore for Mississippi. Hurricane Camille cut Ship Island in two, into two islands, and Hurricane Katrina just made it a lot worse to the point that that island will not -- we don't think will restore itself unless we don't get anymore storms ever, and so that plan is to actually go in, build containment structures and pump that cut, pump sand back into that cut and physically fill it. The other islands the plan is to

place sand in the zones south and east of those islands in such a way that the natural water movement will carry that sand on to those islands and rebuild

them. In Louisiana, we have met -- Louisiana officials came over, met with us, we have agreed to provide dredge material to Louisiana from normal maintenance dredge operations at the Mobile Corps of Engineers carries out in Mississippi, we have agreed to provide some of those dredge materials, those sediments to Louisiana, and, actually, the Corps has agreed to actually place those materials in the vicinity of Chandeleur Island so that the natural water movement will carry those materials on to that island and speed up the recovery of that island, so those kind of things are ongoing, underway, happening.

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MR. HUNTER:

That material is coming out of the Port of Gulfport channel.

DR. WALKER:

The next time, and I don't

remember, I think it's sometime within the first part of the first half of '09, the Corps will dredge that -- do their next maintenance dredging in that channel and those materials -- most of those materials will wind up on Chandeleur Island.

AUDIENCE MEMBER:

I think clearly, though, it's a lot of the newer material that they really requested from Mississippi where we're actually -- (inaudible) so those funds are available.

AUDIENCE MEMBER:

Those funds are available.

It was part of that supplemental EIS the Corps is doing, the work material from the Gulf --

improvements to the Gulf Harbors channel.

DR. WALKER:

Right.

MR. HUNTER:

Just jotting down a few of the key points that we are bringing up tonight. We appreciate those comments. Obviously there is -- you know, a lot of work has been done, and I think that's consistent, you know, within the whole ecosystem area that we are working with that we have noted and the Corps and those studies seem very well aware that there's been numerous studies within the project area and we are certainly utilizing those studies to the highest potential to not recreate a lot of effort that's already been undertaken, and -- but I'm just looking back, there are several good ideas here that are on the

table. Obviously the barrier islands, restoration of the barrier islands is something that's been accounted for. If

you look at our study area issues and study area opportunities, obviously relevant to Mississippi, Chandeleur Islands and the islands right off the coast of Mississippi, the issue regarding the salinity in the Mississippi Sound, oyster harvest, certainly associated with the freshwater diversion, how do we get some of that freshwater from the Mississippi River to stabilize that salinity regime. The beneficial use of spare material, again, something that's been recognized in our study area opportunities. Here is an opportunity to look at utilizing that material from the channel in Gulfport. I would imagine there may be a similar

opportunity for Port Bienville, the channel there, West Pearl River, and even as far down as in

the Breton Sound area relevant to the Mississippi River, so there is a lot of spare material that we probably could utilize more efficiently and more effectively.

So I think these are some, you know, excellent ideas, obviously there's a study we looked at in the past and need to see how we can incorporate or maybe integrate the concepts into the overall study.

Are there any other similar type ideas, strategies?

AUDIENCE MEMBER:

I just have a question really for Dr. Walker. When you were talking about dredging in Gulfport and using that material to build up the barrier islands and Louisiana agreed to take it, Mississippi agreed to give it,

politically was that a tough thing to do?

DR. WALKER:

No. Not at all. Not at all. I mean, Mississippi understands the value to Mississippi as well as to Louisiana rebuilding Louisiana wetlands. It's critical to us as well.

MR. HUNTER:

And I guess several navigation channels in that area and y'all have a channel to your port and then there's the channel in the West Pearl River, Gulfport. Are there any other ones that we are aware of over here in Southern Mississippi? I guess there's a channel in Pascagoula, but that is getting a little out of the --

DR. WALKER:

Well, I mean, the whole concept is just the idea of beneficial use of dredge

material. I mean, we don't -- we don't want to throw that stuff

away. I mean, for decades everybody thought that was just junk and it's not, it's valuable stuff --

MR. HUNTER:

Permitting problem.

DR. WALKER:

-- that could be used, so we want to use it and we have used it to build marshes, we used it to rebuild islands, so the Corps and the other federal agencies that bought into the overall idea, along with the state, are beneficial use to this material. Let's find some good thing to do with it rather than just throw it away offshore. Put it somewhere where it's going to wind up back in the --

AUDIENCE MEMBER:

I agree, but that's not always that easy to do.

DR. WALKER:

No, I know. I will tell you

the truth, I think when the Louisiana folks came over they expected a little fuss, but it didn't happen. It didn't happen.

MR. HUNTER:

So relevant to the Port Bienville operation, are there any significant exposures or risks associated with maybe some of the damage that's been done here recently due to the hurricanes or anything that you can see that maybe we --

AUDIENCE MEMBER:

Port Bienville is supported by two types of -- they are supported by rail and barge. Prior to the storm we had a small shipping company that was shipping between the Yucatan and us, and believe it or not, they were 33rd in the country for shipping containers, Gulfport got

a lot of credit because of the

port of call. We lost them after the storm. One of the concerns was that we wouldn't be able to get the area dredged out quick enough and we -- the route that we take is a Little Lake -- I mean, yeah, Little Lake to get in and out. You could possibly come in and out by Pearl, right, but the problem is is that it also fills in, too, and also the bridge -- but the point I was making is one of the ways that we were bringing material for the companies that was supported is by rail, and during the last Hurricane Katrina, also the last storm, well, Gustav also, they probably damaged the railroad track for CSX, I don't know, probably five, ten, twenty million dollars each time, so -- and in that case they could use some protection along the coast

there.

MR. HUNTER:

Yeah. That's a CSX line, right?

AUDIENCE MEMBER:

It sure is. And they support Port Bienville. We have a lot of customers there that ship things in and out from there.

MR. HUNTER:

Are there any other key infrastructure in that area in the Mississippi Sound along the Mississippi coast that may be at risk or real vulnerable that improvements to the coastal ecosystem could possibly help reduce the vulnerability of? Any key issues along those same lines we may want to discuss. Obviously have the port facilities that are inherently located on the water and for independent use, but at the same time those types of things come

into play as well.

Let's see. I'm trying to think if there is any other -- does anybody have any other issues that they would like to bring up at this point, something that we haven't discussed yet or something you would really like to discuss while we have -- we have a lot of expertise in the room, a lot of folks from the Corps with a lot of different talents and a lot of knowledge and now would be a good time to bring up something or ask any questions. Okay. Well --

AUDIENCE MEMBER:

Actually, she actually answered some of the questions for me. I know living here in Hancock County there were some concerns about all of the work that's being done to Louisiana as far as building up the levees, closing the MRGO and things like

that, there were concerns that could increase flooding in the county. Now, I have heard of that, discussions in general probably about that because after the storm, after Katrina there was concern that maybe some of the flooding was caused from the levees and all of that in Louisiana. Not saying it was true or not, just saying some of the word on the street was. So I guess what I'm saying is should there be any concern with all of the work that is being done in Louisiana that the Corps is proposing with the additional levees and everything else?

MR. HUNTER:

That is obviously a question I can't answer. Anyone from the Corps or they would like to take a shot at that one that would be fine. The only thing that I was -- relevant to the ecosystem

restoration -- ecosystem restoration project that is underway, certainly there is inherent benefits to both the Louisiana and Mississippi coastline, and I think, Dr. Walker, I think you had mentioned the issue that more or less speed bumps to reduce the overall affect to the surge, so I think from an ecosystem restoration I think there will be benefits, potential -- potential benefits possibly to flooding the storm surge issues. As far as the impact to the levee system they have, I don't know, I cannot answer that question and I don't know if anyone from the Corps wants to make any comment regarding that.

MR. OWEN:

The policies in which we operate on, we account for all impacts, positive or negative, we

view the impacts of a project or to a project is a national account, so impacts in Mississippi are accounted for within the project as a total cost and those are offset, and we also have some policies regarding induced flooding, which is something we endeavor not to doing, so those are all taken into consideration in the design and analysis and selection process.

MR. HUNTER:

Anything anybody would like to add or any further discussion, note any issues?

Okay. Well, Greg, any closing comments you would like to make maybe before we wrap it up.

MR. MILLER:

Sure. Thank you. Again, I appreciate everyone coming out tonight. You know, it's an

opportunity for your voice to be heard, and we are glad to be here to do that. I wanted to remind everyone that we have got these packets here, they have some mailing cards that you can use and information in here about how to get in touch with us otherwise either by mail or internet or just regular pick up the telephone and call us and we can do that for you. Also, we brought some extras, so if you would like to take it back and share it with your neighbors or colleagues we can have all of these things available to take home. If there is anything that you see here tonight that peaks your interest further, it's also available on the internet. You can do that by getting the address from one of the team members here or if you just want to type in the internet MRGO, all

of the things you see here this evening are available. You can download them, you can share them with your friends, your civic groups or anyone else.

We do appreciate, once again, coming out, and we look forward to coming back and seeing you again sometime soon to tell you a little bit about the progress we made in putting it together, and any time if you feel like we ought to come visit you some more, even if it's not something that we have scheduled, you just give us a call and we would be happy to come on over here and spend some more time with you.

Thanks again. Goodnight. Y'all be safe going home.

MR. HUNTER:

Just one last note, everybody, we do have the evaluation forms in the packet and we would appreciate if you

take a few minutes to fill those out. The evaluation forms are simply relevant to the format of the meeting and effectiveness of the meeting and that helps us in the future to design more effective meetings to help us in the planning process.

And with that, thank y'all. Y'all have a good evening.

(Whereupon the meeting was concluded at 7:36 p.m.)

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2 REPORTER'S CERTIFICATE

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4 I, RACHEL Y. TORRES, a Certified
5 Court Reporter, do hereby certify that the within
6 witness, after having been first duly sworn to
7 testify to the truth, did testify as hereinabove
8 set forth.
9 That the testimony was reported by
10 me in shorthand and transcribed under my personal
11 direction and supervision, and is a true and
12 correct transcript, to the best of my ability and
13 understanding; that I am not of counsel, not
14 related to counsel or the parties hereto, and in
15 no way interested in the outcome of this event.
16
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18 ----------
19 RACHEL Y. TORRES, CCR, RPR
20 CERTIFIED COURT REPORTER
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9 MRGO ECOSYSTEM RESTORATION PLAN DEVELOPMENT
10 PUBLIC SCOPING MEETING TAKEN AT THE C.F. ROWLEY
11 SCHOOL, 49 MADISON AVENUE, CHALMETTE, LOUISIANA
12 70043 ON THE 3RD DAY OF NOVEMBER, 2008 COMMENCING
13 AT 6:00 P.M.
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17 REPORTED BY:
18 RACHEL TORRES-REGIS, CCR, RPR
19 CERTIFIED COURT REPORTER
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2 MR. HUNTER:

3 Good evening, everyone. My

4 name is Tom Hunter. I will be the

5 moderator tonight. We'll start

6 tonight out with a few opening

7 remarks from the Parish

8 President, Mr. Craig Taffaro.

9 MR. TAFFARO:

10 Welcome everyone and I want

11 to thank you for being here.

12 Obviously for many of you it's

13 sort of an exercise of review

14 hopefully that the old ideas

15 might generate some new interest

16 or some new movement, especially

17 in funding, and I do want to take

18 a moment to recognize our former

19 President, Mr. Rodriguez, who has

20 been a champion of our coastal

21 issues for many, many years, so

22 thank you, Mr. Rodriguez, for

23 being here.

(Audience applause.)

Again, I won't be long. I

encourage everyone to make use of the time as this feasibility study was explained or sort of introduced to us at the parish government, the idea is to get input from as many different citizen groups and individuals as possible. It is part of a three year process as we understand it. We're asking hopefully that that timeframe maybe Congress can get some relief and shorten the timeframe and use some of the funding to put things into implementation since we believe there's a great deal of information already available to already put into action, so we were hoping that some of that can go on. As we understand it, the idea of these meetings is to reach out to as many different parts of the community as

possible. I have spoken with
Greg and requested that this also

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be brought into the school system
and we have made that known to
Ms. Voltier as well so that the
generation -- in fact, we were
talking just a little bit ago,
the experts who know and have all
of the information historically
seem to be aging a bit and that
information may not be
transmitted to the people who are
going to follow behind us, that
that needs to continue to push
for these issues, so any ideas
that you have in terms of getting
this information out to the
public as well as getting
information from the public to
the Corps and of course
contractors, very valuable, so I
would appreciate you being here,
and we do want to recognize that
one of those long awaited

agreements with the MRGO closure
structure has, as I understand,
one small obstacle but hopefully

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that will be cleared, but the
idea of the closure, starting
construction and being in place
for next hurricane season,
finally it looks like it may
actually be a reality, so we want
to recognize all of you who have
been a part of that and pushing
for that for many, many years,
and it is, as we know, only one
part of the puzzle and we have to
keep fighting for the rest of the
pieces, so with that I will
introduce Colonel Lee who is --
Colonel Alvin Lee, who is the
head of the New Orleans District,
and hopefully he will be able to
shed a little light, maybe let us
know how the funding is coming
for many of these projects.
Thank you for being here.
COLONEL LEE:

Well, good evening, and I really do appreciate this opportunity to come out and talk

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to you a little bit. I'm going to make a few opening comments, but I really want to thank President Taffaro, the President of St. Bernard Parish, for being here tonight, and I would also like to recognize Mr. Tim Doody, the President of Southeastern Louisiana Flood Protection Authority-East for being here also, and other distinguished guests and particularly the residents of St. Bernard Parish because this really is about you and it's about the future of what we want to do not only will have impacts in St. Bernard Parish, it will have impacts even in another state, Mississippi, and I have had the opportunity to go to Mississippi and talk to them and

they are very interested in some of the things that are going on here, particularly on the MRGO closure that was just referred

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to. We are working very hard and this model over here gives you a visual representation of what that closure is going to look like. It is 433,000 tons of rock that will be put across the MRGO to close it out by next hurricane season, and that is what we are working feverishly. We have been doing that, I came on board last summer, and Greg Miller, our project manager that will be talking to you a little later, our team has been working very hard with a lot of input from you in making this a reality, so we are nearly at the starting line. I didn't say the finish line but we're nearly at the starting line, so we're ready to pull that trigger and get this project

going. But I want to talk a little bit about what this is about and how important it is for your engagement and your input in

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this process, and so tonight is the first of two meetings that we'll be holding to discuss the Mississippi River Gulf Outlet Ecosystem Restoration Plan Feasibility Study, and the second meeting will be held over in Waveland, Mississippi. That will give them an opportunity also to provide input and really it's kind of a two-way thing. We try to educate the public with open houses so that you are aware of what is going on with the project, the study area, what the impacts of that is and then we also are very interested in you providing your feedback because what we want to do is make sure in both of these meetings, and

this is just the beginning, is that we are using -- we're taking the best alternatives. I heard President Taffaro talk about there's a lot of plans that

people already have, there is a lot of ideas out there and we're very interested in hearing about those ideas because it's not like we have all of the plans and ideas here. This is a collaborative process. We are very interested in your input into the process, and, again, this is all about restoring and maintaining the areas that were affected by the MRGO being opened up in that navigational channel, so, as you know, there's been quite a bit of devastation over the past several decades from saltwater intrusion, from the wave action, from vessels that transit the MRGO that caused a lot of erosion and affected a lot

of the wetlands, some of the cypress swamps that used to be in there, a lot of the fresh water regimes that were affected by that saltwater that moved out, so

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that is really what this is all about.

And one of the things that we also want to hear from you is your ideas and your concerns from the residents that live here that know the most about this area. That is one of the things that I have learned since being here in Louisiana. I did grow up in the south, I grew up -- you ever heard of a place called Okefenokee Swamp, south Georgia, swamp area also, but this is a different area and we need the input from you because you have lived here your entire lives, you have a stake here in making sure that this gets done right, so we

want to make sure that you have
that opportunity to provide us
the input that we need to move
this forward -- study forward, so
with that I want to close up and
let Greg Miller, I will introduce

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the project manager for this
project. He has endured quite a
bit of input and perseverance in
getting this to where we are now,
so I would like to introduce Greg
Miller and he will take over for
me. Thanks, Greg.

MR. MILLER:

Thank you, sir. Just want to
say, once again, welcome. I do
see a lot of familiar faces in
the audience and I also see some
faces that I just met today.
This morning we came from a
meeting in the Ninth Ward, where we are
looking at the restoration of
wetlands in Bayou Bienvenue. If
you know where that is and you
know how pretty it is and realize

that is an area that is important to some of the residents of Orleans Parish, it doesn't take very far to go half a block down the road and you are in St. Bernard Parish and you see

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another area that is just as pretty, it is just as degraded and it needs ecosystem restoration work. Raise your hand if you came to any of the meetings about the closure of the channel in the last year and a half.

(AUDIENCE MEMBERS RAISED THEIR HANDS.)

That's excellent. That is excellent. I'm glad to see that folks are still here and that's a commitment that we'll make to you today is that we did that in a collaborative process. The very first meeting and there are a lot of folks in this room that were

there. The Corps didn't do a lot of talking. In fact, what we did was just tell you what Congress asked to do and we asked for your help in trying to decide how to approach that and do it. We're going to do the same thing

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tonight. We are going to spend a lot of time listening to you talk. A lot of time looking at the information that we made available from our team here and then hopefully walk out of here with a good concept of the types of projects and actions and concerns that you have. I will tell you my phone number and it's always available, I will answer if anybody wants to call, it's 862-2310. If you have a question about this study, you have a question about anything else that the Corps of Engineers is doing in St. Bernard Parish, Orleans Parish or anywhere else in the

New Orleans District, you can call me. If I don't know the answer I will tell you I don't know, but I will find out who can answer it for you. Once again, I do appreciate you coming tonight. Looking forward to a good

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meeting, a good first meeting and then eventually we will get to the point where we have a plan that we can all support. Thank you. Sorry. I should have introduced this. This is Ms. Sandra Stiles, she is the environmental team leader for the Ecosystem Restoration Study.

MS. STILES:

Good evening. I appreciate everybody coming out tonight. It's good to see everybody coming out to share their views. I'm the Environmental Manager. As Greg said, I will be coordinating, getting the efforts

for the environmental documents. The meeting, public meeting tonight is part of the scoping process, which is a requirement of the National Environmental Policy Act, so it's your opportunity to come out and share your ideas on the project. We're

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very interested to hear what the issues are and what you think the restoration opportunities are for the area, so this is all about you and your input and we're very interested to hear what you have to say. The team is multi-district. We have folks from all of the districts as part of the environmental team and we have all of the various agencies; Fish and Wildlife Service, the National Marine Fisheries, Louisiana Department of Wildlife and Fisheries, Mississippi Department of Marine Resources and Department of Environmental

-- agencies from both states are involved in the study, so with that I'm going to turn the meeting over and just listen to what you have to say.

MR. HUNTER:

Thank you, Sandra. Just a couple of other notes I wanted to

cover here. One was just on the meeting, the agenda. Obviously we just wrapped up opening comments and the open house format that took place the first hour. What we're going to do now is we're going to breakout into small group sessions, going to have five actual small groups and we'll have facilitators at each of those meetings and the intent is to try to get input from you regarding this Ecosystem Restoration project. That will last about 45 minutes to an hour. We'll wrap that up hopefully

around 8:15, and at that point we will reconvene back here in this room and we will go through and summarize the results of those different breakout sessions. And then we intend to wrap up between 8:50 and 9 o'clock tonight. A couple of other key things. Number 1, if you have not signed in,

please do. We would like to have a record of everyone who has attended tonight. Relevant to comments, we have a couple of -- we have several ways in which you can provide your comments. One is we do have a court reporter here, located over here in the corner. If you would like to verbally express comments to her she will be more than happy to take that information down. We also have -- in your packet you have a comment card, if you can fill that out, drop it off in the white box near the exit, when you

leave that will be great. If not, you can fill it out later and you can mail it back. We also have in the packet under our scoping meeting guide they have an e-mail address in which you can e-mail comments. They have a website address and they also provide information on address to

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mail, just regular mail, or anything relevant to overnight mail is also addressed there. We also had one other form, an evaluation form on the effectiveness of the meeting here tonight. We would appreciate if you fill that out and drop that off again on your way out tonight at the same table where you registered or signed in a little earlier.

A couple of ground rules that I wanted to go through. First of all, facilitators are gathering

comments throughout the open house and as well as in the breakout session, so please note that the comments that you are giving earlier and in the facilitator breakout session will be recorded. Please be courteous to others during these small group breakout sessions. We would like everybody to have an

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opportunity to speak and express their concerns and their issues. All written and oral comments will be given equal consideration during the scoping process.

Now, at this point what I would like to do is actually break everybody out into these group sessions, and what I would like everybody to do on the packet that you received everybody will have a colored dot in the upper right hand corner, and, let me see, I had it noted as to where you would go. Blue

dots will report to Room 18, which will be through the doors to my right. Red dots will go to Room 15, doors to the right. And then yellow dots, Room 8, to the left. Green dots, Room 19 to the left. And white dots, Room 5 to the left. And I will repeat that one more time. I imagine everybody didn't get it right off

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the bat. Again, blue dots, Room 18, doors to my right. Yellow is going to be Room 8 to the left. Red is Room 15 to the right. Green, Room 19 to the left. And white, Room 5 to the left. In each of these sessions, in these breakout groups we will have a facilitator, a Corps representative there as well. As it was noted earlier, we are very early in the process, we're in the scoping process, and the key purpose is to receive input from

you, so hopefully we'll be listening, doing a lot of listening and a lot of listening to the comments from you. The focus at this early stage is really to try to identify problems and issues associated with ecosystem that has been affected by the MRGO and to discuss alternative strategies and solutions to address these

problems. That is where the real focus should be tonight. And with that, I would say let's go ahead and break into the groups and get the process started.

(Whereupon the different groups have broken out to their sessions at 7:20 p.m. to 8:30 p.m.)

MR. HUNTER:

At this point we would like to reconvene. Within just the next couple of minutes we are going to try to get each

facilitator to come up and summarize a few key points of the breakout session. So if everybody will please take their seats, we will go ahead and continue.

Okay. We are going to go ahead and begin the summarization of the breakout sessions to give you an idea of some of the key points or general thoughts that

came out of the sessions. And, let's see, first of all, with the white dots, the representative will go ahead and present some of their findings.

WHITE GROUP REPRESENTATIVE:

Okay. Great. We had a very informed group of stakeholders in the white group. I'm going to read off some of the main points that were raised. It was suggested that the Corps consider revisiting the consensus points

that were brought forth during the closure stakeholder meeting. Several times it was brought up that we need to address the first line of defense at the south end of the basin and in the Chandeleur Islands area. In that area they talk specifically about drop armoring, marsh creation, and in other areas we talked a lot about freshwater diversion, which I'm sure will come up many

times, but specifically those freshwater diversions should be pulsed so that the salinity of the water is not affected to a point where it's detrimental to the area. And finally we talked about a comprehensive approach, systemic approach rather than project by project, which some of the folks felt like the way the situation is being addressed currently they suggested that we take a more comprehensive look at

the situation. One other point that I feel is important to bring up. When we were talking about the Chandeleur Islands someone mentioned the fact that we need some legislation to change the status of that area before a closure structure could be built because currently it's a wildlife refuge and it's an impossibility to do the things that we would need to do in order to make that

a proper first line of defense. So I hope I didn't miss anything. Again, that was from the white group. Thank you.

YELLOW GROUP REPRESENTATIVE:

All right. I'm going to report on the yellow group, and there is a lot more ideas than what I'm going to say here, but the eight major ones are a lot of emphasis on restoring the barrier islands. That was the highest

priority that we came up with in the meeting. There was the idea of using the natural ridges as a starting point for restoration including Bayou La Loutre and several other natural ridges. There was the comment that makes -- to ensure that the diversion projects actually moved sediment and not just freshwater and that the sediment is managed so it doesn't all go to one place, but it goes to where it needs to go

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to restore the marshes. Also, we had the idea of restoring the Biloxi marsh area and including the use of the sand and other sediment material for marsh creation. Somebody brought up the idea of protecting the south bank of Lake Borgne and the north bank of MRGO from extreme vulnerability to erosion. And also we had several people from St. Bernard Parish government, I

guess, former and present who wanted to make sure that the St. Bernard plan that has been prepared and is published is included as a starting point and that is going to be part of the record. We do have that. And then we're also quite emphatic from several people in the room to speed up the process. It's an emergency and it's taking too long. Thank you.

GREEN GROUP REPRESENTATIVE:

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Okay. I will report on the green room. Actually sounds like everybody in the audience has basically the same ideas. We talked significantly about large scale sediment diversion projects. We talked about restoring barrier islands including Chandeleur. One item that we did discuss was developing a polder type system.

We somewhat compartmentalized the areas and then focus on those as well. Mr. Arceneaux has his plan or his thought to build a massive wall from Mississippi to Mississippi River to Mississippi Gulf Coast, block the storm surge that way. And everything else that were talked about in the other rooms as well.

RED GROUP REPRESENTATIVE:

I'm going to summarize from the red group. I think one of the key points I think that was

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pointed out was the need to expedite all of this. I guess the idea of no more studies was reiterated over and over and over. That currently there are a number of studies that have already been done by the state, by the parish. Those studies having been approved and ready to go. I think the emphasis was to move directly into the

implementation. To do away with the studies and to get into that. That was probably the number one issue in that group. Along with the same as the other studies, one of the key points was to go in and restore the Chandeleur Islands, basically to kind of build those back up as the first line of defense for the Biloxi marsh area for that whole Breton Sound area. A third idea was to create a barrier ridge along the eastern side of St. Bernard Parish. I

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think between Lake Borgne and St. Bernard Parish to kind of come in on the west side of MRGO, kind of create the barrier ridge. That will essentially tie into some of the levees and thereby kind of eliminate some of the flooding through that area. And then last was kind of thrown out to consider that as part of all of

this that is going on to really take into consideration both the social and economic impacts this is having on the local residents throughout the area.

MR. HUNTER:

Okay, Charlie. Thanks. I guess I was in the session with the blue dots and I will go over some of the key issues that came out of that meeting and keep in mind that there were many, many thoughts and ideas that were discussed at that meeting so certainly this is not

comprehensive but some of the key ones that I can remember relative to short notice.

First of all, certainly freshwater diversion, sediment diversions are critical to reestablishing the habitat. Another comment that was brought up that is relevant to that was the fact whether or not treated

wastewater from St. Bernard Parish, Plaquemines Parish could actually be used along those same lines.

AUDIENCE MEMBER:

It's Orleans Parish that the water is going to come from to St. Bernard.

MR. HUNTER:

Thank you. There was also discussions that we should certainly consider economic impacts and potential economic opportunities that may be created in this process, but certainly a

consideration of the oyster harvest areas within the study area. Another issue was we should focus on stabilizing certain areas first. That may be an area where we should really concentrate our efforts. Initially stabilize the situation and then focus on critical areas

that provide the most risk reduction. Beneficial use of dredge material was discussed numerous times. One option was to look at beneficial dredge material from the Mississippi River and Southwest Pass. There was also a very interesting theory that was brought out that may be worth investigating was the fact that currently the rock jetties that extend well into the Breton Sound and Mississippi Sound area may be blocking nutrient from the Mississippi River that migrate northward and

they cannot penetrate that specific rock jetty and in turn negatively impacting the Barrier Islands and Biloxi marsh area. Let's see. Barrier Island restoration was certainly discussed numerous times. Restoration of the Bayou La Loutre was brought up as a

potential, very beneficial project. Another discussion was relevant to a multiple closure structures on the MRGO with the intent being right now it just basically stops navigation but from approximately, I guess, mile 37 back toward the east, additional structures to reduce saltwater intrusion in the Biloxi marsh area may be beneficial. And, let's see, the last one is discussions relevant to saltwater intrusion were also prevalent throughout our discussion.

And with that, I think that

summarizes ideas and thoughts and strategies that came out of the facilitated breakout sessions. And I will just have a couple of items that I wanted to bring up to close here tonight. Number one, there are numerous ways to provide comments if you haven't

been able to comment to date. There is a comment card in your packet that you can drop off up front or you can fill out a later time and mail it. Within the brochure there are addresses for e-mails, there's a website address, there's sites to mail things in both to regular mail and overnight mail, so please take the opportunity to provide comments if you can. We also have an evaluation form in your packet. We would certainly appreciate if you would take the time to fill out the evaluation form. The intent of the

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evaluation form is to discuss the effectiveness of our meeting format here tonight and help us provide better, more effective meetings in the future.

And with that I'm going to go ahead and turn it over to the project manager, Greg, at this

point for a few closing comments.

MR. MILLER:

I do appreciate everyone coming this evening. I popped into two groups and I heard more than two new ideas. Junior is sitting back here saying he has got the complete plan but I heard some things that I haven't heard before tonight and that's exactly why we came here today and it's exactly why we keep coming back until we have our plan put together. I want to encourage folks if there are any folders left, take them home and give them to your neighbor or give it

to somebody you think might be interested, and if there is anything that you see here tonight that you would like a copy of, it's available on the internet. Google MRGO, the Corps of Engineers and this information

comes up. It's a valuable set of interactive information that we provide on the web. It's a lesson that we learn from our efforts with the closure structure, the development of the plan for the closure structure and it's something that we'll continue to do.

Once again, I do appreciate everyone coming. We look forward to continuing to collaborate with you on the development of the plan, and members of the team will be available afterwards if there is anything else that you would like to add. Thank you very much and goodnight.

(Whereupon the meeting has been concluded at 8:44 p.m.)

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REPORTER'S CERTIFICATE

I, RACHEL Y. TORRES, a Certified Court Reporter, do hereby certify that the within witness, after having been first duly sworn to

testify to the truth, did testify as hereinabove set forth.

That the testimony was reported by me in shorthand and transcribed under my personal direction and supervision, and is a true and correct transcript, to the best of my ability and understanding; that I am not of counsel, not related to counsel or the parties hereto, and in no way interested in the outcome of this event.

RACHEL Y. TORRES, CCR, RPR

CERTIFIED COURT REPORTER

MRGO ECOSYSTEM RESTORATION PLAN DEVELOPMENT PUBLIC SCOPING MEETING TAKEN AT THE LEO SEAL COMMUNITY CENTER, 529 HIGHWAY 90, WAVELAND, MISSISSIPPI 39576 ON THE 6TH DAY OF NOVEMBER, 2008 COMMENCING AT 6:00 P.M.

REPORTED BY:

RACHEL TORRES-REGIS, CCR, RPR

CERTIFIED COURT REPORTER

MR. HUNTER:

At this point we would like to start the opening remarks session. If everybody can find a seat and we'll get started. I would like to welcome everyone out tonight to our scoping meeting on the Mississippi River Gulf Outlet EIS, Ecosystem Restoration Study. My name is Tom Hunter and I will be the facilitator throughout this evening's activities, and what we would like to do right now, I would like to introduce Dr. Walker with the Department of Marine Resources, and he has a few opening comments that he would like to share with everyone.

DR. WALKER:

Thank you, sir. Thank y'all for being here. I'm going to try to take just a few minutes to

maybe get a little bit of a historical perspective to some of the stuff that was going on before and sort of guide us here tonight. I know this meeting is focused on MRGO primarily, but the MRGO issue is part of a broader issue of restoration of Louisiana and Mississippi coastal wetlands and freshwater diversions from Mississippi to Louisiana.

The freshwater diversion work started probably 25 years ago. It was actually -- and Mississippi's need and Mississippi's request to congress back then was to divert enough freshwater from Louisiana to return Mississippi's oyster growing areas to historical salinity regimes. The salinity has been slowly increasing in these areas in part because the Mississippi River has not been

contributing as much water on an annual basis to Mississippi as it historically did, so we were trying to get some additional waters released from the river. Back in those days we try to do it through Bonnet Carre which would route most -- that water through Lake Pontchartrain, and one point in time congress actually appropriated enough money to actually carry this project out and Mississippi and Louisiana were in the process of coming up with their magic when the deal kind of fell apart because of potential negative impacts to the Lake Pontchartrain area, so since then we have been working with the State of Louisiana to explore other areas to divert water from. One of which is Violet Canal that we'll -- I guess we will be talking about a little bit tonight. So

our hope is -- well, our hope is multi-fold. One, we would like to get freshwater for Mississippi from Louisiana because it would help -- it will help Mississippi's oyster industry, but at the same time Mississippi is very supportive of all of the restoration efforts that are going on in Louisiana. We work with my counterparts in Louisiana and in Louisiana Governor's office, we work with them in Washington to support their efforts in congress to provide funding for this -- for the Louisiana Restoration Program because bottom line is the Louisiana coastal wetlands are very important to Mississippi. Hurricane Katrina is an example. Hurricane Katrina was a level five hurricane when it came across the barrier islands offshore from Louisiana,

Mississippi and across those marshes in mid-southeast Louisiana and those islands reduced Hurricane Katrina to a category three by the time it actually came ashore right along the Mississippi/Louisiana line, and as bad as it was in our state, it could have been a lot worse, would have been a lot worse had it not been for those -- our governor likes to call them speed bumps out there to slow those things down as we cross them, and so the Louisiana marshes are continuing to disappear, have been doing that for many years, a couple of decades, and it's going to take a while to get that trim turned around and get it going back the way it used to be when the river would flood on an annual basis and nourish those areas, and we're very supportive of that.

We hope that there would be some freshwater diversion perhaps most of it come through Violet. There is another possibility of getting some of it through Bonnet Carre that would nourish another part of Louisiana marshes and still provide the water we need to Mississippi, so I thank you again for taking time to come tonight. I hope you get your questions answered. If you have any of me before I get done, I will take them right now. If not, I'm going to sit down and turn this over to Greg. Greg.

MR. MILLER:

Thank you. It's nice to be up here in Mississippi. We -- first of all, my name is Greg Miller. I'm the senior project manager for the MRGO Ecosystem Restoration. As Bill mentioned, we have a lot of different aspects of this and it's one of

the reasons we wanted to spend some time over here this evening.

For the last, oh, well, over three years we have been over here and had folks from the Corps that came over and helped with some of the initial recovery efforts here in coastal Mississippi. You guys suffered as much of a tragedy as you saw happening to the coast of Louisiana and so on with Katrina, and it's been a pleasure to meet some folks in the work and now that we are getting a little bit further out of the recovery aspect, we are starting to look to the future, and, that is, how do we go about trying to plan and repair the coastline is also damaged by those storms and damaged previously by other storms. And that's the real forum tonight. As the project manager, I want to make sure that

I get a chance to meet you and I make myself available as well as the members of the team that we brought tonight and we can answer any questions, and more importantly, we can give you any information that you think you need to help us put this study together because our goal is at the end to not only complete the study but to come out with some recommendation, and we can go to congress and get some projects authorized that address the problems that we see here along the Louisiana coast as well as over here in Mississippi. And as Bill mentioned, it's not a problem that stops at state line, it's something that we see the wetlands in Louisiana, if you are familiar with the area along the Rigolets and Pearl River, you ride in the boat, you go from one state to another and you don't

even realize. It's just an important place and means a lot to folks that either live here or they make their living here or they just enjoy coming to these areas to have a vacation, so that is what we're here for tonight is to try to hear from you what is important to you, what are the aspects of the area that you think you ought to take some focus on, and we got a lot of information here. We have a small group, which is some ways a nice thing, so we'll have some time tonight to go through any of the information you see or if you have information yourself you want to give to us that we haven't put up on any of these posters and maps and such, we really like to hear that from you.

Finally, I will leave you with, one, my phone number. You

can you reach me at the District of New Orleans at (504)862-2310. I will have some of my cards in the back. Any time you have a question about what we're doing, not only this evening but as we move through this into the future, you give me a call. We have some folks from the Mobile District, the Corps of Engineers has a district that covers part of the Mississippi area, it is actually Mobile, Alabama. They are our partners in this effort and our partners with both the State of Mississippi as well as the State of Louisiana.

We really appreciate you coming and hope we can answer your questions and help you learn a little bit more about what we are up to tonight. I will turn over now to Ms. Sandra Stiles. She is the environmental manager for the conduct of this study.

She is going to tell you a little bit about what we're going to run through this evening and then we will get a chance to look at some of these maps in detail. Thank you again for coming. I appreciate it.

MS. STILES:

Good evening. As Greg said, Sandra Stiles. I'm the environmental manager for this study. Meeting the development of the Environmental Impact Statement. We are working with the Mobile District and we have a multi-agency, habitat evaluation team that is participating in this and the Department of Marine Fisheries from Mississippi here and the Mississippi DEQ as well as Fish and Wildlife Services in Louisiana, Department of Natural Resources, National Marine Fisheries Service, they are all part of the team on this project.

Tonight's public meeting is a part of the scoping process that is spelled out and a requirement of the National Environmental Policy Act and we are here to just hear from you. This is your night, this is your opportunity to give us your feedback in which you think the issues are in the area and what you think you would like -- what the restoration ideas are, so we want to hear from you, and the scoping process goes all of the way through to the release of the Draft EIS. If you want your comments to be a part of the scoping report, we need to receive them by November 20, but even beyond that up until the draft is released and I think our schedule is for January of 2010 or May 2010 for the release to the public. So up until that point we are interested to hear whatever you have to say. Thank

you.

MR. HUNTER:

Sandra, thank you. Okay. A couple of housekeeping issues. No. 1, if you have not signed in, please do so before you leave tonight. We would like to have a record of everyone who is in attendance. Let's see. We do have a court reporter here. She is actually recording all of the comments that will be made tonight. We also -- everyone that received a packet, in your packet they have a comment card. If you have any comments, please fill that out. That is one option you have. They have a comment box at the registration table, drop it off there. You will also note that the cards are in itself addressed stamped envelopes, so you can actually fill them out at a later date and drop them in the mail. In the

packet you also see under the scoping meeting guide they have numerous other ways to correspond to get information on the study and provide comments. They have an e-mail address, they have a website address, they have an address for regular mail as well as for overnight mail. Also, one other item in the packet there is an evaluation form. The evaluation form is actually relevant to the meeting format and content here tonight. If you do have time, we would appreciate if you fill that form out and help us to design these meetings in the most effective manner possible.

As far as overall agenda, we started out, we had a little open house session, I hope everybody had a chance to look at the different graphics and exhibits that we have, and hopefully you

were able to talk to Corps representatives about any key issues that you may be interested in. We just included some of the opening remarks, and at this point what we would like to do is move into what we would call I guess a group discussion to talk about specific issues relevant to this Ecosystem Restoration planning initiative.

Let's see, it's right about 7. I would imagine we would go probably between 30 minutes, an hour depending on how many comments we may have. The intent here is really to get input from you. It is a scoping meeting and that's the primary goal here tonight.

Just a few notes, No. 1, please be courteous to everyone here tonight. You may have opposing issues or views, that's no problem, we want to hear

everybody's comments. Please be courteous. As has been noted a couple of times, we are very early in the process. This is the scoping meeting. This is one of the first meetings relevant to this process. The purpose is to receive input from the people that are here tonight. The focus tonight where we really like to focus effort -- first of all, as I said, we are willing to answer questions relevant to process and issues that you see on the display and exhibits here tonight and we'll do the best we can to answer any questions that you may have, but the real purpose is really to hear from you relevant to problems and issues associated with the ecosystem that may have been affected by the MRGO, and also to possibly discuss alternative strategies and solutions relevant to the

restoration of the ecosystem here in the Mississippi Sound area as well as the Chandeleur Sound area, Lake Pontchartrain, lower Lake Pontchartrain basin as well as Breton Sound.

And with that said, what we would like to do is, once again, engage you in bringing up any issues that you may have, any points you would like to discuss regarding the ecosystem problem issues, alternative strategies or things that you would like to discuss here tonight. We have several Corps representatives here who are technical experts, many of them in certain areas, and they will certainly do their best to answer any questions.

We would love to hear any input you may have. Yes, sir.

AUDIENCE MEMBER:

The border of this -- I can't help but wonder how this project

down here on the canal is going to affect some of the areas that are within the boundary, the distance upstream.

MR. HUNTER:

Okay. I think he is referring to the study area. If you look at the study area, it is fairly expansive and extends all of the way down to the lower section of the Mississippi River and extends up the Mississippi River and takes in the upper portion of the Lake Pontchartrain basin as well as the lower portion; Lake Borgne, Mississippi Sound, Chandeleur Sound, all of the way down to the Breton Sound, and they have had several meetings to discuss overall study area and potential impacts. Obviously right along here is the Mississippi River Gulf Outlet and that is one of the primary component of this overall study,

and obviously there were numerous impacts in this area, but based on some of those discussions that the Corps had with different entities, the stakeholders, this was the initial study area that was developed, but we are certainly willing to listen if you have -- if you would like to talk about modifications to that or anything along the other line, we would like to hear your comments.

AUDIENCE MEMBER:

Suggestion, it just seems strange that the study of this project is on the other side of Lake Pontchartrain.

MR. HUNTER:

On the basin of Lake Pontchartrain? Uh --

AUDIENCE MEMBER:

That just -- the study area is so large.

MR. HUNTER:

I understand. When I first looked at it I said the same thing. I live actually in this area over here in the Madisonville area and I know there were several issues regarding saltwater intrusion and impacts that are actually in the Maurepas Swamp and all, and there are some beliefs, I believe, that the impacts of the MRGO may have enhanced the saltwater intrusion, and I think that was brought into discussion. I'm not sure if anybody else wants to comment on that issue.

MS. STILES:

You are right as far as the MRGO can have potential impacts -- (inaudible)

MR. MILLER:

Sandra, a little louder. We can't hear you.

MS. STILES:

I am sorry. Maybe we can all

get a little closer.

MR. MILLER:

Well, she has to stay right there.

MS. STILES:

Well, okay. Sorry. I will try to talk louder.

The reason we kept a larger area for this area to capture the watershed for middle and lower Pontchartrain, so that is why it's out here some, but there is a belief that the MRGO impacted the Maurepas, so we wanted to make sure we captured that but we took the larger area as part of the watershed.

MR. HUNTER:

Okay. I think Dr. Walker had mentioned something I thought was of a great interest. Obviously the oyster beds are located here in Mississippi and the Mississippi Sound and there were some concerns that he had, I

guess something that had been going on for quite some period of time obviously increasing in the Mississippi Sound which has been negative relevant to the arch -- along those lines, so there has been an effort to try to introduce some freshwater into that area, and certainly with the MRGO having direct impacts or apparent impacts in this area relevant to saltwater intrusion, it's possible that it may have impacted that area as well, so that is, again, maybe a relationship between the MRGO and increase the salinity levels, you know, it's one possibility, anyway. And if anybody would like to maybe discuss that in more detail or specific issues regarding the Mississippi Sound, the Biloxi marsh, any ideas relevant to specific problems that they see out in those areas

or areas where they are seeing significant erosion, land lost, change in the salinity levels, we would certainly like to hear about them, and anybody who maybe has any ideas relevant to strategies or alternatives that they may want us to consider in this EIS process, we certainly would like to hear that as well.

AUDIENCE MEMBER:

The main thing that I have to say is, all of you, don't eat the raw oysters. I'm not kidding you. My friend -- my friend's son passed away because he ate those raw oysters and they had to send him to a hospital and he had had some type of medication previously, you know, and then they went through it and all, so I have to tell everybody I know because we have so many friends on the Gulf Coast, you know, and the kids go right out there, they

are right about it. They don't want to hear from you, you know. They go right in, so if any of you letting the kids go out and pick up the oysters, tell them bring them home in the shell, don't touch them and then you can look at them and see if you want to keep them or whatever. They are not that bad, I don't suppose, but the way he used it, and I just thought to myself, boy, I'm going to that meeting and I am going to tell all of those people about the raw oysters. I did, so that's that.

AUDIENCE MEMBER:

A question. We had thousands of these nutria wash up here. Probably those filters probably -- where those nutria washed up, dead nutria. I guess I'm asking how does this affect those nutria? I understood Louisiana is trying to get rid of those nutria

any way they possibly can. It's probably bad, get rid of them, but how is this supposed to affect that, does anybody know?

MR. HUNTER:

What storm was it, was it off of Ike --

MR. MILLER:

Tom, can you summarize the question because we couldn't hear it and she couldn't hear it either.

MR. HUNTER:

He had asked in the last storm events, I guess there were a lot of dead nutria that washed up on the beach in the Waveland/ Bay St. Louis area, and he was trying to understand possibly what impact that had or what caused that or something along those lines.

AUDIENCE MEMBER:

Yeah. Or how this might affect those nutria and perhaps

someone here knows whether that storm actually had an affect on the nutria population or whether, you know, we might got all of the dead ones on our beach, but I doubt it.

MR. HUNTER:

To be honest with you, I'm not familiar with that phenomenon and I really don't know that answer. I don't know if there is anybody here that would really have any knowledge of that.

MS. STILES:

I don't know. I hadn't heard anything. Gib.

MR. OWEN:

It didn't happen -- I haven't heard of it due to Gustav and Ike, but we had quite a number of them die during Katrina. There is 20, 30 feet of water, they don't have anywhere to go. In this case you had under Ike and Gustav you had eight, nine feet

of water and --

AUDIENCE MEMBER:

This was only a month ago and we got -- they were out there and some poor souls had to pick up these dead animals that had been down a while and drive up and down and smell it from the car, so it was kind of a mess, but I just wondered whether anybody here knew that this was going to do about those animals or, you know, what had happened to them due to this last episode. That's all I had. Because of that -- but at the same time it probably had something to do with her friend getting all of those bad oysters because there were an awful lot of dead animals out there, a lot of seaweed that all got caught up in the seaweed up there.

MR. HUNTER:

Well, I don't necessarily

have any answer to that.
Relative to that, I'm not sure whether anyone does at this point.

AUDIENCE MEMBER:

The little kids catch and picking up the oysters, you know, and his wife was in her kitchen looking out the back door watching him and she said every time he cracked one of those oysters it scrape inside and he took the oyster and ate it and she said that is enough, she kept saying, that's enough, but it never got to be enough until they put him in an ambulance in the hospital and he passed away.

MR. HUNTER:

Okay.

AUDIENCE MEMBER:

Don't let them eat the oysters, that's all I say.

MR. HUNTER:

I would say at this point

anybody who is here tonight from the public or any agency or anything, one thing we may want to discuss is do y'all have any specific ideas relevant to Ecosystem Restoration, relevant to some type of improvements or strategies or something that y'all may want to see implemented in this area. That's the question posed to the group.

AUDIENCE MEMBER:

Once again, I can't help but wonder what would happen if we just didn't do that. In other words, just let nature take its course, what will the result be.

MR. OWEN:

That would be one of those study efforts that is done in part of the -- we call it the No-Action Alternative, and that will be looked at in detail in the report.

AUDIENCE MEMBER:

Hasn't been done yet?

MR. OWEN:

No. Not to the extent that it will be done in this report.

MR. HUNTER:

Historically we have some information over here that clearly shows that there had been significant land loss in the entire coastal Louisiana area and there's been significant land loss, and obviously, I guess, the study, the No-Action Alternative to get some better estimate the type of impacts, whether that will continue or not, but that will be part of the process for the study process. Yes, sir.

AUDIENCE MEMBER:

When you are talking about Ecosystem Restoration, hopefully you are being all inclusive; barrier islands, vegetative wetlands and insofar as restoration of source of silt,

unless you dredge from one place to put it in another, obviously the river system, the Mississippi River is the mother load, many have been a proponent of utilizing river diversions in the sediment loads to restore some of the areas that have been eroding away or for whatever reasons, but when you talk about the ecosystem, the barriers islands are also extremely important.

MR. HUNTER:

Are there any specific barrier islands that you --

AUDIENCE MEMBER:

All of them. Not -- you know, it has changed, of course, over the years. It's a natural process. They erode as time progresses, but we certainly know they are the first line of defense from hurricanes.

MR. HUNTER:

That would include the

Chandeleur islands as well as the islands off the Mississippi Gulf Coast.

AUDIENCE MEMBER:

You are talking about total ecosystems, so that's all of them, yeah.

MR. HUNTER:

Okay. I understand. Do you have any specific ideas relevant to how -- I mean, what would be a reasonable process to go through on alternative strategy for that or the freshwater diversion, sediment diversion, anything along that line?

AUDIENCE MEMBER:

Well, I understand a little bit about NEPA and the process, and I say let's go to work and start building and quit studying, but we need it done as quickly as we can. Recognizing that studies have to be made, but, my gosh, some of these studies of this

type have been going on for a number of years.

MR. HUNTER:

Yes, sir.

DR. WALKER:

I would just like to add to that that at this point in time Mississippi in working with the Mobile District, and I will just say for the record that that was a very inclusive process that the state and the Corps and other federal agencies were at the same table throughout the process to develop that plan. That plan is complete. That plan has been submitted to the Corps of Engineers D.C. office, my understanding it is out of that office and now under review of the Office of Management and Budget or wherever else, and Mississippi is trying very hard to actually have congress provide the funding that that Corps

report asked for. Congress directed the Corps to do the study and to do the report. Congress directed the Corps to do an interim report. Congress funded the projects in the interim report at $105 million, I believe, for fifteen or so projects that are presently underway in the State of Mississippi, so it's just logical that eventually the congress will fund the final report on Mississippi and we hope that will happen sooner than later because we are missing opportunities in Mississippi to do restoration that we're not going to be able to do because the funds aren't there to do them. There are places that are being rebuilt in areas that we would have preferred to purchase and restore to the natural environment of decades ago, and while we still

intend to do that, the longer the delay in providing the funding that the Corps has asked for, the more of missed opportunities. But I'm comfortable that that will happen, so at least in Mississippi we are pretty far along to be ready to start work when funding is provided, and I think in Louisiana their plan is also a very good plan, and while I agree that some additional study is necessary on some of these diversions, we should be fairly close to moving forward with some of these projects, so I'm just kind of optimistic about the future and where we are going to go here. I think the mood of congress is to do what is necessary to provide the support to make these projects a reality and to really begin the process of restoring both coastal Louisiana and coastal

Mississippi.

MR. HUNTER:

Are you familiar with some of the key projects maybe that were included in that plan and had been funded that you could share with the group.

DR. WALKER:

Well, in Mississippi there is a big part of the Mississippi plan is to restore all of the barrier islands offshore for Mississippi. Hurricane Katrina cut Ship Island in two, into two islands, and Hurricane Katrina just made it a lot worse to the point that that island will not -- we don't think will restore itself unless we don't get anymore storms ever, and so that plan is to actually go in, build containment structures and pump that cut, pump sand back into that cut and physically fill it. The other islands the plan is to

place sand in the zones south and east of those islands in such a way that the natural water movement will carry that sand on to those islands and rebuild them. In Louisiana, we have met -- Louisiana officials came over, met with us, we have agreed to provide dredge material to Louisiana from normal maintenance dredge operations at the Mobile Corps of Engineers carries out in Mississippi, we have agreed to provide some of those dredge materials, those sediments to Louisiana, and, actually, the Corps has agreed to actually place those materials in the vicinity of Chandeleur Island so that the natural water movement will carry those materials on to that island and speed up the recovery of that island, so those kind of things are ongoing, underway, happening.

MR. HUNTER:

That material is coming out of the Port of Gulfport channel.

DR. WALKER:

The next time, and I don't remember, I think it's sometime within the first part of the first half of '09, the Corps will dredge that -- do their next maintenance dredging in that channel and those materials -- most of those materials will wind up on Chandeleur Island.

AUDIENCE MEMBER:

I think clearly, though, it's a lot of the newer material that they really requested from Mississippi where we're actually -- (inaudible) so those funds are available.

AUDIENCE MEMBER:

Those funds are available. It was part of that supplemental EIS the Corps is doing, the work material from the Gulf --

improvements to the Gulf Harbors channel.

DR. WALKER:

Right.

MR. HUNTER:

Just jotting down a few of the key points that we are bringing up tonight. We appreciate those comments. Obviously there is -- you know, a lot of work has been done, and I think that's consistent, you know, within the whole ecosystem area that we are working with that we have noted and the Corps and those studies seem very well aware that there's been numerous studies within the project area and we are certainly utilizing those studies to the highest potential to not recreate a lot of effort that's already been undertaking, and -- but I'm just looking back, there are several good ideas here that are on the

table. Obviously the barrier islands, restoration of the barrier islands is something that's been accounted for. If you look at our study area issues and study area opportunities, obviously relevant to Mississippi, Chandeleur Islands and the islands right off the coast of Mississippi, the issue regarding the salinity in the Mississippi Sound, oyster harvest, certainly associated with the freshwater diversion, how do we get some of that freshwater from the Mississippi River to stabilize that salinity regime. The beneficial use of spar material, again, something that's been recognized in our study area opportunities. Here is an opportunity to look at utilizing that material from the channel in Gulfport. I would imagine there may be a similar

opportunity for Port Bienville, the channel there, West Pearl River, and even as far down as in the Breton Sound area relevant to the Mississippi River, so there is a lot of spar material that we probably could utilize more efficiently and more effectively.

So I think these are some, you know, excellent ideas, obviously there's a study we looked at in the past and need to see how we can incorporate or maybe integrate the concepts into the overall study.

Are there any other similar type ideas, strategies?

AUDIENCE MEMBER:

I just have a question really for Dr. Walker. When you were talking about dredging in Gulfport and using that material to build up the barrier islands and Louisiana agreed to take it, Mississippi agreed to give it,

politically was that a tough thing to do?

DR. WALKER:

No. Not at all. Not at all. I mean, Mississippi understands the value to Mississippi as well as to Louisiana rebuilding Louisiana wetlands. It's critical to us as well.

MR. HUNTER:

And I guess several navigation channels in that area and y'all have a channel to your port and then there's the channel in the West Pearl River, Gulfport. Any there any other ones that we are aware of over here in Southern Mississippi? I guess there's a channel in Pascagoula, but that is getting a little out of the --

DR. WALKER:

Well, I mean, the whole concept is just the idea of beneficial use of dredge

material. I mean, we don't -- we don't want to throw that stuff away. I mean, for decades everybody thought that was just junk and it's not, it's valuable stuff --

MR. HUNTER:

Permitting problem.

DR. WALKER:

-- that could be used, so we want to use it and we have used it to build marshes, we used it to rebuild islands, so the Corps and the other federal agencies that bought into the overall idea, along with the state, are beneficial use to this material. Let's find some good thing to do with it rather than just throw it away offshore. Put it somewhere where it's going to wind up back in the --

AUDIENCE MEMBER:

I agree, but that's not always that easy to do.

DR. WALKER:

No, I know. I will tell you the truth, I think when the Louisiana folks came over they expected a little fuss, but it didn't happen. It didn't happen.

MR. HUNTER:

So relevant to the Port Bienville operation, are there any significant exposures or risks associated with maybe some of the damage that's been done here recently due to the hurricanes or anything that you can see that maybe we --

AUDIENCE MEMBER:

Port Bienville is supported by two types of -- they are supported by rail and barge. Prior to the storm we had a small shipping company that was shipping between the Yucatan and us, and believe it or not, they were 33rd in the country for shipping containers, Gulfport got

a lot of credit because of the port of call. We lost them after the storm. One of the concerns was that we wouldn't be able to get the area dredged out quick enough and we -- the route that we take is a Little Lake -- I mean, yeah, Little Lake to get in and out. You could possibly come in and out by Pearl, right, but the problem is is that it also fills in, too, and also the bridge -- but the point I was making is one of the ways that we bringing material for the companies that was supported is by rail, and during the last hurricane Katrina, also the last storm, well, Gustav also, they probably damaged the railroad track for CSX, I don't know, probably five, ten, twenty million dollars each time, so -- and in that case they could use some protection along the coast

there.

MR. HUNTER:

Yeah. That's a CSX line, right?

AUDIENCE MEMBER:

It sure is. And they support Port Bienville. We have a lot of customers there that ship things in and out from there.

MR. HUNTER:

Are there any other key infrastructure in that area in the Mississippi Sound along the Mississippi coast that may be at risk or real vulnerable that improvements to the coastal ecosystem could possibly help reduce the vulnerability of? Any key issues along those same lines we may want to discuss. Obviously have the port facilities that are inherently located on the water and for independent use, but at the same time those types of things come

into play as well.

Let's see. I'm trying to think if there is any other -- does anybody have any other issues that they would like to bring up at this point, something that we haven't discussed yet or something you would really like to discuss while we have -- we have a lot of expertise in the room, a lot of folks from the Corps with a lot of different talents and a lot of knowledge and now would be a good time to bring up something or ask any questions. Okay. Well --

AUDIENCE MEMBER:

Actually, she actually answered some of the questions for me. I know living here in Hancock County there were some concerns about all of the work that's being done to Louisiana as far as building up the levees, closing the MRGO and things like

that, there were concerns that could increase flooding in the county. Now, I have heard of that, discussions in general probably about that because after the storm, after Katrina there was concern that maybe some of the flooding was caused from the levees and all of that in Louisiana. Not saying it was true or not, just saying some of the word on the street was. So I guess what I'm saying is should there be any concern with all of the work that is being done in Louisiana that the Corps is proposing with the additional levees and everything else.

MR. HUNTER:

That is obviously a question I can't answer. Anyone from the Corps or they would like to take a shot at that one that would be fine. The only thing that I was -- relevant to the ecosystem

restoration -- ecosystem restoration project that is underway, certainly there is inherent benefits to both the Louisiana and Mississippi coastline, and I think, Dr. Walker, I think you had mentioned the issue that more or less speed bumps to reduce the overall affect to the surge, so I think from an ecosystem restoration I think there will be benefits, potential -- potential benefits possibly to flooding the storm surge issues. As far as the impact to the levee system they have, I don't know, I cannot answer that question and I don't know if anyone from the Corps wants to make any comment regarding that.

MR. OWEN:

The policies in which we operate on, we account for all impacts, positive or negative, we

view the impacts of a project or to a project is a national account, so impacts in Mississippi are accounted for within the project as a total cost and those are offset, and we also have some policies regarding reduce flooding, which is something we endeavor not to doing, so those are all taken into consideration in the design and analysis and selection process.

MR. HUNTER:

Anything anybody would like to add or any further discussion, note any issues?

Okay. Well, Greg, any closing comments you would like to make maybe before we wrap it up.

MR. MILLER:

Sure. Thank you. Again, I appreciate everyone coming out tonight. You know, it's an

opportunity for your voice to be heard, and we are glad to be here to do that. I wanted to remind everyone that we have got these packets here, they have some mailing cards that you can view and information in here about how to get in touch with us otherwise either by mail or internet or just regular pick up the telephone and call us and we can do that for you. Also, we brought some extras, so if you would like to take it back and share it with your neighbors or colleagues we can have all of these things available to take home. If there is anything that you see here tonight that peaks your interest further, it's also available on the internet. You can do that by getting the address from one of the team members here or if you just want to type in the internet MRGO, all

of the things you see here this evening are available. You can download them, you can share them with your friends, your civic groups or anyone else.

We do appreciate, once again, coming out, and we look forward to coming back and seeing you again sometime soon to tell you a little bit about the progress we made in putting it together, and any time if you feel like we ought to come visit you some more, even if it's not something that we have scheduled, you just give us a call and we would be happy to come on over here and spend some more time with you.

Thanks again. Goodnight. Y'all be safe going home.

MR. HUNTER:

Just one last note, everybody, we do have the evaluation forms in the packet and we would appreciate if you

take a few minutes to fill those out. The evaluation forms are simply relevant to the format of the meeting and effectiveness of the meeting and that helps us in the future to design more effective meetings to help us in the planning process.

And with that, thank y'all. Y'all have a good evening.

(Whereupon the meeting was concluded at 7:36 p.m.)

REPORTER'S CERTIFICATE

I, RACHEL Y. TORRES, a Certified Court Reporter, do hereby certify that the within witness, after having been first duly sworn to testify to the truth, did testify as hereinabove set forth.

That the testimony was reported by me in shorthand and transcribed under my personal direction and supervision, and is a true and correct transcript, to the best of my ability and understanding; that I am not of counsel, not related to counsel or the parties hereto, and in no way interested in the outcome of this event.

RACHEL Y. TORRES, CCR, RPR

CERTIFIED COURT REPORTER

MRGO ECOSYSTEM RESTORATION PLAN DEVELOPMENT PUBLIC SCOPING MEETING TAKEN AT THE C.F. ROWLEY SCHOOL, 49 MADISON AVENUE, CHALMETTE, LOUISIANA 70043 ON THE 3RD DAY OF NOVEMBER, 2008 COMMENCING AT 6:00 P.M.

REPORTED BY:

RACHEL TORRES-REGIS, CCR, RPR

CERTIFIED COURT REPORTER

MR. HUNTER:

Good evening, everyone. My name is Tom Hunter. I will be the moderator tonight. We'll start tonight out with a few opening remarks from the Parish President, Mr. Craig Taffaro.

MR. TAFFARO:

Welcome everyone and I want to thank you for being here. Obviously for many of you it's sort of an exercise of review hopefully that the old ideas might generate some new interest or some new movement, especially in funding, and I do want to take a moment to recognize our former President, Mr. Rodriguez, who has been a champion of our coastal issues for many, many years, so thank you, Mr. Rodriguez, for being here.

(Audience applause.)

Again, I won't be long. I

encourage everyone to make use of the time as this feasibility study was explained or sort of introduced to us at the parish government, the idea is to get input from as many different citizen groups and individuals as possible. It is part of a three year process as we understand it. We're asking hopefully that that timeframe maybe congress can get some relief and shorten the timeframe and use some of the funding to put things into implementation since we believe there's a great deal of information already available to already put into action, so we were hoping that some of that can go on. As we understand it, the idea of these meetings is to reach out to as many different parts of the community as possible. I have spoken with Greg and requested that this also

be brought into the school system and we have made that known to Ms. Voltier as well so that the generation -- in fact, we were talking just a little bit ago, the experts who know and have all of the information historically seem to be aging a bit and that information may not be transmitted to the people who are going to follow behind us, that that needs to continue to push for these issues, so any ideas that you have in terms of getting this information out to the public as well as getting information from the public to the Corps and of course contractors, very valuable, so I would appreciate you being here, and we do want to recognize that one of those long awaited agreements with the MRGO closure structure has, as I understand, one small obstacle but hopefully

that will be cleared, but the idea of the closure, starting construction and being in place for next hurricane season, finally it looks like it may actually be a reality, so we want to recognize all of you who have been a part of that and pushing for that for many, many years, and it is, as we know, only one part of the puzzle and we have to keep fighting for the rest of the pieces, so with that I will introduce Colonel Lee who is -- Colonel Alvin Lee, who is the head of the New Orleans District, and hopefully he will be able to shed a little light, maybe let us know how the funding is coming for many of these projects. Thank you for being here.

COLONEL LEE:

Well, good evening, and I really do appreciate this opportunity to come out and talk

to you a little bit. I'm going to make a few opening comments, but I really want to thank President Taffaro, the President of St. Bernard Parish, for being here tonight, and I would also like to recognize Mr. Tim Doody, the President of Southeastern Louisiana Flood Protection Authority-East for being here also, and other distinguished guests and particularly the residence of St. Bernard Parish because this really is about you and it's about the future of what we want to do not only will have impacts in St. Bernard Parish, it will have impacts even in another state, Mississippi, and I have had the opportunity to go to Mississippi and talk to them and they are very interested in some of the things that are going on here, particularly on the MRGO closure that was just referred

to. We are working very hard and this model over here gives you a visual representation of what that closure is going to look like. It is 433,000 tons of rock that will be put across the MRGO to close it out by next hurricane season, and that is what we are working feverishly. We have been doing that, I came on board last summer, and Greg Miller, our project manager that will be talking to you a little later, our team has been working very hard with a lot of input from you in making this a reality, so we are nearly at the starting line. I didn't say the finish line but we're nearly at the starting line, so we're ready to pull that trigger and get this project going. But I want to talk a little bit about what this is about and how important it is for your engagement and your input in

this process, and so tonight is the first of two meetings that we'll be holding to discuss the Mississippi River Gulf Outlet Ecosystem Restoration and Feasibility Study, and the second meeting will be held over in Waveland, Mississippi. That will give them an opportunity also to provide input and really it's kind of a two-way thing. We try to educate the public with open houses so that you are aware of what is going on with the project, the study area, what the impacts of that is and then we also are very interested in you providing your feedback because what we want to do is make sure in both of these meetings, and this is just the beginning, is that we are using -- we're taking the best alternatives. I heard President Taffaro talk about there's a lot of plans that

people already have, there is a lot of ideas out there and we're very interested in hearing about those ideas because it's not like we have all of the plans and ideas here. This is a collaborative process. We are very interested in your input into the process, and, again, this is all about restoring and maintaining the areas that were affected by the MRGO being opened up in that navigational channel, so, as you know, there's been quite a bit of devastation over the past several decades from saltwater intrusion, from the wave action, from vessels that transit the MRGO that caused a lot of erosion and affected a lot of the wetlands, some of the Cypress swamps that used to be in there, a lot of the fresh water regimes that were affected by that saltwater that moved out, so

that is really what this is all about.

And one of the things that we also want to hear from you is your ideas and your concerns from the residents that live here that know the most about this area. That is one of the things that I have learned since being here in Louisiana. I did grow up in the south, I grew up -- you ever heard of a place called Okefenokee Swamp, south Georgia, swamp area also, but this is a different area and we need the input from you because you have lived here your entire lives, you have a stake here in making sure that this gets done right, so we want to make sure that you have that opportunity to provide us the input that we need to move this forward -- study forward, so with that I want to close up and let Greg Miller, I will introduce

the project manager for this project. He has endured quite a bit of input and perseverance in getting this to where we are now, so I would like to introduce Greg Miller and he will take over for me. Thanks, Greg.

MR. MILLER:

Thank you, sir. Just want to say, once again, welcome. I do see a lot of familiar faces in the audience and I also see some faces that I just met today. This morning we came from a meeting in the Ninth Ward, were looking at the restoration of wetlands in Bayou Bienvenue. If you know where that is and you know how pretty it is and realize that is an area that is important to some of the residents of Orleans Parish, it doesn't take very far to go half a block down the road and you are in St. Bernard Parish and you see

another area that is just as pretty, it is just as degraded and it needs ecosystem restoration work. Raise your hand if you came to any of the meetings about the closure of the channel in the last year and a half.

(AUDIENCE MEMBERS RAISED THEIR HANDS.)

That's excellent. That is excellent. I'm glad to see that folks are still here and that's a commitment that we'll make to you today is that we did that in a collaborative process. The very first meeting and there are a lot of folks in this room that were there. The Corps didn't do a lot of talking. In fact, what we did was just tell you what congress asked to do and we asked for your help in trying to decide how to approach that and do it. We're going to do the same thing

tonight. We are going to spend a lot of time listening to you talk. A lot of time looking at the information that we made available from our team here and then hopefully walk out of here with a good concept of the types of projects and actions and concerns that you have. I will tell you my phone number and it's always available, I will answer if anybody wants to call, it's 862-2310. If you have a question about this study, you have a question about anything else that the Corps of Engineers is doing in St. Bernard Parish, Orleans Parish or anywhere else in the New Orleans District, you can call me. If I don't know the answer I will tell you I don't know, but I will find out who can answer it for you. Once again, I do appreciate you coming tonight. Looking forward to a good

meeting, a good first meeting and then eventually we will get to the point where we have a plan that we can all support. Thank you. Sorry. I should have introduced this. This is Ms. Sandra Stiles, she is the environmental team leader for the Ecosystem Restoration Study.

MS. STILES:

Good evening. I appreciate everybody coming out tonight. It's good to see everybody coming out to share their views. I'm the Environmental Manager. As Greg said, I will be coordinating, getting the efforts for the environmental documents. The meeting, public meeting tonight is part of the scoping process, which is a requirement of the National Environmental Policy Act, so it's your opportunity to come out and share your ideas on the project. We're

very interested to hear what the issues are and what you think the restoration opportunities are for the area, so this is all about you and your input and we're very interested to hear what you have to say. The team is multi-district. We have folks from all of the districts as part of the environmental team and we have all of the various agencies; Fish and Wildlife Service, the National Marine Fisheries, Louisiana Department of Wildlife and Fisheries, Mississippi Department of Marine Resources and Department of Environmental -- agencies from both states are involved in the study, so with that I'm going to turn the meeting over and just listen to what you have to say.

MR. HUNTER:

Thank you, Sandra. Just a couple of other notes I wanted to

cover here. One was just on the meeting, the agenda. Obviously we just wrapped up opening comments and the open house format that took place the first hour. What we're going to do now is we're going to breakout into small group sessions, going to have five actual small groups and we'll have facilitators at each of those meetings and the intent is to try to get input from you regarding this Ecosystem Restoration project. That will last about 45 minutes to an hour. We'll wrap that up hopefully around 8:15, and at that point we will reconvene back here in this room and we will go through and summarize the results of those different breakout sessions. And then we intend to wrap up between 8:50 and 9 o'clock tonight. A couple of other key things. No. 1, if you have not signed in,

please do. We would like to have a record of everyone who has attended tonight. Relevant to comments, we have a couple of -- we have several ways in which you can provide your comments. One is we do have a court reporter here, located over here in the corner. If you would like to verbally express comments to her she will be more than happy to take that information down. We also have -- in your packet you have a comment card, if you can fill that out, drop it off in the white box near the exit, when you leave that will be great. If not, you can fill it out later and you can mail it back. We also have in the packet under our scoping meeting guide they have an e-mail address in which you can e-mail comments. They have a website address and they also provide information on address to

mail, just regular mail, or anything relevant to overnight mail is also addressed there. We also had one other form, an evaluation form on the effectiveness of the meeting here tonight. We would appreciate if you fill that out and drop that off again on your way out tonight at the same table where you registered or signed in a little earlier.

A couple of ground rules that I wanted to go through. First of all, facilitators are gathering comments throughout the open house and as well as in the breakout session, so please note that the comments that you are giving earlier and in the facilitator breakout session will be recorded. Please be courteous to others during these small group breakout sessions. We would like everybody to have an

opportunity to speak and express their concerns and their issues. All written and oral comments will be given equal consideration during the scoping process.

Now, at this point what I would like to do is actually break everybody out into these group sessions, and what I would like everybody to do on the packet that you received everybody will have a colored dot in the upper right hand corner, and, let me see, I had it noted as to where you would go. Blue dots will report to Room 18, which will be through the doors to my right. Red dots will go to Room 15, doors to the right. And then yellow dots, Room 8, to the left. Green dots, Room 19 to the left. And white dots, Room 5 to the left. And I will repeat that one more time. I imagine everybody didn't get it right off

the bat. Again, blue dots, Room 18, doors to my right. Yellow is going to be Room 8 to the left. Red is Room 15 to the right. Green, Room 19 to the left. And white, Room 5 to the left. In each of these sessions, in these breakout groups we will have a facilitator, a Corps representative there as well. As it was noted earlier, we are very early in the process, we're in the scoping process, and the key purpose is to receive input from you, so hopefully we'll be listening, doing a lot of listening and a lot of listening to the comments from you. The focus at this early stage is really to try to identify problems and issues associated with ecosystem that has been affected by the MRGO and to discuss alternative strategies and solutions to address these

problems. That is where the real focus should be tonight. And with that, I would say let's go ahead and break into the groups and get the process started.

(Whereupon the different groups have broken out to their sessions at 7:20 p.m. to 8:30 p.m.)

MR. HUNTER:

At this point we would like to reconvene. Within just the next couple of minutes we are going to try to get each facilitator to come up and summarize a few key points of the breakout session. So if everybody will please take their seats, we will go ahead and continue.

Okay. We are going to go ahead and begin the summarization of the breakout sessions to give you an idea of some of the key points or general thought that

came out of the sessions. And, let's see, first of all, with the white dots, the representative will go ahead and present some of their findings.

WHITE GROUP REPRESENTATIVE:

Okay. Great. We had a very informed group of stakeholders in the white group. I'm going to read off some of the main points that were raised. It was suggested that the Corps consider revisiting the consensus points that were brought forth during the closure stakeholder meeting. Several times it was brought up that we need to address the first line of defense at the south end of the basin and in the Chandeleur islands area. In that area they talk specifically about drop armoring, marsh creation, and in other areas we talked a lot about freshwater diversion, which I'm sure will come up many

times, but specifically those freshwater diversions should be pulsed so that the salinity of the water is not affected to a point where it's detrimental to the area. And finally we talked about a comprehensive approach, systemic approach rather than project by project, which some of the folks felt like the way the situation is being addressed currently they suggested that we take a more comprehensive look at the situation. One other point that I feel is important to bring up. When we were talking about the Chandeleur Island someone mentioned the fact that we need some legislation to change the status of that area before a closure structure could be built because currently it's a wildlife refuge and it's an impossibility to do the things that we would need to do in order to make that

a proper first line of defense. So I hope I didn't miss anything. Again, that was from the white group. Thank you.

YELLOW GROUP REPRESENTATIVE: All right. I'm going to report on the yellow group, and there is a lot more ideas than what I'm going to say here, but the eight major ones are a lot of emphasis on restoring the barrier islands. That was the highest priority that we came up with in the meeting. There was the idea of using the natural ridges as a starting point for restoration including Bayou La Loutre and several other natural ridges. There was the comment that makes -- to ensure that the diversion projects actually moved sediment and not just freshwater and that the sediment is managed so it doesn't all go to one place, but it goes to where it needs to go

to restore the marshes. Also, we had the idea of restoring the Biloxi marsh area and including the use of the sand and other sediment material for marsh creation. Somebody brought up the idea of protecting the south bank of Lake Borgne and the north bank of MRGO from extreme vulnerability to erosion. And also we had several people from St. Bernard Parish government, I guess, former and present who wanted to make sure that the St. Bernard plan that has been prepared and is published is included as a starting point and that is going to be part of the record. We do have that. And then we're also quite emphatic from several people in the room to speed up the process. It's an emergency and it's taking too long. Thank you.

GREEN GROUP REPRESENTATIVE:

Okay. I will report on the green room. Actually sounds like everybody in the audience has basically the same ideas. We talked significantly about large scale sediment diversion projects. We talked about restoring barrier islands including Chandeleur. One item that we did discuss was developing a polder type system. We somewhat compartmentalized the areas and then focus on those as well. Mr. Arceneaux has his plan or his thought to build a massive wall from Mississippi to Mississippi River to Mississippi Gulf Coast, block the storm surge that way. And everything else that were talked about in the other rooms as well.

RED GROUP REPRESENTATIVE:

I'm going to summarize from the red group. I think one of the key points I think that was

pointed out was the need to expedite all of this. I guess the idea of no more studies was reiterated over and over and over. That currently there are a number of studies that have already been done by the state, by the parish. Those studies having been approved and ready to go. I think the emphasis was to move directly into the implementation. To do away with the studies and to get into that. That was probably the No. 1 issue in that group. Along with the same as the other studies, one of the key points was to go in and restore the Chandeleur Island, basically to kind of build those back up as the first line of defense for the Biloxi marsh area for that whole Breton Sound area. A third idea was to create a barrier ridge along the eastern side of St. Bernard Parish. I

think between Lake Borgne and St. Bernard Parish to kind of come in on the west side of MRGO, kind of create the barrier ridge. That will essentially tie into some of the levees and thereby kind of eliminate some of the flooding through that area. And then last was kind of thrown out to consider that as part of all of this that is going on to really take into consideration both the social and economic impacts this is having on the local residents throughout the area.

MR. HUNTER:

Okay, Charlie. Thanks. I guess I was in the session with the blue dots and I will go over some of the key issues that came out of that meeting and keep in mind that there were many, many thoughts and ideas that were discussed at that meeting so certainly this is not

comprehensive but some of the key ones that I can remember relative to short notice.

First of all, certainly freshwater diversion, sediment diversions are critical to reestablishing the habitat. Another comment that was brought up that is relevant to that was the fact whether or not treated wastewater from St. Bernard Parish, Plaquemines Parish could actually be used along those same lines.

AUDIENCE MEMBER:

It's Orleans Parish that the water is going to come from to St. Bernard.

MR. HUNTER:

Thank you. There was also discussions that we should certainly consider economic impacts and potential economic opportunities that may be created in this process, but certainly a

consideration of the oyster harvest areas within the study area. Another issue was we should focus on stabilizing certain areas first. That may be an area where we should really concentrate our efforts. Initially stabilize the situation and then focus on critical areas that provide the most risk reduction. Beneficial use of dredge material was discussed numerous times. One option was to look at beneficial dredge material from the Mississippi River and Southwest Pass. There was also a very interesting theory that was brought out that may be worth investigating was the fact that currently the rock jetties that extend well into the Breton Sound and Mississippi Sound area may be blocking nutrient from the Mississippi River that migrate northward and

they cannot penetrate that specific rock jetty and in turn negatively impacting the Barrier Islands and Biloxi marsh area. Let's see. Barrier Island restoration was certainly discussed numerous times. Restoration of the Bayou La Loutre was brought up as a potential, very beneficial project. Another discussion was relevant to a multiple closure structures on the MRGO with the intent being right now it just basically stops navigation but from approximately, I guess, mile 37 back toward the east, additional structures to reduce saltwater intrusion in the Biloxi marsh area may be beneficial. And, let's see, the last one is discussions relevant to saltwater intrusion were also prevalent throughout our discussion.

And with that, I think that

summarizes ideas and thoughts and strategies that came out of the facilitated breakout sessions. And I will just have a couple of items that I wanted to bring up to close here tonight. No. 1, there are numerous ways to provide comments if you haven't been able to comment to date. There is a comment card in your packet that you can drop off up front or you can fill out a later time and mail it. Within the brochure there are addresses for e-mails, there's a website address, there's sites to mail things in both to regular mail and overnight mail, so please take the opportunity to provide comments if you can. We also have an evaluation form in your packet. We would certainly appreciate if you would take the time to fill out the evaluation form. The intent of the

evaluation form is to discuss the effectiveness of our meeting format here tonight and help us provide better, more effective meetings in the future.

And with that I'm going to go ahead and turn it over to the project manager, Greg, at this point for a few closing comments.

MR. MILLER:

I do appreciate everyone coming this evening. I popped into two groups and I heard more than two new ideas. Junior is sitting back here saying he has got the complete plan but I heard some things that I haven't heard before tonight and that's exactly why we came here today and it's exactly why we keep coming back until we have our plan put together. I want to encourage folks if there are any folders left, take them home and give them to your neighbor or give it

to somebody you think might be interested, and if there is anything that you see here tonight that you would like a copy of, it's available on the internet. Google MRGO, the Corps of Engineers and this information comes up. It's a valuable set of interactive information that we provide on the web. It's a lesson that we learn from our efforts with the closure structure, the development of the plan for the closure structure and it's something that we'll continue to do.

Once again, I do appreciate everyone coming. We look forward to continuing to collaborate with you on the development of the plan, and members of the team will be available afterwards if there is anything else that you would like to add. Thank you very much and goodnight.

(Whereupon the meeting has been concluded at 8:44 p.m.)

REPORTER'S CERTIFICATE

I, RACHEL Y. TORRES, a Certified Court Reporter, do hereby certify that the within witness, after having been first duly sworn to testify to the truth, did testify as hereinabove set forth.

That the testimony was reported by me in shorthand and transcribed under my personal direction and supervision, and is a true and correct transcript, to the best of my ability and understanding; that I am not of counsel, not related to counsel or the parties hereto, and in no way interested in the outcome of this event.

RACHEL Y. TORRES, CCR, RPR

CERTIFIED COURT REPORTER

US Army Corps of Engineers
New Orleans District

EVALUATION FORM

Scoping Meeting Evaluation Form

Goals and Objectives

Indicate agreement with the following statements based on a 5 scale selection of – strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, strongly disagree.

Statement	Strongly Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat Disagree	Strongly Disagree	Not Applicable
As a result of this meeting, I have a better understanding of the process the Corps is using to prepare the MRGO Ecosystem Restoration Plan Feasibility Study.	☐	☒	☒	☐	☐	☐
The handouts provided at this meeting helped me better understand the process the Corps is using to prepare the MRGO Ecosystem Restoration Study	☐	☐	☒	☐	☐	☐
As a result of this meeting, I am more likely to support the MRGO Ecosystem Restoration Plan Feasibility Study process.	☐	☐	☒	☐	☐	☐
The community plays an important role in helping the Corps meet its goals for ecosystem restoration along coastal Louisiana.	☐	☒	☐	☐	☐	☐
Restoring the MRGO ecosystem is a local, state, and national priority.	☐	☒	☐	☐	☐	☐
Minimizing the risk and protecting Louisiana's citizens, and natural and economic resources from hurricanes and other natural disasters is the number one priority of the Corps.	☐	☒	☐	☐	☐	☐

U.S. ARMY CORPS OF ENGINEERS

Meeting Logistics

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The location of the meeting was convenient for me.	☐	☒	☐	☐	☐	☐
The time of the meeting was convenient for me.	☐	☐	☒	☐	☐	☐
The information presented was easy to understand.	☐	☒	☐	☐	☐	☐
I preferred this meeting's format to others I've attended	☐	☒	☐	☐	☐	☐

Additional Meeting Suggestions:

From Michael & Alice Williams
6521 4TH ST, Violet, LA. 70092

If you would like to assist us in our ongoing efforts to keep you informed, you can be added to our mailing list. *(Optional)*

Name:		
Organization:		
Address:		
City:	State:	Zip:
Email:		



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Additional Meeting Suggestions:

If you would like to assist us in our ongoing efforts to keep you informed, you can be added to our mailing list. *(Optional)*

Name: GLENN R OUSSET		
Organization:		
Address: 2012 E BEAUREGARD ST		
City: CHALMETTE	State: LA	Zip: 70043
Email: gousset@bellsouth.net		

US Army Corps of Engineers
New Orleans District

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Additional Meeting Suggestions:

More building on existing plans

Focus group discussion 1/2 of time on specific issues

2 breakout sessions – 1 random & 1 participant-chosen interest areas

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I preferred this meeting's format to others I've attended	☐	☐	☒	☐	☐	☒

Additional Meeting Suggestions:

If you would like to assist us in our ongoing efforts to keep you informed, you can be added to our mailing list. *(Optional)*

Name: Jessica Janneck		
Organization:		
Address: 45 Thornton Dr		
City: Chalmette	State: LA	Zip: 70043
Email:		

US Army Corps of Engineers
New Orleans District

EVALUATION FORM

Scoping Meeting Evaluation Form

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U.S. ARMY CORPS OF ENGINEERS

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Name: Chuck Commiskey		
Organization: Titan Dumbarton Lascouses		
Address:		
City:	State:	Zip:
Email: CCOMMISKEY@TITANAMERICA.COM		

US Army Corps of Engineers
New Orleans District

EVALUATION FORM

Scoping Meeting Evaluation Form

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Organization:		
Address:		
City:	State:	Zip:
Email:		

US Army Corps of Engineers
New Orleans District

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U.S. ARMY CORPS OF ENGINEERS

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Name: Danny Bourgeois		
Organization: St Bernard Economic Dev Fnd		
Address:		
City:	State:	Zip:
Email: DBourgeois10@yahoo.com.		



Scoping Meeting Evaluation Form

Goals and Objectives

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Name: BEAU C. WEBER		
Organization: Land Owner		
Address: 4429 YOUNG ST.		
City: METAIRIE	State: LA.	Zip: 70006
Email:		

US Army Corps of Engineers
New Orleans District

EVALUATION FORM

Scoping Meeting Evaluation Form

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U.S. ARMY CORPS OF ENGINEERS

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Additional Meeting Suggestions:

The meeting was run very well and the idea to breakdown into smaller discussion groups was great. It was nice to hear first-hand how the residents of the area felt. It seems like the overall focus of all groups was to stabilize the area, bring in more sediments to build the area back up and promote new business in the area.

If you would like to assist us in our ongoing efforts to keep you informed, you can be added to our mailing list. *(Optional)*

Name: Nancy Woodlock

Organization: Jefferson Parish Environmental Affairs

Address: 4901 Jefferson Highway

City: Jefferson State: LA Zip: 70121

Email: nwoodlock@jeffparish.net

US Army Corps of Engineers
New Orleans District

EVALUATION FORM

Scoping Meeting Evaluation Form

Goals and Objectives

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U.S. ARMY CORPS OF ENGINEERS

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Additional Meeting Suggestions:

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Name: Mark Schexnayder		
Organization: LSU Ag Ctr		
Address: [illegible]		
City: [illegible]	State: [illegible]	Zip: [illegible]
Email: [illegible]		

TIME IS OF THE ESSENCE!

US Army Corps of Engineers
New Orleans District

EVALUATION FORM

Scoping Meeting Evaluation Form

IMPLEMENTATION!!!

Goals and Objectives

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NO MORE STUDIES!!!

U.S. ARMY CORPS OF ENGINEERS

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Additional Meeting Suggestions:

NO MORE STUDIES!
IMPLEMENTATION
NOW!

ALREADY ON MAILING LIST BUT PLEASE VERIFY SINCE I HAVEN'T

If you would like to assist us in our ongoing efforts to keep you informed, you can be added to our mailing list. *(Optional)*

Name: KATHY MUSE		
Organization: HCNA/CSED		
Address: P O BOX 3417		
City: NO	State: LA	Zip: 70177
Email: kcqmuse@yahoo.com		

RECEIVED 10/16 NOTIFICATIONS

US Army Corps of Engineers
New Orleans District

EVALUATION FORM

Scoping Meeting Evaluation Form

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U.S. ARMY CORPS OF ENGINEERS

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Additional Meeting Suggestions:

I apologize for being all over the place on this evaluation, but I believe we should be taking the plans that already exists, prioritizing our steps and putting the plan into action.

If you would like to assist us in our ongoing efforts to keep you informed, you can be added to our mailing list. *(Optional)*

Name: Mike Benge		
Organization: Delacroix Corporation		
Address: 206 Decatur Street		
City: New Orleans	State: LA	Zip: 70130
Email: RMBenge34@aol.com		

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study
Public Scoping Meetings Request for Comment 30

Comments We need to take the plans that already exist and move forward.

Mike Benge
Name [redacted]
Street [redacted]
City, State, Zip

Delacroix Corporation
Affiliation [redacted]
Phone [redacted]
E-mail

I attended the meeting in: ☒ LA ☐ MS

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study
Public Scoping Meetings Request for Comment 32

Comments Excellent Forum — Corps encouraged and invited input.

Name Tony Bourgeois
Street [redacted]
City, State, Zip [redacted]

St. Bernard Eco Dev.
Affiliation [redacted]
E-mail [redacted]

I attended the meeting in: ☒ LA ☐ MS

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study
Public Scoping Meetings Request for Comment 38

Comments

BEAU C. WEBBER
Name [redacted]
Street [redacted]
City, State, Zip

Affiliation [redacted]
Phone
E-mail

I attended the meeting in: ☒ LA ☐ MS

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study
Public Scoping Meetings Request for Comment

Comments More Diversions from River into Marshes of St. Bernard + PLQ.

Jim Wasik — CZM

[redacted] — Affiliation [redacted]

Street [redacted] — Phone

City, State, Zip — E-mail

I attended the meeting in: ☑ LA ☐ MS

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study
Public Scoping Meetings Request for Comment

Comments The Group Leader's seemed genuine but will the meeting Really Help

Name — Affiliation

Street — Phone

City, State, Zip — E-mail

I attended the meeting in: ☒ LA ☐ MS

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study
Public Scoping Meetings Request for Comment

Comments Glad you're here. Please help us to exist, that's all we ask.

Name — Affiliation

Street — Phone

City, State, Zip — E-mail

I attended the meeting in: ☐ LA ☐ MS

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study 4
Public Scoping Meetings Request for Comment

Comments We have NO Levee after Verret – Any New Canals be built? Also – water flows channel wide fix-up or NO Water Traffic – Save our Marsh. Save our Chandeleur Islands. 1st step close the Channel MRGO – Great –

Name Cecile Robin
Affiliation [redacted]
Street [redacted]
Phone [redacted]
City, State, Zip
E-mail

I attended the meeting in: ☒ LA ☐ MS

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study
Public Scoping Meetings Request for Comment 21

Comments Residents (adults & students) do not want/need to wait 3 years for coastal restoration to begin. There are many community organizations & activists who are anxious to "begin." Will "pilot" projects be available for us to participate in along the way? Not feel good but REAL good projects!

Name Polly Boudreaux
Affiliation Lexington Place Civic Assoc.
Street [redacted]
Phone [redacted]
City, State, Zip [redacted]
E-mail [redacted]

I attended the meeting in: ☒ LA ☐ MS

Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study
Public Scoping Meetings Request for Comment 7

Comments A STEP in The Righ WAY
NEED Reg. meeting

Name FRANK DiBETTA SR
Affiliation TO SAVE LA. COAST
Mailing [redacted]
Phone [redacted]
E-mail [redacted]

I attended the meeting in: ☒ LA ☐ MS

Individual e-mails

From: Sunshine Bond [redacted]
Sent: Friday, November 07, 2008 6:11 PM
To: Stiles, Sandra E MVN
Subject: Comments on MRGO Ecosystem Restoration Feasibility Study

Sandra Stiles,
U.S. Army Corps of Engineers

Dear Ms. Stiles:

Thank you for the opportunity to comment on the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Feasibility Study. How much longer do we have to wait? How much longer will we wade through the muck of bureaucracy to get this task accomplished?

Please stay focused and do your work. We need MRGO closed yesterday!

Thank you!
Sunshine Bond
[redacted]

From "Cecile Jenevein" [redacted]
Sent: Sun, 9 Nov 2008 09:56:41 0600
To: "Stiles, Sandra E MVN" <Sandra.E.Stiles@usace.army.mil>
Subject: Comments on MRGO Ecosystem Restoration Feasibility Study

Sandra Stiles,
U.S. Army Corps of Engineers

Dear Ms. Stiles:

Thank you for the opportunity to comment on the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Feasibility Study. The construction and operation of the MRGO destroyed more than 27,000 acres of wetlands that used to help protect the people of St. Bernard Parish and the New Orleans Metropolitan Area from storm surge and waves.

We need to focus on the wetlands- places like Grand Isle and the barrier islands that help protect southern Lousiana as far up as NOLA east and St. Bernard Parish. Then the MRGO needs to be closed to also not only help St. Bernard and NOLA east, but New Orleans in general.

You would think that NOLA would see the light and join us in this endeavor since we protect them just like the barrier island, Grand Isle and other wetland areas protect St. Bernard Parish. Without us, where will they be?

Cecile Jenevein
[redacted]

From "Cambre Eagan" [redacted]
Sent: Sun, 9 Nov 2008 20:08:37 -0600 ---
To: "Stiles, Sandra E MVN" <Sandra.E.Stiles@usace.army.mil>
Subject: Comments on MRGO Ecosystem Restoration Feasibility Study

Sandra Stiles,
U.S. Army Corps of Engineers

Dear Ms. Stiles:

Thank you for hearing the concerns of our community.

The people of Southwest Louisiana have been urging the federal government and the Army Corps of Engineers to review the MRGO for years, and with ever increasing urgency since its contribution to the destruction during hurricane Katrina. It has been three years since those horrible days in August '05 and I am writing to tell you WE CAN'T WAIT ANOTHER TWO.

I am tired of the Corps's failing to meet deadlines, disregarding the safety of my community, and dismissing their accountability in restoring the ecosystem they helped destroy.

Please stand up with us, and demand they put the safety of our families first. Help us fix this, we can't afford to wait another two years for a plan. We need a solution NOW.

Cambre Eagan
[redacted]

From: Robert Link [redacted]
Sent: Thursday, November 13, 2008 6:37 PM
To: Stiles, Sandra E MVN
Subject: MRGO

Sandra Stiles,
U.S. Army Corps of Engineers
P.O. Box 60267
New Orleans,LA 70160-0267

Dear Ms. Stiles,

After Hurricane Betsy in 1965, when a barge in the Industrial Canal plunged through a levee and flooded 1/3rd of the City with water that had been pushed up through the newly built Mississippi River Gulf
Outlet, I thought, even though I was only 15, why don't they close this channel? It's just been the cause of flooding tens of thousands of homes. Nothing was done.

After Katrina, when the exact same thing happened 40 years later and additional waters from Ponchartrain flooded the City through our outfall canals, I thought "good, they'll finally close the MRGO."
Then I hear on TV that MRGO will definitely be closed (heard this several times as a matter of fact.)
Now I hear there will be a draft plan to rebuild the wetlands published in 2 years. Back to the old ways and the old days. You guys don't get it – we can't wait. We can't afford to follow the rules. Maybe you are not in a hurry but we are!

Rebuilding the wetlands is a very complex process - closing MRGO is not. It must be done immediately - we are not going to wait. I have heard revisionist opinion that the MRGO did not contribute to the flooding. Utter nonsense to anyone who lives here - I watched the land around MRGO disappear during my lifetime because of MRGO - THE ENTIRE CITY WANTS THIS THING CLOSED - AND IF THERE ARE ANY SPECIAL INTERESTS THAT DO NOT, THEN THEY CAN PERSONALLY REBUILD MY HOME NEXT TIME.

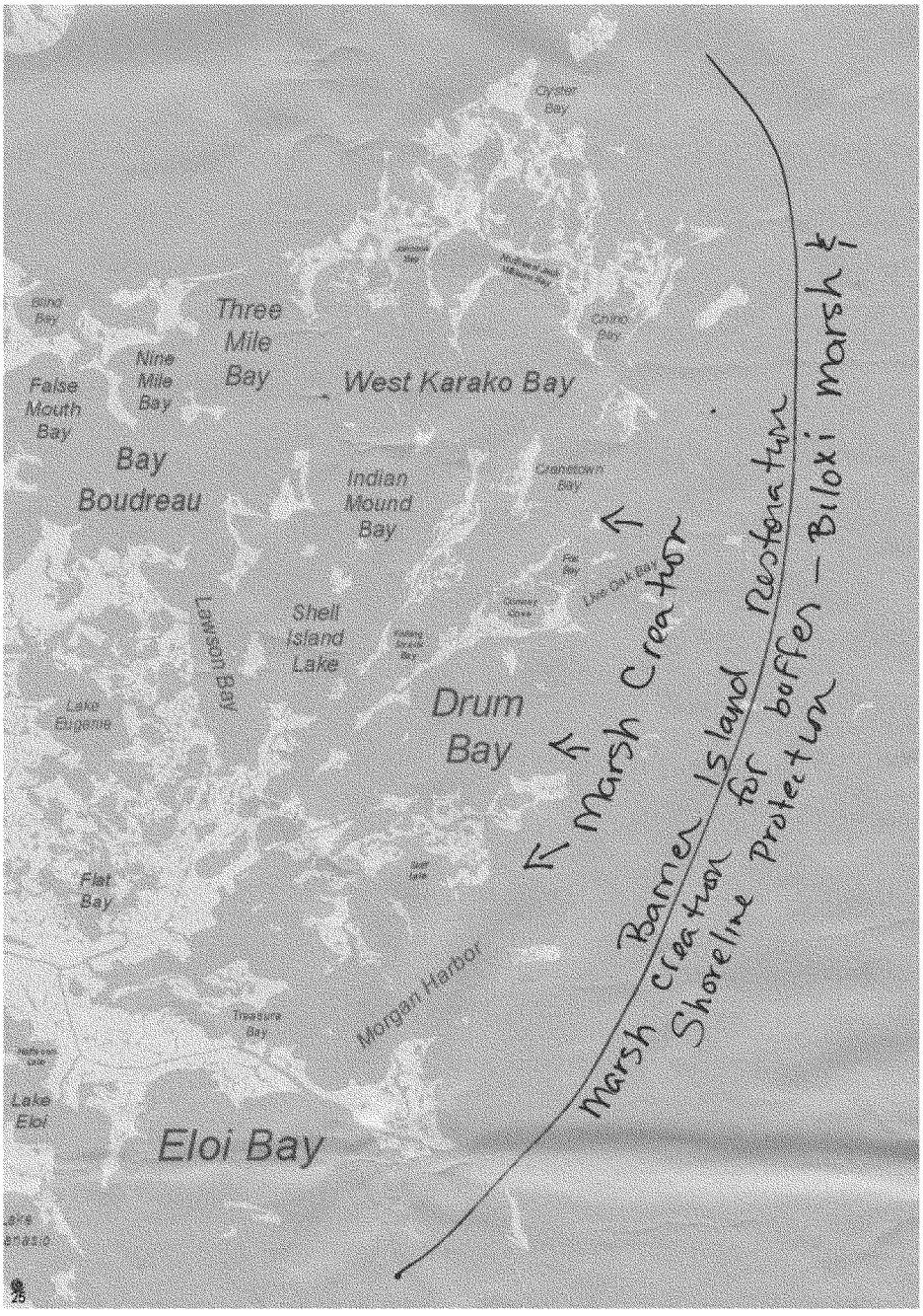
PLEASE STOP STALLING - the next thing you will see is 10,000 people on the banks of that damned waterway with shovels.

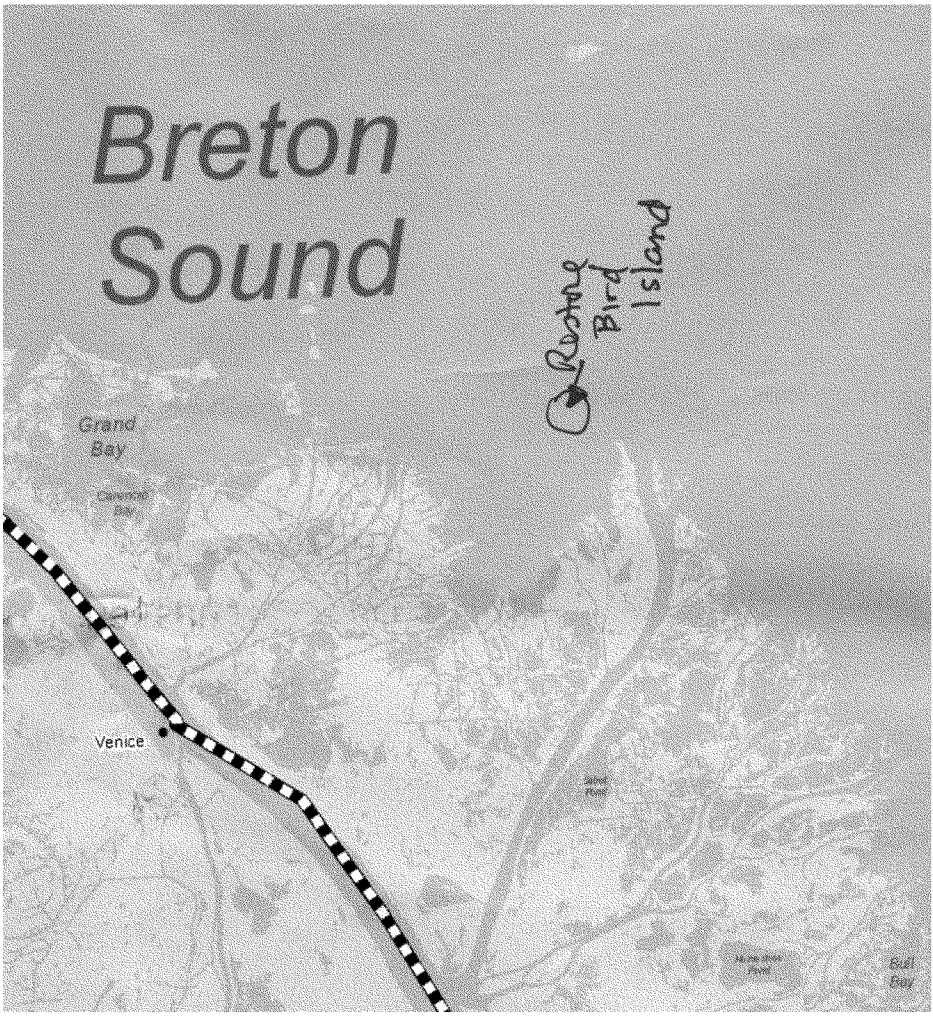
Sincerely,
Robert B. Link MD
[redacted]

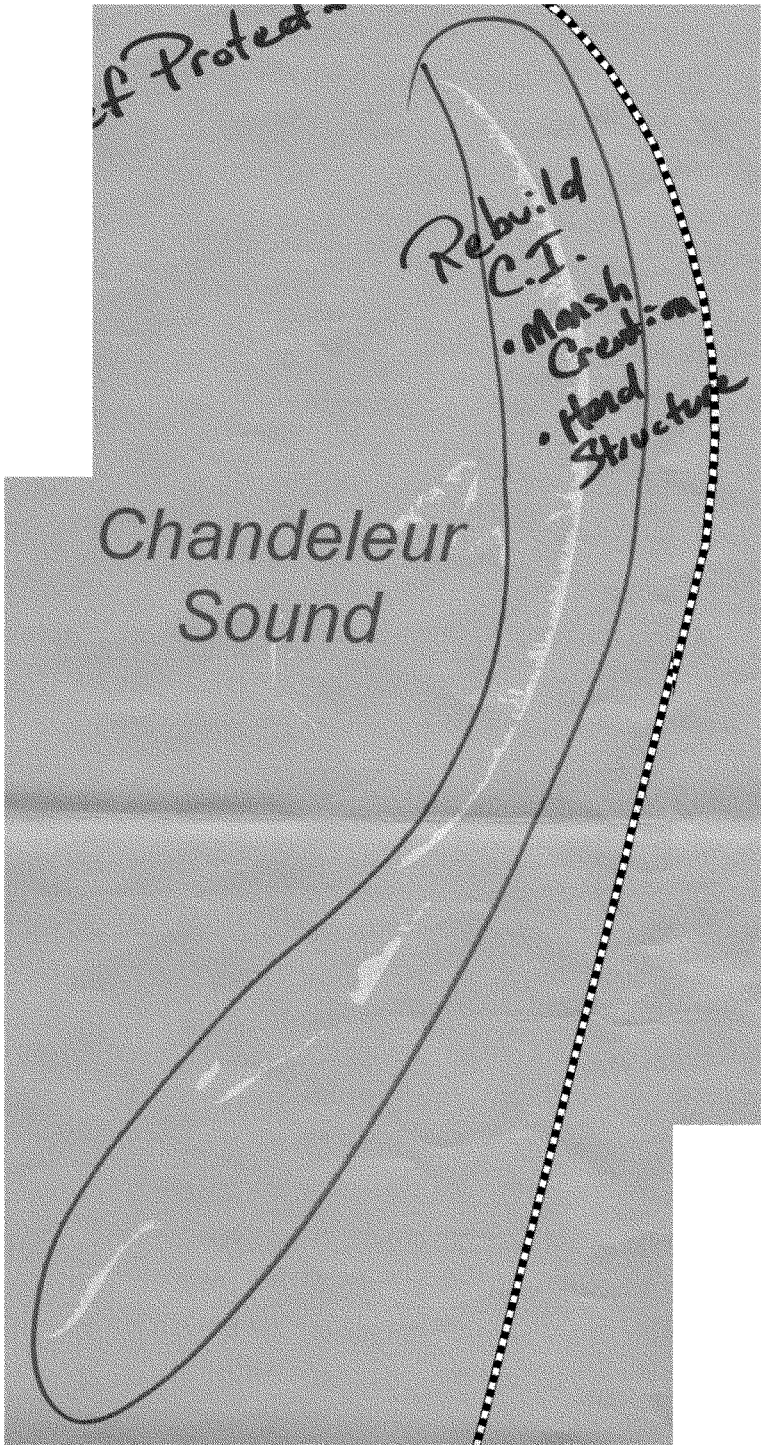
Handwritten Comments on Maps

andeleur
Sound
(Deposit dredge material
on Chandeleur Islands)

Lake
Borgne
Gulf Intracoastal
Chef Pass
Mississippi River Gulf Outlet
Arabi
Chalmette
Meraux
Violet
Poydras
Verret
Shell Beach
Ysclosky
Hopedale
Reggio
Caernarvon
Saint Bernard
Caernarvon Diversion
Big Mar
Lake Lery
Scarsdale
Belle Chasse
Stella
Dalcour
MRGO Closure
Shoreline Protection
Ridge Restoration
Barrier Island Restoration
Central Wetlands
Freshwater Diversion
55
60
50
45
40
35


Oyster Bay
Three Mile Bay
Nine Mile Bay
False Mouth Bay
West Karako Bay
Bay Boudreau
Indian Mound Bay
Shell Island Lake
Lawson Bay
Drum Bay
Lake Eupenia
Flat Bay
Morgan Harbor
Treasure Bay
Lake Eloi
Eloi Bay
Marsh creation for buffer – Biloxi marsh
Shoreline Protection
Barrier Island restoration
Marsh Creation


Breton
Sound
Raccoon
Bird
Island
Grand
Bay
Venice
Bull
Bay


Rebuild
C.I.
• Marsh
Creation
• Hard
Structure
Chandeleur
Sound

Oyster Reef Trail 2m
Chandeleur Sound
Isle d'Arbeaux
Lake Borgne
Pipeline Sediment
Mississippi
Multiple pipeline closures
Gulf Intracoastal Waterway
Sediment Pipelines
Red Ambrosia
Pipeline Sediment
Pipeline Sediment
Pipeline Sediment

Poydras
Caernarvon
Saint Bernard
Toca
Verret
Caernarvon Diversion
Big Mar
Reggio
Lake Lery
Delacroix Island

Form Email Signers

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
	Zentura	[redacted]		[redacted]	[redacted]	[redacted]
Accorsi	Suzanne	[redacted]		[redacted]	[redacted]	[redacted]
Acuff	Carolyn	[redacted]		[redacted]		[redacted]
Adams	Edward	[redacted]		[redacted]		[redacted]
Adams	Marguerite	[redacted]		[redacted]		[redacted]
Affonso	Jane	[redacted]		[redacted]		[redacted]
Albares	Nicholas	[redacted]		[redacted]		[redacted]
Aldrich-Wolfe	Laura	[redacted]		[redacted]		[redacted]
Alexander	Jonathan	[redacted]		[redacted]		[redacted]
Alfonso	Dianne	[redacted]		[redacted]		[redacted]
Alldrin	Lynn	[redacted]		[redacted]		[redacted]
Allen	Lerah	[redacted]		[redacted]		[redacted]
Alsup	Allison	[redacted]		[redacted]		[redacted]
Andersen	Wendy	[redacted]	[redacted]	[redacted]		[redacted]
Anderson	John H.	[redacted]		[redacted]		[redacted]
Anderson	Suzanne	[redacted]	[redacted]	[redacted]		[redacted]
Anderson	John	[redacted]		[redacted]		[redacted]
Andersson	Andrea	[redacted]		[redacted]		[redacted]
Apfel	Sarah	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Arceneaux	Louis	[redacted]		[redacted]		[redacted]
Arnold	Mike	[redacted]		[redacted]	[redacted]	[redacted]
Arruda	Jennifer	[redacted]		[redacted]		[redacted]
Arsenaux	Bradley	[redacted]		[redacted]		[redacted]
Asher	Harold	[redacted]	[redacted]	[redacted]		[redacted]
Asteinza	Maria	[redacted]		[redacted]		[redacted]
Ausman	Candi	[redacted]		[redacted]	[redacted]	[redacted]
Ayers	Melissa	[redacted]		[redacted]		[redacted]
Babb	Tricia A.	[redacted]		[redacted]		[redacted]
Babin	Mike	[redacted]		[redacted]		[redacted]
Bafik-Vehslage	Michelle	[redacted]		[redacted]		[redacted]
Bain	Patrick	[redacted]	[redacted]	[redacted]		[redacted]
Baker	Alice	[redacted]		[redacted]		[redacted]
Baker	Paula	[redacted]		[redacted]		[redacted]
Ball	Eldon	[redacted]		[redacted]		[redacted]
Barahona	Mandy	[redacted]		[redacted]		[redacted]
Barfield	Ellen E.	[redacted]		[redacted]		[redacted]
Barker	Claudia	[redacted]		[redacted]		[redacted]
Barrois	William	[redacted]		[redacted]		[redacted]
Beatty	Lorne	[redacted]		[redacted]	[redacted]	[redacted]
Beaullieu	Babette	[redacted]		[redacted]		[redacted]
Beckman	Barbara	[redacted]		[redacted]	[redacted]	[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Beechler	Victoria	[redacted]	[redacted]	[redacted]		[redacted]
Bell	David	[redacted]		[redacted]		[redacted]
Bell	Marco	[redacted]		[redacted]		[redacted]
Bergen	Linsey	[redacted]		[redacted]		[redacted]
Bernard	Joseph	[redacted]		[redacted]		[redacted]
Bernard	Merry	[redacted]		[redacted]		[redacted]
Bernstein	Scott	[redacted]	[redacted]	[redacted]		[redacted]
Berrigan	Brian	[redacted]		[redacted]		[redacted]
Bevier	Robert	[redacted]		[redacted]		[redacted]
Bienvenu	June	[redacted]		[redacted]		[redacted]
Bierhuizen	Rudy	[redacted]		[redacted]		[redacted]
Billeaud	Theresa	[redacted]		[redacted]		[redacted]
Bird	Michelle	[redacted]		[redacted]		[redacted]
Black	Michael	[redacted]		[redacted]	[redacted]	[redacted]
Blakely	Charity	[redacted]		[redacted]		[redacted]
Bloodworth	Patrick	[redacted]		[redacted]		[redacted]
Blow	George	[redacted]		[redacted]		[redacted]
Boehm	Melanie	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Boekbinder	Leo	[redacted]		[redacted]	[redacted]	[redacted]
Bonds	Dale	[redacted]		[redacted]	[redacted]	[redacted]
Boniol	Karen	[redacted]		[redacted]		[redacted]
Bordelon	Rhonda	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Borges	Alex	[redacted]		[redacted]		[redacted]
Borgono	Deboreah	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Boudreaux	Ken	[redacted]		[redacted]		[redacted]
Boudreaux	Linda	[redacted]		[redacted]		[redacted]
Boudreaux	Lindsay	[redacted]	[redacted]	[redacted]		[redacted]
Bourgeois	Nolan	[redacted]		[redacted]		[redacted]
BourQuard	Connie	[redacted]	[redacted]			[redacted]
Bradburn	Donald	[redacted]		[redacted]	[redacted]	[redacted]
Brainard	Ann	[redacted]		[redacted]		[redacted]
Brandao	Edward	[redacted]		[redacted]		[redacted]
Brandon	Diane	[redacted]		[redacted]		[redacted]
Braren	David	[redacted]		[redacted]	[redacted]	[redacted]
Breaud	Margaret	[redacted]		[redacted]		[redacted]
Breen	Mary Ann	[redacted]		[redacted]	[redacted]	[redacted]
Brien	Claire	[redacted]		[redacted]		[redacted]
Brimm	Martha	[redacted]		[redacted]		[redacted]
Brogan	Sunny	[redacted]		[redacted]		[redacted]
Brooker	Eric	[redacted]		[redacted]		[redacted]
Brooks	Pamela	[redacted]		[redacted]		[redacted]
Broome	Julia	[redacted]		[redacted]		[redacted]
Broussard	Trudie	[redacted]		[redacted]		[redacted]
Brown	Renate	[redacted]		[redacted]	[redacted]	[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Brown	Melissa	[redacted]		[redacted]		[redacted]
Bryant	Georgia and Alton	[redacted]		[redacted]		[redacted]
Buch	Anthony	[redacted]		[redacted]		[redacted]
Buckley	Joseph	[redacted]		[redacted]		[redacted]
Burch-Celentano	Paula	[redacted]		[redacted]		[redacted]
Burke	Laurie	[redacted]		[redacted]		[redacted]
Burtchaell	Sandra	[redacted]		[redacted]		[redacted]
Buschmann	Janet	[redacted]		[redacted]		[redacted]
Byrd	Carole	[redacted]		[redacted]		[redacted]
Caire	Donna	[redacted]		[redacted]		[redacted]
Cameron	Tracy	[redacted]		[redacted]		[redacted]
Campbell	Liz	[redacted]		[redacted]		[redacted]
Canalizo	Jane	[redacted]		[redacted]		[redacted]
Cappel	Diane	[redacted]		[redacted]		[redacted]
Carbajal	Abby	[redacted]		[redacted]		[redacted]
Carbajal	Mario	[redacted]		[redacted]		[redacted]
Carll	Christine	[redacted]		[redacted]	[redacted]	[redacted]
Caronna	Salvador	[redacted]		[redacted]		[redacted]
Carpenter	Joseph	[redacted]	[redacted]	[redacted]		[redacted]
Carroll	Linda	[redacted]		[redacted]		[redacted]
Carter	Veronica	[redacted]		[redacted]		[redacted]
Cary	Debbie	[redacted]		[redacted]	[redacted]	[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Cassels	Jean	[redacted]		[redacted]		[redacted]t
Cassidy	Karen	[redacted]		[redacted]		[redacted]
Cassreino	Ellen	[redacted]		[redacted]		[redacted]
Castillo	Claudia	[redacted]		[redacted]		[redacted]
Caudill	Claire	[redacted]		[redacted]		[redacted]
Chachere	Richard	[redacted]		[redacted]	[redacted]	[redacted]
Chang	Emery	[redacted]		[redacted]		[redacted]
Charlot	Velma	[redacted]		[redacted]		[redacted]
Chiappetta	Michelle	[redacted]		[redacted]		[redacted]
Childress	Richard	[redacted]		[redacted]		[redacted]
Christian	Steven	[redacted]		[redacted]		[redacted]
Christoif	Linda	[redacted]		[redacted]		[redacted]
Chubb	Eden	[redacted]	[redacted]	[redacted]		[redacted]
Clark	Regina	[redacted]		[redacted]		[redacted]
Clatworthy, Ph.D.	J. Sanders	[redacted]		[redacted]		[redacted]
Clayton	Maggie	[redacted]		[redacted]		[redacted]
Cobb	John	[redacted]		[redacted]	[redacted]	[redacted]
Cohen	Brian and Rita	[redacted]		[redacted]	[redacted]	[redacted]
Cohen	Claire	[redacted]		[redacted]		[redacted]
Cohen	Howard	[redacted]		[redacted]		[redacted]
Cohen	Jean	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Cohn	Michael	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Collins	Sherwood	[redacted]		[redacted]	[redacted]	[redacted]
Comeaux	Charlie	[redacted]		[redacted]		[redacted]
Conn	Craig	[redacted]		[redacted]		[redacted]
Connelly	Leon	[redacted]		[redacted]		[redacted]
Connor	Thomas	[redacted]		[redacted]	[redacted]	[redacted]
Constant	Pat	[redacted]		[redacted]		[redacted]
Corbridge	Charlotte	[redacted]		[redacted]		[redacted]
Cornett	Andy	[redacted]		[redacted]		[redacted]
Cosgriff	Mark	[redacted]		[redacted]		[redacted]
Cosgrove	Renita	[redacted]		[redacted]		[redacted]
Cousins	Donna	[redacted]		[redacted]	[redacted]	[redacted]
Cox	Darren	[redacted]		[redacted]		[redacted]
Crawford	Marie	[redacted]		[redacted]		[redacted]
Creed	Marisa	[redacted]		[redacted]	[redacted]	[redacted]
Cripps	Cindy	[redacted]		[redacted]		[redacted]
Crowe	Ashley	[redacted]		[redacted]		[redacted]
Cullen	Theodora	[redacted]		[redacted]		[redacted]
Cutts	Matt	[redacted]		[redacted]	[redacted]	[redacted]
Dahlquist	Carrie	[redacted]	[redacted]	[redacted]		[redacted]
Daluz	Ze	[redacted]		[redacted]	[redacted]	[redacted]
Daly	Adrienne	[redacted]		[redacted]		[redacted]
Dampeer	Milly	[redacted]		[redacted]	[redacted]	[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Daniels	J Scott	[redacted]		[redacted]	[redacted]	[redacted]
Dantonio	Lisa	[redacted]		[redacted]	[redacted]	[redacted]
Daschbach	Hugh	[redacted]		[redacted]		[redacted]
Dauterive	Margaret	[redacted]		[redacted]		[redacted]
Davis	Frances	[redacted]		[redacted]		[redacted]
DeFilippi	Joseph	[redacted]		[redacted]		[redacted]
Del Vecchio	Matt	[redacted]		[redacted]	[redacted]	[redacted]
DeNetz	Jennifer	[redacted]		[redacted]		[redacted]
Denison	James	[redacted]		[redacted]		[redacted]
Deroche	Russel	[redacted]		[redacted]		[redacted]
Desai	D P	[redacted]		[redacted]		[redacted]
Detraz	Berry	[redacted]		[redacted]		[redacted]
Dietze	Clemens	[redacted]		[redacted]		[redacted]
Dike	Cynthia	[redacted]		[redacted]		[redacted]
Dishman	Patricia	[redacted]		[redacted]	[redacted]	[redacted]
Dixon	Virginia	[redacted]		[redacted]		[redacted]
Dolney	Rachel	[redacted]		[redacted]	[redacted]	[redacted]
Donnelly	Stephen	[redacted]		[redacted]		[redacted]
Donovan	Stephan	[redacted]		[redacted]		[redacted]
Dorn	Valerie	[redacted]		[redacted]	[redacted]	[redacted]
Dorroh	Diana	[redacted]		[redacted]		[redacted]
Dorsey	Nicole	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Doucet	Lisha	[redacted]		[redacted]		[redacted]
Dowd	Kerry	[redacted]		[redacted]		[redacted]
Dubinsky	Jeffrey	[redacted]		[redacted]	[redacted]	[redacted]
Duda	Tim	[redacted]		[redacted]		[redacted]
Duffey	Michael	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dulas	Scott	[redacted]		[redacted]		[redacted]
Dunn	Diana	[redacted]		[redacted]		[redacted]
Dunn	Holly	[redacted]	[redacted]	[redacted]		[redacted]
Durham	Keith	[redacted]		[redacted]	[redacted]	[redacted]
Duvic	Tammy	[redacted]		[redacted]		[redacted]
Dwyer	Timothy & Jan	[redacted]		[redacted]		[redacted]
Dykema	Jane	[redacted]		[redacted]		[redacted]
Eades	Debra	[redacted]		[redacted]		[redacted]
Eames	Jen	[redacted]		[redacted]		[redacted]
Eastman	Kathy	[redacted]		[redacted]		[redacted]
Easton	Cheryl	[redacted]		[redacted]		[redacted]
Eaton	Leila	[redacted]		[redacted]		[redacted]
Edwards	Victoria	[redacted]		[redacted]		[redacted]
Ell	Christopher	[redacted]		[redacted]	[redacted]	[redacted]
Ely	Ernest	[redacted]		[redacted]		[redacted]
Esteve	Gregory	[redacted]		[redacted]	[redacted]	[redacted]
Etheredge	Yarrow	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Evans	Corbin	[redacted]	[redacted]	[redacted]		[redacted]
Fabian	Lisette	[redacted]		[redacted]	[redacted]	[redacted]
Farrin	John	[redacted]		[redacted]		[redacted]
Faucheaux	Gwen	[redacted]		[redacted]		[redacted]
Fazzio	Gail	[redacted]		[redacted]		[redacted]
Felton	George	[redacted]		[redacted]		[redacted]
Femat	Deborah	[redacted]		[redacted]		[redacted]
Ferger	David	[redacted]		[redacted]		[redacted]
Ferguson	Joanne	[redacted]		[redacted]		[redacted]
Ferguson	William	[redacted]		[redacted]		[redacted]
Ferguson III	Henry J.	[redacted]		[redacted]		[redacted]
Fillion	Doreen	[redacted]		[redacted]		[redacted]
Fink	Jane	[redacted]		[redacted]		[redacted]
Finley	Mary Lou	[redacted]		[redacted]	[redacted]	[redacted]
Fitterer	Lyn	[redacted]		[redacted]		[redacted]
Fitzpatrick	Pat	[redacted]		[redacted]		[redacted]
Fletcher	Carol	[redacted]		[redacted]		[redacted]
Floyd	Philip and Jennifer	[redacted]		[redacted]		[redacted]
Foley	Angela	[redacted]		[redacted]		[redacted]
Fontenot	Michelle	[redacted]		[redacted]		[redacted]
Frank	Darryl	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Frank	Harriette	[redacted]		[redacted]	[redacted]	[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Frank	Lee	[redacted]		[redacted]		[redacted]
Frederick	Nicholas	[redacted]		[redacted]	[redacted]	[redacted]
Freiberg	Harry			[redacted]		[redacted]
Friedman	Neil	[redacted]		[redacted]		[redacted]
Frost	Vivienne	[redacted]		[redacted]		[redacted]
Gabor	Beth	[redacted]		[redacted]		[redacted]
Gallassero	Bruce	[redacted]		[redacted]		[redacted]
Gardner	Rachael	[redacted]		[redacted]		[redacted]
Garrott	Anne	[redacted]		[redacted]		[redacted]
Garvey	Lydia	[redacted]		[redacted]		[redacted]
Gassen	Tina	[redacted]		[redacted]		[redacted]
Gaston	Ralph	[redacted]		[redacted]		[redacted]
Gathing	Nancy	[redacted]		[redacted]		[redacted]
Geer	Hayden	[redacted]		[redacted]		[redacted]
Gelderman	Carol	[redacted]		[redacted]		[redacted]
Gerald	David	[redacted]		[redacted]		[redacted]
Gessler	Mary Jo	[redacted]		[redacted]		[redacted]
Gibbons	Brian	[redacted]		[redacted]	[redacted]	[redacted]
Giese	Dale	[redacted]		[redacted]		[redacted]
Giniewicz	Deborah	[redacted]		[redacted]		[redacted]
Giorda	Doris	[redacted]		[redacted]		[redacted]
Giroir	Scott D.	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Giron	Ricardo A.	[redacted]		[redacted]		[redacted]
Gladney	William	[redacted]		[redacted]		[redacted]
Gleeson	Jill	[redacted]		[redacted]	[redacted]	[redacted]
Goeken	Murlin	[redacted]		[redacted]		[redacted]
Goldshlag	Nate	[redacted]		[redacted]		[redacted]
Goldstein	Carol Ann			[redacted]		[redacted]
Gonzales	Lisa	[redacted]		[redacted]		[redacted]
Goode	Kathleen	[redacted]		[redacted]	[redacted]	[redacted]
Gore	Jesse	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Gorman	Bobby	[redacted]		[redacted]	[redacted]	[redacted]
Granatelli	Ann	[redacted]	[redacted]	[redacted]		[redacted]
Grand	Sean	[redacted]		[redacted]		[redacted]
Granen	Anna	[redacted]		[redacted]		[redacted]
Gray	Judith	[redacted]		[redacted]		[redacted]
Grice	Jim	[redacted]		[redacted]	[redacted]6	[redacted]
Grille	Geneva	[redacted]		[redacted]		[redacted]
Grishman	Milton	[redacted]		[redacted]	[redacted]	[redacted]
Grubb	Karen	[redacted]		[redacted]		[redacted]
Guarisco	Jocelyn	[redacted]		[redacted]		[redacted]
Guillot	Onelia	[redacted]		[redacted]		[redacted]
Gundlach	Virginia	[redacted]		[redacted]		[redacted]
Gurry	Daniel	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Hadden	John	[redacted]		[redacted]		[redacted]
Haftings	Cath	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Hahn	Lurana	[redacted]		[redacted]		[redacted]
Halizak	Kimberly Anne	[redacted]		[redacted]		[redacted]
Hall	Shawn	[redacted]		[redacted]		[redacted]
Hamsher	Donna	[redacted]		[redacted]	[redacted]	[redacted]
Hanemann	Donald	[redacted]		[redacted]		[redacted]
Hanson	Art	[redacted]		[redacted]		[redacted]
Hanson	Natalie	[redacted]		[redacted]		[redacted]
Hardin	Patricia W.	[redacted]		[redacted]		[redacted]
Haro	Cary	[redacted]		[redacted]		[redacted]
Haro	Emile	[redacted]		[redacted]		[redacted]
Haro	Noel	[redacted]		[redacted]		[redacted]
Haro, Sr.	Nolan F.	[redacted]		[redacted]		[redacted]
Harpole	Thane	[redacted]		[redacted]		[redacted]
Harrell	Chris	[redacted]		[redacted]		[redacted]
Harris	James	[redacted]		[redacted]		[redacted]
Harris	Merle	[redacted]		[redacted]		[redacted]
Harris	Carol	[redacted]	[redacted]			[redacted]
Harvey	Kim L.	[redacted]		[redacted]		[redacted]
Hasbrouck	Mary Ellen	[redacted]		[redacted]		[redacted]
Heaning	Richard	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Heller	Elizabeth	[redacted]		[redacted]		[redacted]
Helstad	Jonathan	[redacted]		[redacted]		[redacted]
Hendershot	Philip	[redacted]		[redacted]		[redacted]
Henderson	Cathy	[redacted]		[redacted]		[redacted]
Henderson	Lyle E.	[redacted]		[redacted]		[redacted]
Hendricks	Jennifer	[redacted]		[redacted]		[redacted]
Herndon	Laura	[redacted]		[redacted]		[redacted]
Herner	Betty Jean	[redacted]		[redacted]		[redacted]
Hero	Anna	[redacted]		[redacted]		[redacted]
Hersh	Rich	[redacted]		[redacted]		[redacted]
Hervert	Carla	[redacted]		[redacted]	[redacted]	[redacted]
Hess	Heidi	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Hevia	Rebecca	[redacted]		[redacted]		[redacted]
Hevia, MD	Armando	[redacted]		[redacted]		[redacted]
Heymann	Caroline	[redacted]		[redacted]		[redacted]
Hilborn	Janice	[redacted]		[redacted]		[redacted]
Hill	Gail	[redacted]	[redacted]	[redacted]		[redacted]
Hill	Robert	[redacted]		[redacted]		[redacted]
Hitter	Heidi	[redacted]		[redacted]		[redacted]
Hocevar	John	[redacted]		[redacted]		[redacted]
Hock	Cecilia	[redacted]		[redacted]	[redacted]	[redacted]
Hodges	Gloria	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Hoffman	Emily	[redacted]	[redacted]	[redacted]		[redacted]
Hoffman	Jeff	[redacted]		[redacted]		[redacted]
Hoffman	Laura	[redacted]		[redacted]		[redacted]
Hogan	Tammi	[redacted]		[redacted]		[redacted]
Holtzman	Leslie	[redacted]		[redacted]		[redacted]
Hoodwin	Marcia	[redacted]		[redacted]	[redacted]	[redacted]
Hooper	Michael	[redacted]		[redacted]		[redacted]
House	Darrell	[redacted]		[redacted]		[redacted]
Hughes	Michael	[redacted]		[redacted]		[redacted]
Hugret	Alixe and Jeffrey	[redacted]		[redacted]		[redacted]
Humphrey	Pamela					[redacted]
Hunter	Joseph	[redacted]		[redacted]		[redacted]
Huston	Kristin	[redacted]		[redacted]	[redacted]	[redacted]
Imhof	John	[redacted]		[redacted]		[redacted]
Inman	Jean	[redacted]		[redacted]		[redacted]
Irvin	Jane	[redacted]		[redacted]		[redacted]
Jackson	Brian	[redacted]	[redacted]	[redacted]		[redacted]
James	Michael	[redacted]		[redacted]		[redacted]
Jeanjacques	David	[redacted]		[redacted]		[redacted]
Jerolleman	Mary	[redacted]		[redacted]		[redacted]
Jobert	Frank	[redacted]		[redacted]		[redacted]
Johnson	Jane	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Johnson	Vicki	[redacted]		[redacted]		[redacted]
Jones	Drew	[redacted]		[redacted]		[redacted]
Jones	Pamela	[redacted]		[redacted]	[redacted]	[redacted]
Jones	Tod	[redacted]		[redacted]		[redacted]
Jutras	Jennifer	[redacted]		[redacted]		[redacted]
Kane	Karen	[redacted]		[redacted]		[redacted]
Kane	Annie	[redacted]		[redacted]		[redacted]
Kansas	Alan	[redacted]		[redacted]		[redacted]
Katz	Shelley	[redacted]		[redacted]		[redacted]
Kay	Joan	[redacted]		[redacted]		[redacted]
Keenan	Lucille	[redacted]		[redacted]	[redacted]	[redacted]
Keith	Alice	[redacted]		[redacted]		[redacted]
Kelchner-Bunn	Bonnie	[redacted]		[redacted]		[redacted]
Kennon	Ellen	[redacted]		[redacted]		[redacted]
Kerl	Elise	[redacted]		[redacted]	[redacted]	[redacted]
Kerstein	Briana	[redacted]		[redacted]		[redacted]
Kibbel	Kathi	[redacted]		[redacted]	[redacted]	[redacted]
Kiern	Jjennifer	[redacted]		[redacted]		[redacted]
Kimball	Jeffrey	[redacted]		[redacted]		[redacted]
Kimble	Dawn	[redacted]		[redacted]	[redacted]	[redacted]
Kinne	David	[redacted]		[redacted]		[redacted]
Kirchoff	Don	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Kirkes	Shirley	[redacted]		[redacted]		[redacted]
Kittok	Simon	[redacted]		[redacted]		[redacted]
Klepko	Deborah	[redacted]	[redacted]	[redacted]		[redacted]
Kneale	Suzanne	[redacted]		[redacted]	[redacted]	[redacted]
Knight	Henry	[redacted]		[redacted]		[redacted]
Koch,MD	Brian	[redacted]		[redacted]		[redacted]
Koeller	David	[redacted]		[redacted]		[redacted]
Koivisto	Ellen	[redacted]		[redacted]		[redacted]
Koneval	Maureen	[redacted]		[redacted]		[redacted]
Koon	William	[redacted]		[redacted]		[redacted]
Koon	Bonnie	[redacted]		[redacted]	[redacted]	[redacted]
Koppman	Julie	[redacted]	[redacted]	[redacted]		[redacted]
Kostelka-Lemoine	Kathryn	[redacted]	[redacted]	[redacted]		[redacted]
Krauskopf	Dana	[redacted]		[redacted]	[redacted]	[redacted]
Kuebel	Ck	[redacted]		[redacted]	[redacted]	[redacted]
Kunian	David	[redacted]		[redacted]	[redacted]	[redacted]
Lacey	Lauren	[redacted]		[redacted]		[redacted]
LaFargue	Leigh	[redacted]		[redacted]		[redacted]
Lamb	George	[redacted]		[redacted]	[redacted]	[redacted]
Lambert	Sharon	[redacted]		[redacted]		[redacted]
LaNasa	Barbara	[redacted]		[redacted]		[redacted]
Landry	Aline	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Landry	Janet	[redacted]		[redacted]		[redacted]
Landry	Val	[redacted]		[redacted]		[redacted]
LaPoint	Thomas	[redacted]		[redacted]		[redacted]
Larimore	Richard	[redacted]		[redacted]		[redacted]
LaRose	Jennifer	[redacted]		[redacted]		[redacted]
Lassalle	Kennith	[redacted]		[redacted]		[redacted]
Lasswell	Michele	[redacted]		[redacted]		[redacted]
Lauran	Michael	[redacted]		[redacted]		[redacted]
Laurion Bowman	Ruth	[redacted]		[redacted]	[redacted]	[redacted]
Lauterbach	Susan	[redacted]		[redacted]	[redacted]	[redacted]
Lavie	Steve	[redacted]		[redacted]		[redacted]
Lebourgeois	Myrthe	[redacted]		[redacted]		[redacted]
Lefrancis	Lynette	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
LeGaux	Amelia	[redacted]		[redacted]		[redacted]
Legier	Kelly	[redacted]		[redacted]		[redacted]
Legrand	Bernard	[redacted]		[redacted]	[redacted]	[redacted]
Lenahan	Laurie	[redacted]	[redacted]	[redacted]		[redacted]
Lenaz	Jerry	[redacted]		[redacted]		[redacted]
Lennert	Susan	[redacted]		[redacted]		[redacted]
Lenzo	Hannah	[redacted]		[redacted]	[redacted]	[redacted]
Lewis	Marie	[redacted]		[redacted]		[redacted]
Lim	Chris	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Lind	Karen	[redacted]	[redacted]	[redacted]		[redacted]
Lippold	Kye	[redacted]		[redacted]		[redacted]
Lizarraga	August	[redacted]		[redacted]		[redacted]
Lizer	Deja	[redacted]		[redacted]		[redacted]
Locantro	Mary Anne	[redacted]		[redacted]		[redacted]
Locke	Mike	[redacted]		[redacted]	[redacted]	[redacted]
Loewy	Amy	[redacted]		[redacted]		[redacted]
Loftus	Jenny	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Loggins	Carl	[redacted]	[redacted]	[redacted]		[redacted]
Long	Joan	[redacted]		[redacted]		[redacted]
Loomis	Ann	[redacted]		[redacted]		[redacted]
Loup	Georgette	[redacted]		[redacted]		[redacted]
Lowery	Virginia	[redacted]		[redacted]		[redacted]
Luna	Dennis	[redacted]		[redacted]	[redacted]	[redacted]
Lynn	Andy	[redacted]		[redacted]	[redacted]	[redacted]
Lyons	Deborah	[redacted]	[redacted]	[redacted]		[redacted]
Lytle	Denise	[redacted]		[redacted]	[redacted]	[redacted]
Mackin	T.R.	[redacted]		[redacted]	[redacted]	[redacted]
Madere	Karen	[redacted]		[redacted]		[redacted]
Madona	Christianne	[redacted]	[redacted]	[redacted]		[redacted]
Maguire	Joel	[redacted]		[redacted]		[redacted]
Maheu	Jamie	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Maitland	Tammy	[redacted]		[redacted]		[redacted]
Majnerick	Denise	[redacted]		[redacted]		[redacted]
Malin	Helen and Bill	[redacted]		[redacted]	[redacted]	[redacted]
Markus	Mary	[redacted]		[redacted]		[redacted]
Marque	Jacqueline	[redacted]		[redacted]		[redacted]
Marquette	Nicole	[redacted]		[redacted]		[redacted]
Marra	Tony	[redacted]		[redacted]		[redacted]
Marszalek	Eloise	[redacted]		[redacted]		[redacted]
Martin	Susan	[redacted]		[redacted]		[redacted]
Martin	Valerie	[redacted]	[redacted]	[redacted]		[redacted]
Martino	Ruth	[redacted]		[redacted]		[redacted]
Mason	Barrie Ann	[redacted]		[redacted]		[redacted]
Matejcek	Patricia	[redacted]		[redacted]		[redacted]
Matherne	Robert	[redacted]	[redacted]	[redacted]		[redacted]
Mattan	Steve	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Matthes	Barb	[redacted]		[redacted]		[redacted]
Mauskopf	Linda	[redacted]		[redacted]		[redacted]
Mayeux	Charles	[redacted]		[redacted]		[redacted]
McCain	Morris	[redacted]		[redacted]		[redacted]
McClatchey Jr.	Walter	[redacted]		[redacted]		[redacted]
McCloskey	Darren	[redacted]		[redacted]	[redacted]	[redacted]
Mccloskey	Josephine	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
McCoy	Janet	[redacted]		[redacted]		[redacted]
McDermet	Pamela	[redacted]		[redacted]	[redacted]	[redacted]
McDonald	Kim	[redacted]		[redacted]		[redacted]
McDonnell	Mell	[redacted]		[redacted]		[redacted]
McGowan	Ronald	[redacted]		[redacted]	[redacted]	[redacted]
Mcintosh	John	[redacted]		[redacted]		[redacted]
McIntosh III	William	[redacted]		[redacted]		[redacted]
Mclean	Andrew	[redacted]		[redacted]		[redacted]
McLean	Sean	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
McLellan	Donald	[redacted]		[redacted]		[redacted]
McMahon	Gail	[redacted]		[redacted]		[redacted]
Mcmillian	Melvina	[redacted]		[redacted]		[redacted]
Mcmillian	Dewitt	[redacted]		[redacted]		[redacted]
McSwain	Nolan	[redacted]		[redacted]		[redacted]
Mejides	Andres	[redacted]		[redacted]		[redacted]
Melton	Brian	[redacted]		[redacted]		[redacted]
Menconi	Elissa	[redacted]		[redacted]		[redacted]
Mendelsohn	Cal	[redacted]		[redacted]		[redacted]
Mercado	Marisa	[redacted]		[redacted]	[redacted]	[redacted]
Meredith	Nancy	[redacted]		[redacted]		[redacted]
Merletti	Kathy	[redacted]		[redacted]		[redacted]
Messer	Kelly	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Messina	Annette	[redacted]		[redacted]		[redacted]
Meyer	Barbara	[redacted]		[redacted]		[redacted]
Mielke	Howard	[redacted]	[redacted]		[redacted]	[redacted]
Miller	Barbara	[redacted]		[redacted]		[redacted]
Miller	Christine	[redacted]		[redacted]	[redacted]	[redacted]
Miller	John	[redacted]	[redacted]	[redacted]		[redacted]
Miller	Laura	[redacted]		[redacted]	[redacted]	[redacted]
Miller	Ruth	[redacted]		[redacted]		[redacted]
Miller	Sandra	[redacted]		[redacted]		[redacted]
Milliken	Sandi	[redacted]		[redacted]		[redacted]
Mipro	Darleen	[redacted]		[redacted]		[redacted]
Mittleman	Lori	[redacted]		[redacted]		[redacted]
Mittra	Saurabh	[redacted]	[redacted]	[redacted]		[redacted]
Morales	Laura E.	[redacted]		[redacted]		[redacted]
Moriarty	Sandra	[redacted]		[redacted]		[redacted]
Mork	Stuart	[redacted]		[redacted]	[redacted]	[redacted]
Morrell Lomas	Loretta	[redacted]		[redacted]		[redacted]
Morris	Anne	[redacted]		[redacted]		[redacted]
Morris	John	[redacted]		[redacted]		[redacted]
Morris	Kathleen	[redacted]		[redacted]		[redacted]
Morris	Michael	[redacted]		[redacted]		[redacted]
Morris	Michelle	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Morris	Robert	[redacted]		[redacted]		[redacted]
Mouser	Clinton	[redacted]		[redacted]		[redacted]
Muir	Eve	[redacted]		[redacted]	[redacted]	[redacted]
Murray	Thomas	[redacted]		[redacted]	[redacted]	[redacted]
Murray James	Sally	[redacted]		[redacted]		[redacted]
Muse	Kathleen	[redacted]		[redacted]		[redacted]
Mutch	Mary	[redacted]		[redacted]		[redacted]
Myer	Shulond	[redacted]		[redacted]		[redacted]
Nath	Pam	[redacted]		[redacted]		[redacted]
Naumann	Kay	[redacted]		[redacted]	[redacted]	[redacted]
Neal	Burt	[redacted]		[redacted]		[redacted]
Netto	Jessica	[redacted]		[redacted]	[redacted]	[redacted]
Neyrey	Jerome	[redacted]	[redacted]	[redacted]		[redacted]
Nicholas	Linda	[redacted]		[redacted]		[redacted]
Nicholson	Grant	[redacted]		[redacted]		[redacted]
Nielsen	Kristin T.	[redacted]		[redacted]		[redacted]
Nogare	Susan	[redacted]		[redacted]		[redacted]
Norman	Melissa	[redacted]		[redacted]		[redacted]
Norris	Stephanie	[redacted]		[redacted]	[redacted]	[redacted]
Nosacka	Doug	[redacted]		[redacted]		[redacted]
Nuccio	Keith	[redacted]		[redacted]		[redacted]
Nunez	Carlos	[redacted]	[redacted]	[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Nye	Eric	[redacted]		[redacted]		[redacted]
ODonnell	Barbara	[redacted]		[redacted]		[redacted]
O'Leary	Maria	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Oriol	Amelie	[redacted]		[redacted]		[redacted]
Orosz-Coghlan	Patricia	[redacted]		[redacted]		[redacted]
Osborn	Irene	[redacted]		[redacted]		[redacted]
Osborne	Jerry	[redacted]		[redacted]		[redacted]
O'Shea	Lynn	[redacted]		[redacted]	[redacted]	[redacted]
Pabian	Wendy	[redacted]	[redacted]	[redacted]		[redacted]
Pacyna	Cathy	[redacted]		[redacted]		[redacted]
Pais	Noah	[redacted]		[redacted]		[redacted]
Palm	R	[redacted]		[redacted]		[redacted]
Pan	Pinky Jain	[redacted]		[redacted]		[redacted]
Panno	Bonnie	[redacted]		[redacted]		[redacted]
Parham	John W.	[redacted]	[redacted]	[redacted]		[redacted]
Patrizzi	Lee	[redacted]		[redacted]	[redacted]	[redacted]
Payne	Barbara	[redacted]		[redacted]		[redacted]
Pearl	Jennifer	[redacted]		[redacted]	[redacted]	[redacted]
Pecot	Mariellen	[redacted]		[redacted]		[redacted]
Pegram	Tory	[redacted]		[redacted]		[redacted]
Peltier	Karen	[redacted]		[redacted]		[redacted]
Pendragon	Barbara R.	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Petersen	RNobert	[redacted]		[redacted]	[redacted]	[redacted]
Petrosini	Adrienne	[redacted]		[redacted]		[redacted]
Pezold Roberts	Nedra	[redacted]		[redacted]		[redacted]
Pick	Lindsay	[redacted]		[redacted]	[redacted]	[redacted]
Pinner	Janice	[redacted]		[redacted]		[redacted]
Pisani	Maureen	[redacted]		[redacted]		[redacted]
Pizarro	Rolando-Carlos	[redacted]		[redacted]		[redacted]
Plauche	Barbara	[redacted]		[redacted]		[redacted]
Plyer	Allison	[redacted]	[redacted]	[redacted]		[redacted]
Pooler	Kristi	[redacted]		[redacted]	[redacted]	[redacted]
Popovic	Ozrenka	[redacted]		[redacted]		[redacted]
Porter	Brian	[redacted]		[redacted]		[redacted]
Potashnick	Jo Ann	[redacted]		[redacted]	[redacted]	[redacted]
Powell	Kim	[redacted]		[redacted]		[redacted]
Prather	Michele	[redacted]		[redacted]		[redacted]
Preston	Susan	[redacted]		[redacted]		[redacted]
Pundtq	Susan	[redacted]		[redacted]		[redacted]
Quebedeaux	Karen	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Quenan	Will	[redacted]		[redacted]		[redacted]
Quezergue	Karl	[redacted]		[redacted]		[redacted]
Rahm	Jan	[redacted]		[redacted]		[redacted]
Rahman	Verna	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
Ramsey-Boissiere	Merle	[redacted]		[redacted]		[redacted]
Randolph	Dee	[redacted]		[redacted]	[redacted]	[redacted]
Rau	Debra	[redacted]		[redacted]		[redacted]
Raymond	David	[redacted]		[redacted]		[redacted]
Raynor	Preston	[redacted]		[redacted]		[redacted]
Reed	Marthe	[redacted]		[redacted]	[redacted]	[redacted]u
Reehlmann	David	[redacted]		[redacted]		[redacted]
Reel	Joseph	[redacted]		[redacted]		[redacted]
Reese	Elizabeth	[redacted]		[redacted]		[redacted]
Reese	T	[redacted]		[redacted]		[redacted]
Rego	Stewart	[redacted]		[redacted]	[redacted]	[redacted]
Reine	Kathleen	[redacted]		[redacted]		[redacted]
Reinhardt	Patricia	[redacted]		[redacted]		[redacted]
Reiss	James	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Reynaud	Alicia	[redacted]		[redacted]	[redacted]	[redacted]
Rich	Sharon	[redacted]		[redacted]		[redacted]
Richard	Suzanne	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Richardson	Julie	[redacted]		[redacted]		[redacted]
Richardson	William	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Richmond	Jo Ann	[redacted]		[redacted]		[redacted]
Richoux	Norma	[redacted]		[redacted]		[redacted]
Ricks	Linda	[redacted]		[redacted]		[redacted]

LNAME	FNAME	ADD1	ADD2	CityState Zip	Phone	Email
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Rife	Howard	[redacted]		[redacted]	[redacted]	[redacted]
Riley	Kelly	[redacted]		[redacted]	[redacted]	[redacted]
Riley	Kevin	[redacted]	[redacted]	[redacted]		[redacted]
Rippey	Kathleen	[redacted]	[redacted]	[redacted]		[redacted]
Rittenhouse	Calvin	[redacted]		[redacted]		[redacted]
Robb	Heather	[redacted]		[redacted]	[redacted]	[redacted]
Robbin	Darelle	[redacted]		[redacted]		[redacted]
Roberts	Les	[redacted]		[redacted]	[redacted]	[redacted]
Roberts	Lori	[redacted]		[redacted]		[redacted]
Robertson	Richard	[redacted]		[redacted]		[redacted]
Robson	Colleen	[redacted]		[redacted]		[redacted]
Rolfes	Kevin	[redacted]		[redacted]		[redacted]
Ronnlund	Karen	[redacted]		[redacted]		[redacted]
Roth	David	[redacted]	[redacted]	[redacted]		[redacted]c
Rowles	Trinity	[redacted]		[redacted]		[redacted]
Ryan	Christopher	[redacted]	[redacted]	[redacted]		[redacted]
Saichuk	Kathryn	[redacted]		[redacted]		[redacted]
Saizan	Alveraize	[redacted]		[redacted]		[redacted]
Saizan	Paula	[redacted]		[redacted]		[redacted]
Samet	Melissa	[redacted]	[redacted]	[redacted]		[redacted]
Sanders	Calvin D.	[redacted]	[redacted]	[redacted]		[redacted]

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Saporito	Rhenda	[redacted]		[redacted]	[redacted]	[redacted]
Sapp	Warren	[redacted]		[redacted]		[redacted]
Sari	Mary	[redacted]		[redacted]		[redacted]
Savitske	Jessica	[redacted]		[redacted]		[redacted]
Scanlan	Jennifer	[redacted]		[redacted]		[redacted]
Scapin	Nicholas	[redacted]		[redacted]	[redacted]	[redacted]
Scarabin	Minos	[redacted]	[redacted]	[redacted]		[redacted]
Schaefer	Jeanne	[redacted]		[redacted]	[redacted]	[redacted]
Schlesinger	Sybil	[redacted]		[redacted]		[redacted]
Schlossberger	Lynn	[redacted]		[redacted]		[redacted]
Schnatz	Darlene	[redacted]		[redacted]		[redacted]
Schneider	Emily	[redacted]		[redacted]		[redacted]
Schroeder	William	[redacted]		[redacted]	[redacted]	[redacted]
Schuessler	Betty	[redacted]		[redacted]		[redacted]
Schulte	Doug	[redacted]		[redacted]		[redacted]
Schulte	Marilyn	[redacted]		[redacted]		[redacted]
Schwartz	Elaine	[redacted]		[redacted]		[redacted]
Schwartz	William	[redacted]		[redacted]		[redacted]
Sciambra	Mary	[redacted]		[redacted]		[redacted]
Scott	Andrew	[redacted]		[redacted]	[redacted]	[redacted]
Scott	Dorinda	[redacted]		[redacted]		[redacted]
Serigne	Jared	[redacted]		[redacted]		[redacted]

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Serio	Rick	[redacted]		[redacted]		[redacted]
Shaneyfelt	Ann	[redacted]		[redacted]		[redacted]
Shedd	Rebecca	[redacted]		[redacted]	[redacted]	[redacted]
Sheridan	Mark	[redacted]		[redacted]		[redacted]
Shirley	Eleanor	[redacted]		[redacted]		[redacted]
Shoenfelt	Mary	[redacted]		[redacted]		[redacted]
Shoenfelt	Mimi	[redacted]		[redacted]		[redacted]
Shorr	David	[redacted]		[redacted]		[redacted]
Shroyer	Lisa	[redacted]	[redacted]	[redacted]		[redacted]
Shutt	Kamryn	[redacted]		[redacted]		[redacted]
Silbernagel	John	[redacted]		[redacted]		[redacted]
Simon	Philip	[redacted]		[redacted]		[redacted]
Simon	Philip	[redacted]		[redacted]		[redacted]
Simpson	Jack	[redacted]		[redacted]		[redacted]
Sinno	Suzanne	[redacted]		[redacted]		[redacted]
Sins	Amy	[redacted]		[redacted]		[redacted]
Sive	Rebecca	[redacted]		[redacted]		[redacted]
Sloan	Courtney	[redacted]		[redacted]		[redacted]
Smith	E	[redacted]		[redacted]	[redacted]	[redacted]
Smith	Madeleine	[redacted]		[redacted]	[redacted]	[redacted]
Smith	George	[redacted]	[redacted]	[redacted]		[redacted]
Smith	Diana	[redacted]	[redacted]	[redacted]		[redacted]

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Smoke	Henry	[redacted]		[redacted]		[redacted]
Snyder	Sally	[redacted]		[redacted]		[redacted]
Soniat	Martha	[redacted]		[redacted]		[redacted]
Spain	Monica	[redacted]		[redacted]	[redacted]	[redacted]
Spansel	Carol	[redacted]		[redacted]		[redacted]
Speed	Terrie	[redacted]		[redacted]		[redacted]
Sperry	Abigail	[redacted]		[redacted]		[redacted]
Spielvogel	Barry	[redacted]	[redacted]	[redacted]		[redacted]
Spradlin	Michael	[redacted]		[redacted]	[redacted]	[redacted]
St. Ann	Marilyn	[redacted]		[redacted]		[redacted]
Stahl	Frieda	[redacted]		[redacted]		[redacted]
Stamp	Barbara	[redacted]		[redacted]		[redacted]
Stanley	Sue	[redacted]		[redacted]		[redacted]
Starrett	Heather	[redacted]		[redacted]		[redacted]
Steele	Bambi	[redacted]		[redacted]		[redacted]
Stein	Sharon	[redacted]		[redacted]		[redacted]
Steuck	Greg	[redacted]		[redacted]		[redacted]
Stober	Paula	[redacted]		[redacted]		[redacted]
Storbeck	John	[redacted]		[redacted]		[redacted]
Stover	Judy	[redacted]		[redacted]	[redacted]	[redacted]
Streiffer	Adam	[redacted]		[redacted]		[redacted]

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Stuart	Lee	[redacted]		[redacted]		[redacted]
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Sullivan	Charlotte	[redacted]		[redacted]		[redacted]
Swan	Rachel	[redacted]	[redacted]	[redacted]		[redacted]
Syrdal	Holly	[redacted]		[redacted]		[redacted]
Tallon	Marian	[redacted]		[redacted]		[redacted]
Tan	Frances	[redacted]		[redacted]		[redacted]
Tatje	Susan	[redacted]		[redacted]		[redacted]
Tessier	Karlin	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Thomas	Donald	[redacted]		[redacted]		[redacted]
Thomas	Kimberley	[redacted]		[redacted]	[redacted]	[redacted]
Thomas	Tammy	[redacted]		[redacted]		[redacted]
Thome	Katherine	[redacted]	[redacted]	[redacted]		[redacted]
Todd	Vivian	[redacted]		[redacted]	[redacted]	[redacted]
Tolito	Anthony	[redacted]		[redacted]		[redacted]
Tompkins	Martha Claire	[redacted]		[redacted]		[redacted]
Torres	Linda	[redacted]		[redacted]		[redacted]
Troyano	Paul	[redacted]		[redacted]		[redacted]
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Unland	Raymond	[redacted]		[redacted]		[redacted]
Unruh	Jerry	[redacted]		[redacted]		[redacted]
Uricek	Agnela	[redacted]		[redacted]		[redacted]
Valencia	Suzanne	[redacted]		[redacted]	[redacted]	[redacted]
Valliere	Jean	[redacted]		[redacted]		[redacted]
Vallone	Cheryl	[redacted]		[redacted]		[redacted]
Van Aman	Linda	[redacted]		[redacted]		[redacted]
Vance	Alec	[redacted]		[redacted]		[redacted]
Vandermay	Lisa	[redacted]		[redacted]	[redacted]	[redacted]
Varisco	Michel	[redacted]	[redacted]	[redacted]		[redacted]
Verdi	Michael	[redacted]		[redacted]		[redacted]
Veristain	Gelasio	[redacted]		[redacted]		[redacted]
Verret	Terry	[redacted]		[redacted]		[redacted]
Vicknair	Margie	[redacted]		[redacted]		[redacted]
Vida	David	[redacted]		[redacted]		[redacted]
Vigilante	Diane	[redacted]		[redacted]		[redacted]
Viles	Aaron	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Vines	Patricia	[redacted]		[redacted]		[redacted]
Vogel	Richard	[redacted]		[redacted]		[redacted]
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Weitz	Stephen	[redacted]		[redacted]		[redacted]
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Wessel	David	[redacted]		[redacted]		[redacted]
White	Kathlyn	[redacted]		[redacted]		[redacted]
White	Mary Pat	[redacted]		[redacted]		[redacted]
Widmann	Julia	[redacted]		[redacted]		[redacted]
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Wilder	Sidney	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Wildes	Gregory	[redacted]		[redacted]		[redacted]
Wilkinson	Anita	[redacted]		[redacted]		[redacted]
Williams	Bonnie	[redacted]		[redacted]		[redacted]
Williamson	Trevor	[redacted]		[redacted]	[redacted]	[redacted]
Wilson	Elizabeth	[redacted]		[redacted]		[redacted]
Wilson	Phyllis	[redacted]		[redacted]		[redacted]
Wineski	Kathryn	[redacted]	[redacted]	[redacted]		[redacted]
Wolf	Robert	[redacted]		[redacted]	[redacted]	[redacted]
Woolf	Sharon	[redacted]	[redacted]			[redacted]
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Yeostros	Amy	[redacted]		[redacted]		[redacted]
York	Bruce	[redacted]		[redacted]		[redacted]
Young	David	[redacted]		[redacted]		[redacted]
Youngblood	Patricia	[redacted]		[redacted]		[redacted]
Younger	Michael	[redacted]		[redacted]		[redacted]
Yurt	William	[redacted]		[redacted]	[redacted]	[redacted]
Zizzo	James	[redacted]		[redacted]		[redacted]
Zorthian	Anna	[redacted]		[redacted]		[redacted]

Comments Based on Notice of Intent

From: Bk1492@aol.com [redacted]
Sent: Thursday, October 02, 2008 5:31 AM
To: Stiles, Sandra E MVN; AMERICANVOICES@MAIL.HOUSE.GOV
Subject: PUBLIC COMMENT ON FEDERAL REGISTER ATTACHED BELOW IN FULL

who would trust this agency, which built the levees that overflowed? get people out of the area. the area is not possible to save. the taxpayers cant pay the billions to rebuild it safely since wall street needs the billions. i would not trust this agency at all. it is clear that this agency is anti environmental because 99% of the time they give approvals for environmental destruction. this is an agency as bad as fannie mae - a real waste. it needs to be disassembled and the people in it fired.

b. sachau
[redacted]



November 20, 2008

Via email: sandra.e.stiles@usace.army.mil

Ms. Sandra Stiles
U.S. Army Corps of Engineers
CEMVNPM–RS
P.O. Box 60267
New Orleans, LA 70160–0267

Re: Comments on Proposed Draft Environmental Impact Statement for the Mississippi River-Gulf Outlet Ecosystem Restoration Feasibility Study; Scoping Comments

Dear Ms. Stiles:

American Rivers appreciates the opportunity to comment on the U.S. Army Corps of Engineers' (Corps) Notice of Intent to Prepare a Draft Environmental Impact Statement for the Mississippi River-Gulf Outlet Ecosystem Restoration Feasibility Study (the "Proposed Draft EIS").

American Rivers is a national conservation organization working to protect and restore the nation's rivers and wetlands so communities can thrive. American Rivers has a long history of working for the effective closure of the Mississippi River-Gulf Outlet (MRGO) to protect New Orleans and St. Bernard Parish and to restore the wetlands lost to the MRGO. American Rivers has more than 65,000 supporters nationwide, and works in partnership with thousands of river and conservation organizations.

I. The Corps Must Prioritize MRGO Planning And Complete The Feasibility Study As Quickly As Possible; The Corps' Current Planning Timeline Is Unacceptable

Section 7013 of the Water Resources Development Act of 2007 (WRDA 2007) directs the Corps to develop and implement a plan to restore natural ecosystem features of the MRGO channel that will reduce or prevent damage from storm surge and restore the areas affected by the navigation channel. Specifically, WRDA 2007 requires the Corps to develop a plan to: (1) physically modify the MRGO channel and restore the areas affected by the MRGO; (2) restore the natural features of the ecosystem that will reduce or prevent damage from storm surge; and (3) prevent the intrusion of saltwater into the waterway. The Corps was required to finalize this plan by May 8, 2008 – more than six months ago. Public Law 110-114, 121 Stat. 1281.

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While the Corps has recommended (and is in the process of awarding a contract for) construction of a rock closure at Bayou la Loutre to minimize saltwater intrusion,[1] the Corps has announced that it will not release a *draft* of the remaining elements of this legally required plan until March 2010 at the "earliest." 73 Fed. Reg. at 57342 (October 2, 2008). The Corps does not even attempt to estimate when the EIS and restoration plan will be finalized.

This delay violates the plain language of WRDA 2007 and ignores the clear intent of Congress that the Corps must act quickly to address the dire threat posed by the MRGO. Importantly, this delay is not acceptable from a public safety perspective. Highly credible scientific evidence also makes it clear that public safety will continue to be in jeopardy until the MRGO channel and the wetlands affected by the MRGO are restored. Full and rapid compliance with the WRDA 2007 is essential for public safety and the Corps should prioritize this critical project and commit to finalizing the restoration plan and necessary environmental review as soon as possible. On the ground implementation of the restoration plan should begin within two years (by November 2010), *at the absolute latest.*

While American Rivers recognizes the significant amount of planning currently being carried out by the Corps' New Orleans District, Congress has made it clear that minimizing the dire safety threats posed by the MRGO is of the highest priority. The Corps should comply with this Congressional mandate and place the highest priority on finalizing the restoration plan for the MRGO. If resource constraints nevertheless continue to slow MRGO planning, the Corps should contract out some, or all, of its planning and modeling efforts on the MRGO to other governmental agencies (such as NOAA or USGS), academic or scientific institutions, or private entities with extensive and proven experience in developing effective ecosystem restoration plans.

II. The Proposed Draft EIS and Restoration Plan Should Comprehensively Examine – And Recommend – The Full Suite Of Scientifically Sound Measures Already Provided To The Corps In Connection With Its MRGO Planning Efforts

The Corps has already been presented with a host of recommended measures designed by scientists to ameliorate the public safety risks created by the MRGO and to restore the wetlands lost to the MRGO.[2] These measures would: reduce storm surge; protect the MRGO levees – and the communities behind those levees – from the destructive assault of wind-driven waves; and restore vital, storm-buffering coastal wetlands. The Corps should start from this significant base of information and fully evaluate these recommendations.

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[1] The rock closure was recommended by the Corps in the Integrated Final Report to Congress and Legislative Environmental Impact Statement for the Mississippi River – Gulf Outlet Deep-Draft De-authorization Study, November 2007 (the "Phase I MRGO Report"). American Rivers strongly supports the closure at Bayou la Loutre. However, that single closure does nothing to address the significant public safety threats created by the MRGO. Significant additional measures are also required to restore the wetlands lost to the MRGO.

[2] These measures were improperly dismissed, without any meaningful analysis, in the Phase I MRGO Report. Proper compliance with the National Environmental Policy Act requires a full and robust evaluation of these measures in the Proposed Draft EIS.

A number of these critical, scientifically-based measures to minimize the storm surge impacts of the MRGO channel and restore the wetlands and storm buffering capabilities lost to the MRGO are discussed in detail in the *MRGO Must Go* report previously submitted to the Corps in connection with its planning for the MRGO. These measures were developed by scientists from Louisiana State University Department of Oceanography and Coastal Sciences, Louisiana University Hurricane Center, the Coalition to Restore Coastal Louisiana, and the Lake Pontchartrain Basin Foundation. The *MRGO Must Go* report is endorsed by American Rivers, Lake Pontchartrain Basin Foundation, Coalition to Restore Coastal Louisiana, Environmental Defense, Gulf Restoration Network, National Wildlife Federation, Louisiana Wildlife Federation, and St. Bernard Parish. A copy of the *MRGO Must Go* report is attached at Tab A to these comments.

The Proposed Draft EIS should fully evaluate – and the Corps should recommend and implement – measures to:

1. *Restore and Rehabilitate the Bank Lines Along the MRGO.* It is essential to reclaim as much of the original 1965 bank lines of the MRGO as is reasonable to: reduce destructive storm surge and storm-driven waves; reduce the vulnerability of the MRGO levee to those forces; and restore vital, storm-buffering coastal wetlands. While reclamation of both bank lines will provide the most benefit, reclamation must take place along the west side of the MRGO as quickly as possible to provide an essential buffer for the MRGO levees.[3] Reclamation should be done with dredged material to the elevation needed to support native vegetation, approximately three to five feet. The reclaimed banks should be planted with dense native coastal vegetation to provide added critical protection from storm surge, wind, and wave action. The Corps should also investigate additional opportunities for minimizing, and protecting against, wave attack on the MRGO levee and for bolstering the Forty Arpent Levee.

Bank reclamation will provide at least the following benefits:

- Bank reclamation/planting would provide a vitally important line of defense against future levee breaches. As a result, the benefits of such reclamation/planting would include reduced threat to public health, safety, and welfare, and reduced damage to property from future levee breaches.

- Bank reclamation/planting would help protect the MRGO levees by minimizing the impacts of storm surge and wind and wave action. The reclaimed banks and vegetation would cause waves to break away from the levees, instead of on or directly against the levees. Evidence shows that south Louisiana levees protected by an appropriate buffer of wetlands or cypress forest had dramatically less chance of failure during Katrina. Studies of Asian tsunamis have also shown that a football field length of dense vegetation could reduce wave energy by up to 95 percent.

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[3] Contrary to the Corps' assertion in the Phase I MRGO Report, this recommendation does not demand activities that are infeasible from an engineering perspective.

- Bank reclamation/planting would help minimize the development of destructive storm-driven waves as winds and storm surge sweep across the MRGO channel. Even where wetlands on the east side of the MRGO channel are available to reduce the size and intensity of wind-driven waves and storm surge, the open expanse of the MRGO channel can allow those forces to return to their original strength, posing a significant risk to the MRGO levees and the communities behind those levees.

- Bank reclamation/planting would help prevent the continued widening of the MRGO channel. The Phase I MRGO Report concludes that widening of the MRGO channel from erosion could increase by 1/3 over the next 50 years. As the channel widens, it will put additional stress on the MRGO levees, making them more vulnerable than they are today. Continued erosion could make the levee base vulnerable to geo-technical failures and could require the implementation of expensive protective measures.

- Bank reclamation/planting would reduce the future costs associated with maintaining and reinforcing the MRGO levees.

2. *Construct Channel Constrictions / Lateral Fills at Additional Locations.* It is essential that Reach 2 of the MRGO channel be constricted or closed with lateral fills at four or preferably more locations in addition to the closure at Bayou la Loutre (as the number of lateral fills decrease, the size of those fills would need to increase to provide effective storm surge protection). These lateral fills should be planted with dense native vegetation to anchor them in place and to provide an additional buffer to wind and wave action during future storm events. These constrictions would convert the MRGO from an open channel into a series of pools, providing at least the following benefits:

- The constrictions/lateral fills would reduce the channel cross section and conveyance capacity of the MRGO channel, reducing both the speed and volume of water that could reach New Orleans, the MRGO levees, or any floodgates or other barriers.

- The constrictions/lateral fills would reduce the amount of flood damage that would be caused by any possible future breach of the MRGO levees by limiting the amount of water available to flow through any breach to the water in the pool immediately adjacent to the breach. Without the constrictions, the MRGO channel would continue to provide a virtually unlimited amount of water at a faster rate through any future levee breaches.

- The constrictions/lateral fills would keep introduced freshwater moving east into now-degraded marshes instead of north into the Industrial Canal and Lake Pontchartrain.

- The constrictions/lateral fills would create an uneven shoreline making it more difficult for storm surge in one part of the coastline to flow sideways and take advantage of a MRGO levee breach in another part of the coastline.

- The constrictions/lateral fills would promote the filling in of the existing channel with sediment and marine debris deposited during storm events. Without the lateral fills, Reach 2 of the MRGO would be more likely to remain at, or close to, its current depth.

3. *Restore and Maintain the Narrow Land Between Lake Borgne and the MRGO.* This thin strip of land was once part of the mainland of what is called the Central Wetlands. Construction of the MRGO isolated this thin strip of land, increased its exposure to storm tides and waves, and exposed it to erosion from boat wakes. This has greatly accelerated land loss in this area. Full restoration of this land mass is necessary to protect the Lake Borgne ecosystem and to ensure that the newly constructed levees on the southwest side of the MRGO are not exposed to even greater winds, tides, and surges. Efforts are currently underway to address this critical problem, but full restoration of this land mass must be an essential component of the final restoration plan should the current efforts prove to be insufficient.

4. *Rebuild and Restore Natural Ridges, Including the Ridge at Bayou la Loutre.* Reversing the damage caused when the MRGO channel was cut through the natural ridge at Bayou la Loutre involves plugging the ridge across the channel, restoring the ridge to its natural level, and planting the ridge. Salinity modeling done by scientists at the University of New Orleans shows that pre-MRGO salinity conditions would be restored through combining a Bayou la Loutre closure and freshwater diversion at Violet (see below). Restoring the ridge to its natural level and planting it with dense native vegetation will add to the benefits of the rock closure at Bayou la Loutre by reducing the artificial flow of saltwater into Lake Borgne and Lake Pontchartrain, eliminating the annual dead zone in Lake Pontchartrain, and increasing the effectiveness of freshwater reintroductions. The Biloxi, Breton, and New Orleans East land bridges should also be restored.

5. *Move Nourishing Freshwater and Sediment into the Wetlands.* If properly implemented, the Violet Diversion and the Central Wetlands wastewater assimilation projects will restore some of the Mississippi River's natural capacity to build land; reduce salt water stress and improve conditions for wetland restoration; and reduce the amount of harmful nutrients carried to the Gulf of Mexico by the Mississippi. These projects are needed to restore and rehabilitate the historic water conditions and wetlands that used to reduce storm surge and provide vital habitat, and both projects should be included in the MRGO restoration plan. Preliminary modeling of saltwater flows by the University of New Orleans suggests that approximately 7,500 cubic feet per second of freshwater from the Violet Diversion will be needed to reestablish historic salinity levels in Lake Borgne during normal rainfall years. The restoration plan for the MRGO should be designed to accommodate and take advantage of this new freshwater flow, and should include a Violet diversion of the appropriate size as an identified and integral component of the final MRGO restoration plan.

6. *Restore Degraded Marshes and Cypress Forests*: Replanting, restoring, and sustaining the Central Wetlands cypress forest will reduce the risk to levees and communities from waves and storm surge and provide critical habitat for economically important fish and wildlife species.

American Rivers urges the Corps to fully evaluate and include this full suite of measures in the Proposed Draft EIS and the final restoration plan for the MRGO. Each of these measures is essential for ensuring the future safety and well-being of the people of St. Bernard Parish and the greater New Orleans area, and for promoting effective restoration of the wetlands lost to, and affected by, the MRGO.

III. The Proposed Draft EIS And Restoration Plan Must Fully Consider The Highly Credible Scientific Evidence On The MRGO's Role In Significantly Exacerbating The Effects Of Hurricane Katrina

Highly credible scientific evidence demonstrates that the MRGO channel greatly exacerbated the effects of Hurricane Katrina, and that the MRGO will continue to pose a significant threat even after completion of the rock closure at Bayou la Loutre and planned levee upgrades. The Phase I MRGO Report improperly dismisses this scientific evidence out of hand, and as such, the conclusions in the Phase I MRGO Report cannot be relied on in developing the Proposed Draft EIS or the restoration plan.

The Phase I MRGO Report completely ignores highly credible scientific evidence which demonstrates that the MRGO greatly exacerbated the effects of Hurricane Katrina, leading to catastrophic flooding in New Orleans and St. Bernard Parish. These scientific studies draw a markedly different picture than the Phase I MRGO Report about the public safety risks posed by the MRGO, and they dictate additional critical measures that must be taken to protect the greater New Orleans region. Failure to consider the full body of available scientific information led the Corps to incorrectly conclude in the Phase I MRGO Report that measures to reduce the storm surge propagation effects of the MRGO channel are not needed.

It is essential that the Corps comprehensively evaluate the scientific information discussed below, and any additional scientific information that has been, or is currently being, developed by storm surge and engineering experts on the role of the MRGO during Katrina.

Detailed post-Katrina modeling has been carried out by a group of scientists known as Team Louisiana[4] and by Dr. Hassan Mashriqui formerly with Louisiana State University.[5] This modeling shows that the MRGO channel acts as a conveyor belt for storm surge during Katrina, increasing the speed, volume, and height of waters that eventually flooded much of New Orleans and St. Bernard Parish.[6] The Team Louisiana report discussed below and Dr. Mashriqui's initial modeling shows that during Katrina:

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[4] Louisiana State University (LSU) was commissioned in October, 2005 by the Louisiana Department of Transportation and Development (LDOTD) to assemble a team of Louisiana-based academic and private sector experts to collect, review, and evaluate data related to the failure of the levee systems in and around New Orleans during Hurricane Katrina. This group later became known as Team Louisiana.

[5] Copies of selected slides prepared by Dr. Mashriqui are attached to these comments at Tab B.

[6] Dr. Mashriqui's findings, which have enormous implications for the appropriate steps to take to address the storm surge problems created by the MRGO channel, were presented by Dr. Mashriqui to Maj. General Riley, Director of Civil Works, Steve Stockton, Deputy Director of Civil Works, Zoltan Montvai, Deputy Chief, MVD Regional Integration Team and other Corps employees at a science and technology briefing in Washington, D.C. on March 5, 2007. At that meeting, Dr. Mashriqui offered to work with the Corps to help them better understand his findings and their implications for closing the MRGO, and American Rivers and other conservation organizations urged the Corps to work with Dr. Mashriqui and other scientists. Dr. Mashriqui's findings were also discussed in American Rivers' comments on the draft Phase I MRGO Report and in Group comments on the Final Phase I MRGO Report. Copies of these comments are attached at Tabs C and D.

- Water traveled 8 to 10 feet per second through Reach 1 of the MRGO channel—approximately 3 to 4 times faster than it would have traveled over natural wetlands.

- The peak flow rate through Reach 1 of the MRGO channel was about 350,000 cfs—approximately between 6 and 7 times greater than it would have been without the MRGO channel.

- Water traveled 6 to 7 feet per second through Reach 2 of the MRGO channel—approximately 2 to 3 times faster than it would have traveled over natural wetlands.

- The peak flow rate through Reach 2 of the MRGO channel near Bayou Bienvenue was about 258,000 cfs—between 6 and 7 times greater than it would have been without the MRGO channel.

- Approximately 60 billion gallons of water surged through Reach 1 of the MRGO channel—almost 10 times more than the volume of water that would have passed through the original dimensions of the GIWW or through natural wetlands.

- Flooding attributable to the MRGO was particularly catastrophic. In Chalmette and the Lower Ninth Ward—where virtually all of the flooding came from the MRGO (and associated navigation channels)—water levels reached 11 feet above sea level in just 3 to 4 hours. By contrast, in metro New Orleans—which saw less flooding from the MRGO—it took much longer for water levels to reach depths of 5 to 6 feet. While this flooding was also horrendous, the slower rate of flooding gave residents far more time to escape.

  To fully appreciate the strength of the flooding from the MRGO it is also important to recognize that Chalmette and the Lower Ninth Ward are located at much higher elevations than metro New Orleans and East New Orleans. Some parts of Chalmette are approximately 3 feet above sea level; the Lower Ninth Ward is approximately 4 feet below sea level; and Lake View of New Orleans and some parts of East New Orleans are approximately 8 feet below sea level.

A December 2006 report prepared for the State of Louisiana by Team Louisiana provides a detailed analysis of the role of the MRGO in the post-Katrina flooding of New Orleans. Ivor Ll. van Heerden, G. Paul Kemp, Hassan Mashriqui, *et al.*, *The Failure of the New Orleans Levee System during Hurricane Katrina*, A Report prepared for Secretary Johnny Bradberry Louisiana Department of Transportation and Development, Baton Rouge, Louisiana State Project No. 704-92-0022, 20, December 18, 2006, at Chapter 7 (the "Team Louisiana Report"). The Team Louisiana Report reaches starkly different conclusions than the MRGO Report regarding the role of the MRGO channel in the propagation of storm surge. The Team Louisiana Report also highlights numerous limitations, shortcomings, and misinterpretations applicable to the post-Katrina storm surge modeling relied on in the MRGO Report. Team Louisiana Report at 259-266. A copy of Chapter 7 of the Team Louisiana Report is attached to these comments at Tab E.

In December 2006, a number of scientists and engineers also advised Congress that the findings in the draft interim MRGO deauthorization report submitted to Congress were "demonstrably erroneous" and that the Corps' plan for the MRGO was inadequate for providing hurricane and storm protection to the region. Dr. Robert Bea, University of California at Berkeley; Dr. John Day, Louisiana State University; Dr. Sherwood Gagliano, Louisiana Citizen/Coastal Scientist; Dr. Paul Kemp, Louisiana State University; Dr. Ivor van Heerden, Louisiana State University, *Statement of Concerns* regarding the Corps' Mississippi River Gulf Outlet Deep-Draft De-Authorization Interim Report to Congress, transmitted to Congress by letter dated December 21, 2006. The findings and plan in the Phase I MRGO Report are essentially unchanged from the challenged findings in the draft interim deauthorization report. A copy of the *Statement of Concerns* and transmittal letter are attached to these comments at Tab F.

It is our understanding that scientists from the Netherlands have also found that the open expanse of the MRGO channel provides the conditions necessary for significant increases in the size and intensity of wind-driven waves and storm surge across the channel, posing a significant risk to the MRGO levees and the communities behind those levees.

In addition to fully evaluating the scientific analyses discussed above:

- The Corps should reassess its wholesale reliance on the IPET findings discussed in the Phase I MRGO Report. It is our understanding that the IPET modelers had all the ADCIRC model data available to Louisiana State University and other scientists. As a result, the IPET modelers could have estimated the maximum velocity, peak surge, and volume of surge that passed through the MRGO. However, the IPET report suggests that neither the IPET modelers nor the Corps looked at water velocity or water transport through the MRGO channel. Instead, the IPET report looked only at surge height. If our understanding is correct, the IPET analysis would have limited application as surge height is not the only (nor indeed, the controlling) factor in hurricane and storm induced flooding. Water volume, velocity, wave generation, and duration of high water levels are critical elements that also must be assessed to properly evaluate the MRGO's role in Katrina.

- The Corps should reassess its reliance on the conclusion drawn from the May 2004 Mississippi River Gulf Outlet Reevaluation Study Storm Surge Modeling Assessment. According to the Phase I MRGO Report, the only conclusion that can be drawn from that report is that "the MRGO has a minimal influence upon storm surge propagation." Phase I MRGO Report at D-EI-1. However, the May 2004 pre-Katrina study looked only at the differences in storm surge propagation with and without a single closure at Bayou la Loutre. As a result, we would posit that the ***only*** conclusion that could reasonably be drawn from that that study is that a single closure structure at Bayou la Loutre would have minimal effect on storm surge propagation; a conclusion that has little to no bearing on the role of the entire MRGO channel in propagating storm surge.

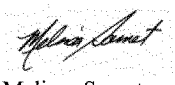
IV. The Proposed Draft EIS Should Prioritize Assessment of Socioeconomic Issues On Public Safety, Housing, Community Cohesion, And Environmental Justice

American Rivers strongly supports a full and robust evaluation of the socioeconomic issues related to the comprehensive restoration of the MRGO channel and impacted wetlands. We believe, however, that this analysis should prioritize the implications of restoring the MRGO on public safety, housing, community cohesion and environmental justice. Because the MRGO has been deauthorized as a federal navigation channel, we believe that the implications on navigation, which is identified in the Federal Register Notice as the first socioeconomic issue to be evaluated, should have a lesser priority in this analysis.

V. Conclusion

The construction and operation of the MRGO destroyed more than 27,000 acres of wetlands that used to help protect the people of St. Bernard Parish and the New Orleans Metropolitan Area from storm surge and waves. The MRGO also funneled and intensified Hurricane Katrina's storm surge, and exposed the MRGO levees to significant and catastrophic assault by waves and storm surge. American Rivers urges the Corps to comprehensively evaluate and recommend the full suite of measures discussed above to minimize the continued danger from the MRGO and restore the wetlands lost to the channel. The Corps should complete this study as soon as possible, and begin on the ground construction and implementation of the restoration plan within two years, at the absolute latest.

Sincerely,



Melissa Samet
Senior Director, Water Resources

Attachments:
Tab A—*MRGO Must Go* Report
Tab B—Selected Slides Prepared by Dr. Hassan Mashriqui
Tab C—American Rivers' Comments on the Draft Phase I MRGO Report, September 4, 2007
Tab D—Group Comments on Phase I MRGO Report, dated December 14, 2007
Tab E—Team Louisiana Report, Chapter 7
Tab F—Statement of Concerns and Transmittal Letter, December 21, 2006

SAVE OUR LAKE
LAKE PONTCHARTRAIN BASIN FOUNDATION
SAVE OUR COAST
LAKE PONTCHARTRAIN BASIN FOUNDATION
P.O Box 6965 Metairie, LA. 70009-6965 - SaveOurLake.org

November 19, 2008

RE: Formal Comments on the MRGO Ecosystem Restoration Feasibility Study

To: Mr. Greg Miller
Coastal Restoration Branch
CEMVN-PM
PO Box 60267
New Orleans, LA. 70160- 0267
Via email:

Dear Mr. Miller:

Please accept the attached comments submitted by the Lake Pontchartrain Basin Foundation regarding the MRGO Ecosystem Restoration Feasibility Study (MRGO FS).

LPBF supports the recommended measure to build a dam in the MRGO at Bayou la Loutre, but find that the 2007 MRGO report is otherwise wholly deficient in addressing the larger legacy of impacts by the MRGO. At least, seven additional recommendations need to be included in the MRGO FS.

The MRGO FS project must be completed within the proposed timeline and meet all of the Corps obligations to the Public, State and US Congress, or otherwise our organization will have no other alternative but pursue other recourses to remedy the MRGO impacts.

If you have any questions, please do not hesitate to call or email.

Sincerely,



John A. Lopez, Ph.D.
Director - Coastal Sustainability Program
Lake Pontchartrain Basin Foundation
225 294-4998
504 421-7348 cell
johnlopez@pobox.com

Formal Comments MRGO Ecosystem Restoration Feasibility Study (MRGO FS)

Submitted by the Lake Pontchartrain Basin Foundation
November 19, 2008

The Tentatively Selected Plan in the MRGO Report (2007) does not meet the objectives stated:

In the MRGO report title -***"Integrated** Final report to Congress and the Legislative Environmental Impact Statement for the Mississippi River Gulf Outlet Deep-Draft De-authorization Study",*

In the MRGO report - *"Develop a **comprehensive plan** to de-authorize deep-draft navigation on the MRGO channel from the GIWW to the Gulf of Mexico",*

In the letter by Governor Blanco in the MRGO Report - *"plan for closure, **restoration of the extensive wetlands lost as a direct result of the MRGO**, and the integration of this closure into the comprehensive hurricane protection plan".*

The MRGO 2007 report plan only recommends one specific action, which is to plug the channel with a rock dam at Bayou la Loutre. Although we agree with this measure and agree it is the highest environmental priority, the complete absence of other complimentary actions that might be considered as **"Integrated"**, a "**comprehensive plan**" or addressing the significant "**restoration of extensive wetland loss"** clearly does not meet the federal and state mandates for this report or even the title of the MRGO report .

As a participant in the many Corps' MRGO planning meetings, I can testify that the Corps staff emphasized during the planning process that stakeholders present their own comprehensive plans and then work toward some consensus. All this activity is documented in the MRGO report as part of the planning activities. However, it is very disturbing that no other recommendations are made individually or collectively in the plan. In spite of strong support for many common recommendations, the report deals with stakeholder "comments" on most of these recommendations with: "This could be considered under LACPR". Now, the intent of this has been revealed by the Corps, which is to spend another two years of study formulating MRGO alternatives.

Once again the Corps has failed to meet its obligations to the Public, the State, and to the US Congress. Again, the Public asked to repeat its participation in planning to the MRGO restoration. Again, the Public is asked to believe the Corps will deliver on its promises. The MRGO FS project must be completed within the proposed timeline and meet all of the Corps obligations to the Public, State and US Congress, or otherwise our organization will have no other alternative but pursue other recourses to remedy the MRGO impacts.

The fact is that if the Corps acts on the one MRGO report recommendation, it is taking the cheapest way out of a huge debacle created by their own hands. The MRGO report acknowledges direct loss of 22,000 acres (Page vi) of marsh or swamp habitats due to the MRGO. A conservative cost estimate to rebuild the equivalent marsh is at least $570,000,000.

This estimate would actually be much higher if the restoration included building wetlands over the MRGO channel or included reestablishment of the hydrology, such as river diversions. Nevertheless, the recommended rock dam cost is just 5% of the cost to restore 22,000 acres of typical marsh or swamp outside of the channel.

Specifically, we request that the MRGO FS include the following measures which allow a plan which is more integrated, comprehensive and addresses historic wetland loss:

1) Restoration of the Ridge at Bayou la Loutre.
Specific design information for this was requested by the USACE during the MRGO report planning. This was provided to Greg Miller with USACE.
Cost: $80M

2) **Channel Severance or Constriction at Other Locations.**
We recommend three additional plugs of similar design to the dam described in the MRGO report. These would be located between the Bayou la Loutre plug (in the TSP) and the flood gate proposed at Bayou Bienvenue. These additional plugs would serve to segment the 20 mile reach of the channel to reduce wave fetch and the channeling of surge water adjacent to the MRGO levee. This will reduce the risk of damage and failure to the MRGO hurricane protection levee.
Cost: $60M

3) Central Wetlands Swamp Restoration.
Fund the New Orleans Sewage and Water Board project to use treated wastewater for wetlands assimilation and swamp restoration.
Cost: $50M

Rebuild swamp elevation with piping of dredged material from the Mississippi River into the Central Wetlands area.
Cost: $100 M

4) Monitoring
The USFWS makes several important recommendations for the USACE in the MRGO report. We concur with the following USFWS recommendation.

USFWS recommendation (MRGO Report):
"The area in and around the total closure structure and key locations from the total closure structure and north as far as Lake Maurepas, if possible, should be monitored to sufficiently determine the hydrologic effects of the closure and to document the changes in circulation patterns, salinity changes, and changes to the hypoxic-anoxic (H-A) zone, which is about 100 square miles in Lake Pontchartrain with the Industrial Canal as the focal point."

The USACE should fund a five-year monitoring effort jointly through the University of New Orleans and the University of Southeastern Louisiana. Monitoring should focus on changes in water quality, vegetation and fisheries.
Cost $2M

5) Maintaining existing bank stabilization.
USFWS recommendation (MRGO report):
"The Corps should investigate and seek legislative approval (e.g., project specific, Continuing Authority Program Section 206, etc.) to maintain the existing 9.9 miles of bank stabilization features and jetties that provide erosion protection benefits."

The new local sponsor should be funded to maintain the 10 miles of bank stabilization features.
Cost: $20M

6) Violet Diversion.
A freshwater diversion from the Mississippi River at Violet is needed to restore the "Central Wetlands" cypress swamp damaged by the MRGO. A diversion here has very wide support from all the stakeholders. A final report on hydrologic modeling has recently been released by the University of New Orleans (see attachment). This modeling concludes that a diversion at Violet has the potential to achieve the desired ecologic benefits. The state of Louisiana has committed $50M to this diversion, but additional federal funding is needed.

Cost: Other legislation is pending to fund this diversion. Nevertheless, the MRGO report should include this with the MRGO plan for closure since it provides an integral element of the post-MRGO restoration.

7) Marsh/Swamp Creation.
Mechanically rebuilding marsh elevation with pumping of sediment is critical to quickly reestablish the integrity of critical areas of wetlands in the vicinity of the MRGO channel or areas that help buffer storm surge for St. Bernard or Orleans Parishes. These areas should include the Lake Borgne shoreline rim and the Biloxi marsh. (10,000 acres)
Cost: $260M

Conclusion
LPBF supports the recommended measure to build a dam in the MRGO at Bayou la Loutre, but find that the report is otherwise vastly deficient in addressing the larger legacy of impacts by the MRGO. The seven additional recommendations should have been included in the MRGO report, but now must be included in the MRGO FS. The MRGO FS project must be completed within the proposed timeline and meet all of the Corps obligations to the Public, State and US Congress, or otherwise our organization will have no other alternative but pursue other recourses to remedy the MRGO impacts.

Attached Files (also can be found at SaveOurLake.org):
- Violet Diversion modeling report by University of New Orleans
- LPBF's Comprehensive Habitat Management Plan
- Mister Go must go -A guide for the Army Corps. congressionally-directed closure of the MRGO
- Comprehensive Recommendations Supporting the Use of the Multiple Lines of Defense Strategy to Sustain Coastal Louisiana 2008 (Version I)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701

October 27, 2008 F/SER46/RH:jk
225/389-0508

Ms. Elizabeth Wiggins, Chief
Environmental Compliance and Analysis Branch
New Orleans District
Department of the Army, Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Ms. Wiggins:

NOAA's National Marine Fisheries Service (NMFS) has received the October 2, 2008, Federal Register advertising the Department of the Army, Corps of Engineers intent to prepare a Draft Environmental Impact Statement (DEIS) for the Mississippi River-Gulf Outlet Ecosystem Restoration Feasibility Study. The Mississippi River – Gulf Outlet (MRGO) channel has been deauthorized and is in the process of being plugged with a rock structure at the Bayou LaLoutre ridge. The New Orleans District (NOD) is preparing a DEIS to evaluate a full range of comprehensive restoration measures to restore important estuarine components and ecosystem processes within the areas affected by the MRGO navigation channel. The further purpose of the DEIS is to assist in the selection of an array of project components that best restore ecosystems and wetland maintenance processes important to the long term sustainability of wetlands in the project area. Based on our participation to date in the Habitation Evaluation Team (HET) meetings, principal among those activities could be marsh creation with dredged material, ridge construction/restoration using dredged material, shoreline protection using rock breakwaters, and barrier island restoration. It should be noted that while NMFS staff have agreed to serve as members of the HET for this effort, to date NMFS has not been requested to serve as a cooperating agency under provisions of the National Environmental Policy Act (NEPA).

Aquatic and tidally influenced wetland habitats in portions of the study area are designated as essential fish habitat (EFH) for species listed in the fishery management plans for shrimp, red drum, reef fish, and Gulf stone crab managed by the Gulf of Mexico Fishery Management Council (GMFMC). The attached table lists life stages and subcategories of EFH for federally managed fishery species potentially impacted by this project. Primary categories of EFH in the study area include estuarine emergent wetlands; submerged aquatic vegetation/seagrass beds; mud, sand and shell substrates; and estuarine and marine water column. Detailed information on federally-managed fisheries and their EFH is provided in the 2005 generic amendment of the FMPs for the Gulf of Mexico prepared by the GMFMC. The generic amendment was prepared as required by the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act, P.L. 104-297).

In addition to being designated as EFH for the species listed in the attached table, water bodies and wetlands in the study area provide nursery and foraging habitats supportive of a variety of economically important marine fishery species, such as striped mullet, Atlantic croaker, gulf menhaden, spotted and sand seatrout, southern flounder, black drum, and blue crab. Some of these species also serve as prey for other fish species managed under the Magnuson-Stevens Act by the GMFMC (e.g., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks).

NMFS recommends the DEIS include separate sections titled "Essential Fish Habitat" and "Marine Fishery Resources" that identify the EFH and fisheries resources of the study area and describe the potential impacts and benefits to those resources that could be caused by various activities to be described in the document. While NMFS believes that overall project implementation would be very beneficial to protecting and restoring EFH and to maintaining the productivity of marine fishery resources, there are some potential adverse impacts that could be caused by various design features. Direct adverse impacts may be associated with the dredging of channels in shallow water areas to allow equipment to access construction areas and the dredging of deep borrow pits to generate fill for marsh creation. The location and depth of the borrow pits could affect wave and circulation patterns and create anoxic conditions detrimental to aquatic life. Other adverse impacts could be associated with the destruction of shallow water or wetland areas due to the placement of rock rip-rap or concrete mats. The construction of foreshore or sediment containment dikes also could indirectly impact marine fishery resources by impeding access for those fishery species to shallow water and wetlands located behind those structures. Finally, the creation or restoration of ridges to create hydrologic barriers could result in the conversion of marsh to upland elevations. The DEIS should fully evaluate all ridge construction components to ensure they are located in the most beneficial alignment possible and to minimize the filling of marsh.

The EFH and marine fishery resources sections of the document also should describe and quantify the potential impacts and benefits of the proposed activities on EFH sub-categories (e.g., marsh, marsh edge, submerged aquatic vegetation/seagrass beds, mud bottoms, oyster reefs, and estuarine water column). The appropriate sections should describe the potential impacts and benefits of the project components on the utilization of these sub-categories of EFH by those fishery species and life stages included in the enclosed table. The DEIS should evaluate alternatives to any activities that would result in an adverse impact to those resources to determine if there are less damaging methods to achieve the same result. The overall net benefits of the project on wetland habitats supportive of marine fishery resources should not preclude efforts to avoid or minimize negative impacts of some design features on those resources. For example, the DEIS should discuss foreshore dike and/or containment dike design alternatives that avoid or minimize the blockage of access for marine fishery species to EFH. Such alternatives include installing dips in the dikes, not connecting the dikes to the wetlands located behind them, offsetting dike sections to leave openings that allow tidal and fish movement, and the use of existing marsh or features such as spoil banks for dredged material containment.

Finally, NMFS recommends the following general design considerations be incorporated in the feasibility study and during drafting of the DEIS to maximize the fishery productivity of the project area. These measures should be included in the alternatives identified and discussed in the DEIS:

General Design Recommendations

1. To maximize the creation of intertidal wetlands, the NOD should limit final elevations of disposal sites. NMFS recommends final elevations for all tidally-influenced disposal sites not exceed those of naturally occurring, healthy, intertidal marshes in the area. Based on engineering data and sediment compaction curves, the initial fill elevations should be selected such that the final elevations are achieved in no longer than a five year time frame. All contract specifications should include provisions to allow the contractor to be directed to wash or grade any dredged material exceeding initial target elevations prior to demobilization.

2. All containment dikes should be designed and constructed to degrade after dewatering of the dredged material to maximize marine fishery access to beneficial use sites. If a containment dike fails to degrade as designed, provisions should be made to breach the dikes within a reasonable time period. Statements indicating that all containment dikes would be breached if they do not naturally degrade should be provided in the DEIS.

3. Marsh creation sites should be designed and constructed to maximize their ecological productivity and function. Dredged material used to create marsh elevations should be placed in a manner to avoid creating continuous unbroken tracts of marsh. Sites should be designed such that the maximum amount of marsh edge is created and tidal exchange is provided throughout the sites.

4. Temporary work areas and discharge pipe rights-of-way should be aligned and designed to minimize impacts to natural and created wetland habitats.

5. If fish dips are considered, NMFS generally recommends no less than one dip every 1,000 ft. The exact contours, locations and number of openings are dependent on specific site conditions and should be coordinated with NMFS.

6. To the maximum extent possible, ridge construction should be sited on top of existing upland or supratidal features to minimize impacts to wetland habitats. The design of such features should be selected based on a desired elevation to prevent overtopping by a design storm coordinated with the HET. The width, length and alignment of such ridges should be fully coordinated with the HET prior to selection of the final plan.

Please note that our Protected Resources Division is responsible for all issues regarding threatened and endangered species and marine mammals for which NMFS is responsible. For information regarding those resources, please contact Mr. David Bernhart of our Protected Resources Division at (727) 824-5312. For additional information regarding EFH, marine fisheries, or National Environmental Policy Act issues, please contact Mr. Richard Hartman of our Habitat Conservation Division, Baton Rouge Office at (225) 389-0508, ext 203.

Sincerely,

for Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

Enclosure

c:
FWS, Lafayette
EPA, Dallas
LA DNR, Consistency
F/SER46, Swafford
F/SER3, Bernhart
Files

EFH Requirements for Species Managed by the Gulf of Mexico Fishery Management Council: Ecoregion 3, Pensacola Bay, FL to Mississippi River Delta (South Pass) that occur in the study area.

Species	Life Stage	System[a]	EFH
Brown shrimp	larvae	M	<82 m; planktonic, sand/shell/soft bottom, SAV, emergent marsh, oyster reef
	juvenile	E	<18 m; SAV, sand/shell/soft bottom, SAV, emergent marsh, oyster reef
White shrimp	juvenile	E	<30 m; SAV, soft bottom, emergent marsh
Pink shrimp	juvenile	E	<65 m; sand/shell substrate
Gulf stone crab	eggs	E/M	<18 m; sand/shell/soft bottom
	larvae/postlarvae	E/M	<18 m; planktonic/oyster reefs, soft bottom
	juvenile	E	<18 m; sand/shell/soft bottom, oyster reef
Red drum	larvae/postlarvae	E	all estuaries planktonic, SAV, sand/shell/soft bottom, emergent marsh
	juvenile	E/M	GOM <5 m W from Mobile Bay; all estuaries SAV, sand/shell/soft/hard bottom, emergent marsh
	adults	M/E	GOM 1-46 m W from Mobile Bay; all estuaries SAV, pelagic, sand/shell/soft/hard bottom, emergent marsh
Lane snapper	larvae	E/M	4-132 m; reefs, SAV
	juvenile	E/M	<20 m; SAV, mangrove, reefs, sand/shell/soft bottom
Dog snapper	juvenile	E/M	SAV, mangrove, emergent marsh

[a] E=estuarine, M=marine

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506

October 31, 2008

Colonel Alvin B. Lee
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

SUBJECT: Mississippi River Gulf Outlet Ecosystem Restoration Feasibility Study
Department of Interior Reference Number ER08/1032

Dear Colonel Lee:

The U.S. Fish and Wildlife Service's (Service) Lafayette, Louisiana, Field Office has received the U.S. Army Corps of Engineers' (Corps) October 2, 2008, Notice of Intent (NOI) to prepare a Draft Environmental Impact Statement (DEIS) for the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Feasibility Study that would encompass the middle and lower Lake Pontchartrain Basin, in Orleans and St. Bernard Parishes, Louisiana. We have reviewed the information provided, and offer the following comments in accordance with the National Environmental Policy Act (NEPA) of 1969 (83 Stat. 852; 42 U.S.C. 4321 et seq.), Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.), Bald and Golden Eagle Protection Act (BGEPA) (54 Stat. 250, as amended, 16 U.S.C. 668a-d), Migratory Bird Treaty Act (MBTA) (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.), and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

According to the NOI, the Corps proposes to develop a comprehensive ecosystem restoration plan to restore the areas affected by the MRGO navigation channel. That plan would include physically modifying the MRGO channel and restoring areas affected by the channel; restoring natural ecosystem features to reduce damage from storm surge; measures to prevent saltwater intrusion into the channel; measures to protect, restore, or increase wetlands to prevent saltwater intrusion or storm surge; measures to reduce risk of storm damage to communities by preventing or reducing wetland losses or restoring wetlands in areas affected by navigation, oil and gas, and other manmade channels; and constructing diversions to restore the Lake Borgne ecosystem. Restoration measures being considered during the feasibility study include freshwater, sediment, and nutrient introductions; shoreline protection and bank stabilization; restoration and protection of natural ridges; barrier island protection and restoration; wetland protection, creation, and restoration; water control measures (e.g., gates, weirs, sills, plugs, etc.); measures to increase native vegetation; and restoration of natural features to reduce storm surge. As the Corps

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develops the proposed DEIS we recommend that the following fish and wildlife resources also receive consideration during the feasibility study.

Endangered Species

Federally listed as an endangered species, West Indian manatees (*Trichechus manatus*) occasionally enter Lakes Pontchartrain and Maurepas, and associated coastal waters and streams during the summer months (i.e., June through September). Manatee occurrences appear to be increasing, and they have been regularly reported in the Amite, Blind, Tchefuncte, and Tickfaw Rivers, and in canals within the adjacent coastal marshes of Louisiana. They have also been occasionally observed elsewhere along the Louisiana Gulf coast. The manatee has declined in numbers due to collisions with boats and barges, entrapment in flood control structures, poaching, habitat loss, and pollution. Cold weather and outbreaks of red tide may also adversely affect these animals. Should any proposed projects involve activities in the aquatic environment in those areas during summer months, further consultation with this office will be necessary.

Federally listed as an endangered species, brown pelicans (*Pelecanus occidentalis*) are currently known to nest on Raccoon Point on Isles Dernieres, as well as Queen Bess Island, Plover Island (Baptiste Collette), Wine Island, Rabbit Island in Calcasieu Lake, and islands in the Chandeleur chain. Pelicans change nesting sites as habitat changes occur; thus, they may also be found nesting on mud lumps at the mouth of South Pass (Mississippi River Delta) and on small islands in St. Bernard Parish. In spring and summer, nests are built in mangrove trees or other shrubby vegetation, although ground nesting may also occur. Brown pelicans feed along the Louisiana coast in shallow estuarine waters, using sand spits and offshore sand bars as rest and roost areas. Major threats to this species include chemical pollutants, colony site erosion, disease, and human disturbance.

Federally listed as a threatened species, the piping plover (*Charadrius melodus*), as well as its designated critical habitat, occur along the Louisiana coast. Piping plovers winter in Louisiana, and may be present for 8 to 10 months annually. They arrive from the breeding grounds as early as late July and remain until late March or April. Piping plovers feed extensively on intertidal beaches, mudflats, sand flats, algal flats, and wash-over passes with no or very sparse emergent vegetation; they also require unvegetated or sparsely vegetated areas for roosting. Roosting areas may have debris, detritus, or micro-topographic relief offering refuge to plovers from high winds and cold weather. In most areas, wintering piping plovers are dependent on a mosaic of sites distributed throughout the landscape, because the suitability of a particular site for foraging or roosting is dependant on local weather and tidal conditions. Plovers move among sites as environmental conditions change, and studies have indicated that they generally remain within a 2-mile area. Major threats to this species include the loss and degradation of habitat due to development, disturbance by humans and pets, and predation.

On July 10, 2001, the Service designated critical habitat for wintering piping plovers (Federal Register Volume 66, No. 132). Their designated critical habitat identifies specific areas that are essential to the conservation of the species. The primary constituent elements for piping plover wintering habitat are those habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support those habitat components. Constituent elements are found in geologically dynamic coastal areas that contain intertidal beaches and flats (between annual low tide and annual high tide), and associated dune

systems and flats above annual high tide. Important components (or primary constituent elements) of intertidal flats include sand and/or mud flats with no or very sparse emergent vegetation. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting plovers.

The Gulf sturgeon (*Acipenser oxyrhynchus desotoi*), federally listed as a threatened species, is an anadromous fish that occurs in many rivers, streams, and estuarine waters along the northern Gulf coast between the Mississippi River and the Suwannee River, Florida. In Louisiana, Gulf sturgeon have been reported at Rigolets Pass, rivers and lakes of the Lake Pontchartrain basin, and adjacent estuarine areas. Spawning occurs in coastal rivers between late winter and early spring (i.e., March to May). Adults and sub-adults may be found in those rivers and streams until November, and in estuarine or marine waters during the remainder of the year. Sturgeon less than two years old appear to remain in riverine habitats and estuarine areas throughout the year, rather than migrate to marine waters. Habitat alterations such as those caused by water control structures that limit and prevent spawning, poor water quality, and over-fishing have negatively affected this species.

On March 19, 2003, the Service and the National Marine Fisheries Service (NMFS) published a final rule in the Federal Register (Volume 68, No. 53) designating critical habitat for the Gulf sturgeon in Louisiana, Mississippi, Alabama, and Florida. Portions of the Pearl and Bogue Chitto Rivers, Lake Pontchartrain east of the Lake Pontchartrain Causeway, all of Little Lake, The Rigolets, Lake St. Catherine, and Lake Borgne within Louisiana were included in that designation. The primary constituent elements essential for the conservation of Gulf sturgeon are those habitat components that support feeding, resting, sheltering, reproduction, migration, and physical features necessary for maintaining the natural processes that support those habitat components; those elements should be considered when determining potential project impacts. The primary constituent elements for Gulf sturgeon critical habitat include:

- abundant prey items within riverine habitats for larval and juvenile life stages, and within estuarine and marine habitats for juvenile, sub-adult, and adult life stages;

- riverine spawning sites with substrates suitable for egg deposition and development, such as limestone outcrops and cut limestone banks, bedrock, large gravel or cobble beds, marl, soapstone, or hard clay;

- riverine aggregation areas, also referred to as resting, holding and staging areas, used by adult, sub-adult, and/or juveniles, generally, but not always, located in holes below normal river bend depths, believed necessary for minimizing energy expenditures during freshwater residency and possibly for osmoregulatory functions;

- a flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of freshwater discharge over time) necessary for normal behavior, growth, and survival of all life stages in the riverine environment, including migration, breeding site selection, courtship, egg fertilization, resting, and staging; and necessary for maintaining spawning sites in suitable condition for egg attachment, egg sheltering, resting, and larvae staging;

- water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages;

- sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages; and

- safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (e.g., a river unobstructed by a permanent structure, or a dammed river that still allows for passage).

In that critical habitat designation, responsibility for consultation with specific Federal agencies was also identified for the Service and for the NMFS. For estuarine waters in Louisiana, the NMFS is responsible for consultations regarding impacts to the sturgeon and its critical habitat with all Federal agencies, except the Department of Transportation, the Environmental Protection Agency, the U.S. Coast Guard, and the Federal Emergency Management Agency, which consult with the Service. In riverine waters, the Service is responsible for all consultations regarding Gulf sturgeon and critical habitat, while in marine waters the NMFS is responsible for consultation. Therefore, please contact Dr. Stephania Bolden (727/824-5312) in St. Petersburg, Florida, for information concerning that species and its critical habitat. Should the proposed project directly or indirectly affect the Gulf sturgeon or its critical habitat in Louisiana, further consultation with that office will be necessary.

The pallid sturgeon (*Scaphirhynchus albus*) is an endangered fish found in Louisiana, in both the Mississippi and Atchafalaya Rivers (with known concentrations in the vicinity of the Old River Control Structure Complex); it is possibly found in the Red River as well. The pallid sturgeon is adapted to large, free-flowing, turbid rivers with a diverse assemblage of physical characteristics that are in a constant state of change. Detailed habitat requirements of this fish are not known, but it is believed to spawn in Louisiana. Habitat loss through river channelization and dams has adversely affected this species throughout its range. Entrainment issues associated with dredging operations in the Mississippi and Atchafalaya Rivers and through diversion structures off the Mississippi River are two potential effects that should be addressed in future planning studies and/or in analyzing any specific project effects.

Endangered and threatened sea turtles forage in the nearshore waters, bays and sounds of Louisiana. The NMFS is responsible for aquatic marine threatened or endangered species. Please contact Eric Hawk (727/824-5312) at the NMFS' Regional Office in St. Petersburg, Florida, for information concerning those species in the aquatic environment. When sea turtles leave the aquatic environment and come onshore to nest, however, the Service is responsible for consultation. Accordingly, we recommend that you contact this office if your activities would occur on beach areas during the sea turtle nesting season, which depends on the species in question.

Migratory Birds

The project-area forested wetlands may provide nesting habitat for the bald eagle (*Haliaeetus leucocephalus*), which was officially removed from the List of Endangered and Threatened

Species on August 8, 2007. Bald eagles nest in Louisiana from October through mid-May. Eagles typically nest in mature trees (e.g., bald cypress, sycamore, willow, etc.) near fresh to intermediate marshes or open water in the southeastern Parishes. Areas with high numbers of nests include the Lake Verret Basin south to Houma, the marsh/ridge complex south of Houma to Bayou Vista, the north shore of Lake Pontchartrain, and the Lake Salvador area. Eagles also winter, and infrequently nest, in mature pine trees near large lakes in central and northern Louisiana. Major threats to this species include habitat alteration, human disturbance, and environmental contaminants (i.e., organochlorine pesticides and lead).

Breeding bald eagles occupy "territories" that they will typically defend against intrusion by other eagles, and that they likely return to each year. A territory may include one or more alternate nests that are built and maintained by the eagles, but which may not be used for nesting in a given year. Potential nest trees within a nesting territory may, therefore, provide important alternative bald eagle nest sites. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that may weigh more than 1,000 pounds. Most nests are located in the upper 30 feet of the tree; the cone-shaped nest may be 6 to 8 feet in diameter and 6 to 8 feet from top to bottom. Nest sites typically include at least one perch with a clear view of the water or area where the eagles usually forage. Shoreline trees or snags located near large waterbodies provide the visibility and accessibility needed to locate aquatic prey. Bald eagles are vulnerable to disturbance during courtship, nest building, egg laying, incubation, and brooding. Disturbance during this critical period may lead to nest abandonment, cracked and chilled eggs, and exposure of small young to the elements. Human activity near a nest late in the nesting cycle may also cause flightless birds to jump from the nest tree, thus reducing their chance of survival.

Although the bald eagle has been removed from the List of Endangered and Threatened Species, it continues to be protected under the BGEPA and the MBTA. The Service developed the National Bald Eagle Management (NBEM) Guidelines to provide landowners, land managers, and others with information and recommendations to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the BGEPA. A copy of the NBEM Guidelines is available at: http://www.fws.gov/southeast/es/baldeagle/NationalBaldEagleManagementGuidelines.pdf. Those guidelines recommend: (1) maintaining a specified distance between the activity and the nest (buffer area); (2) maintaining natural areas (preferably forested) between the activity and nest trees (landscape buffers); and (3) avoiding certain activities during the breeding season. On-site personnel should be informed of the possible presence of nesting bald eagles within the project boundary, and should identify, avoid, and immediately report any such nests to this office. If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary. The Division of Migratory Birds for the Southeast Region of the Service (phone: 404/679-7051, e-mail: SEmigratorybirds@fws.gov) has the lead role in conducting such consultations. Should you need further assistance interpreting the guidelines or performing an on-line project evaluation, please contact this office.

The proposed feasibility study would also encompass areas where colonial nesting waterbirds may be present. Colonies may be present that are not currently listed in the database maintained by the Louisiana Department of Wildlife and Fisheries. That database is updated primarily by monitoring the colony sites that were previously surveyed during the 1980s. Until a new, comprehensive coast-wide survey is conducted to determine the location of newly-established nesting colonies, we recommend that a qualified biologist inspect the proposed work site for the presence of undocumented nesting colonies during the nesting season. To minimize disturbance to colonial nesting birds, the following restrictions on activity should be observed:

1. For colonies containing nesting brown pelicans, all activity occurring within 2,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 15 through March 31). Nesting periods vary considerably among Louisiana's brown pelican colonies, however, so it is possible that this activity window could be altered based upon the dynamics of the individual colony. The Louisiana Department of Wildlife and Fisheries' Fur and Refuge Division should be contacted to obtain the most current information about the nesting chronology of individual brown pelican colonies. Brown pelicans are known to nest on barrier islands and other coastal islands in St. Bernard, Plaquemines, Jefferson, Lafourche, and Terrebonne Parishes, and on Rabbit Island in lower Calcasieu Lake, in Cameron Parish.

2. For colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present).

3. For colonies containing nesting gulls, terns, and/or black skimmers, all activity occurring within 650 feet of a rookery should be restricted to the non-nesting period (i.e., September 16 through April 1, exact dates may vary within this window depending on species present).

In addition, we recommend that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests, and should avoid affecting them during the breeding season.

National Wildlife Refuges and State Wildlife Management Areas

The Service's Bayou Sauvage National Wildlife Refuge (NWR) is located within the city limits of New Orleans and encompasses approximately 23,000 acres in Orleans Parish. It is the largest urban NWR in the United States and one of the last remaining marsh areas adjacent to Lakes Pontchartrain and Borgne. The NWR contains a wide variety of habitat including bottomland hardwoods, fresh and brackish water marshes, lagoons, canals, borrow pits, cheniers, and natural bayous. Primary refuge objectives are to provide high-quality habitat for migratory birds, threatened and endangered species, and other native fish and wildlife species, along with compatible recreational opportunities for the public. Fishing, crawfishing, crabbing, canoeing, hiking, biking, and wildlife viewing are allowed on that NWR.

The National Wildlife Refuge System Improvement Act of 1997 mandates that no new or expanded use of a NWR may be allowed unless it is first determined to be compatible with the

objectives for which that NWR was established and managed. A compatibility determination is a written determination, signifying that a proposed or existing use of a NWR is, or is not, a compatible use. Compatible uses are defined as proposed or existing wildlife-dependent recreational uses or any other uses of an NWR that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the NWR. A compatibility determination is only required when the Service has jurisdiction over the use. For example, proposed uses that deal exclusively with air space, navigable waters, or overlay refuges where another Federal agency has primary jurisdiction over the area, would not be subject to compatibility determinations.

Accordingly, we strongly recommend that, prior to proposing any projects that include features on that NWR, you should contact the Refuge Manager early in the planning process to determine if the proposed project constitutes a "refuge use" subject to a compatibility determination. In order to determine the anticipated impacts of any proposed use, the Federal planning agency may be required to provide sufficient data and information sources to document any short-term, long-term, direct, indirect or cumulative impacts on refuge resources. Compatibility determinations will include a public review and comment period before issuance of a final decision by the Refuge Manager. Please contact the Southeast Louisiana Refuges Complex at (985/882-2000) for further information.

The Biloxi Wildlife Management Area (WMA), owned by the Louisiana Department of Wildlife and Fisheries (LDWF), is located in upper St. Bernard Parish approximately 40 miles east of New Orleans. It consists of approximately 39,583 acres of low brackish to saline marsh. A few oak trees are scattered on old ridges, but the major vegetation consists of marsh hay cord grass, black rush, hog cane, smooth cord grass, salt grass, glasswort, and three square. The submerged aquatic vegetation in the area is dominated by widgeon grass. Numerous species of non-game amphibians, reptiles, birds, mammals, and invertebrates utilize the area. The area is popular with hunters and trapping for furbearers is permitted. The area is also used by recreational and commercial fishermen. Other forms of recreation on the WMA include boating, crabbing, shrimping, and wildlife watching. Any project proposals that may affect the Biloxi WMA should be coordinated with LDWF's New Iberia, Louisiana, Office (337/373-5100).

The Service supports restoration of ecosystem impacts related to the MRGO navigation channel. We look forward to working with the Corps in the development of the proposed comprehensive plan and individual restoration projects. We appreciate the opportunity to assist in the early planning stages of this proposed project, and we also look forward to working closely with Corps during development of the forthcoming DEIS. If you need further assistance or have questions regarding our letter, please contact Ms. Catherine Breaux (504/862-2689) or Mr. David Walther (337/291-3122) of this office.

Sincerely,

James F. Boggs
Supervisor
Louisiana Field Office

cc: DOI, OEPC, Washington, D.C.
DOI, OEPC, Albuquerque, NM
FWS, BAP & HC (ERT), Washington, D.C.
FWS, (ES/HC) Atlanta, GA (Attn: Mr. Jeff Weller)
FWS, Southeast Louisiana NWR Complex, Lacombe, LA
EPA, Dallas, TX
NMFS, Baton Rouge, Louisiana
NMFS, St. Petersburg, FL
LA Dept. of Natural Resources, Coastal Management Division, Baton Rouge, LA
LA Dept. of Natural Resources, Coastal Restoration Division, Baton Rouge, LA
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Wildlife and Fisheries, New Iberia, LA
LA Natural Heritage Program, Baton Rouge, LA

APPENDIX
B

Basis for Analysis

Following the identification of the tentatively selected plan (TSP), a construction sequence was developed. Assumptions factoring into the construction sequence include production rates for building rock projects, dredge equipment availability, land loss rates, and the limitation of alternating dredging cycles in the lobes of Lake Borgne. The benefits for the MRGO plan were calculated using this construction sequence and without the incorporation of Operation and maintenance (O&M). However, due to uncertainties associated with the timing and availability of funding for the plan, only those features that are sustainable without the implementation of any other feature (such as a diversion) are recommended for construction at this time. A tiered implementation approach has been developed for the TSP (Table 2-28 of EIS) based on these uncertainties. In addition, O&M has been included in the TSP. The benefits have been recalculated by tier utilizing the previously developed construction sequence and without O&M. Due to the uncertainty of when each feature will be implemented, the WVAs will require updating in later phases of the project.

Draft Implementation Plan (used to calculate benefits without O&M)	
Measure	**Description**
Construction Year 1	
LS1	47,000 linear feet (8.9 miles) of shoreline protection beginning at the terminus of the Bayou Dupre supplemental shoreline project, extending around Proctor Point to the West of Shell Beach supplemental funding shoreline protection.
MRGO1	3,850 feet of new foreshore protection between MRGO miles 56.6 and 57.4. This stone protection feature is embedded within the limits of MRGO7.
MRGO6	8,132 linear feet of new, non-continuous foreshore protection between MRGO miles 36.0 and 34.2, immediately east of the existing stone closure of the MRGO. MRGO6 ties into an existing foreshore dike immediately downstream.
LM1	3,240 acres of marsh restoration from open water and nourishment of 777 adjacent acres in the Golden Triangle, south of the IHNC Surge Barrier. Approximately 12.8 million cubic yards of borrow to be obtained from Lake Borgne Borrow Area 6.
LM4	289 acres of marsh restoration and nourishment of 95 adjacent acres of marsh in the portion of the Golden Triangle bordered by the GIWW, the IHNC Surge Barrier, and the MRGO. Approximately 1.4 million cubic yards of borrow material would be obtained from Lake Borgne Area 6.
LM2	422 acres of marsh restoration and 2,523 acres of marsh nourishment in the area between Proctor Point and the MRGO. Approximately 4.9 million cubic yards of borrow material to be obtained from Lake Borgne Borrow Area 3.

Draft Implementation Plan (used to calculate benefits without O&M)	
Measure	**Description**
Construction Year 2	
BS1	Approximately 51,000 linear feet (9.7 miles) of shoreline protection along the southeast shore of Lake Borgne. This feature begins at the northern terminus of the Biloxi Marsh Shoreline Protection Project (PO-72) south of Point aux Marchettes and extends north to Malheureax Point.
BS2	Approximately 39,600 linear feet (7.5 miles) of artificial oyster reef development on the Chandeleur Sound side of the Biloxi Marsh between Eloi Point and the mouth of Bayou La Loutre.
CC4-A	420 acres of cypress restoration in the Bienvenue Triangle. Approximately 2.9 million cubic yards of material to be obtained from the Mississippi River.
BR1	Approximately 48 acres of ridge restoration on the south bank of Bayou La Loutre. 425,000 cubic yards of silty sand material to be obtained from the Mississippi River.
CM2	795 acres of marsh restoration and 190 acres of marsh nourishment north of Paris Road. 3.3 million cubic yards of material are required, 2.6 million cubic yards of which can be obtained from the adjacent reach of the GIWW. The remaining material would be obtained from the Michoud Canal.
Construction Year 3	
ES1	24,000 linear feet (4.6 miles) of shoreline protection from the south shore of Lake Pontchartrain to the terminus of the existing Bayou Chevee shoreline protection feature.
ES2	30,750 linear feet of shoreline protection in Lake Pontchartrain between Chef Menteur Pass and The Rigolets.
ES3	70,000 feet of foreshore protection along Lake Borgne between Alligator Point and The Rigolets.
Construction Year 4	
HM1	757 acres of marsh restoration and the nourishment of 973 acres of adjacent marsh, located in the Hopedale area bordered by MRGO to the northeast. 4.1 million cubic yards of dredged material would be obtained from Lake Borgne Borrow Area 2.
TM1	760 acres of marsh restoration and 223 acres of marsh nourishment, requiring approximately 3.2 million cubic yards of material to be obtained from Lake Borgne Borrow Site 2.
TM2	770 acres of marsh restoration and 3,400 acres of marsh nourishment in the vicinity of Lake Ameda. Approximately 7.4 million cubic yards of borrow material would be obtained from Lake Borgne Borrow Area 2.
MRGO5	188 acres of marsh would be restored behind 14,485 linear feet of vinyl sheet pile wall to establish the shoreline. 2.7 million cubic yards of material would be obtained from Lake Borgne.

Draft Implementation Plan (used to calculate benefits without O&M)	
Measure	**Description**
MRGO8	200 acres of marsh restoration adjacent to approximately 20,640 linear feet of bank reclamation constructed using vinyl sheet pile wall. 3.2 million cubic yards of material would be obtained from Lake Borgne. Approximately 13,572 linear feet of new foreshore protection would also be included between approximate channel miles 51.0 and 48.3
Construction Year 5	
MRGO7	91 acres of marsh restoration adjacent to approximately 9,700 linear feet of bankline reclamation, consisting of 9,700 linear feet of vinyl sheet pile wall. 1.3 million cubic yards of material would be obtained from Lake Borgne.
EM1	1,175 acres of marsh restoration and nourishment of 2,830 acres of surrounding marsh in the area bounded by the Lake Pontchartrain shoreline, Chef Menteur Pass, and the levee. Approximately 8.1 million cubic yards of material would be obtained from Lake Borgne Borrow Area 6.
Construction Year 6	
LM3	911 acres of marsh creation and 950 acres of marsh nourishment in South Lake Borgne north of Lena Lagoon in the area bounded by the lake, Bayou St. Malo, MRGO, and Doulets Canal. Approximately 4.6 million cubic yards of borrow to be obtained from Lake Borgne Borrow Area 2.
BM1	8,295 acres of marsh nourishment along the south shore of Lake Borgne. 10.8 million cubic yards of material would be obtained from Lake Borgne Borrow Area 2.
Construction Year 7	
CM1	1,240 acres of marsh nourishment south of Paris Road between cypress restoration feature CC3 and the Chalmette Loop Levee. Approximately 3.0 million cubic yards of material would be dredged from Lake Borgne Borrow Area 5 for this feature.
CM3	300 acres of marsh restoration and 215 acres of marsh nourishment in the area north of Bayou Dupre and south of MRGO. 1.9 million cubic yards of borrow material would be obtained from Lake Borgne Borrow Area 5.
CM4	98 acres of marsh restoration and 129 acres of marsh nourishment south of Bayou Dupre. 900,000 cubic yards of dredged material would be obtained from Lake Borgne Borrow Area 4.
CM5	245 acres of marsh restoration and 70 acres of marsh nourishment in the area north of Bayou Bienvenue and Paris Road. 1.2 million cubic yards of material would be obtained from Lake Borgne Borrow Area 4.
Construction Year 8	
TM7	2,255 acres of marsh restoration and up to 3,338 acres of adjacent marsh nourishment on the east side of Bayou Terre aux Boeufs. 11.5 million cubic yards of material would be obtained from Lake Lery if available, but it is currently assumed that material will be obtained from Lake Borgne Borrow Area 2.

Draft Implementation Plan (used to calculate benefits without O&M)	
Measure	**Description**
TM8	1,511 acres of marsh restoration on the east side of Bayou Terre aux Boeufs in the vicinity of Delacroix. 5.5 million cubic yards of material would be dredged from Lake Lery if possible, but it is currently assumed that material will be obtained from Lake Borgne Borrow Area 2.
EM2	1,095 acres of marsh nourishment on Hog Island, located between the west and east mouth of the West Pearl River. Approximately 2.2 million cubic yards of dredged material would be obtained from Lake Borgne Borrow Area 8.
EM3	861 acres of marsh restoration and 180 acres of adjacent marsh nourishment in the area bounded by Highway 433, Little Lagoon, Salt Bayou and Highway 90. Approximately 3.5 million cubic yards of dredged material would be obtained from Lake Borgne Borrow Area 8.
EM4	2,625 acres of marsh restoration and 1,455 acres of adjacent marsh nourishment in the area bounded by Salt Bayou to the north, the West Pearl River to the east, the Rigolets to the south and Highway 80 to the north. Approximately 10.6 million cubic yards of material would be obtained from Lake Borgne Borrow Area 8.
Construction Year 9	
CC1	1,020 acres of cypress swamp restoration and 953 acres of cypress swamp nourishment in the area north of the existing Violet Canal along the Forty Arpent levee. 8.5 million cubic yards of borrow material to be obtained from Lake Borgne Borrow Area 5.
CC2	250 acres of cypress swamp restoration and 250 acres of swamp nourishment to the northeast of CC1. 2.4 million cubic yards of borrow material to be obtained from Lake Borgne Borrow Area 5.
CC3	370 acres of cypress swamp restoration and 790 acres of swamp nourishment along the Forty Arpent Levee south of Paris Road. Approximately 5.3 million cubic yards of material to be obtained from Lake Borgne Borrow Area 5.
CC4	1,465 acres of cypress swamp restoration in the open water areas adjacent to the Forty Arpent Levee north of Paris Road, including the Bienvenue Triangle area in Orleans Parish. 11.3 million cubic yards of borrow material to be obtained from Lake Borgne Borrow Area 6.
Construction Year 10	
CC5	1,120 acres of swamp restoration and 1,645 acres of swamp nourishment south of the Violet Canal along the Forty Arpent Levee and the Chalmette Loop Levee. 9.6 million cubic yards of borrow material to be obtained from Lake Borgne Borrow Area 4.
CC6	1,028 acres of swamp restoration and 1,540 acres of swamp nourishment in the southwest corner of the Central Wetlands. 11.2 million cubic yards of borrow material would be obtained Lake Borgne Borrow Area 4.
Maintenance As Needed	

Draft Implementation Plan (used to calculate benefits without O&M)	
Measure	**Description**
MRGO2	Repair and maintenance of approximately 15,070 linear feet (2.85 miles) of foreshore protection between Mile 44.4 and 39.9 of the MRGO.
MRGO3	Repair and maintenance of existing approximately 10,420 linear feet (1.97 miles) of foreshore protection between approximately Mile 56 to 51 of the MRGO.
MRGO4	Repair and maintenance of approximately 6,690 linear feet (1.27 miles) of existing retention dike MRGO Miles 36.6 to 37.1 and MRGO Miles 33.9 to 32.9.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506

March 13, 2012

Colonel Edward R Fleming
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel Fleming:

Please reference the "Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study." The MRGO Ecosystem Restoration Plan (Plan) is being developed as a supplement to the June 2008 MRGO Deep-Draft De-Authorization Report and is intended to fully meet the requirements of the Water Resources Development Act (WRDA) of 2007, Section 7013. This feasibility study is anticipated to result in a Chief of Engineers' Report containing a recommended MRGO Ecosystem Restoration Plan, which has been conditionally authorized for construction by WRDA 2007, Section 7013. The Plan will address systematic ecosystem restoration and protection of the Lake Borgne ecosystem and areas affected by the former MRGO navigation channel, and will include considerations of measures to reduce or prevent damage from possible future storm surge.

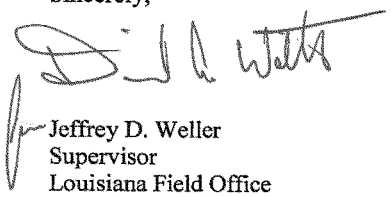
One feature of the plan, the Violet Diversion, will be implemented only after additional study and under a separate authority; however, the Fish and Wildlife Service (Service) has included our recommendations in this report on that feature to aid in the future planning efforts. The Service supports the Plan as proposed, but encourages the inclusion of a barrier island feature to address impacts to the Breton National Wildlife Refuge resulting from construction and maintenance of the MRGO.

This final report contains a description of existing fish and wildlife resources in the project area, discusses future with-project (FWP) and future without-project (FWOP) habitat conditions, identifies fish and wildlife-related impacts, and provides recommendations to improve the proposed MRGO Ecosystem Restoration Project. This document constitutes the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The Service has coordinated with National Marine Fisheries (NMFS) and Louisiana Department of Wildlife and Fisheries (LDWF); their comments are incorporated into this final report.

TAKE PRIDE IN AMERICA

We appreciate the cooperation of your staff on this study. Should your staff have any questions regarding the enclosed report, please have them contact Mrs. Catherine Breaux (504/862-2689) of this office.

Sincerely,



Jeffrey D. Weller
Supervisor
Louisiana Field Office

Enclosures

cc: Southeast Louisiana Refuges Complex, Bayou Lacombe, LA
FWS, Jackson, MS
Gulf Islands National Seashore, Gulf Breeze, FL
EPA, Dallas, TX
National Marine Fisheries Service, Baton Rouge, LA
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Natural Resources (CMD), Baton Rouge, LA
Coastal Protection and Restoration Authority (CPRA), Baton Rouge, LA

FINAL
Fish and Wildlife Coordination Act Report

THE MISSISSIPPI RIVER GULF OUTLET (MRGO) ECOSYSTEM RESTORATION PLAN FEASIBILITY STUDY

PROVIDED TO
NEW ORLEANS DISTRICT
U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

PREPARED BY
CATHERINE BREAUX, SENIOR FIELD BIOLOGIST

U.S. FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
LAFAYETTE, LOUISIANA

MARCH 2012

U.S. FISH AND WILDLIFE SERVICE – SOUTHEAST REGION

EXECUTIVE SUMMARY

The "Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study" (MRGO Ecosystem Restoration Plan) is being developed as a supplement to the June 2008 MRGO Deep-Draft De-Authorization Report and is intended to fully meet the requirements of the Water Resources Development Act (WRDA) of 2007, Section 7013. This feasibility study is anticipated to result in a Chief of Engineers' Report containing a recommended MRGO Ecosystem Restoration Plan, which has been conditionally authorized for construction by WRDA 2007, Section 7013. The Plan will address systematic ecosystem restoration and protection of the Lake Borgne ecosystem and areas affected by the former MRGO navigation channel and will also include consideration of measures to reduce or prevent damage from storm surge.

If the Assistant Secretary of the Army, Civil Works determines that the recommendations of the MRGO Ecosystem Restoration Plan are cost-effective, environmentally acceptable, and technically feasible, no further Congressional authorization is needed. However, the execution of the implementation phase is subject to additional funding and appropriations. Cost-sharing for implementation is subject to the rules for ecosystem restoration projects established in Section 210 of WRDA 1996.

The MRGO Ecosystem Restoration Plan would: 1) Restore the Lake Borgne ecosystem and the areas affected by the MRGO navigation channel by restoring historic salinity regimes through reduced saltwater intrusion into the MRGO, restoring and sustaining critical geomorphic structures that serve as salinity barriers, and introducing freshwater; 2) Restore habitat diversity by restoring and sustaining marsh, swamp, bottomland hardwood, and ridge habitats; 3) Restore and sustain historic water quality, hydrologic functions, and circulation patterns; 4) Achieve ecosystem sustainability to the greatest degree possible; and 5) Restore natural features of the ecosystem that will reduce or prevent damage from storm surge by protecting, restoring, or increasing wetlands, forested habitats, and critical geomorphic structures in the study area.

This final report contains a description of existing fish and wildlife resources in the project area, discusses future with-project (FWP) and future without-project (FWOP) habitat conditions, identifies fish and wildlife-related impacts, and provides recommendations to improve the proposed MRGO Ecosystem Restoration Project. This document constitutes the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The Fish and Wildlife Service (Service) has coordinated with National Marine Fisheries (NMFS) and Louisiana Department of Wildlife and Fisheries (LDWF); their comments have been incorporated into the draft and final reports.

The project area is centered on the Lake Borgne ecosystem, and includes parts of southwestern Mississippi and southeastern Louisiana. This includes St. Bernard, Orleans, and Plaquemines parishes in Louisiana and Hancock and Harrison counties in Mississippi. The project area is bordered to the west by the East Orleans landbridge and continues southward to include the Golden Triangle, Central Wetlands, Proctor Point, the former MRGO, and Terre aux Boeufs ridge. The northern boundary follows the coastline into Mississippi and includes the lower Pearl River basin and Western Mississippi Sound. The eastern edge of the project area extends to the

Chandeleur Islands.

The Tentatively Selected Plan (TSP) is alternative C, which would initially restore approximately 57,472 acres of habitat in the study area, including 14,123 acres of fresh and intermediate marsh; 32,511 acres of brackish marsh; 10,318 acres of cypress swamp; 466 acres of saline marsh; and 54 acres of ridge habitat. Alternative C also includes approximately 71 miles of shoreline protection. Features in the East Orleans Landbridge and South Lake Borgne subunits include marsh creation and nourishment and shoreline protection. The Terre Aux Boeuf subunits include marsh creation and nourishment. The Central Wetland features include a freshwater diversion at Violet, cypress swamp and marsh restoration and nourishment. Features in the Biloxi Marshes consist of restoring part of the existing subsided ridge on the south bank of Bayou La Loutre, marsh creation and nourishment, and shoreline protection. It should be noted that there is no barrier island feature in the TSP, even though construction and maintenance of the MRGO adversely impacted Breton Island which is part of the Breton National Wildlife Refuge (NWR).

The TSP will benefit the fish and wildlife resources of the MRGO Ecosystem Restoration area by providing freshwater, nutrients, and sediments, and restoring ridge, swamp and marsh habitats in the study area thus facilitating increasing organic production, increasing biological productivity, increasing habitat diversity, and reducing wetland loss. Approximately 37,980 Average Annual Habitat Units (AAHUs) and 31,930 net acres of fresh/intermediate, brackish, and saline marsh, swamp and ridge habitats would benefit by the proposed project at the end of the project life given an intermediate sea level rise scenario. The Service supports implementation of the TSP and respectfully request the following fish and wildlife recommendations be implemented concurrently with project construction:

1. Regarding the barrier island component of the MRGO Ecosystem Restoration; the Service recommends, with support from NMFS and LDWF, the selection of a barrier island component be a part of the TSP. The Service feels the design and evaluation of the barrier island alternatives was sufficient to warrant selection, though further engineering would be required prior to construction. Breton Island is a National Wildlife Refuge, managed by the Service and is of National importance. Recent scientific investigations (Lavoie, D, ed., 2009; Thomson et al., 2009) demonstrate the long-term impacts to this important refuge as a result of the MRGO channel. Therefore, the Service recommends amelioration of the areal loss of Breton Island due to the construction and maintenance of the MRGO channel should be appropriately addressed in the TSP. The Corps should contact the Service regarding a compatibility determination, Wilderness Act provisions and special use permits that may be necessary to conduct activities on Breton NWR. The Corps is encouraged to establish and continue coordination with the Service until construction of any project feature is complete and prior to any subsequent maintenance. Points of contacts for the Service are: Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Neil Lalonde (985) 882-2000, Refuge Manager for the Breton Island NWR.

2. The Corps should contact the Service regarding a compatibility determination, and special use permits that may be necessary to conduct activities on Bayou Sauvage NWR.

The Corps should establish and continue coordination with the Service until construction of any project feature is complete and prior to any subsequent maintenance. Points of contacts for the Service are: Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Neil Lalonde (985) 882-2000, Refuge Manager for the Breton Island NWR.

3. The final recommendations for the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083. This means the Violet Diversion will be funded and constructed under a different authorization than the authorization for the MRGO Ecosystem Restoration Plan. The Service recommends any additional study, design, and implementation include the Service and other resource agency involvement. In addition if the diversion location or other aspects of the diversion change significantly from what was analyzed in the MRGO Ecosystem Restoration Plan, the Service recommends the Sediment and Nutrient Diversion model (SAND2) and Wetland Value Assessment benefits analysis be revised to reflect the changes.

4. The Service recommends the operational plans for the Violet Diversion be evaluated to include more flexibility of flow (flows between 1000cfs and 7000cfs) to achieve optimal habitat conditions favorable to nearby intermediate marsh and to bald cypress germination, growth, and reproduction by controlling depth and duration of inundation and salinity levels. As the operational plan for the Violet Diversion is further developed, future hydrological and fisheries (i.e., CASM) modeling, and updated habitat assessments (i.e., Wetland Value Assessments) should be conducted.

5. The Service recommends, with support from NMFS and LDWF, the diversion operational plan be developed in a way to avoid or minimize adverse impacts to marine fisheries and Essential Fish Habitat (EFH) while maximizing freshwater and nutrient input to the extent practicable to meet habitat objectives.

6. The Service and LDWF recommend salinity meters be placed in appropriate locations to assist in determining when target salinities are met.

7. The Service recommends the diversion be adaptively managed to enhance surrounding wetlands, that habitat switching (as a result of re-introduced river water) is allowed to occur in a manner that is not detrimental or destructive to the ecological processes, and that the diversion allows for draw down periods sufficient for cypress regeneration and cypress growth.

8. The Service recommends, with support from LDWF, a comprehensive examination of the river and all existing and proposed diversions to coordinate their operation and ensure that their operation will maximize their restoration capabilities. The ongoing Mississippi River Hydrodynamic and Delta Management Study could be utilized to address this issue.

9. The Service recommends, with support from NMFS and LDWF, establishment of a

committee similar to review the operation and monitoring and adaptive management results of the Violet diversion and when necessary, provide recommendations regarding any future operational and maintenance changes. The Service and other natural resource agencies are amenable to participate on this committee.

10. The large quantity of borrow material proposed to be taken from Lake Borgne, which is designated Gulf sturgeon critical habitat, for the TSP may have an adverse effect to fisheries, EFH, and the threatened Gulf sturgeon by: 1) alteration in water bottom substrate habitat: 2) direct removal of benthos from a large area which may (at least temporarily) reduce food availability for fishery organisms; 3) other sessile resources, such as oysters could be affected; and 4) by continually moving the dredge, the resuspended sediments will take longer to settle and could prolong the periods of high turbidity associated with dredging operations. The Service recommends, with support from NMFS and LDWF, careful consideration be given to the affects of taking all borrow, including monitoring for benthos and water quality, from Lake Borgne and consideration should be give to obtaining borrow from other "outside" sources, such as the Mississippi River, and adjacent bays, and offshore areas. Over the project life, search for borrow from outside sources should continue as alternative sources may become economically feasible or as new advances in technology become available.

11. The NMFS is responsible for consultations regarding impacts to the Gulf sturgeon and its critical habitat for the MRGO Ecosystem Restoration project. Therefore, please contact Dr. Stephania Bolden (727/824-5312) in St. Petersburg, Florida, for information concerning that species and its critical habitat. Should the proposed project directly or indirectly affect the Gulf sturgeon or its critical habitat in Louisiana, further consultation with that office will be necessary.

12. The Service, with support from NMFS and LDWF, recommends the Lake Borgne borrow plan should initially specify monitoring three different depths of borrow sites for a minimum of two-years post dredging and prior to continued excavation. The Service recommends monitoring of water quality parameters are included in the MAMP in order to assess if anoxic or hypoxic conditions occur. If anoxia is a problem at 10 feet below the existing sediment surface with a +/- 5 foot tolerance, then the borrow sites will have to be dug shallower and other borrow source options explored to minimize impacts to estuarine water bottoms and EFH. The Service, NMFS, and LDWF recommend a summary of the Monitoring and Adaptive Management Plan for borrow be included in the Feasibility Study or Environmental Impact Statement. The Service, NMFS, and LDWF also recommend that all borrow sites be at least 1,000 feet from the shoreline to help avoid increasing shoreline erosion via increased wave height.

13. The proposed borrow areas in Lake Borgne do include private leases as well as public oyster seed grounds. LDWF manages the public seed grounds and should be consulted before final borrow locations are determined.

14. The Service recommends that all shoreline protection features include one fish dip every 1,000 feet (ft) constructed to a 25 ft bottom width to the pre-project elevation. On a case

by case basis the 1,000 ft distance can be adjusted, in consultation with NMFS, to incorporate existing water exchange points.

15. The Service and NMFS recommends the retention dikes constructed for swamp and marsh creation and nourishment areas be gapped and degraded within three years of use if they have not naturally degraded on their own. Please coordinate gapping and degrading efforts with the Service and NMFS.

16. The Service and LDWF recommend a buffer of at least 500 feet be placed around existing hard bottom and oyster leases to minimize impacts to those resources.

17. The Monitoring and Adaptive Management Plan, as it is further developed, should be provided to the Service, NMFS, and LDWF for continued review, comment, and input.

18. If a proposed project feature is changed significantly or is not implemented within one year of the Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with the Service and NMFS to ensure that the proposed project would not adversely affect any Federally listed threatened or endangered species or their critical habitat.

19. The proposed Violet Freshwater Diversion structure off the Mississippi River has the potential to entrain pallid sturgeon, that effect should be addressed in the diversions future planning studies. Should the proposed project directly or indirectly affect the pallid sturgeon or its habitat, further consultation with this office will be necessary.

20. Avoid adverse impacts to nesting bald eagles, gulls, terns, and/or black skimmers, wading birds, and brown pelicans through the careful design of project features and timing of construction. A qualified biologist should inspect the proposed work area for the presence of undocumented nesting colonies and bald eagles during the nesting season (i.e., September 15 through March 31 for brown pelican, September 1 through February 15 for wading bird nesting colonies, September 16 through April 1 for colonies containing nesting gulls, terns, and/or black skimmers, and October through mid-May for bald eagles).
    - To minimize disturbance to colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present).
    - For colonies containing nesting brown pelicans, all activity occurring within 2,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 15 through March 31). Nesting periods vary considerably among Louisiana's brown pelican colonies so it is possible that this activity window could be altered based upon the dynamics of the individual colony.
    - For colonies containing nesting gulls, terns, and/or black skimmers, all activity occurring within 650 feet of a rookery should be restricted to the non-nesting period (i.e., September 16 through April 1, exact dates may vary within this

window depending on species present).

- If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary and those results should be forwarded to this office.

21. Land clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

22. Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service and other State and Federal natural resource agencies, and shall be provided an opportunity to review and submit recommendations on all work addressed in those reports.

23. A report documenting the status of implementation, maintenance, and adaptive management measures should be prepared every three years by the managing agency and provided to the Corps, the Service, NMFS, U.S. Environmental Protection Agency (EPA), Louisiana Department of Natural Resources (LDNR), Office of Coastal Protection and Restoration (OCPR), and LDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

24. The Service recommends minimizing impacts to marsh from marsh buggy activities. Options to achieve that minimization include limiting the repetitive use of a route or to build temporary boardwalks over marsh where feasible and then backfilling the boardwalk area if needed. In areas with large marsh creation features that have minimal access routes, such as the inner Terre Aux Bouef marsh features, the Service recommends that work begin at the farthest location and proceed to the outer edges of the site to minimize the amount of damage.

25. The Service recommends the CASM model should be updated to incorporate conditions from the oil spill in the adaptive management plan. This model should also use the corrected assumptions.

26. Due to the significant acreage of marsh that will be accessed for swamp and marsh creation/nourishment, the Service request the Corps quantify the estimated acreage of flotation and construction access canal impacts to shallow open water habitat.

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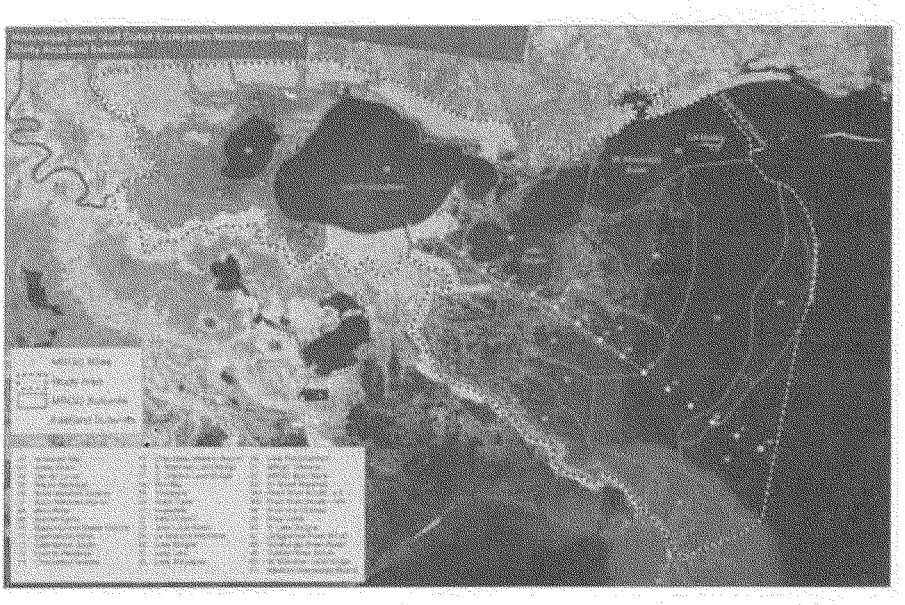
DESCRIPTION OF STUDY AREA

The project area is centered on the Lake Borgne ecosystem, and includes parts of southwestern Mississippi and southeastern Louisiana (Figure 1). It includes St. Bernard, Orleans, and Plaquemines parishes in Louisiana and Hancock and Harrison counties in Mississippi. The project area is bordered to the west by the East Orleans landbridge and continues southward to

include the Golden Triangle, Central Wetlands, Proctor Point, the former MRGO, and Terre aux Boeufs ridge. The northern boundary follows the coastline into Mississippi and includes the lower Pearl River basin and Western Mississippi Sound. The eastern edge of the project area extends to the Chandeleur Islands. There are approximately 3,845,766 acres within the study area.

The project area suffers from many problems including land loss, shoreline erosion, habitat change and loss, modification of natural hydrology, decreased freshwater, sediment and nutrients, saltwater intrusion, eroding barrier islands, ridge habitat degradation, invasive species, herbivory, and increasing susceptibility to storm surge.

Figure 1. Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Study Area and Subunits.



FISH AND WILDLIFE RESOURCES

Description of Habitats

The eastern Louisiana coast consists of a deltaic system with fronting barrier islands built by the Mississippi River. High, firm land is rare in coastal Louisiana. Elevations of the wetlands are just above Mean Gulf Level and at best the soils are soft and poorly consolidated. The portion of the project area in Mississippi consists of broad expanses of emergent tidal marsh and riverine swamps that have suffered from lack of sediment and freshwater flows resulting in increased saltwater intrusion and coastal erosion. The Mississippi saline marsh area includes

sandy forested hummocks that are above mean high tide. This marsh area is also well-known for an abundance of waterfowl. The Mississippi Sound is a shallow body of water that separates the Mississippi coast from Cat Island, a barrier island that lies approximately six miles offshore. The Pearl River and its associated river swamp are tidally influenced freshwater habitat with bald-cypress, black gum, and water tupelo forming the swamp canopy.

The de-authorized MRGO traverses wetlands and marshes in Plaquemines, St. Bernard, and eastern Orleans parishes. Construction of that channel altered circulation patterns along its route between Breton Sound and Lake Borgne, resulting in steep salinity increases. Prior to construction, the Bayou La Loutre ridge provided a between basin hydrologic barrier that limited the flow of saline water from Breton Sound into Lake Borgne. At that time Lake Borgne was dominated by tidal flow from the Mississippi Sound, but after the construction of MRGO, the dominant tidal flow into Lake Borgne switched to Breton Sound. Changes in vegetation communities in the project area were observed after completion of the MRGO. Prior to construction of the MRGO, the freshwater wetlands had survived nutria "eat-outs", hurricanes, droughts, subsidence, and construction of trenasses for duck hunter and trapper access. However, the construction of MRGO altered the salinity and hydrologic regime beyond the wetlands' tolerance. MRGO changed regional hydrology and affected the flow, type, direction, and salinity of the water in addition to changing the tidal amplitude and duration.

Louisiana wetlands (forested, marsh, and scrub-shrub) provide 26 percent of the seafood landed in the contiguous United States and over 5 million migratory waterfowl utilize those wetlands every year. Wetlands within the study area provide plant detritus to adjacent coastal waters and thereby contribute to the production of fishes and shellfishes. Wetlands also provide valuable water quality functions such as reducing excessive dissolved nutrient levels, filtering waterborne contaminants, and removing suspending sediment matter. In addition, coastal wetlands buffer storm surges and reduce damaging effects to man-made infrastructure within the coastal area.

Wetlands are being lost because of several factors including the loss of Mississippi River sediment due to construction of levees, sea level rise, subsidence, hurricanes and construction of channels and canals. As this habitat is destroyed species that form the base of the food chain throughout the Gulf of Mexico could experience population decreases. Failure to address the loss of this habitat in the Gulf region threatens the long-term health of the entire ecosystem. The ongoing loss of coastal Louisiana wetlands (approximately 1,149 square miles between 1956 and 2004; average loss rate of 24 square miles per year) was exacerbated by Hurricanes Katrina and Rita in 2005. Those hurricanes caused an initial loss of wetlands equivalent to 9 years (approximately 217 square miles) of mean annual losses.

Appendix C of this report provides common and scientific names of plants and animals in the study area mentioned throughout this report.

Marshes

Marsh types within the project area include fresh, intermediate, brackish, and saline. Fresh marshes occur at the upper ends of interdistributary basins and are often characterized by floating or semi-floating organic soils and minimal daily tidal action. Vegetation may include maidencane, bulltongue, cattail, California bulrush, pennywort, giant cutgrass, American

cupscale, spikerushes, bacopa, and alligatorweed.

Intermediate marshes occur in transitional zones between fresh and brackish marshes and are often characterized by organic, semi-floating soils. Typically, intermediate marshes experience low levels of daily tidal action. Salinities are negligible or low throughout much of the year, with salinity peaks occurring during late summer and fall. Vegetation includes saltmeadow cordgrass, deer pea, three-cornered grass, cattail, bulltongue, seashore paspalum, wild millet, fall panicum, and bacopa.

Brackish marshes are characterized by low to moderate daily tidal energy and soils ranging from firm mineral soils to organic semi-floating soils. Freshwater conditions may prevail for several months during early spring; however, low to moderate salinities occur during much of the year, with peak salinities in the late summer or fall. Vegetation is usually dominated by saltmeadow cordgrass, but also includes saltgrass, three-cornered grass, leafy three-square, and deer pea.

Saline marshes occur along the gulfward fringe of the coastal wetlands. Those marshes usually exhibit fairly firm mineral soils and experience moderate to high daily tidal energy. Vegetation is dominated by saltmarsh cordgrass but may also include saltgrass, saltmeadow cordgrass, black needlerush, and leafy three-square.

Ridge Habitat

Within the Deltaic Plain narrow alluvial ridges having finger-like patterns, extend toward the Gulf and are higher in elevation and have firmer soils than emergent marsh. These natural levees, formed by overbank processes, occur along active and abandoned Mississippi River distributaries (Coast 2050). Natural and man-made ridges form the skeletal framework to which the coastal wetlands are attached. They form hydrologic basin divides and are more resistant to erosion than the wetlands. Natural factors such as subsidence have contributed to the destruction of the ridges with most of the ridges having subsided below elevations that support the maritime forest community. Part of the Bayou La Loutre ridge, however, has been enhanced with disposed dredged material, but subsidence continues to be the biggest threat. The Bayou La Loutre ridge was directly affected by construction of the MRGO channel bisecting the ridge.

High ridges sustain upland shrubs and trees, providing unique habitat for certain plant and animal species. The dominant species of the forested habitat found on the abandoned distributary ridges in the project area include live and water oaks, and hackberry. Groundsel bush, marsh elder, and yaupon are the dominant shrubs, with dwarf palmetto and elderberry present in the understory. Vines such as blackberry, marsh morning glory, and pretty dodder are common.

Cypress/Tupelo Swamp

Cypress-tupelo swamps were once common throughout the southeastern U.S. but have been significantly reduced in areal extent. Cypress-tupelo swamps are located along the flanks of larger distributary ridges as a transition zone between bottomland hardwoods and lower-elevation marsh or scrub-shrub habitats. Cypress-tupelo swamps exist where there is little or no salinity, minimal daily tidal action, and are usually flooded throughout most of the growing season. Bald cypress and tupelo gum are the dominant vegetation within this habitat type, but Drummond red maple, green ash, and black willow are also common.

In the project area, cypress swamp used to exist predominately in the Central Wetlands area. These swamps were abundant in parts of the study area but have declined due to extensive logging operations during the late 1800s. In addition, the swamps of the Central Wetlands were maintained by freshwater introduced from the Mississippi River and other natural water sources. The construction of flood protection levees limits the flow of freshwater into the wetlands, and the construction of canals, especially the MRGO, allowed additional saltwater into the estuary. These and other changes have caused the loss of most of the Central Wetland swamps. The MRGO channel and connecting waterways provide a direct route for tidal exchange and allows any freshwater surplus to exit regularly at low tide and be replaced by the inflow of more saline water at high tide.

Barrier Island

The barrier islands in the Louisiana portion of the study area are the remains of an abandoned Mississippi River Delta lobe; their degradation is the result of natural deltaic processes. The formation of Cat Island in Mississippi was also influenced by this abandoned delta, and it is distinct from other Mississippi barrier islands (Schmid 2001). Barrier islands act as buffers to reduce the effects of ocean waves and currents on associated estuaries and wetlands. Louisiana's barrier islands are eroding at a rate of up to 66 feet per year. According to recent U.S. Geological Survey (USGS) estimates, several islands will disappear by the end of the century (USACE 2009). Although Cat Island has lost 39% of the land area it had in 1848, it is the most stable of the Mississippi barrier islands. Interior elevations and the orientation of Cat Island prevent breaching and overwash by storm waves except along spits of the eastern shore (Morton 2005).

Study area barrier islands consist primarily of beach, dune, high marsh (scrub/shrub), and back-barrier saline marsh. Beach vegetation may include sea purslane, marsh hay cordgrass, sea rocket, and seaside heliotrope. Dune plants are dominated by sea oats, but can include marsh hay cordgrass, bitter panicum, Roseau cane (on the Chandeleur islands) and beach croton. Shrub/scrub plants often found on high marsh zones typically behind dunes and include sea myrtle, sea ox-eye and marsh elder (*Iva* and *Baccharis*). Black mangrove occurs as a shrub along the flooded marsh edges of the barrier islands and on the banks of tidal streams, ponds, and bays. Saline back barrier marshes dominant species is saltmarsh cordgrass, although the highly salt-tolerant salt grass, black needle rush, and glassworts are also frequently present.

In the future without the project scenario, the barrier islands will diminish in size greatly while some of the islands, such as Breton Island, are expected to become a shoal that is no longer subareal. Without replenishing sediment in the littoral system, the islands have no chance of recovering. With the loss of the islands; there will be a loss of unique and vital habitat for nesting terns, piping plover, and fisheries.

Open-Water Habitats

Lake Borgne is hydrologically connected to Lake Pontchartrain. The Lake Borgne ecosystem is also influenced by the Pearl River to the north and by areas located as far south as the River Aux Chenes ridge, which is located between the MRGO and the Mississippi River. To the east, the Western Mississippi Sound is an extension of Lake Borgne. The Western Mississippi Sound,

Chandeleur Sound, and Breton Sound form the eastern boundary of hydrologic influence of the Lake Borgne ecosystem.

Open-water habitat within the project area consists of ponds, lakes, canals, bays, and bayous. Natural marsh ponds and lakes are typically shallow, ranging in depth from 6 inches to over 2 feet. Typically, the smaller ponds are shallow and the larger lakes and bays are deeper. Canals and larger bayous typically range in depth from 4 or 5 feet, to over 15 feet. Strong tidal flows may occur at times through those waterways, especially where they provide hydrologic connections to other large water bodies.

Major open water and channel areas in the project area include Bayou La Loutre, Bayou St. Malo, Bayou Bienvenue, Bayou Dupre, the former MRGO, the Rigolets, Lake Borgne, Chandeleur Sound, Breton Sound, Mississippi Sound, and Lake Saint Catherine.

Hypoxic/Anoxic zones

Hypoxic/anoxic conditions ("dead zones") occur in Lake Pontchartrain and the Gulf of Mexico. These conditions are caused primarily by excess nitrogen in combination with stratification of more saline waters. Due to the control of the Mississippi River, nutrients pass though the study area and into the northern Gulf rather than into adjacent wetlands, which would absorb these nutrients. Hypoxic/anoxic conditions can also occur in borrow sites where the depth in combination with thermal and/or salinity stratification can reduce water column mixing.

Submerged Aquatic Vegetation

Shallow open water habitats may often support extensive beds of submerged aquatic vegetation (SAV). Within the estuaries, SAVs are typically found in ponds and lakes but they are also associated with sandy substrate around barrier islands where they are often referred to as seagrass beds or marine SAVs. In fresh environments, floating-leafed and submerged SAVs include water hyacinth, *Salvinia*, duckweeds, American lotus, white water lily, water lettuce, coontail, Eurasian milfoil, hydrilla, alligatorweed, hydrocotyle, pondweeds, naiads, fanwort, wild celery, water stargrass, elodea, and others. Ponds and lakes within the intermediate marsh zone often support southern naiad, Eurasian milfoil, and wigeongrass. Shallow brackish marsh ponds occasionally support abundant beds of wigeongrass. SAV growth in saline marsh environments is rare.

As reported by Ritchie et al., 1992, the extensive seagrass beds associated with the Chandeleur Islands occupy the sandy platform along the bay shoreline sheltered by the main arc of the islands from just south of Hewes Point at the northern end to just north of the southern end and extending out to the western bar system. Patches of sea grasses also occur behind Breton Island, within the Freemason Island complex and associated with North and New Harbor islands. No SAVs have been observed behind Grand Gosier or Curlew islands probably because of the constantly shifting sediment in these areas. Widgeon grass and shoalgrass are most common in the shallower areas and are usually the first to colonize the subaqueous portions of new washover fans. Manatee grass prefers somewhat deeper areas that are never threatened by exposure at extreme low tides. *Halophila engelmanii* grows as an understory to the other SAVs. Turtle grass colonizes the deepest areas of all the SAVs. All of these species occur at intermediate depths.

Coastal SAV meadows are a rapidly declining habitat that is important for juvenile aquatic species, sea turtles, west Indian Manatee, and wintering migratory waterfowl in the northern Gulf of Mexico (Byron and Heck, 2006; Poirrier and Handley, 2006; Michot, et al. 2008). Aside from their important role in providing habitat, these seagrass meadows provide essential physical benefits to the stability of the Chandeleur Islands by reducing wave energy and current velocity due to the baffling effects of the seagrass. This process results in backbarrier sediment trapping (vertical accretion) and protection of backbarrier marsh shorelines form wave attack in the Chandeleur Sound. The latter is especially important during the passage of winter cold fronts because of the large fetch of the Chandeleur Sound. These seagrass beds are amazingly resistant to hurricanes and recover rapidly after storms when destroyed; however, the occurrence and distribution of seagrass at the Chandeleur Islands is directly related to the presence of a fronting barrier island (Poirier and Handley, 2006; Bethel and Martinez, 2008). The island dissection and rapid land loss associated with Hurricane Katrina has resulted in decreased suitable conditions for seagrass recolonization (Bethel and Martinez, 2008).

The seagrass beds are decreasing in size as the barrier islands they are behind also decrease in size. As the island area is reduced to only subtidal or shoal habitat, waves from the Gulf are able to impact the beds. Therefore, when all intertidal acreage is lost, it is assumed that all of the seagrass beds in that portion of the project area will be lost.

Fisheries Resources

Estuaries are among the most productive habitats in the world because they support high primary and fisheries production (Whittaker and Likens 1973; Walme 1972). The majority of the MRGO Ecosystem Restoration study area is considered estuarine habitat. Most of the economically important saltwater fishes and crustaceans harvested in Louisiana and Mississippi spawn offshore and then use estuarine areas for nursery habitat (Herke 1995). Marine fishes penetrate inland to fresher habitats, while freshwater species are sometimes found in intermediate or brackish environments. In addition, the lower reaches of freshwater streams may serve as nursery areas for the young of some marine species.

Factors that will strongly influence future fish resource conditions include freshwater input and loss of coastal wetlands. Freshwater inputs into the project area wetlands have been limited to rainwater and runoff and a few Mississippi river diversions and siphons. Even though extensive areas of marsh have been lost in coastal Louisiana, commercial harvest and recreational catches of most estuarine fishery species have not diminished (NMFS 2006). One hypothesis to explain continued high fisheries production is that as marshes have deteriorated, tremendous amounts of organic detritus have been released into the estuarine system, resulting in high levels of primary productivity. High primary productivity increases the resources available for secondary productivity. Additionally, an increase in marsh to water interface (i.e., marsh edge), and the formation of shallow, protected lagoons and ponds, has resulted in areas prime for growth and development of estuarine species (Browder et al., 1985; Browder et al., 1989; Minello and Rozas 2002). At the same time, saltwater intrusion into previously low-salinity areas has increased the amount of estuarine area available to estuarine and marine fishery species (Chesney et al. 2000; Zimmerman et al., 2000). However, this intrusion can exacerbate marsh loss in those areas (Chabreck and Linscombe 1982; McKee and Mendelssohn 1989).

The seagrass beds, as well as the barrier islands they exist behind, provide unique nursery, foraging, predator refugia, and spawning habitat for numerous economically important marine and estuarine species that exhibit a preference for or are dependent on these habitats during a portion of their life (Saucier and Baltz 1993). Seagrass beds, surf zone, intra-island ponds, tidal creeks, and back-bay sand flats associated with these barrier islands support distinct fish and crustacean assemblages in comparison to mainland or inland saline marshes (Williams 1998).

The project area supports both marine and estuarine finfishes and shellfishes. Finfishes occurring or expected in that area include anchovies, scaled sardine, Gulf menhaden, striped mullet, white mullet, black drum, red drum, spot, spotted seatrout, sand seatrout, Atlantic croaker, gaff-topsail catfish, southern flounder, bull shark, ladyfish, Atlantic needlefish, Gulf killifish, longnose killifish, sheepshead minnow, fat sleeper, gobies, speckled worm eel, least puffer, Gulf pipefish, Atlantic spadefish, alligator gar, southern kingfish, Florida pompano, Atlantic bumper, Spotfin mojarra, rough silverside, inland silversides, and mangrove snapper. The Mississippi Sound estuary provides prime habitat for various life stages of red drum, Spanish and king mackerel, grouper, spotted sea trout, jack crevalle, cobia, amberjack, and various species of sharks (MsCIP 2008).

Crustaceans expected to occur in the area include white shrimp, brown shrimp, seabob, roughneck shrimp, grass shrimp, mysid shrimp, Gulf stone crab, blue crab, and mud crab. Other invertebrates found there include American oyster, jellyfish, and ctenophores.

The American oyster is indigenous to coastal Louisiana and Mississippi, and provides a rich ecological and commercial resource. This organism is unique in that it does not migrate like other estuarine species. Salinity plays a key role in oyster sustainability. Typically, they proliferate in salinities ranging from 5 to 15 parts per thousand. Fresher waters fail to support biological functions, and more saline waters promote disease and predation. Production of oysters in Louisiana has been relatively stable for the last 50 years, with harvest from public beds replacing the decreasing harvest from private leases. The Louisiana oyster industry has been experiencing many stressors over the past several decades that threaten the long-term sustainability of both the industry and the resource. Increasing coastal land loss is reducing the amount of marsh that provides shelter to reefs, and saltwater intrusion is exacerbating disease and predation.

The estuarine benthic zone regulates or modifies most physical, chemical, geological, and biological processes throughout the entire estuarine system via what is commonly called a "benthic effect" (Day et al. 1989). Within a salt marsh, less than ten percent of the above-ground primary production of the salt marsh is grazed by aerial consumers. Most plant biomass dies and decays and its energy is processed through the detrital pathway. The major consumer groups of the benthic habitat include: bacteria and fungi, microalgae, meiofauna, and microfauna (Mitsch and Gosselink 1993).

Benthic community structure is not static; it provides a residence for many sessile, burrowing, crawling, and even swimming organisms. The benthic community is a storehouse of organic matter and inorganic nutrients, as well as a site for many vital chemical exchanges and physical

interactions. The benthic assemblage of the study area is dominated by polychaetes (62%), bivalves (14%) and amphipods (11%).

Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; P.L. 104-297) set forth a new mandate for National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS), regional fishery management councils (FMC), and other federal agencies to identify and protect important marine and anadromous fish habitat. The Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Act support one of the nation's overall marine resource management goals-maintaining sustainable fisheries. Essential to achieving this goal is the maintenance of suitable marine fishery habitat quality and quantity. Detailed information on federally managed fisheries and their EFH is provided in the 1999 generic amendment of the Fishery Management Plans for the Gulf of Mexico prepared by the Gulf of Mexico Fishery Management Council (GMFMC). The generic FMP subsequently was updated and revised in 2005 and became effective in January 2006 (70 FR 76216). NMFS administers EFH regulations. Categories of EFH in the project area include estuarine and marine areas. Estuarine categories include estuarine emergent wetlands, mangrove wetlands (estuarine and barrier island), submerged aquatic vegetation, estuarine water column, and mud, sand and shell water bottoms. Marine areas include water column, vegetated bottoms (seagrass beds of Breton and Chandeleur islands), non-vegetated bottoms, live bottoms (oyster reefs in Lake Borgne and Biloxi marshes), and geologic features (Breton and Chandeleur islands).

EFH has been designated in the project area for Gulf stone crab, brown shrimp, white shrimp, pink shrimp, red drum, lane snapper, dog snapper, dwarf sand perch, king mackerel, Spanish mackerel, cobia, bonnethead shark, and Atlantic sharpnose shark. EFH species and their life stages are presented in Table 1. Coastal wetlands also provide nursery and foraging habitat that supports economically important marine fishery species such as spotted seatrout, sand seatrout, southern flounder, Atlantic croaker, spot, Gulf menhaden, striped mullet, white mullet, silversides, killifish, kingfish, pompano, scaled sardines, anchovies, and blue crab. Some of these species serve as prey for other fish species managed under the Magnuson-Stevens Act by the GMFMC (e.g., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks). These wetlands also produce nutrients and detritus, important components of the aquatic food web, which contribute to the overall productivity of the Pontchartrain basin estuary and nearshore Gulf of Mexico.

Table 1. EFH Species and Their Life Stages for the MRGO Ecosystem Restoration Project Area.

Species	Life stage	System	EFH
Brown shrimp	larvae	Marine	<82 m; planktonic, sand/shell/soft bottom, SAV, emergent marsh, oyster reef
	juvenile	Estuarine	<18 m; SAV, sand/shell/soft bottom, SAV, emergent marsh, oyster reef
	adult	Marine	<14-110 m; sand/shell/soft substrate
White shrimp	juvenile	Estuarine	<30 m; SAV, soft bottom, emergent marsh
Pink shrimp	juvenile	Estuarine	<65 m; sand/shell substrate
Gulf stone crab	eggs	Estuarine/Marine	<18 m; sand/shell/soft bottom
	larvae/post larvae	Estuarine/Marine	<18 m; planktonic/oyster reefs, soft bottom
	juvenile	Estuarine	<18 m; sand/shell/soft bottom, oyster reef
Red drum	larvae/post larvae	Estuarine	all estuaries planktonic, SAV, sand/shell/soft bottom, emergent marsh
	juvenile	Estuarine/Marine	GOM <5 m W from Mobile Bay; all estuaries SAV, sand/shell/soft/hard bottom, emergent marsh
	adult	Estuarine/Marine	GOM 1-46 m W from Mobile Bay; all estuaries SAV, pelagic, sand/shell/soft/hard bottom, emergent marsh
Lane Snapper	larvae	Estuarine/Marine	4-132 m; reefs, SAV
	juvenile	Estuarine/Marine	<20 m; SAV, mangrove, reefs, sand/shell/soft btm.
Dog Snapper	juvenile	Estuarine/Marine	SAV, mangrove, emergent marsh
Dwarf Sand perch	juvenile	Marine	hard bottom
King mackerel	larvae	Marine	9-180 m; planktonic
	juvenile	Marine	<9 m; pelagic
	adults	Marine	35-180 m; pelagic
Spanish mackerel	eggs	Marine	<50 m; planktonic
	larvae	Marine	9-84 m; planktonic
	juvenile	Estuarine/Marine	<50 m; pelagic
	adults	Estuarine/Marine	<75 m; pelagic
Cobia	eggs	Marine	planktonic
	larvae	Marine	11-53 m; planktonic
	juvenile	Marine	5-183 m; pelagic
Bonnethead shark	juvenile	Marine	inlets, estuaries, coastal waters <25 m, FL Keys to Cedar Key; LA and TX
Atlantic sharpnose shark	adults	Marine	<50 m MS Sound & Galveston to Laguna Madre

Wildlife Resources

There are three federal and one state protected areas located within the project area. The federal areas include the Bayou Sauvage National Wildlife Refuge (NWR), Breton NWR, and the Gulf Island National Seashore (Mississippi Unit; western end of Cat Island); while the state area is the Biloxi Wildlife Management Area.

Prior to construction of the MRGO, the interior fresh to intermediate wetlands had high value for furbearing animals and wintering waterfowl including lesser snow geese, mallard, green-winged teal, and lesser scaup. Between 1969 and 1978, wildlife surveys recorded less than 20,000 annual wintering waterfowl in an area that had previously supported 250,000 individuals. Furbearers, supported in large numbers in this area, included muskrat, mink, nutria, river otter, and raccoons were once staples of the Louisiana fur industry. After construction of the MRGO, wildlife surveys showed a noticeable decline in the productivity of these wetlands.

Even with declines in productivity, the project area provides important habitat for several species of wildlife, including waterfowl, wading birds, shorebirds, mammals, reptiles and amphibians. The project area provides wintering habitat for migratory puddle ducks including gadwall, blue-winged teal, green-winged teal, American widgeon, and northern shoveler. Diving duck species which utilize the project area include lesser scaup and ring-necked ducks. The red-breasted merganser is also a common wintering waterfowl species in the Breton/Lake Borgne system. The resident mottled duck, which nests in fresh to brackish marshes, is found throughout the year in those habitats.

Common wading bird species which utilize the project area include the great blue heron, green heron, tricolored heron, great egret, snowy egret, yellow-crowned night-heron, black-crowned night-heron, and white ibis. Mudflats and shallow-water areas provide habitat for numerous species of shorebirds and seabirds. Barrier island habitat is used by wintering piping plovers, brown pelicans, and nesting terns Shorebirds include the American avocet, willet, black-necked stilt, dowitchers, common snipe, and various species of sandpipers. Seabirds include the white pelican, black skimmer, herring gull, laughing gull, and several species of terns.

Non-game birds, such as the boat-tailed grackle, red-winged blackbird, seaside sparrow, northern harrier, belted kingfisher, and marsh wrens, also utilize the project area. Important gamebirds found in the area include the clapper rail, sora rail, Virginia rail, American coot, common moorhen, and common snipe in addition to resident and migratory waterfowl.

Mammals found in the project area include swamp rabbit, raccoon, fox/gray squirrels, opossum, nine-banded armadillo, muskrat, mink, nutria, river otter, and raccoons, and bats. Reptiles and amphibians are fairly common in the low-salinity brackish marshes found within the project area. Reptiles present include the American alligator, water snakes, western cottonmouth speckled, kingsnake, rat snake, and eastern mud turtle. Amphibians expected to occur include the bullfrog, southern leopard frog, and Gulf coast frog.

The barrier islands of the Chandeleur Island chain have provided numerous benefits to wildlife. Prior to the storms of the late 1990's and early 2000's and the resulting habitat loss, the use by nesting colonial seabirds and wintering migratory birds was tremendous. This is enhanced by

their proximity to the productive bays, marshes, seagrass beds, and shallow marine waters of Mississippi and Louisiana.

Those islands supported the largest brown pelican nesting colonies along the Gulf coast from Florida to Texas, and production of young was higher than that of other colonies due to the high productivity of the surrounding waters. From a high of almost 13,000 nests in the late 1990's, the islands had fewer than 3,000 nesting pairs of brown pelicans in 2009. The same is true for other nesting colonial seabirds. With over 100,000 nesting pair of sandwich and royal terns (the largest colonies in North America) the islands now support less than ¼ of that number.

The Chandeleurs supported the largest flock of wintering redhead ducks between Florida and Texas with over 20,000 using the seagrass beds of Chandeleur Sound. That number has dropped precipitously following the loss of seagrass habitats. Likewise wintering piping plover and other shorebird numbers have also dropped due to loss of suitable wintering habitat. All of these reductions in bird numbers can be directly attributed to the loss of suitable habitat caused by island fragmentation and deterioration. The problem is that these habitats are not being replaced in other areas.

The barrier island, swamps, adjacent marshes, and the Bayou La Loutre ridge habitat serve as vital resting and foraging habitat for trans-Gulf neotropical migrant birds. Available habitat along the coast is very important to trans-Gulf migrants, they utilize wooded (swamp, bottomland hardwood, ridge and scrub/shrub) wetland habitats and adjacent spoil or bayou banks more than open marshes. This habitat is especially critical when severe weather in spring causes migrating birds to reach land exhausted, or during the fall, when bad weather forces the birds to abort their southward migration at the last moment, before leaving land. Many of these forested wetlands have been lost in the vicinity of the project area, and as the barrier islands and few remaining ridges continue to subside below elevations that can support scrub/shrub habitat and maritime forest, very large numbers of neotropical migratory birds will be negatively affected.

Under the No Action Alternative, the project area would continue to provide habitat for a multitude of species including migratory waterfowl, wading birds, shorebirds, mammals, reptiles, and amphibians. However, the continued loss of emergent wetlands with the lack of sustainable freshwater sediment and nutrient input would negatively impact those species which utilize the project area. The intertidal marsh and shallow, isolated ponds and associated SAV, forested wetlands, and the barrier island habitats are utilized by those species for foraging, resting, or nesting habitat. Conversion of those habitat types to large, unvegetated open-water areas would diminish habitat value for all wildlife species.

Threatened and Endangered Species and Species of Concern

Threatened and Endangered Species

Federally listed threatened (T) and endangered (E) species and/or their designated critical habitat occurring in the project area include the Gulf sturgeon (T), pallid sturgeon (E), piping plover (T), and West Indian manatee (E). Several species of threatened/endangered sea turtles are also known to forage in the coastal waters of the study area. Those species include the loggerhead sea turtle (T), Kemp's ridley sea turtle (E), green sea turtle (T), leatherback sea turtle (E), and

hawksbill sea turtle (E). Additionally species of concern in the project area include the bald eagle, brown pelican, and other colonial wading birds protected under the Migratory Bird Treaty Act (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.) and/or the Bald and Golden Eagle Act (54 Stat. 250, as amended, 16 U.S.C. 668a-d).

Gulf sturgeon
The Gulf sturgeon is an anadromous fish that occurs in many rivers, streams, and estuarine waters along the northern Gulf coast between the Mississippi River and the Suwannee River, Florida. In Louisiana, Gulf sturgeon have been reported at Rigolets Pass, rivers and lakes of the Lake Pontchartrain basin, and adjacent estuarine areas. Spawning occurs in coastal rivers between late winter and early spring (i.e., March to May). Adults and sub-adults may be found in those rivers and streams until November, and in estuarine or marine waters during the remainder of the year. Sturgeon less than two years old appear to remain in riverine habitats and estuarine areas throughout the year, rather than migrate to marine waters.

On March 19, 2003, the Service and NMFS published a final rule in the Federal Register (Volume 68, No. 53) designating critical habitat for the Gulf sturgeon in Louisiana, Mississippi, Alabama, and Florida. Designated critical habitat in the project area includes Pontchartrain east of the Lake Pontchartrain Causeway, The Rigolets, Lake St. Catherine, Mississippi Sound, and Lake Borgne. Habitat alterations such as those caused by water control structures that limit and prevent spawning, poor water quality, and over-fishing have negatively affected this species. In riverine waters, the Service is responsible for all consultations regarding Gulf sturgeon and critical habitat, while in marine waters the NMFS is responsible for consultation. Therefore, please contact Dr. Stephania Bolden (727/824-5312) in St. Petersburg, Florida, for information concerning that species and its critical habitat.

Pallid sturgeon
The pallid sturgeon is an endangered fish found in Louisiana, in both the Mississippi and Atchafalaya Rivers (with known concentrations in the vicinity of the Old River Control Structure Complex); it is possibly found in the Red River as well. The pallid sturgeon requires large, turbid, free-flowing riverine habitat with rocky or sand substrate. They are usually found on the bottoms of the rivers on sand flats or gravel bars, and apparently prefer areas with strong currents in or near the main channel. It is one of the largest and rarest fish in the Mississippi and Missouri River basins. Pallid sturgeon are opportunistic feeders that eat insects, crustaceans, mollusks, annelids, fish and eggs of other fish. Little information exists on the range and habitat preferences of pallid sturgeon for this part of the Mississippi River, but it is believed to spawn in Louisiana. Most data are from populations in upper Missouri and other Midwest rivers, and also the Atchafalaya River in Louisiana. Surveys are currently being conducted to determine the presence/absence of this species in the lower reaches of the Mississippi River, including the reach adjacent to the proposed Violet Diversion that is a part of the MRGO Ecosystem Restoration Plan.

Piping plover
Federally listed as a threatened species, the piping plover, as well as its designated critical habitat, occur along the Louisiana coast. Piping plovers winter in Louisiana, and may be present for 8 to 10 months annually. They arrive from the breeding grounds as early as late July and

remain until late March or April. Piping plovers feed extensively on intertidal beaches, mudflats, sand flats, algal flats, and wash-over passes with no or very sparse emergent vegetation; they also require unvegetated or sparsely vegetated areas for roosting. Roosting areas may have debris, detritus, or micro-topographic relief offering refuge to plovers from high winds and cold weather. In most areas, wintering piping plovers are dependent on a mosaic of sites distributed throughout the landscape, because the suitability of a particular site for foraging or roosting is dependent on local weather and tidal conditions. Plovers move among sites as environmental conditions change, and studies have indicated that they generally remain within a 2-mile area. Major threats to this species include the loss and degradation of habitat due to development, disturbance by humans and pets, and predation.

On July 10, 2001, the Service designated critical habitat for wintering piping plovers (Federal Register Volume 66, No. 132). Their designated critical habitat identifies specific areas that are essential to the conservation of the species. The primary constituent elements for piping plover wintering habitat are those habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support those habitat components. Constituent elements are found in geologically dynamic coastal areas that contain intertidal beaches and flats (between annual low tide and annual high tide), and associated dune systems and flats above annual high tide. Important components (or primary constituent elements) of intertidal flats include sand and/or mud flats with no or very sparse emergent vegetation. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting plovers.

West Indian Manatee

Federally listed as an endangered species, West Indian manatees occasionally enter Lakes Pontchartrain and Maurepas, and associated coastal waters and streams during the summer months (i.e., June through September). Manatee occurrences appear to be increasing, and they have been sighted in the Amite, Blind, Tchefuncte, and Tickfaw Rivers, the MRGO, the Inner Harbor Navigation Canal (IHNC) Lock and in canals within the adjacent coastal marshes of Louisiana. Manatees are known to travel long distances up coastal waterways from the Gulf of Mexico. The manatee population has declined in numbers due to collisions with boats and barges, entrapment in flood control structures, poaching, habitat loss, and pollution. Cold weather and outbreaks of red tide may also adversely affect these animals.

Sea turtles

Endangered and threatened sea turtles forage in the nearshore waters, bays and sounds of Louisiana. The National Marine Fisheries Service (NMFS) is responsible for aquatic marine threatened or endangered species. Please contact Eric Hawk (727/824-5312) at the NMFS Regional Office in St. Petersburg, Florida, for information concerning those species in the aquatic environment. When sea turtles leave the aquatic environment and come onshore to nest, however, the Service is responsible for consultation. Accordingly, we recommend that you contact this office if your activities would occur on beach areas during the sea turtle nesting season.

Species of Concern

As previously mentioned, the Chandeleur Island chain supported the largest brown pelican nesting colonies of the northern Gulf coast, in addition to the largest colonies of sandwich and royal terns in North America, however, the islands now support less than one-quarter of that number.

Colonial nesting birds

The proposed projects would be located in an area where colonial nesting waterbirds may be present. Colonies may be present that are not currently listed in the database maintained by the Louisiana Department of Wildlife and Fisheries. That database is updated primarily by monitoring the colony sites that were previously surveyed during the 1980s. Until a new, comprehensive coast-wide survey is conducted to determine the location of newly-established nesting colonies, we recommend that a qualified biologist inspect the proposed work site for the presence of undocumented nesting colonies during the nesting season. To minimize disturbance to colonial containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present). For colonies containing nesting gulls, terns, and/or black skimmers, all activity occurring within 650 feet of a rookery should be restricted to the non-nesting period (i.e., September 16 through April 1, exact dates may vary within this window depending on species present). In addition, we recommend that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests, and should avoid affecting them during the breeding season.

Brown pelican

Brown pelicans were delisted (due to recovery) on December 17, 2009, and are no longer protected under the ESA, but they are still protected by the Migratory Bird Treaty Act (MBTA). Brown pelicans are known to nest on barrier islands and other coastal islands in St. Bernard, Plaquemines, and Jefferson parishes. Brown pelicans may occasionally feed in the shallow estuarine waters found within the project area.

Bald eagle

The project-area forested wetlands may provide nesting habitat for the bald eagle, which has officially been removed from the List of Endangered and Threatened Species as of August 8, 2007. Bald eagles nest in Louisiana from October through mid-May. Eagles typically nest in mature trees (e.g., bald cypress, sycamore, willow, etc.) near fresh to intermediate marshes or open water in the southeastern Parishes. Major threats to this species include habitat alteration, human disturbance, and environmental contaminants (i.e., organochlorine pesticides and lead).

The Service developed the National Bald Eagle Management (NBEM) Guidelines to provide information and recommendations to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the Bald and Golden Eagle Protection Act. A copy of the NBEM Guidelines is available at: http://www.fws.gov/southeast/es/baldeagle/NationalBaldEagleManagementGuidelines.pdf. Those guidelines recommend: (1) maintaining a specified distance between the activity and the nest (buffer area); (2) maintaining natural areas (preferably forested) between the activity and

nest trees (landscape buffers); and (3) avoiding certain activities during the breeding season. On-site personnel should be informed of the possible presence of nesting bald eagles within the project boundary, and should identify, avoid, and immediately report any such nests to this office. If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary. The Division of Migratory Birds for the Southeast Region of the Service (phone: 404/679-7051, e-mail: SEmigratorybirds@fws.gov) has the lead role in conducting such consultations.

EVALUATION METHODOLOGY

Evaluation of project-related impacts on fish and wildlife resources for MRGO Ecosystem Restoration Plan Feasibility Study was conducted using the Wetland Value Assessment (WVA), the Sediment and Nutrient Diversion model (SAND2), a water quality model, and the Comprehensive Aquatic Systems Model (CASM) model.

The WVA is used to evaluate proposed Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) projects, and is similar to the Service's Habitat Evaluation Program (HEP), in that habitat quality and quantity (acreage) are measured for baseline conditions, and predicted for future without-project and future with-project conditions. As with HEP, the WVA provides a quantitative estimate of project-related impacts to fish and wildlife resources. Results are annualized over the project life to determine the Average Annual Habitat Units (AAHUs) available for each habitat type. Separate models were used for fresh/intermediate marsh, brackish marsh, saline marsh, ridge habitat, swamp habitat, and barrier islands. The WVA models assess the suitability of each habitat type for providing resting, foraging, breeding, and nursery habitat to a diverse assemblage of fish and wildlife species. Using the WVA methodology, impact assessments were conducted by the Habitat Evaluation Team (HET), which included representatives of the Corps, Office of Coastal Protection and Restoration (OCPR), NMFS, National Resource Conservation Service (NRCS), and the Service. For the Final EIS and FWCAR the latest 2011 version of WVAs were used for the benefits analysis.

During the later stages of project planning, changes were made to the WVA models. Those changes primarily addressed concerns regarding how the existing WVA marsh models assigned greater habitat values to wetlands that had a greater amount of vegetated area. That assignment of values is consistent with the authorization and goals of the CWPPRA program (i.e., restoration of vegetated wetlands) and is therefore appropriate for its evaluations. Revisions to the WVA marsh models were incorporated to reduce the degree of influence vegetated areas had on project benefits and to reflect the habitat values for most species utilizing all natural habitats within each marsh type. There were no apparent equivalent trends or relationships regarding the amount of change to calculated benefits (i.e., AAHUs) for each individual project feature resulting from the change in models. However, the relative degree of benefits produced (high, medium and low) by each project feature appeared to be generally consistent between the models. All three sea–level rise rates were evaluated using the revised WVA models and again,

no equivalent changes were noted between the analyses. As previously seen, the relative degree of benefits appeared to be consistent. It is believed that individual site conditions (e.g., greater subsidence or shoreline erosion rates, etc.) for each project feature can produce differences between the models as well as the sea-level rise rates. Those individual site conditions can confound any predictions regarding specific definable differences in benefits calculated by the different models and those resulting from application of different sea-level rise rates.

To determine wetland benefits (net acres) of the Violet diversion for each alternative, an empirical model (SAND2 model) developed by the Engineering Research and Development Center (ERDC) and Mr. Ron Boustany of the Natural Resources Conservation Service (NRCS) was utilized by the HET. The SAND2 model estimates the benefits resulting from the introduction of sediments and nutrients into the study area. Model predictions are based on diversion flows into the project area and nutrient and sediment concentrations of the diversion water. The model derives an estimate of the wetland acreage sustained and/or created as a function of nutrients and sediments introduced into the system.

The CASM has been adapted to assess direct and indirect ecological effects of proposed freshwater diversions into Lake Borgne and associated coastal and marine areas that define the MRGO ecosystem. The CASM is a bioenergetics-based ecosystem model that simulates the daily production dynamics (gC/m2) of modeled populations of aquatic plants and animals. The principal modeling objective was to assess the potential effects of alterations in salinity and other water quality parameters that will result from the proposed freshwater diversions on selected populations of valued ecological resources in the MRGO ecosystem.

The final array under a low relative sea level rise scenario and the Tenatively Selected Plan (TSP) under a high, medium, and low relative sea level rise scenario were evaluated by the HET using the WVA. The SAND2 model was run for each final alternative and TSP and results (wetland acres) utilized in the WVA. Details of the SAND2 model, WVAs and assumptions for the TSP are available in Appendix B. WVA and assumption information on the final array of alternatives are available for review at the Service's Lafayette, Louisiana, field office.

DESCRIPTION OF TENATIVELY SELECTED PLAN

Description of Feature Types

Marsh Restoration

A hydraulic dredge would be used to discharge slurry (i.e., dredged material) into shallow open water areas and degraded marsh areas. Material would be obtained from study area borrow sites for each feature. Slurry would be discharged to an elevation conducive to the development of wetlands habitat following dewatering and compaction. It is anticipated that the final result of this dredged material placement would be a combination of wetlands, mud flat, and shallow water habitat within the placement site. Following compaction and dewatering, the area would be planted with marsh vegetation appropriate for the site. Material would be allowed to overflow over existing emergent marsh vegetation within the proposed restoration area. If necessary, retention dikes would be degraded to restore fishery access and water exchange.

Marsh Nourishment
Marsh nourishment is proposed for areas of degraded marsh, and consists of the placement of a thin layer of dredged material slurry material that would be allowed to flow over existing marsh vegetation within the proposed nourishment area, but would not be allowed to exceed a height of about 1 – 1.5-feet above the existing marsh elevation to facilitate the recruitment and consolidation of marsh vegetation after dewatering. Unlike marsh restoration features, no plantings are associated with marsh nourishment features.

Swamp Restoration
Swamp restoration is proposed in areas that were historically cypress-tupelo swamps and are currently shallow open water. Swamp restoration consists of pumping dredged material from borrow areas to a maximum elevation of +4.5 feet (ft) within containment dikes. Swamp restoration areas would be planted primarily with cypress. Swamp restoration features would have a dewatered and settled target elevation approximately +2ft to support cypress habitat.

Swamp Nourishment
Swamp nourishment is proposed for areas that are currently at marsh elevation, and consists of placing a thin layer of dredged material to nourish the area, raise elevation to approximately +2 feet, and encourage the recruitment of cypress-tupelo community species. The depth of the layer of dredged material will be determined on a site-by-site basis to adjust for varying topography.

The PDT and HET have identified several critical factors that would need to be considered in the design phase for swamp restoration and nourishment features. These include: the level and timing of inundation, salinity levels in soil and area water bodies, elevation, invasive species and herbivory control, and water quality.

For marsh and swamp creation and nourishment
Retention dikes, deflection dikes, and/or closures may be used to contain material for each feature. Interior low-level earthen weirs also may be constructed within the disposal area to facilitate the deposition of sediments in a manner that would enhance wetlands development. Borrow material for dike/closure/weir construction would be taken from within the disposal area. Earthen dikes/closures would be allowed to degrade naturally. If earthen dikes/closures do not sufficiently degrade to provide fisheries and tidal ingress/egress following appropriate settlement of dredged material placed within the disposal area, earthen dikes/closures would be mechanically breached and/or degraded as necessary.

Access corridors would be a maximum of approximately 350 feet in width and would cross over wetlands and shallow water as necessary. Access corridors for some features may occur across existing levees and different methods will be utilized to best prevent damage to the levee while allowing access. The level of storm protection provided by these levees would be maintained throughout construction, and any damage to levee vegetation would be repaired upon removal of the construction equipment. The construction, or designation, of staging areas may be necessary for construction equipment. Staging areas will be determined on a site-by-site basis to minimize impacts to existing wetlands.

Flotation access channels would be excavated, as needed, in shallow water areas to allow construction equipment to access the project features. If necessary, flotation access channels would be excavated by a mechanical dredge. It is estimated that access channels will average approximately -2 feet. Material dredged for flotation access channels would be used in dike/closure construction or refurbishment, to backfill the access channels, or would be placed adjacent to and behind the dikes and closures in shallow water to a maximum initial elevation conducive to wetlands development following consolidation of the material. Flotation access channel material used to backfill the flotation access channels following completion of disposal work would be temporarily stockpiled on water bottom adjacent to the flotation access channel.

If existing canals are used for access, they may be dredged to facilitate flotation of pipeline and other necessary equipment from the dredging reach to pipeline discharge sites within the designated staging areas. Dredged material removed from existing canals would be placed on adjacent existing levees and/or into shallow water on either side of canals. Material placed in shallow water areas would be placed to a height conducive for wetland development.

Shoreline Protection

These features consist of either foreshore (shoreline between high water and low water) rock dikes or rock dikes placed near the existing shoreline to dissipate wave energy before it reaches the shoreline. Foreshore rock dikes would be constructed by placing rock in a linear mound at the -1.5 to -2.0-foot depth contour, to a height above the water's surface. Heights will be determined based on existing site conditions. Nearshore (beginning at foreshore and extending to the beginning of the offshore zone) rock dikes would be constructed in places where the bathymetry prohibits a foreshore dike (water deepens too quickly from the shore). Rock used for dike construction would be graded large enough to resist movement during high energy events, such as frontal passages. Shoreline protection features include site-specific, periodic gaps for organism access, navigation, and water exchange.

Ridge Restoration

A ridge restoration feature is proposed on the south side of Bayou La Loutre. Restoration would consist of the placement of dredged silty-sand material obtained from the Mississippi River. The initial elevation of the ridge would be approximately +8 feet, with a crown width of 25 feet and 1vertical:8 horizontal side slopes. The base width of the ridge would vary, with an average width of approximately 120 feet. A 50-foot access corridor on the south side (marsh side) would be designated for construction equipment. Access along Bayou La Loutre may require excavation to the channel's authorized depth of -6 feet Mean Low Gulf. If excavation is required, material excavated for floatation will be incorporated into the ridge. The ridge would be planted to develop forested habitat as described in the planting plan for this study (see Appendix B, Attachment 8).

Violet Freshwater Diversion

The Violet Freshwater Diversion is an important component of the restoration plan because it would to restore pre-MRGO salinities and provide freshwater and nutrients to nourish existing and restored wetlands in the study area. The Violet Freshwater Diversion would mimic natural river flooding processes and enhance the sustainability of the system through the input of freshwater, nutrients and sediment.

However, additional study is needed to improve decisions about where, when, and how to divert Mississippi River flows in a systems context. Therefore, the final recommendations in the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083. For the purposes of this study, the Violet Freshwater Diversion is anticipated to cost approximately $500 million.

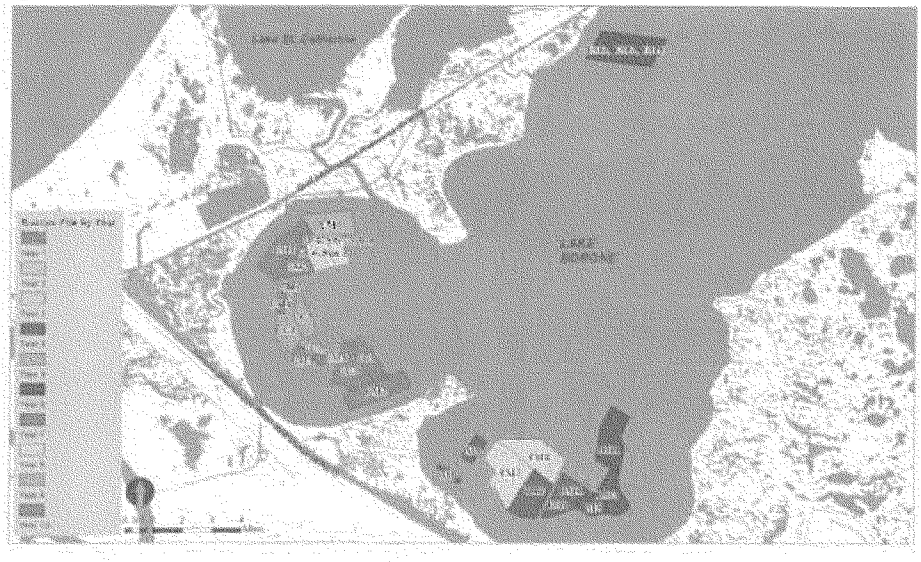
The diversion at Violet is part of the Central Wetland project feature. As proposed, the diversion will have a maximum discharge of 7,000 cubic feet per second (cfs) depending on Mississippi River water levels. In low water periods, the diversion is expected to discharge a minimum of 870 cfs for a total of 1000 cfs being discharged into the Central Wetlands once the Orleans Parish Sewer and Water Board discharge is included. The Violet Freshwater Diversion is proposed to extend from the Mississippi River and Tributaries Levee to the 40 Arpent Levee via a controlled conveyance channel. The proposed diversion channel would then flow through the Central Wetlands to an outfall structure in the Chalmette Loop Levee and discharge into the MRGO. Openings to intersecting channels in the Central Wetlands would provide the freshwater and nutrients required to maintain the restored cypress swamp. The diversion design includes a closure at the intersection of the MRGO and the Dupre Cut, that is currently open to shallow draft navigation, to ensure the efficient transport of freshwater via the MRGO. A sediment trap is also proposed to reduce required maintenance and capture Mississippi River sediments for use in restoration projects in the vicinity.

For the final TSP, it is assumed for the benefit analysis that the Violet Diversion will become operational in year 2027. Increased flows (i.e., pulsing) 4 out of every 10 years was based on recommendations from the 1984 Mississippi and Louisiana Estuarine Areas, Freshwater Diversion to Lake Pontchartrain and Mississippi Sound Feasibility Study (i.e., Bonnet Carre Freshwater Diversion) to maintain optimal salinities at the Chatry line. The Chatry line was developed to optimize oyster production on state oyster seed grounds in and adjacent to Breton Sound.

Borrow

A significant amount of sediment (152,220,000 cfs) will be required for the proposed restoration features. Borrow will be excavated to a depth of 10 feet with 5 feet allowable over depth. In addition, borrow sites will be located at least 3,000 feet from the existing shoreline to reduce wave impacts and have sloping side slopes to encourage circulation. Figure 2 illustrates the proposed borrow site for each proposed feature.

Figure 2. Proposed Borrow Sites for the MRGO Ecosystem Restoration Plan.

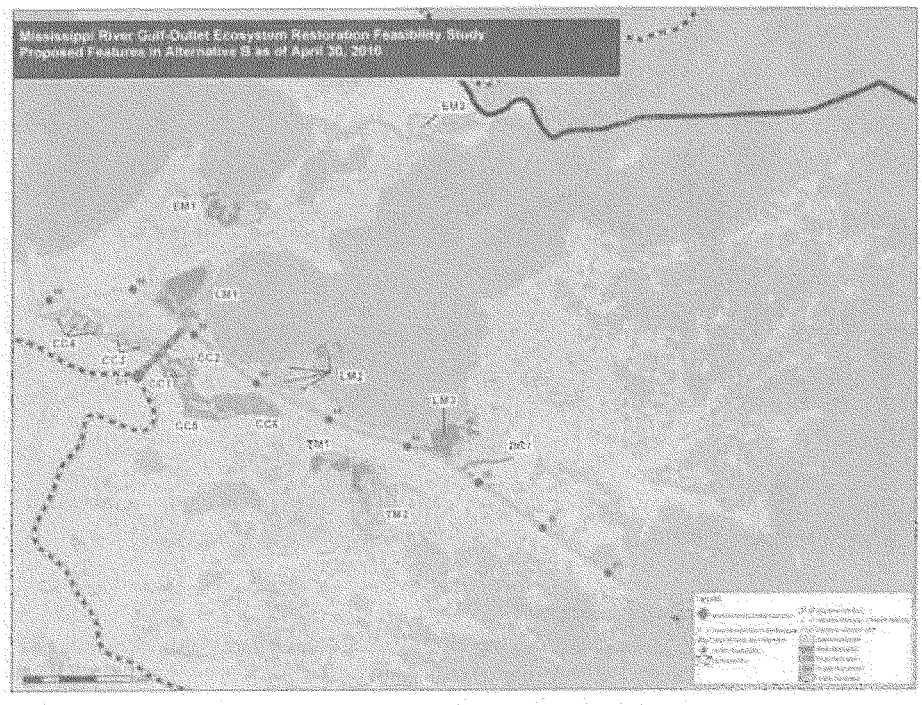


Final Array of Alternatives Considered

Three Best Buy plans (i.e., most cost effective) were selected for the final array. Best Buy plans B, C, and D were chosen based on cost effective increments where a large amount of benefits could be gained for minimal additional cost. All alternative plans in the final array include a freshwater diversion at Violet. These plans represent a wide range of costs and benefits. The alternatives retained for further evaluation build on each successive plan i.e., Plan C includes all of the features in Plan B, and Plan D incorporates all of the features in Plan C. Plan B includes the restoration of all targeted habitat types, but does not fully accomplish the planning objectives. Plan C meets all of the objectives and forms a complete, effective, efficient, and acceptable plan, and therefore has been selected as the TSP. Plan D meets or exceeds all of the restoration objectives and provides a more comprehensive restoration plan for the areas affected by the MRGO and the Lake Borgne ecosystem.

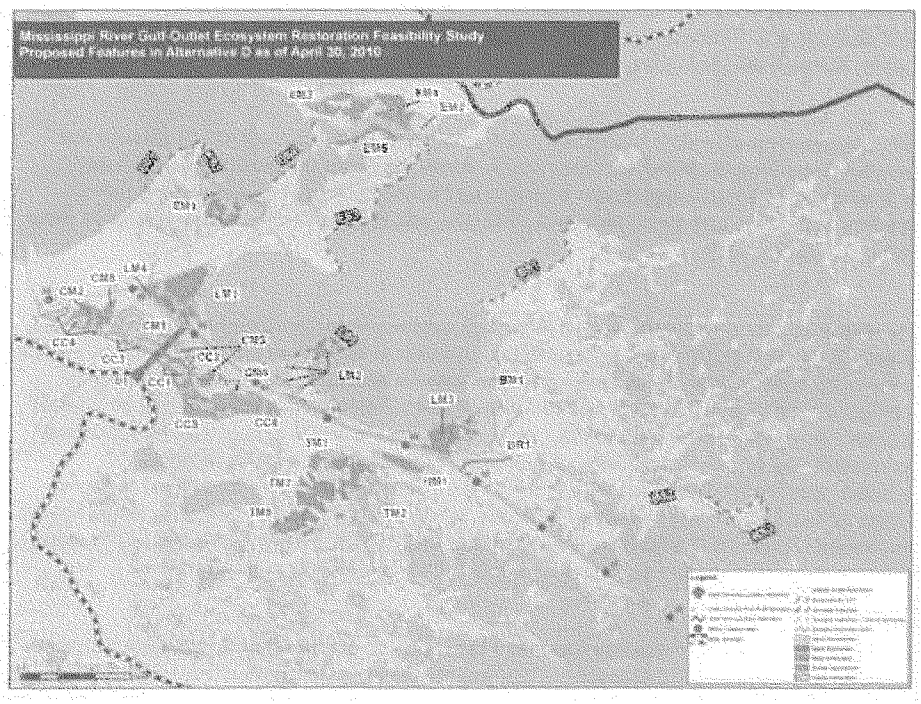
Alternative Plan B would restore approximately 10,318 acres of cypress swamp, 10,473 acres of fresh and intermediate marsh, 10,496 acres of brackish marsh, 0 acres of saline marsh, and 48 acres of ridge habitat (Figure 2). Features in the East Orleans Landbridge, South Lake Borgne, and Terre Aux Boeuf subunits include marsh creation and nourishment. The Central Wetland features include a freshwater diversion at Violet and cypress swamp restoration and nourishment. Features in the Biloxi Marshes consist of restoring part of the existing subsided ridge on the south bank of Bayou La Loutre.

Figure 3. MRGO Ecosystem Restoration, Alternative Plan B Features.



Alternative Plan D would restore approximately 10,318 acres of cypress swamp, 15,028 acres of fresh and intermediate marsh, 3,979 acres of brackish marsh, 699 acres of saline marsh, and 48 acres of ridge habitat (Figure 3). In addition to all of the features described for Plans B and C, Plan D includes additional restoration components in the East Orleans Landbridge, the Biloxi Marsh, and Terre aux Bouefs. Plan D also includes restoration features in the Hopedale area, and the most cost-effective features in the MRGO.

Figure 4. MRGO Ecosystem Restoration, Alternative Plan D Features.



Tentatively Selected Plan (TSP): Plan C

The TSP - Alternative C would initially restore approximately 57,472 acres of habitat in the study area, including 14,123 acres of fresh and intermediate marsh; 32,511 acres of brackish marsh; 10,318 acres of cypress swamp; 466 acres of saline marsh; and 54 acres of ridge habitat. Alternative C includes approximately 71 miles of shoreline protection. These acreage values are based on WVA results, which take into account marsh creation behind the shoreline protection features. Features in the East Orleans Landbridge and South Lake Borgne subunits include marsh creation and nourishment and shoreline protection. The Terre Aux Boeuf subunits include marsh creation and nourishment. The Central Wetland features include a freshwater diversion at Violet, cypress swamp and marsh restoration and nourishment. Features in the Biloxi Marshes consist of restoring part of the existing subsided ridge on the south bank of Bayou La Loutre, marsh creation and nourishment, and shoreline protection including oyster reef restoration as shoreline protection.

Internal guidance was received in July 2011 that directed the Planning Development Team (PDT) to develop a phased plan for implementation. The guidance stated that project features that have feasibility level of design, and are sustainable without the future implementation of any other feature, should be prioritized for early implementation. The guidance noted that features

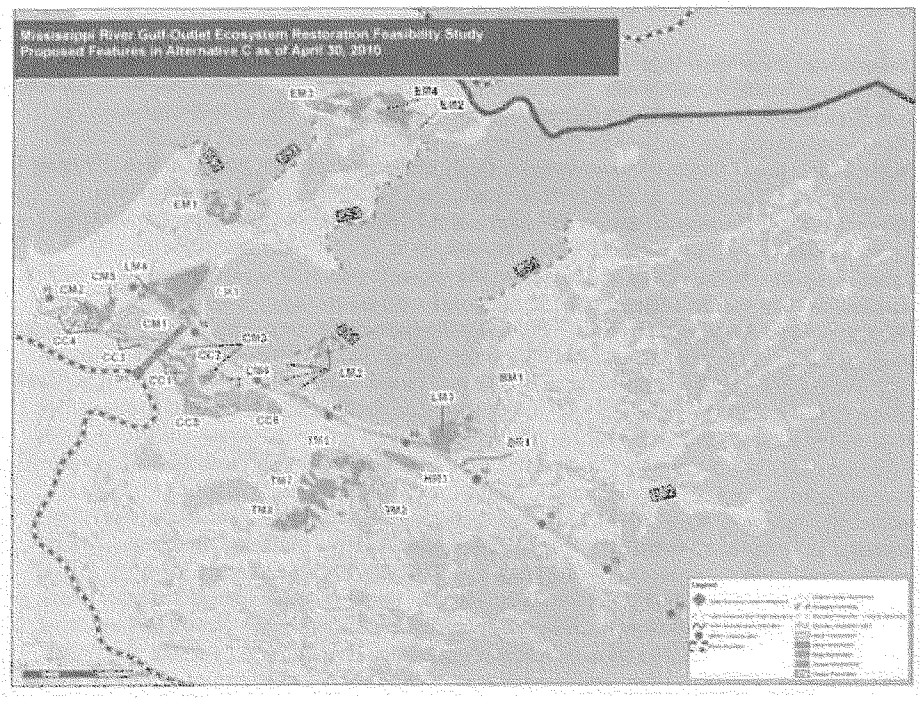
lacking feasibility level of detail or requiring additional scientific investigation to support decision-making should be recommended for further analysis. Lastly, the guidance directed the PDT to develop a Monitoring and Adaptive Management Plan to reduce knowledge gaps and support future decision-making.

Shoreline protection, marsh restoration and nourishment, and ridge restoration features are prioritized and recommended for construction, contingent upon the identification of a non-Federal sponsor. There is significant institutional knowledge regarding the construction of shoreline protection and marsh restoration features, and therefore further investigation of these features is not required.

The Violet Freshwater Diversion is an important component of the plan to restore pre-MRGO salinity conditions and provide freshwater and nutrients to nourish existing and restored wetlands in the study area. However, because additional study is needed to develop the feature to a feasibility level of detail, it must undergo further analysis and implementation will be delayed. Because the cypress restoration features proposed in the Central Wetlands may be dependent upon additional inputs of freshwater, the majority of these features are conditionally recommended for implementation, subject to verification of planning assumptions in future phases of the project. For evaluation purposes, we assumed the Violet Diversion would become operational in year 2027 allowing time for further study and implementation and implementation of the cypress swamp restoration feature would follow completion of the diversion.

The Monitoring and Adaptive Management Plan (MAMP) for the study describes a systematic approach to reduce and address some of the uncertaintics associated with the study. An initial adaptive increment of cypress restoration would be constructed in the Bienvenue Triangle area for monitoring and adaptive management. The knowledge gained from this initial adaptive increment will be applied to future cypress restoration projects. Additionally, there are some uncertainties regarding the potential water quality impacts of dredging in Lake Borgne. The MAMP outlines a monitoring program to reduce uncertainties and apply knowledge gained to future projects. The MAMP for this study has developed decision criteria, also referred to as Adaptive Management (AM) triggers, to determine if and when AM opportunities should be implemented.

Figure 5. MRGO Ecosystem Restoration, Alternative Plan C – Tentatively Selected Plan Features.



Barrier Island Feature

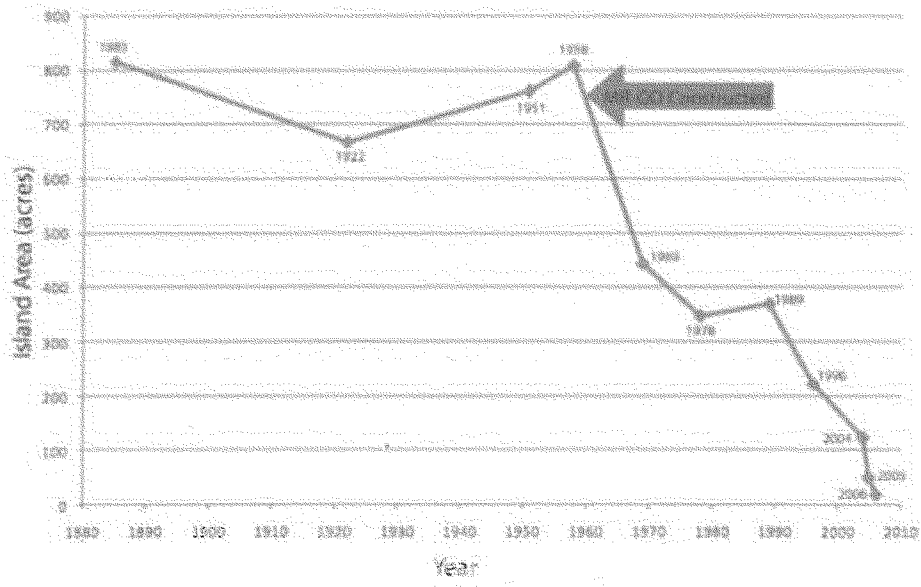
Six barrier island alternatives were evaluated as part of the MRGO Ecosystem Restoration Plan. They included one Chandeleur alternative which yielded considerable benefits and its' cost per benefit was not excessive. The remaining five alternatives were various designs for Breton Island. Breton Island alternatives one and three produced the best benefits per cost. Breton Island Alternative 1, is the more robust of the two alternatives, that includes a 4-mile long, crescent shaped beach and dune with a 3,700 ft wide back barrier marsh. Breton Island Alternative 3 was developed as the least expensive approach to achieving as many benefits as possible by discharging at a single point to create a 1,000 feet wide, 10 feet high platform at the northern end of the island and allow the island to naturally rework that material. Even though alternatives for the islands were developed and conceptually ready for selection, the Corps choose not to include a barrier island component in the TSP. The reasons given included the need for more engineering investigations to complete feasibility level design prior to finalizing the document and more importantly the Corps position that impacts to Breton Island from the MRGO are difficult to quantify.

Though the Chandeleur alternative had the most benefits, the Service agrees the Chandeleur Islands were not likely to have been directly or indirectly affected by the MRGO. Conversely,

the Service believes that although barrier islands have many factors contributing to their reduction in area, the MRGO did impact Breton Island.

Breton Island does not follow the same trends in island area change exhibited by Curlew and Grand Gosier Islands to the north. The difference is attributed to the construction of the MRGO outer bar channel for navigation purposes (Lavoie, D, ed., 2009). The MRGO intersects the Chandeleur Islands just north of Breton Island and was cut through the existing tidal inlet of Breton Island Pass. Deepened ship channels facilitated sand loss from littoral drift to offshore seafloor areas (Morton, R. A. 2008). Prior to construction of the MRGO, sand that was transported alongshore could bypass this inlet via the ebb tide delta, nourishing the flanking barrier islands (Thomson et al., 2009 and Thomson et al., 2010). As reported in the 2003 ODMDS report, "Sediment accumulation should increase with increasing channel depth until it becomes so deep that the channel traps all sediment crossing the inlet" (USACE 2003). The MRGO required frequent maintenance dredging to remove sand, which was placed in the Ocean Dredged Material Disposal Site (ODMDS), before being deauthorized in 2008. However, in 1992 and beyond, dredged material was occasionally used beneficially to enhance Breton Island. Strong tidal currents flow through MRGO because it is a major conduit for tidal exchange for much of the Lake Pontchartrain Basin. The increased tidal prism and strong ebb tide currents resulted in the seaward transport of sand to a now distant ebb tide shoal that prevents sand from nourishing Breton Island (Thomson et al., 2009). As a result, Breton Island has undergone accelerated land loss due to the MRGO channel interrupting the natural sediment bypassing pathway, by removal of sediment through flushing action of the increased tidal prism, and by maintenance dredging of the MRGO channel, all of which remove sediments from the littoral system (Lavoie, D, ed., 2009; Thomson et al., 2009). These processes prohibit Breton Island from recovering from storms in a similar manner to the islands north of the MRGO and have resulted in a long-term reduction in the Breton Island area (Lavoie, D, ed., 2009). Further indirect evidence of these detrimental processes is provided by the restoration efforts that used dredged material from the MRGO. Some of the material removed from the MRGO was placed in a feeder berm that was most likely in closer proximity to the pre-MRGO ebb tide delta location that the more distal ODMDS. Material placed in the feeder berms eventually accreted to the island (Penland and Westphal 1996). Figure 6 shows the historic acreage of the islands from 1885 through 2006. This figure highlights the significant decreases in island acreage that occurred immediately after the construction of the MRGO (Thomson et al., 2009).

Figure 6. Breton Island area change through time showing the impact of MRGO construction and maintenance dredging (Thomson et al., 2009).



Similar responses to navigation channels bisecting island chains are seen in other parts of coastal Louisiana and along the east coast. On the eastern side of Louisiana and western Mississippi, it is reported that deepened ship channels facilitate sand loss from littoral drift to offshore seafloor areas (Otvos & Carter, 2008). Specific to Louisiana, the evaluation for the deepening of the Houma Navigation Channel at Cat Island Pass (Rosati 2007) reported that a deeper channel will intercept sand presently bypassing the channel and will increase shoaling resulting in an approximately 15% increase in maintenance dredging. As a result, the study recommended sediment dredged from Cat Island Past should be placed on East Island, downdrift of the channel to renourish the island that would otherwise loose sediment as a result of the deeper channel.

Breton Island is a National Wildlife Refuge, managed by the Service and is of national importance. Until recently (Lavoie, D, ed., 2009; Thomson et al., 2009) the Service was unaware of the long-term impacts to this important refuge as a result of the MRGO channel. However, the Service believes the connection between the areal loss of Breton Island and the MRGO channel has been proven and should be appropriately addressed in the TSP of the MRGO Ecosystem Restoration Plan. The importance of Breton Island is clear not only as America's second oldest Refuge (established in 1904) but by the tremendous benefits it provides to nesting colonial seabirds, including the largest sandwich and royal terns colonies in North America, wintering migratory birds, wintering piping plover critical habitat, and other shorebird habitat. Restoration of this island habitat will have benefits on a scale that cannot be realized anywhere else on the coast. Without restoration of the island, a great loss of habitat would occur with the islands disappearance.

PROJECT IMPACTS

All features of the TSP (Alternative C) were evaluated by examining benefits produced by three different relative sea level rise scenarios (see Appendix B for more details) as reported in Table 2. For the purposes of discussion, the medium rate will be reported.

The TSP would initially restore approximately 57,472 acres of habitat in the study area, including 14,123 acres of fresh and intermediate marsh; 32,511 acres of brackish marsh; 10,318 acres of cypress swamp; 466 acres of saline marsh; and 54 acres of ridge habitat. Alternative C includes approximately 71 miles of shoreline protection. These acreage values are based on WVA results, which take into account marsh creation behind the shoreline protection features. The implementation of the TSP is anticipated to restore unique habitats, significant ecosystem functions, structure, and dynamic processes through a comprehensive systems-based approach. Construction of a 7,000 cfs (maximum flow) diversion at Violet, marsh creation and nourishment, swamp creation and nourishment, shoreline protection, and ridge restoration features would have 376,980 AAHUs and 31,930 net acres at the end of 50 years based on a medium relative sea level rise scenario (Table 2).

Table 2. Potential Estimated Impacts (AAHU and Net Acres at 50 years) for the Tentatively Selected Plan for the MRGO Ecosystem Restoration Project for Low, Medium, and High Relative Sea level Rise Scenarios.

	LOW RSLR		MEDIUM RSLR		HIGH RSLR	
Feature	AAHU	Net Acres	AAHU	Net Acres	AAHU	Net Acres
Inner Biloxi marsh	1,684	1,818	1,947	602	401	0
Bayou LaLoutra outer SP	0.5	1	0.4	0	0.2	0
Bayou LaLoutra ridge	33	19	34	55	49	55
Central Wetlands marsh	5,275	2,593	9,289	5,668	8,934	0
Central Wetlands swamp	4,600	6,387	4,843	9,577	5,584	11,332
Diversion footprint Impacts	-165	-236	-155	-90	-95	0
East Orleans Landbridge	2,110	1,568	1,612	581	718	0
Lower Pearl River	419	3,379	505	1,303	121	0
Lower Lake Borgne marsh	18,112	7,965	18,034	11,940	10,021	0
Hopedale	176	736	192	286	70	0
Inner Terre Aux Boufs	1,595	5,123	1,678	2,008	519	0
TOTAL	**33,839**	**29,353**	**37,980**	**31,930**	**26,322**	**11,387**

Construction of several features would have an initial negative impact on existing wetland

vegetation, primarily through the excavation of the diversion outfall channel, placement of excavated material on existing marsh to create ridge and swamp, and freshwater inputs from the diversion that would convert existing brackish marsh to intermediate marsh. According to the WVA, the TSP would result in the direct and indirect loss of 3,874 acres (3,866 AAHUs) at the end of 50 years, of brackish marsh habitats due to the channel excavation, swamp creation, and conversion to fresher habitat and saline marsh due to ridge restoration (Table 3). However, the placement of excavated material for swamp and ridge restoration and the conversion to fresher wetlands will provide a base for the regeneration of approximately 34,919 acres (24,729 AAHUs) of bottomland hardwood and wetland vegetation (Table 4) and a net increase of 31,930 acres (37,980 AAHUs, Table 2).

Table 3. Negative Impacts to wetlands due to Habitat Switching.

	LOW RSLR		MEDIUM RSLR		HIGH RSLR	
Feature	AAHU	Net Acres	AAHU	Net Acres	AAHU	Net Acres
Diversion footprint Impacts	-165	-236	-155	-90	-95	0
Brackish to Swamp	52	-4,945	295	-1,755	1,055	0
Saline to Ridge	-9	-36	-8	0	9	0
CW Brackish to Intermediate	-237	-6,088	3,733	-2,029	5,268	0
Borgne Brackish to Intermediate	2,890	-10,026	3,451	-3,895	5,350	0
TOTAL	**-359**	**-11,305**	**3,866**	**-3,874**	**6,237**	**0**

Table 4. Positive Impacts to wetlands due to Habitat Switching.

	LOW RSLR		MEDIUM RSLR		HIGH RSLR	
Feature	AAHU	Net Acres	AAHU	Net Acres	AAHU	Net Acres
Brackish to Swamp	4,548	11,332	4,548	11,332	4,529	11,332
Saline to Ridge	42	55	42	55	40	55
CW Brackish to Intermediate	5,512	8,681	5,557	7,697	3,666	0
Borgne Brackish to Intermediate	15,222	17,991	14,583	15,835	4,670	0
TOTAL	**25,324**	**38,059**	**24,729**	**34,919**	**12,905**	**11,387**

A freshwater diversion is necessary to achieve habitat objectives adopted for this study and enhance surrounding wetlands. The future without project salinity conditions suggest that salinities in the study area will be reduced by the closures on the MRGO and other authorized projects. However, additional freshwater, sediment (fines), and nutrient inputs will enhance many of the nearby wetland habitats.

The diversion was originally conceived to meet habitat objectives for the Lake Borgne ecosystem, including restoring cypress swamp in the Central Wetlands, intermediate marsh in the lower Lake Borgne marshes, and enhancing other surrounding marshes, as well as achieving desirable habitat conditions of the Mississippi Sound and the upper Biloxi marshes. Habitat salinity targets that would be favorable to oysters were used as an indication of the health of the Mississippi Sound and the upper Biloxi marshes. The HET agreed that the established salinity

targets based on the Chatry line originally proposed for the Bonnet Carre Freshwater Diversion and then for the Violet Diversion (in WRDA 2007) was an appropriate indicator of the health of that ecosystem. However, based on hydrologic modeling results that incorporated the MRGO closure the target salinities are met, or exceeded, for all but one month (May) of the year and in that month there was only a 1 part per thousand (ppt) difference. The HET agreed that meeting the Chatry salinity line in May was not crucial to the health of that ecosystem. In addition, there is a concern that the required high pulse (i.e., increased) flow in April and/or May to meet the Chatry target might have an over freshening effect on the estuarine fisheries in the Lake Borgne ecosystem and possibly the Mississippi Sound and the upper Biloxi marshes. It was agreed by the HET that a diversion capable of flowing up to 7,000 cfs provides the flexibility necessary to achieve the habitat objectives throughout the Lake Borgne ecosystem, however, the goal is no longer to achieve all the monthly (i.e., May) Chatry salinity targets in the upper Biloxi marshes. Under this scenario, a range of high flows can help control/eliminate salinity spikes as needed while not requiring the diversion to have a high pulse flow in April and/or May each year, unless needed. It is expected that through the associated Adaptive Management and Monitoring Plan, the diversion operation plan will be refined to achieve optimal habitat benefits of the Central Wetlands and the Lake Borgne ecosystem and surrounding marsh.

Though the actual operation may be somewhat different, the diversion was modeled at the original maximum proposed flows which show the full capability of the diversion. Specifically, the diversion was modeled to operate at a constant flow of 870 cfs, with a pulsing of 7,000 cfs during April and/or May. A combined 1,000 cfs was modeled to flow through the Central Wetlands and during the pulse while the remaining 6000 cfs will flow directly out of the Central Wetlands into the Lake Borgne/Biloxi Marsh ecosystem. It should be noted that wetland benefits analysis incorporated this operation scheme and will have to be adjusted once further refinement of the operation is developed. The Violet Diversion is designed so that management of the estimated base flow of 1,000 cfs can provide conditions favorable to bald cypress germination, growth, and reproduction by controlling depth and duration of inundation and salinity levels. In addition, an estimated 7,000 cfs diversion rate to achieve the earlier proposed salinity levels in May in the Biloxi marsh target area was modeled. The management of the diversion control structures will allow maintenance of favorable conditions for forested wetlands of the Central Wetlands as well as enhancing the habitat of the lower Lake Borgne marshes and parts of the East Orleans Landbridge and Biloxi marshes (see Appendix B – WVA Assumptions for more detail on the diversion operation).

Operation of the maximum 7,000 cfs diversion alternative would provide an inflow of fresh water, sediments, and nutrients to the project area and support the re-establishment and nourishment of wetland vegetation in the project area. It is anticipated that the Central Wetlands currently classified as brackish marsh would be converted to swamp and fresh marsh and the brackish marsh of lower Lake Borgne would convert to intermediate marsh following the start of the diversion operation. A gain in wetlands of the Central Wetlands area is expected while other area wetlands influenced by the diversion (East Orleans Landbridge, Lake Borgne marshes, and the inner Biloxi marshes) will become more sustainable.

Additionally, the SAND2 model land loss calculations conducted in support of the WVA for the 7,000 cfs diversion, including all features constructed with in the diversion influence area,

projected that the TSP would produce an overall gain, in fresh/intermediate, brackish, and saline marsh, swamp, and ridge habitat of approximately 28,368 acres and 35,725 AAHUs 50 years after project implementation (Table 2).

Depending on the frequency and magnitude of operation, river diversions may result in the conversion of more salt tolerant vegetation to vegetation less tolerant of salt water. Howes et al., (2010) determined that roots of fresh marsh vegetation in the Caernarvon Freshwater Diversion (Caernarvon) influence area are shorter than the roots of salt marsh vegetation. Exposure of marsh vegetation to nutrient rich river water may result in decreased lateral and vertical root growth. Additionally, some studies have indicated that exposure to nutrient rich river water may accelerate bacterial decomposition of soil organic matter and result in root mat degradation (Swarzenski, et al., 2008). These conditions can lead to shallower rooting of vegetation in lower salinity marshes, and a loss of root mat strength in those areas, which may increase the potential for erosion during tropical storm events (Howes, et al, 2010, Swarzenski, et al., 2008). Loss of low salinity marsh vegetation following Hurricane Katrina was observed in the areas downstream of Caernarvon (Howes, et al., 2010) leading to the thought that diversions may not be as beneficial to coastal restoration as previously believed. Examination of post Hurricane Katrina wetland loss maps confirm the extensive loss of wetlands in that area (Barras 2007). However, those same maps display a greater loss of shoreline marshes at the Mississippi River and Atchafalaya River deltas than the more interior fresher marshes. Shoreline erosion could account for some of this loss, but those observations confound the generalization that low saline marshes created by river flows are always more susceptible to erosion. Chabreck and Palmisano (1973) believed that the increased mineral content of the Mississippi River Delta soils prevented those areas from being lost to anaerobic conditions following Hurricane Camille. Examination of several delta crevasses constructed in the Mississippi River Delta, visible in the post Hurricane Katrina land loss maps (Barras 2007), indicate that little if any land loss occurred in those relatively newly formed low salinity marshes.

Howes et al., (2010) attributed the extensive Katrina-related loss of fresh marshes to the shorter and less dense rooting characteristics of fresh marsh plants than the longer and stronger roots of saline marsh plants. Although Howes noted that the relative strength of those marsh soils may be "exacerbated" by lack of soil mineral content, he attributed the differential marsh loss primarily on soil strength differences as determined by vegetation type. A Service assessment of Breton Sound marsh loss rates indicted that Katrina-related losses were greatest in the narrow brackish marsh zone. Because Howes addressed only the fresh and saline zone, and because Deltaic Plain low-salinity and interior marsh soils are typically more organic (where not receiving riverine inputs) than saline marshes (Hatton et al. 1983, Nyman and DeLaune 1991, and Nyman et al. 2006), it is not clear whether the Katrina related losses were due to diversion effects or to pre-hurricane and/or pre-diversion soil characteristics.

When Coastal Wetland Planning and Protection Act Coastwide Reference Monitoring System (CRMS) marsh soil bulk density data (i.e., a measurement of mineral content) for coastal Louisiana is compared to wetland loss maps, the results suggest that the mineral content of the soils may have a greater influence on the ability of marsh vegetation to resist storm erosion than salinity and associated vegetation type. Marshes with greater mineral content would be expected to occur in areas that are receiving or have recently received riverine mineral sediments

(Atchafalaya River Delta, Mississippi River Delta, crevasses in that delta), and also in saline marshes near large lakes and bays where there is frequent deposition of resuspended bay-bottom mineral sediment. CRMS 2008 soil bulk density data from the Caernarvon area indicate that soils in much of the fresh and intermediate marsh zones have received little additional mineral sediment from the diversion. This may be because heavier mineral sediments are being trapped in the outfall area (recently experiencing delta formation), Lake Lery, and other receiving open water areas. Also, diversion discharge rates did not often raise water levels sufficiently to flush and flood adjacent marshes and increase their mineral content. Increased elevation of bank levees (man-made or via natural accretion) and deposition in shoreline openings as a result of increased sediments could have also restricted the movement of riverine sediments to those adjacent marshes.

The ability to determine the actual effects of a diversion are further complicated because the methods used to classify satellite imagery are known to misclassify floating and submerged aquatic vegetation as land. Given that diversions tend to stimulate the growth of extensive beds of such vegetation in fresh and intermediate marsh zones, it is possible that short-term storm-related losses of such aquatic beds may be misclassified as marsh loss. Because those aquatic beds occur predominantly in the fresh and intermediate marsh zones, it is therefore likely that the actual Katrina-related loss of emergent fresh marsh and intermediate marsh may have been overestimated. The over-estimation of Katrina related land loss was observed in the Wax Lake Outlet, where map-depicted land loss was actually not land, but was extensive beds of aquatic vegetation.

Examination of the above information suggests that in the early years of diversion operation, the fresher water marshes may become more susceptible to erosive forces. However, with continued accretion of diverted mineral sediments, the once organic marsh soils become more mineral rich and the ability of those lower salinity marshes to resist erosive forces may substantially improve. To ensure that such a transition occurs it is important that adaptive management be incorporated into all diversion plans. That management should maximize the introduction of suspended sediments and ensure that over marsh flows would disperse those sediments across the outfall area as opposed to such flows remaining in the waterways and filling open water areas.

Wildlife Resources

Construction of the project features may disrupt or displace wildlife in the immediate vicinity. However, the long-term impact of construction is expected to be beneficial to overall habitat quality. By the proposed diversion having a potential pulse as needed, the salinity gradient of the Lake Borgne and Biloxi marsh estuary is maintained while sustaining and enhancing existing marsh in the study area. Because ridge and swamp habitat are considered to be a limiting factor for migrating birds, the creation of these habitats are considered an essential restoration need of the project area. The TSP will have a positive effect on wildlife resources by increasing unique and vital habitat that will be utilized by wildlife species.

Currently the TSP does not include a barrier island component. If a barrier island feature was included it would increase the sustainability of the barrier island; help restore the geomorphic function of the barrier island thus restoring the hydrologic benefits of the islands to the basin;

and create and restore shoreline and island habitat. By restoring the barrier island, vital seagrass bed habitat would be enhanced and maintained for sea turtles, manatee, and wintering migratory waterfowl in the northern Gulf of Mexico. The restored island would greatly benefit nesting colonial seabirds, especially brown pelican and sandwich and royal terns nesting colonies, piping plover and other shorebirds. Restoration of these island habitats will have benefits on a scale that cannot be realized anywhere else on the coast. Without a barrier island component many of these benefits to wildlife may be lost.

Overall, the TSP would result in improved habitat conditions for several species of wildlife including migratory and resident waterfowl, shorebirds, wading birds, and furbearers. Migratory waterfowl utilizing the project area would benefit from a greater food supply resulting from the increased abundance and diversity of emergent, submerged, and floating-leaved species. Enhanced marsh and marsh edge would provide increased foraging opportunities for shorebirds and wading birds. Small fishes and crustaceans are often found in greater densities along vegetated marsh edge (Castellanos and Rozas 2001, Rozas and Minello 2001), and many of those species are important prey items for wading birds such as the great blue heron, little blue heron, great egret, black-crowned night-heron, and snowy egret. Furbearers (such as muskrat) which feed on vegetation would benefit from the increased marsh acreage in the project area. Representative furbearers such as the mink, river otter, and raccoon have a diverse diet and feed on many different species of fishes and crustaceans. Those species often feed along vegetated shorelines which provide cover for many of their prey species.

Fisheries Resources

There would be negative impacts to fisheries resulting from swamp, ridge, and diversion construction as the existing marsh (1,845 acres) is lost to those new habitats (Table 3). However, there would be positive impacts to fisheries habitat from marsh creation as marsh edge is restored, nourished, and protected. The shoreline protection features of the TSP will provide additional fisheries habitats for estuarine fish. If a barrier island feature was part of the TSP, it would have a positive effect on fish resources by reestablish a barrier between a deteriorating estuarine ecosystem and the Gulf of Mexico thereby increasing unique and essential habitat that will be utilized by various fisheries species. The seagrass beds associated with the barrier island feature would enhance that rapidly declining vital habitat for juvenile aquatic species. Without the barrier island component these benefits may be lost.

The potential impact of the proposed borrow sites on water quality, specifically in regards to low dissolved oxygen and anaerobic or anoxic conditions is a significant concern to the Service. To help reduce the potential for anoxic conditions to occur, the borrow sites are proposed to be dredged to approximately -10 feet with 5 feet of allowable over depth and sides sloping up to the adjacent lake bottom. In addition, the borrow sites will be located at least 3,000 feet from the existing shoreline to reduce wave impacts and will be monitored for dissolved oxygen levels. Because borrow material is to be excavated primarily from Lake Borgne (see Figure 2), a large portion of the lake will be affected in both the alteration in water bottom substrate habitat, as well as, the increased potential of change in the flushing ability that otherwise would prevent anerobic conditions from occurring.

Anerobic conditions in dredge holes can severely limit species diversity and often eliminate all benthic organisms except certain bacteria that can tolerate those conditions (Taylor and Saloman 1968, in: USFWS undated; Sullivan and Hancock 1973, in: USFWS 1977). While some species of fish are attracted to the holes during certain times of the year when water quality improves, they must evacuate those areas when severe oxygen stress forces them to either leave or die (USFWS undated). Evacuation of study areas may occur in the late spring or summer when low oxygen levels are most likely to occur (Kinne 1963, in: USFWS undated).

Because a very large quantity of dredged material will be needed to create approximately 10,318 acres of cypress swamp, 13,140 acres of fresh and intermediate marsh, 31,048 acres of brackish marsh, 466 acres of saline marsh, 54 acres of ridge habitat, and 71 acres of shoreline protection, careful consideration should be given to the borrow site design. Though borrow sites are proposed to be dredged to shallow depths to avoid creating anoxic sumps, the need for excavating material over more surface area is necessary to collect the needed quantity of material. By dredging over a larger surface area, potential complications may include: 1) alteration in water bottom substrate habitat: 2) more benthos may be directly removed, which may (at least temporarily) reduce food availability for fishery organisms; 3) other sessile resources, such as oysters could be affected; and 4) by continually moving the dredge, the resuspended sediments will take longer to settle and could prolong the periods of high turbidity associated with dredging operations.

Recovery (both in terms of organisms and re-filling with sediment) of these borrow sites appears to be a function of the original depth and other local factors. Several scientific studies indicate that recovery may take from 6 to 10 years in relatively shallow holes (e.g. 6 feet below natural bottom) or, as is more frequently reported, much longer in the deeper holes (USFWS undated).

Implementation of the TSP following the operational plan evaluated in the hydraulic modeling, CASM and WVA (i.e., 7,000 cfs flow in April and May; 870 cfs rest of year) is expected to freshen much of project area including the Central Wetlands, lower Lake Borgne marshes, part of the inner Biloxi marshes, and some of the East Orleans Landbridge while the diversion is at full flow and for several weeks after the return to maintenance flow. The overall effect of the diversion is that it is expected to decrease salinities spikes throughout the project area and convert the brackish marsh of the Central Wetlands to fresh marsh and swamp and the brackish marsh of the lower Lake Borgne marshes to intermediate marsh. Water levels, velocities, and turbidity in outfall areas are all expected to increase during full flow conditions. Entrainment of eggs, larvae or fry of Mississippi River fish species in the immediate vicinity of the diversion inflow may occur during operation of the structure.

High nutrient levels could result in blooms of algae and phytoplankton, and subsequent decomposition of these organisms could decrease dissolved oxygen levels of water bodies within the project area. These changes could result in localized adverse impacts to estuarine fishery productivity, particularly when the diversion is at full flow.

Freshwater fishery species especially in the Central Wetlands, such as crawfish, crappie, bluegill, redear sunfish, warmouth, channel catfish, and blue catfish, largemouth bass, yellow bullhead, freshwater drum, bowfin, carp, buffaloes, and gars should benefit from implementation of the

diversion. Some fishery species would be impacted by anticipated decreases in salinity and water temperature, and increased turbidity during maximum flow periods. Less freshwater tolerant species, such as brown shrimp and spotted seatrout, may be displaced from the Central Wetlands portion of the project area. In fact, modeling results show that running the Violet Diversion at maximum flow of 7,000 cfs in the Central Wetlands may negate tidal input to the area limiting aquatic organism access to the marshes.

The CASM modeling focused on key species of ecological, recreational, and commercial value including oysters, brown shrimp, white shrimp, blue crab, red drum, spotted sea trout, striped mullet, Gulf menhaden, bay anchovy, sheepshead, and Atlantic croaker. Gulf sturgeon was additionally included because of its endangered species status. To address different habitat requirements (e.g., salinity, depth, etc.) juvenile (or immature) and adult stages were modeled as separate populations for oysters, blue crab, brown shrimp, white shrimp, red drum, and spotted sea trout (Bartell et al 2010).

Inspection of the future with-out project (FWOP) results suggests minimal differences between the baseline simulation and the results for FWOP. There are small increases or decreases in the productivity of the modeled plant populations and consumer populations. These small differences reflect the differences in salinity between the baseline University of New Orleans (UNO) hydrologic model results and the corresponding results for the FWOP alternative (Bartell et al 2010).

Comparison of the revised baseline plant population production with plant production for future with-project (FWP) (i.e., TSP) indicates general decreases in the production of *Halodule* and *Thalassia* that would be expected with decreases in salinity for these populations characteristic of more saline environments. The model results also indicate shifts in the spatial distribution and abundance of *Phragmites* that correspond to spatial-temporal changes in salinity as determined by the FWP condition (Bartell et al 2010).

The responses of the consumer populations to FWP compared to the baseline simulation vary among populations and locations. For example, oyster production for FWP increases in some nodes and decreases in others compared to the baseline results. Production for FWP increases for oysters, blue crab, brown shrimp, and white shrimp in the node (73) that corresponds to the Biloxi Marshes. FWP effects on production for the modeled fish species also varies among locations with both increases and decreases compared to the baseline conditions. Importantly, the model results for this proposed diversion do not suggest drastic alterations in production and appear consistent with the moderate changes in salinity (and other water quality parameters) associated with this proposed diversion (Bartell et al 2010).

By implementing an operational plan to enhance surrounding wetlands, estuarine-dependent fisheries may be enhanced by reducing high salinity spikes (without over-freshening), increasing organic production, increasing biological productivity and improving fisheries habitat. The introduction of freshwater to the project area would ensure that the project area continues to provide important nursery functions beyond the 50-year project life. However some estuarine species may be displaced. Oysters may benefit from the diversion during normal base flow years depending on environmental conditions but over freshening would occur during high pulse years. The over freshening of oyster habitat in Lake Borgne that would occur during the high pulse years has the potential to lead to oyster mortality.

Historically, salinity appears to be the chief controlling factor in the number of plankton species

present, while temperature, competition, and predation control the numbers of individuals present (Day et al., 1989). Therefore, introduction of large amounts of river water (pulsing) into estuarine systems may have dramatic short-term impacts on plankton populations in adjacent coastal waters (Hawes and Perry 1978). Freshwater inflow is an important component of circulation and flushing processes in estuaries that assist in the transportation of plankton, nutrients, and detritus to the Gulf of Mexico. Over the long term, operation of the diversion is expected to help support the aquatic food web of marine fishery species.

Essential Fish Habitat

There would be negative impacts to EFH resulting from swamp, ridge, and diversion construction as the existing marsh (1,845 acres) is lost to those new habitats (Table 3). Direct impacts of swamp, ridge, and diversion construction would disturb and displace managed species in the construction footprint. Changes to the salinity levels and temperatures due to the diversion flows into the southern part of Lake Borgne may have potential impacts to the identified EFH species in Lake Borgne. Marsh creation would result in the loss of mud bottom and estuarine water column as emergent marsh would replace those habitat types. If the TSP had a barrier island component, it would have a positive effect on EFH resources by increasing the essential habitats of the barrier island and associated seagrass beds. The diversion may reduce fishery use of the Central Wetlands as tidal exchange is diminished by diversion flows. Although adverse impacts would occur to some types of EFH, overall more productive types of EFH (i.e., estuarine emergent wetlands) would be created and enhanced with the diversion and marsh creation features. The input of freshwater, sediments, and nutrients are expected to benefit estuarine EFH within the project area. The TSP is projected to increase SAV in the project area and decrease emergent marsh loss across all marsh zones (fresh/intermediate, brackish, and saline). These changes in the project area would not only increase the aerial extent of EFH, but would also improve the quality of EFH for several managed species.

As discussed in greater detail in the above Fisheries Resources section, the large quantity (153,000,000 cfs) of borrow material proposed to be taken from Lake Borgne for the TSP may have an adverse effect to species designated under EFH by presenting the potential for low dissolved oxygen or anaerobic conditions to occur, altering water bottom substrate, and by directly affecting more benthos, which may (at least temporarily) reduce food availability for EFH.

Threatened and Endangered Species and Species of Concern

Habitat alterations and poor water quality are two of the known impacts to have negatively affected the Gulf sturgeon. One of the primary constituent elements for Gulf sturgeon critical habitat is water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages. The large quantity of proposed borrow excavation in Lake Borgne and high diversion flows through Gulf sturgeon critical habitat may be a concern for this species by altering a potential habitat alteration, by increasing the potential of poor water quality as a result of numerous borrow holes, and by decreased water temperatures as a result of high flows from the cooler Mississippi River through the proposed diversion. In riverine waters, the Service is

responsible for all consultations regarding Gulf sturgeon and critical habitat, while in marine waters the NMFS is responsible for consultation. Therefore, please contact Dr. Stephania Bolden (727/824-5312) in St. Petersburg, Florida, for information concerning that species and its critical habitat. Should the proposed project directly or indirectly affect the Gulf sturgeon or its critical habitat in Louisiana, further consultation with that office will be necessary.

Entrainment of pallid sturgeon through diversion structures off the Mississippi River is a potential effect that should be addressed in future planning studies and/or in analyzing current project effects. Should the proposed project directly or indirectly affect the pallid sturgeon or its habitat, further consultation with this office will be necessary. Possible entrainment of pallid sturgeon in the Mississippi River in the immediate vicinity of the diversion inflow channel may occur during operation of the structure.

The study area encompasses piping plover Critical Habitat Unit LA–7 which includes, at the time of designation, 3,116 ha (7,700 ac) of the Breton, Grand Gosier, and Curlew Islands and the Chandeleur Island chain in Plaquemines and St. Bernard parishes. Those islands are part of the Breton National Wildlife Refuge or are state owned. The entire islands where primary constituent elements occur down to mean low low water (MLLW) are included in this unit. Should the proposed project directly or indirectly affect the piping plover or its critical habitat, further consultation with this office will be necessary.

Colonies nesting birds maybe present in the outer Biloxi marshes, on Bayou Savage NWR, on the barrier islands and new nesting colonies may have been established in the project area since the 1980 surveys. Brown pelicans are known to nest on barrier islands and other coastal islands in St. Bernard Parish. Bald eagle are known to occur within the study area north of Violet, north of the Rigolcts, and near thc Central Wetlands area. Other unknown nest sites may potentially exist in the project area as well.

The Corps is responsible for determining whether the proposed plan is likely (or not likely) to adversely affect any listed species and/or critical habitat, and for requesting the Service's concurrence with that determination. If the Corps determines, and the Service concurs, that the selected alternative is likely to adversely affect listed species and/or critical habitat, a request for formal consultation in accordance with Section 7 of the ESA should be submitted to the Service. That request should also include the Corps' rationale supporting their determination. If project construction has not been initiated within 1 year of the Corps determination and the Service's concurrence, follow-up consultation should be accomplished prior to making expenditures for construction. If the scope or location of the proposed work is changed, consultation should be reinitiated as soon as such changes are made.

SERVICE POSITION AND RECOMMENDATIONS

The TSP will benefit the fish and wildlife resources of the MRGO Ecosystem Restoration area by providing freshwater, nutrients, and sediments, and restoring ridge, swamp and marsh habitats in the study area thus facilitating increasing organic production, increasing biological productivity, increasing habitat diversity, and reducing wetland loss. Approximately 37,980

Average Annual Habitat Units (AAHUs) and 31,930 net acres of fresh/intermediate, brackish, and saline marsh, swamp and ridge habitats would benefit by the proposed project at the end of the project life given an intermediate sea level rise scenario. The Service supports implementation of the TSP and respectfully request the following fish and wildlife recommendations be implemented concurrently with project construction:

1. Regarding the barrier island component of the MRGO Ecosystem Restoration; the Service recommends, with support from NMFS and LDWF, the selection of a barrier island component be a part of the TSP. The Service feels the design and evaluation of the barrier island alternatives was sufficient to warrant selection, though further engineering would be required prior to construction. Breton Island is a National Wildlife Refuge, managed by the Service and is of National importance. Recent scientific investigations (Lavoie, D, ed., 2009; Thomson et al., 2009) demonstrate the long-term impacts to this important refuge as a result of the MRGO channel. Therefore, the Service recommends amelioration of the areal loss of Breton Island due to the construction and maintenance of the MRGO channel should be appropriately addressed in the TSP. The Corps should contact the Service regarding a compatibility determination, Wilderness Act provisions and special use permits that may be necessary to conduct activities on Breton NWR. The Corps is encouraged to establish and continue coordination with the Service until construction of any project feature is complete and prior to any subsequent maintenance. Points of contacts for the Service are: Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Neil Lalonde (985) 882-2000, Refuge Manager for the Breton Island NWR.

2. The Corps should contact the Service regarding a compatibility determination, and special use permits that may be necessary to conduct activities on Bayou Sauvage NWR. The Corps should establish and continue coordination with the Service until construction of any project feature is complete and prior to any subsequent maintenance. Points of contacts for the Service are: Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Neil Lalonde (985) 882-2000, Refuge Manager for the Breton Island NWR.

3. The final recommendations for the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083. This means the Violet Diversion will be funded and constructed under a different authorization than the authorization for the MRGO Ecosystem Restoration Plan. The Service recommends any additional study, design, and implementation include the Service and other resource agency involvement. In addition if the diversion location or other aspects of the diversion change significantly from what was analyzed in the MRGO Ecosystem Restoration Plan, the Service recommends the Sediment and Nutrient Diversion model (SAND2) and Wetland Value Assessment benefits analysis be revised to reflect the changes.

4. The Service recommends the operational plans for the Violet Diversion be evaluated to include more flexibility of flow (flows between 1000cfs and 7000cfs) to achieve optimal habitat conditions favorable to nearby intermediate marsh and to bald cypress

germination, growth, and reproduction by controlling depth and duration of inundation and salinity levels. As the operational plan for the Violet Diversion is further developed, future hydrological and fisheries (i.e., CASM) modeling, and updated habitat assessments (i.e., Wetland Value Assessments) should be conducted.

5. The Service recommends, with support from NMFS and LDWF, the diversion operational plan be developed in a way to avoid or minimize adverse impacts to marine fisheries and Essential Fish Habitat (EFH) while maximizing freshwater and nutrient input to the extent practicable to meet habitat objectives.

6. The Service and LDWF recommend salinity meters be placed in appropriate locations to assist in determining when target salinities are met.

7. The Service recommends the diversion be adaptively managed to enhance surrounding wetlands, that habitat switching (as a result of re-introduced river water) is allowed to occur in a manner that is not detrimental or destructive to the ecological processes, and that the diversion allows for draw down periods sufficient for cypress regeneration and cypress growth.

8. The Service recommends, with support from LDWF, a comprehensive examination of the river and all existing and proposed diversions to coordinate their operation and ensure that their operation will maximize their restoration capabilities. The ongoing Mississippi River Hydrodynamic and Delta Management Study could be utilized to address this issue.

9. The Service recommends, with support from NMFS and LDWF, establishment of a committee similar to review the operation and monitoring and adaptive management results of the Violet diversion and when necessary, provide recommendations regarding any future operational and maintenance changes. The Service and other natural resource agencies are amenable to participate on this committee.

10. The large quantity of borrow material proposed to be taken from Lake Borgne, which is designated Gulf sturgeon critical habitat, for the TSP may have an adverse effect to fisheries, EFH, and the threatened Gulf sturgeon by: 1) alteration in water bottom substrate habitat: 2) direct removal of benthos from a large area which may (at least temporarily) reduce food availability for fishery organisms; 3) other sessile resources, such as oysters could be affected; and 4) by continually moving the dredge, the resuspended sediments will take longer to settle and could prolong the periods of high turbidity associated with dredging operations. The Service recommends, with support from NMFS and LDWF, careful consideration be given to the affects of taking all borrow, including monitoring for benthos and water quality, from Lake Borgne and consideration should be give to obtaining borrow from other "outside" sources, such as the Mississippi River, and adjacent bays, and offshore areas. Over the project life, search for borrow from outside sources should continue as alternative sources may become economically feasible or as new advances in technology become available.

11. The NMFS is responsible for consultations regarding impacts to the Gulf sturgeon and its critical habitat for the MRGO Ecosystem Restoration project. Therefore, please contact Dr. Stephania Bolden (727/824-5312) in St. Petersburg, Florida, for information concerning that species and its critical habitat. Should the proposed project directly or indirectly affect the Gulf sturgeon or its critical habitat in Louisiana, further consultation with that office will be necessary.

12. The Service, with support from NMFS and LDWF, recommends the Lake Borgne borrow plan should initially specify monitoring three different depths of borrow sites for a minimum of two-years post dredging and prior to continued excavation. The Service recommends monitoring of water quality parameters are included in the MAMP in order to assess if anoxic or hypoxic conditions occur. If anoxia is a problem at 10 feet below the existing sediment surface with a +/- 5 foot tolerance, then the borrow sites will have to be dug shallower and other borrow source options explored to minimize impacts to estuarine water bottoms and EFH. The Service, NMFS, and LDWF recommend a summary of the Monitoring and Adaptive Management Plan for borrow be included in the Feasibility Study or Environmental Impact Statement. The Service, NMFS, and LDWF also recommend that all borrow sites be at least 1,000 feet from the shoreline to help avoid increasing shoreline erosion via increased wave height.

13. The proposed borrow areas in Lake Borgne do include private leases as well as public oyster seed grounds. LDWF manages the public seed grounds and should be consulted before final borrow locations are determined.

14. The Service recommends that all shoreline protection features include one fish dip every 1,000 feet (ft) constructed to a 25 ft bottom width to the pre-project elevation. On a case by case basis the 1,000 ft distance can be adjusted, in consultation with NMFS, to incorporate existing water exchange points.

15. The Service and NMFS recommends the retention dikes constructed for swamp and marsh creation and nourishment areas be gapped and degraded within three years of use if they have not naturally degraded on their own. Please coordinate gapping and degrading efforts with the Service and NMFS.

16. The Service and LDWF recommend a buffer of at least 500 feet be placed around existing hard bottom and oyster leases to minimize impacts to those resources.

17. The Monitoring and Adaptive Management Plan, as it is further developed, should be provided to the Service, NMFS, and LDWF for continued review, comment, and input.

18. If a proposed project feature is changed significantly or is not implemented within one year of the Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with the Service and NMFS to ensure that the proposed project would not adversely affect any Federally listed threatened or endangered species or their critical habitat.

19. The proposed Violet Freshwater Diversion structure off the Mississippi River has the potential to entrain pallid sturgeon, that effect should be addressed in the diversions future planning studies. Should the proposed project directly or indirectly affect the pallid sturgeon or its habitat, further consultation with this office will be necessary.

20. Avoid adverse impacts to nesting bald eagles, gulls, terns, and/or black skimmers, wading birds, and brown pelicans through the careful design of project features and timing of construction. A qualified biologist should inspect the proposed work area for the presence of undocumented nesting colonies and bald eagles during the nesting season (i.e., September 15 through March 31 for brown pelican, September 1 through February 15 for wading bird nesting colonies, September 16 through April 1 for colonies containing nesting gulls, terns, and/or black skimmers, and October through mid-May for bald eagles).
    - To minimize disturbance to colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present).
    - For colonies containing nesting brown pelicans, all activity occurring within 2,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 15 through March 31). Nesting periods vary considerably among Louisiana's brown pelican colonies so it is possible that this activity window could be altered based upon the dynamics of the individual colony.
    - For colonies containing nesting gulls, terns, and/or black skimmers, all activity occurring within 650 feet of a rookery should be restricted to the non-nesting period (i.e., September 16 through April 1, exact dates may vary within this window depending on species present).
    - If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary and those results should be forwarded to this office.

21. Land clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

22. Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service and other State and Federal natural resource agencies, and shall be provided an opportunity to review and submit recommendations on all work addressed in those reports.

23. A report documenting the status of implementation, maintenance, and adaptive management measures should be prepared every three years by the managing agency and provided to the Corps, the Service, NMFS, U.S. Environmental Protection Agency

(EPA), Louisiana Department of Natural Resources (LDNR), Office of Coastal Protection and Restoration (OCPR), and LDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

24. The Service recommends minimizing impacts to marsh from marsh buggy activities. Options to achieve that minimization include limiting the repetitive use of a route or to build temporary boardwalks over marsh where feasible and then backfilling the boardwalk area if needed. In areas with large marsh creation features that have minimal access routes, such as the inner Terre Aux Bouef marsh features, the Service recommends that work begin at the farthest location and proceed to the outer edges of the site to minimize the amount of damage.

25. The Service recommends the CASM model should be updated to incorporate conditions from the oil spill in the adaptive management plan. This model should also use the corrected assumptions.

26. Due to the significant acreage of marsh that will be accessed for swamp and marsh creation/nourishment, the Service request the Corps quantify the estimated acreage of flotation and construction access canal impacts to shallow open water habitat.

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APPENDIX A

National Marine Fisheries Service and Louisiana Department of Wildlife and Fisheries Comment letters

RECEIVED
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FISH & WLDL. SERV
LAFAYETTE, LA.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
263 13th Avenue, South
St. Petersburg, Florida 33701

Mr. James F. Boggs, Supervisor
Louisiana Field Office
U.S. Fish and Wildlife Service
646 Cajundome Blvd., Suite 400
Lafayette, Louisiana 70506

July 12, 2010 F/SER46/RH:jk
225/389-0508

Dear Mr. Boggs:

NOAA's National Marine Fisheries Service (NMFS) has received the Preliminary Draft Fish and Wildlife Coordination Act Report (Report) on the "Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study". The MRGO Plan evaluates and addresses systematic ecosystem restoration and protection for the Lake Borgne ecosystem and areas affected by the former MRGO navigation channel. In addition, the plan considers measures to reduce or prevent damage from storm surge. The New Orleans District (NOD) has identified a tentatively selected plan that proposes to restore 10,431 acres of cypress swamp, 13,890 acres of fresh and intermediate marsh, 33,696 acres of brackish marsh, 464 acres of saline marsh, and 48 acres of ridge habitat.

NMFS has reviewed the Report and concurs with its findings and recommendations. However, we would like to provide additional suggestions to be considered for inclusion into the document.

Borrow
Due to the significant quantities of material proposed as borrow material for marsh creation/nourishment, the U.S. Fish and Wildlife Service should request the NOD provide estimates of cubic yardage and depth of cut for the borrow sites highlighted in Figure 2 on page 20.

Fisheries Resources
The introductory sentence under "**Fisheries Resources**" should include the construction direct impacts to marsh (224 acres) from the proposed diversion canal identified in Table 3 on page 27. The sentence should read, "There would be negative impacts to fisheries resulting from swamp, ridge, and diversion construction as the existing marsh (2,672 acres) is lost to those new habitats". The second sentence in paragraph two on page 30 should acknowledge that the dredged cut limitation for borrow material is a recommended elevation. The sentence should read, "To help reduce the potential for anoxic conditions to occur, the borrow sites are proposed to be dredged to approximately -10.0 ft NAVD 88 with 5 ft of allowable over depth and sloping edges up to the adjacent water bottoms. It should also be identified that the borrow area locations should be at least 1,000 ft from the existing shoreline to reduce wave impacts.

The fourth paragraph on page 31 identifies that the Comprehensive Aquatic Systems Model results are preliminary and once completed, the information will be provided in this section to discuss the impacts of the freshwater diversion on representative fishery species. NMFS recommends that this paragraph be revised to include the following sentence, "In addition to modeling changes in salinity and water quality, the model has the capability to measure changes in dissolved oxygen levels. NMFS recommends that the

model be utilized to measure the potential impacts from low dissolved oxygen levels on fisheries resources in Lake Borgne".

The fifth paragraph on page 31 discusses the implementation of the operational plan of the freshwater diversion to enhance the ecosystem and increase biological productivity. It also identifies that there is potential to displace some species such as oysters in Lake Borgne. The paragraph should be revised to include the following sentence, "The over freshening that would occur during the high pulse years over the oyster habitat in Lake Borgne has the potential to lead to oyster mortality.

Essential Fish Habitat (EFH)
The first paragraph of the "**Essential Fish Habitat**" section on page 32 should identify the quantity of direct impacts to marsh, (2,672 acres), as the Report acknowledged in the Fisheries Resources section. The **Mass Balance of Flow, Nutrients, and Suspended Sediments Model** located in **Attachment 3: H & H Diversion Modeling,** demonstrates the distribution of water from the Violet Diversion over the Lake Borgne/Biloxi Marsh ecosystem at various flow scenarios. In Table 2 on page B36, the model indicates under the selected plan (Alternative 2), that 57% of the diversion flows into the southern portion of Lake Borgne. Changes to the salinity level and temperatures have potential impacts to the identified EFH species in Lake Borgne. The document should include a statement to identify the potential indirect impacts to EFH species from water quality changes with the diversion feature.

Due to the significant quantities of sediment proposed as borrow material for marsh creation/nourishment, the second paragraph on page 32 should identify the borrow quantities for Lake Borgne in supplement to the locations on the map for Figure 2 on page 20. In addition, due to the significant acreage of marsh that will be accessed for marsh creation/nourishment, the U.S. Fish and Wildlife Service should request that NOD quantify the estimated flotation access and construction access impacts to shallow open water habitat.

Appendix A: Latin Names for Species Discussed in Report
On page A4 of listed fish species, speckled trout, *Cynoscion nebulosus*, needs to be removed from the list. It is a duplicate for spotted seatrout which is already identified in the list.

We appreciate the opportunity to review and comment on this Report.

Sincerely,

for Miles M. Croom
Assistant Regional Director
Habitat Conservation Division

c:
LA DNR, Consistency, Ducote
F/SER46, Swafford
Files

JUL-14-2010 WED 07:49 AM LDWF R&A DIVISION FAX NO. 2257652624 P. 02

BOBBY JINDAL
GOVERNOR

State of Louisiana

ROBERT J. BARHAM
SECRETARY

DEPARTMENT OF WILDLIFE AND FISHERIES
OFFICE OF WILDLIFE

JIMMY L. ANTHONY
ASSISTANT SECRETARY

July 13, 2010

Mr. James F. Boggs, Supervisor
Fish and Wildlife Service
Louisiana Field Office
646 Cajundome Blvd.
Lafayette, LA 70506

RE: *Application Number: Draft Report - Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study*
Notice Date: June 16, 2010

Dear Mr. Boggs:

The professional staff of the Louisiana Department of Wildlife and Fisheries (LDWF) has reviewed the above referenced draft Fish and Wildlife Coordination Act Report. Based upon this review, the following has been determined:

LDWF concurs with the positions and recommendations outlined by the U.S. Fish and Wildlife Service.

LDWF believes that the restoration of Breton Island should be considered as the Service suggested. We also agree with the Service that the construction of the MRGO did increase land loss at Breton Island.

The proposed borrow areas in Lake Borgne do include private leases as well as public oyster seed grounds. LDWF manages the public seed grounds and should be consulted before final borrow locations are determined. LDWF also recommends that all borrow sites be less than 10ft below the existing sediment surface and 1000ft from the shoreline.

Recommendations 4, 6, 7 and 16 address trust resources of special concern for LDWF Office of Fisheries and we are supportive of the Services recommendations on these issues.

Application Number: *Draft Report – Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study*

July 13, 2010

The Louisiana Department of Wildlife and Fisheries appreciates the opportunity to review and provide recommendations to you regarding this proposed activity. Please do not hesitate to contact Fishery Habitat biologist Robert Bourgeois at 225-765-0765 should you need further assistance.

Sincerely,

Heather Finley
Biologist DCL B

hf/rb/kb

c: Rob Bourgeois, Fisheries Biologist
Kyle Balkum, Biologist Program Manager

APPENDIX B:

Mississippi River Gulf Outlet (MRGO) Environmental Wetland Value Assessment (WVA) Assumptions

General Assumptions

- Period of analysis will be from 2014 to 2065. Implementation of project is expected to take 10 years within the 50-year period of analysis.
- The 50-year period begins with the first year of operation (first year when benefits would be realized) from 2015 to 2065.
- For the Final EIS and FWCAR the latest 2011 version of WVAs were used for the benefits analysis. This version of the WVAs is expected to be recommended for Corps certification.
- WVAs were first run on groupings by geographic location. These locations include Biloxi, East Orleans Landbridge, Central Wetlands, Terre Aux Bouefs, and Hopedale. Early versions also included outer Biloxi, Florrissant, and Caernarvon, which were later determined to be out of the scope of this project.
- Preliminary WVAs were run on each features based on the portion of each feature within the larger group. The resulting benefits analysis (AAHU) was compared with cost in IWR to develop alternative plans.
- The Final Array of alternative plans were evaluated with full WVAs. Additional information includes impacts to wetlands for the diversion footprint and access footprints for each measure and dredging capabilities (see below for details). The resulting benefits analysis (AAHU) was compared with cost in IWR to determine the Tentatively Selected Plan (TSP).
- Subunits Biloxi(07), Central Wetlands(13), Lower Lake Borgne marshes(40), and East Orleans Landbridge (17) were evaluated as the entire subunit rather than the footprint alone. These subunits are within the diversion influence and would have an impact to existing marsh as well as created or nourished marsh and swamp. All other subunits address the feature footprint only.
- We evaluated the TSP with 3 different Relative Sea Level Rise rates (RSLR) including high, medium, and low (see RSLR info below and attachment 4).
- The TSP was reevaluated between the draft and final reports to accommodate changes to the implementation plan (based on refined changes to the borrow plan and feature footprints) and a revised diversion start date and operation schedule (see diversion section for more detail).
- WVA spreadsheets were linked as much as possible.
- Used the Master WVA spreadsheet Structure document (attachment 6) for groupings within subunit for benefits analysis.
- The master WVA spreadsheet contains individual variable assumptions as comments in most cells. See attachment 7 for variable assumptions.
- For initial geographic group WVAs, we established dependencies on measures that influence each other.
    - Shoreline protection features were initially grouped with the adjacent marsh creation/nourishment features.
    - Later each feature was evaluated individually before alternative plans were combined.
    - In the diversion influence areas the entire subunit with all its features were evaluated together.
    - A simplifying assumption was made where shore protection (SP) measures protected portions of a marsh creation (MC) measure. Rather than determine

actual interactions, the interacting SP and MC measures were treated independently according to their respective protocols. The only exception to this was that of the MRGO Channel Narrowing measures, where MC measures along the MRGO are protected by concrete panels. For those measures, we assumed that MC measures reduced the loss of created marsh by 50%, and the SP measures reduced the remaining loss by 50%, resulting in a combined 75% reduction in FWOP loss (polygon40 – South Lake Borgne polygon).

- Assume there will be maintenance on shoreline protection features and the diversion, but no maintenance on all other features (i.e. marsh creation/nourishment, ridge restoration, vegetative plantings, etc).
- Acreage for all features was based on engineering footprints. USGS provided habitat data based on these footprints and 2008 imagery. Acreage provided by USGS may be slightly different than those from the engineering drawings. This difference is attributed to different projections used by the corps (state plan) and USGS (2008 photography and UTM zone 15) provided habitat data analysis. It is necessary for WVA analysis to us the USGS provided data. The USGS data provides a breakdown by habitat, the loss rates are based on this data, and it is the most current and accurate data.
- Future without Project (FWOP) Analysis considered a no-action scenario for each alternative. Coastal processes impacts (erosion, storms, subsidence, and sea level rise) on existing habitats were also considered. Net restoration benefits of CWPPRA (phase II) and other authorized projects were added to baseline acres to produce actual FWOP predicted acreages.
- Using Corps predicted future water levels (based on the Shell Beach Gauge) under medium and high sea-level rise scenarios, those water levels were converted into RSLR rates, assuming that those water levels incorporated both subsidence and sea level rise effects. Using the Corps guidance, sea level rise (SLR) was determined using the Shell Beach Gauge to determine base and future subsidence and SLR levels. The baseline SLR year is 2011, and total water level rise (RSLR) at the end of 2064 (50 years) is 3.6ft High, 2.2ft Medium, and 1.27ft Low. Subsidence alone is 8.54 mm/yr, and historic SLR is 1.7mm/yr. For more details, see attachment 4, "Methodology for Determining Environmental Benefits for Variable 1, Percent Emergent Marsh."
- Future with Project (FWP) analyses considered changes from processes such as equilibrium, storm events, and subsidence, and resulted in an overall change in the platform area or in the conversion of one WVA habitat type to another.
- Salinity was based on hydrologic modeling results. Most subunits consisted of one major habitat type. Only Subunit 23 (Terre aux Boeufs) had two habitat types (saline and brackish); therefore, different WVA models were used to reflect the habitat difference. The following average salinities were used based on the habitat type.
    - Fresh/intermediate – average salinity during the growing season (March through November)
    - Brackish and saline – average annual salinity
    - Swamp – mean high salinity for March through October
- Habitat switching-

- For those WVAs that had habitat switching (brackish marsh to swamp, brackish marsh to ridge, and brackish to intermediate marsh), the FWOP WVA was inputted into the existing habitat type (brackish marsh in all cases).
- In FWP for intermediate marsh, 5 years were given after the diversion began to account for habitat transitioning from brackish to fresher habitat. And for swamp the switch happened 5 years after the swamp platform was created but only 1 year after the diversion went online. Because the diversion would allow for fresher salinities and the swamp would be planted in those fresher conditions.
- In the FWP WVA spreadsheets the AAHUs were divided by the transition year for the prior and post habitat type WVAs rather than the typical 50years. For instance if the diversion was operational in TY13, FWP for Brackish marsh was run from TY1 through TY17 and the AAHUs was divided by 18 years (because TY18 is the year the habitat switches and TY17 is the last year of the old habitat type). The FWP intermediate marsh portion started in TY18 through TY 50 and the AAHUs are divided by 32 years.
- The ridge platform was created in FWP TY2. It was assumed to take 4 years (TY6) before the material was sufficient (decomposition, desalination, etc) to plant ridge vegetation. In this case the WVAs assumed ridge was created in TY2 and was no longer marsh even though the ridge did not get credit until for being a ridge until after planting in TY6. The FWP ridge AAHUs were divided by 48 years.

Diversion

- Additional study is needed to improve decisions about where, when, and how to divert Mississippi River flows in a systems context. Therefore, the final recommendations for the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083. For the purposes of this study, the Violet Freshwater Diversion is anticipated to be built with appropriations from the Violet Authorization (Section 3083 of WRDA 2007).
- For all previous analysis, it was assume diversion construction will begin immediately (2015) and takes 5 years to construct (based on actual construction time for Davis Pond). In that case it was assumed that the first year of diversion discharges was TY 6 (2020).
- For the final TSP, it is assumed for the WVA and SAND2 analysis that the Violet Diversion will come online in year 2027. This number is derived from taking 5 years to complete the Mississippi Hydro and Delta Management Study, waiting a 3 year budget cycle, completing 2 years of additional NEPA analysis and 6 years to complete PED and construction of the project (see table below for target years).
- Previously the SAND2 Model was run with the assumption that the diversion would pulse every year, thus benefits were overestimated. WVA analysis was redone using Sand2.2 and had pulsing of 4 out of every 10 years (see table below for target years).
- Pulsing 4 out of every 10 years was based on recommendations from the 1984 Bonnet Carre report to maintain optimal salinities at the Chatry line.

- The diversion starts to flow with low cfs (no pulsing) to allow for natural habitat switching from brackish to intermediate marsh. The first pulse is not until two years after the diversion starts to flow.
- Alternating pulsing on 2yr/3yr cycle to account for pulsing 4 out of every 10 years.
- The pulsing years were applied in the SAND model runs, the results of which are used in V1 and acreages in the WVA. The WVA did not have additional TYs to represent each pulsing year. Instead we assumed all pulsing effects are cumulatively represented in the target years selected (Table 1)

Table 1. years of diversion beginning operation and pulsing.

YEAR	TY	NOTE
2027	13	Diversion starts to flow
2029	15	First pulse waits two years to allow for lower flows to aid in natural habitat
2032	18	Alternating pulsing on 2yr/3yr cycle
2034	20	
2037	23	
2039	25	
2042	28	
2044	30	
2047	33	
2049	35	
2052	38	
2054	40	
2057	43	
2059	45	
2062	48	
2064	50	

- Assume the diversion design used in the evaluation has a maximum discharge of 7,000 cfs depending on available river water level. In low water periods, we assume the diversion to operate at 870 cfs for a total of 1000 cfs including the Sewage and Water Board (SWB) estimated diversion. Specifically, we assumed that the diversion is operated at a constant flow of 1,000 cfs, with pulsing of 7,000 cfs during April and/or May in the years of pulsing. 1000 cfs will run through the Central Wetlands Area (CWA) and during the pulse the remaining 6000 cfs will run directly out of the CWA into the Lake Borgne/Biloxi ecosystem.
- It is assumed that flows over 5,000 cfs would overwhelm the Central Wetlands and cause flooding to Paris Road given the existing two structure openings at bayou dupery and bayou beinvenue. It is assumed that not more than 1000 cfs would flow through the CWA.
    - The effects of the diversion on the flooding of Paris Road are unknown but assumed not to be an issue with flows not to exceed 1000cfs. To prevent more than 1000cfs from circulating in the CWA a structure will be built in the channel to release controlled amounts of water into the Central Wetlands during pulses or high flows.
    - The WVAs are evaluated assuming not more than an additional 1000cfs flow through the CWA. Existing openings would remain open and to the same diameter and dimensions that currently exist. The WVAs will have to be re-evaluated if the assumption changes as a result of this method,

- The diversion is assumed to use a newly created canal (See Figure 1). Diversion 1 (Figure 1) is the proposed diversion structure and channel location. The diversion location may change within the CWA pending the future NEPA of the Violet authorization.
- Either overflow from the diversion or controlled water input will be allowed into the CWA in order to freshen the area enough to support a cypress swamp habitat. See attached proposed diversion operation scenario document (Attachment 5). Water is assumed to flow through the MRGO back levee canal to reach the north western parts of the CWA.
- A shoreline closure between the Golden Triangle and Procter Point (see Figure 2) will help distribute water to surrounding marshes rather than flowing directly into Lake Borgne. It is expected water will flow through the marshes of Golden Triangle, Proctor Point, and Biloxi marshes north of Bayou La Loutre.
- Modeling results showed the closure between Golden Triangle and Procter Point is effective in guiding diverted water through wetlands rather than directly into Lake Borgne and specifically resulting in more water going through the Biloxi marshes and affecting the target salinities.
- Used SAND2.2 model for diversion benefits to input into WVA by determining additional reduction in loss rate on marsh creation/nourished areas and existing marsh due to diversion.
- Diversion effects were evaluated in SAND2.2 for 50 years.
- Hydrologic modelers provide expert opinion to help determine the influence area for nutrient cycling and salinity (see appended 3).
    - Note: It is expected that water quality modeling and CASM modeling will be conducted to assess indirect impacts to fisheries, such as the displacement of species involving the introduced freshwater into Lake Borgne. This would also include the changes in salinity, temperature, uptake of nutrients in marshes, and the potential for hypoxia due to eutrophication. These effects will be addressed in the EIS. WVAs will not capture and not be used in this effort.

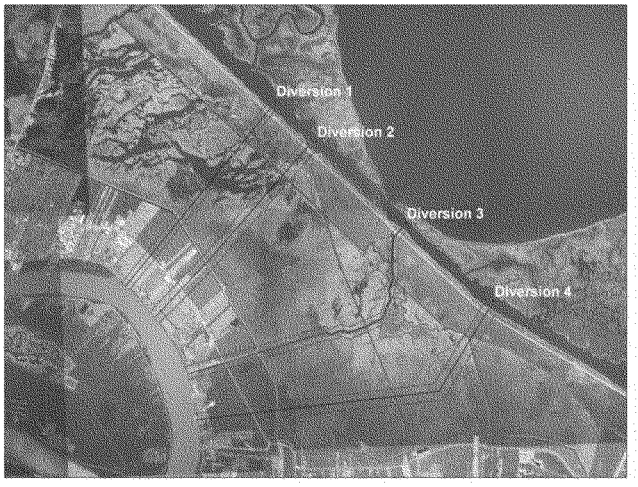


Figure 1. Proposed Violet Diversion Locations.

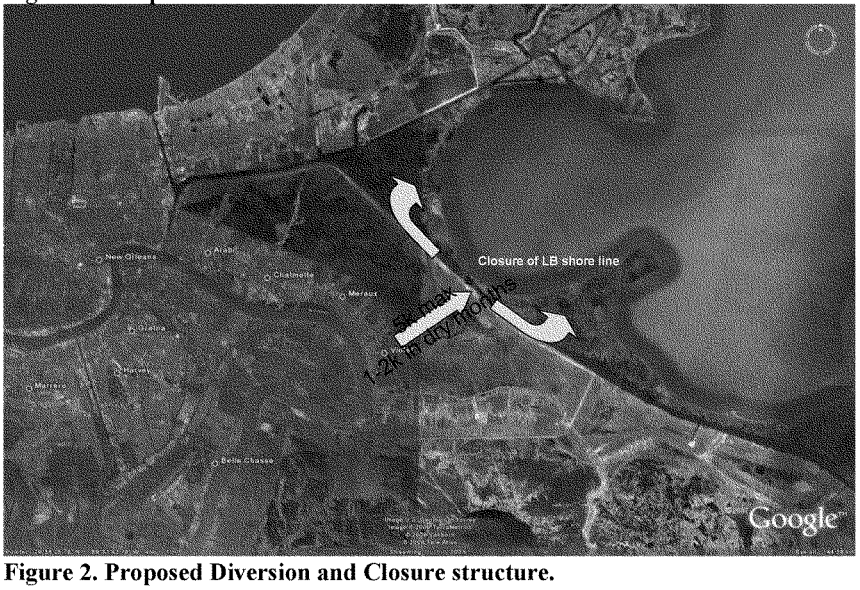


Figure 2. Proposed Diversion and Closure structure.

Marsh Creation

- See Attachment 2 for academic input on various issues.
- The difference in the acres between Corps provided engineering footprints and the USGS provided data (USGS used Corps footprints to develop their boundaries) are because the Corps and USGS used different projections. The Corps uses State Plane Louisiana South (feet). The USGS classified data is in UTM NAD 83 zone 15. If USGS were to re-project the thematic data to State Plane, the shifts in data would be too large to use.
- Used 2006 USGS habitat data and projected forward (applying loss) to 2014 for baseline (TY0) acres. USGS is advising that the provided 2008 data is not used because the numbers could be temporary as a result of impacts from Hurricane Gustav.

- Marsh Creation and Dredging

  For benefits evaluation of the final TSP an implementation plan was created that represented a 10 year construction window for all features. The final TSP analysis incorporated the implementation plan which distinguished the number of acres created and nourished each year and in each of the subunits. The implementation plan was developed based on engineering input and capabilities of available dredges.

  For the evaluation of the Final Array and the TSP prior to the Draft EIS, an implementation plan has not been developed. For the benefits analysis prior to an implementation plan we used the following assumptions. For purposes of the WVA analysis, the HET incorporated dredge production in marsh creation, marsh nourishment, and swamp creation benefits developed from the scenarios below. We used 15,000 cubic yards per day (cyds/day) production and water depths based on engineering assumptions for each feature (see following description). We used appropriate Corps dredging scenario to determine annual wetland creation acreage and assume that 2 dredges are operating at all times. We prioritized wetland creation areas by subunit, based on subunit loss rates (low loss rate areas by subunit are constructed first, high loss rate areas last). We assumed marsh and swamp creation begins in TY1 (2015).

  - *Scenario 1.*
    - Assume an average production of 20,000 cyds/day dredged, and operating 7 days/week for a whole year. Approx 7.3 million cyds would be borrowed. Assume the average elevation of the water bodies to be converted to marsh was -0.5'.
    - a. For marsh creation; approx 1,500 acres of wetlands could be created with 7.3 million cyds. This is based off of a maximum slurry elevation of +4.0' NAVD88 being used.
    - b. For swamp creation/restoration; approx 1,210 acres of swamp habitat could be created with the 7.3 million cyds. This is based off of a maximum slurry elevation of +4.5' NAVD88 being used.

- *Scenario 2.*
  - Assume an average production of 20,000 cyds/day dredged, and operating 7 days/week for a whole year. Approx 7.3 million cyds would be borrowed. Assume the average elevation of the water bodies to be converted to marsh was 1.0'.
  - a. For marsh creation; approx 1,300 acres of wetlands could be created with the 7.3 million cyds. This is based off of a maximum slurry elevation of +4.0' NAVD88 being used.
  - b. For swamp creation/restoration; approx. 1,065 acres of swamp habitat could be created with the 7.3 million cyds. This is based off of a maximum slurry elevation of +4.5' NAVD88 being used.

- *Scenario 3.*
  - Assume an average production of 15,000 cyds/day dredged, and operating 7 days/week for a whole year (approx 5.5 million cyds would be borrowed) and assume the average elevation of the water bodies to be converted to marsh was -0.5'.
  - a. For marsh creation; approx. 1,136 acres of wetlands could be created with the 5.5 million cyds. This is based off of a maximum slurry elevation of +4.0' NAVD88 being used.
  - b. For swamp creation/restoration; approx. 910 acres of swamp habitat could be created with the 5.5 million cyds. This is based off of a maximum slurry elevation of +4.5' NAVD88 being used.

- *Scenario 4.*
  - Assume an average production of 15,000 cyds/day dredged, and operating 7 days/week for a whole year (approx, 5.5 million cyds would be borrowed) and assume the average elevation of the water bodies to be converted to marsh was 1.0'.
  - a. For marsh creation; approx. 975 acres of wetlands could be created with the 5.5 million cyds. This is based off of a maximum slurry elevation of +4.0' NAVD88 being used.
  - b. For swamp creation/restoration; approx. 802 acres of swamp habitat could be created with the 5.5 million cyds. This is based off of a maximum slurry elevation of +4.5' NAVD88 being used.

- *Scenario 5.*
  - Could apply to some of the western Central Wetlands sites where the existing water depths are approx -3'.
  - Assume an average production of 20,000 cyds/day dredged, and operating 7 days/week for a whole year (approx 7.3 million cyds would be borrowed) and assume the average elevation of the water bodies to be converted to swamp was 3.0'.
  - a. For swamp creation/restoration; approx. 725 acres of swamp habitat could be created with the 7.3 million cyds. This is based off of a maximum slurry elevation of +4.5' NAVD88 being used.

- *Scenario 6.*
  - Could apply to some of the western Central Wetlands sites where the existing water depths are approx -3'.
  - Assume an average production of 15,000 cyds/day dredged, and operating 7 days/week for a whole year (approx. 5.5 million cyds would be borrowed) and assume the average elevation of the water bodies to be converted to swamp was 3.0'.
  - a. For swamp creation/restoration; approx 545 acres of swamp habitat could be created with the 5.5 million cyds. This is based off of a maximum slurry elevation of +4.5' NAVD88 being used.

- Thus, the acres of marsh that could be created in a year by one dredge could range from 975 acres to 1,500 acres, and the acres of swamp that could be restored could range from 545 acres to 1,210 acres. Prioritization is based on lowest lost rate first.

- Marsh nourishment design, determined by the engineers, is to free-flow marsh over existing broken marsh.
- Marsh creation utilizes retention features to build up marsh to required elevation. In some cases, existing marsh or shoreline protection features will act as retention. Overflow from marsh creation will nourish surrounding existing marsh. After compaction and dewatering, containment features would be breached to allow exchange of materials. Breaching is assumed to occur in most cases within one year of construction unless naturally degrades on its own.
- Marsh creation will create marsh in open water and nourish the surrounding existing marsh. Marsh nourishment will nourish existing marsh and nearby open water will become shallower.
- Access corridors (floatation channels) were evaluated for impacts to wetlands.
- Baseline (TY 0) is 2014.
- Assume the construction of the first measure(s) will be completed by year 2015, and construction will continue until all project measures are initiated. Construction of marsh creation/nourishment is estimated to end in year 2025 for the TSP based on the implementation plan Construction of the final array was evaluated as follows 2022 for plan C, 2020 for plan D (TSP), and 2019 for plan B based on dredging capabilities and prioritization for each alternative plan.
- For earlier WVA analysis, marsh creation would be constructed by TY 1 (TY 1 represents the as-built configuration). Loss would occur from TY 1 on. For the final array of alternatives and the TSP, the first year of marsh creation/nourishment construction would be complete in TY1. Other representations of as-built configurations vary based on the dredging capabilities discussed above.
- For the final TSP construction would be complete between TY1 and TY10 based on the implementation plan.
- It was discovered after the completion of the WVA analysis that the implementation plan had a mistake in construction year for the feature CM2, a marsh creation and nourishment feature in the Central Wetlands. The WVA assumed (based on the

Implementation Plan) that CM2 would be built in TY2. However based on the borrow plan it was realized that CM2 should have been constructed in TY7. It was agreed that with the lack of time to rerun SAND and WVA which would include changes in WVA TYs, the slight change would be addressed here in the assumptions doc. This change would reflect a slight increase in AAHUs and net acres since less time would be given in the project life to this feature (43 years vs. 48years). For the feature CM2 alone the net acres at the end of 50 years with construction at TY2 are 692acres and at TY7 are 711 acres (does not reflect SAND rerun). The net acres for the whole WVA would increase from 8681 to 8701 and the percent marsh would reflect less than 1% of the 10,791 acres of project area. The nearly 20 acres difference would be minimally (less than .1%) reflected in the AAHU.

- Typically, CWPPRA marsh creation projects apply a 50% reduction in the FWOP marsh loss rate to created or nourished marsh. The created marsh will provide more sediment to the system and combat subsidence. The area is less susceptible to breaching and increased erosion. There will be new nutrients available to the area, and there may be less wave fetch from open water areas from previously broken marsh. The created marsh will be at a higher marsh elevation than some of the FWOP marsh, thus allowing for more vertical accumulation of vegetation.
- Loss of created marshes is assumed to begin in TY1.
- Created marshes are assumed to be 25% vegetated (functional) in TY1, 43% vegetated in TY2, 62% vegetated in TY3, 81% vegetated in TY4, and fully vegetated by TY5. During the TY1-TY5 period, the loss rate (50% of the background FWOP rate) is applied to the marsh creation footprint acreage, and then the percent vegetation/functionality is applied to the remaining footprint to determine the acreage of marsh.
- In this study, a 50% reduction in background loss rate was applied for created and nourished marsh. However, because CWPPRA uses a 20-year period of analysis and this project has a 50-year period of analysis, the HET agreed to increase loss of these measures to full background rate (rather than 50% reduction of background rate) once 10" of sediment accretion occurs post-construction (12" was used in LaCPR), based on the following reasoning:
    - The depth of living roots varies from 8" to 12" depending on the health of the marsh based on academic studies (see attachment 2).
    - We selected 10" as the average depth of living roots.
    - Assuming that when 10" of accretion occurs, marsh vegetation will then be rooted in an organic soil typical of adjacent naturally occurring marshes and that the vegetation at the marsh creation sites will no longer benefit from contact with deposited fill. Biochemical and wetland loss processes typical of natural marshes then begins to occur so that loss of created marshes returns to the rate of naturally occurring marshes.
    - Average study area accretion = 7.4 mm/yr (Attachment 4).

- Median inundation threshold criteria developed by the Coastal Protection and Restoration Authority were used to predict onset of marsh collapse (Coastal Protection and Restoration Authority of Louisiana 2012). See Table 2.

Table 2. Cumulative accretion deficit values assumed to initiate marsh collapse.

Marsh Type	Range Low Limit (cm)	Range High Limit (cm)	Range Median (cm)
Intermediate	30.7	38.0	34.4
Brackish	20.0	25.6	22.8
Saline	16.0	25.0	20.5

- Using the average accretion rate and the water level increases associated with sea level rise (post the SLR baseline year of 2011), the years in which the collapse criteria occurred were determined (Table 3).

Table 3. Years when marsh collapse is predicted to begin.

SLR Scenario	Year Marsh Collapse Begins		
	INT marsh	BR marsh	SAL marsh
Med SLR	**	2058	2054
High SLR	2044	2035	2033

** *collapse occurs beyond the project life*

- Based on HET concensus, all marshes would be lost 10 years after meeting the collapse threshold criteria. Such criteria were met under the high SLR scenario and in TY50 for saline marsh under the medium SLR scenario.
- For both FWOP and FWP for the high RSLR scenario WVAs, target years were added for the year marsh collapse begins and year marsh acreage goes to zero. TYs vary based on subunit and habitat type.
- Only the low RSLR scenario will be used for early screening (WVAs and cost) and the final array of alternatives. The 3 RSLR rates will be used to evaluate the TSP.
- There will be vegetative plantings.
- Fully functional marsh
    - Typically, in CWPPRA, 25% of created marsh with vegetative planting is considered functional at TY 1 and is fully functional by TY 3. Fresh environments can often naturally vegetate much more rapidly than brackish or saline areas.
    - Presumably, adding 6 to 12 inches of sediment to nourish fragmented marsh allows those sites to vegetate more rapidly than sites created in open water. Therefore, nourished marshes are typically considered fully functional at TY1.
    - For created marsh, the HET will assume marsh is fully functional five years after marsh is created/nourished (based on dredging capabilities discussed above by subunit for the final array and draft TSP and based on the

implementation plan for the final TSP) rather than three years after to reduce the overall number of target years. This is a very conservative approach compared to standard CWPPRA protocol.
    - Nourished marshes will be considered fully functional at TY1.
- V3 Interspersion marsh creation – Based on the newly developed CWPPRA interspersion variable (2011), TY 1 will be class 5 for interspersion and TY 5 will be class 1. Typically CWPPRA assigns created marsh a class 3 in TY 3. We will not have a TY 3 in order to reduce the overall number of TYs.
- Target Years will include:
    - FWOP (low and medium RSLR) – TY 0, TY 1 TY 50.
    - FWOP (high RSLR)- TY0, TY 1, TY (beginning of marsh collapse), TY (year marsh goes to zero) and TY 50.
    - FWP – TY 1, TYX (created/nourished marsh or swamp based on production rate for final array/draft TSP and implementation plan for final TSP), TY13 (diversion benefits start), TYY (TYX + 4years = 5 years after marsh/swamp is created/nourished. TY X is counted as a full year post construction),TY marsh has subsided 10" (for reverting back to baseline loss rate),TY marsh collapse begins (1cm/year), TY marsh collapses ends, and TY50. TY year marsh collapses and TY marsh acreage goes to zero will only occur at high RSLR.
    - Note TY), TY marsh has subsided 10" (for reverting back to baseline loss rate), TY marsh collapses 1.2cm/year were not used for early screening and final array of alternative evaluations. TY marsh subsided 10" happened beyond the 50 year project life based on the low loss rate used for early screening and the final array of alternatives. TSP includes 10" subsidence in low, med, and high SLR scenarios.

Ridge

- Used other projects (PPL18 Grand Liard Marsh and Ridge Restoration, PPL16 Bayou Dupont Marsh and Ridge Restoration, LCA Wetland Creation), existing ridges, input from NRCS, and realistic project funding capabilities to develop ridge design.
- Ridge dimensions are +6ft NAVD88 (with initial overbuilding to +8ft NAVD88), 25 ft crown width, and 1V:8H slope
- Assume (without having surveys) that the existing ground line averages are approximately +1.5ft NAVD88
- Total footprint (worst case scenario – it will likely be less) is 200 ft wide.
- There are 2 sections of Bayou La Loutre Ridge that were evaluated (see Figure 3).
    - From MRGO to pipeline (where the ridge is at marsh elevation), the ridge will be constructed on former ridge foundation which is currently marsh habitat.
        - From the pipeline canal to around the bend, the ridge was designed to expand 25-ft crown width behind the existing ridge minimizing impacts to existing mature trees.
        - Borrow material for ridge was estimated taking borrow from other location (ODMDS, Bayou La Loutre, etc)
    - Impacts to existing marsh due to direct ridge footprint were evaluated.

- Future projections are based on CWPPRA PPL 18 Grand Liard Project (BA-48) and other studies (Monte (1978) - thesis, Maritime Forest Ridge and Marsh Creation at Fourchon, LA project, Fine and Edwards 2005, Didier 2007- thesis, and LDNR 2009).



Figure 3. Proposed Ridges

Swamp

- Swamp elevation will be 2 ft (after dewater and compaction) based on academic input (see Attachment 2), area experts, existing survey date of existing swamps, and other project data (e.g. Lane et al. 2006, Reed and Yuill 2009, Jordan et al. 2009). Appropriate elevations ranged from 1.5 ft to 2 ft (and even up to 2.5 ft considering SLR over a longer time period). Because this has a 50 year project life, the higher (2 ft) side of the range was used.
- With the freshening of the Central Wetlands, it is expected the swamp will have a good flooding regime.
- In the early screening phase, in the FWP no diversion scenario, cypress is not expected to survive because salinities will be greater than cypress trees can withstand. The WVA for this reflected a high brackish marsh habitat.
- The final array of alternatives and the TSP assumes there is no longer a without diversion scenario. All swamp measures are evaluated with a diversion influence that will sustain the swamp.
- Initial Planting/Monitoring - An average of 200 bald cypress trees/acre with 75% bare-root seedlings/saplings and 25% container-grown will be planted from October through March. All will have a nutria protection device. Trees

will be monitored monthly for survivorship and will be replaced when necessary.

Shoreline Protection

- 100% reduction in existing shoreline erosion was given for hard structures (rock revetment or breakwaters).
- 75% reduction in existing shoreline erosion was given for submerged oyster reef protection.
- Assume that hard structures will be maintained for the 50-year project life.
- Assume oyster reef will be self maintaining as a living reef.
- Assume there are no limiting factors for the SP features. With money and materials, the SP features will be completely built within the first year and protection benefits begin in TY1 for SP features.

Barrier Island

- Input provided by Pontchartrain Institute for Environmental Sciences, University of New Orleans (PIES-UNO).
- Used SBeach for existing FWOP, and FWP habitat acres for WVA.
- Percent vegetative cover and percent woody cover are estimated by best professional judgment of FWS Refuge field personnel and UNO scientist who frequent the islands as part of their research and regular activities.

V1: Percent Emergent Marsh

As is typically done in CWPPRA projects, loss is applied to acreages from 2008 surveys to predict acreage remaining at 2014 (TY 0). 2014 (TY0) represents the baseline year and TY1 represents a full year of benefits after construction.

Trendline for Interior Loss

Assumptions

- Used a linear trendline for loss rate projections incorporating multiple points in time rather than the CWPPRA compound rate based on 2 points in time will provide a more accurate estimate over a longer period (50 or 100 year evaluation period vs. 20 years).
- Benefits assessment of the TSP was made under 3 RSLR conditions. The 3 RSLR scenarios were provided by the Corps and are based on the water level data from the Shell Beach Tide Gauge (see Appendix 4 for details). Low RSLR has been used in all WVAs for early screening and the final array of alternatives. The 3 RSLR scenarios were used in the final TSP WVA assessment.
- SLR and subsidence rates are combined for Relative Sea Level Rise (RSLR). Subsidence will remain the same in the evaluation, even though there are three levels of RSLR.
- For more details on RSLR see Attachment 4.

Loss Projection Spreadsheets

- Spreadsheet formulas compute changes in loss rate and assume a maximum amount of land can be built per year based on available equipment and production. Production spans multiple years. The spreadsheet differentiates between nourished and created marsh.

To Develop Landloss Projections

- Used 1985 – 2006 USGS land/water data to determine future loss.
- Only wetland and open water were used; fastlands not included.
- Used the listed "land" area (acres).
- Excluded the 2000 and 2005 data sets from Sigma Plot analyses to develop linear regressions.
- Used Sigma Plot to obtain regression equations.
- Used only 1985 to 2006 data, with the above exclusions.
- Assume the project life is 2015 through 2065, so begin projections in 1985 and carry through 2065.
- Set up a tab that lists FWOP acreage with sea level rise (similar to Donaldsonville to the Gulf Project).
- FWOP restoration project benefits were included in the final FWOP results.
- Land loss was applied in a linear manner (acres/year) rather than compound loss projections used in CWPPRA.

Shoreline erosion

- Shoreline erosion varied by location. Shoreline erosion was determined by USGS using 1985 to 2006 time period.

V_2: Percent Open Water covered by SAV

- Collected field data. To see field data, please contact FWS.
- Used data from other projects in the areas.
- Assume SAV increase with diversion compared to without diversion over time.

V_3: Marsh edge and interspersion

- Baseline conditions were determined by comparing aerial photographs (Google Earth, engineering footprints, and USGS maps) to interspersion photographs corresponding to recently developed interspersion variable (2011).

V_4: Percent of open water area less than 1.5 feet deep in relation to marsh surface

- Final TSP used engineering survey data for each feature to determine water depth and percent open water less than 1.5 feet deep.
- Final Array and draft TSP
    - Field data collection: representative samples were taken because of the large project area. Areas of broken marsh and areas of open water were chosen in the field for water depth sampling. Similar areas are then compared to field data and water depths are assumed the same. The average is weighted to extrapolate over the entire area.

  - Existing surveys and other projects in the area were gathered to use and supplement field data.
- For marsh creation sites, it was assumed that open water will become marsh and surrounding marsh will be nourished, leaving any remaining existing water as mostly shallow. For marsh nourishment sites, existing marsh will be nourished and nearby open water will become shallower.
- Assume where there was marsh loss that marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low, Med, or High SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.

V_5: Salinity

- H&H modeling provided existing, FWOP, and FWP salinity.
- For FWOP and FWP at low and medium RSLR scenarios, it is assumed that salinity will rise 1 ppt within 50 years unless in FWP the area is influenced by the diversion.
- For FWOP and FWP at high RSLR scenario, it is assumed that salinity will rise 2 ppt within 50 years.
- Fresh/intermediate model: Mean salinity during the growing season (March-Nov)
  - Fresh -0.5 ppt or less is optimal
  - Intermediate – 2.5 ppt or less is optimal
- Brackish and Saline Model: average annual salinity
  - Brackish – between 0 ppt and 10 ppt (5 ppt-10 ppt)
  - Saline – greater than 16ppt

V_6: Aquatic organism access.

- Features affecting aquatic organism access were noted on field visits and on aerial maps of the area.

NOTE: See Attachment 6 and 7 for the Master WVA spreadsheet and individual WVA variable assumptions for the Final TSP. Early screening, final alternative array, and draft TSP WVAs and individual assumptions are available for review at the Fish and Wildlife Service's (Service) Lafayette, Louisiana, field office.

Literature Cited

Coastal Protection and Restoration Authority of Louisiana 2012. Louisiana's Comprehensive Master Plan for a Sustainable Coast. Appendix – Draft Wetland Morphology Modeling Report.

ATTACHMENT 1

Diversion Considerations

MRGO ECOSYSTEM RESTORATION PLAN

Diversion Considerations by Habitat Type

The restoration goal for the Central Wetlands is the reestablishment of cypress swamp and freshwater marsh. Habitat in the area is currently brackish marsh.
The MRGO Ecosystem Restoration H&H team requested environmental input concerning operational flow schemes of the proposed Violet Diversion. The H&H team identified the following seven pertinent questions arising from a meeting on September 18, 2009. The environmental team has attempted to amass answers to these questions through research of peer-reviewed journal publications and the invaluable information from the dialogue of email traffic and personal communications. Specific information and sources follow the question/answer section. Dominant species of trees and marsh plants in fresh and intermediate marsh were used as indicators of acceptable conditions

Recommended Flows

Adaptive management for (1) habitat switching; (2) pulsing to reach target salinity.

- No pulsing in the first 2-3 years to achieve habitat switching and allow cypress seedlings time to establish.
- After first 2-3 years, ramp up pulsing from few days – one week pulse toward a two week pulsing cycle (cycle includes maximum pulsing of no more than 2 weeks with 2 weeks of no flow between pulses) to achieve target salinities.
- Every 3-5 years a drawdown should be initiated to elevation -4 to -6 below surface beginning in March for cypress regeneration. After seed fall to achieve successful reestablishment of cypress, the area should not be flooded (soils saturated but no water above the -4 elevation) during growing season (March – November) for the next two growing seasons.
- After drawdown, flows should be introduced slowly - not more than +2 inches initially and gradually increasing over the year not to exceed +8 inches by the end of that growing year.
- Flows for months other than pulsing or drawdown months would be at a level to achieve fresh wetlands (0 ppt-0.5 ppt mean growing season March-Nov) with a maximum peak of 2 ppt or less.

1. Are there seasonal considerations that should be considered for flow through the Central Wetlands rather than static levels presently modeled for all months outside April and May?

Yes. Cypress trees need to have intermittent dry periods in the growing season (March through November) for regeneration and early height growth. Cypress will do well once the tree foliage (tops) is above the flood water during the growing season. Swamp forest can tolerate inundation up to a year if the water is not stagnant; however this is not recommended for multiple consecutive years. Flooding and flow are required for seed dispersal of bald cypress from around October to January/February followed by a

drawdown period to -4 to -6 elevation through the growing season (March-November) where there is no standing water. The dry period should extend through the growing season during the first several years to allow seedlings to develop aggressive root systems, and that variable wet and dry periods during the growing season after the first few years of seedling growth would be acceptable (OCPR personal communication with Clason)

Optimal flooding for fresh, intermediate and saline marshes is assumed to occur at 50% inundation per year, whereas optimal flooding for brackish marsh was assumed to occur at 40% (Habitat Switching module). The assumptions of the Habitat Switching Module are well within flood tolerance ranges of fresh and intermediate marsh plants such as *Panicum* spp. and *Sagittaria* spp. as well as brackish marsh plants such as *Spartina patens*. In addition, increased flooding depths during the growing season have been shown to stimulate growth in these species with the exception of *S. patens*

2. Are there wet and dry periods at other times of the year that are important?

Yes - sites where cypress grow usually hold water for most of the year. Flooding and flow are required for seed dispersal of bald cypress from around October to January/February. A drawdown period of no standing water through the growing season (Starting in March following dispersal flooding) is required because cypress seeds cannot germinate in standing water or do not grow tall enough during short drawdown periods to survive subsequent flooding. Clason (OCPR personal communication) stated that the dry period should extend through the growing season (April-October) during the first several years to allow seedlings to develop aggressive root systems, and variable wet and dry periods during the growing season after the first few years of seedling growth would be acceptable.

Most cypress cannot tolerate a chronic presence of salinity of around 3 ppt or greater. Some trees have been known to withstand short periods of acute salinity of much higher levels especially during the dormant season. Long-term, average salinity levels less than 2 ppt are better with fresh conditions being ideal.

Seasonal changes in hydroperiod are an integral factor in life cycles of swamp and marsh species in the deltaic plain. Highest productivity in forested wetlands in Louisiana occurred when the pulsing events followed a seasonal pattern. In addition, cycles of wet and dry years would aid in establishment and regeneration as well as growth. Historically, the hydroperiod was determined by the Mississippi River stage and average rainfall. These should be considered when establishing an operational plan benefitting not only plants but also dependent fauna in addition to the requirements of bald cypress. An operational scheme would need to be developed that incorporates both pulsing years and dry periods from March to November.

3. Is there a preferred and/or threshold standing pool elevation relative to the proposed marsh? - Is there a residence time criteria? How long can water "stand" in the Central Wetlands without being replaced?

Cypress seedlings can withstand complete inundation for up to 45 days, but long-term flooding above the foliage results in high mortality. Once established, young seedlings grow rapidly, often reaching heights of 8-14 inches the first growing season and 16-24 inches the second season. We will assume planting of cypress will include saplings at least 3-ft tall. Even though many of the forest species growing in these areas are adapted to prolonged inundation, extended flooding during the growing season can cause mortality of these tree species. Flooding as defined in this paper is understood to be beneficial and a necessary component of wetland productivity. Seasonal flooding of wetlands is part of the life cycle of wetland plants.

3a. Is there a preferred or maximum standing pool elevation relative to the proposed cypress swamp and fresh/intermediate marsh?

Yes. Average standing pool should fluctuate within the root zone to prevent constant anoxic conditions. From greenhouse and field studies, it appears that a periodic drawdown of - 4 inches to – 6 inches (-10cm to -15cm) would accomplish aeration of wetland soils. This base level coupled with the seasonal hydroperiod developed for bald cypress should be sufficient, if not advantageous to restore and maintain swamp and marsh. Both cypress trees and many fresh/intermediate marsh plants are stimulated by water level and benefit from the lack of competition from less flood-tolerant plants.

3b Is there a residence time criteria?

No. There is no indication from the literature reviewed that there is a critical residence time.

3c How long can water "stand" in the CWA without being replaced?

Flow should be maintained at a level as not to become stagnant for an extended period of time leading to low dissolved oxygen levels in both the soil and water. Tidal exchange and base flow rate should be adequate to prevent widespread stagnation.

4. During high flow periods are there ecological considerations related to inundation?

Yes. Care should be taken when establishing flow-through rates during cypress seed dispersal and at peak diversion times to insure that trees and plants are not "swept away". We do not have a definitive answer at this time. Common sense, expert opinion and experience at Caernarvon and Davis Pond should be incorporated to determine and ecological-appropriate peak flow rate.

Adaptively management would be necessary for (1) habitat switching; (2) pulsing to reach target salinity. The environmental team recommends no pulsing in the first 2-3 years (to achieve habitat switching) and then ramp up pulsing toward a two week pulsing cycle (maximum pulsing of no more than 2-3 weeks) to achieve target salinities.

5. How deep can water get inside the Central Wetlands? They are currently working under the assumption that 1 to 2 feet over the cypress swamp elevation as acceptable as per the 18 September meeting.

Cypress seedlings can withstand complete inundation for up to 45 days, but long-term flooding above the foliage results in high mortality. One and two yr old cypress seedlings estimated height range after one year is 8-14 in (20-36 cm) and 16-24 in (40 - 60 cm) after two years. Once established, cypress trees, maidencane, and bulltongue should be able to withstand flooding of 1 to 2 foot on a regular basis. Even though many of the forest species growing in these areas are adapted to prolonged inundation, extended flooding during the growing season can cause mortality of these tree species. Fresh and intermediate marsh can tolerate inundation below 12 inches. Seasonal flooding during the growing season has been shown to stimulate growth and is an integral part of the adaptive lifecycle of wetland trees and plants. Thus a flood stage of one foot should not be detrimental.

6. How long can the water stay at these depths? Weeks? Months? Particular months?

Short periods of flooding are not a problem. Longer periods of flooding should not be a problem once the tree crowns are above the flood levels. Cypress seedlings can withstand complete inundation for up to 45 days, but long-term flooding above the foliage results in high mortality. Saplings need to remain dry between March and November for height growth and regeneration. Established 2 to 3 year old and older trees are more tolerant of long flood durations and relatively deep flooding, even when coupled with low salinity levels of less than 2 to 3 ppt.

Freshwater and intermediate marsh plants are known to tolerate extended periods of flooding. Flooding levels not detrimental to grasses such as maidencane (Panicum hemitomon) ranged from 8 inches (20 cm) up to 24 inches (61 cm) continually for one year and increased water level of +8 inches (+20 cm) was also found to stimulate growth. Intermediate marsh plants such as duck potato, arrowhead, and bull tongue (Sagittaria spp) are also able to tolerate extended periods of flooding such as +8 inches (+20 cm) over a one year period and have been found growing in water up to 30 inches (80cm) in the field. Brackish marsh has been shown to tolerate <64% annual inundation at salinity levels between 6-15 ppt. *Spartina patens*, a dominant brackish marsh plant as well as constituent in intermediate marshes. Flooding levels in excess of +10 cm have been shown to decrease biomass; decreased root specific gravity, while levels greater than 20

cm result in mortality, regardless of salinity level. Salinity range found to not be detrimental to S. patens ranged from 0 to 8 ppt. Levels above 15 ppt resulted in reduced aboveground biomass and root dry weight.

Established length of inundation needs to be determined using the required hydroperiod and depth constraint of bald cypress, seasonal water levels based on the Mississippi River stage and average rainfall, and acceptable inundation levels of fresh and intermediate marsh plants which vary by species, life stage, and season.

Flooding and Bald Cypress Seedling Germination

Cypress tends to grow in even-aged stands because the environmental conditions needed for germination and establishment of young trees occur very infrequently (Lester et al. 2005). Additionally, although some seeds are produced every year, good seed crops occur only at 3- to 5-year intervals (Wilhite and Toliver 1990). One of the most critical environmental factors to consider for successful cypress seedling germination and establishment is the periodic flooding and drying of the swamp. Wet and dry cycles are variable in healthy, sustainable cypress swamps, so producing some variation in cycles is desirable in restored cypress swamps (Chambers, personal communication). Although dry periods are needed for seedling germination, it's important to note that some years of permanent flooding will restrict the growth of other flood tolerant species and thus reduce competition (Chambers, personal communication).

Although mature cypress trees can tolerate long periods of flooding, cypress seedlings are not as flood tolerant. First of all, cypress seedlings will not germinate under water. Furthermore, Myers et al. (1995) showed that there is a large increase in seedling mortality when seedlings are inundated longer than two weeks. Souther and Shaffer (2000) indicated that newly-germinated cypress seedlings (less than two weeks of age) may be capable of surviving up to one and one-half months of submergence, but will suffer complete mortality after a period of submergence longer than 57 days. However, one-year-old seedlings experience up to a 75% survival rate when they are submerged for as long as five months (Souther and Shaffer 2000).

There are some varying opinions about the period of time soils should be un-flooded to allow successful cypress seedling germination and establishment. Wilhite and Tolver (1990) indicated that soils should be saturated, but not flooded, for a period of 1 to 3 months after seed fall for successful germination, and Chambers (personal communication) also stated that a several-month period of non-flooded conditions must occur during the growing season. However, according to Shaffer (personal communication), cypress seedlings and trees should experience many pulses of nutrient-rich fresh water during the growing season, and once the seedlings are above high water, they can handle permanent flooding if the water is fresh and moving. In a combination of these two opinions, Clason (personal communication) stated that the dry period should extend through the growing season (April-October) during the first several years to allow seedlings to develop aggressive root systems, and that variable wet and dry periods during the growing season after the first few years of seedling growth would be

acceptable. According to Chambers (personal communication), flooding during dormant seasons probably does not severely impact cypress seedlings, so cypress swamps can be flooded in the winter as long as removal of flood waters occurs early in successive growing seasons and continues each growing season until the seedlings are one to two feet above the highest flood waters that occur during the growing season. Middleton (1995) suggests a longer dry period is necessary for cypress establishment. According to Middleton (1995), cypress seedlings require a drawdown of two years, and once established saplings will tolerate flooding better than seedlings.

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RESOURCES:

Definition of wetlands

As used by the U.S. Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (EPA) since the 1970s for regulatory purposes. Section 404 of the Clean Water Act: How Wetlands are Defined and Identified is as follows:

"Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Freshwater Swamp Species
***Taxodium distichum* (bald cypress)**

The following information concerning bald cypress can be found in the "Final Report of the Science Working Group to the Governor of Louisiana. Conservation, Protection, and Utilization of Louisiana's Coastal Wetland Forests" that Jim Chambers provided unless otherwise noted. The link is:
http://www.rnr.lsu.edu/SpecialProjects&Activities/SWG_FinalReport.pdf. Specific references are available in the in-depth report. We have condensed the pertinent information for ease of presentation.

Bald cypress cones generally mature in October through December. Seed is released beginning at time of maturation and continuing for several months and are primarily dispersed by water and seeds will float for an extended period of time (studies indicate on average 42 days). Dispersal of seeds is determined by the timing, magnitude and flow direction of floodwater and float for an average of 18 days (cones and scale) to 42 days (seeds). A cold, moist environment is required for stratification of the seeds and germination ensues within 2-2.5 wks in favorable conditions. Seeds require a drawdown period because the seeds cannot germinate in standing water and germination is initiated by exposure to aerobic conditions so to avoid flooding. In addition, a drawdown period is essential to allow seedlings to extend above the water surface to survive flooding during the growing season (March - November). Seedlings can withstand complete inundation for up to 45 days but must grow rapidly to reduce the risk of long-term submergence during the growing season. Young seedlings grow rapidly the first and second growing season (8-14 inches and 16-24 respectively). In artificial restoration it is common to planting one-year-old seedlings that are at least 3.3 feet tall and larger than 0.5 inches in diameter to improve early survival and growth. Estimates of annual growth rate during the first 50yrs of growth were 0.2-0.3 inches in diameter and two feet in height per yr. Bald cypress is tolerant of long flood durations and relatively deep flooding, even when coupled with low salinity levels. Flooding during the growing season is essential to prevent growth of tree species that may shade bald cypress and are will likely become

dominated by the shade-tolerant species. In addition, studies have shown that primary productivity is higher in forested wetlands that are open to flow and have a more "pulsing" hydrologic regime than a stagnant, continually flooded regime. Highest productivity in forested wetlands in Louisiana occurred when the pulsing events followed a seasonal pattern (Conner and Day, 1976, 1982; Conner et al. 1981)

In summation:

- Flooding and flow are required for seed dispersal from around October to January/February. Assuming that a goal of the restoration plan is natural regeneration, ideally flood levels should not overtop last year's germination class that have been estimated to grow at least 8 inches in one year but not fall below the surface.
- A drawdown period should follow dispersal flooding starting sometime in January/February to instigate germination. Flood levels should be reduced to below surface.
- Once germination has occurred, levels of flooding can be increased but should not last more than 45 days to prevent seedling death.
- Bald cypress is tolerant of long flood durations and relatively deep flooding, even when coupled with low salinity levels (< 3 ppt; ideally <2 ppt) except during germination and seedling growth.
- Once established, seasonal flooding and flow-through reduces competition and increases primary productivity.

Freshwater and Intermediate Marsh Species

Two principal factors affecting plant zonation in the coastal plain are salinity and hydrologic regime (Adams 1963; Chabreck 1972; Cowardin et al. 1979; Odum 1988; Day and Templet 1989; Keddy 2000; Mitsch and Gosselink 2000). Four dominant marsh types that closely correlate with salinity level have been identified in the deltaic coastal plain of Louisiana (Penfound and Hathaway 1938, Chabreck 1972):

- fresh (strictly fresh water, salinity < 0.5ppt);
- intermediate (nearly fresh water, salinity range of 0.5 to 5.0 ppt);
- brackish water salinity level range of 5 ppt to 18 ppt; and
- salt (salinity level greater than 18 ppt).

The dominant species of fresh and intermediate marsh were used as indicators of acceptable conditions. The following details salinity and flooding levels.

Maidencane (Panicum hemitomon)

- A dominant fresh water marsh species that is an aquatic or subaquatic perennial often found in water +2 feet (Godfrey and Wooten 1979).

- Increased flooding depth stimulated productivity under fresh and low salinity conditions (Willis and Hester 2004 and Fisher 2003).
- Increased flooding depths of +5 and +20 cm stimulated productivity under fresh and low salinity conditions, even under constant inundation. Under fresh conditions, *P. hemitomon* produced significantly more biomass under flooded conditions. Increased flooding depth also significantly stimulated adventitious root production under fresh conditions with the most adventitious roots per cm water depth being produced in the +20 cm flooding depth (Spalding 2003 and Spalding and Hester 2007).
- *Panicum hemitomon* has been reported to tolerate gradual increases of salinity level in the range of 7 to 12 ppt over the short-term (McKee and Mendelssohn 1989; Hester et al. 1998; Howard and Mendelssohn 1999; Hester et al. 2001).
- Prolonged exposure to increased salinity levels ranging from 4 to 6 ppt (Pezeshki et al. 1987; Hester et al. 2001) and sudden increases in salinity level (Pezeshki et al. 1987; Howard and Mendelssohn 1999; Howard and Mendelssohn 2000) have proved to be detrimental and sometimes fatal.
- Salinity levels of 7.6 – 12 ‰ have proved lethal (Hester et al. 1998) and a salinity level of only 4 ‰ significantly depressed both plant photosynthetic response and (Hester et al. 2001).

Bulltongue (***Sagittaria lancifolia)***

- A dominant fresh water and intermediate marsh species that is often found in fairly deep water along marshy shores and edges (Godfrey and Wooten 1979).
- Germination can occur in water, but is reduced in anaerobic conditions (Collon and Velasquez 1989).
- Seedlings emerged at flooding depths of 4-5 cm and a salinity level of 4 ‰ and biomass production was higher under flooded conditions (+10 cm) (Baldwin et al. 1996).
- Percent cover increased with an increased hydroperiod David (1996).
- Mean height increased with +7.5 and +15 cm of flood waters and that maximum leaf height was attained at +15 cm flooding, (Howard and Mendelssohn 1995).
- Biomass was reduced at 6‰ salinity (Baldwin and Mendelssohn 1998)
- Growth increased at 2 ‰ and decreased at 4 ‰ and 8‰ La Peyre (2001).
- Salinity ranges from 4 ‰-5 ‰ were not detrimental to growth, but the interaction of salt and flooding of +15 cm was detrimental and 15‰ salinity in the field was lethal. (Webb and Mendelssohn 1996).

- Productivity was not affected by increased flooding depths of +5 and +20 cm utilized and prolonged exposure (+ 6 months) to increased flooding depths did not significantly affect productivity (Spalding 2003 and Spalding and Hester 2007).
- Field studies reported another species, *Sagittaria latifolia*, growing in a water depth of 80cm (2.6ft) (Thunhorst 1993, as cited in Field and Philipp 2000).

Spartina patens

- *Spartina patens* has been described a dominant oligohaline marsh plant (Visser et al. 1999; Taylor and Grace 1995; Taylor et al. 1997).
- It inhabits saline to brackish marsh environments but also can be found in infrequently flooded fresh marsh (Oosting and Billings 1942; Godfrey and Wooten 1979). NOTE: Godfrey and Wooten do not use intermediate as a marsh type.
- Flooding levels determined to be detrimental to S. patens: decreased biomass as at +10 cm flooding (Baldwin and Mendelssohn 1998); decreased root specific gravity at +10cm (Naidoo et al. 1992); lowered biomass and death at +30 cm (Broome et al. 1995); and death at +20cm, especially coupled with long-term duration, regardless of salinity level (Spalding and Hester 200??).
- Effect of salinity levels ranged from: no effect from a salinity range of 0 ‰ to 4 ‰ (Taylor and Grace 1995; Taylor et al. 1997); no effect of a salt pulse of up to 6.68‰ (Chabreck and Palmisano 1973); no decrease in growth at 0 ‰, 2 ‰, 4 ‰ and 8 ‰ salinity (La Peyre et al. 2001); plant height, foliage, and root dry weight were reduced at 15 ‰ and 25 ‰ (Pezeshki and DeLaune 1991); and Ewing et al. (1995) found leaf growth and live aboveground biomass to higher in 0 ‰ and 7 ‰ than 21‰ and 28‰. s.

Eleocharis spp.

- *Eleocharis* spp. grow in wet environments, generally flowers in shallow water, and reproduce via vegetative growth in deep water (Godfrey and Wooten 1979).
- They have been reported from fresh, tidal fresh, intermediate and oligohaline marshes and in areas ranging in salinity from 0 ‰ to 12 ‰ (White 1983, McKee and Mendelssohn 1989, Howard and Mendelssohn 1995, Perry and Hershner 1999, Visser et al. 1999).
- Reports of flood tolerance range from: a submerged plant, indicating flood tolerance (Brown 1987); a mean water depth was 24 cm (David 1996); and up to depth of 71 cm (David 1996).

- Reported detrimental effects of increased salinity levels range from: decreased biomass at a salinity of 6‰ and by flooding of +10 cm (Baldwin and Mendelssohn 1998); salinities of 2 ‰, 3.5 ‰, and 5 ‰ resulted in lower plant height and a salinity of 7‰ resulted in death (James and Hart 1993); salinity levels of 3‰ lead to reduced growth rate, 5‰ resulted in zero growth, and 10‰ resulted in death (Wilson et al. 1996).

Scirpus olneyi

- Optimum growth occurred at flooding of +10 cm and growth at -10 cm and +30 cm was nearly equal (Broome et al. 1995).
- Salinity levels above 10 ‰ resulted in reduced growth (Broome et al. 1995).

ATTACHMENT 2

Academic Input

ACADEMIC INPUT

The following Attachment is complied from emails between Cathy Breaux, USFWS, and the following experts: Andy Nyman, LSU; Mark Hester, LSU; Jenneke Visser, UL-L.

- *Andy Nyman, LSU*
  - In two papers (one is attached as a pdf; I don't have a pdf of the other but the citation is below), we described our unplanned observations of a marsh collapse (it collapsed in the middle of several years of field work). In this marsh, we estimated submergence (global sea-level rise + local subsidence) to be 1.4 cm/year. Marsh vertical accretion was 1.0 cm/yr (the fastest I think ever reported, but not fast enough to keep up with submergence there). I therefore assume that 1.0 cm/yr is the fastest submergence that any marsh can tolerate. I assume that subsidence in the MRGO area is about 0.5 cm/yr (because of the depth-to-Pleistocene, but I could be way off). I assume that global sea-level rise is 0.2 cm/yr. I therefore don't anticipate rapid marsh collapse in the St. Bernard delta like that observed in the Barataria-Terrebonne delta unless global-sea-level rise reaches 0.5 cm/yr. What's the best subsidence measurements in the area? (data published in DeLaune et al. 1994)
  - Citation: DeLaune, R.D., J.A. Nyman, and W.H. Patrick, Jr. 1994. Peat collapse, ponding, and wetland loss in a rapidly submerging coastal marsh. Journal of Coastal Research 10:1021-1030.

- *Mark Hester, LSU*
  - Just a quick response before I leave for Australia. I agree that the upper 30 cm (12") is where living roots would most likely be found in a wetland. Also, Andy's student's data (Tommy) on the upper 20 cm (8") for living roots seems right on for that subsiding environment. I just want to add that the depth of living roots would be correlated with marsh surface elevation. So, in theory, in a healthy accreting marsh you may find living roots down to 30 cm or deeper depending on the marsh surface elevation and hydrogeomorphic setting. However, I think that 30 cm would be max in Louisiana based on personal observation/experience. I'm sure most of you have seen the attached Morris et al. 2002 pdf, but if not, his theoretical maximum for a (salt) marsh to keep pace with relative sea-level rise is 1.2 cm/yr. Regarding peat collapse - dunno - you may want to see if Don Cahoon (USGS) can give some additional insights. I believe he has a paper in review that looks at some healthy and collapsed marshes in LA.

- *Cathy Breaux, USFWS*
  - Following up on the comments that roots only extend downward 8" (or greater in healthy marshes), I'm wondering if we should go ahead and use 8" of post-construction RSLR to restore MC loss rates to background, or, should we attempt to capture other effects (such as bioturbation that might mix deposited mineral material upward in the soil matrix, plus the effects

of MC-related interior pond shoaling and associated reduced shoreline erosion), to increase our loss rate change point to the year when post-construction RSLR reached 10 inches. Any thoughts???

- I have no doubt that plants will accumulate and carry up with them over the decades those elements in the dredged material that are soluble and desirable. N, P, come to mind but there are others too. The proof of this statement is found in some of Ron DeLaune's work in which they consistently noted that the concentration of most elements is higher in the surface sediments than in the underlying sediments. This condition is typical of nutrient poor wetlands. The mechanism for this is the translocation of valuable elements from older roots and leaves that are about to senesce into temporary storage and ultimately into new leaf or root tissue. I don't know of any mechanism or data to suggest that physical attributes of the dredged material could migrate upward as chemicals might, but bioturbation might spread the dredged materials both up and down and thereby maintain sediments in the upper portions longer than if there was no bioturbation. But I don't see a lot of fiddler crab holes in marshes, so I guess this isn't an issue. After thinking about this stuff a little, I guess that 8 inches would apply if there were no plants, but there are plants (that will translocate). So 8 inches is extremely conservative, probably overly conservative. I may modify my thinking after someone else adds something (Mark Hester added something last time that I hadn't thought of), so this is not my final word on the question.

- Jenneke Visser, UL-L
  - As for your questions on land loss, with respect to created marshes and loss rates under different climate change scenarios. This is a fairly complex issue. Sedimentation will increase as the marsh subsides and sea-level increases. Marsh plant productivity will decrease as flooding frequency increases and at a certain point the plants will die. The length of this time, may be less related to the depth of rooting than on the availability of suspended sediments in the area and the probability that these sediments can be transported to the marsh surface. The probability of sedimentation is also what will drive interior loss in areas surrounded by shoreline protection. If the shoreline protection reduces the exchange between the interior marsh and surrounding water bodies, this may actually increase the interior loss, while preventing the shoreline erosion losses and even potentially creation of new marsh with sediments trapped immediately behind shoreline protection features.

ATTACHMENT 3

H & H Diversion Modeling

MASS BALANCE OF FLOW, NUTRIENTS AND SUSPENDED SEDIMENTS

Alternatives

Two Alternative diversion scenarios have been considered:

1. A diversion of an average of 1000 cfs at or near the existing Violet Syphon during all months except April and May when the Diversion would be in the range 5000 to 7000 cfs; the large gap between MRGO and Lake Borgne is left open in this Alternative.
2. A diversion of an average of 1000 cfs at or near the existing Violet Syphon during all months except April and May when the Diversion would be in the range 5000 to 7000 cfs; the large gap between MRGO and Lake Borgne is blocked in this Alternative.

Figure 1 shows a schematic organization chart for the flow distribution from the Violet diversion. It is assumed that the nutrients can be represented by dissolved inorganic nitrogen (DIN) as a surrogate. It is also assumed that the suspended solids are of two types: sand and fines (silt and clay), The sand load is assumed to be deposited near the diversion; only the fines are included in the following computations.

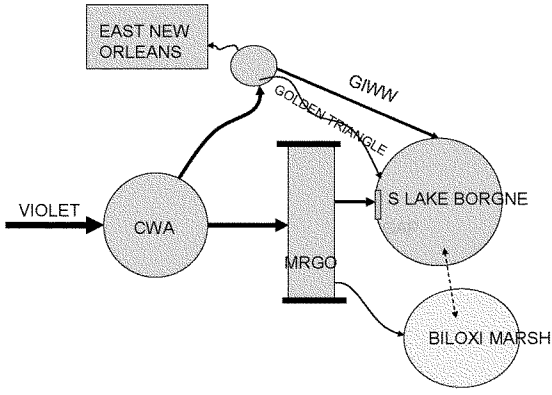


Figure 1. System Compartments

Distribution of Violet Diversion Water

The calibrated link-node model was used to estimate the flow distribution for Alternatives 1 and 2.

Alternative 1: The second column of the first half of Table 1 shows the percentage of the Violet flow that reaches the various compartments for flows up to 2000 cfs for Alternative 1.Table 1 indicates that about 68% of the flow that enters the CWA leaves via the Bayou Dupre structure and 32% leaves by Bayou Bienvenue. The flow from Bayou Bienvenue is split three ways in terms of

the original Violet flow, 9% goes to East New Orleans toward Lake Pontchartrain, 4% goes to the Golden Triangle and 19% travels eastward to Lake Borgne. Of the water that leaves through Bayou Dupre approximately 6% of the Violet flow goes directly to the Biloxi Marsh while the rest goes directly to Lake Borgne (62%). A total of about 85% of the Violet flow eventually enters South Lake Borgne. Table 2 presents similar information for a diversion of about 6000 cfs; the flow distribution is not too sensitive to the magnitude of the diversion up to about 6000 cfs. Figure 2 shows the distribution of the Violet diversion water for Alternative 1.

Alternative 2: The second column of the second half of Table 1 shows the percentage of the Violet flow that reaches the various compartments for flows up to 2000 cfs for Alternative 2. Table 1 indicates that about 68% of the flow that enters the CWA leaves via the Bayou Dupre structure and 32% leaves by Bayou Bienvenue. The flow from Bayou Bienvenue is split three ways in very similar distribution to Alternative 1. Of the water that leaves through Bayou Dupre approximately 34% of the Violet flow goes directly to the Biloxi Marsh while the rest goes directly to Lake Borgne (34%). A total of about 57% of the Violet flow eventually enters South Lake Borgne. Table 2 presents similar information for a diversion of about 6000 cfs. Figure 3 shows the distribution of the Violet diversion water for Alternative 2.

Distribution of DIN in the Violet Diversion

It is assumed that the nutrients are transported by the net flow as calculated by the link-node model which was used to estimate the flow distribution for Alternatives 1 and 2. The delivery of Dissolved Inorganic Nitrogen (DIN) depends on the flow distribution and the uptake or conversion of DIN along the pathway. Based on our modelling of Lake Pontchartrain we made two assumptions: a) flow through wetlands can remove about 50% of the DIN at low flows (Roblin 2008 based on work by Day et al on the 1994 Bonnet Carré experimental opening) and b) the DIN update is reduced as the flow increases above some limit (1000-2000 cfs in this analysis).

Alternative 1: The third column of the first half of Table 1 shows the percentage of the Violet DIN load that reaches the various compartments for flows up to 2000 cfs for Alternative 1. Column 4 shows that estimate percentage loss or update of DIN in a particular compartment in terms of DIN load entering the CWA. Table 1 indicates that about 34% of the DIN that enters the CWA leaves via the Bayou Dupre structure and 16% leaves by Bayou Bienvenue. The flow from Bayou Bienvenue is split three ways and in terms of the original Violet DIN load:

4.5% goes to East New Orleans toward Lake Pontchartrain
2% goes to the Golden Triangle and
9.5% travels eastward along the GIWW to Lake Borgne.

Of the DIN that leaves through Bayou Dupre approximately 3% of the Violet DIN load goes directly to the Biloxi Marsh while the rest goes directly to Lake Borgne (31%). A total of about 41% of the Violet DIN load eventually enters South Lake Borgne. Table 2 shows the estimates for DIN for a diversion of the order of 6000 cfs from Violet. The uptakes are considerably less because the detention times are reduced. Above 2000 cfs, it is assumed that the uptake rates are proportional to the diversion flow divided by the 2000 cfs.

Alternative 2: The third column of the second half of Table 1 shows the percentage of the Violet DIN load that reaches the various compartments for flows up to 2000 cfs for Alternative 2. Column

4 shows that the estimated percentage loss or uptake of DIN in a particular compartment in terms of DIN load entering the CWA. Table 1 indicates that about 34% of the DIN that enters the CWA leaves via the Bayou Dupre structure and 16% leaves by Bayou Bienvenue.

As in Alternative 1, the flow from Bayou Bienvenue is split three ways and in terms of the original Violet DIN load:

4.5% goes to East New Orleans toward Lake Pontchartrain
2% goes to the Golden Triangle and
9.5% travels eastward along the GIWW to Lake Borgne.

Of the DIN that leaves through Bayou Dupre approximately 17% of the Violet DIN load goes directly to the Biloxi Marsh while the rest goes directly to Lake Borgne (~17%). A total of about 27% of the Violet DIN load eventually enters South Lake Borgne through the Bayou Dupre route and the Bayou Bienvenue route. Table 2 shows the estimates for DIN for a diversion of the order of 6000 cfs from Violet.

Distribution of Fine SS in the Violet Diversion

The delivery of SS depends on the flow distribution and the deposition rates along the pathway. Based on our modelling of Lake Pontchartrain, we have estimated that at low flows about 30% of the fine sediment will be deposited in the wetland compartments and at high flows this will be proportional to the diversion flow divided by the 2000 cfs. It is assumed that the deposition in the channels is very small O(1%) or less.

Alternative 1: The fifth column of the first half of Table 1 shows the percentage of the Violet fine suspended sediment (SS) load that reaches the various compartments for flows up to 2000 cfs for Alternative 1. The last column (6) shows the estimated percentage deposition of SS in a particular compartment in terms of SS load entering the CWA. Table 1 indicates that about 48% of the SS that enters the CWA leaves via the Bayou Dupre structure and 22% leaves by Bayou Bienvenue. The flow from Bayou Bienvenue is split three ways and in terms of the original Violet SS load:

6% goes to East New Orleans toward Lake Pontchartrain,

3% goes to the Golden Triangle and

13% travels eastward in the GIWW to Lake Borgne.

Of the water that leaves through Bayou Dupre approximately 3% of the Violet flow goes directly to the Biloxi Marsh while the rest goes directly to Lake Borgne (~45%). A total of about 58% of the Violet SS load eventually enters South Lake Borgne. Table 2 shows that same estimates for SS for a diversion of the order of 6000 cfs from Violet.

Alternative 2: The fifth column of the second half of Table 1 shows the percentage of the Violet fine suspended sediment (SS) load that reaches the various compartments for flows up to 2000 cfs for Alternative 2. The last column (6) shows the estimated percentage deposition of SS in a particular compartment in terms of SS load entering the CWA. Table 1 indicates that about 48% of the SS that enters the CWA leaves via the Bayou Dupre structure and 22% leaves by Bayou Bienvenue. The SS from Bayou Bienvenue is split three ways and in terms of the original Violet SS load:

~6% goes to East New Orleans toward Lake Pontchartrain,

~3% goes to the Golden Triangle and

~13% travels eastward in the GIWW to Lake Borgne.

Of the SS that leaves through Bayou Dupre approximately 23% of the Violet SS load goes directly to the Biloxi Marsh while the rest goes directly to Lake Borgne (~23%). A total of about 38% of the Violet SS load eventually enters South Lake Borgne. Table 2 shows that similar estimates for SS for a diversion of the order of 6000 cfs from Violet.

Alex McCorquodale September 2, 2009

Table 1. Mass Balance of Water, DIN and Fine Suspended Sediments from Violet Diversion for a Diversion of up to 2000 cfs for Alternatives 1 and 2

Alternative	1	Flows <= 2000 cfs			
System Compartment	*% of Violet Flow Delivered*	*% of Violet DIN Delivered*	*DIN Uptake %*	*TSS % Delivered*	*TSS deposited %*
CWA	100	100	50.0	100	30
Bayou Dupre	68.0	34.0	0.0	47.6	0.0
Bayou Bienvenue	32.0	16.0	0.0	22.4	0.0
GIWW E. New Orleans	9.0	4.5	4.5	6.3	6.3
Golden Triangle	4.0	2.0	1.0	2.8	0.8
GIWW East	19.0	9.5	0.2	13.3	1.0
MRGO	68.0	34.0	0.2	47.6	1.0
S. Lake Borgne	85.0	41.1	41.1	57.9	57.9
Biloxi Marsh Direct	6.0	3.0	3.0	2.9	2.9
Uptake %			100.0		100

Alternative	2	Flows <= 2000 cfs			
System Compartment	*% of Violet Flow Delivered*	*% of Violet DIN Delivered*	*DIN Uptake %*	*TSS % Delivered*	*TSS deposited %*
CWA	100	100	50.0	100	30
Bayou Dupre	68.0	34.0	0.0	47.6	0.0
Bayou Bienvenue	32.0	16.0	0.0	22.4	0.0
GIWW E. New Orleans	9.0	4.5	4.5	6.3	6.3
Golden Triangle	4.0	2.0	1.0	2.8	0.8
GIWW East	19.0	9.5	0.2	13.3	1.0
MRGO	68.0	34.0	0.2	47.6	1.0
S. Lake Borgne	57.0	27.1	27.1	37.6	37.6
Biloxi Marsh Direct	34.0	17.0	17.0	23.3	23.3
			100		100
		fDIN	50%	fTSS	30%

Table 2. Mass Balance of Water, DIN and Fine Suspended Sediments from Violet Diversion for a Diversion of approximately 6000 cfs for Alternatives 1 and 2.

Alternative	1	Flows ~ 6000 cfs			
System Compartment	*% of Violet Flow Delivered*	*% of Violet DIN Delivered*	*DIN Uptake %*	*TSS % Delivered*	*TSS deposited %*
CWA	100	100	17	100	10
Bayou Dupre	68.0	56.4	0.0	61.2	0.0
Bayou Bienvenue	32.0	26.6	0.0	28.8	0.0
GIWW E. New Orleans	9.0	7.5	7.5	8.1	8.1
Golden Triangle	4.0	3.3	0.6	3.6	0.4
GIWW East	19.0	15.8	0.5	17.1	0.5
MRGO	68.0	56.4	0.5	61.2	0.5
S. Lake Borgne	85.0	69.0	69.0	75.4	75.4
Biloxi Marsh Direct	6.0	5.0	5.0	5.2	5.2
Uptake %			100		100

Alternative	2	Flows ~ 6000 cfs			
System Compartment	*% of Violet Flow Delivered*	*% of Violet DIN Delivered*	*DIN Uptake %*	*TSS % Delivered*	*TSS deposited %*
CWA	100	100	17	100	10
Bayou Dupre	68.0	56.4	0.0	61.2	0.0
Bayou Bienvenue	32.0	26.6	0.0	28.8	0.0
GIWW E. New Orleans	9.0	7.5	7.5	8.1	8.1
Golden Triangle	4.0	3.3	1.7	3.6	0.4
GIWW East	19.0	15.8	0.5	17.1	0.5
MRGO	68.0	56.4	0.5	61.2	0.5
S. Lake Borgne	57.0	44.7	44.7	50.2	50.2
Biloxi Marsh Direct	34.0	28.2	28.2	30.4	30.4
			100		100
		fDIN	17%	fTSS	10.0%

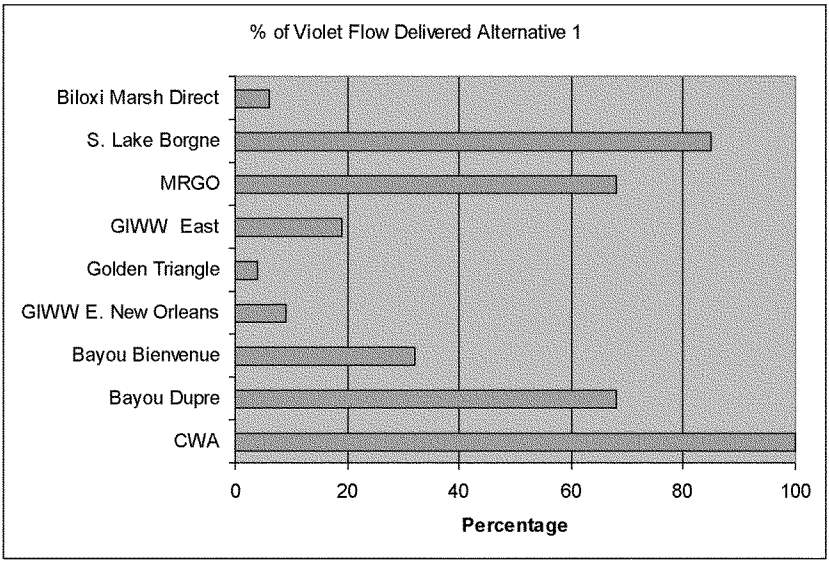


Figure 2 Percent of Flow Delivered in Alternative 1

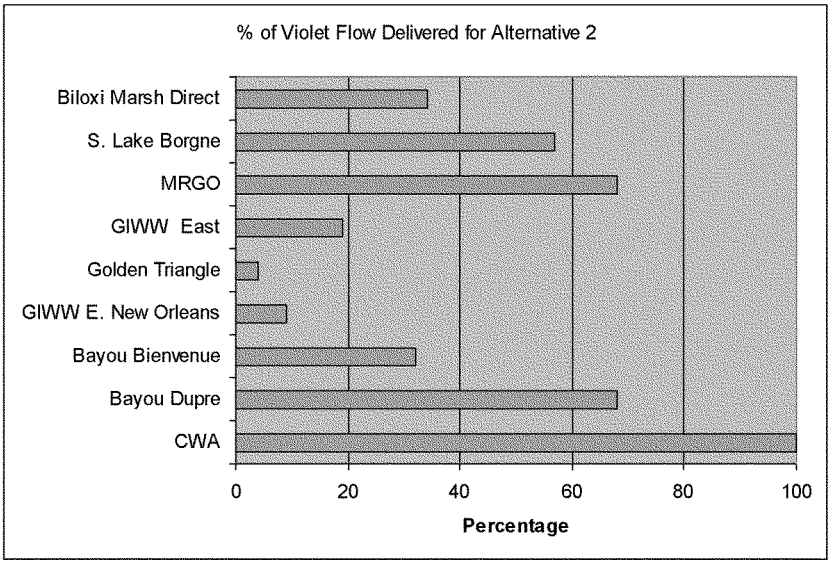


Figure 3 Percent of Flow Delivered in Alternative 2\

ATTACHMENT 4

Methodology for Determining Environmental Benefits For Variable 1, Percent Emergent Marsh

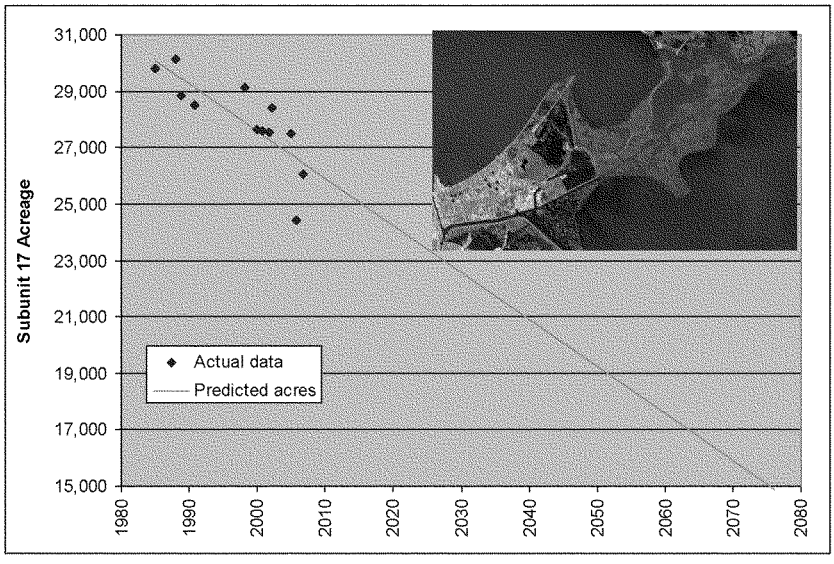
Methodology for Determining Environmental Benefits

The HET agreed that use of the Wetland Value Assessment (WVA) methodology would be most appropriate given considering the tight feasibility study schedule. Use of the WVA, however, requires estimates of FWP and FWOP marsh acreages. Described below are the models and methods used to determine FWOP marsh acreages and predicted acreages for the proposed project features.

FWOP Wetland Acreage Projections

Wetland acreage data (1985 through 2006) was obtained from the USGS for each of the study area subunits. Future-without-project (FWOP) subunit wetland acreages were determined via a linear trendline through those data (Figure 1). Where applicable, annual net acreage benefits associated with pre-existing or soon to be constructed restoration projects were added to the base subunit FWOP acreages to obtain revised FWOP subunit acreages.

Figure 1. Actual and predicted acreage for subunit 17.



Predicting Wetland Benefits of Mississippi River Diversions - General

Given the short study schedule, a quick and easy-to-use methodology was needed for assessing wetland benefits associated with proposed Mississippi River diversion measures. The SAND2 (Sediment and Nutrient Diversion) model was used. This model is an Engineering Research and Development Center (ERDC) revision of the SAND1 (Boustany-ERDC spreadsheet model) used in the Louisiana Coastal Protection and Restoration Final Technical Report (LACPR). The SAND2

version differs from the SAND1 model by incorporating an improved method for determined nutrient benefits, plus it includes the ability to capture diversion synergies with proposed marsh creation measures constructed within the diversion benefit area.

Given the great uncertainties regarding future subsidence rate changes, sea-level rise changes, and many other factors that might affect future wetland loss rates over the project life, there is considerable uncertainty regarding the accuracy of the predicted river diversion benefits. However, the SAND models do provide an objective means for comparing alternative measures and plans.

All environmental assessments were conducted for the duration of the project's 50-yr life. Utilizing the predicted FWOP wetland acreage as a basis, the SAND2 model calculates FWP benefits (in acres) via the accretion of suspended sediments (land building) together with the effects of nitrogen additions. The nitrogen benefits in acres are calculated as the grams of nitrogen in an acre of vegetation (calculated from % nitrogen data in Chabreck 1972) required to produce a wetland acre multiplied by the grams of introduced nitrogen (less nitrogen lost to denitrification) = wetland acres created/supported via introduced nitrogen. Inputs required for estimating the nitrogen benefits are:

1. Mississippi River Discharge
   All diversion benefit assessments utilized twenty five years of Tarbert's Landing discharge data (1985-2009) repeated 2 times to create a 50-yr input.

2. Diversion Discharge
   During non-pulse periods, the Violet Diversion was assumed to operate year-round at 870 cfs. Pulse discharges of 6,870 cfs, were to occur only during the months of April and May, and those events would occur once every 2 to 3 years as defined by the study team.

4. Nutrient Concentrations
   Monthly USGS Belle Chase nitrogen concentration data (1976 through 2007) are used to calculate nitrogen additions to diversion receiving areas.

5. Plant Productivity Rate
   Monthly above-ground emergent vegetation productivity values, by marsh type, are selectable with the model. Productivity values according to the FWOP marsh type were chosen.

6. Emergent Vegetation % Nitrogen
   Percent nitrogen of emergent vegetation biomass (Chabreck 1972) is incorporated into the model, and selectable by habitat type. Percent nitrogen based on FWOP habitat type was used.

7. Denitrification Rate
   A literature reported value of $21 g/m^2/yr$ was used (Delaune and Jugsujinda 2003, Bond 2006, and Day et al. 2004). Denitrification was assumed to reduce the amount of introduced nitrogen available for uptake by emergent wetland vegetation.

Land building benefits under the SAND2 model were estimated utilizing a Belle Chase sediment rating curve, together with the assumed diversion discharge, to compute the volume of introduced sediment. The model's sediment retention module then applied all or a portion of the introduced

suspended toward accretion of new wetland acres. The sediment retention module uses the size and dimensions of the receiving area, and diversion discharge, to calculate velocities within the receiving area. Whenever receiving area velocities drop below the thresholds required to keep any one of the 3 sediment types (fine sand, silts, and clay) in suspension, the model calculates deposition of that sediment type. However, land building is not solely based on the accretion of introduced mineral sediments. The model automatically includes sufficient organic material to achieve the average surface soil bulk density of the selected habitat type (which was always selected as that of the FWOP condition). In addition to using the surface soil bulk density by habitat type, the model also uses depth of fill, and bulk density compaction with depth change rate to calculate a depth-averaged soil bulk density

The previously defined study area subunits were utilized as the diversion receiving areas. Required inputs to calculate acres of diversion-related land-building include; width, acreage, and average water depth, and roughness height of bottom sediments.

1. Mississippi River Sediment Concentrations
   The sediment load of introduced water was assumed equal to that determined via a sediment rating using (1991-2004) depth-integrated suspended sediment concentration values measured at Belle Chase and plotted relative to Tarbert's Landing discharges (Smith 2010). Sediment size fractions measured in the Caernarvon diversion outfall channel were used (1% fine sand, 63% silt, 36% clay) as per Snedden et al. 2007. Percent flocs were estimated based on the FWOP salinity regime. Higher % flocs are assumed in higher salinity receiving areas, and lower % flocs are assumed in lower salinity receiving areas.

2. Diversion Discharge
   During non-pulse periods, the Violet Diversion was assumed to operate year-round at 870 cfs. Pulse discharges of 6,870 cfs, were to occur only during the months of April and May, and those events would occur once every 2 to 3 years as defined by the study team.

3. Receiving Area length
   Using ArcMap, the receiving area length was measured as the length of the primary diversion flow pathway through the receiving area.

4. Receiving Area Width
   This was calculated by dividing the receiving area length into area of the receiving area (i.e., subunit area).

5. Average Depth
   This was obtained through any available data source. If no data source was available, average depth was estimated based on field observations and professional judgment.

6. Roughness Height of Water Bottoms
   Based on *Smith 2007* and Soulsby 1983, a roughness height for mud of 0.0006562 feet was used for all model runs.

7. Wetland Soil Bulk Density

Surface bulk density values were determined by averaging surface values from 3 CRMS (Coastwide Reference Monitoring System) stations within the study area. The average surface obtained was 0.17 g/cc. The model computes a depth-averaged bulk density using surface bulk density, depth of fill, and bulk density change with depth.

8. Maximum Tidal Velocity
   Maximum tidal velocities are required in the model's sediment retention module. Lacking velocity data for all evaluated diversion receiving areas, velocities were estimated to be 1.0 feet per second.

The application of the SAND2 model to the Violet Diversion was atypical because sediment and nitrogen retention within the immediate Central Wetlands receiving area, the deep MRGO channel, and Lake Borgne, would reduce inputs to the more distant influence areas such as the Inner Biloxi marshes and the east Orleans landbridge. Consequently, benefits were determined separately for the Central Wetlands, South Lake Bornge marshes, Inner Biloxi Marshes, and East Orleans Landbridge study area subunits. To assist in this effort, Dr. Alex McCorquodale (University of New Orleans) utilized a simple hydrologic model to provide estimates (see Attachment 3) to estimate the portion of diverted water, nutrients, and sediments that would be delivered to and retained within each of the receiving areas at diversion discharges of 2,000 cfs and 6,000 cfs. That modeling included the simulated effects of closure structure across the MRGO's east bank opening to Lake Borgne (near Bayou Dupre). Additionally, Dr. McCorquodale's work indicated that all sands would be deposited within the Central Wetlands, and that only fine sediments would travel further. Therefore, sand retention values were manually set to 0 in all receiving areas, except for the Central Wetlands model run.

Use of the SAND2 model also required input of FWOP and FWP wetland loss rates, plus initial marsh and water acreages of the receiving area. FWOP target year 0 (TY0) acreages (year 2014) were determined via application of a linear trendline as described above. The SAND2 model was developed to allow input of up to 3 different FWOP and 3 FWP loss rates. Because Coastal Wetland Planning and Protection, and Restoration Act (CWPPRA) projects have a 20-yr project life, implementation of CWPPRA projects may cause FWOP subunit loss rates to change several times. If several CWPPRA projects occur within a subunit, they may result in more than 3 FWOP loss rate changes over the 50-yr SAND2 analysis period. In such cases, a weighted average was utilized to combine similar loss rates. In many cases, FWP marsh creation and marsh nourishment measures also resulted in more than 3 loss rate changes. In such cases, a weighted average was utilized to combine similar loss rates.

Predicting Wetland Benefits of the Mississippi River Diversion at Violet

The SAND2 model was run to determine diversion benefits in each of 4 study area subunits (Central Wetlands, the South Lake Borgne marshes, the Biloxi marshes, and the east Orleans landbridge marshes) which would be significantly influenced according to hydrologic modeling. Non-diversion restoration measures would all be constructed prior to 2027 when the diversion would begins operation. Benefits associated with all restoration measures located within a subunit were incorporated into the future-without-diversion scenario for that subunit. Consequently, the predicted future-with-diversion acreages incorporate benefits of all project measures within that subunit.

The evaluated Violet Diversion was assumed to operate year-round at 870 cfs, except during the months of April and May, when it would operate at 6,870 cfs. Because the diverted water would flow through the Central Wetlands area, that area would receive 100% of the discharge. The McCorquodale report determined that the maximum sediment deposition (at 2,000 cfs) was 30% of the total introduced sediment and the maximum nitrogen uptake was 50% of the total introduced nitrogen. Therefore, input nutrient load in the SAND2 model run for the Central Wetlands was reduced by 50% and the sediment rating curve concentrations were manually reduced to 30% of the total introduced suspended sediment load.

According to the McCorquodale report (Attachment 3), under low discharges, the South Lake Borgne marshes would receive 57% of the total river water, 37.6% of the suspended sediment, and 27.1% of the introduced nitrogen. Therefore, the SAND2 model diversion inputs to this area were reduced to 57% of the total. Because the percent suspended sediment input was less than the percent water input, the sediment input was adjusted to 66% of introduced water's sediment load (37.6% of the total sediment/57% of the total diversion discharge = 66%). Similarly, the nitrogen load was adjusted to 48% (27.1% total nitrogen delivered/57% of the total water delivered). Under high discharges, 57% of the total volume diverted would flow through the South Lake Borgne marshes. Of that water, 88% of the sediment load would be available (50.2%/57%), and 78% of the nitrogen load would be available (44.7%/57%).

Under low diversion discharge, the East Orleans landbridge marshes were estimated to receive 9% of the total diverted discharge. Of that water, the estimated sediment load was 70% (6.3%/9%), and the estimated nitrogen load available was estimated as 50% (4.5%/9%). Under high pulse discharges, the area would again receive 9% of the total diverted flow, and of that flow, the sediment load would be 90% (8.1%/9%), and 83% of the nitrogen input would be available (7.5%/9%).

The Biloxi marshes would receive 34% of the total low-discharge flows. Of that flow, the sediment load was estimated as 69% (23.3%/34%), and the nitrogen available was estimated as 50% of that flow (17%/34%). Under pulse discharges, the Biloxi marshes would receive 34% of the total discharge. The associated sediment load was estimated as 89% (30.4%/34%), and 83% of the nitrogen load would be available (28.2%/34%).

For each non-diversion restoration measure, the future-without and future-with acreages are calculated every year for each measure. The methods for those calculations are briefly described below.

Predicting Wetland Benefits of Marsh Creation Projects
Typically, marsh creation projects are open water areas filled with sediments to an elevation appropriate for growth of marsh vegetation.

Model Assumptions:
a) The loss rate of created marsh is initially 50% of the subunit loss rate (background rate)

b) The loss rate of created marsh returns to the subunit loss rate when 10 inches of accretion occurs post-construction
c) With an average accretion rate of 7.4 mm/yr, the loss rate reverts to background in the 34th year after construction
d) At the end of the construction year, 25% of the constructed marsh platform acreage is marsh
e) At the end of year two, 43% of the constructed marsh platform is marsh
f) At the end of year three, 62% of the constructed platform is marsh
g) Loss of the marsh platform occurs at half the subunit (background) loss rate during the first five years following construction
h) Following construction, no re-lifting or other maintenance is conducted
i) Any marsh existing within the marsh creation area is ignored and treated as if it were water

Mathematical models or formula were developed to calculate FWP and FWOP acreages for each year during the project life. Formula inputs include:

MCac – the acres of created marsh
YR – calendar year
CnstrYR – calendar year in which the marsh is created
LLR – polygon land loss rate (% of 1985 acres lost per year)
HLLR – half of the LLR
RevYr – calendar year in which HLLR reverts to LLR
PYr – previous calendar year, or current yr -1

Excel Model Formula – Marsh Creation FWP:
=IF(YR<CnstrYR,0,IF(YR=ConstrYr,(MCac+MCac*HLLR)*0.25,IF(YR=CnstrYr+1,(MCac +MCac*HLLR*2)*0.43,IF(YR=CnstrYr+2,(MCac +MCac*HLLR*3)* 0.62,IF(YR=CnstrYr+3,(MCac+MCac*HLLR*4)*0.81,IF(YR=CnstrYr+4,(MCac +MCac*HLLR*5),IF(YR<RevYr,IF(PYr+MCac*HLLR<0,0,MCac*HLLR),IF(PYr+MCac*LLR< 0,0,MCac*LLR)))))))

Excel Model Formula – Marsh Creation FWOP:
The marsh acreage remains at zero throughout the project life. No formula needed.

Predicting Wetland Benefits of Marsh Nourishment Projects
Marsh nourishment projects are marsh areas onto which a sediment slurry is pumped to raise elevations, invigorate the existing marsh, and to provide mineral sediments and nutrients needed for growth in anoxic and brackish substrates.

Model Assumptions:
a) Nourished marsh is initially lost at 50% of the subunit background loss rate
b) The loss rate of nourished marsh returns to the subunit loss rate when 10 inches of accretion occurs post-construction
c) With an average accretion rate of 7.4 mm/yr, the loss rate reverts to background in the 34th year after construction
d) Nourished marsh is considered to be fully vegetated/functional at the end of the construction year

e) Following construction, no re-lifting or other maintenance is conducted

Mathematical models or formula were developed to calculate FWP and FWOP acreages for each year during the project life. Formula inputs include:

MNac – the acres of nourished marsh
YR – calendar year
CnstrYR – calendar year in which the marsh is nourished
LLR – polygon land loss rate (% of 1985 acres lost per year)
HLLR – half of the LLR
RevYr – calendar year in which HLLR reverts to LLR
PYr – previous calendar year, or current yr -1

Excel Model Formula – Marsh Nourishment FWP:
IF(YR<CnstrYR,0,IF(YR=CnstrYR,MNac,IF(YR<RevYr,PYr+MNac*HLLR,PYr+MNac*LLR)))

Excel Model Formula – Marsh Nourishment FWOP:
IF(YR<=CnstrYr-1,0,IF(YR=CnstrYR,MNac+MNac*LLR,IF(PYr+MNac*LLR<0,0,PYr+ MNac*LLR)))

Predicting Wetland Benefits of Shoreline Protection Projects
Shoreline protection projects often consist in the placement of rock or other engineered structures in front of marsh shorelines experiencing wave related erosion and loss. In appropriate salinity regimes, the establishment of foreshore oyster reefs may also function to protect eroding marshes. For each shoreline protection measure, land retreat rates were estimated by USGS staff using aerial imagery and projected on imagery to determine the acreage of marshes likely to be lost during the project life without protection.

Model Assumptions:
a) Protection structures will be maintained to provide benefits throughout the project life
b) Rock dikes and/or concrete panel structures will be 100% effective in stopping erosion
c) Foreshore oyster reefs will be 75% effective in stopping erosion

Mathematical models or formula were developed to calculate FWP and FWOP acreages for each year during the project life. Formula inputs include:

2009ac – the 2009 marsh acres that would be protected once the feature was constructed
1985ac – the 1985 marsh acres that would be protected once the feature was constructed
YR – calendar year
CnstrYR – calendar year in which the measure is constructed
LLR – polygon land loss rate (% of 1985 acres lost per year)
RLLR – reduced LLR according to effectiveness of protection measure
FWOPac – marsh acres under FWOP conditions
PYr – previous calendar year, or current yr -1

Excel Model Formula – Shoreline Protection FWP:

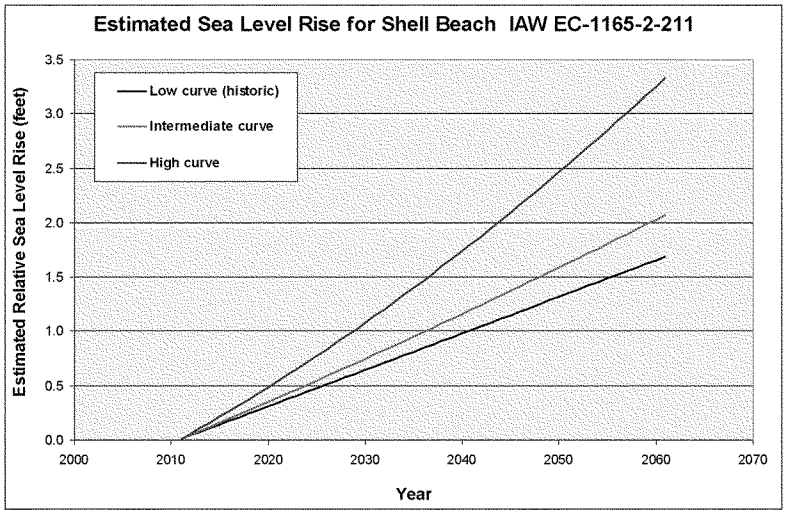
IF(YR<CnstrYR,FWOPac,IF(YR>=CnstrYR,IF(PYr+1985ac*RLLR<0,0,PYr+1985*RLLR)))

Excel Model Formula – Shoreline Protection FWOP:
IF(YR<2009,0,IF(YR=2009,2009ac,IF(PYr+1985ac*LLR<0,0,PYr+1985ac*LLR)))

Wetland Acreage Predictions Under Increased SLR Rates

The historic wetland loss rates (1985-2006) were assumed to have occurred under a constant low SLR rate. Those rates were assumed to continue under the historic sea level rise (SLR) scenario. Under higher sea level rise scenarios (Figure 2), increased inundation impacts are expected to result in increasing marsh loss rates.

Figure 2. Shell Beach predicted relative sea level rise estimates.



Assuming that inundation associated with varying subsidence rates could be determined and used to estimate marsh loss increases, average historic marsh loss rates were obtained for statewide subsidence zones (Figure 3). Those zones were converted into RSLR by adding a historic SLR rate of 1.7mm/yr to each. Historic acreage trends were obtained from USGS for each zone and plotted to obtain a relationship between RSLR and wetland loss rate (Figure 4). Based on the slope of this relationship, every 1.0 mm/yr increase in RSLR would result in a 0.11%/yr increase in wetland loss rate. The additional annual loss rate resulting from increased SLR was then added to the baseline or historic loss rate to obtain total annual loss rates under the increasing sea level rise scenarios, for each study area subunit.

Figure 3. Map illustrating statewide subsidence zones.

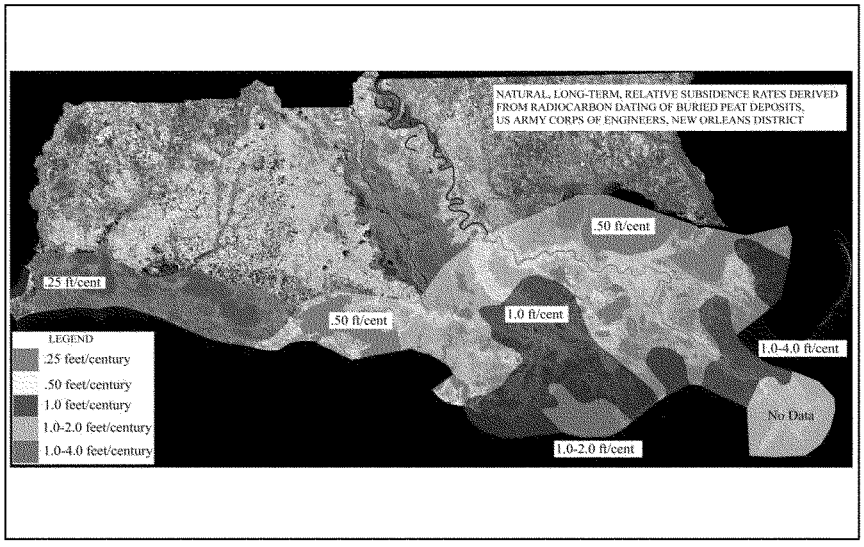
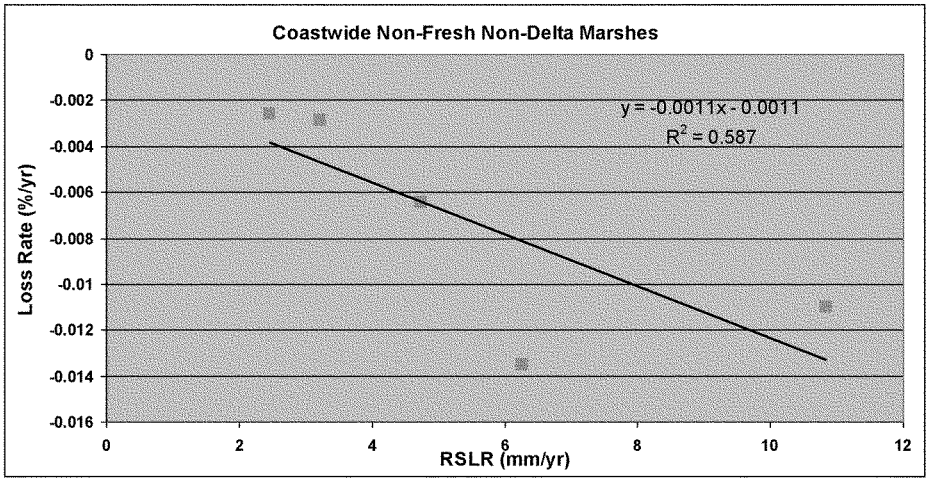


Figure 4. Plot of statewide RSLR rates vs wetland loss rates (% of 1985 ac lost/yr).



Research by Nyman et al. (1993) and Nyman et al. (2006) suggests that coastal marshes undergo rapid degradation and conversion to open water beyond a critical rate of submergence/inundation. Louisiana Coastal Protection and Restoration Authority (CPRA) personnel working to model marsh loss for the 2012 Louisiana Coastal Master Plan have used statewide Coastal Reference Monitoring

System data to develop plant productivity vs inundation (i.e., accretion deficit) relationships which were used to develop inundation ranges (Table 3) for predicting onset of abrupt marsh collapse (Coastal Protection and Restoration Authority of Louisiana 2012). The median values by habitat type were used in this effort to predict onset of abrupt marsh collapse.

Table 3. Cumulative accretion deficits assumed to initiate marsh collapse.

Marsh Type	Range Low Limit (cm)	Range High Limit (cm)	Range Median (cm)
Intermediate	30.7	38.0	34.4
Brackish	20.0	25.6	22.8
Saline	16.0	25.0	20.5

It is assumed that it will take 10 years for the collapsing wetland landscape to completely convert to open water (the 10-year period was assumed to account for wetlands of varying elevations). These values incorporated the average area accretion rate of 7.4 mm per year (Table 4).

Table 4. Study area accretion measurements.

Site	Date	Wetland Type	Method	Accretion rate (cm yr^{-1})	Source
Breton Sound	1963-1999	Freshwater	^{137}Cs	0.65 ± 0.18	DeLaune and Pezeshki, 2003
Caernarvon diversion	1999	Freshwater	feldspar	1.57 ± 0.05*	Lane et al., 2006
Violet diversion	1999	Saline	feldspar	0.44 ± 0.01*	Lane et al., 2006
Central Wetlands				0.47	U.S. Army Corps *
St. Bernard Parish (Shell Beach)	1963-1992	Saline	^{137}Cs	0.54 ± 0.13	DeLaune et al., 1992
Rigolets	1963-1992	Saline	^{137}Cs	0.77 ± 0.09	DeLaune et al., 1992
Caernarvon	1963-1992	Freshwater	^{137}Cs	0.75 ± 0.12	DeLaune et al., 1992
				ave = 0.74	

** personal communication, Mr. Del Britsch, New Orleans District, U.S. Army Corps of Engineers*

Using this average accretion rate and the water level increases associated with sea level rise (post the SLR baseline year of 2011, see Figure 2), the cumulative accretion and cumulative water level rise were calculated for each year within the project life. The accretion deficit may then be calculated as the difference between the cumulative water level rise and the cumulative accretion. Based on those calculations, the collapse criteria were determined (Table 5).

Table 5 Years when marsh collapse is predicted to begin.

SLR Scenario	Year Marsh Collapse Begins		
	INT marsh	BR marsh	SAL marsh
Med SLR	**	2058	2054
High SLR	2044	2035	2033

** *collapse occurs beyond the 50-year project life*

Using the 7.4 mm/year average accretion rate, the spreadsheet analysis projected that marsh collapse would begin in 2033 and 2035 for saline and brackish marshes, respectively, under the High RSLR scenario. Under the intermediate SLR scenario, collapse would begin in 2054 and 2058 for saline and brackish marshes, respectively.

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ATTACHMENT 5

Operations Scheme for Cypress Swamp and Adjacent Marsh

OPERATIONS SCHEMES FOR CYPRESS SWAMP AND ADJACENT MARSH

The yearly operational scheme of the Violet diversion to benefit cypress swamp and marsh restoration as part of the MRGO ecosystem restoration feasibility study is based on the required hydroperiod and depth constraints of bald cypress (*Taxodium distichum* L.) phenology and seasonal water levels based on the Mississippi River stage. Because of the specific requirements of bald cypress, it was used as an indicator of conditions conductive to swamp tupelo (*Nyssa aquatica* L.) and other constituents of forested wetland. In addition, maiden cane (*Panicum hemitomon*) and bull tongue (*Sagittaria lancifolia*) are dominant species of fresh/intermediate marsh and marsh-hay cordgrass (*Spartina patens*) of brackish marsh. These species are often used as indicators of ecosystem health and restoration success.

The Mississippi River follows a general sinusoidal pattern of rise and fall by season in both wet and dry years. Bald cypress and swamp tupelo are adapted to the historical, seasonal changes in hydroperiod due to the River and are able to exploit the natural conditions presented to insure

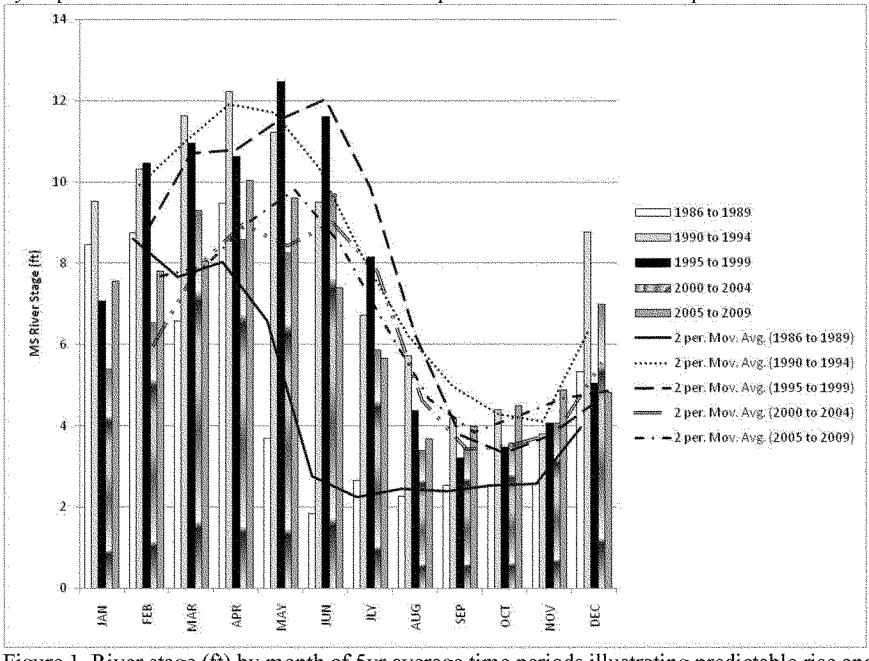


Figure 1. River stage (ft) by month of 5yr average time periods illustrating predictable rise and fall from 1986 to 2009. This pattern holds prior to 1986. Data from the Mississippi River at New Orleans, Carrollton, Gage #01300, gage zero at 0ft. NGVD29, river mile 102.8.

survival. The critical environmental factor for successful cypress seedling germination and establishment is the periodic flooding and drying of the forested wetland consisting of fresh to low-

salinity water. Changes in the traditional hydrologic regime due to anthropogenic and natural forces have impacted the ability of southeastern swamps to reproduce successfully.
The Violet diversion presents the opportunity to aid in reestablishment of natural hydrologic cycles conducive to bald cypress and tupelo establishment, growth, and reproduction. The operation regime presented is based on the report "Final Report of the Science Working Group to the Governor of Louisiana. Conservation, Protection, and Utilization of Louisiana's Coastal Wetland Forests" unless otherwise noted. The report is a compilation of academic research and federal, state, and local governmental reports and specific are available within the report.

The Violet diversion is designed so that management of the estimated base flow of 1,000 cfs or greater can provide conditions favorable to bald cypress germination, growth, and reproduction by controlling depth and duration of inundation and salinity levels. Although an estimated 7,000 cfs diversion rate is needed to achieve required salinity levels in May in the Biloxi marsh target area, management of the diversion control structures will allow maintenance of favorable conditions for forested wetlands.

Studies have shown that primary productivity is higher in forested wetlands that are open to flow and have a more "pulsing" hydrologic regime following a seasonal pattern (Figure 1) than a stagnant, continually flooded regime. This also reduces competition from less flood-tolerant species. Bald cypress is tolerant of long flood durations and relatively deep flooding coupled with low salinity levels (< 2ppt) except during germination and seedling growth. Fluctuating water levels within the root zone will aid in preventing constant anoxic conditions. From greenhouse and field studies, it appears that a periodic drawdown of approximately -15 cm is sufficient to periodically aerate the wetland soils. In addition, flow should be maintained at a level as not to become stagnant for an extended period of time leading to low dissolved oxygen levels in both the soil and water. Tidal exchange and base flow rate should be adequate to prevent widespread stagnation. This base level coupled with the seasonal hydroperiod developed for bald cypress should be sufficient, if not advantageous, to restore and maintain swamp and marsh. Bald cypress and swamp tupelo are stimulated by water level and benefit from the lack of competition from less flood-tolerant trees, scrub/shrub, and plants.

General operations scheme
Initially it is advisable to operate the diversion at a reduced level for the first two to three years after swamp plantings to allow for establishment and habitat switching. This scheme presents general depth and duration of flooding and is not dependent upon cyclic climatic events. Wet and dry years should be incorporated into the operations scheme as indicated by river stage. Every 3 to 5 years, a drawdown should be initiated in March (after seed fall and dispersal) to approximately 4 to 6 inches below swamp surface. The drawdown should continue through the growing season until November to aid in reestablishment. An adaptive management plan will further insure sustainability.
The diversion should be operated to achieve a salinity level conducive to fresh swamp and marsh conditions during the growing season with a maximum not to exceed of 2 ppt.
January: low sheet-flow rate and flooding depth <1ft above marsh surface for seed dispersal.
February: begin drawdown to approximately 4 to 6 inches below marsh surface to provide aerobic conditions needed for germination and initial growth
March: continue drawdown to aid in germination and initial growth.
April: continue drawdown to aid in germination and initial growth. Gradually increase water level at or near surface elevation to stimulate seedling growth.

May: although the full diversion scenario of 7,000 cfs will be in effect, the water level in the CWA to be maintained at or near surface elevation.
June: maintain water level near surface and some sheet flow to prevent establishment of undesirable and less flood-tolerant plants that are able to out-compete target species under drier conditions
July: manipulate background flow of 1,000 cfs to maintain water level near surface to prevent establishment of undesirable and less flood-tolerant plants that are able to out-compete and shade bald cypress and swamp tupelo under drier conditions.
August: same as July
September: same as July
October: begin low flow for seed dispersal <1ft above marsh surface. Cypress seedlings are estimated to grow at least 8 inches in one year. Flood level should not overtop seedlings for extended periods of time.
November: low flow for seed dispersal above marsh surface (≤ 1ft)
December: low flow for seed dispersal above marsh surface (≤ 1ft)

Effects of the operation scheme on fresh and intermediate marsh restoration

As with bald cypress and tupelo, many fresh and intermediate marsh plants are adapted to the seasonal hydroperiod of the Mississippi River. Increased flooding depths during the growing season have been shown to stimulate growth in many fresh/intermediate marsh plants and some brackish plants with the exception species like marsh-hay cordgrass. In addition, marsh plants benefit from the lack of competition from less flood-tolerant plants and less fluctuating, lower, salinity levels. Optimal flooding for fresh and intermediate marshes is assumed to occur at 50% inundation per year, whereas optimal flooding for brackish marsh was assumed to occur at 40% (Habitat Switching module). The assumptions of the Habitat Switching Module are well within flood tolerance ranges of fresh and intermediate marsh plants such as maidencane and bull-tongue, as well as brackish marsh plants such as marsh-hay cordgrass. Thus, the operational scheme developed for bald cypress should be sufficient, if not advantageous, to restore and maintain wetland marsh.

ATTACHMENT 6

Master WVA Input Document Spreadsheet For TSP

V1 Acres Input

		FWOP Acres						FWP Acres																				
				TY Z						TY X		TY X+5				TY Y				TY Y		TY Z						
Project Area	Total Project acres	TY0 acres	TY1 acres	collapse begin year	collapse year	collapse end year	TY50 acres	TY0 acres	TY1 acres	MC constr year	MC constr yr acres	MC + 5 year	MC + 5 year acres	Div year	Div year acres	Div + 4 year	Div + 4 year acres	Div + 5 year	Div + 5 year acres	MC LLR change year	MC LLR change acres	collapse begin year	collapse begin year	collapse e end year	collapse e end year acres	collapse end year	TY50 acres
A-16-Salt-Low SLR (w/out ridge rest.)	3,982.0	3,863.2	3,840.4				2,724.8	3,863.2	3,840.5																		3,561.7
A-16-Salt-Med SLR (w/out ridge rest.)	3,982.0	3,862.5	3,839.0	2054	2,740.4	2064	0.0	3,862.5	3,839.1													2054	3,406.7	2064			0.0
A-16-Salt-High SLR (w/out ridge rest.)	3,982.0	3,860.2	3,834.4	2033	3,199.6	2043	0.0	3,860.2	3,834.5													2033	3,307.2	2043			0.0
A-16-Ridge-Low SLR	55.1	51.7	51.4				36.4	51.7	51.4																		0.0
A-16-Ridge-Med SLR	55.1	51.7	51.3	2054	36.6	2064	0.0	51.7	51.3													2054	0.0	2064			0.0
A-16-Ridge-High SLR	55.1	51.6	51.3	2033	42.8	2043	0.0	51.6	51.3													2033	0.0	2043			0.0
A-07-Brack-Low SLR	8,013.8	7,815.7	7,778.7				5,965.7	7,815.7	7,778.7	2020	7,637.0	2024	7,545.6	2027	7,484.6												6,565.3
A-07-Brack-Med SLR	8,013.8	7,814.3	7,775.9	2058	5,688.8	2068	2,275.5	7,814.3	7,775.9	2020	7,610.4	2024	7,509.6	2027	7,429.2							2055	6,461.6	2058	6,288.4	2068	2,515.3
A-07-Brack-High SLR	8,013.8	7,809.8	7,766.9	2035	6,496.3	2045	0.0	7,809.8	7,766.9	2020	7,556.2	2024	7,390.3	2027	7,248.7							2035	6,779.4	2045			0.0
A-07-Brack-Div-Low SLR	95,873.0	54,593.5	54,335.0				41,671.3	54,593.5	54,335.0	2020	53,076.1	2024	52,108.9	2027	51,406.4							2055	45,496.5				43,489.0
A-07-Brack-Div-Med SLR	95,873.0	54,583.8	54,315.7	2058	38,737.2	2068	15,894.9	54,583.8	54,315.7	2020	52,960.1	2024	51,857.5	2027	51,017.4							2055	42,360.5	2058	41,242.7	2068	16,497.1
A-07-Brack-Div-High SLR	95,873.0	54,552.3	54,252.6	2035	45,377.3	2045	0.0	54,552.3	54,252.6	2020	52,581.9	2024	51,038.2	2027	49,752.2							2035	45,849.4	2045			0.0
D-13-Brack-Low SLR (Swamp Footprint)	11,551.0	7,129.4	7,090.1				5,163.7	7,129.4	7,090.1	2024	8,598.5	2028	10,831.7	2027	10,655.7	2031	10,727.2	2032	10,692.3	2059	9,708.6						9,411.6
D-13-Brack-Med SLR (Swamp Footprint)	11,551.0	7,128.1	7,087.5	2058	4,935.5	2068	1,974.2	7,128.1	7,087.5	2024	8,561.6	2028	10,765.8	2027	10,599.3	2031	10,626.2	2032	10,578.4	2059	8,999.1	2074					8,539.9
D-13-Brack-High SLR (Swamp Footprint)	11,551.0	7,123.9	7,079.2	2035	5,799.2	2045	0.0	7,123.9	7,079.1	2024	8,441.3	2028	10,551.0	2027	10,415.5	2031	10,297.3	2032	10,207.2	2059	0.0	2044	8,910.7	2054			0.0
D-13-Brac-Low SLR (Marsh Footprint)	3,785.0	2,120.2	2,108.5				1,535.6	2,120.2	2,108.5	2021	2,993.4	2025	3,431.6	2027	3,107.8	2031	3,072.1	2032	3,063.2	2056	2,829.3						2,695.5
D-13-Brac-Med SLR (Marsh Footprint)	3,785.0	2,119.8	2,107.7	2058	1,467.7	2068	587.1	2,119.8	2,107.7	2021	2,986.6	2025	3,416.9	2027	3,089.7	2031	3,041.1	2032	3,028.6	2056	2,652.2	2074					2,447.4
D-13-Brac-High SLR (Marsh Footprint)	3,785.0	2,118.5	2,105.2	2035	1,724.6	2045	0.0	2,118.5	2,105.2	2021	2,964.6	2025	3,369.2	2027	3,030.5	2031	2,940.3	2032	2,915.8	2056	0.0	2046	2,561.1	2054			0.0
D-13-Brac-Div-Low SLR--all Central Wetlands	22,342.0	16,202.0	16,112.6				11,734.8	16,202.0	16,112.6	2021	16,925.9	2025	19,242.4	2027	20,257.8	2031	20,279.7	2032	20,298.7	2056	19,138.2						18,577.7
D-13-Brac-Div-Med SLR--all Central Wetlands	22,342.0	16,199.0	16,106.8	2058	11,216.1	2068	4,486.4	16,199.0	16,106.8	2021	16,880.6	2025	19,146.7	2027	20,127.8	2031	20,048.3	2032	19,977.3	2056	17,852.7	2074					16,721.7
D-13-Brac-Div-High SLR--all Central Wetlands	22,342.0	16,189.5	16,087.7	2035	13,178.9	2045	0.0	16,189.5	16,087.7	2021	16,793.1	2025	18,834.8	2027	19,712.1	2031	19,316.8	2032	19,154.8	2056	0.0	2044	16,776.4	2054			0.0
d05-Violet diversion footprint-Low SLR	483.0	325.6	323.8				235.9	325.6	323.8					2027	0.0												0.0
d05-Violet diversion footprint-Med SLR	483.0	325.6	323.7	2058	225.4	2068	90.2	325.6	323.7					2030	0.0							2074					0.0
d05-Violet diversion footprint-High SLR	483.0	325.4	323.3	2035	264.9	2045	0.0	325.4	323.3					2016	0.0							2044	0.0	2054			0.0
E-17-Brack-Low SLR	4,035.0	2,786.3	2,774.9				2,214.3	2,786.3	2,774.9	2019	3,048.5	2023	3,894.7	2027	3,861.3							2054	3,612.9				3,455.9
E-17-Brack-Med SLR	4,035.0	2,785.8	2,773.9	2058	2,107.9	2068	843.2	2,785.8	2,773.9	2019	3,043.5	2023	3,883.3	2027	3,837.9							2054	3,415.0	2058	3,312.5	2068	1,325.0
E-17-Brack-High SLR	4,035.0	2,784.3	2,770.7	2035	2,355.8	2045	0.0	2,784.3	2,770.7	2019	3,027.3	2023	3,846.3	2027	3,761.7							2054	0.0	2035	3,546.8	2045	0.0
E-17-Brack-Div-Low SLR	45,637.0	26,704.8	26,620.5				21,223.1	26,704.8	26,620.5	2019	26,501.3	2023	26,954.7	2027	26,534.6							2054	23,846.1				22,791.3
E-17-Brack-Div-Med SLR	45,637.0	26,702.2	26,611.2	2058	20,207.4	2068	8,083.0	26,702.2	26,611.2	2019	26,457.4	2023	26,851.6	2027	26,343.9							2054	22,376.0	2058	21,659.5	2068	8,663.8
E-17-Brack-Div-High SLR	45,637.0	26,685.9	26,581.0	2035	22,603.0	2045	0.0	26,685.9	26,581.0	2019	26,314.5	2023	26,515.7	2027	25,723.0							2054	0.0	2035	23,846.1	2045	0.0
E-36-Brack-Low SLR	6,216.0	2,691.0	2,683.2				2,300.6	2,691.0	2,683.2	2022	3,513.4	2026	6,089.2	2027	6,080.3							2057	5,800.1				5,680.2
E-36-Brack-Med SLR	6,216.0	2,690.5	2,682.2	2058	2,183.7	2068	873.5	2,690.5	2,682.2	2022	3,503.3	2026	6,070.7	2027	6,056.9							2057	5,472.5	2058	5,440.1	2068	2,176.0
E-36-Brack-High SLR	6,216.0	2,689.0	2,679.3	2035	2,349.0	2045	0.0	2,689.0	2,679.3	2022	3,470.3	2026	6,010.6	2027	5,980.6							2057	0.0	2035	5,689.2	2045	0.0
E-40-Brack-Low SLR	9,969.7	5,035.3	4,995.2				3,030.1	5,035.3	5,942.5	2020	9,278.9	2024	9,797.2	2027	9,675.2	2031	9,512.5	2032	9,471.9	2055	8,376.5						7,739.3
E-40-Brack-Med SLR	9,969.7	5,034.4	4,993.3	2058	2,922.8	2068	1,169.1	5,034.4	5,940.0	2020	9,263.8	2024	9,759.2	2027	9,612.5	2031	9,408.6	2032	9,356.1	2055	7,827.3	2074					6,935.8
E-40-Brack-High SLR	9,969.7	5,031.2	4,987.0	2035	3,814.9	2045	0.0	5,031.2	5,931.8	2020	9,214.7	2024	9,635.4	2027	9,408.1	2031	9,069.8	2032	8,979.0	2055	0.0	2044	7,693.4	2054			0.0
E-40-Brack-Div-Low SLR	28,490.0	16,563	16,527.3				10,025.8	16,562.6	17,474.6	2020	20,441.9	2024	20,665.0	2027	20,390.8	2031	20,203.5	2032	20,224.7	2055	18,725.9						17,990.6
E-40-Brack-Div-Med SLR	28,490.0	16,559	16,521.1	2058	9,736.6	2068	3,894.6	16,559.5	17,467.8	2020	20,401.0	2024	20,571.0	2027	20,234.7	2031	19,927.0	2032	19,907.3	2055	17,217.8	2074					15,835.4
E-40-Brack-Div-High SLR	28,490.0	16,604	16,564.6	2035	13,258.7	2045	0.0	16,603.9	17,509.4	2020	20,376.9	2024	20,410.5	2027	19,907.4	2031	19,777.5	2032	19,151.2	2055	0.0	2044	16,525.9	2054			0.0
F-23-Inner-Brack-Low SLR	11,097.0	5,581.0	5,544.7				3,761.5	5,581.0	5,544.7	2022	7,846.6	2026	10,522.5							2057	9,343.5						8,884.1
F-23-Inner-Brack-Med SLR	11,097.0	5,580.0	5,542.6	2058	3,607.4	2068	1,442.9	5,580.0	5,542.6	2022	7,824.9	2026	10,478.7							2057	8,721.7	2058	8,627.5	2068			3,451.0
F-23-Inner-Brack-High SLR	11,097.0	5,576.6	5,535.8	2035	4,411.9	2045	0.0	5,576.6	5,535.8	2022	7,754.1	2026	10,336.0							2057	0.0	2035	9,566.5	2045			0.0
H-21-Brack-Low SLR-feature 190	1,730.0	949.6	945.0				716.1	949.6	945.0	2018	1,134.0	2022	1,673.7							2053	1,539.6						1,452.4
H-21-Brack-Med SLR-feature 190	1,730.0	949.5	944.6	2058	683.3	2068	273.3	949.5	944.6	2018	1,122.6	2022	1,670.2							2053	1,459.0	2058	1,398.4	2068			559.3
H-21-Brack-High SLR-feature 190	1,730.0	948.9	943.5	2035	785.4	2045	0.0	948.9	943.5	2018	1,118.0	2022	1,658.8							2053	0.0	2035	1,514.2	2045			0.0

	Low	Med	High							
SLR	1.7	2.2	3.6							
last modified Feb 6, 2012										
A-18-Sal-Low-P7										
			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	3863	119	97.0	0	100%-c2	11	14.0	1.0000
3983		1	3840	142	96.4	0	100%-c2	25	14.0	1.0000
		50	2725	1258	68.4	0	100%-c4	90	15.0	1.0000
	FWP	1	3840	142	96.4	0	100%-c2	25	14.0	1.0000
		50	3562	421	89.4	0	100%-c3	70	15.0	1.0000
A-18-Sal-Med-P7										
			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	3863	120	97.0	0	100%-c2	11	14.0	1.0000
3983		1	3839	144	96.4	0	100%-c2	25	14.0	1.0000
		40	2740	1242	68.8	0	100%-c3	40	14.0	1.0000
		50	0	3983	0.0	0	100%-c5	79	15.0	1.0000
	FWP	1	3839	144	96.4	0	100%-c2	25	14.0	1.0000
		40	3407	576	85.5	0	100%-c3	50	14.0	1.0000
		50	0	3983	0.0	0	100%-c5	92	15.0	1.0000
A-18-Sal-High-P7										
			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	3860	122	96.9	0	100%-c2	11	14.0	1.0000
3983		1	3834	148	96.3	0	100%-c2	26	14.0	1.0000
		19	3200	783	80.3	0	100%-C3	84	14.0	1.0000
		28	0	3983	0.0	0	100%-C5	93	15.0	1.0000
		50	0	3983	0.0	0	100%-C5	44	16.0	1.0000
	FWP	1	3834	148	96.3	0	100%-c2	26	14.0	1.0000
		19	3507	475	88.1	0	50%-c2 50%-c3	73	14.0	1.0000
		28	0	3983	0.0	0	100%-c5	95	15.0	1.0000
		50	0	3983	0.0	0	100%-c5	45	16.0	1.0000

A-18-Ridge-Low (133a only)										
FWP Ridge footprint										
A1-18-Ridge-Low			V1 % canopy cover				V2 %midstory cover		V3 woody sp diversi	
Project Area	FWOP	0	Leave the variables blank for FWOP.				0		0	
Project Area		1	0				0		0	
55		50	0				0		0	
	FWP	1	0				0		0	
		2	0				0		0	
		6	0				20		6	
		11	10				75		10	
		25	40				65		13	
		50	80				55		13	
FWOP marshfootprint										
A1-18-Brackish-Low			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinity	V6 fish ac
Project Area	FWOP	0	52	3	93.8	0	100%-c1	46	8.4	1.0000
Project Area		1	51	4	93.2	0	100%-c1	50	8.4	1.0000
55		50	36	19	66.1	0	100%-c2	84	9.4	1.0000
	FWP	1	51	4	93.2	0	100%-c1	50	8.4	1.0000
Becomes Ridge in TY2		2	0	0	0.0	0	0.0	0	0	0.0000
		50	0	0	0.0	0	0.0	0	0	0.0000
A-18-Ridge-Med (133a only)										
FWP Ridge footprint										
A1-18-Ridge-Med			V1 % canopy cover				V2 %midstory cover		V3 woody sp diversi	
Project Area	FWOP	0	Leave the variables blank for FWOP.				0		0	
55		1	0				0		0	
		50	0				0		0	
	FWP	1	0				0		0	
		2	0				0		0	
		6	0				20		6	
		11	10				75		10	
		25	40				65		13	
		50	80				55		13	
FWOP marsh footprint										
A1-18-Brackish-Med			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinity	V6 fish ac
Project Area	FWOP	0	52	3	93.7	0	100%-c1	46	8.4	1.0000
55		1	51	4	93.2	0	100%-c1	50	8.4	1.0000
		44	37	18	66.5					
		50	0	55	0.0	0	100%-c2	94	9.4	1.0000
	FWP	1	51	4	93.2	0	100%-c1	50	8.4	1.0000
Becomes Ridge in TY2		2	0	0	0.0	0	0.0	0	0	0.0000
		50	0	0	0.0	0	0.0	0	0	0.0000
A-18-Ridge-High (133a only)										
FWP Ridge footprint										
A1-18-Ridge-High			V1 % canopy cover				V2 %midstory cover		V3 woody sp diversi	
Project Area	FWOP	0	Leave the variables blank for FWOP.				0		0	
55		1	0				0		0	
		50	0				0		0	
	FWP	1	0				0		0	
		2	0				0		0	
		6	0				20		6	
		11	10				75		10	
		25	40				65		13	
		50	50				65		8	
FWOP marsh footprint										
A1-18-Brackish-High			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinity	V6 fish ac
Project Area	FWOP	0	52	3	93.7	0	100%-c1	46	8.4	1.0000
55		1	51	4	93.1	0	100%-c2	50	8.4	1.0000
		2	0	55	0.0	0	100%-C5	98	8.4	1.0000
		28	0	55	0.0	0	100%-c5	36	9.4	1.0000
		50	0	55	0.0	0	100%-c5	17	10.4	1.0000
	FWP	1	51	4	93.1	0	100%-c1	50	8.4	1.0000
Becomes Ridge in TY2		2	0	0	0.0	0	0.0	0	0	0.0000
		50	0	0	0.0	0	0.0	0	0	0.0000

A-07-Brack-Div-Low-P7

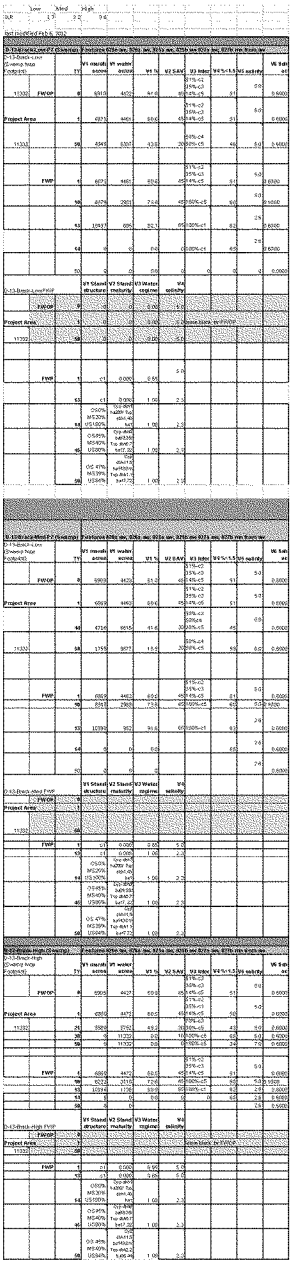
			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinity	V6 fish ac
Project Area	FWOP	0	54593	31280	63.6	0	20%-c2 80%-c3	21	8.4	1.0000
85873		1	54335	31538	63.3	0	20%-c2 80%-c3	21	8.4	1.0000
		50	41671	44202	48.5	0	100%-c3	35	9.4	1.0000
	FWP	1	54335	31538	63.3	0	20%-c2 80%-c3	21	8.4	1.0000
		6	53076	32797	61.8	0	2%-c1 90%-C2 8%-c5	23	8.4	0.9000
		10	52109	33764	60.7	0	2%-c1 90%-C2 8%-C1	24	8.4	1.0000
		13	51406	34467	59.9	5	2%-c1 90%-C2 8%-C1	25	7.5	1.0000
		41	45496	40377	53.0	8	50%-c2 50%-c3	29	7.5	1.0000
		50	43489	42384	50.6	10	10%-C2 90%-C3	30	7.5	1.0000

A-07-Brack-Div-Med-P7

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinity	V6 fish ac
Project Area	FWOP	0	54584	31289	63.6	0	20%-c2 80%-c3	21	8.4	1.0000
85873		1	54316	31557	63.3	0	20%-c2 80%-c3	21	8.4	1.0000
		44	39737	46136	46.3	0	100%-c3	37	8.4	1.0000
		50	15895	69978	18.5	0	50%-c3 50%-c4	56	9.4	1.0000
	FWP	1	54316	31557	63.3	0	20%-c2 80%-c3	21	8.4	1.0000
		6	52960	32913	61.7	0	2%-c1 90%-C2 8%-c5	23	8.4	0.9000
		10	51858	34015	60.4	0	2%-c1 90%-C2 8%-C1	24	8.4	1.0000
		13	51017	34856	59.4	5	2%-c1 90%-C2 8%-C1	25	7.5	1.0000
		41	42360	43513	49.3	5	40%-c2 60%-c3	32	7.5	1.0000
		44	41243	44630	48.0	5	30%-c2 70%-c3	32	7.5	1.0000
		50	16497	69376	19.2	5	10%-C2 60%-C3 30%-C4	54	8.5	1.0000

A-07-Brack-Div-High-P7

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinity	V6 fish ac
Project Area	FWOP	0	54552	31321	63.5	0	20%-c2 80%-c3	21	8.4	1.0000
85873		1	54253	31620	63.2	0	20%-c2 80%-c3	21	8.4	1.0000
		21	45377	40496	52.8	0	100%-c3	31	8.4	1.0000
		30	0	85873	0.0	0	100%-C5	64	9.4	1.0000
		50	0	85873	0.0	0	100%-C5	33	10.4	1.0000
	FWP	1	54253	31620	63.2	0	20%-c2 80%-c3	21	8.4	1.0000
		6	52582	33291	61.2	0	2%-c1 90%-C2 8%-c5	23	8.4	0.9000
		10	51038	34835	59.4	0	2%-c1 90%-C2 8%-C1	24	8.4	1.0000
		13	49752	36121	57.9	0	2%-c1 90%-C2 8%-C1	25	7.5	1.0000
		21	45849	40024	53.4	0	50%-c2 50%-c3	28	7.5	1.0000
		30	0	85873	0.0	0	100%-c5	64	8.4	1.0000
		50	0	85873	0.0	0	100%-c5	33	9.5	1.0000



D-13-Brac-Low-P7						features 026c mc, 026d mc, 026b mn, 026b mn/mc, 027b mn/m			
Marsh footprint									
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinity	V6 fish ac
	FWOP	0	8580	2201	79.6	45	7%-c2 53%-c3 40%-c4	51	5.0	0.6000
Project Area		1	8538	2252	79.1	45	7%-c2 53%-c3 40%-c4	51	5.0	0.6000
10791		50	6088	4703	56.4	30	30%-c4 90%-c5	63	6.0	0.6000
	FWP	1	8539	2252	79.1	45	7%-c2 53%-c3 40%-c4	51	5.0	0.6000
		10	9407	1304	87.2	45	100%-c5	69	5.0	0.1000
		13	9119	1572	84.5	65	100%-c2	62	2.0	0.6000
		14	9109	1582	84.4	65	100%-c1	65	2.0	0.6000
		17	9070	1721	84.0	70	100%-c1	70	2.0	0.6000
		19	0	0	0.0	0	0	0	0.0	0.0000
		50	0	0	0.0	0	0	0	0.0	0.0000

D-13-Brac-Med-P7						features 026c mc, 026d mc, 026b mn, 026b mn/mc, 027b mn/m			
Marsh footprint									
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinity	V6 fish ac
	FWOP	0	8588	2203	79.6	45	7%-c2 53%-c3 40%-c4	51	5.0	0.6000
Project Area		1	8536	2255	79.1	45	7%-c2 53%-c3 40%-c4	51	5.0	0.6000
		44	5798	4966	53.7	30	20%-c3 70%-c4 10%-c5	63	5.0	0.6000
10791		50	2029	8762	18.8	20	10%-c4 90%-c5	78	8.0	0.6000
	FWP	1	8536	2255	79.1	45	7%-c2 53%-c3 40%-c4	51	5.0	0.6000
		10	9362	1429	86.8	45	100%-c5	66	5.0	0.1000
		13	9045	1746	83.8	65	100%-c2	63	2.0	0.6000
		14	9022	1769	83.6	65	100%-c1	67	2.0	0.6000
		17	8939	1852	82.8	70	100%-c1	72	2.0	0.6000
		50	0	0	0.0	0	0	0	0.0	0.0000

D-13-Brac-High-P7						features 026c mc, 026d mc, 026b mn, 026b mn/mc, 027b mn/m			
Marsh footprint									
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinity	V6 fish ac
	FWOP	0	8583	2208	79.5	45	7%-c2 53%-c3 40%-c4	51	5.0	0.6000
Project Area		1	8526	2265	79.0	45	7%-c2 53%-c3 40%-c4	51	5.0	0.6000
10791		21	6897	3894	63.9	20	50%-c4 50%-c5	57	5.0	0.6000
		30	0	10791	0.0	0	100%-c5	80	6.0	0.6000
		50	0	10791	0.0	0	100%-c5	40	7.0	0.6000
	FWP	1	8526	2265	79.0	45	53%-c3	51	5.0	0.6000
		10	9215	1576	85.4	45	100%-c5	60	5.0	0.1000
		13	8814	1977	81.7	65	100%-c2	65	2.0	0.6000
		14	8748	2042	81.1	65	100%-c1	64	2.0	0.6000
		17	8536	2255	79.1	70	100%-c2	63	2.0	0.6000
		50	0	10791	0.0	0	0		2.0	0.6000

D-13-Int-Low-P7					features 026c mc, 026d mc, 025b mn, 025b mn/mc, 027b mn h					
Marsh footprint										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinity	V6 fish ac
	FWOP	0	0	0	0.0	0	0	0	0.0	0.0000
Project Area		1	0	0	0.0	0	0	0	0.0	0.0000
10791		50	0	0	0.0	0	0	0	0.0	0.0000
	FWP	1	0	10791	0.0				5.0	0.6000
		17	0	10791	0.0				2.6	0.6000
		18	9063	1728	84.0	70	100%-c1	71	2.6	0.6000
		45	8756	2035	81.1	80	100%-c2	57	2.6	0.6000
		50	8683	2108	80.5	80	100%-c2	55	2.6	0.6000

D-13-Int-Med-P7					features 026c mc, 026d mc, 025b mn, 025b mn/mc, 027b mn h					
Marsh footprint										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinity	V6 fish ac
	FWOP	0	0	0	0.0	0	0	0	0.0	0.0000
Project Area		1	0	0	0.0	0	0	0	0.0	0.0000
10791		50	0	0	0.0	0	0	0	0.0	0.0000
	FWP	1	0	10791	0.0				5.0	0.6000
		17	0	10791	0.0				2.6	0.6000
		18	8916	1875	82.6	70	100%-c1	73	2.6	0.6000
		45	7945	2846	73.6	80	100%-c2	63	2.6	0.6000
		50	7699	3092	71.3	80	100%-c2	62	2.6	0.6000

D-13-Int-High-P7					features 026c mc, 026d mc, 025b mn, 025b mn/mc, 027b mn h					
Marsh footprint										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinity	V6 fish ac
	FWOP	0	0	0	0.0	0	0	0	0.0	0.0000
Project Area		1	0	0	0.0	0	0	0	0.0	0.0000
10791		50	0	0	0.0	0	0	0	0.0	0.0000
	FWP	1	0	10791	0.0				5.0	0.6000
		17	0	10791	0.0			63	2.6	0.6000
		18	8465	2326	78.4	70	100%-c2	75	2.6	0.6000
		30	7383	3408	68.4	60	100%-c3	68	2.6	0.6000
		39	0	10791	0.0	30	100%-c5	86	2.6	0.6000
		50	0	10791	0.0	10	100%-c5	63	2.6	0.6000

d05-Violet diversion footprint-Low

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinity	V6 fish ac
Project Ac	FWOP	0	326	157	67.4	90	80%-c1 20%-c5	51	5.0	0.6000
483		1	324	159	67.0	90	80%-c1 20%-c5	51	5.0	0.6000
		50	236	247	48.8	75	80%-c3 20%-c5	50	6.0	0.6000
	FWP	1	324	159	67.0	90	80%-c1 20%-c5	50.9	5.0	0.6000
		12	0	483	0.0	0	100% c5	2	2.6	0.0001
		13	0	483	0.0	0	100% c5	2	2.6	0.0001
		50	0	483	0.0	0	100% c5	2	2.6	0.0001

d05-Violet diversion footprint-Med

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinity	V6 fish ac
Project Ac	FWOP	0	326	157	67.4	90	80%-c1 20%-c5	51	5.0	0.6000
483		1	324	159	67.0	90	80%-c1 20%-c5	51	5.0	0.6000
		44	225	258	46.7	80	80%-c2 20%-c5	50	5.0	0.6000
		50	90	393	18.7	75	80%-c3 20%-c5	64	6.0	0.6000
	FWP	1	324	159	67.0	90	80%-c1 20%-c5	50.7	5.0	0.6000
		12	0	483	0.0	0	100% c5	2	5.0	0.0001
		13	0	483	0.0	0	100% c5	2	2.6	0.0001
		50	0	483	0.0	0	100% c5	2	2.6	0.0001

d05-Violet diversion footprint-High

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinity	V6 fish ac
Project Ac	FWOP	0	325	158	67.4	90	80%-c1 20%-c5	51	5.0	0.6000
483		1	323	160	66.9	90	80%-c1 20%-c5	50	5.0	0.6000
		21	265	218	54.8	50	80%-c2 20%-c5	46	5.0	0.6000
		30	0	483	0.0	20	100%-c5	71	6.0	0.6000
		50	0	483	0.0	5	100%-C5	37	7.0	0.6000
	FWP	1	323	160	66.9	90	80%-c1 20%-c5	50	5.0	0.6000
		12	0	483	0.0	0	100% c5	2	5.0	0.0001
		13	0	483	0.0	0	100% c5	2	2.6	0.0001
		50	0	483	0.0	0	100% c5	2	2.6	0.0001

	Low	Med	High							
SLR	1.7	2.2	3.6							
last modified Feb 6, 2012										
E-17-Brack-Div-Low-P7										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinity	V6 fish ac
Project Area	FWOP	0	26705	18932	58.5	30	100%-c3	24	5.3	1.0000
45637		1	26621	19016	58.3	30	100%-c3	24	5.3	1.0000
		50	21223	24414	46.5	30	100%-c4	30	6.3	1.0000
	FWP	1	26621	19016	58.3	30	100%-c3	24	5.3	1.0000
		5	26501	19136	58.1	35	100%-c5	23	5.3	0.8000
		9	26955	18682	59.1	35	100%-c1	21	5.3	1.0000
		13	26535	19102	58.1	40	70%-c1 30%-c2	21	4.0	1.0000
		40	23846	21791	52.3	50	100%-c2	25	4.0	1.0000
		50	22791	22846	49.9	60	100%-c3	26	4.0	1.0000
E-17-Brack-Div-Med-P7										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinity	V6 fish ac
Project Area	FWOP	0	26700	18937	58.5	30	100%-c3	24	5.3	1.0000
45637		1	26611	19026	58.3	30	100%-c3	24	5.3	1.0000
		44	20207	25430	44.3	30	70%-c3 30%-c4	32	5.3	1.0000
		50	8083	37554	17.7	30	100%-c4	52	5.3	1.0000
	FWP	1	26611	19026	58.3	30	100%-c3	24	5.3	1.0000
		5	26457	19180	58.0	35	100%-c5	23	5.3	0.8000
		9	26852	18785	58.8	35	100%-c1	20	5.3	1.0000
		13	26344	19293	57.7	40	100%-c2	21	4.0	1.0000
		40	22376	23261	49.0	40	100%-c3	28	4.0	1.0000
		44	21660	23977	47.5	40	100%-c3	28	4.0	1.0000
		50	8664	36973	19.0	50	50%-c3 50%-c4	52	5.0	1.0000
E-17-Brack-Div-High-P7										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinity	V6 fish ac
Project Area	FWOP	0	26685	18952	58.5	30	100%-c3	24	5.3	1.0000
45637		1	26581	19056	58.2	30	100%-c3	24	5.3	1.0000
		21	22603	23034	49.5	30	100%-c4	28	5.3	1.0000
		30	0	45637	0.0	15	100%-c5	60	6.3	1.0000
		50	0	45637	0.0	0	100%-c5	31	7.3	1.0000
	FWP	1	26581	19056	58.2	30	100%-c3	24	5.3	1.0000
		5	26314	19323	57.7	35	100%-c5	23	5.3	0.8000
		9	26516	19121	58.1	35	100%-c1	20	5.3	1.0000
		13	25723	19914	56.4	40	100%-c2	21	4.0	1.0000
		21	23846	21791	52.3	40	100%-c3	24	4.0	1.0000
		30	0	45637	0.0	20	100%-c5	61	5.0	1.0000
		50	0	45637	0.0	0	100%-c5	32	6.0	1.0000

E-36-Brack-Low-P7			features 10a,10b							
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	/5 salinity	V6 fish ac
Project Area	FWOP	0	2691	3525	43.3	66	85%-c3 15%-c4	57	5.5	1.0000
6216		1	2683	3533	43.2	66	85%-c3 15%-c4	56	5.5	1.0000
		50	2301	3915	37.0	66	100%-c4	32	6.5	1.0000
	FWP	1	2683	3533	43.2	66	85%-c3 15%-c4	56	5.5	1.0000
		8	3513	2703	56.5	66	100%-c5	65	5.5	0.0001
		12	6089	127	98.0	66	100%-c1	65	5.5	1.0000
		13	6080	136	97.8	66	100%-c2	67	4.8	1.0000
		43	5800	416	93.3	66	50%-c2 50%-c3	82	4.8	1
		50	5680	536	91.4	66	100%-c3	81	4.8	1.0000

E-36-Brack-Med-P7			features 10a,10b							
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	/5 salinity	V6 fish ac
Project Area	FWOP	0	2691	3525	43.3	66	85%-c3 15%-c4	57	5.5	1.0000
6216		1	2682	3534	43.2	66	85%-c3 15%-c4	56	5.5	1.0000
		44	2184	4032	35.1	66	50%-c3 50%-c4	31	5.5	1.0000
		50	873	5343	14.1	66	100%-c4	46	6.5	1.0000
	FWP	1	2682	3534	43.2	66	85%-c3 15%-c4	56	5.5	1.0000
		8	3503	2713	56.4	66	100%-c5	65	5.5	0.0001
		12	6071	145	97.7	66	100%-c1	65	5.5	1.0000
		13	6057	159	97.4	66	100%-c2	67	4.8	1.0000
		43	5472	744	88.0	66	100%-c3	87	4.8	1.0000
		44	5440	776	87.5	66	100%-c3	86	4.8	1.0000
		50	2176	4040	35.0	66	70%-c3 30%-c4	96	5.8	1.0000

E-36-Brack-High-P7			features 10a,10b							
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	/5 salinity	V6 fish ac
Project Area	FWOP	0	2689	3527	43.3	66	85%-c3 15%-c4	57	5.5	1.0000
6216		1	2679	3537	43.1	66	85%-c3 15%-c4	56	5.5	1.0000
		21	2349	3867	37.8	66	50%-c3 50%-c4	35	5.5	1.0000
		30	0	6216	0.0	0	100%-c5	55	6.5	1.0000
		50	0	6216	0.0	0	100%-c5	29	7.5	1.0000
	FWP	1	2679	3537	43.1	66	85%-c3 15%-c4	56	5.5	1.0000
		8	3470	2746	55.8	66	100%-c5	65	5.5	0.0001
		12	6011	205	96.7	66	100%-c1	65	5.5	1.0000
		13	5981	235	96.2	66	100%-c2	68	4.8	1.0000
		21	5689	527	91.5	66	100%-c3	80	4.8	1.0000
		30	0	6216	0.0	0	100%-c5	97	5.8	1.0000
		50	0	6216	0.0	0	100%-c5	50	6.8	1.0000

E-40-Brack-Div-Low-P7										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	/5 salinity	V6 fish ac
Project Area	FWOP	0	16563	11927	58.1	0	100%-c3	22	5.1	1.0000
28490		1	16527	11963	58.0	0	100%-c3	22	5.1	1.0000
		50	10026	18464	35.2	0	100%-c4	42	6.1	1.0000
	FWP	1	17475	11015	61.3	0	100%-c3	22	5.1	1.0000
		6	20442	8048	71.8	5	100%-c5	30	5.1	0.7000
		10	20665	7825	72.5	5	100%-c1	32	5.1	1.0000
		13	20391	8099	71.6	20	100%-c1	35	2.9	1.0000
		17	20204	8286	70.9	35	100%-c1	37	2.9	1
		18	0	0	0.0	0	0.0	0	0	0
		50	0	0	0	0	0	0	0	0

E-40-Brack-Div-Med-P7										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	/5 salinity	V6 fish ac
Project Area	FWOP	0	16559	11931	58.1	0	100%-c3	22	5.1	1.0000
28490		1	16521	11969	58.0	0	100%-c3	22	5.1	1.0000
		44	9737	18753	34.2	0	50%-c3 50%-c4	41	5.1	1.0000
		50	3895	24595	13.7	0	100%-c4	53	6.1	1.0000
	FWP	1	17468	11022	61.3	0	100%-c3	22	5.1	1.0000
		6	20401	8089	71.6	5	100%-c5	30	5.1	0.7000
		10	20571	7919	72.2	5	100%-c1	32	5.1	1.0000
		13	20235	8255	71.0	20	100%-c1	35	2.9	1.0000
		17	19927	8563	69.9	35	100%-c1	38	2.9	1.0000
		18	0	0	0.0	0	0.0	0	0	0.0000
		50	0	0	0	0	0	0	0	0

E-40-Brack-Div-High-P7										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	/5 salinity	V6 fish ac
Project Area	FWOP	0	16604	11886	58.3	0	100%-c3	22	5.1	1.0000
28490		1	16565	11925	58.1	0	100%-c3	22	5.1	1.0000
		21	13259	15231	46.5	0	50%-c3 50%-c4	31	5.1	1.0000
		30	0	28490	0.0	0	100%-c5	59	6.1	1.0000
		50	0	28490	0.0	0	100%-c5	31	7.1	1.0000
	FWP	1	17509	10981	61.5	0	100%-c3	22	5.1	1.0000
		6	20377	8113	71.5	5	100%-c5	30	5.1	0.7000
		10	20411	8079	71.6	5	100%-c1	32	5.1	1.0000
		13	19907	8583	69.9	20	100%-c1	35	2.9	1.0000
		17	19278	9212	67.7	20	100%-c2	40	2.9	1.0000
		18	0	0	0.0	0	0.0	0	0	0.0000
		50	0	0	0	0	0	0	0	0

E-40-Int-Div-Low-P7										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5/5 salinity		V6 fish ac
Project Area	FWOP	0	0	0	0	0	0	0	0	0
28490		1	0	0	0	0	0	0	0	0
		50	0	0	0	0	0	0	0	0
	FWP	1	0	0	0	0	0	0	0	0
		17	0	0	0	35	0	37	0	0
		18	20225	8265	71.0	35	100%-c1	38	2.9	1.0000
		41	18726	9764	65.7	45	100%-c2	39	2.9	1.0000
		50	17991	10499	63.1	50	100%-c2	40	2.9	1.0000
E-40-Int-Div-Med-P7										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5/5 salinity		V6 fish ac
Project Area	FWOP	0	0	0	0	0	0	0	0	0
28490		1	0	0	0	0	0	0	0	0
		50	0	0	0	0	0	0	0	0
	FWP	1	0	0	0	0	0	0	0	0
		17	0	0	0	35	0	0	0	0
		18	19907	8583	69.9	35	100%-c1	40	2.9	1.0000
		41	17218	11272	60.4	45	100%-c3	44	2.9	1.0000
		50	15835	12655	55.6	50	100%-c3	45	3.9	1.0000
E-40-Int-Div-High-P7										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5/5 salinity		V6 fish ac
Project Area	FWOP	0	0	0	0	0	0	0	0	0
28490		1	0	0	0	0	0	0	0	0
		21	0	0	0	0	0	0	0	0
		30	0	0	0	0	0	0	0	0
		50	0	0	0	0	0	0	0	0
	FWP	1	0	0	0	0	0	0	0	0
		17	0	0	0	20	0	0	0	0
		18	19151	9339	67.2	20	100%-c2	40	2.9	1.0000
		21	16526	11964	58.0	20	50%-c3 50%-c4	51	2.9	1.0000
		30	0	28490	0.0	0	100%-c5	75	3.9	1.0000
		50	0	28490	0.0	0	100%-c5	39	4.9	1.0000

	Low	Med	High							
SLR	1.7	2.2	3.6							
last modified Feb 6, 2012										
F-23-Inner-Brack-Low-P7			Features 2a,2b,2c,245							
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	/5 salinity	V6 fish ac
Project Area	FWOP	0	5581	5516	50.3	0	77%-c3 23%-c4	35	5.5	1.0000
11097		1	5545	5552	50.0	0	77%-c3 23%-c4	35	5.5	1.0000
		50	3761	7336	33.9	0	100%-c4	36	6.5	1.0000
	FWP	1	5545	5552	50.0	0	77%-c3 23%-c4	35	5.5	1.0000
		8	7847	3250	70.7	0	100%-c5	45	5.5	0.0001
		12	10523	574	94.8	0	100%-c1	45	5.5	1.0000
		43	9344	1753	84.2	0	50%-c2, 50% c3	77	5.5	1
		50	8884	2213	80.1	0	100%-c3	77	6.5	1.0000
F-23-Inner-Brack-Med-P7			Features 2a,2b,2c,245							
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	/5 salinity	V6 fish ac
Project Area	FWOP	0	5580	5517	50.3	0	77%-c3 23%-c4	35	5.5	1.0000
11097		1	5543	5554	49.9	0	77%-c3 23%-c4	35	5.5	1.0000
		44	3607	7490	32.5	0	20%-c3 80%-c4	35	5.5	1.0000
		50	1443	9654	13.0	0	100%-c4	47	6.5	1.0000
	FWP	1	5543	5554	49.9	0	77%-c3 23%-c4	35	5.5	1.0000
		8	7825	3272	70.5	0	100%-c5	45	5.5	0.0001
		12	10479	618	94.4	0	100%-c1	45	5.5	1.0000
		43	8722	2375	78.6	0	50%-c2 50%-c3	80	5.5	1.0000
		44	8628	2469	77.7	0	100%-c3	80	5.5	1.0000
		50	3451	7646	31.1	0	80%-c3 20%-c4	91	6.5	1.0000
F-23-Inner-Brack-High-P7			Features 2a,2b,2c,245							
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	/5 salinity	V6 fish ac
Project Area	FWOP	0	5577	5520	50.3	0	77%-c3 23%-c4	35	5.5	1.0000
11097		1	5536	5561	49.9	0	77%-c3 23%-c4	35	5.5	1.0000
		21	4412	6685	39.8	0	20%-c3 80%-c4	32	5.5	1.0000
		30	0	11097	0.0	0	100%-c5	55	6.5	1.0000
		50	0	11097	0.0	0	100%-c5	28	7.5	1.0000
	FWP	1	5536	5561	49.9	0	77%-c3 23%-c4	35	5.5	1.0000
		8	7754	3343	69.9	0	100%-c5	45	5.5	0.0001
		12	10336	761	93.1	0	100%-c1	45	5.5	1.0000
		21	9566	1531	86.2	0	80%-c2 20%-c3	68	5.5	1.0000
		30	0	11097	0.0	0	100%-c5	94	6.5	1.0000
		50	0	11097	0.0	0	100%-c5	49	7.5	1.0000

	Low	Med	High							
SLR	1.7	2.2	3.6							
last modified Jan 23 2012										
H-21-Brack-Low-feature 190-P7										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	/5 salinity	V6 fish ac
Project Area	FWOP	0	950	780	54.9	0	100%-c3	41	7.4	0.4000
1730		1	945	785	54.6	0	100%-c3	41	7.4	0.4000
		50	716	1014	41.4	0	100%-c4	37	8.4	0.4000
	FWP	1	945	785	54.6	0	100%-c3	41	7.4	0.4000
		4	1124	606	65.0	0	100%-c5	50	7.4	0.0001
		8	1674	56	96.7	0	100%-c1	50	7.4	0.4000
		39	1540	190	89.0	0	50%-c2 50%-c3	80	7.4	0.4000
		50	1452	278	84.0	0	100%-c3	79	8.4	0.4000
H-21-Brack-Med-feature 190-P7										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	/5 salinity	V6 fish ac
Project Area	FWOP	0	949	781	54.9	0	100%-c3	41	7.4	0.4000
1730		1	945	785	54.6	0	100%-c3	41	7.4	0.4000
		44	683	1047	39.5	0	50%-c3 50%-c4	36	7.4	0.4000
		50	273	1457	15.8	0	100%-c4	52	8.4	0.4000
	FWP	1	945	785	54.6	0	100%-c3	41	7.4	0.4000
		4	1123	607	64.9	0	100%-c5	50	7.4	0.0001
		8	1670	60	96.5	0	100%-c1	51	7.4	0.4000
		39	1459	271	84.3	0	50%-c2 50%-c3	84	7.4	0.4000
		44	1398	332	80.8	0	100%-c3	82	7.4	0.4000
		50	559	1171	32.3	0	80%-c3 20%-c4	93	8.4	0.4000
H-21-Brack-High-feature 190-P7										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	/5 salinity	V6 fish ac
Project Area	FWOP	0	949	781	54.9	0	100%-c3	41	7.4	0.4000
1730		1	944	786	54.5	0	100%-c3	40	7.4	0.4000
		21	785	945	45.4	0	100%-c4	34	7.4	0.4000
		30	0	1730	0.0	0	100%-c5	60	8.4	0.4000
		50	0	1730	0.0	0	100%-c5	31	9.4	0.4000
	FWP	1	944	786	54.5	0	100%-c3	40	7.4	0.4000
		4	1118	612	64.6	0	100%-c5	50	7.4	0.0001
		8	1659	71	95.9	0	100%-c1	53	7.4	0.4000
		21	1514	216	87.5	0	100%-c2	79	7.4	0.4000
		30	0	1730	0.0	0	100%-c5	95	8.4	0.4000
		50	0	1730	0.0	0	100%-c5	50	9.4	0.4000

ATTACHMENT 7

Individual WVA Variable Assumptions For TSP

Project	Measure	Alt	T	Varia	Assumption
Biloxi Marshes					
Biloxi Marshes	Low SLR				10.24 mm/yr * 50 years = 512 mm 512 mm = 0.512m = 1.68 ft (1.7 ft)
Biloxi Marshes	A-18-Sal-Low-P7	FWOP	0	V3	feature 29b sp is C3 feature 29a sp is C1
Biloxi Marshes	A-18-Sal-Low-P7	FWOP	0	V4	Based on survey data
Biloxi Marshes	A-18-Sal-Low-P7	FWOP	0	V5	Rounded up to 14 from 13.6 b/c salinity model would not allow decimals. Received error message.
Biloxi Marshes	A-18-Sal-Low-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-18-Sal-Low-P7	FWOP	1	V5	Rounded up to 14 from 13.6 b/c salinity model would not allow decimals. Received error message.
Biloxi Marshes	A-18-Sal-Low-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-18-Sal-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt Rounded 14.6 up to 15 b/c error message received in WVA when entered decimal
Biloxi Marshes	A-18-Sal-Low-P7	FWP	1	V5	Rounded up from 13.6 to 14 due to error message received in WVA
Biloxi Marshes	A-18-Sal-Low-P7	FWP	1	V6	SP with fish dips
Biloxi Marshes	A-18-Sal-Low-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-18-Sal-Low-P7	FWP	50	V5	restoration measures counter the effects of relative sea level rise Rounded up to 14.6 to 15 due to error message received in WVA
Biloxi Marshes	A-18-Sal-Med-P7	FWOP	0	V3	feature 29b sp is C3 feature 29a sp is C1
Biloxi Marshes	A-18-Sal-Med-P7	FWOP	0	V4	based survey data
Biloxi Marshes	A-18-Sal-Med-P7	FWOP	0	V5	rounded 13.6 up to 14 due to error message received in WVA
Biloxi Marshes	A-18-Sal-Med-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-18-Sal-Med-P7	FWOP	1	V5	rounded 13.6 up to 14 due to error message received in WVA
Biloxi Marshes	A-18-Sal-Med-P7	FWOP	40		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058

Main Marshes	A-1b Dal-Med-PT	FWOP	50	V4	Assume the marsh across trail become shallow water. Of the remaining existing shallow water, subsidence is interpolated between Target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Main Marshes	A-1b Dal-Med-PT	FWOP	50	V5	Due to relative sea level rise, after 50 years salinity increases 1 ppt Rounded 14 sub to 15 due to error message received in WVA
Main Marshes	A-1b Dal-Med-PT	FWP	1	V5	Rounded 13 sub to 14 due to error message received in WVA
Main Marshes	A-1b Dal-Med-PT	FWP	1	V6	SP with fish dike
Main Marshes	A-1b Dal-Med-PT	FWP	49		The CPRA collapse criteria used for MRCO have collapse occuring differently pre-depending on marsh type. Under High SLR, a) Algae begins at: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2064 BR marsh = 2075
Main Marshes	A-1b Dal-Med-PT	FWP	50	V4	Assume the marsh across trail become shallow water. Of the remaining existing shallow water, subsidence is interpolated between Target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Main Marshes	A-1b Dal-Med-PT	FWP	50	V5	Due to high relative sea level rise, after 50 years salinity increases 1 ppt Rounded 14 sub to 15 due to error message received in WVA
Main Marshes	A-1b Sal-High-PT	FWOP	0	V1	Nodata. 2% land
Main Marshes	A-1b Sal-High-PT	FWOP	0	V2	Nodata. 2% land
Main Marshes	A-1b Sal-High-PT	FWOP	0	V4	Baked oyster data
Main Marshes	A-1b Sal-High-PT	FWOP	0	V5	rounded 13 sub to 14 due to error message received in WVA
Main Marshes	A-1b Sal-High-PT	FWOP	1	V4	Assume the marsh across trail become shallow water. Of the remaining existing shallow water, subsidence is interpolated between Target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Main Marshes	A-1b Sal-High-PT	FWOP	1	V5	rounded 13 sub to 14 due to error message received in WVA
Main Marshes	A-1b Sal-High-PT	FWOP	10		The CPRA collapse criteria used for MRCO have collapse occuring differently pre-depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2032 BR marsh = 2035 INT marsh = 2044
Main Marshes	A-1b Sal-High-PT	FWOP	18		Assume the marsh across trail become shallow water. Of the remaining existing shallow water, subsidence is interpolated between Target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Main Marshes	A-1b Sal-High-PT	FWOP	18	V5	rounded 13 sub to 14 due to error message received in WVA
Main Marshes	A-1b Sal-High-PT	FWOP	19		new marsh goes to 0
Main Marshes	A-1b Sal-High-PT	FWOP	20		Assume the marsh across trail become shallow water. Of the remaining existing shallow water, subsidence is interpolated between Target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Main Marshes	A-1b Sal-High-PT	FWOP	20	V5	rounded 13 sub to 14 due to error message received in WVA
Main Marshes	A-1b Sal-High-PT	FWOP	25		Assume the marsh across trail become shallow water. Of the remaining existing shallow water, subsidence is interpolated between Target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Main Marshes	A-1b Sal-High-PT	FWOP	25	V5	rounded 13 sub to 14 due to error message received in WVA
Main Marshes	A-1b Sal-High-PT	FWOP	50	V4	Assume the marsh across trail become shallow water. Of the remaining existing shallow water, subsidence is interpolated between Target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Main Marshes	A-1b Sal-High-PT	FWOP	50	V5	Due to relative sea level rise, after 50 years salinity increases 2 ppt Rounded 14 sub to 15 due to error message received in WVA
Main Marshes	A-1b Sal-High-PT	FWP	1	V1	SP Nodata
Main Marshes	A-1b Sal-High-PT	FWP	1	V3	rounded 13 sub to 14 due to error message received in WVA
Main Marshes	A-1b Sal-High-PT	FWP	1	V6	SP with fish dike
Main Marshes	A-1b Sal-High-PT	FWP	18		The CPRA collapse criteria used for MRCO have collapse occuring differently pre-depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2032 BR marsh = 2035 INT marsh = 2044
Main Marshes	A-1b Sal-High-PT	FWP	18		Assume the marsh across trail become shallow water. Of the remaining existing shallow water, subsidence is interpolated between Target years (based on low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Main Marshes	A-1b Sal-High-PT	FWP	18	V5	rounded 13 sub to 14 due to error message received in WVA
Main Marshes	A-1b Sal-High-PT	FWP	19		new marsh goes to 0
Main Marshes	A-1b Sal-High-PT	FWP	20		Assume the marsh across trail become shallow water. Of the remaining existing shallow water, subsidence is interpolated between Target years (based on low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Main Marshes	A-1b Sal-High-PT	FWP	20	V5	rounded 14 sub to 15 due to error message received in WVA
Main Marshes	A-1b Sal-High-PT	FWP	50	V4	Assume the marsh across trail become shallow water. Of the remaining existing shallow water, subsidence is interpolated between Target years (based on low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Main Marshes	A-1b Sal-High-PT	FWP	50	V5	Due to high relative sea level rise, after 50 years salinity increases 2 ppt Rounded up to 15 due to error message received in WVA
Main Marshes	A-1b Algae-Low	FWP	2		Algae contributes to V2
Main Marshes	A-1b Brackish-Low	FWP	1	V2	assume planting does after FY 2 has also dredged material may not be suitable initially. Plant 5 species at trees in FY19. Assume 4 more species will recruite by or time.
Main Marshes	A-1b Brackish-Low	FWOP	0	V4	Baked oyster data
Main Marshes	A-1b Brackish-Low	FWOP	1	V4	Assume the marsh across trail become shallow water. Of the remaining existing shallow water, subsidence is interpolated between Target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Main Marshes	A-1b Brackish-Low	FWOP	50	V4	Assume the marsh across trail become shallow water. Of the remaining existing shallow water, subsidence is interpolated between Target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Main Marshes	A-1b Brackish-Low	FWOP	50	V5	Due to relative sea level rise, after 50 years salinity increases 1 ppt

Biloxi Marshes	A1-18-Brackish-Low	FWP	1	V4	based survey data
Biloxi Marshes	A1-18-Brackish-Low	FWP	2		Becomes ridge in TY2.
Biloxi Marshes	A1-18-Ridge-Med	FWP			future projections based on Grand Liard PPL18 CWPPRA project (BA 48).
Biloxi Marshes	A1-18-Ridge-Med	FWP	2		Ridge constructed in TY2
Biloxi Marshes	A1-18-Ridge-Med	FWP	2	V3	assume planting trees after TY2 because dredged material may not be suitable initially. Plant 6 species of trees by TY6. Assume 4 more species will recruit over time.
Biloxi Marshes	A1-18-Brackish-Med	FWOP	0	V4	based survey data
Biloxi Marshes	A1-18-Brackish-Med	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A1-18-Brackish-Med	FWOP	44		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
Biloxi Marshes	A1-18-Brackish-Med	FWOP	44	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A1-18-Brackish-Med	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A1-18-Brackish-Med	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Biloxi Marshes	A1-18-Brackish-Med	FWP	1	V4	based survey data
Biloxi Marshes	A1-18-Brackish-Med	FWP	2		Becomes ridge in TY2.
Biloxi Marshes	A1-18-Ridge-High	FWP			future projections based on Grand Liard PPL18 CWPPRA project (BA 48).
Biloxi Marshes	A1-18-Ridge-High	FWP	2		Ridge constructed in TY2
Biloxi Marshes	A1-18-Ridge-High	FWP	2	V3	assume planting trees after TY2 because dredged material may not be suitable initially. Plant 6 species of trees by TY6. Assume 4 more species will recruit over time.
Biloxi Marshes	A1-18-Ridge-High	FWP	50	V1	reduced as ridge subsides
Biloxi Marshes	A1-18-Ridge-High	FWP	50	V2	Stays high as overstory doesn't increase substantially with subsidence.
Biloxi Marshes	A1-18-Ridge-High	FWP	50	V3	reduced as ridge subsides
Biloxi Marshes	A1-18-Brackish-High	FWOP	0	V4	based survey data
Biloxi Marshes	A1-18-Brackish-High	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A1-18-Brackish-High	FWOP	2		In high SLR all marsh is lost by TY2
Biloxi Marshes	A1-18-Brackish-High	FWOP	2	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A1-18-Brackish-High	FWOP	28		year marsh goes to 0

Biloxi Marshes	A1-18-Brackish-High	FWOP	28	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A1-18-Brackish-High	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A1-18-Brackish-High	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Biloxi Marshes	A1-18-Brackish-High	FWP	1	V4	based survey data
Biloxi Marshes	A1-18-Brackish-High	FWP	2		Becomes ridge in TY2.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWOP	0	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWOP	0	V4	based survey data
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWOP	1	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	1	V1	SP feature
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	1	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	6		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	6	V3	Features make up about 10% (8066 acres) of Subunit. Of the about 10%: 20% c1 for SP 80% c5 for mc Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	6	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	6	V6	Marsh nourishment with retention dikes.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	10		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	10	V3	Features make up about 10% (8066 acres) of Subunit. Of the about 10%: 20% c1 for SP 80% c2 for mc Assume remaining 90% of SU is Class 2

Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	10	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	13		TY diversion is functional
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	13	V2	Diversion influence may enhance a small amount of SAV in this area.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	13	V3	Features make up about 10% (8066 acres) of Subunit. Of the about 10%: 20% c1 for SP 80% c2 for mc Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	13	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	13	V5	Based on mean high for Subunit 73, since this is the saline portion
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	41		The LLR increases to background LLR once 10 inches of accretion occurs above the created platform. The LLR change yr is the 34th yr after MC constr yr (constr yr + 35).
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	41	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	50	V3	Features make up about 10% of Subunit. 10% C2. Diversion helps maintain nourished marsh. Assume remaining 90% of SU is C3
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	50	V5	Diversion input helps combate RSLR.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWOP	0	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWOP	0	V4	based survey data
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWOP	1	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWOP	44		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058

Biloxi Marshes	A-07-Brack-Div-Med-P7	FWOP	50	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interperlated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	1	V1	SP feature
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	1	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	6		Year MC or MN is completed. MC or MN assumed to be completed on day 1 of this year. IF there are multiple construction years, report the last construction year in this column.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	6	V3	Features make up about 10% (8063 acres) of Subunit. Of the about 10%: 20% c1 for SP 80% c5 for mc Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	6	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interperlated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	6	V6	Marsh nourishment w ith retention dikes.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	10		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	10	V3	Features make up about 10% (8063 acres) of Subunit. Of the about 10%: 20% c1 for SP 80% c2 for mc Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	10	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interperlated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	13		TY diversion is functional
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	13	V2	Diversion influence may enhance a small amount of SAV in this area.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	13	V3	Features make up about 10% (8063 acres) of Subunit. Of the about 10%: 20% c1 for SP 80% c2 for mc Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	13	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interperlated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	13	V5	Based on mean high for Subunit 73, since this is the saline portion
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	41		The LLR increases to background LLR once 10 inches of accretion occurs above the created platform. The LLR change yr is the 34th yr after MC constr yr (constr yr + 35).
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	41	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interperlated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.

Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	44		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	0	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	0	V4	based survey data
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	1	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	21		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	21	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	30		year marsh goes to 0
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	30	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 2 ppt
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	1	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	6		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	6	V3	Features make up about 10% (8053 acres) of Subunit. Of the about 10%: 20% c1 for SP 80% c5 for mc Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	6	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	6	V6	Marsh nourishment with retention dikes.

Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	10		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	10	V3	Features make up about 10% (8053 acres) of Subunit. Of the about 10%: 20% c1 for SP 80% c2 for mc Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	10	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	13		diversion begins operating in 2027
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	13	V3	Features make up about 10% (8053 acres) of Subunit. Of the about 10%: 20% c1 for SP 80% c2 for mc Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	13	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	13	V5	Based on mean high for Subunit 73, since this is the saline portion
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	21		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	21	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	30		year marsh goes to 0
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	30	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	50	V5	Due to high relative seal level rise, after 50 years salinity increases 2 ppt

Central Wetlands	Low SLR				10.24 mm/yr * 50 years = 512 mm 512 mm = 0.512m = 1.68 ft (1.7 ft)
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWOP	0	V2	Used field data = 52%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWOP	0	V3	triangle is c5 Mid CW is c3 South of B Dupre is c2
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWOP	0	V4	based survey data
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWOP	0	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWOP	1	V3	triangle is c5 Mid CW is c3 South of B Dupre is c2
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWOP	50	V2	SAV decrease over time as less open water is shallow and increase salinity.
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWOP	50	V5	beause of relative sea level rise, salinity raises 1 ppt
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWP	1	V3	triangle is c5 Mid CW is c3 South of B Dupre is c2
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWP	10		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWP	10	V3	All created and nourished marsh becomes C5
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWP	10	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishement.
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWP	10	V6	Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWP	13		diversion begins operating in 2027
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWP	13	V2	Increase in SAV due to the diversion
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWP	13	V3	All created and nourished marsh becomes C1
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWP	13	V4	the diversion starts and brings sedimenet with it.
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWP	14		TY 5 years after swamp is created. swamp creation year is counted as a full year post construction swamp is planted after the diversion freshens the area enough to support swamp habitat.
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWP	14	V1	habitat switches to swamp
Central Wetlands	D-13-Brack-Low (Swamp Footp	FWP	14	V4	Sediment from the diversion affects the Central Wetlands more than any other subunit.
Central Wetlands	D-13-Brack-Low (Project Area)				219 acres was removed from fwp in the swamp area for the SWB project.
Central Wetlands	D-13-Brack-Low	FWOP	0	V3	30% permanently flooded, remainder temporarily flooded = semi permanent flood duration. Low exchange due to two gates
Central Wetlands	D-13-Brack-Low	FWP	1	V1	no trees planted until after diversion reduces salinity enough to support cypress.
Central Wetlands	D-13-Brack-Low	FWP	1	V2	Cypress are not supported until after diversion is active.
Central Wetlands	D-13-Brack-Low	FWP	1	V3	Flow/exchange is low and flood duration is temporarily flooded.
Central Wetlands	D-13-Brack-Low	FWP	1	V4	baseline salinity before diversion is active.
Central Wetlands	D-13-Brack-Low	FWP	13		diversion begins operating in 2027
Central Wetlands	D-13-Brack-Low	FWP	13	V1	no trees planted until after diversion reduces salinity enough to support cypress.

Central Wetlands	D-13-Brack-Low	FWP	13	V2	Cypress are not supported until after diversion is active.
Central Wetlands	D-13-Brack-Low	FWP	13	V3	Flow/exchange is high due to diversion constant flow for most of the year and pulsing. Flood duration seasonally flooded
Central Wetlands	D-13-Brack-Low	FWP	14		swamp is planted after the diversion freshens the area enough to support swamp habitat.
Central Wetlands	D-13-Brack-Low	FWP	14	V1	Sapplings planted <33% overstory closure.
Central Wetlands	D-13-Brack-Low	FWP	14	V2	dbh less than or equal to 1. BA is 200
Central Wetlands	D-13-Brack-Low	FWP	14	V3	Flow/exchange is high due to diversion constant flow for most of the year and pulsing. Flood duration seasonally flooded
Central Wetlands	D-13-Brack-Low	FWP	45		The LLR increases to background LLR once 10 inches of accretion occurs above the created platform. The LLR change yr is the 34th yr after MC constr yr (constr yr + 35).
Central Wetlands	D-13-Brack-Low	FWP	45	V1	assume 1"dbh sapplings grow to 9"dbh by TY45.
Central Wetlands	D-13-Brack-Low	FWP	45	V2	Assume dbh is 9 based on growing tree spreadsheet.
Central Wetlands	D-13-Brack-Low	FWP	45	V3	Flow/exchange is high due to diversion constant flow for most of the year and pulsing. Flood duration seasonally flooded
Central Wetlands	D-13-Brack-Low	FWP	50	V1	Based on healthy swamp existing conditions (IER1 floodside WA 47% overstory, 39% midstory, 64% understory). Here assume 33% overstory, 40% midstory, and 40% understory.
Central Wetlands	D-13-Brack-Low	FWP	50	V2	assume dbh is 15 bassed tree growth. If dbh is between 13 and 16, then SI is (0.067*dbh) 0.072.
Central Wetlands	D-13-Brack-Low	FWP	50	V3	Flow/exchange is high due to diversion constant flow for most of the year and pulsing. Flood duration seasonally flooded
Central Wetlands	D-13-Brack-Low	FWP	50	V4	restoration measures counter the effects of relative sea level rise
Central Wetlands	D-13-Brack-Med (Project Area)				219 acres was removed from fwop for SWB project.
Central Wetlands	D-13-Brack-Med (Swamp Footpri	FWOP	0	V2	Used field data = 52%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brack-Med (Swamp Footpri	FWOP	0	V3	triangle is c5 Mid CW is c3 South of B Dupre is c2
Central Wetlands	D-13-Brack-Med (Swamp Footpri	FWOP	0	V4	based survey data
Central Wetlands	D-13-Brack-Med (Swamp Footpri	FWOP	0	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures
Central Wetlands	D-13-Brack-Med (Swamp Footpri	FWOP	1	V3	triangle is c5 Mid CW is c3 South of B Dupre is c2
Central Wetlands	D-13-Brack-Med (Swamp Footpri	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-Med (Swamp Footpri	FWOP	44		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
Central Wetlands	D-13-Brack-Med (Swamp Footpri	FWOP	50	V2	SAV decrease over time as less open water is shallow and increase salinity.

Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWOP	50	V5	beause of relative sea level rise, salinity raises 1 ppt
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWP	1	V3	triangle is c5 Mid CW is c3 South of B.Dupre is c2
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWP	1	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWP	10		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWP	10	V3	All created and nourished marsh becomes C5
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWP	10	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishement.
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWP	10	V6	Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWP	13		diversion begins operating in 2027
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWP	13	V2	Increase in SAV due to the diversion
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWP	13	V3	All created and nourished marsh becomes C1
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWP	13	V4	the diversion starts and brings sedimenet with it.
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWP	14		TY 5 years after swamp is created. swamp creation year is counted as a full year post construction swamp is planted after the diversion freshens the area enough to support swamp habitat.
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWP	14	V1	habitat switches to swamp
Central Wetlands	D-13-Brack-Med (Swamp Footpr	FWP	14	V4	Sediment from the diversion affects the Central Wetlands more than any other subunit.
Central Wetlands	D-13-Brack-Med (Project Area)				219 acres was removed from fwop for SWB project.
Central Wetlands	D-13-Brack-Med	FWP	1	V1	no trees planted until after diversion reduces salinity enough to support cypress.
Central Wetlands	D-13-Brack-Med	FWP	1	V2	Cypress are not supported until after diversion is active.
Central Wetlands	D-13-Brack-Med	FWP	1	V3	Flow/exchange is low and flood duration is temporarily flooded.
Central Wetlands	D-13-Brack-Med	FWP	1	V4	baseline salinity before diversion is active.
Central Wetlands	D-13-Brack-Med	FWP	13		diversion begins operating in 2027
Central Wetlands	D-13-Brack-Med	FWP	13	V1	no trees planted until after diversion reduces salinity enough to support cypress.
Central Wetlands	D-13-Brack-Med	FWP	13	V2	Cypress are not supported until after diversion is active.
Central Wetlands	D-13-Brack-Med	FWP	13	V3	Flow/exchange is high due to diversion constant flow for most of the year and pulsing. Flood duration seasonally flooded
Central Wetlands	D-13-Brack-Med	FWP	14		swamp is planted after the diversion freshens the area enough to support swamp habitat.
Central Wetlands	D-13-Brack-Med	FWP	14	V1	Sapplings planted <33% overstory closure.
Central Wetlands	D-13-Brack-Med	FWP	14	V2	dbh less than or equal to 1. BA is 200
Central Wetlands	D-13-Brack-Med	FWP	14	V3	Flow/exchange is high due to diversion constant flow for most of the year and pulsing. Flood duration seasonally flooded
Central Wetlands	D-13-Brack-Med	FWP	45		The LLR increases to background LLR once 10 inches of accretion occurs above the created platform. The LLR change yr is the 34th yr after MC constr yr (constr yr + 35).
Central Wetlands	D-13-Brack-Med	FWP	45	V1	assume 1"dbh sapplings grow to 9"dbh by TY45.
Central Wetlands	D-13-Brack-Med	FWP	45	V2	Assume dbh is 9 based on growing tree spreadsheet.
Central Wetlands	D-13-Brack-Med	FWP	45	V3	Flow/exchange is high due to diversion constant flow for most of the year and pulsing. Flood duration seasonally flooded

Central Wetlands	D-13-Brack-Med	FWP	50	V1	Based on healthy swamp existing conditions (IER1 floodside WVA 47% overstory, 39% midstory, 64% understory). Here assume 33% overstory, 40% midstory, and 40% understory.
Central Wetlands	D-13-Brack-Med	FWP	50	V2	assume dbh is 15 bassed tree growth. If dbh is between 13 and 16, then SI is (0.067*dbh) 0.072.
Central Wetlands	D-13-Brack-Med	FWP	50	V3	Flow/exchange is high due to diversion constant flow for most of the year and pulsing. Flood duration seasonally flooded
Central Wetlands	D-13-Brack-Med	FWP	50	V4	restoration measures counter the effects of relative sea level rise
Central Wetlands	D-13-Brack-High (Project Area)				219 acres was removed from fwop for SWB project.
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	0	V2	Used field data = 52%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	0	V3	triangle is c5 Mid CW is c3 South of B Dupre is c2
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	0	V4	based survey data
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	0	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	1	V3	triangle is c5 Mid CW is c3 South of B Dupre is c2
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	21		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	21	V2	SAV decrease over time as less open water is shallow and increase salinity.
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	21	V3	27a and 27b c2; 25a and 25b c2, 26a and 26e c5
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	21	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	30		year marsh goes to 0
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	30	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	50	V2	SAV decrease over time as less open water is shallow and increase salinity.
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWOP	50	V5	beause of high relative sea level rise, salinity raises 2 ppt

Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	1	V3	triangle is c5 Mid CW is c3 South of B.Dupre is c2
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	1	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	10		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	10	V1	25% of created marsh is functional. Existing marsh is functional.
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	10	V3	All created and nourished marsh becomes C5
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	10	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishement.
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	10	V6	Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	13		diversion begins operating in 2027
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	13	V2	Increase in SAV due to the diversion
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	13	V3	All created and nourished marsh becomes C1
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	13	V4	the diversion starts and brings sedimenet with it.
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	14		TY 5 years after swamp is created. swamp creation year is counted as a full year post construction swamp is planted after the diversion freshens the area enough to support swamp habitat.
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	14	V1	habitat switches to swamp
Central Wetlands	D-13-Brack-High (Swamp Footpr	FWP	14	V4	Sediment from the diversion affects the Central Wetlands more than any other subunit.
Central Wetlands	D-13-Brack-High (Project Area)				219 acres was removed from fwop for SWB project.
Central Wetlands	D-13-Brack-High	FWP	1	V1	no trees planted until after diversion reduces salinity enough to support cypress.
Central Wetlands	D-13-Brack-High	FWP	1	V2	Cypress are not supported until after diversion is active.
Central Wetlands	D-13-Brack-High	FWP	1	V3	Flow/exchange is low and flood duration is temporarily flooded.
Central Wetlands	D-13-Brack-High	FWP	1	V4	baseline salinity before diversion is active.
Central Wetlands	D-13-Brack-High	FWP	13		diversion begins operating in 2027
Central Wetlands	D-13-Brack-High	FWP	13	V1	no trees planted until after diversion reduces salinity enough to support cypress.
Central Wetlands	D-13-Brack-High	FWP	13	V2	Cypress are not supported until after diversion is active.
Central Wetlands	D-13-Brack-High	FWP	13	V3	Flow/exchange is low and flood duration is temporarily flooded.
Central Wetlands	D-13-Brack-High	FWP	13	V4	baseline salinity before diversion is active.
Central Wetlands	D-13-Brack-High	FWP	14		swamp is planted after the diversion freshens the area enough to support swamp habitat.
Central Wetlands	D-13-Brack-High	FWP	14	V1	Sapplings planted <33% overstory closure.
Central Wetlands	D-13-Brack-High	FWP	14	V2	dbh less than or equal to 1. BA is 200
Central Wetlands	D-13-Brack-High	FWP	14	V3	Flow/exchange is high due to diversion constant flow for most of the year and pulsing. Flood duration seasonally flooded
Central Wetlands	D-13-Brack-High	FWP	45		The LLR increases to background LLR once 10 inches of accretion occurs above the created platform. The LLR change yr is the 34th yr after MC constr yr (constr yr + 35). Assume swamp does not collapse.
Central Wetlands	D-13-Brack-High	FWP	45	V1	assume 1"dbh sapplings grow to 9"dbh by TY45.
Central Wetlands	D-13-Brack-High	FWP	45	V2	Assume dbh is 9 based on growing tree spreadsheet.
Central Wetlands	D-13-Brack-High	FWP	45	V3	Flow/exchange is high due to diversion constant flow for most of the year and pulsing. Flood duration seasonally flooded
Central Wetlands	D-13-Brack-High	FWP	50	V1	Based on healthy swamp existing conditions (IER1 floodside WVA 47% overstory, 39% midstory, 64% understory). Here assume 33% overstory, 40% midstory, and 40% understory.
Central Wetlands	D-13-Brack-High	FWP	50	V2	assume dbh is 15 bassed tree growth. If dbh is between 13 and 16, then SI is (0.067*dbh) 0.072.

Central Wetlands	D-13-Brack-High	FWP	50	V3	Flow/exchange is high due to diversion constant flow for most of the year and pulsing. Flood duration seasonally flooded
Central Wetlands	D-13-Brack-High	FWP	50	V4	restoration measures counter the effects of relative sea level rise
Central Wetlands	D-13-Brack-Low-P7 (Project Area)				This project area is the polygon total area less channel footprint of 483 acres.
Central Wetlands	D-13-Brack-Low-P7	FWOP	0	V1	This project area is the polygon total area less channel footprint of 483 acres. The polygon minus the swamp is used to get the diversion benefits to all marsh (march create/nourished and existing marsh).
Central Wetlands	D-13-Brack-Low-P7	FWOP	0	V2	Used field data = 52%, adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brack-Low-P7	FWOP	0	V3	Triangle is C4 Mid CW is C3 South of B Dupre is C2
Central Wetlands	D-13-Brack-Low-P7	FWOP	0	V4	based survey data
Central Wetlands	D-13-Brack-Low-P7	FWOP	0	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures
Central Wetlands	D-13-Brack-Low-P7	FWOP	1	V3	Triangle is C4 Mid CW is C3 South of B Dupre is C2
Central Wetlands	D-13-Brack-Low-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-Low-P7	FWOP	50	V2	SAV decrease over time as less open water is shallow and increase salinity due to subsidence.
Central Wetlands	D-13-Brack-Low-P7	FWOP	50	V3	c2 becomes c4, c3 and c4 becomes c5
Central Wetlands	D-13-Brack-Low-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Central Wetlands	D-13-Brack-Low-P7	FWP			Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Brack-Low-P7	FWP	1	V3	Triangle is C4 Mid CW is C3 South of B Dupre is C2
Central Wetlands	D-13-Brack-Low-P7	FWP	1	V4	based survey data
Central Wetlands	D-13-Brack-Low-P7	FWP	10		Year MC or MN is completed. MC or MN assumed to be completed on day 1 of this year. IF there are multiple construction years, report the last construction year in this column.
Central Wetlands	D-13-Brack-Low-P7	FWP	10	V3	All created and nourished marsh becomes C5
Central Wetlands	D-13-Brack-Low-P7	FWP	10	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishement.
Central Wetlands	D-13-Brack-Low-P7	FWP	10	V6	Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Brack-Low-P7	FWP	13		diversion begins operating in 2027
Central Wetlands	D-13-Brack-Low-P7	FWP	13	V2	Increase in SAV due to the diversion
Central Wetlands	D-13-Brack-Low-P7	FWP	13	V3	All created and nourished marsh becomes C2, not fully functional until 5 yrs after marsh is created.
Central Wetlands	D-13-Brack-Low-P7	FWP	13	V4	the diversion starts and brings sedimenet with it.
Central Wetlands	D-13-Brack-Low-P7	FWP	14		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
Central Wetlands	D-13-Brack-Low-P7	FWP	14	V3	All created and nourished marsh becomes C1
Central Wetlands	D-13-Brack-Low-P7	FWP	14	V4	Sediment from the diversion affects the Central Wetlands more than any other subunit.
Central Wetlands	D-13-Brack-Low-P7	FWP	17		The end of the transition time for habitat switching takes about 4 years.
Central Wetlands	D-13-Brack-Low-P7	FWP	17	V3	marsh is maintained with diversion

Central Wetlands	D-13-Brack-Med-P7 (Project Area)				This project area is the polygon total area less channel footprint of 483 acres.
Central Wetlands	D-13-Brack-Med-P7	FWOP	0	V2	Used field data = 52%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brack-Med-P7	FWOP	0	V3	Triangle is C4 Mid CW is C3 South of B Dupre is C2
Central Wetlands	D-13-Brack-Med-P7	FWOP	0	V4	based survey data
Central Wetlands	D-13-Brack-Med-P7	FWOP	0	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures
Central Wetlands	D-13-Brack-Med-P7	FWOP	1	V3	Triangle is C4 Mid CW is C3 South of B Dupre is C2
Central Wetlands	D-13-Brack-Med-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This arrount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-Med-P7	FWOP	44		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
Central Wetlands	D-13-Brack-Med-P7	FWOP	44	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This arrount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-Med-P7	FWOP	50	V2	SAV decrease over time as less open water is shallow and increase salinity due to subsidence.
Central Wetlands	D-13-Brack-Med-P7	FWOP	50	V3	c2 becomes c4, c3 and c4 becomes c5
Central Wetlands	D-13-Brack-Med-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This arrount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-Med-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Central Wetlands	D-13-Brack-Med-P7	FWP			Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Brack-Med-P7	FWP	1	V3	Triangle is C4 Mid CW is C3 South of B Dupre is C2
Central Wetlands	D-13-Brack-Med-P7	FWP	1	V4	based survey data
Central Wetlands	D-13-Brack-Med-P7	FWP	10		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
Central Wetlands	D-13-Brack-Med-P7	FWP	10	V3	All created and nourished marsh becomes C5
Central Wetlands	D-13-Brack-Med-P7	FWP	10	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishement.
Central Wetlands	D-13-Brack-Med-P7	FWP	10	V6	Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Brack-Med-P7	FWP	13		diversion begins operating in 2027
Central Wetlands	D-13-Brack-Med-P7	FWP	13	V2	Increase in SAV due to the diversion
Central Wetlands	D-13-Brack-Med-P7	FWP	13	V3	All created and nourished marsh becomes C2, not fully functional until 5 yrs after marsh is created.
Central Wetlands	D-13-Brack-Med-P7	FWP	13	V4	the diversion starts and brings sedimenet with it.

Central Wetlands	D-13-Brack-Med-P7	FWP	14		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
Central Wetlands	D-13-Brack-Med-P7	FWP	14	V3	All created and nourished marsh becomes C1
Central Wetlands	D-13-Brack-Med-P7	FWP	14	V4	Sediment from the diversion affects the Central Wetlands more than any other subunit.
Central Wetlands	D-13-Brack-Med-P7	FWP	17		The end of the transition time for habitat switching takes about 4 years.
Central Wetlands	D-13-Brack-Med-P7	FWP	17	V3	marsh is maintained with diversion
Central Wetlands	D-13-Brack-High-P7 (Project Area)				This project area is the polygon total area less channel footprint of 483 acres.
Central Wetlands	D-13-Brack-High-P7	FWOP	0	V2	Used field data = 52%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brack-High-P7	FWOP	0	V3	Triangle is C4 Mid CW is C3 South of B Dupre is C2
Central Wetlands	D-13-Brack-High-P7	FWOP	0	V4	based survey data
Central Wetlands	D-13-Brack-High-P7	FWOP	0	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures
Central Wetlands	D-13-Brack-High-P7	FWOP	1	V3	Triangle is C4 Mid CW is C3 South of B Dupre is C2
Central Wetlands	D-13-Brack-High-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-High-P7	FWOP	21		The CPRA collapse criteria used for MRGO have collapse occuring in differents yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
Central Wetlands	D-13-Brack-High-P7	FWOP	21	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-High-P7	FWOP	30		year marsh goes to 0
Central Wetlands	D-13-Brack-High-P7	FWOP	30	V2	SAV decrease over time as less open water is shallow and increase salinity due to subsidence.
Central Wetlands	D-13-Brack-High-P7	FWOP	30	V3	All marsh is gone.
Central Wetlands	D-13-Brack-High-P7	FWOP	30	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-High-P7	FWOP	50	V2	SAV decrease over time as less open water is shallow and increase salinity due to subsidence.
Central Wetlands	D-13-Brack-High-P7	FWOP	50	V3	All marsh is gone.
Central Wetlands	D-13-Brack-High-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-High-P7	FWOP	50	V5	Due to high relative seal level rise, after 50 years salinity increases 2 ppt
Central Wetlands	D-13-Brack-High-P7	FWP			Assume diversion channel does not have levees restricting fish access across the subunit.

Central Wetlands	D-13-Brack-High-P7	FWP	1	V3	Triangle is C4 Mid CW is C3 South of B Dupre is C2
Central Wetlands	D-13-Brack-High-P7	FWP	1	V4	based survey data
Central Wetlands	D-13-Brack-High-P7	FWP	10		Year MC or MN is completed. MC or MN assumed to be completed on day 1 of this year. IF there are multiple construction years, report the last construction year in this column.
Central Wetlands	D-13-Brack-High-P7	FWP	10	V3	All created and nourished marsh becomes C5
Central Wetlands	D-13-Brack-High-P7	FWP	10	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishement.
Central Wetlands	D-13-Brack-High-P7	FWP	10	V6	Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Brack-High-P7	FWP	13		diversion begins operating in 2027
Central Wetlands	D-13-Brack-High-P7	FWP	13	V2	Increase in SAV due to the diversion
Central Wetlands	D-13-Brack-High-P7	FWP	13	V3	All created and nourished marsh becomes C2
Central Wetlands	D-13-Brack-High-P7	FWP	13	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-High-P7	FWP	14		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
Central Wetlands	D-13-Brack-High-P7	FWP	14	V3	All created and nourished marsh becomes C1
Central Wetlands	D-13-Brack-High-P7	FWP	14	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Brack-High-P7	FWP	17		The end of the transition time for habitat switching takes about 4 years.
Central Wetlands	D-13-Brack-High-P7	FWP	17	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Int-Low-P7 (Project Area)				This project area is the polygon total area less channel footprint of 483 acres.
Central Wetlands	D-13-Int-Low-P7	FWP			Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Int-Low-P7	FWP	17		The end of the transition time for habitat switching takes about 4 years.
Central Wetlands	D-13-Int-Low-P7	FWP	18		The beginning of a new habitat after switching starts about 5 years after the diversion.
Central Wetlands	D-13-Int-Low-P7	FWP	18	V3	Diversion help sustain marsh. Model projects completely filling in the CW.
Central Wetlands	D-13-Int-Low-P7	FWP	45		The LLR increases to background LLR once 10 inches of accretion occurs above the created platform. The LLR change yr is the 34th yr after MC constr yr (constr yr + 35).
Central Wetlands	D-13-Int-Low-P7	FWP	45	V3	Diversion help sustain marsh. Model projects completely filling in the CW.
Central Wetlands	D-13-Int-Low-P7	FWP	45	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Int-Low-P7	FWP	50	V1	With Diversion 100% of area is filled in. We assume there would still be about 5% open water.
Central Wetlands	D-13-Int-Low-P7	FWP	50	V3	Diversion help sustain marsh. Model projects completely filling in the CW.

Central Wetlands	D-13-Int-Low-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Int-Med-P7 (Project Area)				This project area is the polygon total area less channel footprint of 483 acres.
Central Wetlands	D-13-Int-Med-P7	FWP			Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Int-Med-P7	FWP	17		The end of the transition time for habitat switching takes about 4 years.
Central Wetlands	D-13-Int-Med-P7	FWP	18		The beginning of a new habitat after switching starts about 5 years after the diversion.
Central Wetlands	D-13-Int-Med-P7	FWP	18	V3	Diversion help sustain marsh. Model projects completely filling in the CW.
Central Wetlands	D-13-Int-Med-P7	FWP	45		The LLR increases to background LLR once 10 inches of accretion occurs above the created platform. The LLR change yr is the 34th yr after MC constr yr (constr yr + 35).
Central Wetlands	D-13-Int-Med-P7	FWP	45	V3	Diversion help sustain marsh. Model projects completely filling in the CW.
Central Wetlands	D-13-Int-Med-P7	FWP	45	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Int-Med-P7	FWP	50	V3	Diversion help sustain marsh. Model projects completely filling in the CW.
Central Wetlands	D-13-Int-Med-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Int-High-P7 (Project Area)				This project area is the polygon total area less channel footprint of 483 acres.
Central Wetlands	D-13-Int-High-P7	FWP			Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Int-High-P7	FWP	17		The end of the transition time for habitat switching takes about 4 years.
Central Wetlands	D-13-Int-High-P7	FWP	18		The beginning of a new habitat after switching starts about 5 years after the diversion.
Central Wetlands	D-13-Int-High-P7	FWP	18	V3	Diversion help sustain marsh. Model projects completely filling in the CW.
Central Wetlands	D-13-Int-High-P7	FWP	30		The CPRA collapse criteria used for MRGO have collapse occuring in differents yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
Central Wetlands	D-13-Int-High-P7	FWP	30	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	D-13-Int-High-P7	FWP	39		year marsh goes to 0
Central Wetlands	D-13-Int-High-P7	FWP	39	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.

Central Wetlands	D-13-Int-High-P7	FWP	50	V2	remaining shallow open water but more wave fetch reduces SAV.
Central Wetlands	D-13-Int-High-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWOP	0	V2	used 5C transect from data collection
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWOP	0	V3	Most is unbroken marsh except for a few areas of open w ater w ithin the diversion footprint.
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWOP	0	V4	based survey data
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWOP	0	V5	used other Central Wetland estimates
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWOP	50	V2	decreases as w ater is deeper due to subsidence.
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWP	1	V2	used 5C transect from data collection
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWP	1	V3	Most is unbroken marsh except for a few areas of open w ater w ithin the diversion footprint.
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWP	1	V4	from the data collection 5C
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWP	12		year of assumed impact and not the year diversion begins
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWP	12	V1	Diversion is built removing all marsh.
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWP	12	V3	All becomes open diversion channel.
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWP	13		diversion begins
Central Wetlands	d05-Violet Diversion Footprint-Lo	FWP	13	V1	Diversion is built removing all marsh.
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWOP	0	V2	used 5C transect from data collection
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWOP	0	V3	Most is unbroken marsh except for a few areas of open w ater w ithin the diversion footprint.
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWOP	0	V4	from the data collection 5C
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWOP	0	V5	used other Central Wetland estimates
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWOP	44		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWOP	50	V2	decreases as w ater is deeper due to subsidence.
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.

Central Wetlands	d05-Violet Diversion Footprint-Mi	FWP	1	V2	used 5C transect from data collection
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWP	1	V3	Most is unbroken marsh except for a few areas of open water within the diversion footprint.
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWP	1	V4	from the data collection 5C
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWP	12		year of assumed impact and not the year diversion begins
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWP	12	V1	Diversion is built removing all marsh.
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWP	13		Diversion begins
Central Wetlands	d05-Violet Diversion Footprint-Mi	FWP	13	V1	Diversion is built removing all marsh.
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWOP	0	V2	used 5C transect from data collection
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWOP	0	V3	Most is unbroken marsh except for a few areas of open water within the diversion footprint.
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWOP	0	V4	based survey data
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWOP	0	V5	used other Central Wetland estimates
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWOP	21		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWOP	21	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWOP	30		year marsh goes to 0
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWOP	30	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWOP	50	V2	decreases as water is deeper due to subsidence.
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interperlated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWP	1	V3	Most is unbroken marsh except for a few areas of open water within the diversion footprint.
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWP	1	V4	Assume channel is deeper than 1.5ft and only the margins are shallow.
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWP	12		year of assumed impact and not the year diversion begins
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWP	12	V3	All becomes open diversion channel.
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWP	13		diversion begins
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWP	13	V1	Diversion is built removing all marsh.
Central Wetlands	d05-Violet Diversion Footprint-Hi	FWP	50	V4	Assume channel is deeper than 1.5ft and only the margins are shallow.

East Orleans Land Bridge	Low SLR				10.24 mm/yr * 50 years = 512 mm 512 mm = 0.512m = 1.68 ft (1.7 ft)
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	0	V2	based on Oct 2009 site visit, transects 22 and 23 look at whole subunit
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	0	V3	all class 3
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	0	V4	Based on survey data
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	1	V3	all class 3
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	1	V3	all class 3
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	5		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	5	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	5	V2	marsh creation/nourishment provides protection and less wave fetch.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	5	V3	All created and nourished marsh becomes C5
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	5	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	5	V6	50% of project area has features. SP has fish dips, marsh creation has no access in TY1, marsh nourishment has access.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	9		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	9	V3	All created and nourished marsh becomes C1
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	9	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	13		TY diversion is functional
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	13	V2	Diversion influence begins.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	13	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	13	V5	diversion is functional and freshens salinities
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	40		The LLR increases to background LLR once 10 inches of accretion occurs above the created platform. The LLR change yr is the 34th yr after MC constr yr (constr yr + 35).
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	40	V2	overall freshening of this portion of the basin.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	40	V3	Diversion help sustain marsh

East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	40	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	50	V3	Diversion help sustain marsh
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWOP	0	V2	based on Oct 2009 site visit, transects 22 and 23 look at whole subunit
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWOP	0	V3	all class 3
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWOP	0	V4	Based on survey data
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWOP	1	V3	all class 3
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWOP	44		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	1	V3	all class 3
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	5		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	5	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	5	V2	marsh creation/nourishment provides protection and less wave fetch.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	5	V3	All created and nourished marsh becomes C5
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	5	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	5	V6	50% of project area has features. SP has fish dips, marsh creation has no access in TY1, marsh nourishment has access.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	9		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	9	V3	All created and nourished marsh becomes C1

East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	9	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	13		TY diversion is functional
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	13	V2	Diversion influence begins.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	13	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	13	V5	diversion is functional and freshens salinities
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	40		The LLR increases to background LLR once 10 inches of accretion occurs above the created platform. The LLR change yr is the 34th yr after MC constr yr (constr yr + 35).
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	40	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	44		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	50	V2	assumed that medium water level would result in slightly deeper water, so SAV growth may be reduced from low water level
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	50	V3	Diversion help sustain marsh
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWOP	0	V2	based on Oct 2009 site visit, transects 22 and 23 look at whole subunit
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWOP	0	V3	all calss 3
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWOP	0	V4	based on survey data
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWOP	1	V3	all calss 3
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWOP	21		The CPRA collapse criteria used for MRGO have collapse occurring in different yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044

East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWOP	21	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWOP	30		year marsh goes to 0
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWOP	30	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 2 ppt
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	1	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	1	V3	all class 3
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	5		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	5	V2	marsh creation/nourishment provides protection and less wave fetch.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	5	V3	All created and nourished marsh becomes C5
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	5	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	5	V6	50% of project area has features. SP has fish dips, marsh creation has no access in TY1, marsh nourishment has access.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	9		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	9	V3	All created and nourished marsh becomes C1
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	9	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	13		TY diversion is functional
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	13	V2	diversion influence begins
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	13	V3	marsh is maintained with diversion
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	13	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	13	V5	TY6 diversion is functional and freshens salinities

East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	21		The CPRA collapse criteria used for MRGO have collapse occurring in different yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	21	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	30		year marsh goes to 0
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	30	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	50	V2	High water levels may limit benefits SAV growth receives from project
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	50	V3	diversion helps sustain marsh
East Orleans Land Bridge	E-17-Brack-Div-High-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-36-Brack-Low -P7	FWOP	0	V2	based on Oct 2009 site visit, averaging transects 18, 19, 20, 22
East Orleans Land Bridge	E-36-Brack-Low -P7	FWOP	0	V3	Based on engineering maps
East Orleans Land Bridge	E-36-Brack-Low -P7	FWOP	0	V4	Based on survey data
East Orleans Land Bridge	E-36-Brack-Low -P7	FWOP	1	V3	Based on engineering maps
East Orleans Land Bridge	E-36-Brack-Low -P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-36-Brack-Low -P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-36-Brack-Low -P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
East Orleans Land Bridge	E-36-Brack-Low -P7	FWP	1	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-36-Brack-Low -P7	FWP	1	V3	Based on engineering maps
East Orleans Land Bridge	E-36-Brack-Low -P7	FWP	8		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
East Orleans Land Bridge	E-36-Brack-Low -P7	FWP	8	V3	All created and nourished marsh becomes C5
East Orleans Land Bridge	E-36-Brack-Low -P7	FWP	8	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
East Orleans Land Bridge	E-36-Brack-Low -P7	FWP	12		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
East Orleans Land Bridge	E-36-Brack-Low -P7	FWP	12	V3	All created and nourished marsh becomes C1
East Orleans Land Bridge	E-36-Brack-Low -P7	FWP	13		TY diversion is functional

East Orleans Land Bridge	E-36-Brack-Low-P7	FWP	13	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-36-Brack-Low-P7	FWP	43		The LLR increases to background LLR once 10 inches of accretion occurs above the created platform. The LLR change yr is the 34th yr after MC constr yr (constr yr + 35).
East Orleans Land Bridge	E-36-Brack-Low-P7	FWP	43	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-36-Brack-Low-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	0	V2	based on Oct 2009 site visit, averaging transects 18, 19, 20, 22
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	0	V3	Based on engineering maps
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	0	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	1	V3	Based on engineering maps
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	44		The CPRA collapse criteria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	1	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	1	V3	Based on engineering maps
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	8		Year MC or MN is completed. MC or MN assumed to be completed on day 1 of this year. IF there are multiple construction years, report the last construction year in this column.
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	8	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	8	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.

East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	12		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	13		TY diversion is functional
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	13	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	43	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	44		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	0	V2	based on Oct 2009 site visit, averaging transects 18, 19, 20, 22
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	0	V3	Based on engineering maps
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	0	V4	Based on survey data
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	1	V3	Based on engineering maps
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	1	V4	Marsh is created increasing the shallow open w ater from the overflow of the mc sites and marsh nourishment.
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	21		The CPRA collapse criteria used for MRGO have collapse occurring in different yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	21	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	30		year marsh goes to 0
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	30	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.

East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 2 ppt
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	1	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	1	V3	Based on engineering maps
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	8		Year MC or MN is completed. MC or MN assumed to be completed on day 1 of this year. IF there are multiple construction years, report the last construction year in this column.
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	8	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	8	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	12		TY 5 years after marsh created
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	13		TY diversion is functional
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	13	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	21		The CPRA collapse criteria used for MRGO have collapse occurring in different yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	21	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	30		year marsh goes to 0
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	30	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	50	V5	Due to high relative seal level rise, after 50 years salinity increases 2 ppt
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWOP	0	V3	Based on engineering maps
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWOP	0	V4	Based on survey data
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWOP	1	V3	based on engineering maps
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt

East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	1	V3	based on engineering maps
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	6		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	6	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	6	V2	marsh creation/nourishment provides protection and less wave fetch.
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	6	V3	All created and nourished marsh becomes C5
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	6	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	6	V6	Features take up 30% of subunit. Golden triangle and st. milo are closed; proctor point is open but marsh is too high for access until after dewater and compaction.
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	10		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	10	V3	All created and nourished marsh becomes C1
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	13		diversion begins operating in 2027
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	13	V2	Diversion influence begins
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	13	V3	marsh is maintained with diversion
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	13	V4	the diversion starts and brings sediment with it.
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	13	V5	diversion is functional and freshens salinities
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	17		The end of the transition time for habitat switching takes about 4 years
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	17	V2	close proximity to the diversion provides increase freshening and SAV growth potential
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWP	17	V3	marsh is maintained with diversion
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWOP	0	V3	Based on engineering maps
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWOP	0	V4	Based on survey data
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWOP	1	V3	Based on engineering maps
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWOP	44		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	1	V3	based on engineering maps
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	6		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	6	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	6	V2	marsh creation/nourishment provides protection and less wave fetch.
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	6	V3	All created and nourished marsh becomes C5
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	6	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.

East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	6	V6	Features take up 30% of subunit. Golden triangle and st. milo are closed; proctor point is open but marsh is too high for access until after dewater and compaction.
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	10		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	10	V3	All created and nourished marsh becomes C1
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	13		diversion begins operating in 2027
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	13	V2	Diversion influence begins.
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	13	V3	marsh is maintained with diversion
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	13	V4	the diversion starts and brings sediment with it.
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	13	V5	diversion is functional and freshens salinities
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	17		The end of the transition time for habitat switching takes about 4 years.
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	17	V2	close proximity to the diversion provides increase freshening and SAV growth potential.
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWP	17	V3	marsh is maintained with diversion
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	0	V3	based on engineering maps
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	0	V4	Based on survey data
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	1	V3	based on engineering maps
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	21		The CPRA collapse criteria used for MRGO have collapse occurring in different yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	21	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	30		year marsh goes to 0
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	30	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 2 ppt
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	1	V3	based on engineering maps
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	6		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	6	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	6	V2	marsh creation/nourishment provides protection and less wave fetch.
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	6	V3	All created and nourished marsh becomes C5
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	6	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.

East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	6	V6	Features take up 30% of subunit. Golden triangle and st. milo are closed; proctor point is open but marsh is too high for access until after dewater and compaction.
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	10		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	10	V3	All created and nourished marsh becomes C1
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	13		diversion begins operating in 2027
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	13	V2	Diversion influence begins.
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	13	V3	marsh is maintained with diversion
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	13	V4	the diversion starts and brings sediment with it.
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	13	V5	diversion is functional and freshens salinities
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	17		The end of the transition time for habitat switching takes about 4 years.
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWP	17	V3	Diversion help sustain marsh.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	17		The end of the transition time for habitat switching takes about 4 years.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	18		The beginning of a new habitat after switching starts about 5 years after the diversion.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	18	V3	marsh is maintained with diversion
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	18	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	18	V5	diversion is functional and freshens salinities
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	41	V3	Diversion help sustain marsh.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	41	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	41	V5	diversion is functional and freshens salinities

East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	50	V3	Diversion help sustain marsh. Model projects completely filling in the CW.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	50	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	50	V5	diversion is functional and freshens salinities
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	17		The end of the transition time for habitat sw itching takes about 4 years.
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	18		The beginning of a new habitat after sw itching starts about 5 years after the diversion.
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	18	V3	marsh is maintained w ith diversion
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	41	V3	Diversion help sustain marsh
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	41	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	50	V3	Diversion help sustain marsh
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	50	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWOP	21		The CPRA collapse criteria used for MRGO have collapse occurring in different yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWOP	30		year marsh goes to 0
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	17		The end of the transition time for habitat sw itching takes about 4 years.
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	18		The beginning of a new habitat after sw itching starts about 5 years after the diversion.
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	18	V3	Diversion help sustain marsh.
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	21		The CPRA collapse criteria used for MRGO have collapse occurring in different yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	21	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	30		year marsh goes to 0
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	30	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	50	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.

Terre Aux Bouef	Low SLR				10.24 mm/yr * 50 years = 512 mm 512 mm = 0.512m = 1.68 ft (1.7 ft)
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWOP	0	V3	Based on engineering drawings.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWOP	0	V4	Based on survey data
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWOP	0	V5	modeling results grouped this area with Caernarvon influence area and gave it 0.8ppt. B/c the existing habitat is brackish will use 5ppt for brackish mode (based on box 12 near by box of he salinity model). No CRMS data available for this area. No change in salinity fwop vs. fwp based on project features.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWOP	1	V3	Based on engineering drawings.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	1	V3	Based on engineering drawings.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	1	V4	No new field data so kept the same
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	1	V5	modeling results grouped this area with Caernarvon influence area and gave it 0.8ppt. B/c the existing habitat is brackish will use 5ppt for brackish mode (based on box 12 near by box of he salinity model). No CRMS data available for this area. No change in salinity fwop vs. fwp based on project features.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	8		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	8	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	12		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	12	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	43		The LLR increases to background LLR once 10 inches of accretion occurs above the created platform. The LLR change yr is the 34th yr after MC constr yr (constr yr + 35).
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	43	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.

Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	0	V3	Based on engineering drawings.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	0	V4	Based on survey data
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	0	V5	modeling results grouped this area with Caernarvon influence area and gave it 0.8ppt. B/c the existing habitat is brackish will use 5ppt for brackish mode (based on box 12 near by box of he salinity model). No CRMS data available for this area. No change in salinity fwop vs. fwp based on project features.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	1	V3	Based on engineering drawings.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	44		The CPRA collapse criteria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	1	V2	More interior than above. May have some Caernarvon influence FWP will have less wave action and shallower water, which may stimulate some SAV growth over time.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	1	V3	Based on engineering drawings.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	1	V4	No new field data so kept the same
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	1	V5	modeling results grouped this area with Caernarvon influence area and gave it 0.8ppt. B/c the existing habitat is brackish will use 5ppt for brackish mode (based on box 12 near by box of he salinity model). No CRMS data available for this area. No change in salinity fwop vs. fwp based on project features.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	8		year marsh created
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	8	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	12		TY 5 yrs after marsh created
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	12	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	43		10"/yr

Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	43	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	44		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	50	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	0	V3	Based on engineering draw ings.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	0	V4	Based on survey data
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	0	V5	modeling results grouped this area w ith Caernarvon influence area and gave it 0.8ppt. B/c the existing habitat is brackish w ill use 5ppt for brackish mode (based on box 12 near by box of he salinity model). No CRMS data available for this area. No change in salinity fw op vs. fw p based on project features.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	1	V3	Based on engineering draw ings.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	1	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	21	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	30	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	50	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	50	V5	Due to high relative seal level rise, after 50 years salinity increases 2 ppt
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	1	V3	Based on engineering draw ings.

Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	1	V4	No new field data so kept the same
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	1	V5	modeling results grouped this area with Caernarvon influence area and gave it 0.8ppt. B/c the existing habitat is brackish will use 5ppt for brackish mode (based on box 12 near by box of he salinity model). No CRMS data available for this area. No change in salinity fwop vs. fwp based on project features.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	8		year marsh created
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	8	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	12		TY 5 yrs after marsh created
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	12	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	21		The CPRA collapse criteria used for MRGO have collapse occurring in different yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	21	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	30		year marsh goes to 0
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	30	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	50	V5	Due to high relative seal level rise, after 50 years salinity increases 2 ppt

Hopedale	Low SLR				10.24 mm/yr * 50 years = 512 mm 512 mm = 0.512m = 1.68 ft (1.7 ft)
Hopedale	H-21-Brack-Low-feature 190-P7	FWOP	0	V4	Based on survey data
Hopedale	H-21-Brack-Low-feature 190-P7	FWOP	0	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than CW.
Hopedale	H-21-Brack-Low-feature 190-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Hopedale	H-21-Brack-Low-feature 190-P7	FWOP	1	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than CW.
Hopedale	H-21-Brack-Low-feature 190-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Hopedale	H-21-Brack-Low-feature 190-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Hopedale	H-21-Brack-Low-feature 190-P7	FWOP	50	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than CW.
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	1	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than CW.
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	4		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	4	V1	25% of created marsh is functional.
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	4	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	4	V6	marsh created is too high until after compaction and dewatering.
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	8		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	8	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	39		The LLR increases to background LLR once 10 inches of accretion occurs above the created platform. The LLR change yr is the 34th yr after MC constr yr (constr yr + 35).
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	39	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	50	V3	Changes two classes over 50 years
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.

Hopedale	H-21-Brack-Low-feature 190-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Hopedale	H-21-Brack-Med-feature 190-P7	FWOP	0	V4	Based on survey data
Hopedale	H-21-Brack-Med-feature 190-P7	FWOP	0	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than CW.
Hopedale	H-21-Brack-Med-feature 190-P7	FWOP	1	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Hopedale	H-21-Brack-Med-feature 190-P7	FWOP	1	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than CW.
Hopedale	H-21-Brack-Med-feature 190-P7	FWOP	44		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
Hopedale	H-21-Brack-Med-feature 190-P7	FWOP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Hopedale	H-21-Brack-Med-feature 190-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Hopedale	H-21-Brack-Med-feature 190-P7	FWOP	50	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than CW.
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	1	V1	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than CW.
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	4		Year MC or MN is completed. MC or MN assurred to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	4	V1	25% of created marsh is functional.
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	4	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	4	V6	marsh created is too high until after compaction and dewatering.
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	8		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	8	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	39		The LLR increases to background LLR once 10 inches of accretion occurs above the created platform. The LLR change yr is the 34th yr after MC constr yr (constr yr + 35).
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	39	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.

Hopedale	H-21-Brack-Med-feature 190-P7	FWP	44		The CPRA collapse critieria used for MRGO have collapse occuring in differents yrs depending on marsh type. Under High SLR, collapse begins in: SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044 Under Med SLR, collapse begins in: SAL marsh = 2054 BR marsh = 2058
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	50	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Hopedale	H-21-Brack-High-feature 190-P7	FWOP	0	V4	Based on survey data
Hopedale	H-21-Brack-High-feature 190-P7	FWOP	0	V6	Restricted to one canal opening w ith structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than CW.
Hopedale	H-21-Brack-High-feature 190-P7	FWOP	1	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Hopedale	H-21-Brack-High-feature 190-P7	FWOP	1	V6	Restricted to one canal opening w ith structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than CW.
Hopedale	H-21-Brack-High-feature 190-P7	FWOP	21	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Hopedale	H-21-Brack-High-feature 190-P7	FWOP	30	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Hopedale	H-21-Brack-High-feature 190-P7	FWOP	50	V4	Assume the marsh acres lost become shallow w ater. Of the remaining existing shallow w ater, subsidence is interpolated betw een target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis show ed that adjusting the subsidence rate for intermediate and high w ould not affect the outcome.
Hopedale	H-21-Brack-High-feature 190-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 2 ppt
Hopedale	H-21-Brack-High-feature 190-P7	FWOP	50	V6	Restricted to one canal opening w ith structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than CW.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	1	V6	Restricted to one canal opening w ith structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than CW.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	4		Year MC or MN is completed. MC or MN assumed to be completed on day1 of this year. IF there are multiple construction years, report the last construction year in this column.

Hopedale	H-21-Brack-High-feature 190-P7	FWP	4	V1	25% of created marsh is functional.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	4	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	4	V6	marsh created is too high until after compaction and dewatering.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	8		TY 5 years after marsh is created. Marsh creation year is counted as a full year post construction
Hopedale	H-21-Brack-High-feature 190-P7	FWP	8	V4	Marsh is created increasing the shallow open water from the overflow of the mc sites and marsh nourishment.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	21		The CPRA collapse criteria used for MRGO have collapse occurring in different yrs depending on marsh type. Collapse occurs only during the High SLR scenario. SAL marsh = 2033 BR marsh = 2035 INT marsh = 2044
Hopedale	H-21-Brack-High-feature 190-P7	FWP	21	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	30		year marsh goes to 0.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	30	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	50	V4	Assume the marsh acres lost become shallow water. Of the remaining existing shallow water, subsidence is interpolated between target years (based on Low SLR scenario). This amount becomes deeper than 1.5ft. Note sensitivity analysis showed that adjusting the subsidence rate for intermediate and high would not affect the outcome.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	50	V5	Due to high relative seal level rise, after 50 years salinity increases 2 ppt

ATTACHMENT 8

Planting Plan for MRGO Ecosystem Restoration Project

Planting Plan

Two principal factors affecting plant zonation in the coastal plain are salinity and hydrologic regime (Adams 1963; Chabreck 1972; Cowardin, Carter et al. 1979; Odum 1988; Day and Templet 1989; Keddy 2000; Mitsch and Gosselink 2000). Although dependent upon actual site-specific conditions, a general planting scheme can be established based on salinity requirements and depth and duration of flooding. Specific detailed 'plans' will be developed later with appropriate species and applications based on site-specific conditions and criteria and project specifications. Four dominant marsh types that closely correlate with salinity level have been identified in the deltaic coastal plain of Louisiana (Penfound and Hathaway 1938; Chabreck 1972):

fresh (strictly fresh water, salinity < 0.5ppt);
intermediate (nearly fresh water, salinity range of 0.5 to 5.0 ppt);
brackish water salinity level range of 5 ppt to 18 ppt; and
salt (salinity level greater than 18 ppt).

Depth and duration of flooding also determines what species should be utilized. Although not distinct divisions these hydrologic areas have been identified that need to be considered when creating a planting plan:

subtidal – area below mean low tide and is submerged a majority of the time with the exception of low tides associated with moon phases;
intertidal – area between mean low tide and mean high tide that is inundated daily due to tidal cycles; and
supratidal – area above mean high tide and is inundated rarely except during extreme weather events.

It is assumed that borrow material used to restore the marsh, swamps, and ridges is conducive to growth of wetland marsh plants and borrow material has been adequately dewatered after placement. Ridge and possibly other supratidal areas will require site preparation that could include ripping and chemical prep, and possibly pre-establishment of a critical cover application, especially vital for successful woody establishment, in addition to grading and shaping. If borrow is obtained from higher salinity areas than where being placed, additional time may be needed before planting to allow salinity reduction through precipitation and tidal flow. It is assumed that the necessary preparations will be undertaken prior to planting. To the maximum extent possible and practical, Louisiana ecotypes of species will be planted. Applicable planting practices based on prior Louisiana coastal restoration projects will be implemented where necessary to aid in establishment, improve disease resistance and increase growth rate such as utilizing a slow release nitrogen tablet when planting species such as *Panicum amarum*, *Spartina patens*, and *Uniola paniculata*.

Cypress Swamp

The dominant species is bald cypress (*Taxodium distichum*). Swamp tupelo (*Nyssa aquatic)* is also a major component while others such as Drummond's maple (*Acer rubrum* var. *drummondii)* are also interspersed. In areas with preferred salinity levels and hydroperiod, an average of 200 trees/acre with 75% bare-root seedlings/saplings and 25% container-grown should be planted. All should have a nutria protection device.

Restored Marsh

Fresh and Intermediate Marsh

Some of the dominant marsh plants in freshwater and intermediate wetlands are: maidencane (*Panicum hemitomon)*, bull tongue (*Sagittaria lancifolia)*, giant cutgrass (*Zizaniopsis miliacea*) California bulrush (*Schoenoplectus californicus*), coast cockspur (*Echinochloa walteri)*, marshay cordgrass (*Spartina patens*), and roseau cane (*Phragmites australis*). Location within the marsh depends on their ability to withstand depth and length of flooding. CWPPRA estimate for vegetative planting is 625 plants/acre planted on 8ft center on rows 8ft apart. Some are available commercially and can be propagated.

Brackish Marsh
Species usually dominant in a brackish marsh are: marshhay cordgrass (*Spartina patens),* saltgrass (*Distichlis spicata)*, American bulrush (*Schoenoplectus americanus)*, black needle rush (*Juncus roemerianus),* seashore paspalum (*Paspalum vaginatum*), and switchgrass (*Panicum virgatum*) . The low marsh is typically dominated by *Spartina alterniflora.* CWPPRA estimate for vegetative planting is 875 plants/acre planted on 7ft centers on rows 7ft apart. Some are available commercially and can be propagated.

Salt Marsh (not included in restoration plan)
Salt marsh communities are primarily composed of oyster grass (*Spartina alterniflora*), salt grass, black needle rush, gulf cordgrass (*Spartina spartinae*) and marshhay cordgrass. CWPPRA estimate for vegetative planting is 1,250 plants/acre planted 5ft centers on rows 7ft apart. Some are available commercially and can be propagated.

Shoreline Restored Wetlands – with or without shoreline protection.
Because shoreline protection dissipates energy, planting plan for restored marsh landward of shoreline protection will be planted in much the same way as above with species used dependent upon salinity levels and depth and duration of flooding.

In high energy environments such as the intertidal zone, planting estimate consists of 2 rows of trade gallons on 5-foot alternating centers or 2 rows of bare-root vegetative plugs on 3-foot alternating centers.

Ridge Component
Based on the ongoing studies and evaluation of current projects the following guidelines have been developed. A layered, phased approach may be the most suitable to help stabilize the ridge, promote growth of the different tree stories, and create habitat for neotropical migrant birds.

Side slopes of the ridge affected by tides will be seeded for critical area cover and/or planted with herbaceous species in much the same manner as above based on salinity and depth of flooding. Plantings on the bayou-side of the ridge should mimic the pattern outlined for shorelines with no protection while behind the ridge will be planted as applicable marsh is.

Side slopes of the ridge not affected by the tides as well as the ridge top are suitable for midstory/shrub-scrub species such as wax myrtle (*Myrica cerifera*), groundsel bush (*Baccharis halimifolia*), marsh elder (*Iva frutescens*), and yaupon (*Ilex vomitoria*). These will aid in stabilization and provide needed habitat for neo-tropical migrants. It is suggested to plant bare-root seedlings with typically 200-300 plant/acre density. Other woody species such as red mulberry (*Morus rubra*), hackberry/sugarberry (*Celtis laevigata*), California desert-thorn (*Lycium carolinianum*)

and green ash (*Fraxinus pennsylvanica*) could also be used on the high side slopes.

Hardwoods should be planted on upper sides of the ridge slopes and the ridge top. Several species typically grow on ridge tops based on studies of cheniers, spoil banks, and a few natural ridges left in the deltaic plain. Hardwoods such as live oak (*Quercus virginiana)*, sugarberry (*Celtis laevigata*), dwarf palmetto (*Sabal minor*), and red cedar (*Thuja occidentalis*) will likely be suitable for high ridge planting. Seedlings should be planted on 8' x 8' spacing totaling about 680 trees/acre. Chinese Tallow control will be included in operations and management.

Barrier Islands

Because of the landscape features of barrier islands, distinct vegetative zones develop based on wave energy, elevation, wind, and salt spray, as well as poor soils because of low organic matter, nutrients, and water-retention (Hester, Spalding et al. 2005). Species planted and planting plans are determined by the location in the landscape. The following is broken down into distinct zones of a typical barrier island.

The foreshore (beach) is characterized by high wave energy and transitory nature thus planting is not recommended.

The backshore/foredune/dune is also subjected to wave energy during high tides and storm events as well as wind and salt spray. Vegetation commonly found and are commercially available include: bitter panicum (*Panicum amarum*); marshhay cordgrass; and sea oats (*Uniola paniculata*). If using plugs when planting, they will be on 3ft-centers in alternating rows with the exception of sea oats on 1ft-centers. If using container plants, they will be planted on 6 to 8ft centers (depending on container size) in alternating rows. In addition, smaller forbs are common such as sea rocket (*Cakile fusiformis*) and beach morning glory (*Ipomea pes-caprae*) should self-seed. Density per acre will be determined based on site conditions.

The rear dune is less exposed than the foredune and usually subjected to overwash only in storm events. Vegetation commonly found and may be commercially available include: beach tea (*Croton punctatus*), sea oats, bitter panicum, marshhay cordgrass, sedges (*Cyperus spp*) and wax myrtle. The same planting plan as the backshore is applicable. Again, smaller forbs like beach morning glory should self-seed.

The barrier flats and swale include both high marsh and saltpans. Vegetation commonly found and may be commercially available include: marshhay cordgrass, sandrush (*Fimbristylis castanea*), wax myrtle, groundsel bush, marsh elder, and saltgrass. The same planting plan as the backshore is applicable. Shrub /scrub such as groundsel bush and marsh elder will be planted on 8ft centers. Seaside goldenrod (*Solidago sempervirens*) is a major constituent of this zone and will be considered in planting plan but will most likely be self-seeding.

As high marsh grades to low marsh/salt marsh, oyster grass and black mangrove (*Avicennia germinans*) become the dominant species. The planting plan for oyster grass again follows the backshore plan. Black mangroves will be planted in patches 100 to 200ft^2 on 6 to 10ft centers.

On subtidal flats that extend out on the back-barrier platform, turtle grass (*Thalassia testudinum*) is the dominant seagrass along with manatee grass (*Syringodium filiforme*), shoalgrass (*Halodule wrightii*), and star grass (*Halophila engelmannii*). Widgeon grass (*Ruppia maritima*) is also found. Large scale re-establishment may not be feasible due to the scarcity of commercially available plants, the dynamics of the system, and lack of technical experience in the system.

Quality Control

Plants will be purchased from a registered, licensed nursery grower. Trees and plants will be randomly inspected prior to planting, and systematically once planted. Planting work will be inspected at least one daily to ensure proper planting technique, proper configuration, and species. Survival and percent cover are highly dependent on local climatic conditions, salinities, and other factors. Success will be evaluated by determining percent survival and mortality.

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APPENDIX C

Latin Names for Species Discussed in Report

PLANTS

Alligatorweed	*Alternanthera philoxeroides*
American cupscale	*Sacciolepis striata*
American lotus	*Nelumbo lutea*
Bacopa	*Bacopa spp.*
Bald cypress	*Taxodium distichum*
Beach oats	*Uniola paniculata*
Bitter panicum	*Panicum amarum*
Blackberry	*Rubus spp*
Black mangrove	*Avicennia germinans*
Black needlerush	*Juncus roemerianus*
Black willow	*Salix nigra*
Bulltongue	*Sagittaria lancifolia*
California bulrush	*Schoenoplectus californicus*
Cattail	*Typha* spp.
Coontail	*Ceratophyllum demersum*
Deerpea	*Vigna luteola*
Drummond red maple	*Acer rubrum var. drummondii*
Duckweed	*Lemna spp*
Dwarf palmetto	*Sabal minor*
Elderberry	*Sambucus nigra*
Elodea	*Elodea canadensis*
Eurasian milfoil	*Myriophyllum spicatum*
Fall panicum	*Panicum dichotomiflorum*
Fanwort	*Cabomba caroliniana*
Giant cutgrass	*Zizaniopsis miliacea*
Glassworts	*Salicornia depressa*
Green ash	*Fraxinus pennsylvanica*
Groundsel bush	*Baccharis halmnifolia*
Hackberry	*Celtis occidentalis*
Hydrilla	*Hydrilla verticillata*
Leafy three-square	*Schoenoplectus robustus*
Live oak	*Quercus virginiana*
Maidencane	*Panicum hemitomon*
Manatee grass	*Cymodocea manatorum*
Marsh elder	*Iva spp.*
Marsh hay cordgrass	*Spartina patens*
Marsh morning glory	*Ipomoea sagittata*
Naiads	*Najas marin*
Panicum	*Panicum* sp.
Pennywort	*Hydrocotyle* spp.
Pondweeds	*Potamogeton spp.*
Pretty dodder	*Cuscuta spp.*
Roseau cane	*Phragmites australis*
Saltgrass	*Distichlis spicata*

Saltmarsh cordgrass	*Spartina alterniflora*
Saltmeadow cordgrass	*Spartina patens*
Salvinia	*Salvinia spp.*
Sea myrtle	*Baccharis halmnifolia*
Sea oats	*Uniola paniculata*
Sea ox-eye	*Borrichia frutescens*
Sea purslane	*Sesuvium portulacastrum*
Sea rocket	*Cakile edentula*
Seaside heliotrope	*Heliotropium curassavicum*
Seashore paspalum	*Paspalum vaginatum*
Shoalgrass	*Halodule wrightii*
Spikerush	*Eleocharis* spp.
Threecornered grass	*Scirpus olneyi*
Tupelo	*Nyssa aquatica*
Turtle grass	*Thalassia testudinum*
Water lettuce	*Pistia Stratiotes*
Water hyacinth	*Eichornia crassipes*
Water oak	*Quercus nigra*
Water stargrass	*Heteranthera dubia*
White water lily	*Nymphaea alba*
Widgeongrass	*Ruppia maritime*
Wild celery	*Vallisneria americana*
Wild millet	*Echinocloa muricata*
Yaupon	*Ilex vomitoria*

FISH

Alligator gar	*Atractosteus spatula*
Amberjack	*Seriola dumeril*
Anchovies	*Engraulidae*
Atlantic bumper	*Chloroscombrus chrysurus*
Atlantic croaker	*Micropogonias undulatus*
Atlantic needlefish	*Strongylura marina*
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*
Atlantic spadefish	*Chaetodipterus faber*
Black drum	*Pogonias cromis*
Blue catfish	*Ictalurus furcatus*
Bluegill	*Lepomis macrochirus*
Bonnethead shark	*Sphyrna tiburo*
Bowfin	Amia calva
Bull shark	*Carcharhinus leucas*
Carp	*Cyprinus carpio*
Channel catfish	*Ictalurus punctatus*
Cobia	*Rachycentron canadum*
Crappie	*Pomoxis* ssp.

Dog snapper	*Lutjanus novemfasciatus*
Dwarf sand perch	*Diplectrum bivittatum*
Fat sleeper	*Dormitator maculatus*
Florida pompano	*Trachinotus carolinus*
Freshwater drum	*Aplodinotus grunniens*
Gafftopsail catfish	*Bagre marinus*
Gobies	*Gobiosoma spp.*
Grouper	*Epinephelus* ssp.
Gulf menhaden	*Brevoortia patronus*
Gulf pipefish	*Syngnathus scovelli*
Gulf sturgeon	*Acipenser oxyrinchus desotoi*
Inland silversides	*Menidia beryllina*
Jack crevalle	*Caranx hippos*
Killifish	*Funduus* spp.
King mackerel	*Scomberomorus cavalla*
Lady fish	*Elops affinis*
Lane snapper	*Lutjanus synagris*
Largemouth bass	*Micropterus salmoides*
Least puffer	*Sphoeroides parvus*
Mangrove snapper	*Lutjanus griseus*
Marlin	*Makaira mazara*
Pallid sturgeon	*Scaphirhynchus albus*
Red drum	*Sciaenops ocellatus*
Red snapper	*Lutjanus campechanus*
Redear sunfish	*Lepomis microlophus*
Rough silverside	*Membras martinica*
Scaled sardines	*Harengula Jaguana*
Sheepshead minnow	*Cyprinodon variegatus*
Silversides	*Menidia menidia*
Southern flounder	*Paralichthys lethostigma*
Southern Kingfish	*Menticirrhus americanus*
Spanish mackerel	*Scomberomorus maculatus*
Speckled wormeel	*Myrophis punctatus*
Spotfin mojarra	*Eucinostomus argenteus*
Spotted seatrout	*Cynoscion nebulosus*
Striped mullet	*Mugil cephalus*
Tuna	*Thunnus thynnus*
Warmouth	*Lepomis gulosus*
White mullet	*Mugil curema*
Yellow bullhead	*Ameiurus natalis*

CRUSTACEANS AND OTHER INVERTEBRATES

American oyster	*Crassostrea virginica*
Amphipods	
Blue crab	*Callinectes sapidus*
Brown shrimp	*Farfantepenaeus aztecus*
Crawfish	*Procambarus clarkii*
Ctenophores	
Grass shrimp	*Palaemonetes pugio*
Gulf stone crab	*Menippe adina*
Jellyfish	
Mud crab	*Scylla serrata*
Mysid shrimp	*Americamysis bahia*
Pink shrimp	*Farfantepenaeus duorarum*
Polychaetes	
Roughneck shrimp	*Trachypenaeus constrictis*
Royal red shrimp	*Pleoticus robustus*
Seabob	*Xiphopenaeus kroyeri*
White Shrimp	*Litopeneaus setiferus*

AMPHIBIANS

Bullfrog	*Rana catesbeiana*
Gulf coast toad	*Bufo valliceps*
Southern leopard frog	*Rana sphenocephala*

REPTILES

American alligator	*Alligator mississippiensis*
Western cottonmouth	*Agkistrodon piscivorus*
Eastern mud turtle	*Kinosternon subrubrum*
Rat snake	*Elaphe obsoleta*
Speckled kingsnake	*Lampropeltis getulus*
Water snakes	*Neodia* spp.

BIRDS

American avocet	*Recurvirostra americana*
American coot	*Fulica americana*
American widgeon	*Anas americana*
Anhingas	*Anhinga anhinga*
Bald eagle	*Haliaeetus leucocephalus*
Belted kingfisher	*Megaceryle alcyon*
Boat-tailed grackle	*Quiscalus major*
Black skimmer	*Rynchops niger*
Black-crowned night-heron	*Nycticorax nycticorax*

Black-necked stilt	*Himantopus mexicanus*
Blue-winged teal	*Anas discors*
Brown pelican	*Pelecanus occidentalis*
Cattle egret	*Bubulcus ibis*
Clapper rail	*Rallus longirostris*
Common moorhen	*Gallinula chloropus*
Common snipe	*Bubulcus ibis*
Cormorants	*Phalacrocorax auritus*
Dowitchers	*Limnodromus sp*
Gadwall	*Anas strepera*
Great blue heron	*Ardea herodias*
Great egret	*Ardea alba*
Green heron	*Butorides virescens*
Green winged teal	*Anas carolinensis*
Herring gull	*Larus argentatus*
Ibis	*Eudocimus albus*
	Plegadis falcinellus
	Plegadis chihi
Laughing gull	*Leucophaeus atricilla*
Lesser scaup	*Aythya affinis*
Lesser snow geese	*Anser caerulescens caerulescens*
Mallard	*Anas platyrhynchos*
Marsh wrens	*Cistothorus palustris*
Northern harrier	*Circus cyaneus*
Northern shoveler	*Anas clypeata*
Piping plover	*Charadrius melodus*
Redwinged blackbird	*Agelaius phoeniceus*
Ring-necked ducks	*Aythya collaris*
Roseate spoonbills	*Platalea ajaja*
Sandpipers	*Actitis* spp.
Seaside Sparrow	*Ammodramus maritimus*
Snowy egret	*Egretta thula*
Sora rail	*Porzana carolina*
Terns	
Virginia rail	*Rallus limicola*
White ibis	*Eudocimus albus*
White pelican	*Pelecanus erythrorhynchos*
Willet	*Tringa semipalmata*
Yellow-crowned night-heron	*Nyctanassa violacea*

MAMMALS

Armadillo	*Dasypus novemcinctus*
Bats	
Fox squirrel	*Sciurus niger*

Grey squirrel	*Sciurus carolinensis*
Mink	*Mustela vison*
Muskrat	*Ondatra zibethicus rivalicius*
Northern raccoon	*Procyon lotor*
Nutria	*Myocaster coypus*
River Otter	*Lutra canadensis*
Swamp rabbit	*Sylvilagus aquaticus*
Virginia opossum	*Didelphis virginiana*
West Indian Manatee	*Trichechus manatus*

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506

July 16, 2010

Colonel Alvin B. Lee
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

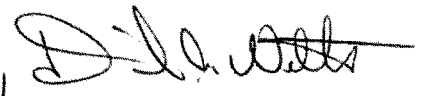
Dear Colonel Lee:

Please reference the "Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study." The MRGO Ecosystem Restoration Plan (Plan) is being developed as a supplement to the June 2008 MRGO Deep-Draft De-Authorization Report and is intended to fully meet the requirements of the Water Resources Development Act (WRDA) of 2007, Section 7013. This feasibility study is anticipated to result in a Chief of Engineers' Report containing a recommended MRGO Ecosystem Restoration Plan, which has been conditionally authorized for construction by WRDA 2007, Section 7013. The Plan will address systematic ecosystem restoration and protection of the Lake Borgne ecosystem and areas affected by the former MRGO navigation channel, and will include considerations of measures to reduce or prevent damage from storm surge.

This draft report contains a description of existing fish and wildlife resources in the project area, discusses future with-project (FWP) and future without-project (FWOP) habitat conditions, identifies fish and wildlife-related impacts, and provides recommendations to improve the proposed MRGO Ecosystem Restoration Project. This document does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The Fish and Wildlife Service (Service) is coordinating with National Marine Fisheries (NMFS) and Louisiana Department of Wildlife and Fisheries (LDWF); their comments are incorporated into this draft report.

We appreciate the cooperation of your staff on this study. Should your staff have any questions regarding the enclosed report, please have them contact Mrs. Catherine Breaux (504/862-2689) of this office.

Sincerely,



James F. Boggs
Supervisor
Louisiana Field Office

Enclosures

cc: EPA, Dallas, TX
National Marine Fisheries Service, Baton Rouge, LA
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Natural Resources (CMD), Baton Rouge, LA
OCPR, Baton Rouge, LA

Draft
Fish and Wildlife Coordination Act Report

THE MISSISSIPPI RIVER GULF OUTLET (MRGO) ECOSYSTEM RESTORATION PLAN FEASIBILITY STUDY

PROVIDED TO
NEW ORLEANS DISTRICT
U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

PREPARED BY
CATHERINE BREAUX, SENIOR FIELD BIOLOGIST

U.S. FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
LAFAYETTE, LOUISIANA

JULY 2010

U.S. FISH AND WILDLIFE SERVICE – SOUTHEAST REGION

EXECUTIVE SUMMARY

The "Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study" (MRGO Ecosystem Restoration Plan) is being developed as a supplement to the June 2008 MRGO Deep-Draft De-Authorization Report and is intended to fully meet the requirements of the Water Resources Development Act (WRDA) of 2007, Section 7013. This feasibility study is anticipated to result in a Chief of Engineers' Report containing a recommended MRGO Ecosystem Restoration Plan, which has been conditionally authorized for construction by WRDA 2007, Section 7013. The Plan will address systematic ecosystem restoration and protection of the Lake Borgne ecosystem and areas affected by the former MRGO navigation channel and will also include consideration of measures to reduce or prevent damage from storm surge.

If the Assistant Secretary of the Army, Civil Works determines that the recommendations of the MRGO Ecosystem Restoration Plan are cost-effective, environmentally acceptable, and technically feasible, no further Congressional authorization is needed. However, the execution of the implementation phase is subject to additional funding and appropriations. Cost-sharing for implementation is subject to the rules for ecosystem restoration projects established in Section 210 of WRDA 1996.

The MRGO Ecosystem Restoration Plan would: 1) Restore the Lake Borgne ecosystem and the areas affected by the MRGO navigation channel by restoring historic salinity regimes through reduced saltwater intrusion into the MRGO, restoring and sustaining critical geomorphic structures that serve as salinity barriers, and introducing freshwater; 2) Restore habitat diversity by restoring and sustaining marsh, swamp, bottomland hardwood, and ridge habitats; 3) Restore and sustain historic water quality, hydrologic functions, and circulation patterns; 4) Achieve ecosystem sustainability to the greatest degree possible; and 5) Restore natural features of the ecosystem that will reduce or prevent damage from storm surge by protecting, restoring, or increasing wetlands, forested habitats, and critical geomorphic structures in the study area.

This draft report contains a description of existing fish and wildlife resources in the project area, discusses future with-project (FWP) and future without-project (FWOP) habitat conditions, identifies fish and wildlife-related impacts, and provides recommendations to improve the proposed MRGO Ecosystem Restoration Project. This document does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The Fish and Wildlife Service (Service) is coordinating with National Marine Fisheries (NMFS) and Louisiana Department of Wildlife and Fisheries (LDWF); their comments have been incorporated into the draft report.

The project area is centered on the Lake Borgne ecosystem, and includes parts of southwestern Mississippi and southeastern Louisiana. This includes St. Bernard, Orleans, and Plaquemines parishes in Louisiana and Hancock and Harrison counties in Mississippi. The project area is bordered to the west by the East Orleans landbridge and continues southward to include the Golden Triangle, Central Wetlands, Proctor Point, the former MRGO, and Terre aux Boeufs ridge. The northern boundary follows the coastline into Mississippi and includes the lower Pearl River basin and Western Mississippi Sound. The eastern edge of the project area extends to the

Chandeleur Islands.

The Tentatively Selected Plan (TSP) would restore approximately 10,431 acres of cypress swamp, 13,890 acres of fresh and intermediate marsh, 33,696 acres of brackish marsh, 466 acres of saline marsh, and 48 acres of ridge habitat. Features in the East Orleans Landbridge and South Lake Borgne subunits include marsh creation and nourishment and shoreline protection. The Terre Aux Boeuf subunits include marsh creation and nourishment. The Central Wetland features include a freshwater diversion at Violet, cypress swamp and marsh restoration and nourishment. Features in the Biloxi Marshes consist of restoring part of the existing subsided ridge on the south bank of Bayou La Loutre, marsh creation and nourishment, and shoreline protection.

The TSP will benefit the fish and wildlife resources of the MRGO Ecosystem Restoration area by providing freshwater, nutrients, and sediments, and restoring ridge, swamp and marsh habitats in the study area thus facilitating increasing organic production, increasing biological productivity, increasing habitat diversity, and reducing wetland loss. Approximately 15,628 AAHUS and 20,767 net acres of fresh/intermediate, brackish, and saline marsh, swamp and ridge habitats would benefit by the proposed project at the end of the project life given a medium sea level rise scenario. The Service supports implementation of the TSP provided the following fish and wildlife recommendations are implemented concurrently with project implementation:

1. The Service recommends, with support from NMFS and LDWF, the selection of a barrier island component of the MRGO Ecosystem Restoration Plan be a part of the TSP. The Service feels the design and evaluation of the barrier island alternatives was sufficient to warrant selection, though further engineering would be required prior to construction. Breton Island is a National Wildlife Refuge (NWR), managed by the Service and is of National importance. Until recently (**Lavoie, D, ed., 2009;** Thomson et al., 2009) the Service was unaware of the long-term impacts to this important refuge as a result of the MRGO channel. However, the Service believes restoration of the areal loss of Breton Island due to the construction and maintenance of the MRGO channel should be appropriately addressed in the TSP .

2. The Corps should contact the Service regarding a compatibility determination, Wilderness Act provisions and special use permits that may be necessary to conduct activities on Breton Island NWR. The Corps should establish and continue coordination with the Service until construction of any project feature is complete and prior to any subsequent maintenance. Points of contacts for the Service are: Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Jack Bohannan (985) 822-2000, Refuge Manager for the Breton Island NWR.

3. The Service recommends the operational plans for the Violet Diversion be evaluated to include more flexibility of flow (flows between 1000cfs and 7000cfs) to achieve optimal habitat conditions favorable to nearby intermediate marsh and to bald cypress germination, growth, and reproduction by controlling depth and duration of inundation and salinity levels. As the operational plan for the Violet Diversion is further developed,

future hydrological and fisheries (i.e., CASM) modeling, and updated habitat assessments (i.e., Wetland Value Assessements) should be conducted.

4. The Service recommends, with support from LDWF, the diversion operational plan be developed in a way to avoid or minimize adverse impacts to marine fisheries and Essential Fish Habitat (EFH) while maximizing freshwater and nutrient input to the extent practicable to meet habitat objectives.

5. The Service recommends the diversion be adaptively managed to enhance surrounding wetlands, that habitat switching (as a result of re-introduced river water) is allowed to occur in a manner that is not detrimental or destructive to the ecological processes, and that the diversion allows for draw down periods sufficient for cypress regeneration and cypress growth.

6. The Service recommends, with support from LDWF, a comprehensive examination of the river and all existing and proposed diversions to coordinate their operation and ensure that their operation will maximize their restoration capabilities. The ongoing Mississippi River Hydrodynamic and Delta Management Study should be utilized to address this issue. The Service and other natural resource agencies should be involved in this study.

7. The Service recommends, with support from LDWF, establishment of a committee similar to the Caernarvon Interagency Advisory Committee or Davis Pond Advisory Committee to review the operation and the monitoring and adaptive management results of the Violet diversion and when necessary, provide recommendations regarding any future operational and maintenance changes. The Service and other natural resource agencies should be on this committee.

8. The Service recommends that all shoreline protection features include one fish dip every 1,000 feet (ft) constructed to a 25 ft bottom width to the pre-project elevation. On a case by case basis the 1,000 ft distance can be adjusted, in consultation with National Marie Fisheries Service (NMFS), to incorporate existing exchange points.

9. The Monitoring and Adaptive Management Plan, as it is further developed, should be provided to the Service, NMFS, and Louisiana Department of Wildlife and Fisheries (LDWF) for continued review, comment, and input.

10. If a proposed project feature is changed significantly or is not implemented within one year of the Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with the Service and NMFS to ensure that the proposed project would not adversely affect any Federally listed threatened or endangered species or their habitat.

11. Avoid adverse impacts to nesting bald eagles, gulls, terns, and/or black skimmers, wading birds, and brown pelicans through the careful design of project features and timing of construction. A qualified biologist should inspect the proposed work area for the presence of undocumented nesting colonies and bald eagles during the nesting season

(i.e., September 15 through March 31 for brown pelican, September 1 through February 15 for wading bird nesting colonies, September 16 through April 1 for colonies containing nesting gulls, terns, and/or black skimmers, and October through mid-May for bald eagles).

- To minimize disturbance to colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present).
- For colonies containing nesting brown pelicans, all activity occurring within 2,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 15 through March 31). Nesting periods vary considerably among Louisiana's brown pelican colonies, however, so it is possible that this activity window could be altered based upon the dynamics of the individual colony.
- For colonies containing nesting gulls, terns, and/or black skimmers, all activity occurring within 650 feet of a rookery should be restricted to the non-nesting period (i.e., September 16 through April 1, exact dates may vary within this window depending on species present).
- If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary and those results should be forwarded to this office.

12. Land clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

13. Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service and other State and Federal natural resource agencies, and shall be provided an opportunity to review and submit recommendations on all work addressed in those reports.

14. A report documenting the status of implementation, maintenance, and adaptive management measures should be prepared every three years by the managing agency and provided to the Corps, the Service, NMFS, U.S. Environmental Protection Agency (EPA), Louisiana Department of Natural Resources (LDNR), Office of Coastal Protection and Restoration (OCPR), and LDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

15. The Service recommends minimizing impacts to marsh from marsh buggy activities. One way is to limit repetitive use of the same marsh buggy route to prevent ruts and lasting damage while at the same time reducing the amount of marsh buggy tracts as much as possible. Another option is to build temporary boardwalks over marsh where

feasible and then backfilling the boardwalk area if needed. In areas with large marsh creation features that have minimal access routes, such as the inner Terre Aux Bouef marsh features, the Service recommends that work begin at the farthest location and proceed to the outer edges of the site to minimize the amount of damage.

16. The large quantity of borrow material proposed to be taken from Lake Borgne for the TSP may have an adverse effect to fisheries, EFH, and the threatened Gulf sturgeon by: 1) alteration in water bottom substrate habitat: 2) direct removal of benthos from a large area which may (at least temporarily) reduces food availability for fishery organisms; 3) other sessile resources, such as oysters could be affected; and 4) by continually moving the dredge, the resuspended sediments will take longer to settle and could prolong the periods of high turbidity associated with dredging operations. The Service recommends, with support from LDWF, careful consideration be given to the affects of taking all borrow from Lake Borgne and consideration should be give to obtaining borrow from other "outside" sources, such as the Mississippi River, and adjacent bays, and offshore areas.

17. The proposed borrow areas in Lake Borgne do include private leases as well as public oyster seed grounds. LDWF manages the public seed grounds and should be consulted before final borrow locations are determined. LDWF also recommends that all borrow sites be less than 10 feet below the existing sediment surface and 1000 feet from the shoreline.

18. The aquatic modeling, Comprehensive Aquatic Systems Model (CASM) used to help evaluate the impacts of the freshwater diversion on representative fish species as well as the potential impacts from low dissolved oxygen levels on fisheries resources in Lake Borgne was developed and had produced initial results. The Service, LDWF, and NMFS support the CASM modeling effort and agree the trends may provide reasonable results. However, because the model results represent the first draft and have since been provided corrected assumptions and interactions to better represent Louisiana waters, a final model run is necessary to obtain more accurate results relative to Louisiana. The assumptions were corrected in consultation with NMFS and LDWF. Because of funding constraints the CASM modeling efforts were halted. The Service recommends completion of the CASM model to achieve more accurate results that will be used to fully address impacts to aquatic resources.

19. In addition the Service recommends the CASM model should be updated to incorporate conditions from the oil spill in the adaptive management plan. This model should also use the corrected assumptions.

20. Due to the significant acreage of marsh that will be accessed for swamp and marsh creation/nourishment, the Service request the Corps quantify the estimated flotation access and construction access impacts to shallow open water habitat.

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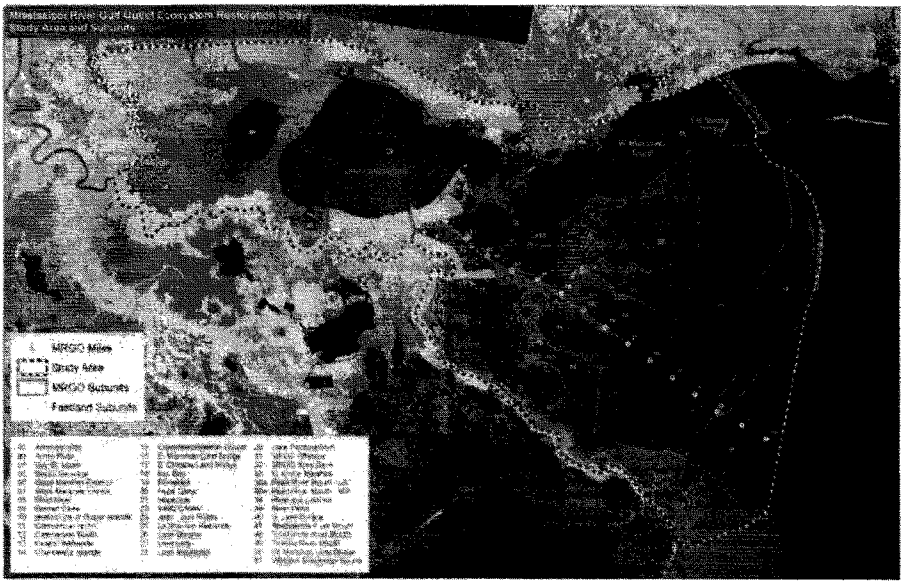
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Plaquemines parishes in Louisiana and Hancock and Harrison counties in Mississippi. The project area is bordered to the west by the East Orleans landbridge and continues southward to include the Golden Triangle, Central Wetlands, Proctor Point, the former MRGO, and Terre aux Boeufs ridge. The northern boundary follows the coastline into Mississippi and includes the lower Pearl River basin and Western Mississippi Sound. The eastern edge of the project area extends to the Chandeleur Islands.

The project area suffers from many problems including land loss, shoreline erosion, habitat change and loss, modification of natural hydrology, decreased freshwater, sediment and nutrients, saltwater intrusion, eroding barrier islands, ridge habitat degradation, invasive species, herbivory, and increasing susceptibility to storm surge.

Figure 1. Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Study Area and Subunits.



FISH AND WILDLIFE RESOURCES

Description of Habitats

The eastern Louisiana coast consists of a deltaic system with fronting barrier islands built by the Mississippi River. High, firm land is rare in coastal Louisiana. Elevations of the wetlands are barely above Mean Gulf Level and at best the soils are soft and poorly consolidated. The portion of the project area in Mississippi consists of broad expanses of emergent tidal marsh and riverine swamps that have suffered from lack of sediment and

freshwater flows resulting in increased saltwater intrusion and coastal erosion. The Mississippi saline marsh area includes sandy forested hummocks that are above mean high tide. This marsh area is also well-known for an abundance of waterfowl. The Mississippi Sound is a shallow body of water that separates the Mississippi coast from Cat Island, a barrier island that lies approximately six miles offshore. The Pearl River and its associated river swamp are tidally influenced freshwater habitat with bald-cypress, black gum, and water tupelo forming the swamp canopy.

The deauthorized MRGO traverses wetlands and marshes in Plaquemines, St. Bernard, and eastern Orleans parishes. Construction of the channel altered circulation patterns along its route between Breton Sound and Lake Borgne, resulting in steep salinity increases. Prior to construction, the Bayou La Loutre ridge provided a between basin hydrologic barrier that limited the flow of saline water from Breton Sound into Lake Borgne. Previously, the tidal flow into Lake Borgne was dominated by flow from the Mississippi Sound, but after the construction of MRGO, the dominant tidal flow into Lake Borgne switched to Breton Sound. Changes in vegetation communities in the project area were observed after completion of the MRGO. Prior to construction of the MRGO, the freshwater wetlands had survived nutria "eat-outs", hurricanes, droughts, subsidence, and construction of trenasses for duck hunter and trapper access. However, the construction of MRGO altered the salinity and hydrologic regime beyond the wetlands' tolerance. MRGO changed regional hydrology and affected the flow, type, direction, and salinity of the water in addition to changing the tidal amplitude and duration.

There are approximately 3,845,766 acres within the study area. Louisiana wetlands (forested, marsh, and scrub-shrub) provide 26 percent of the seafood landed in the contiguous United States and over 5 million migratory waterfowl utilize those wetlands every year. Wetlands within the study area provide plant detritus to adjacent coastal waters and thereby contribute to the production of fishes and shellfishes. Wetlands also provide valuable water quality functions such as reducing excessive dissolved nutrient levels, filtering waterborne contaminants, and removing suspending sediment matter. In addition, coastal wetlands buffer storm surges and reduce damaging effects to man-made infrastructure within the coastal area.

Wetlands are being lost because of the loss of Mississippi River sediment due to construction of levees, sea level rise, subsidence, hurricanes and construction of channels and canals. As this habitat is destroyed, it further depletes the species that form the base of the food chain throughout the Gulf of Mexico. Failure to address the loss of this habitat in the Gulf region threatens the long-term health of the entire ecosystem. The ongoing loss of coastal Louisiana wetlands (approximately 1,149 square miles between 1956 and 2004; average loss rate of 24 square miles per year) was recently exacerbated by Hurricanes Katrina and Rita in 2005. Those hurricanes caused an initial loss of wetlands equivalent to 9 years (approximately 217 square miles) of mean annual losses.

Appendix C of this report provides common and scientific names of plants and animals in the study area mentioned throughout this report.

Marshes

Marsh types within the project area include fresh, intermediate, brackish, and saline. Fresh

marshes occur at the upper ends of interdistributary basins and are often characterized by floating or semi-floating organic soils and minimal daily tidal action. Vegetation may include maidencane, bulltongue, cattail, California bulrush, pennywort, giant cutgrass, American cupscale, spikerushes, bacopa, and alligatorweed.

Intermediate marshes occur in transitional zones between fresh and brackish marshes and are often characterized by organic, semi-floating soils. Typically, intermediate marshes experience low levels of daily tidal action. Salinities are negligible or low throughout much of the year, with salinity peaks occurring during late summer and fall. Vegetation includes saltmeadow cordgrass, deer pea, three-cornered grass, cattail, bulltongue, seashore paspalum, wild millet, fall panicum, and bacopa.

Brackish marshes are characterized by low to moderate daily tidal energy and soils ranging from firm mineral soils to organic semi-floating soils. Freshwater conditions may prevail for several months during early spring; however, low to moderate salinities occur during much of the year, with peak salinities in the late summer or fall. Vegetation is usually dominated by saltmeadow cordgrass, but also includes saltgrass, three-cornered grass, leafy three-square, and deer pea.

Saline marshes occur along the Gulfward fringe of the coastal wetlands. Those marshes usually exhibit fairly firm mineral soils and experience moderate to high daily tidal energy. Vegetation is dominated by saltmarsh cordgrass but may also include saltgrass, saltmeadow cordgrass, black needlerush, and leafy three-square.

Ridge Habitat

Within the Deltaic Plain narrow alluvial ridges having finger-like patterns, extend toward the Gulf, are higher in elevation and have firmer soils than emergent marsh. These natural levees, formed by overbank processes, occur along active and abandoned Mississippi River distributaries (Coast 2050). Natural and man-made ridges form the skeletal framework to which the coastal wetlands are attached. They form hydrologic basin divides and are more resistant to erosion than the wetlands. Natural factors such as subsidence have contributed to the destruction of the ridges with most of the ridges having subsided below elevations that support the maritime forest community. Part of the Bayou La Loutre ridge, however, has been enhanced with disposed dredged material, but subsidence continues to be the biggest threat. The Bayou La Loutre ridge was directly affected by construction of the MRGO channel through the ridge.

Ridges sustain upland shrubs and trees, providing unique habitat for certain plant and animal species. The dominant species of the forested habitat found on the abandoned distributary ridges in the project area include live and water oaks, and hackberry. Groundsel bush, marsh elder, and yaupon are the dominant shrubs, with dwarf palmetto and elderberry present in the understory. Vines such as blackberry, marsh morning glory, and pretty dodder are common.

Cypress/Tupelo Swamp

Cypress-tupelo swamps were once common throughout the southeastern U.S. but have been significantly reduced in areal extent. Cypress-tupelo swamps are located along the flanks of larger distributary ridges as a transition zone between bottomland hardwoods and lower-elevation marsh or scrub-shrub habitats. Cypress-tupelo swamps exist where there is little or no

salinity, minimal daily tidal action, and are usually flooded throughout most of the growing season. Bald cypress and tupelo gum are the dominant vegetation within this habitat type, but Drummond red maple, green ash, and black willow are also common.

In the project area, cypress swamp used to exist predominately in the Central Wetlands area. These swamps were abundant in parts of the study area but have declined due to extensive logging operations during the late 1800s. In addition, the swamps of the Central Wetlands were maintained by freshwater introduced from the Mississippi River and other natural water sources. The construction of flood protection levees limits the flow of freshwater into the wetlands, and the construction of canals, especially the MRGO, allowed additional saltwater into the estuary. These and other changes have caused the loss of most of the Central Wetland swamps. The MRGO channel and connecting waterways provide a direct route for tidal exchange and allows any freshwater surplus to exit regularly at low tide and be replaced by the inflow of more saline water at high tide.

Barrier Island

The barrier islands in the Louisiana portion of the study area are the remains of an abandoned Mississippi River Delta lobe; their degradation is the result of natural deltaic processes. The formation of Cat Island in Mississippi was also influenced by this abandoned delta, and it is distinct from other Mississippi barrier islands (Schmid 2001). Barrier islands act as buffers to reduce the effects of ocean waves and currents on associated estuaries and wetlands. Louisiana's barrier islands are eroding at a rate of up to 66 feet per year. According to recent U.S. Geological Survey (USGS) estimates, several islands will disappear by the end of the century (USACE 2009). Although Cat Island has lost 39% of the land area it had in 1848, it is the most stable of the Mississippi barrier islands. Interior elevations and the orientation of Cat Island prevent breaching and overwash by storm waves except along spits of the eastern shore (Morton 2005).

Study area barrier islands consist primarily of beach, dune, high marsh (scrub/shrub), and back-barrier saline marsh. Beach vegetation may include sea purslane, marsh hay cordgrass, sea rocket, and seaside heliotrope. Dune plants are dominated by sea oats, but can include marsh hay cordgrass, bitter panicum, Roseau cane (on the Chandeleur islands) and beach croton. Shrub/scrub plants often found on high marsh zones typically behind dunes and include sea myrtle, sea ox-eye and marsh elder (*Iva* and *Baccharis*). Black mangrove occurs as a shrub along the flooded marsh edges of the barrier islands and on the banks of tidal streams, ponds, and bays. Saline back barrier marshes dominant species is saltmarsh cordgrass, although the highly salt-tolerant salt grass, black needle rush, and glassworts are also frequently present.

In the future without the project scenario, the barrier islands will diminish in size greatly while some of the islands, such as Breton Island, are expected to become a shoal that is no longer subareal. Without replenishing sediment in the litoral system, the islands have no chance of recovering. With the loss of the islands; there will be a loss of unique and vital habitat for nesting terns, piping plover, and fisheries.

Open-Water Habitats

Lake Borgne is hydrologically connected to Lake Pontchartrain. The Lake Borgne ecosystem

is also influenced by the Pearl River to the north and by areas located as far south as the River Aux Chenes ridge, which is located between the MRGO and the Mississippi River. To the east, the Western Mississippi Sound is an extension of Lake Borgne. The Western Mississippi Sound, Chandeleur Sound, and Breton Sound form the eastern boundary of hydrologic influence of the Lake Borgne ecosystem.

Open-water habitat within the project area consists of ponds, lakes, canals, bays, and bayous. Natural marsh ponds and lakes are typically shallow, ranging in depth from 6 inches to over 2 feet. Typically, the smaller ponds are shallow and the larger lakes and bays are deeper. Canals and larger bayous typically range in depth from 4 or 5 feet, to over 15 feet. Strong tidal flows may occur at times through those waterways, especially where they provide hydrologic connections to other large water bodies.

Major open water and channel areas in the project area include Bayou La Loutre, Bayou St. Malo, Bayou Bienvenue, Bayou Dupre, the former MRGO, the Rigolets, Lake Borgne, Chandeleur Sound, Breton Sound, Mississippi Sound, and Lake Saint Catherine.

Hypoxic/Anoxic zones

Hypoxic/anoxic conditions ("dead zones") occur in Lake Pontchartrain and the Gulf of Mexico. These conditions are caused primarily by excess nitrogen in combination with stratification of more saline waters. Due to the control of the Mississippi River, nutrients pass though the study area and into the northern Gulf rather than into adjacent wetlands, which would absorb these nutrients.

Submerged Aquatic Vegetation

Shallow open water habitats may often support extensive beds of submerged aquatic vegetation (SAV). Within the estuaries, SAVs are typically found in ponds and lakes but they are also associated with sandy substrate around barrier islands where they are often referred to as seagrass beds or marine SAVs. In fresh environments, floating-leafed and submerged SAVs include water hyacinth, *Salvinia*, duckweeds, American lotus, white water lily, water lettuce, coontail, Eurasian milfoil, hydrilla, alligatorweed, hydrocotyle, pondweeds, naiads, fanwort, wild celery, water stargrass, elodea, and others. Ponds and lakes within the intermediate marsh zone often support southern naiad, Eurasian milfoil, and wigeongrass. Shallow brackish marsh ponds occasionally support abundant beds of wigeongrass. SAV growth in saline marsh environments is rare.

As reported by Ritchie et al., 1992, the extensive seagrass beds associated with the Chandeleur Islands occupy the sandy platform along the bay shoreline sheltered by the main arc of the islands from just south of Hewes Point at the northern end to just north of the southern end and extending out to the western bar system. Patches of sea grasses also occur behind Breton Island, within the Freemason Island complex and associated with North and New Harbor islands. None have been observed behind Grand Gosier or Curlew islands probably because of the constantly shifting sediment in these areas. Widgeon grass and shoalgrass are most common in the shallower areas and are usually the first to colonize the subaqueous portions of new washover fans. Manatee grass prefers somewhat deeper areas that are never threatened by exposure at extreme low tides. *Halophila engelmanii* grows as an understory to the others. Turtle grass

colonizes the deepest areas of all the SAVs. All of these species occur at intermediate depths.

Coastal SAV meadows are a rapidly declining habitat that is important for juvenile aquatic species, sea turtles, west Indian Manatee, and wintering migratory waterfowl in the northern Gulf of Mexico (Byron and Heck, 2006; Poirrier and Handley, 2006; Michot, et al. 2008). Aside from their important role in providing habitat, these seagrass meadows provide essential physical benefits to the stability of the Chandeleur Islands by reducing wave energy and current velocity due to the baffling effects of the seagrass. This process results in backbarrier sediment trapping (vertical accretion) and protection of backbarrier marsh shorelines form wave attack in the Chandeleur Sound. The latter is especially important during the passage of winter cold fronts because of the large fetch of the Chandeleur Sound. These seagrass beds are amazingly resistant to hurricanes and recover rapidly after storms when destroyed; however, the occurrence and distribution of seagrass at the Chandeleur Islands is directly related to the presence of a fronting barrier island (Poirier and Handley, 2006; Bethel and Martinez, 2008). The island dissection and rapid land loss associated with Hurricane Katrina has resulted in decreased suitable conditions for seagrass recolonization (Bethel and Martinez, 2008).

The seagrass beds are decreasing in size as the barrier islands they are behind also decrease in size. As the island area is reduced to only subtidal or shoal habitat, waves from the Gulf are able to impact the beds. Therefore, when all intertidal acreage is lost, it is assumed that all of the seagrass beds in that portion of the project area will be lost.

Fisheries Resources

Estuaries are among the most productive habitats in the world because they support high primary and fisheries production (Whittaker and Likens 1973; Walme 1972). The majority of the MRGO Ecosystem Restoration study area is considered estuarine habitat. Most of the economically important saltwater fishes and crustaceans harvested in Louisiana and Mississippi spawn offshore and then use estuarine areas for nursery habitat (Herke 1995). Marine fishes penetrate inland to fresher habitats, while freshwater species are sometimes found in intermediate or brackish environments. In addition, the lower reaches of freshwater streams may serve as nursery areas for the young of some marine species.

Factors that will strongly influence future fish resource conditions include freshwater input and loss of coastal wetlands. Freshwater inputs into the project area wetlands have been limited to rainwater and runoff and a few Mississippi river diversions and siphons. Even though extensive areas of marsh have been lost in coastal Louisiana, commercial harvest and recreational catches of most estuarine fishery species have not diminished (NMFS 2006). One hypothesis to explain continued high fisheries production is that as marshes have deteriorated, tremendous amounts of organic detritus have been released into the estuarine system, consequently driving high levels of primary productivity. High primary productivity increases the resources available for secondary productivity. Additionally, an increase in marsh to water interface (i.e., marsh edge), and the formation of shallow, protected lagoons and ponds, has resulted in areas prime for growth and development of estuarine species (Browder et al., 1985; Browder et al., 1989; Minello and Rozas 2002). At the same time, saltwater intrusion into previously low-salinity areas has increased the amount of estuarine area available to estuarine and marine fishery species (Chesney et al. 2000;

Zimmerman et al., 2000). However, this intrusion can exacerbate marsh loss in those areas (Chabreck and Linscombe 1982; McKee and Mendelssohn 1989).

The seagrass beds, as well as the barrier islands they exist behind, provide unique nursery, foraging, predator refugia, and spawning habitat for numerous economically important marine and estuarine species that exhibit a preference for or are dependent on these habitats during a portion of their life (Saucier and Baltz 1993). Seagrass beds, surf zone, intra-island ponds, tidal creeks, and back-bay sand flats associated with these barrier islands support distinct fish and crustacean assemblages in comparison to mainland or inland saline marshes (Williams 1998).

The project area supports both marine and estuarine finfishes and shellfishes. Finfishes occurring or expected in that area include anchovies, scaled sardine, Gulf menhaden, striped mullet, white mullet, black drum, red drum, spot, spotted seatrout, sand seatrout, Atlantic croaker, gaff-topsail catfish, southern flounder, bull shark, ladyfish, Atlantic needlefish, Gulf killifish, longnose killifish, sheepshead minnow, fat sleeper, gobies, speckled wormeel, least puffer, Gulf pipefish, Atlantic spadefish, alligator gar, southern kingfish, Florida pompano, Atlantic bumper, Spotfin mojarra, rough silverside, inland silversides, and mangrove snapper. The Mississippi Sound estuary provides prime habitat for various life stages of red drum, Spanish and king mackerel, grouper, spotted sea trout, jack crevalle, cobia, amberjack, and various species of sharks (MSCIP 2008).

Crustaceans expected to occur in the area include white shrimp, brown shrimp, seabob, roughneck shrimp, grass shrimp, mysid shrimp, Gulf stone crab, blue crab, and mud crab. Other invertebrates found there include American oyster, jellyfish, and ctenophores.

The American oyster is indigenous to coastal Louisiana and Mississippi, and provides a rich ecological and commercial resource. This organism is unique in that it does not migrate like other estuarine species. Salinity plays a key role in oyster sustainability. Typically, they proliferate in salinities ranging from 5 to 15 parts per thousand. Fresher waters fail to support biological functions, and more saline waters promote disease and predation. Production of oysters in Louisiana has been relatively stable for the last 50 years, with harvest from public beds replacing the decreasing harvest from private leases. The Louisiana oyster industry has been experiencing many stressors over the past several decades that threaten the long-term sustainability of both the industry and the resource. Increasing coastal land loss is reducing the amount of marsh that provides shelter to reefs, and saltwater intrusion is exacerbating disease and predation.

The bottom estuarine substrate or benthic zone regulates or modifies most physical, chemical, geological, and biological processes throughout the entire estuarine system via what is commonly called a "benthic effect" (Day et al. 1989). Within a salt marsh, less than ten percent of the above-ground primary production of the salt marsh is grazed by aerial consumers. Most plant biomass dies and decays and its energy is processed through the detrital pathway. The major consumer groups of the benthic habitat include: bacteria and fungi, microalgae, meiofauna, and microfauna (Mitsch and Gosselink 1993).

Benthic community structure is not static; it provides a residence for many sessile, burrowing, crawling, and even swimming organisms. The benthic community is a storehouse of organic matter and inorganic nutrients, as well as a site for many vital chemical exchanges and physical interactions. The benthic assemblage of the study area is dominated by polychaetes (62%), bivalves (14%) and amphipods (11%).

Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; P.L. 104-297) set forth a new mandate for National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS), regional fishery management councils (FMC), and other federal agencies to identify and protect important marine and anadromous fish habitat. The Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Act support one of the nation's overall marine resource management goals-maintaining sustainable fisheries. Essential to achieving this goal is the maintenance of suitable marine fishery habitat quality and quantity. Detailed information on federally managed fisheries and their EFH is provided in the 1999 generic amendment of the Fishery Management Plans for the Gulf of Mexico prepared by the Gulf of Mexico FMC (GMFMC). The generic FMP subsequently was updated and revised in 2005 and became effective in January 2006 (70 FR 76216). NMFS administers EFH regulations. Categories of EFH in the project area include estuarine and marine areas. Estuarine categories include estuarine emergent wetlands, mangrove wetlands (estuarine and barrier island), submerged aquatic vegetation, estuarine water column, and mud, sand and shell water bottoms. Marine areas include water column, vegetated bottoms (seagrass beds of Breton and Chandeleur islands), non-vegetated bottoms, live bottoms (oyster reefs in Lake Borgne and Biloxi marshes), and geologic features (Breton and Chandeleur islands).

EFH has been designated in the project area for Gulf stone crab, brown shrimp, white shrimp, pink shrimp, red drum, lane snapper, dog snapper, dwarf sand perch, king mackerel, Spanish mackerel, cobia, bonnethead shark, and Atlantic sharpnose shark. EFH species and their life stages are presented in Table 1. Coastal wetlands also provide nursery and foraging habitat that supports economically important marine fishery species such as spotted seatrout, sand seatrout, southern flounder, Atlantic croaker, spot, Gulf menhaden, striped mullet, white mullet, silversides, killifish, kingfish, pompano, scaled sardines, anchovies, and blue crab. Some of these species serve as prey for other fish species managed under the Magnuson-Stevens Act by the GMFMC (e.g., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks). These wetlands also produce nutrients and detritus, important components of the aquatic food web, which contribute to the overall productivity of the Pontchartrain basin estuary and nearshore Gulf of Mexico.

Table 1. EFH Species and Their Life Stages for the MRGO Ecosystem Restoration Project Area.

Species	Life stage	System	EFH
Brown shrimp	larvae	Marine	<82 m; planktonic, sand/shell/soft bottom, SAV, emergent marsh, oyster reef
	juvenile	Estuarine	<18 m; SAV, sand/shell/soft bottom, SAV, emergent marsh, oyster reef
	adult	Marine	<14-110 m; sand/shell/soft substrate
White shrimp	juvenile	Estuarine	<30 m; SAV, soft bottom, emergent marsh
Pink shrimp	juvenile	Estuarine	<65 m; sand/shell substrate
Gulf stone crab	eggs	Estuarine/Marine	<18 m; sand/shell/soft bottom
	larvae/post larvae	Estuarine/Marine	<18 m; planktonic/oyster reefs, soft bottom
	juvenile	Estuarine	<18 m; sand/shell/soft bottom, oyster reef
Red drum	larvae/post larvae	Estuarine	all estuaries planktonic, SAV, sand/shell/soft bottom, emergent marsh
	juvenile	Estuarine/Marine	GOM <5 m W from Mobile Bay; all estuaries SAV, sand/shell/soft/hard bottom, emergent marsh
	adult	Estuarine/Marine	GOM 1-46 m W from Mobile Bay; all estuaries SAV, pelagic, sand/shell/soft/hard bottom, emergent marsh
Lane Snapper	larvae	Estuarine/Marine	4-132 m; reefs, SAV
	juvenile	Estuarine/Marine	<20 m; SAV, mangrove, reefs, sand/shell/soft btm.
Dog Snapper	juvenile	Estuarine/Marine	SAV, mangrove, emergent marsh
Dwarf Sand perch	juvenile	Marine	hard bottom
King mackerel	larvae	Marine	9-180 m; planktonic
	juvenile	Marine	<9 m; pelagic
	adults	Marine	35-180 m; pelagic
Spanish mackerel	eggs	Marine	<50 m; planktonic
	larvae	Marine	9-84 m; planktonic
	juvenile	Estuarine/Marine	<50 m; pelagic
	adults	Estuarine/Marine	<75 m; pelagic
Cobia	eggs	Marine	planktonic
	larvae	Marine	11-53 m; planktonic
	juvenile	Marine	5-183 m; pelagic
Bonnethead shark	juvenile	Marine	inlets, estuaries, coastal waters <25 m, FL Keys to Cedar Key; LA and TX
Atlantic sharpnose shark	adults	Marine	<50 m MS Sound & Galveston to Laguna Madre

Wildlife Resources

There are three federal and one state protected areas located within the project area. The federal areas include the Bayou Sauvage National Wildlife Refuge (NWR), Breton NWR, and the Gulf Island National Seashore (Mississippi Unit; western end of Cat Island); while the state area is the Biloxi Wildlife Management Area.

Prior to construction of the MRGO, the interior fresh to intermediate wetlands had high value for furbearing animals and wintering waterfowl including lesser snow geese, mallard, green-winged teal, and lesser scaup. Between 1969 and 1978, wildlife surveys recorded less than 20,000 annual wintering waterfowl in an area that had previously supported 250,000 individuals. Furbearers, supported in large numbers in this area, included muskrat, mink, nutria, river otter, and raccoons were once staples of the Louisiana fur industry. After construction of the MRGO, wildlife surveys showed a noticeable decline in the productivity of these wetlands.

The project area provides important habitat for several species of wildlife, including waterfowl, wading birds, shorebirds, mammals, reptiles and amphibians. The project area provides wintering habitat for migratory puddle ducks including gadwall, blue-winged teal, green-winged teal, American widgeon, and northern shoveler. Diving duck species which utilize the project area include lesser scaup and ring-necked ducks. The red-breasted merganser is also a common wintering waterfowl species in the Breton/Lake Borgne system. The resident mottled duck, which nests in fresh to brackish marshes, is found throughout the year.

Common wading bird species which utilize the project area include the great blue heron, green heron, tricolored heron, great egret, snowy egret, yellow-crowned night-heron, black-crowned night-heron, and white ibis. Mudflats and shallow-water areas provide habitat for numerous species of shorebirds and seabirds. The barrier island is habitat used by wintering piping plover, brown pelicans, and nesting terns Shorebirds include the American avocet, willet, black-necked stilt, dowitchers, common snipe, and various species of sandpipers. Seabirds include the white pelican, black skimmer, herring gull, laughing gull, and several species of terns.

Non-game birds, such as the boat-tailed grackle, red-winged blackbird, seaside sparrow, northern harrier, belted kingfisher, and marsh wrens, also utilize the project area. Important gamebirds found in the area include the clapper rail, sora rail, Virginia rail, American coot, common moorhen, and common snipe in addition to resident and migratory waterfowl.

Mammals found in the project area include swamp rabbit, raccoon, fox/gray squirrels, opossum, nine-banded armadillo, muskrat, mink, nutria, river otter, and raccoons, and bats. Reptiles and amphibians are fairly common in the low-salinity brackish marshes found within the project area. Reptiles present include the American alligator, water snakes, western cottonmouth speckled kingsnake, rat snake, and eastern mud turtle. Amphibians expected to occur include the bullfrog, southern leopard frog, and Gulf coast frog.

The barrier islands of the Chandeleur Island chain have provided numerous benefits to wildlife. Prior to the storms of the late 1990's and early 2000's and the resulting habitat loss, the use by nesting colonial seabirds and wintering migratory birds was tremendous. This is enhanced by

their proximity to the productive bays, marshes, seagrass beds, and shallow marine waters of Mississippi and Louisiana.

The islands supported the largest brown pelican nesting colonies of the entire Gulf coast from Florida to Texas, and production of young was higher than that of other colonies due to the high productivity of the surrounding waters. From a high of almost 13,000 nests in the late 1990's, the islands had fewer than 3,000 nesting pairs of brown pelicans in 2009. The same is true for other nesting colonial seabirds. With over 100,000 nesting pair of sandwich and royal terns (the largest colonies in North America) the islands now support less than ¼ of that number.

The Chandeleurs supported the largest group of wintering redhead ducks between Florida and Texas with over 20,000 making their winter home in the seagrass beds of Chandeleur Sound. That number has dropped precipitously following the loss of seagrass habitats. Likewise wintering piping plover and other shorebird numbers have also dropped due to loss of suitable wintering habitat. All of these reductions in bird numbers can be directly attributed to the loss of suitable habitat caused by island fragmentation and deterioration. The problem is that these habitats are not being replaced in other areas.

The barrier island, swamps, adjacent marshes, and the Bayou La Loutre ridge habitat serve as vital resting and foraging habitat for trans-Gulf neotropical migrant birds. Available habitat along the coast is very important to trans-Gulf migrants, they utilize wooded (swamp, bottomland hardwood, ridge and scrub/shrub) wetland habitats and adjacent spoil or bayou banks more than open marshes. This habitat is especially critical when severe weather in spring causes migrating birds to reach land exhausted, or during the fall, when bad weather forces the birds to abort their southward migration at the last moment, before leaving land. Many of these forested wetlands have been lost in the vicinity of the project area, and as the barrier island and few remaining ridges continue to subside below elevations that can support scrub/shrub habitat and maritime forest, very large numbers of neotropical migratory birds will be negatively affected.

Under the No Action Alternative, the project area would continue to provide habitat for a multitude of species including migratory waterfowl, wading birds, shorebirds, mammals, reptiles, and amphibians. However, the continued loss of emergent wetlands with the lack of sustainable freshwater sediment and nutrient input would negatively impact those species which utilize the project area. The intertidal marsh and shallow, isolated ponds and associated SAV, forested wetlands, and the barrier island habitats are utilized by those species for foraging, resting, or nesting habitat. Conversion of that habitat type to large, unvegetated open-water areas would diminish habitat value for all wildlife species.

Threatened and Endangered Species and Species of Concern

Threatened and Endangered Species

Federally listed threatened (T) and endangered (E) species and/or their designated critical habitat occurring in the project area include the Gulf sturgeon (T), pallid sturgeon (E), piping plover (T), and West Indian manatee (E). Several species of threatened/endangered sea turtles are also known to forage in the coastal waters of the study area. Those species include the loggerhead sea turtle (T), Kemp's ridley sea turtle (E), green sea turtle (T), leatherback sea turtle (E), and

hawksbill sea turtle (E). Additionally species of concern in the project area include the bald eagle, brown pelican, and other colonial wading birds protected under the Migratory Bird Treaty Act (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.) and/or the Bald and Golden Eagle Act (54 Stat. 250, as amended, 16 U.S.C. 668a-d).

Gulf sturgeon

The Gulf sturgeon is an anadromous fish that occurs in many rivers, streams, and estuarine waters along the northern Gulf coast between the Mississippi River and the Suwannee River, Florida. In Louisiana, Gulf sturgeon have been reported at Rigolets Pass, rivers and lakes of the Lake Pontchartrain basin, and adjacent estuarine areas. Spawning occurs in coastal rivers between late winter and early spring (i.e., March to May). Adults and sub-adults may be found in those rivers and streams until November, and in estuarine or marine waters during the remainder of the year. Sturgeon less than two years old appear to remain in riverine habitats and estuarine areas throughout the year, rather than migrate to marine waters.

On March 19, 2003, the Fish and Wildlife Service and NMFS published a final rule in the Federal Register (Volume 68, No. 53) designating critical habitat for the Gulf sturgeon in Louisiana, Mississippi, Alabama, and Florida. Designated critical habitat in the project area includes Pontchartrain east of the Lake Pontchartrain Causeway, The Rigolets, Lake St. Catherine, Mississippi Sound, and Lake Borgne. Habitat alterations such as those caused by water control structures that limit and prevent spawning, poor water quality, and over-fishing have negatively affected this species.

Pallid sturgeon

The pallid sturgeon is an endangered fish found in Louisiana, in both the Mississippi and Atchafalaya Rivers (with known concentrations in the vicinity of the Old River Control Structure Complex); it is possibly found in the Red River as well. The pallid sturgeon requires large, turbid, free-flowing riverine habitat with rocky or sand substrate. They are usually found on the bottoms of the rivers on sand flats or gravel bars, and apparently prefer areas with strong currents in or near the main channel. It is one of the largest and rarest fish in the Mississippi and Missouri River basins. Pallid sturgeon are opportunistic feeders that eat insects, crustaceans, mollusks, annelids, fish and eggs of other fish. Scant information exists on the range and habitat preferences of pallid sturgeon for this part of the Mississippi River, but it is believed to spawn in Louisiana. Most data are from populations in upper Missouri and other Midwest rivers, and also the Atchafalaya River in Louisiana, however, it is possible that limited numbers of the species also exists in the Red River. Surveys are currently being conducted to determine the presence/absence of this species in the lower reaches of the Mississippi River, including the reach adjacent to the proposed Violet Diversion that is a part of the MRGO Ecosystem Restoration Plan.

Piping plover

Federally listed as a threatened species, the piping plover, as well as its designated critical habitat, occur along the Louisiana coast. Piping plovers winter in Louisiana, and may be present for 8 to 10 months annually. They arrive from the breeding grounds as early as late July and remain until late March or April. Piping plovers feed extensively on intertidal beaches, mudflats, sand flats, algal flats, and wash-over passes with no or very sparse emergent vegetation; they

also require unvegetated or sparsely vegetated areas for roosting. Roosting areas may have debris, detritus, or micro-topographic relief offering refuge to plovers from high winds and cold weather. In most areas, wintering piping plovers are dependent on a mosaic of sites distributed throughout the landscape, because the suitability of a particular site for foraging or roosting is dependant on local weather and tidal conditions. Plovers move among sites as environmental conditions change, and studies have indicated that they generally remain within a 2-mile area. Major threats to this species include the loss and degradation of habitat due to development, disturbance by humans and pets, and predation.

On July 10, 2001, the Service designated critical habitat for wintering piping plovers (Federal Register Volume 66, No. 132). Their designated critical habitat identifies specific areas that are essential to the conservation of the species. The primary constituent elements for piping plover wintering habitat are those habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support those habitat components. Constituent elements are found in geologically dynamic coastal areas that contain intertidal beaches and flats (between annual low tide and annual high tide), and associated dune systems and flats above annual high tide. Important components (or primary constituent elements) of intertidal flats include sand and/or mud flats with no or very sparse emergent vegetation. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting plovers.

West Indian Manatee

Federally listed as an endangered species, West Indian manatees occasionally enter Lakes Pontchartrain and Maurepas, and associated coastal waters and streams during the summer months (i.e., June through September). Manatee occurrences appear to be increasing, and they have been sighted in the Amite, Blind, Tchefuncte, and Tickfaw Rivers, the MRGO, the Inner Harbor Navigation Canal (IHNC) Lock and in canals within the adjacent coastal marshes of Louisiana. Manatees are known to travel long distances up coastal waterways from the Gulf of Mexico. The manatee population has declined in numbers due to collisions with boats and barges, entrapment in flood control structures, poaching, habitat loss, and pollution. Cold weather and outbreaks of red tide may also adversely affect these animals.

Sea turtles

Endangered and threatened sea turtles forage in the nearshore waters, bays and sounds of Louisiana. The National Marine Fisheries Service (NMFS) is responsible for aquatic marine threatened or endangered species. Please contact Eric Hawk (727/824-5312) at the NMFS Regional Office in St. Petersburg, Florida, for information concerning those species in the aquatic environment. When sea turtles leave the aquatic environment and come onshore to nest, however, the Service is responsible for consultation. Accordingly, we recommend that you contact this office if your activities would occur on beach areas during the sea turtle nesting season.

Species of Concern

The Chandeleur Island chain supported the largest brown pelican nesting colonies of the entire Gulf coast from Florida to Texas, and production of young was higher than that of other colonies

due to the high productivity of the surrounding waters. From a high of almost 13,000 nests in the late 1990's, the islands had fewer than 3,000 nesting pairs of brown pelicans in 2009. The same is true for other nesting colonial seabirds. With over 100,000 nesting pair of sandwich and royal terns (the largest colonies in North America) the islands now support less than ¼ of that number.

Colonial nesting birds

The proposed project would be located in an area where colonial nesting waterbirds may be present. Colonies may be present that are not currently listed in the database maintained by the Louisiana Department of Wildlife and Fisheries. That database is updated primarily by monitoring the colony sites that were previously surveyed during the 1980s. Until a new, comprehensive coast-wide survey is conducted to determine the location of newly-established nesting colonies, we recommend that a qualified biologist inspect the proposed work site for the presence of undocumented nesting colonies during the nesting season. To minimize disturbance to colonial containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present). For colonies containing nesting gulls, terns, and/or black skimmers, all activity occurring within 650 feet of a rookery should be restricted to the non-nesting period (i.e., September 16 through April 1, exact dates may vary within this window depending on species present). In addition, we recommend that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests, and should avoid affecting them during the breeding season.

Brown pelican

Brown pelicans were delisted (due to recovery) on December 17, 2009, and are no longer protected under the ESA, but they are still protected by the Migratory Bird Treaty Act (MBTA). Brown pelicans are known to nest on barrier islands and other coastal islands in St. Bernard, Plaquemines, and Jefferson parishes. Brown pelicans may occasionally feed in the shallow estuarine waters found within the project area.

Bald eagle

The project-area forested wetlands may provide nesting habitat for the bald eagle, which has officially been removed from the List of Endangered and Threatened Species as of August 8, 2007. Bald eagles nest in Louisiana from October through mid-May. Eagles typically nest in mature trees (e.g., bald cypress, sycamore, willow, etc.) near fresh to intermediate marshes or open water in the southeastern Parishes. Major threats to this species include habitat alteration, human disturbance, and environmental contaminants (i.e., organochlorine pesticides and lead).

The Service developed the National Bald Eagle Management (NBEM) Guidelines to provide information and recommendations to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the Bald and Golden Eagle Protection Act. A copy of the NBEM Guidelines is available at: http://www.fws.gov/southeast/es/baldeagle/NationalBaldEagleManagementGuidelines.pdf. Those guidelines recommend: (1) maintaining a specified distance between the activity and the nest (buffer area); (2) maintaining natural areas (preferably forested) between the activity and nest trees (landscape buffers); and (3) avoiding certain activities during the breeding season. On-

site personnel should be informed of the possible presence of nesting bald eagles within the project boundary, and should identify, avoid, and immediately report any such nests to this office. If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary. The Division of Migratory Birds for the Southeast Region of the Service (phone: 404/679-7051, e-mail: SEmigratorybirds@fws.gov) has the lead role in conducting such consultations.

EVALUATION METHODOLOGY

Evaluation of project-related impacts on fish and wildlife resources for MRGO Ecosystem Restoration Plan Feasibility Study was conducted using the Wetland Value Assessment (WVA), the ERDC-Boustany model, a water quality model, and the Comprehensive Aquatic Systems Model (CASM) model.

The WVA is used to evaluate proposed Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) projects, and is similar to the Service's HEP, in that habitat quality and quantity (acreage) are measured for baseline conditions, and predicted for future without-project and future with-project conditions. As with HEP, the WVA provides a quantitative estimate of project-related impacts to fish and wildlife resources. Results are annualized over the project life to determine the Average Annual Habitat Units (AAHUs) available for each habitat type. Separate models were used for fresh/intermediate marsh, brackish marsh, saline marsh, ridge habitat, swamp habitat, and barrier islands. The WVA models assess the suitability of each habitat type for providing resting, foraging, breeding, and nursery habitat to a diverse assemblage of fish and wildlife species. Using the WVA methodology, impact assessments were conducted by the Habitat Evaluation Team (HET), which included representatives of the Corps, Office of Coastal Protection and Restoration (OCPR), NMFS, National Resource Conservation Service (NRCS), and the Service.

To determine wetland benefits (net acres) of the Violet diversion for each alternative, an empirical model (ERDC-Boustany model) developed by the Engineering Research and Development Center (ERDC) and Mr. Ron Boustany of the Natural Resources Conservation Service (NRCS) was utilized by the HET. The ERDC-Boustany model estimates the benefits resulting from the introduction of sediments and nutrients into the study area. Model predictions are based on diversion flows into the project area and nutrient and sediment concentrations of the diversion water. The model derives an estimate of the wetland acreage sustained and/or created as a function of nutrients and sediments introduced into the system.

The CASM has been adapted to assess direct and indirect ecological effects of proposed freshwater diversions into Lake Borgne and associated coastal and marine areas that define the MRGO ecosystem. The CASM is a bioenergetics-based ecosystem model that simulates the daily production dynamics (gC/m2) of modeled populations of aquatic plants and animals. The

principal modeling objective was to assess the potential effects of alterations in salinity and other water quality parameters that will result from the proposed freshwater diversions on selected populations of valued ecological resources in the MRGO ecosystem.

The final array under a low relative sea level rise scenario and the TSP under a high, medium, and low relative sea level rise scenario were evaluated by the HET using the WVA. The ERDC-Boustany model was run for each final alternative and TSP and results (wetland acres) utilized in the WVA. Details of the ERDC-Boustany model, WVAs and assumptions for the TSP are available in Appendix B. WVA and assumption information on the final array of alternatives are available for review at the Service's Lafayette, Louisiana, field office.

DESCRIPTION OF TENATIVELY SELECTED PLAN

Description of Feature Types

Marsh Restoration

A hydraulic dredge would be used to discharge slurry (i.e., dredged material) into shallow open water areas and degraded marsh areas. Material would be obtained from study area borrow sites for each feature. Slurry would be discharged to an elevation conducive to the development of wetlands habitat following dewatering and compaction. It is anticipated that the final result of this dredged material placement would be a combination of wetlands, mud flat, and shallow water habitat within the placement site. Following compaction and dewatering, the area would be planted with marsh vegetation appropriate for the site. Material would be allowed to overflow over existing emergent marsh vegetation within the proposed restoration area.

Marsh Nourishment

Marsh nourishment is proposed for areas of degraded marsh, and consists of the placement of a thin layer of dredged material slurry material that would be allowed to overflow over existing emergent marsh vegetation within the proposed disposal area, but would not be allowed to exceed a height of about 1 – 1.5-feet above the existing marsh elevation to facilitate the recruitment and consolidation of marsh vegetation after dewatering. Unlike marsh restoration features, no plantings are associated with marsh nourishment features.

Swamp Restoration

Swamp restoration is proposed in areas that were historically cypress-tupelo swamps and are currently shallow open water. Swamp restoration consists of pumping dredged material from study area borrow areas to a maximum elevation of +4.5 feet (ft) within containment dikes. Swamp restoration areas would be planted with cypress. Swamp restoration features would have a dewatered and settled target elevation approximately +2ft to support cypress habitat.

Swamp Nourishment

Swamp nourishment is proposed for areas that are currently at marsh elevation, and consists of placing a thin layer of dredged material to nourish the area, raise elevation to approximately +2ft, and encourage the recruitment of cypress-tupelo community species. The depth of the layer of dredged material will be determined on a site-by-site basis to adjust for varying topography.

The PDT and HET have identified several critical factors that would need to be considered in the design phase for swamp restoration and nourishment features. These include: the level and timing of inundation, salinity levels in soil and area water bodies, elevation, invasive species and herbivory control, and water quality.

For marsh and swamp creation and nourishment
Retention dikes, deflection dikes, and/or closures may be used to contain material for each feature. Interior low-level earthen weirs also may be constructed within the disposal area to facilitate the deposition of sediments in a manner that would enhance wetlands development. Borrow material for dike/closure/weir construction would be taken from within the disposal area. Earthen dikes/closures would be allowed to degrade naturally. If earthen dikes/closures do not sufficiently degrade to provide fisheries and tidal ingress/egress following appropriate settlement of dredged material placed within the disposal area, earthen dikes/closures would be mechanically breached and/or degraded as necessary.

Access corridors for construction equipment and dredge pipeline are depicted in the plan view for each feature in the Engineering Appendix of the Feasibility Study. Access corridors would be a maximum of approximately 350 feet in width and would cross over wetlands and shallow water as necessary. Access corridors for some features may occur across existing levees and different methods will be utilized to best prevent compromise of the levee while allowing access. The level of protection provided by these levees would be maintained throughout construction, and any damage to levee vegetation would be repaired upon removal of the construction equipment. The construction, or designation, of staging areas may be necessary for construction equipment. Staging areas will be determined on a site-by-site basis to minimize impacts to existing wetlands.

Flotation access channels would be excavated, as needed, in shallow water areas to allow construction equipment to access the project features. If necessary, flotation access channels would be excavated by a mechanical dredge (as depicted on the plan view in the Engineering Appendix of the Feasibility Study). It is estimated that access channels will average approximately -2 feet. Flotation access channel material would be used in dike/closure construction or refurbishment, to backfill flotation access channels, or would be placed adjacent to and behind the dikes and closures in shallow water to a maximum initial elevation conducive to wetlands development following consolidation of the material. Flotation access channel material used to backfill the flotation access channels following completion of disposal work would be temporarily stockpiled on water bottom adjacent to the flotation access channel.

If existing canals are used for access, they may be dredged to facilitate flotation of pipeline and other necessary equipment from the dredging reach as designated in the plan feature to pipeline discharge sites within the designated staging areas. Dredged material removed from existing canals would be placed on adjacent existing levees and/or into shallow water on either side of canals. Canal dredged material placed in shallow water areas would be placed to a height conducive for wetlands development.

Shoreline Protection

These features consist of either foreshore (shoreline between high water and low water) rock dikes or rock dikes placed near the existing shoreline to dissipate wave energy before it reached the shoreline (shown in the plan views in the Engineering Appendix of the Feasibility Study). Foreshore rock dikes would be constructed by placing rock in a linear mound at the -1.5 to -2.0-foot depth contour, to a height above the water's surface. Height will be determined based on existing site conditions. Nearshore (beginning at foreshore and extending to the beginning of the offshore zone) rock dikes would be constructed in places where the bathymetry prohibits a foreshore dike (water deepens too quickly from the shore). Rock used for dike construction would be graded large enough to resist movement during high energy events, such as frontal passages. Shoreline protection features include site-specific, periodic gaps for organism access, navigation, and water exchange, as noted in the plan view for each feature.

Ridge Restoration

A ridge restoration feature is proposed on the south side of Bayou La Loutre. Restoration would consist of the placement of dredged silty sand material to be obtained from the Mississippi River. The initial elevation of the ridge would be approximately +8 feet, with a crown width of 25 feet and 1:8 side slopes. The base width of the ridge would vary, with an average width of approximately 120 feet. A 50-foot access corridor on the south side (marsh side) would be designated for construction equipment. Access along Bayou La Loutre may require excavation to the channel's authorized depth. If excavation is required material excavated for floatation will be placed in the footprint of the proposed ridge restoration work. The ridge would be planted to develop forested habitat as described in the planting plan for this study (see Appendix B, Attachment 8).

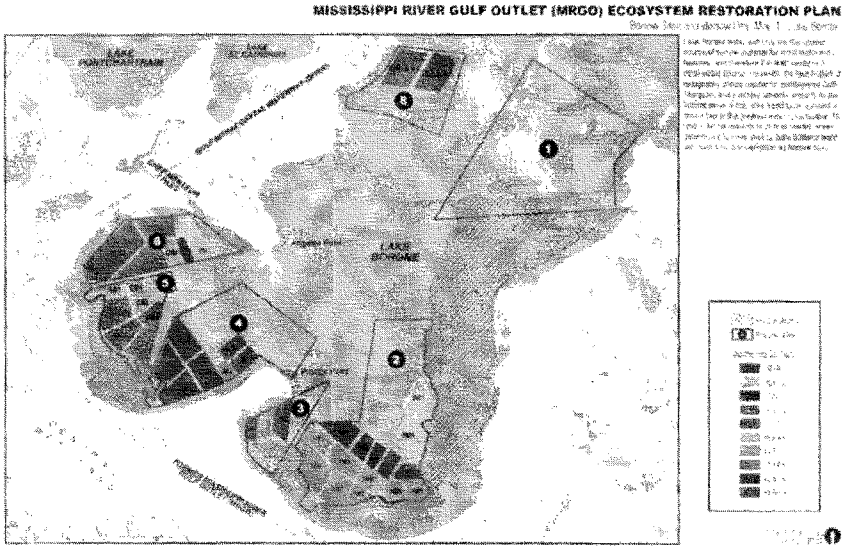
Violet Freshwater Diversion

The Central Wetland feature includes a freshwater diversion at Violet. The diversion will be built to have a maximum discharge of 7,000 cubic feet per second (cfs) depending on Mississippi River water level. In low water periods, the diversion is expected to discharge a minimum of 870 cfs for a total of 1000 cfs being discharged into the Central Wetlands once the Sewer and Water Board discharge is included. The Violet Freshwater Diversion is proposed to extend from the Mississippi River and Tributaries Levee to the 40 Arpent Levee via a controlled conveyance channel. The proposed river diversion channel would flow through the adjacent wetlands to an outfall structure in the Chalmette Loop Levee and discharge into the MRGO. Openings to adjacent channels in the Central Wetlands would provide the freshwater and nutrients required to maintain the restored cypress swamp. The diversion design includes a closure structure at Dupre Cut that is open to shallow draft navigation to better conduct the freshwater via the MRGO. A sediment trap is also proposed as a diversion component to reduce required maintenance and provide Mississippi River sediments for use in restoration projects in the vicinity.

Borrow

A significant amount of sediment (153,000,000 cys) will be required for the proposed features. Borrow areas will be excauvated to a depth of 10 ft with a 5 ft allowable over depth, have sloping edges up to the adjacent water bottoms and will be located at least 1,000 ft from the existing shoreline to reduce wave impacts. Figure 2 illustrates the proposed borrow site for each proposed feature.

Figure 2. Proposed Borrow Sites for the MRGO Ecosystem Restoration Plan.

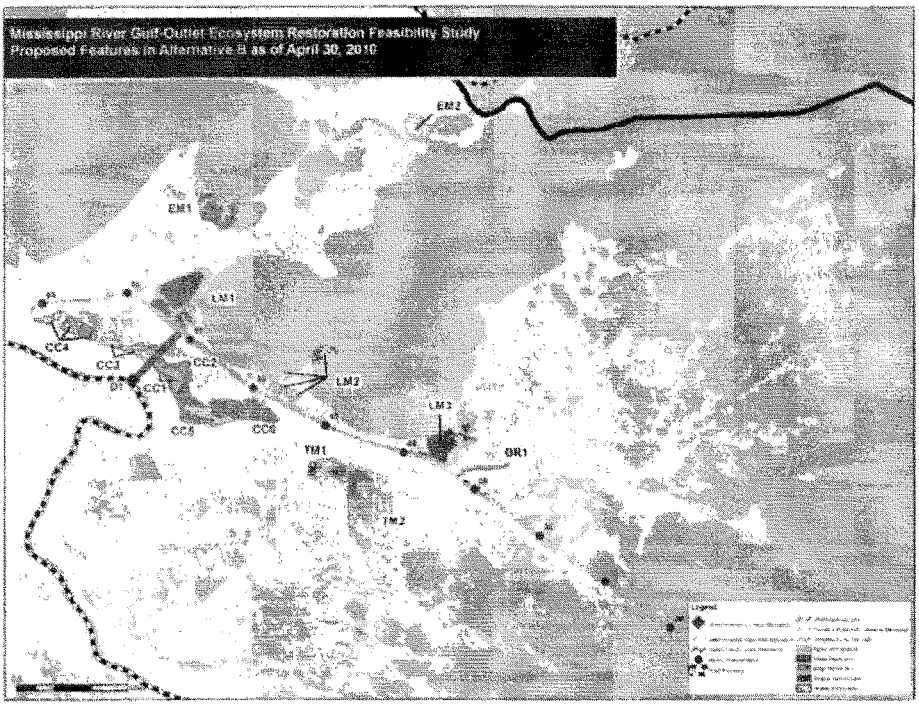


Final Array of Alternatives Considered

Three Best Buy plans (i.e., cost effective) were selected for the final array. Best Buy plans B, C, and D were chosen based on cost effective increments, i.e. where large amount of outputs (i.e., benefits) could be gained for minimal additional cost. All alternative plans in the final array include a freshwater diversion at Violet. These plans represent a wide range of costs and outputs. The alternatives retained for further evaluation build on each successive plan i.e., Plan C includes all of the features in Plan B, and Plan D incorporates all of the features in Plan C. Plan B includes the restoration of all targeted habitat types, but does not fully accomplish the planning objectives. Plan C meets all of the objectives and forms a complete, effective, efficient, and acceptable plan, and therefore has been selected as the Tentatively Selected Plan (TSP). Plan D meets or exceeds all of the restoration objectives and provides a more comprehensive restoration plan for the areas affected by the MRGO and the Lake Borgne ecosystem.

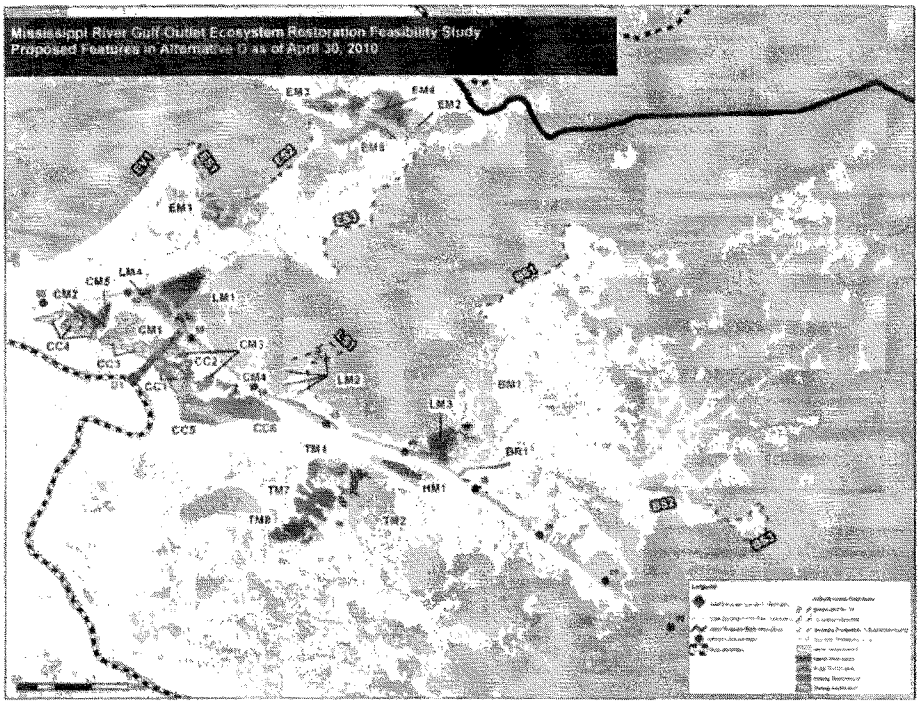
Alternative Plan B would restore approximately 10,431 acres of cypress swamp, 10,473 acres of fresh and intermediate marsh, 10,496 acres of brackish marsh, 0 acres of saline marsh, and 48 acres of ridge habitat (Figure 2). Features in the East Orleans Landbridge, South Lake Borgne, and Terre Aux Boeuf subunits include marsh creation and nourishment. The Central Wetland features include a freshwater diversion at Violet and cypress swamp restoration and nourishment. Features in the Biloxi Marshes consist of restoring part of the existing subsided ridge on the south bank of Bayou La Loutre.

Figure 3. MRGO Ecosystem Restoration, Alternative Plan B Features.



Alternative Plan D would restore approximately 10,431 acres of cypress swamp, 15,028 acres of fresh and intermediate marsh, 3,979 acres of brackish marsh, 699 acres of saline marsh, and 48 acres of ridge habitat (Figure 3). In addition to all of the features described for Plans B and C, Plan D includes additional restoration components in the East Orleans Landbridge, the Biloxi Marsh, and Terre aux Boufs. Plan D also includes restoration features in the Hopedale area, and the most cost-effective features in the MRGO.

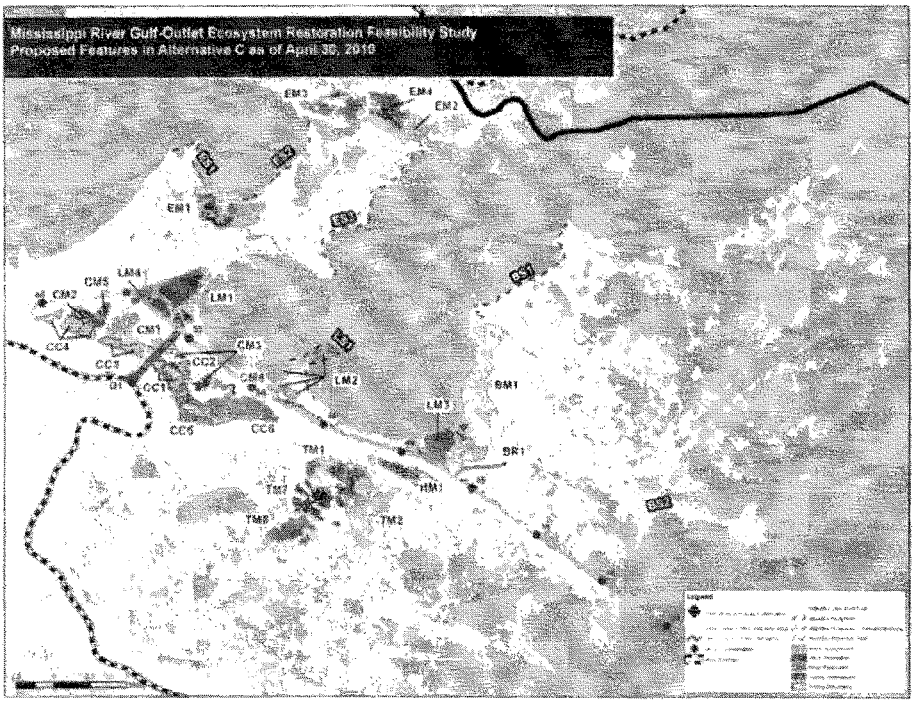
Figure 4. MRGO Ecosystem Restoration, Alternative Plan D Features.



Tentatively Selected Plan (TSP): Plan C

The Tentatively Selected Plan (TSP) would restore approximately 10,431 acres of cypress swamp, 13,890 acres of fresh and intermediate marsh, 33,696 acres of brackish marsh, 466 acres of saline marsh, and 48 acres of ridge habitat. Features in the East Orleans Landbridge and South Lake Borgne subunits include marsh creation and nourishment and shoreline protection. The Terre Aux Boeuf subunits include marsh creation and nourishment. The Central Wetland features include a freshwater diversion at Violet, cypress swamp and marsh restoration and nourishment. Features in the Biloxi Marshes consist of restoring part of the existing subsided ridge on the south bank of Bayou La Loutre, marsh creation and nourishment, and shoreline protection.

Figure 5. MRGO Ecosystem Restoration, Alternative Plan C – Tentatively Selected Plan Features.



Barrier Island Feature

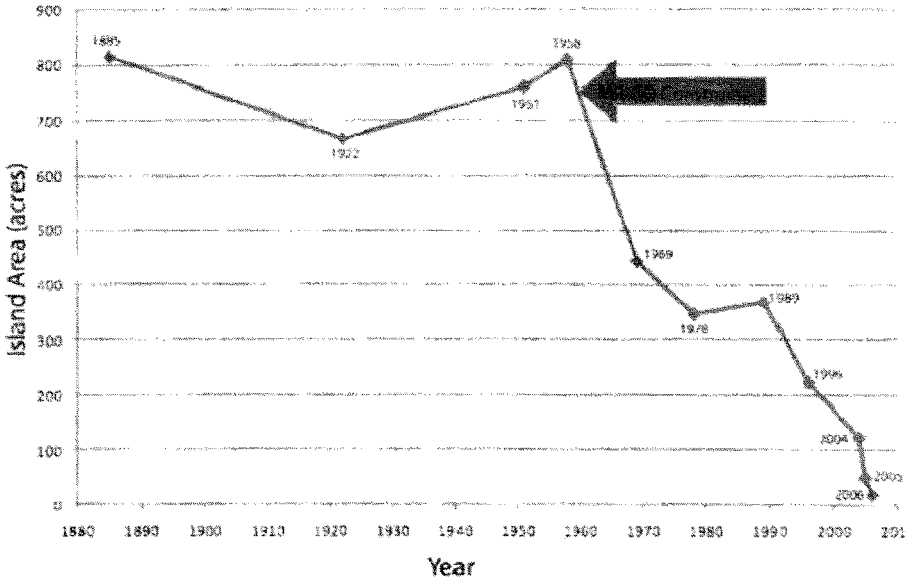
Six barrier island features were evaluated as part of the MRGO Ecosystem Restoration Plan. They included one Chandeleur alternative which faired extremely well in regard to benefits produced as well as cost per benefits. The remaining five alternatives were various designs on Breton Island. Breton Island alternatives one and three performed the best. Breton Island Alternative 1 is the most robust of the two alternatives including a 4-mile long, crescent shaped beach and dune with a 3,700 ft wide back barrier marsh. Breton Island Alternative 3 was developed as the least expensive approach to achieving as many benefits as possible by discharging at a single point to create a 1,000 ft wide, 10 ft high platform at the northern end of the island and allow the island to naturally rework itself. Even though alternatives for the islands were developed and conceptually ready for selection, the Corps choose not to include a barrier island component in the TSP. The reasons given included the need for more engineering investigations to complete feasibility level design prior to finalizing the document and more importantly the Corps position that impacts to Breton Island from the MRGO are difficult to quantify.

Though the Chandeleur alternative had the most benefits, the Service agrees the Chandeleur Islands were most likely not directly or indirectly affected by the MRGO. Conversely, the

Service believes that although barrier islands have many factors contributing to their reduction in area, that there were impacts to Breton Island from the MRGO.

Breton Island does not follow the same trends in island area change exhibited by Curlew and Grand Gosier Islands to the north. The difference is attributed to the construction of the MRGO outer bar channel for navigation purposes (Lavoie, D, ed., 2009). The MRGO intersects the Chandeleur Islands just north of Breton Island and was cut through the existing tidal inlet of Breton Island Pass. Deepened ship channels facilitated sand loss from littoral drift to offshore seafloor areas (Morton, R. A. 2008). Prior to construction of the MRGO, sand that was transported alongshore could bypass this inlet via the ebb tide delta, nourishing the flanking barrier islands (Thomson et al., 2009 and Thomson et al., 2010). As reported in the 2003 ODMDS report, "Sediment accumulation should increase with increasing channel depth until it becomes so deep that the channel traps all sediment crossing the inlet" (USACE 2003). The MRGO required frequent maintenance dredging to remove sand, which was placed in the Ocean Dredged Material Disposal Site (ODMDS), before being deauthorized in 2008. However, in 1992 and beyond, dredged material was occasionally used beneficially to enhance Breton Island. Strong tidal currents flow through MRGO because it is a major conduit for tidal exchange for much of the Lake Pontchartrain Basin. The increased tidal prism and strong ebb tide currents result in the seaward transport of sand to now distant ebb tide shoals that prevent sand from nourishing Breton Island (Thomson et al., 2009). As a result, Breton Island has undergone accelerated land loss due to the MRGO channel interrupting the natural sediment bypassing pathway, by removal of sediment through flushing action of the increased tidal prism, and by maintenance dredging of the MRGO channel, all of which remove sediments from the littoral system (Lavoie, D, ed., 2009; Thomson et al., 2009). These processes prohibit Breton Island from recovering from storms in a similar manner to the islands north of the MRGO and have resulted in a long-term reduction in the Breton Island area (Lavoie, D, ed., 2009). Further indirect evidence of these detrimental processes is provided by the restoration efforts that used dredged material from the MRGO. Some of the material removed from the MRGO was placed in a feeder berm that was most likely in closer proximity to the pre-MRGO ebb tide delta location that the more distal ODMDS. Material placed in the feeder berms eventually accreted to the island (Penland and Westphal 1996). Figure 6 shows the historic acreage of the islands from 1885 through 2006. This figure highlights that significant decreases in island acreage occurred immediately after the construction of the MRGO (Thomson et al., 2009).

Figure 6. Breton Island area change through time showing the impact of MRGO construction and maintenance dredging (Thomson et al., 2009).



Similar responses to navigation channels bisecting island chains are seen in other parts of coastal Louisiana and along the east coast. On the eastern side of Louisiana and western Mississippi, it is reported that deepened ship channels facilitate sand loss from littoral drift to offshore seafloor areas (Otvos & Carter, 2008). Specific to Louisiana, the evaluation of the deepening of the Houma Navigation Channel at Cat Island Pass, Rosati (2007) reported that a deeper channel will intercept sand presently bypassing the channel and will increase shoaling resulting in an approximately 15% increase in maintenance dredging. As a result, the study recommended sediment dredged from Cat Island Past should be placed on East Island, downdrift of the channel to renourish the island that would otherwise loose sediment as a result of the deeper channel.

Breton Island is a National Wildlife Refuge, managed by the Service and is of national importance. Until recently (Lavoie, D, ed., 2009; Thomson et al., 2009) the Service was unaware of the long-term impacts to this important refuge as a result of the MRGO channel. However, the Service believes the connection between the areal loss of Breton Island and the MRGO channel has been proved and should be appropriately addressed in the TSP of the MRGO Ecosystem Restoration Plan. The importance of Breton Island is clear not only as America's second oldest Refuge (established in 1904) but also as the island provides tremendous benefits to nesting colonial seabirds, including the largest sandwich and royal terns colonies in North America, wintering migratory birds, wintering piping plover critical habitat, and other shorebird habitat. Restoration of this island habitat will have benefits on a scale that cannot be realized anywhere else on the coast. Without restoration of the island, a great loss of habitat would occur with the islands disappearance.

PROJECT IMPACTS

The same features were evaluated looking at three different relative sea level rise scenarios (see Appendix B for more details) as reported in Table 2. For the purposes of discussion, the medium rate will be reported.

The TSP would initially restore and/or protect approximately 10,431 acres of cypress swamp, 13,890 acres of fresh and intermediate marsh, 33,696 acres of brackish marsh, 466 acres of saline marsh, and 48 acres of ridge habitat. The implementation of the TSP is anticipated to restore unique habitats, significant ecosystem functions, structure, and dynamic processes through a comprehensive systems-based approach. Construction of a 7,000 cfs (maximum flow) diversion at Violet, marsh creation and nourishment, swamp creation and nourishment, shoreline protection, and ridge restoration features would have 15,628 AAHUs and 20,767 net acres at the end of 50 years based on a medium relative sea level rise scenario (Table 2).

Table 2. Potential Estimated Impacts (AAHU and Net Acres at 50 years) for the Tentatively Selected Plan for the MRGO Ecosystem Restoration Project for Low, Medium, and High Relative Sea level Rise Scenarios.

	LOW RSLR		MEDIUM RSLR		HIGH RSLR	
Feature	AAHU	Net Acres	AAHU	Net Acres	AAHU	Net Acres
Inner Biloxi marsh	2,412	2,809	2,324	2,220	1,739	0
Bayou La Loutre outer SP	29	49	23	48	4	0
Bayou La Loutre ridge	10	14	15	25	27	48
Central Wetlands marsh	2,340	6,478	1,693	4,785	733	0
Central Wetlands swamp	5,201	3,793	5,511	4,914	4,686	7,340
Diversion footprint impacts	-220	-325	-192	-224	-88	0
MRGO	10	95	5	75	3	0
East Orleans Landbridge	1,428	819	1,030	642	955	0
Lower Pearl River	851	1,056	764	905	364	0
Lower Lake Borgne marsh	2,882	6,326	2,467	5,031	546	0
Hopedale	186	244	154	181	75	0
Inner Terre Aux Boufs	2,168	2,937	1,834	2,165	674	0
TOTAL	17,298	24,295	15,628	20,767	9,717	7,388

Construction of several features would have an initial negative impact on existing wetland vegetation, primarily through the excavation of the diversion outfall channel, placement of

excavated material on existing marsh to create ridge and swamp, and freshwater inputs from the diversion that would convert existing brackish marsh to intermediate marsh. According to the WVA, the TSP would result in the direct and indirect loss of 12,430 acres (13,460 AAHUs) at the end of 50 years, of brackish marsh habitats due to the channel excavation, swamp creation, and conversion to fresher habitat and saline marsh due to ridge restoration (Table 3). However, the placement of excavated material for swamp and ridge restoration and the conversion to fresher wetlands will provide a base for the regeneration of approximately 27,036 acres (22,959 AAHUs) of bottomland hardwood and wetland vegetation (Table 4) and a net increase of 20,767 acres (15,628 AAHUs, Table 2).

Table 3. Negative Impacts to wetlands due to Habitat Switching.

	LOW RSLR		MEDIUM RSLR		HIGH RSLR	
Feature	AAHU	Net Acres	AAHU	Net Acres	AAHU	Net Acres
Diversion footprint Impacts	-220	-325	-192	-224	-88	0
Brackish to Swamp	-2,373	-3,547	-2,064	-2,426	-1,124	0
Saline to Ridge	-27	-34	-22	-23	-9	0
Brackish to Intermediate	-13,877	-19,970	-11,183	-9,757	-6,360	0
TOTAL	**-16,497**	**-23,876**	**-13,460**	**-12,430**	**-7,582**	**0**

Table 4. Positive Impacts to wetlands due to Habitat Switching.

	LOW RSLR		MEDIUM RSLR		HIGH RSLR	
Feature	AAHU	Net Acres	AAHU	Net Acres	AAHU	Net Acres
Brackish to Swamp	7,575	7,340	7,575	7,340	5,810	7,340
Saline to Ridge	37	48	37	48	36	48
Brackish to Intermediate	19,109	32,869	15,347	19,648	7,642	0
TOTAL	**26,721**	**40,257**	**22,959**	**27,036**	**13,488**	**7,388**

A freshwater diversion is necessary to achieve habitat objectives adopted for this study and enhance surrounding wetlands. The forecast future without project salinity conditions suggest that salinities in the study area will be reduced by the closures on the MRGO and other authorized projects. However, additional freshwater, sediment (fines), and nutrient inputs will enhance many of the nearby wetland habitats.

The diversion was originally conceived to meet habitat objectives for the Lake Borgne ecosystem, including cypress swamp in the Central Wetlands, intermediate marsh in the lower Lake Borgne marshes, and enhancing other surrounding marshes, as well as achieving desirable habitat conditions of the Mississippi Sound and the upper Biloxi marshes. Habitat salinity targets that would be favorable to oysters were used as an indication of the health of the Mississippi Sound and the upper Biloxi marshes. The HET agreed that the established salinity targets based on the Chatry line originally proposed for the Bonnet Carre Freshwater Diversion and then for the Violet Diversion (in WRDA 2006) was an appropriate indicator of the health of that ecosystem. However, based on hydrologic modeling results that incorporated the MRGO closure the target salinities are met, or exceeded, for all but one month (May) of the year and in

that month there was only a 1part per thousand (ppt) difference. The HET agreed that meeting the Chatry salinity line in May was not crucial to the health of that ecosystem. In addition, there is a concern that the required high pulse (i.e., increased) flow in April and/or May to meet the Chatry target might have an over freshening effect on the estuarine fisheries in the Lake Borgne ecosystem and possibly the Mississippi Sound and the upper Biloxi marshes. It was agreed by the HET that a diversion capable of flowing up to 7,000 cfs provides the flexibility necessary to achieve the habitat objectives throughout the Lake Borgne ecosystem, however, the goal is no longer to achieve all the monthly (i.e., May) Chatry salinity targets in the upper Biloxi marshes. Under this scenario, a range of high flows can help control/eliminate salinity spikes as needed while not requiring the diversion to have a high pulse flow in April and/or May each year, unless needed. It is expected that through the associated Adaptive Management and Monitoring Plan, the diversion operation plan will be refined to achieve optimal habitat benefits of the Central Wetlands and the Lake Borgne ecosystem and surrounding marsh.

Though the actual operation may be somewhat different, the diversion was modeled at the original maximum proposed flows which show the full capability of the diversion. Specifically, the diversion was modeled to operate at a constant flow of 870 cfs, with a pulsing of 7,000 cfs during April and/or May. A combined 1,000 cfs was modeled to flow through the Central Wetlands and during the pulse while the remaining 6000 cfs will flow directly out of the Central Wetlands into the Lake Borgne/Biloxi Marsh ecosystem. It should be noted that wetland benefits analysis incorporated this operation scheme and will have to be adjusted once further refinement of the operation is developed. The Violet Diversion is designed so that management of the estimated base flow of 1,000 cfs can provide conditions favorable to bald cypress germination, growth, and reproduction by controlling depth and duration of inundation and salinity levels. In addition, an estimated 7,000 cfs diversion rate to achieve the earlier proposed salinity levels in May in the Biloxi marsh target area was modeled. The management of the diversion control structures will allow maintenance of favorable conditions for forested wetlands of the Central Wetlands as well as enhancing the habitat of the lower Lake Borgne marshes and parts of the East Orleans Landbridge and Biloxi marshes (see Appendix B – WVA Assumptions for more detail on the diversion operation).

Operation of the maximum 7,000 cfs diversion alternative would provide an inflow of fresh water, sediments, and nutrients to the project area and support the re-establishment and nourishment of wetland vegetation in the project area. It is anticipated that the Central Wetlands currently classified as brackish marsh would be converted to swamp and fresh marsh and the brackish marsh of lower Lake Borgne would convert to intermediate marsh following the start of the diversion operation. A gain in wetlands of the Central Wetlands area is expected while other area wetlands influenced by the diversion (East Orleans Landbridge, Lake Borgne marshes, and the inner Biloxi marshes) will become more sustainable.

Additionally, the ERDC-Boustany model land loss calculations conducted in support of the WVA for the 7,000 cfs diversion, including all features constructed with in the diversion influence area, projected that the TSP would produce an overall gain, in fresh/intermediate, brackish, and saline marsh, swamp, and ridge habitat of approximately 17,592 acres and 13,025 AAHUs 50 years after project implementation (Table 2).

Wildlife Resources

Construction of the project features may disrupt or displace wildlife in the immediate vicinity. However, the long-term impact of construction is expected to be beneficial to overall habitat quality. By the proposed diversion having a potential pulse as needed, the salinity gradient of the Lake Borgne and Biloxi marsh estuary is maintained while sustaining and enhancing existing marsh in the study area. Because ridge and swamp habitat are considered to be a limiting factor for migrating birds, the creation of these habitats are considered an essential restoration need of the project area. The TSP will have a positive effect on wildlife resources by increasing unique critical habitat that will be utilized by wildlife species.

Currently the TSP does not include a barrier island component. If a barrier island feature was included it would increase the sustainability of the barrier island; help restore the geomorphic function of the barrier island thus restoring the hydrologic benefits of the islands to the basin; and create and restore shoreline and island habitat. By restoring the barrier island, the vital seagrass bed habitat would be enhanced and maintained for sea turtles, manatee, and wintering migratory waterfowl in the northern Gulf of Mexico. The restored island would greatly benefit nesting colonial seabirds, especially brown pelican and sandwich and royal terns nesting colonies, piping plover and other shorebirds. Restoration of these island habitats will have benefits on a scale that cannot be realized anywhere else on the coast. Without a barrier island component many of these benefits to wildlife may be lost.

Overall, the TSP would result in improved habitat conditions for several species of wildlife including migratory and resident waterfowl, shorebirds, wading birds, and furbearers. Migratory waterfowl utilizing the project area would benefit from a greater food supply resulting from the increased abundance and diversity of emergent, submerged, and floating-leaved species. Enhanced marsh and marsh edge would provide increased foraging opportunities for shorebirds and wading birds. Small fishes and crustaceans are often found in greater densities along vegetated marsh edge (Castellanos and Rozas 2001, Rozas and Minello 2001), and many of those species are important prey items for wading birds such as the great blue heron, little blue heron, great egret, black-crowned night-heron, and snowy egret. Furbearers (such as muskrat) which feed on vegetation would benefit from the increased marsh acreage in the project area. Representative furbearers such as the mink, river otter, and raccoon have a diverse diet and feed on many different species of fishes and crustaceans. Those species often feed along vegetated shorelines which provide cover for many of their prey species.

Fisheries Resources

There would be negative impacts to fisheries resulting from swamp, ridge, and diversion construction as the existing marsh (2,673 acres) is lost to those new habitats (Table 3). There would be positive impacts to fisheries habitat from marsh creation as marsh edge is restored, nourished, and protected. The shoreline protection features of the TSP will provide additional fisheries habitats for estuarine fish. If a barrier island feature was part of the TSP, it would have a positive effect on fish resources by reestablish a barrier between a deteriorating estuarine ecosystem and the Gulf of Mexico thereby increasing unique and essential habitat that will be utilized by various fisheries species. The seagrass beds associated with the barrier island feature would enhance that rapidly declining vital habitat for juvenile aquatic species. Without the

barrier island component these benefits may be lost.

The potential impact of the TSP proposed borrow sites on water quality, specifically in regards to low dissolved oxygen and anaerobic or anoxic conditions is a significant concern to the Service. To help reduce the potential for anoxic conditions to occur, the borrow sites are proposed to be dredged to approximately -10 ft with 5 ft of allowable over depth and sloping edges up to the adjacent water bottoms and will be located at least 1,000 ft from the existing shoreline to reduce wave impacts. Because borrow material is primarily designated to be excavated from Lake Borgne (see Figure 2), a large portion of the lake will be affected in both the alteration in water bottom substrate habitat as well as, the increased potential of change in the flushing ability that otherwise would prevent anerobic conditions from occurring.

Anerobic conditions in dredge holes can severely limit species diversity and often eliminate all benthic organisms except certain bacteria that can tolerate those conditions (Taylor and Saloman 1968, in: USFWS undated; Sullivan and Hancock 1973, in: USFWS 1977). While some species of fish are attracted to the holes during certain times of the year when water quality improves, they must evacuate those areas when severe oxygen stress forces them to either leave or die (USFWS undated). Evacuation of study areas may occur in the late spring or summer when low oxygen levels are most likely to occur (Kinne 1963, in: USFWS undated).

Because a very large quantity of dredged material will be needed to create approximately 10,430 acres of cypress swamp, 13,898 acres of fresh and intermediate marsh, 26,067 acres of brackish marsh, 10,588 acres of saline marsh, and 50 acres of ridge habitat, careful consideration should be given to the borrow site design. Though borrow sites are proposed to be dredged to shallow depths to avoid creating anoxic sumps, the need for excavating material over more surface area is necessary to collect the needed quantity of material. By dredging over a larger surface area, potential complications may include: 1) alteration in water bottom substrate habitat: 2) more benthos may be directly removed, which may (at least temporarily) reduce food availability for fishery organisms; 3) other sessile resources, such as oysters could be affected; and 4) by continually moving the dredge, the resuspended sediments will take longer to settle and could prolong the periods of high turbidity associated with dredging operations.

Recovery (both in terms of organisms and re-filling with sediment) of these borrow sites appears to be a function of the original depth and other local factors. Several scientific studies indicate that recovery may take from 6 to 10 years in relatively shallow holes (e.g. 6 feet below natural bottom) or, as is more frequently reported, much longer in the deeper holes (USFWS undated).

Implementation of the TSP following the operational plan evaluated in the hydraulic modeling, CASM, and WVA (i.e., 7,000 cfs flow in April and May; 870 cfs rest of year) is expected to freshen much of project area including the Central Wetlands, lower Lake Borgne marshes, part of the inner Biloxi marshes, and some of the East Orleans Landbridge while the diversion is at full flow and for several weeks after the return to maintenance flow. The overall effect of the diversion is that it is expected to decrease salinities spikes throughout the project area and convert the brackish marsh of the Central Wetlands to fresh marsh and swamp and the brackish marsh of the lower Lake Borgne marshes to intermediate marsh. Water levels, velocities, and turbidity in outfall areas are all expected to increase during full flow conditions. Entrainment of

eggs, larvae or fry of Mississippi River fish species in the immediate vicinity of the diversion inflow may occur during operation of the structure.

High nutrient levels could result in blooms of algae and phytoplankton, and subsequent decomposition of these organisms could decrease dissolved oxygen levels of water bodies within the project area. These changes could result in localized adverse impacts to estuarine fishery productivity, particularly when the diversion is at full flow.

Freshwater fishery species especially in the Central Wetlands, such as crawfish, crappie, bluegill, redear sunfish, warmouth, channel catfish, and blue catfish, largemouth bass, yellow bullhead, freshwater drum, bowfin, carp, buffaloes, and gars should benefit from implementation of the diversion. Some fishery species would be impacted by anticipated decreases in salinity and water temperature, and increased turbidity during maximum flow periods. Less freshwater tolerant species, such as brown shrimp and spotted seatrout, may be displaced from the Central Wetlands portion of the project area. In fact, modeling results show that running the Violet Diversion at maximum flow of 7,000 cfs in the Central Wetlands may negate tidal input to the area limiting aquatic organism access to the marshes.

CASM modeling results are preliminary due to some incorrect assumptions incorporated into the model but those are being corrected in consultation with NMFS and LDWF. Once completed, information will be provided in this section to discuss the impacts of the freshwater diversion on representative fishery species. In addition to modeling changes in salinity and water quality, the model has the capability to measure changes in dissolved oxygen levels. Once the modeling results are received, they will be used to measure the potential impacts from low dissolved oxygn levels on fisheries resources in Lake Borgne.

By implementing an operational plan to enhance surrounding wetlands, estuarine-dependent fisheries may be enhanced by reducing high salinity spikes (without over-freshening), increasing organic production, increasing biological productivity and improving fisheries habitat. The introduction of freshwater to the project area would ensure that the project area continues to provide important nursery functions beyond the 50-year project life. However some estuarine species may be displaced. Oysters may benefit from the diversion during normal base flow years depending on environmental conditions but over freshening would occur during high pulse years. The over freshening that would occur during the high pulse years in oyster habitat within Lake Borgne has the potential to cause oyster mortality.

Historically, salinity appears to be the chief controlling factor in the number of plankton species present, while temperature, competition, and predation control the numbers of individuals present (Day et al., 1989). Therefore, introduction of large amounts of river water (pulsing) into estuarine systems may have dramatic short-term impacts on plankton populations in adjacent coastal waters (Hawes and Perry 1978). Freshwater inflow is an important component of circulation and flushing processes in estuaries that assist in the transportation of planktonic organisms, nutrients, and detritus to the Gulf of Mexico. Over the long term, operation of the diversion is expected to help support the aquatic food web of marine fishery species.

Essential Fish Habitat

There would be negative impacts to EFH resulting from swamp, ridge, and diversion construction as the existing marsh (2,673 acres) is lost to those new habitats (Table 3). Direct impacts of swamp, ridge, and diversion construction would disturb and displace managed species in the construction footprint. Changes to the salinity levels and temperatures due to the diversion flows into the southern part of Lake Borgne may have potential impacts to the identified EFH species in Lake Borgne. Marsh creation would result in the loss of mud bottom and estuarine water column as emergent marsh would replace those habitat types. If the TSP had a barrier island component, it would have a positive effect on EFH resources by increasing the essential habitats of the barrier island and associated seagrass beds. The diversion may reduce fishery use of the Central Wetlands as tidal exchange is diminished by diversion flows. Although adverse impacts would occur to some types of EFH, overall more productive types of EFH (i.e., estuarine emergent wetlands) would be created and enhanced with the diversion and marsh creation features. The input of freshwater, sediments, and nutrients are expected to benefit estuarine EFH within the project area. The TSP is projected to increase SAV in the project area and decrease emergent marsh loss across all marsh zones (fresh/intermediate, brackish, and saline). These changes in the project area would not only increase the aerial extent of EFH, but would also improve the quality of EFH for several managed species.

As discussed in greater detail in the above Fisheries Resources section, the large quantity (153,000,000 cys) of borrow material proposed to be taken from Lake Borgne for the TSP may have an adverse effect to species designated under EFH by presenting the potential for low dissolved oxygen or anaerobic conditions to occur, altering water bottom substrate, and by directly affecting more benthos, which may (at least temporarily) reduce food availability for EFH.

Threatened and Endangered Species and Species of Concern

Habitat alterations and poor water quality are two of the known impacts to have negatively affected the Gulf sturgeon. One of the primary constituent elements for Gulf sturgeon critical habitat is water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages. The large quantity of proposed borrow excavation in Lake Borgne and high diversion flows through Gulf sturgeon critical habitat may be a concern for this species by altering a potential habitat alteration, by increasing the potential of poor water quality as a result of numerous borrow holes, and by decreased water temperatures as a result of high flows from the cooler Mississippi River through the proposed diversion. In riverine waters, the Service is responsible for all consultations regarding Gulf sturgeon and critical habitat, while in marine waters the NMFS is responsible for consultation. Therefore, please contact Dr. Stephania Bolden (727/824-5312) in St. Petersburg, Florida, for information concerning that species and its critical habitat. Should the proposed project directly or indirectly affect the Gulf sturgeon or its critical habitat in Louisiana, further consultation with that office will be necessary.

Entrainment issues of the pallid sturgeon through diversion structures off the Mississippi River is a potential effect that should be addressed in future planning studies and/or in analyzing current project effects. Should the proposed project directly or indirectly affect the pallid sturgeon or its habitat, further consultation with this office will be necessary. Possible entrainment of pallid

sturgeon in the Mississippi River in the immediate vicinity of the diversion inflow may occur during operation of the structure.

The study area encompasses piping plover Critical Habitat Unit LA–7 which includes, at the time of designation, 3,116 ha (7,700 ac) of the Breton, Grand Gosier, and Curlew Islands and the Chandeleur Island chain in Plaquemines and St. Bernard parishes. Those islands are part of the Breton National Wildlife Refuge or are state owned. The entire islands where primary constituent elements occur to mean low low water (MLLW) are included in this unit. Should the proposed project directly or indirectly affect the piping plover or its critical habitat, further consultation with this office will be necessary.

Colonies nesting birds maybe present in the outer Biloxi marshes, on Bayou Savage NWR, on the barrier islands and new nesting colonies may have been established in the project area since the 1980 surveys. Brown pelicans are known to nest on barrier islands and other coastal islands in St. Bernard Parish. Bald eagle are known to occur within the study area north of Violet, north of the Rigolets, and near the Central Wetlands area. Other unknown nest sites may potentially exist in the project area as well.

The Corps is responsible for determining whether the proposed plan is likely (or not likely) to adversely affect any listed species and/or critical habitat, and for requesting the Service's concurrence with that determination. If the Corps determines, and the Service concurs, that the selected alternative is likely to adversely affect listed species and/or critical habitat, a request for formal consultation in accordance with Section 7 of the ESA should be submitted to the Service. That request should also include the Corps' rationale supporting their determination. If project construction has not been initiated within 1 year of the Corps determination and the Service's concurrence, follow-up consultation should be accomplished prior to making expenditures for construction. If the scope or location of the proposed work is changed, consultation should be reinitiated as soon as such changes are made.

FISH AND WILDLIFE CONSERVATION MEASURES

Coastal wetlands are considered by the Service to be aquatic resources of national importance due to their increasing scarcity and high habitat value for fish and wildlife within Federal trusteeship (i.e., migratory waterfowl, wading birds, other migratory birds, threatened and endangered species, and inter-jurisdictional fisheries). Because of the Services' close coordination with the Corps on this project, and because the project is expected to have an overall benefit to the wetlands of the MRGO Ecosystem Restoration Project Area, the Service has no conservation measures to offer at this time.

SERVICE POSITIONS AND RECOMMENDATIONS

The TSP will benefit the fish and wildlife resources of the MRGO Ecosystem Restoration area by providing freshwater, nutrients, and sediments, and restoring ridge, swamp and marsh habitats in the study area thus facilitating increasing organic production, increasing biological

productivity, increasing habitat diversity, and reducing wetland loss. Approximately 15,628 AAHUS and 20,767 net acres of fresh/intermediate, brackish, and saline marsh, swamp and ridge habitats would benefit by the proposed project at the end of the project life given a medium sea level rise scenario. The Service supports implementation of the TSP provided the following fish and wildlife recommendations are implemented concurrently with project implementation:

1. The Service recommends, with support from NMFS and LDWF, the selection of a barrier island component of the MRGO Ecosystem Restoration Plan be a part of the TSP. The Service feels the design and evaluation of the barrier island alternatives was sufficient to warrant selection, though further engineering would be required prior to construction. Breton Island is a National Wildlife Refuge (NWR), managed by the Service and is of National importance. Until recently (**Lavoie, D, ed., 2009;** Thomson et al., 2009) the Service was unaware of the long-term impacts to this important refuge as a result of the MRGO channel. However, the Service believes restoration of the areal loss of Breton Island due to the construction and maintenance of the MRGO channel should be appropriately addressed in the TSP .

2. The Corps should contact the Service regarding a compatibility determination, Wilderness Act provisions and special use permits that may be necessary to conduct activities on Breton Island NWR. The Corps should establish and continue coordination with the Service until construction of any project feature is complete and prior to any subsequent maintenance. Points of contacts for the Service are: Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Jack Bohannan (985) 822-2000, Refuge Manager for the Breton Island NWR.

3. The Service recommends the operational plans for the Violet Diversion be evaluated to include more flexibility of flow (flows between 1000cfs and 7000cfs) to achieve optimal habitat conditions favorable to nearby intermediate marsh and to bald cypress germination, growth, and reproduction by controlling depth and duration of inundation and salinity levels. As the operational plan for the Violet Diversion is further developed, future hydrological and fisheries (i.e., CASM) modeling, and updated habitat assessments (i.e., Wetland Value Assessements) should be conducted.

4. The Service recommends, with support from LDWF, the diversion operational plan be developed in a way to avoid or minimize adverse impacts to marine fisheries and Essential Fish Habitat (EFH) while maximizing freshwater and nutrient input to the extent practicable to meet habitat objectives.

5. The Service recommends the diversion be adaptively managed to enhance surrounding wetlands, that habitat switching (as a result of re-introduced river water) is allowed to occur in a manner that is not detrimental or destructive to the ecological processes, and that the diversion allows for draw down periods sufficient for cypress regeneration and cypress growth.

6. The Service recommends, with support from LDWF, a comprehensive examination of the

river and all existing and proposed diversions to coordinate their operation and ensure that their operation will maximize their restoration capabilities. The ongoing Mississippi River Hydrodynamic and Delta Management Study should be utilized to address this issue. The Service and other natural resource agencies should be involved in this study.

7. The Service recommends, with support from LDWF, establishment of a committee similar to the Caernarvon Interagency Advisory Committee or Davis Pond Advisory Committee to review the operation and the monitoring and adaptive management results of the Violet diversion and when necessary, provide recommendations regarding any future operational and maintenance changes. The Service and other natural resource agencies should be on this committee.

8. The Service recommends that all shoreline protection features include one fish dip every 1,000 feet (ft) constructed to a 25 ft bottom width to the pre-project elevation. On a case by case basis the 1,000 ft distance can be adjusted, in consultation with National Marie Fisheries Service (NMFS), to incorporate existing exchange points.

9. The Monitoring and Adaptive Management Plan, as it is further developed, should be provided to the Service, NMFS, and Louisiana Department of Wildlife and Fisheries (LDWF) for continued review, comment, and input.

10. If a proposed project feature is changed significantly or is not implemented within one year of the Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with the Service and NMFS to ensure that the proposed project would not adversely affect any Federally listed threatened or endangered species or their habitat.

11. Avoid adverse impacts to nesting bald eagles, gulls, terns, and/or black skimmers, wading birds, and brown pelicans through the careful design of project features and timing of construction. A qualified biologist should inspect the proposed work area for the presence of undocumented nesting colonies and bald eagles during the nesting season (i.e., September 15 through March 31 for brown pelican, September 1 through February 15 for wading bird nesting colonies, September 16 through April 1 for colonies containing nesting gulls, terns, and/or black skimmers, and October through mid-May for bald eagles).
    - To minimize disturbance to colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present).
    - For colonies containing nesting brown pelicans, all activity occurring within 2,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 15 through March 31). Nesting periods vary considerably among Louisiana's brown pelican colonies, however, so it is possible that this activity window could be altered based upon the dynamics of the individual colony.
    - For colonies containing nesting gulls, terns, and/or black skimmers, all activity

occurring within 650 feet of a rookery should be restricted to the non-nesting period (i.e., September 16 through April 1, exact dates may vary within this window depending on species present).

- If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary and those results should be forwarded to this office.

12. Land clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

13. Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service and other State and Federal natural resource agencies, and shall be provided an opportunity to review and submit recommendations on all work addressed in those reports.

14. A report documenting the status of implementation, maintenance, and adaptive management measures should be prepared every three years by the managing agency and provided to the Corps, the Service, NMFS, U.S. Environmental Protection Agency (EPA), Louisiana Department of Natural Resources (LDNR), Office of Coastal Protection and Restoration (OCPR), and LDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

15. The Service recommends minimizing impacts to marsh from marsh buggy activities. One way is to limit repetitive use of the same marsh buggy route to prevent ruts and lasting damage while at the same time reducing the amount of marsh buggy tracts as much as possible. Another option is to build temporary boardwalks over marsh where feasible and then backfilling the boardwalk area if needed. In areas with large marsh creation features that have minimal access routes, such as the inner Terre Aux Bouef marsh features, the Service recommends that work begin at the farthest location and proceed to the outer edges of the site to minimize the amount of damage.

16. The large quantity of borrow material proposed to be taken from Lake Borgne for the TSP may have an adverse effect to fisheries, EFH, and the threatened Gulf sturgeon by: 1) alteration in water bottom substrate habitat: 2) direct removal of benthos from a large area which may (at least temporarily) reduces food availability for fishery organisms; 3) other sessile resources, such as oysters could be affected; and 4) by continually moving the dredge, the resuspended sediments will take longer to settle and could prolong the periods of high turbidity associated with dredging operations. The Service recommends, with support from LDWF, careful consideration be given to the affects of taking all borrow from Lake Borgne and consideration should be give to obtaining borrow from other "outside" sources, such as the Mississippi River, and adjacent bays, and offshore

areas.

17. The proposed borrow areas in Lake Borgne do include private leases as well as public oyster seed grounds. LDWF manages the public seed grounds and should be consulted before final borrow locations are determined. LDWF also recommends that all borrow sites be less than 10 feet below the existing sediment surface and 1000 feet from the shoreline.

18. The aquatic modeling, Comprehensive Aquatic Systems Model (CASM) used to help evaluate the impacts of the freshwater diversion on representative fish species as well as the potential impacts from low dissolved oxygen levels on fisheries resources in Lake Borgne was developed and had produced initial results. The Service, LDWF, and NMFS support the CASM modeling effort and agree the trends may provide reasonable results. However, because the model results represent the first draft and have since been provided corrected assumptions and interactions to better represent Louisiana waters, a final model run is necessary to obtain more accurate results relative to Louisiana. The assumptions were corrected in consultation with NMFS and LDWF. Because of funding constraints the CASM modeling efforts were halted. The Service recommends completion of the CASM model to achieve more accurate results that will be used to fully address impacts to aquatic resources.

19. In addition the Service recommends the CASM model should be updated to incorporate conditions from the oil spill in the adaptive management plan. This model should also use the corrected assumptions.

20. Due to the significant acreage of marsh that will be accessed for swamp and marsh creation/nourishment, the Service request the Corps quantify the estimated flotation access and construction access impacts to shallow open water habitat.

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APPENDIX A

National Marine Fisheries Service and Louisiana Department of Wildlife and Fisheries Comment letters

RECEIVED
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LAFAYETTE, LA.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
263 13th Avenue, South
St. Petersburg, Florida 33701

Mr. James F. Boggs, Supervisor
Louisiana Field Office
U.S. Fish and Wildlife Service
646 Cajundome Blvd., Suite 400
Lafayette, Louisiana 70506

July 12, 2010 F/SER46/RH:jk
225/389-0508

Dear Mr. Boggs:

NOAA's National Marine Fisheries Service (NMFS) has received the Preliminary Draft Fish and Wildlife Coordination Act Report (Report) on the "Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study". The MRGO Plan evaluates and addresses systematic ecosystem restoration and protection for the Lake Borgne ecosystem and areas affected by the former MRGO navigation channel. In addition, the plan considers measures to reduce or prevent damage from storm surge. The New Orleans District (NOD) has identified a tentatively selected plan that proposes to restore 10,431 acres of cypress swamp, 13,890 acres of fresh and intermediate marsh, 33,696 acres of brackish marsh, 464 acres of saline marsh, and 48 acres of ridge habitat.

NMFS has reviewed the Report and concurs with its findings and recommendations. However, we would like to provide additional suggestions to be considered for inclusion into the document.

Borrow
Due to the significant quantities of material proposed as borrow material for marsh creation/nourishment, the U.S. Fish and Wildlife Service should request the NOD provide estimates of cubic yardage and depth of cut for the borrow sites highlighted in Figure 2 on page 20.

Fisheries Resources
The introductory sentence under "**Fisheries Resources**" should include the construction direct impacts to marsh (224 acres) from the proposed diversion canal identified in Table 3 on page 27. The sentence should read, "There would be negative impacts to fisheries resulting from swamp, ridge, and diversion construction as the existing marsh (2,672 acres) is lost to those new habitats". The second sentence in paragraph two on page 30 should acknowledge that the dredged cut limitation for borrow material is a recommended elevation. The sentence should read, "To help reduce the potential for anoxic conditions to occur, the borrow sites are proposed to be dredged to approximately -10.0 ft NAVD 88 with 5 ft of allowable over depth and sloping edges up to the adjacent water bottoms. It should also be identified that the borrow area locations should be at least 1,000 ft from the existing shoreline to reduce wave impacts.

The fourth paragraph on page 31 identifies that the Comprehensive Aquatic Systems Model results are preliminary and once completed, the information will be provided in this section to discuss the impacts of the freshwater diversion on representative fishery species. NMFS recommends that this paragraph be revised to include the following sentence, "In addition to modeling changes in salinity and water quality, the model has the capability to measure changes in dissolved oxygen levels. NMFS recommends that the

model be utilized to measure the potential impacts from low dissolved oxygen levels on fisheries resources in Lake Borgne".

The fifth paragraph on page 31 discusses the implementation of the operational plan of the freshwater diversion to enhance the ecosystem and increase biological productivity. It also identifies that there is potential to displace some species such as oysters in Lake Borgne. The paragraph should be revised to include the following sentence, "The over freshening that would occur during the high pulse years over the oyster habitat in Lake Borgne has the potential to lead to oyster mortality.

Essential Fish Habitat (EFH)
The first paragraph of the "**Essential Fish Habitat**" section on page 32 should identify the quantity of direct impacts to marsh, (2,672 acres), as the Report acknowledged in the Fisheries Resources section. The **Mass Balance of Flow, Nutrients, and Suspended Sediments Model** located in **Attachment 3: H & H Diversion Modeling,** demonstrates the distribution of water from the Violet Diversion over the Lake Borgne/Biloxi Marsh ecosystem at various flow scenarios. In Table 2 on page B36, the model indicates under the selected plan (Alternative 2), that 57% of the diversion flows into the southern portion of Lake Borgne. Changes to the salinity level and temperatures have potential impacts to the identified EFH species in Lake Borgne. The document should include a statement to identify the potential indirect impacts to EFH species from water quality changes with the diversion feature.

Due to the significant quantities of sediment proposed as borrow material for marsh creation/nourishment, the second paragraph on page 32 should identify the borrow quantities for Lake Borgne in supplement to the locations on the map for Figure 2 on page 20. In addition, due to the significant acreage of marsh that will be accessed for marsh creation/nourishment, the U.S. Fish and Wildlife Service should request that NOD quantify the estimated flotation access and construction access impacts to shallow open water habitat.

Appendix A: Latin Names for Species Discussed in Report
On page A4 of listed fish species, speckled trout, *Cynoscion nebulosus*, needs to be removed from the list. It is a duplicate for spotted seatrout which is already identified in the list.

We appreciate the opportunity to review and comment on this Report.

Sincerely,

for Miles M. Croom
Assistant Regional Director
Habitat Conservation Division

c:
LA DNR, Consistency, Ducote
F/SER46, Swafford
Files

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BOBBY JINDAL
GOVERNOR

State of Louisiana

ROBERT J. BARHAM
SECRETARY

DEPARTMENT OF WILDLIFE AND FISHERIES
OFFICE OF WILDLIFE

JIMMY L. ANTHONY
ASSISTANT SECRETARY

July 13, 2010

Mr. James F. Boggs, Supervisor
Fish and Wildlife Service
Louisiana Field Office
646 Cajundome Blvd.
Lafayette, LA 70506

RE: *Application Number: Draft Report - Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study*
Notice Date: June 16, 2010

Dear Mr. Boggs:

The professional staff of the Louisiana Department of Wildlife and Fisheries (LDWF) has reviewed the above referenced draft Fish and Wildlife Coordination Act Report. Based upon this review, the following has been determined:

LDWF concurs with the positions and recommendations outlined by the U.S. Fish and Wildlife Service.

LDWF believes that the restoration of Breton Island should be considered as the Service suggested. We also agree with the Service that the construction of the MRGO did increase land loss at Breton Island.

The proposed borrow areas in Lake Borgne do include private leases as well as public oyster seed grounds. LDWF manages the public seed grounds and should be consulted before final borrow locations are determined. LDWF also recommends that all borrow sites be less than 10ft below the existing sediment surface and 1000ft from the shoreline.

Recommendations 4, 6, 7 and 16 address trust resources of special concern for LDWF Office of Fisheries and we are supportive of the Services recommendations on these issues.

Application Number: *Draft Report – Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study*

July 13, 2010

The Louisiana Department of Wildlife and Fisheries appreciates the opportunity to review and provide recommendations to you regarding this proposed activity. Please do not hesitate to contact Fishery Habitat biologist Robert Bourgeois at 225-765-0765 should you need further assistance.

Sincerely,

Heather Finley
Biologist DCL B

hf/rb/kb

c: Rob Bourgeois, Fisheries Biologist
Kyle Balkum, Biologist Program Manager

BOBBY JINDAL
GOVERNOR

State of Louisiana

ROBERT J. BARHAM
SECRETARY

DEPARTMENT OF WILDLIFE AND FISHERIES
OFFICE OF SECRETARY

July 28, 2010

Mr. James F. Boggs, Supervisor
Fish and Wildlife Service
Louisiana Field Office
646 Cajundome Blvd.
Lafayette, LA 70506

RE: *Application Number: Draft Report – Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study*
Notice Date: July 28, 2010

Dear Mr. Boggs:

The professional staff of the Louisiana Department of Wildlife and Fisheries (LDWF) has reviewed the above referenced draft Fish and Wildlife Coordination Act Report. The Office of Fisheries supports use of data-based ecological models for civil works projects and large scale restoration projects as a way of evaluating potential ecosystem changes. It allows the public and the resource agencies to be more fully informed of these impacts, so that informed decisions can be made.

We support the ecological modeling that was initially performed on the MRGO Ecosystem Restoration Plan. The Comprehensive Aquatic Systems Model (CASM) used in this study used incorrect species and life stage interactions for Louisiana waters. After consultation with LDWF and NMFS staff Steve Bartell, the model's developer, corrected these errors. The corrections should enable the model to better represent the conditions and interactions in the modeled ecosystem; however the corrected assumptions were not run as part of the CASM output used in the current version of the draft EIS for the MRGO Ecosystem Restoration Plan. We recommend that the models be run with the corrections in place.

The Louisiana Department of Wildlife and Fisheries appreciates the opportunity to review and provide recommendations to you regarding this proposed activity. Please do not hesitate to contact Fishery Habitat biologist Robert Bourgeois at 225-765-0765 should you need further assistance.

Sincerely,

J. Heather Warner-Finley
Biologist DCL B

hf/rb/kb

c: Rob Bourgeois, Fisheries Biologist
Kyle Balkum, Biologist Program Manager

APPENDIX B:

Mississippi River Gulf Outlet (MRGO) Environmental Wetland Value Assessment (WVA) Assumptions

Course WVAs were conducted on TIER 1 and TIER 2 by pulling acres for individual features within each subprovince and applying similar technique and assumptions (see WVA assumptions document for detailed assumptions) that were used on the TSP WVAs. Only Medium SLR was evaluated for the TIER WVAs. WE used the total benefits reported in the Final TSP evaluation, subtracting the TIER 1 and TIER 2 benefits developed, to get the difference for TIER3 Total benefits (AAHUs and net acres). Again pulling the net acres for each feature within subprovince of TIER 3, the remaining acres were attributed to the Diversion effect on the features and existing marsh for all subprovinces combined. The percent of net acres for each subprovince was determined based on the total TIER 3 net acres. That percent was then applied to the TIER 3 total AAHUs to determine the % AAHU for each subprovince feature and the diversion. Note because of time limits, the WVAs for TIER 1 and TIER 2 and the estimated benefits for TIER 3 were not coordinated with the HET for group consensus as is typical of all WVAs.

General Assumptions

- Period of analysis will be from 2011 to 2065. This includes implementation of project plus 50 years.
- The 50-year period begins with the first year of operation (first year when benefits would be realized) from 2015 to 2065. Consideration beyond the period of analysis is given to environmental factors. Environmental modeling looked at benefits of plans to 100 years.
- The latest 2009 version of WVAs were used for the benefits analysis.
- WVAs were first run on groupings by geographic location. These locations include Biloxi, East Orleans Landbridge, Central Wetlands, Terre Aux Bouefs, and Hopedale. Early versions also included outer Biloxi, Florrissant, and Caernarvon, which were later determined to be out of the scope of this project.
- Preliminary WVAs were run on each features based on the portion of each feature within the larger group. The resulting benefits analysis (AAHU) was compared with cost in IWR to develop alternative plans.
- The Final Array of alternative plans were evaluated with Full WVAs. Additional information includes impacts to wetlands for the diversion footprint and access footprints for each measure and dredging capabilities (see below for details). The resulting benefits analysis (AAHU) was compared with cost in IWR to determine the Tentatively Selected Plan (TSP).
- We evaluated the TSP with 3 different Relative Sea Level Rise rates including high, medium, and low (see RSLR info below and attachment 4).
- WVA spreadsheets were linked as much as possible. No variables were automated.
- Used the WVA Structure document (attachment 6) for groupings within subunit for benefits analysis.
- For initial geographic group WVAs, we established dependencies on measures that influence each other.
    - Shoreline protection features were initially grouped with the adjacent marsh creation/nourishment features.
    - Later each feature was evaluated individually before alternative plans were combined.
    - In the diversion influence areas the entire subunit with all its features were evaluated together.
    - A simplifying assumption was made where shore protection (SP) measures protected portions of a marsh creation (MC) measure. Rather than determine actual interactions, the interacting SP and MC measures were treated independently according to their respective protocols. The only exception to this was that of the MRGO Channel Narrowing measures, where MC measures along the MRGO are protected by concrete panels. For those measures, we assumed that MC measures reduced the loss of created marsh by 50%, and the SP measures reduced the remaining loss by 50%, resulting in a combined 75% reduction in FWOP loss (polygon40 – South Lake Borgne polygon).
- Assume there will be maintenance on shoreline protection features and the diversion, but no maintenance on all other features (i.e. marsh creation/nourishment, ridge restoration, vegetative plantings, etc).

- Acreage for all features was based on engineering footprints. USGS provided habitat data based on these footprints and 2008 imagery.
- Future without Project (FWOP) Analysis considered a no-action scenario for each alternative. Coastal processes impacts (erosion, storms, subsidence, and sea level rise) on existing habitats were also considered. Net restoration benefits of CWPPRA (phase II) and other authorized projects were added to baseline acres to produce actual FWOP predicted acreages.
- Future with Project (FWP) analyses considered changes from processes such as equilibrium, storm events, and subsidence, and resulted in an overall change in the platform area or in the conversion of one WVA habitat type to another.
- Salinity was based on modeling results. Most subunits consisted of one major habitat type. Only Subunit 23 (Terre aux Boeufs) had two habitat types (saline and brackish); therefore, different WVA models were used to reflect the habitat difference.
    - Fresh/intermediate – average salinity during the growing season (March through November)
    - Brackish and saline – average annual salinity
    - Swamp – mean high salinity for March through October

Diversion

- Assume construction will begin immediately (2015). Assume it takes 5 years to construct based on actual construction time for Davis Pond. Assume that construction will delay functioning until TY 6 (2020), which will be the first year of diversion discharges. This "diversion start" assumption will therefore require an additional WVA target year at TY 6.
- Assume the diversion design used in the evaluation has a maximum discharge of 7,000 cfs depending on available river water level. In low water periods, we assume the diversion to operate at 870 cfs for a total of 1000 cfs including the SWB estimated diversion. Specifically, we assumed that the diversion is operated at a constant flow of 1,000 cfs, with pulsing of 7,000 cfs during April and/or May. 1000 cfs will run through the Central Wetlands Area (CWA) and during the pulse the remaining 6000 cfs will run directly out of the CWA into the Lake Borgne/Biloxi ecosystem.
- It is assumed that flows over 5,000 cfs would overwhelm the Central Wetlands and cause flooding to Paris Road given the existing two structure openings at bayou dupery and bayou beinvenue. It is assumed that not more than 1000 cfs would flow through the CWA.
    - The effects of diversion on the flooding of Paris Road are unknown but assumed not to be an issue with flows not to exceed 1000cfs. To prevent more than 1000cfs from circulating in the CWA a structure will be built in the channel to release controlled amounts of water into the Central Wetlands during pulses or high flows.
    - The WVAs are evaluated assuming not more than an additional 1000cfs flow through the CWA. Existing openings would remain open and to the same diameter and dimensions that currently exist. The WVAs will have t be re-evaluated if the assumption changes as a result of this method,
- The diversion is assumed to use a newly created canal (See Figure 1). Diversion 1 (Figure 1) is the proposed diversion structure and channel location. Either overflow

from the diversion or controlled water input will be allowed into the CWA in order to freshen the area enough to support a cypress swamp habitat. See attached proposed diversion operation scenario document (Attachment 5). Water is assumed to flow through the MRGO back levee canal to reach the north western parts of the CWA.

- A shoreline closure between the Golden Triangle and Procter Point (see Figure 2) will help distribute water to surrounding marshes rather than flowing directly into Lake Borgne. It is expected water will flow through the marshes of Golden Triangle, Proctor Point, and Biloxi marshes north of Bayou Laloutra.
- Modeling results showed the closure between Golden Triangle and Procter Point is effective in guiding diverted water through wetlands rather than directly into Lake Borgne and specifically resulting in more water going through the Biloxi marshes and affecting the target salinities.
- Used SAND2 model for diversion benefits to input into WVA by determining additional reduction in loss rate on marsh creation/nourished areas due to diversion.
- Diversion effects will be evaluated in SAND2 for 50 and 100 years.
- Hydrologic modelers provide expert opinion to help determine the influence area for nutrient cycling and salinity (see appended 3).
    - Note: It is expected that water quality modeling and CASM modeling will be conducted to assess indirect impacts to fisheries, such as the displacement of species involving the introduced freshwater into Lake Borgne. This would also include the changes in salinity, temperature, uptake of nutrients in marshes, and the potential for hypoxia due to eutrophication. These effects will be addressed in the EIS. WVAs will not capture and not be used in this effort.



Figure 1. Proposed Violet Diversion Locations.

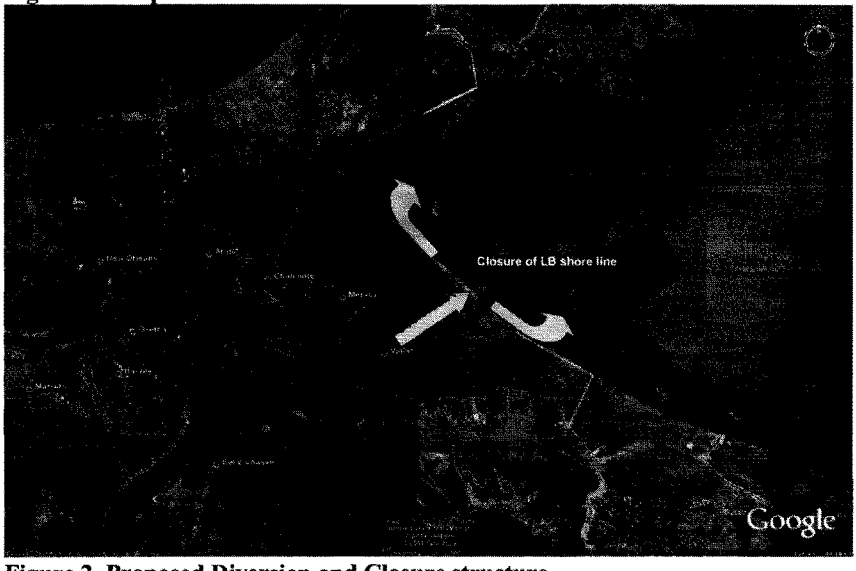


Figure 2. Proposed Diversion and Closure structure.

Marsh Creation

- See Attachment 2 for academic input on various issues.
- The difference in the acres between Corps provided engineering footprints and the USGS provided data (USGS used Corps footprints to develop their boundaries) are because the Corps and USGS used different projections. The Corps uses State Plane Louisiana South (feet). The USGS classified data is in UTM NAD 83 zone 15. If USGS were to re-project the thematic data to State Plane, the shifts in data would be too large to use.
- Used 2006 USGS habitat data and projected forward (applying loss) to 2014 for baseline (TY0) acres. USGS is advising that the provided 2008 data is not used because the numbers could be temporary as a result of impacts from Hurricane Gustav.

- Marsh Creation and Dredging
  An implementation plan has not been developed. For purposes of the WVA analysis, the HET incorporated dredge production in marsh creation, marsh nourishment, and swamp creation benefits developed from the scenarios below. We will use 15,000 cubic yards per day (cyds/day) production and water depths based on engineering assumptions for each feature (see following description). We used appropriate Corps dredging scenario to determine annual wetland creation acreage and assume that 2 dredges are operating at all times. We prioritized wetland creation areas by subunit, based on subunit loss rates (low loss rate areas by subunit are constructed first, high loss rate areas last). We will assume marsh and swamp creation begins in TY1 (2015).

    - *Scenario 1.*
      - Assume an average production of 20,000 cyds/day dredged, and operating 7 days/week for a whole year. Approx 7.3 million cyds would be borrowed. Assume the average elevation of the water bodies to be converted to marsh was -0.5'.
      - a. For marsh creation; approx 1,500 acres of wetlands could be created with 7.3 million cyds. This is based off of a maximum slurry elevation of +4.0' NAVD88 being used.
      - b. For swamp creation/restoration; approx 1,210 acres of swamp habitat could be created with the 7.3 million cyds. This is based off of a maximum slurry elevation of +4.5' NAVD88 being used.

    - *Scenario 2.*
      - Assume an average production of 20,000 cyds/day dredged, and operating 7 days/week for a whole year. Approx 7.3 million cyds would be borrowed. Assume the average elevation of the water bodies to be converted to marsh was 1.0'.
      - a. For marsh creation; approx 1,300 acres of wetlands could be created with the 7.3 million cyds. This is based off of a maximum slurry elevation of +4.0' NAVD88 being used.

- b. For swamp creation/restoration; approx. 1,065 acres of swamp habitat could be created with the 7.3 million cyds. This is based off of a maximum slurry elevation of +4.5' NAVD88 being used.

- *Scenario 3.*
  - Assume an average production of 15,000 cyds/day dredged, and operating 7 days/week for a whole year (approx 5.5 million cyds would be borrowed) and assume the average elevation of the water bodies to be converted to marsh was -0.5'.
  - a. For marsh creation; approx. 1,136 acres of wetlands could be created with the 5.5 million cyds. This is based off of a maximum slurry elevation of +4.0' NAVD88 being used.
  - b. For swamp creation/restoration; approx. 910 acres of swamp habitat could be created with the 5.5 million cyds. This is based off of a maximum slurry elevation of +4.5' NAVD88 being used.

- *Scenario 4.*
  - Assume an average production of 15,000 cyds/day dredged, and operating 7 days/week for a whole year (approx, 5.5 million cyds would be borrowed) and assume the average elevation of the water bodies to be converted to marsh was 1.0'.
  - a. For marsh creation; approx. 975 acres of wetlands could be created with the 5.5 million cyds. This is based off of a maximum slurry elevation of +4.0' NAVD88 being used.
  - b. For swamp creation/restoration; approx. 802 acres of swamp habitat could be created with the 5.5 million cyds. This is based off of a maximum slurry elevation of +4.5' NAVD88 being used.

- *Scenario 5.*
  - Could apply to some of the western Central Wetlands sites where the existing water depths are approx -3'.
  - Assume an average production of 20,000 cyds/day dredged, and operating 7 days/week for a whole year (approx 7.3 million cyds would be borrowed) and assume the average elevation of the water bodies to be converted to swamp was 3.0'.
  - a. For swamp creation/restoration; approx. 725 acres of swamp habitat could be created with the 7.3 million cyds. This is based off of a maximum slurry elevation of +4.5' NAVD88 being used.

- *Scenario 6.*
  - Could apply to some of the western Central Wetlands sites where the existing water depths are approx -3'.
  - Assume an average production of 15,000 cyds/day dredged, and operating 7 days/week for a whole year (approx. 5.5 million cyds would be borrowed) and assume the average elevation of the water bodies to be converted to swamp was 3.0'.

- a. For swamp creation/restoration; approx 545 acres of swamp habitat could be created with the 5.5 million cyds. This is based off of a maximum slurry elevation of +4.5' NAVD88 being used.

- Thus, the acres of marsh that could be created in a year by one dredge could range from 975 acres to 1,500 acres, and the acres of swamp that could be restored could range from 545 acres to 1,210 acres. Prioritization is based on lowest lost rate first.

- Marsh nourishment design, determined by the engineers, is to free-flow marsh over existing broken marsh.
- Marsh creation utilizes retention features to build up marsh to required elevation. In some cases, existing marsh or shoreline protection features will act as retention. Overflow from marsh creation will nourish surrounding existing marsh. After compaction and dewatering, containment features would be breached to allow exchange of materials. Breaching is assumed to occur in most cases within one year of construction unless naturally degrades on its own.
- Marsh creation will create marsh in open water and nourish the surrounding existing marsh. Marsh nourishment will nourish existing marsh and nearby open water will become shallower.
- Access corridors (floatation channels) were evaluated for impacts to wetlands.
- Baseline (TY 0) is 2014.
- Assume the construction of the first measure(s) will be completed by year 2015, and construction will continue until all project measures are initiated. Construction of marsh creation/nourishment is estimated to end in year 2022 for plan 11, 2020 for plan 7, and 2019 for plan 3 based on dredging capabilities and prioritization for each alternative plan in the final array.
- For earlier WVA analysis, marsh creation would be constructed by TY 1 (TY 1 represents the as-built configuration). Loss would occur from TY 1 on. For the final array of alternatives and the TSP, marsh creation would begin construction at TY1 but representation of as-built configurations vary based on the dredging capabilities discussed above.
- Typically, CWPPRA marsh creation projects apply a 50% reduction in the FWOP marsh loss rate to created or nourished marsh. The created marsh will provide more sediment to the system and combat subsidence. The area is less susceptible to breaching and increased erosion. There will be new nutrients available to the area, and there may be less wave fetch from open water areas from previously broken marsh. The created marsh will be at a higher marsh elevation than some of the FWOP marsh, thus allowing for more vertical accumulation of vegetation.
- In this study, a 50% reduction in background loss rate was applied for created and nourished marsh. However, because CWPPRA uses a 20-year period of analysis and this project has a 50-year period of analysis, the HET agreed to increase loss of these measures to full background rate (rather than 50% reduction of background rate) once RSLR of 10" (12" was used in LaCPR), occurs post-construction with the following reasoning:

- Assuming that accretion is occurring during the period over which the 8" to 12" of RSLR occurs, the top 8" to 12" of the marsh (where the majority of plant roots are) are rooted in organic soil typical of naturally occurring marshes and are no longer benefitting from contact with deposited fill. Biochemical and wetland loss processes typical of natural marshes then begins to occur so that loss of created marshes returns to the rate of naturally occurring marshes.
- The input the range of living roots varies from 8" to 12" depending on the health of the marsh based on academic studies (see attachment 2).
- We decided to use 10" of RSLR as the point in which we revert back to the background interior loss rate. Under the low RSLR rate, the marsh will remain above 10" of subsidence.
- Using the low RSLR 10" of subsidence was not reached until after the 50 year project life (TY55 in most areas and TY79 in parts of Terre Aux Bouef)
- The medium and high RSLR reach 10" of subsidence in TY 23 and TY 17, respectively.

- The HET incorporated a RSLR threshold value above which marshes experience more rapid deterioration and collapse. Based on academic input, we are using the year (TY) when the marsh will collapse based on using 1 cm /year. Only for the highest SLR scenario will RSLR rates exceed the 10 mm/yr marsh collapse threshold. We assume once RSLR reaches this threshold, the marsh begins to collapse and is gone within 10 years.
- For both FWOP and FWP for the high RSLR scenario WVAs, target years will be added for the year marsh collapse begins (TY 9) and year marsh acreage goes to zero (TY 19).
- Only the low RSLR scenario will be used for early screening (WVAs and cost) and the final array of alternatives. The 3 RSLR rates will be used to evaluate the TSP.
- There will be vegetative plantings.
- Fully functional marsh
  - Typically, in CWPPRA, 25% of created marsh with vegetative planting is considered functional at TY 1 and is fully functional by TY 3. Fresh environments can often naturally vegetate much more rapidly than brackish or saline areas.
  - Presumably, adding 6 to 12 inches of sediment to nourish fragmented marsh allows those sites to vegetate more rapidly than sites created in open water. Therefore, nourished marshes are typically considered fully functional at TY 3.
  - For created and nourished marsh, the HET will assume marsh is fully functional five years after marsh is created/nourished (based on dredging capabilities discussed above by subunit) rather than three years after to reduce the overall number of target years. One year after marsh is created or nourished, marshes will be considered 25% functional.
- V3 Interspersion marsh creation – Based on the newly developed CWPPRA interspersion variable (2009), TY 1 will be class 5 for interspersion and TY 5 will be class 1. Typically CWPPRA assigns created marsh a class 3 in TY 3. We will not have a TY 3 in order to reduce the overall number of TYs.

- Target Years will include:
    - FWOP (low and medium RSLR) – TY 0, TY 1 TY 50.
    - FWOP (high RSLR)- TY0, TY 1, TY 9 (beginning of marsh collapse), TY 19 (year marsh goes to zero) and TY 50.
    - FWP – TY 1, TYX (created/nourished marsh or swamp based on production rate), TY6 (diversion benefits start), TYY (TYX + 5years = 5 years after marsh/swamp is created/nourished),TY marsh has subsided 10" (for reverting back to baseline loss rate),TY marsh collapse begins,TY marsh collapses 1cm/year, and TY50. TY year marsh collapses (TY9) and TY marsh acreage goes to zero (TY19) will only occur at high RSLR.
- Note TY), TY marsh has subsided 10" (for reverting back to baseline loss rate), TY marsh collapses 1.2cm/year were not used for early screening and final array of alternative evaluations. TY marsh subsided 10" happened beyond the 50 year project life based on the low loss rate used for early screening and the final array of alternatives.

Ridge

- Used other projects (PPL18 Grand Liard Marsh and Ridge Restoration, PPL16 Bayou Dupont Marsh and Ridge Restoration, LCA Wetland Creation), existing ridges, input from NRCS, and realistic project funding capabilities to develop ridge design.
- Ridge dimensions are +6ft NAVD88 (with initial overbuilding to +8ft NAVD88), 25 ft crown width, and 1V:8H slope
- Assume (without having surveys) that the existing ground line averages are approximately +1.5ft NAVD88
- Total footprint (worse case scenario – it will likely be less) is 200 ft wide.
- There are 2 sections of Bayou LaLoutra Ridge that will be evaluated (see Figure 3).
    - From MRGO to pipeline (where the ridge is at marsh elevation), the ridge will be constructed on former ridge foundation which is currently marsh habitat.
        - From the pipeline canal to around the bend, the ridge was designed to expand 25-ft crown width behind the existing ridge minimizing impacts to existing mature trees.
        - Borrow material for ridge was estimated taking borrow from other location (ODMDS, Bayou Laloutre, etc)
    - Impacts to existing marsh due to direct ridge footprint was evaluated.
    - Future projections are based on CWPPRA PPL 18 Grand Liard Project (BA-48) and other studies (Monte (1978) - thesis, Maritime Forest Ridge and Marsh Creation at Fourchon, LA project, Fine and Edwards 2005, Didier 2007- thesis, and LDNR 2009).



Figure 3. Proposed Ridges

Swamp

- Swamp elevation will be 2 ft (after dewater and compaction) based on academic input (see Attachment 2), area experts, existing survey date of existing swamps, and other project data (e.g. Lane et al. 2006, Reed and Yuill 2009, Jordan et al. 2009). Appropriate elevations ranged from 1.5 ft to 2 ft (and even up to 2.5 ft considering SLR over a longer time period). Because this has a 50 year project life, the higher (2 ft) side of the range was used.
- With the freshening of the Central Wetlands, it is expected the swamp will have a good flooding regime.
- In the early screening phase, in the FWP no diversion scenario, cypress is not expected to survive because salinities will be greater than cypress trees can withstand. The WVA for this will reflect a high brackish marsh habitat.
- The final array of alternatives and the TSP assumes there is no longer a without diversion scenario. All swamp measures are evaluated with a diversion influence that will sustain the swamp.

Shoreline Protection

- 100% reduction in existing shoreline erosion is given for hard structures (rock revetment or breakwaters).
- Assume that hard structures will be maintained for the 50-year project life.
- Assume there are no limiting factors for the SP features. With money and materials, the SP features will be completely built within the first few years of

construction. Because they could be constructed so much more quickly, the benefits are not being delayed for SP features.

Barrier Island

- Input provided by Pontchartrain Institute for Environmental Sciences, University of New Orleans (PIES-UNO).
- Used SBeach for existing FWOP, and FWP habitat acres for WVA.
- Percent vegetative cover and percent woody cover are estimated by best professional judgment of FWS Refuge field personnel and UNO scientist who frequent the islands as part of their research and regular activities.

V1: Percent Emergent Marsh

As is typically done in CWPPRA project, the 2008 survey was eroded by six years to represent 2014 conditions for TY 0. 2014 is when construction is expected to begin.

Trendline for Interior Loss

Assumptions

- Used a linear trendline for loss rate projections rather than the CWPPRA compound rate based on 2 points in time will provide a more accurate estimate over a longer period (50 or 100 year evaluation period vs. 20 years).
- Benefits assessment of the TSP were made under 3 RSLR conditions. The 3 RSLR scenarios were provided by the Corps and are based on the Shell Beach Tide Gauge plus accretion rate (see Appendix 4 for details) Low RSLR has been used in all WVAs for early screening and the final array of alternatives. The 3 RSLR was used in the final TSP WVA assessment.
- SLR and subsidence rates are combined for Relative Sea Level Rise (RSLR). Subsidence will remain the same in the evaluation, even though there are three levels of RSLR.
- For more details on RSLR see Attachment 4.

Loss Projection Spreadsheets

- A compound spreadsheet allows for changes in loss rate and assuming a maximum amount of land can be built per year based on available equipment and production. Production spans multiple years. The spreadsheet differentiates between nourished and created marsh.

To Develop

- Used 1985 – 2006 USGS land/water data to determine future loss.
- Only wetland and open water were used; fastlands not included.
- Used the listed "land" area (acres).
- Excluded the 2000 and 2005 data sets from Sigma Plot analyses to develop linear regressions.
- Used Sigma Plot to obtain regression equations.
- Used only 1985 to 2006 data, with the above exclusions.

- Assume the project life is 2015 through 2115, so begin projections in 1985 and carry through 2115.
- Set up a tab that lists FWOP acreage with sea level rise (similar to Donsaldsonville to the Gulf Project).
- FWOP restoration project benefits were used to include in the final FWOP results.
- Used acres/year rather than percent/yr loss rate.

Shoreline erosion

- Shoreline erosion varied by location. Shoreline erosion was determined by USGS using 1985 to 2006 time period.

V_2: Percent Open Water covered by SAV

- Collected field data. To see field data, please contact FWS.
- Used data from other projects in the areas.
- Assume SAV increase with diversion compared to without diversion over time.

V_3: Marsh edge and interspersion

- Baseline conditions were determined by comparing aerial photographs (Google Earth, engineering footprints, and USGS maps) to interspersion photographs corresponding to recently developed interspersion variable (2009).

V_4: Percent of open water area less than 1.5 feet deep in relation to marsh surface

- Field data collection: representative samples were taken because of the large project area. Areas of broken marsh and areas of open water were chosen in the field for water depth sampling. Similar areas are then compared to field data and water depths are assumed the same. The average is weighted to extrapolate over the entire area.
- Existing surveys and other projects in the area were gathered to use and supplement field data.
- For marsh creation sites, it was assumed that open water will become marsh and surrounding marsh will be nourished, leaving any remaining existing water as mostly shallow. For marsh nourishment sites, existing marsh will be nourished and nearby open water will become shallower.
- For FWP TY50, it is assumed that marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence.
- For FWOP TY50, it is assumed that all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.

V_5: Salinity

- H&H modeling provided existing, FWOP, and FWP salinity.
- For FWOP and FWP at low and medium RSLR scenarios, it is assumed that salinity will rise 1 ppt within 50 years.

- For FWOP and FWP at high RSLR scenario, it is assumed that salinity will rise 2 ppt within 50 years.
- Fresh/intermediate model: Mean salinity during the growing season (March-Nov)
    - Fresh -0.5 ppt or less is optimal
    - Intermediate – 2.5 ppt or less is optimal
- Brackish and Saline Model: average annual salinity
    - Brackish – between 0 ppt and 10 ppt (5 ppt-10 ppt)
    - Saline – greater than 16ppt

V_6: Aquatic organism access.

- Features affecting aquatic organism access were noted on field visits and on aerial maps of the area.

NOTE: See Attachment 6 and 7 for the Master WVA spreadsheet and individual WVA variable assumptions for the TSP. Early screening and final alternative array WVAs and individual assumptions are available for review at the Fish and Wildlife Service's (Service) Lafayette, Louisiana, field office.

ATTACHMENT 1

Diversion Considerations

MRGO ECOSYSTEM RESTORATION PLAN

Diversion Considerations by Habitat Type

The restoration goal for the Central Wetlands is the reestablishment of cypress swamp and freshwater marsh. Habitat in the area is currently brackish marsh.
The MRGO Ecosystem Restoration H&H team requested environmental input concerning operational flow schemes of the proposed Violet Diversion. The H&H team identified the following seven pertinent questions arising from a meeting on September 18, 2009. The environmental team has attempted to amass answers to these questions through research of peer-reviewed journal publications and the invaluable information from the dialogue of email traffic and personal communications. Specific information and sources follow the question/answer section. Dominant species of trees and marsh plants in fresh and intermediate marsh were used as indicators of acceptable conditions

Recommended Flows

Adaptive management for (1) habitat switching; (2) pulsing to reach target salinity.

- No pulsing in the first 2-3 years to achieve habitat switching and allow cypress seedlings time to establish.
- After first 2-3 years, ramp up pulsing from few days – one week pulse toward a two week pulsing cycle (cycle includes maximum pulsing of no more than 2 weeks with 2 weeks of no flow between pulses) to achieve target salinities.
- Every 3-5 years a drawdown should be initiated to elevation -4 to -6 below surface beginning in March for cypress regeneration. After seed fall to achieve successful reestablishment of cypress, the area should not be flooded (soils saturated but no water above the -4 elevation) during growing season (March – November) for the next two growing seasons.
- After drawdown, flows should be introduced slowly - not more than +2 inches initially and gradually increasing over the year not to exceed +8 inches by the end of that growing year.
- Flows for months other than pulsing or drawdown months would be at a level to achieve fresh wetlands (0 ppt-0.5 ppt mean growing season March-Nov) with a maximum peak of 2 ppt or less.

1. Are there seasonal considerations that should be considered for flow through the Central Wetlands rather than static levels presently modeled for all months outside April and May?

Yes. Cypress trees need to have intermittent dry periods in the growing season (March through November) for regeneration and early height growth. Cypress will do well once the tree foliage (tops) is above the flood water during the growing season. Swamp forest can tolerate inundation up to a year if the water is not stagnant; however this is not recommended for multiple consecutive years. Flooding and flow are required for seed dispersal of bald cypress from around October to January/February followed by a

drawdown period to -4 to -6 elevation through the growing season (March-November) where there is no standing water. The dry period should extend through the growing season during the first several years to allow seedlings to develop aggressive root systems, and that variable wet and dry periods during the growing season after the first few years of seedling growth would be acceptable (OCPR personal communication with Clason)

Optimal flooding for fresh, intermediate and saline marshes is assumed to occur at 50% inundation per year, whereas optimal flooding for brackish marsh was assumed to occur at 40% (Habitat Switching module). The assumptions of the Habitat Switching Module are well within flood tolerance ranges of fresh and intermediate marsh plants such as *Panicum* spp. and *Sagittaria* spp. as well as brackish marsh plants such as *Spartina patens*. In addition, increased flooding depths during the growing season have been shown to stimulate growth in these species with the exception of *S. patens*

2. Are there wet and dry periods at other times of the year that are important?

Yes - sites where cypress grow usually hold water for most of the year. Flooding and flow are required for seed dispersal of bald cypress from around October to January/February. A drawdown period of no standing water through the growing season (Starting in March following dispersal flooding) is required because cypress seeds cannot germinate in standing water or do not grow tall enough during short drawdown periods to survive subsequent flooding. Clason (OCPR personal communication) stated that the dry period should extend through the growing season (April-October) during the first several years to allow seedlings to develop aggressive root systems, and variable wet and dry periods during the growing season after the first few years of seedling growth would be acceptable.

Most cypress cannot tolerate a chronic presence of salinity of around 3 ppt or greater. Some trees have been known to withstand short periods of acute salinity of much higher levels especially during the dormant season. Long-term, average salinity levels less than 2 ppt are better with fresh conditions being ideal.

Seasonal changes in hydroperiod are an integral factor in life cycles of swamp and marsh species in the deltaic plain. Highest productivity in forested wetlands in Louisiana occurred when the pulsing events followed a seasonal pattern. In addition, cycles of wet and dry years would aid in establishment and regeneration as well as growth. Historically, the hydroperiod was determined by the Mississippi River stage and average rainfall. These should be considered when establishing an operational plan benefitting not only plants but also dependent fauna in addition to the requirements of bald cypress. An operational scheme would need to be developed that incorporates both pulsing years and dry periods from March to November.

3. Is there a preferred and/or threshold standing pool elevation relative to the proposed marsh? - Is there a residence time criteria? How long can water "stand" in the Central Wetlands without being replaced?

Cypress seedlings can withstand complete inundation for up to 45 days, but long-term flooding above the foliage results in high mortality. Once established, young seedlings grow rapidly, often reaching heights of 8-14 inches the first growing season and 16-24 inches the second season. We will assume planting of cypress will include saplings at least 3-ft tall. Even though many of the forest species growing in these areas are adapted to prolonged inundation, extended flooding during the growing season can cause mortality of these tree species. Flooding as defined in this paper is understood to be beneficial and a necessary component of wetland productivity. Seasonal flooding of wetlands is part of the life cycle of wetland plants.

3a. Is there a preferred or maximum standing pool elevation relative to the proposed cypress swamp and fresh/intermediate marsh?

Yes. Average standing pool should fluctuate within the root zone to prevent constant anoxic conditions. From greenhouse and field studies, it appears that a periodic drawdown of - 4 inches to – 6 inches (-10cm to -15cm) would accomplish aeration of wetland soils. This base level coupled with the seasonal hydroperiod developed for bald cypress should be sufficient, if not advantageous to restore and maintain swamp and marsh. Both cypress trees and many fresh/intermediate marsh plants are stimulated by water level and benefit from the lack of competition from less flood-tolerant plants.

3b Is there a residence time criteria?

No. There is no indication from the literature reviewed that there is a critical residence time.

3c How long can water "stand" in the CWA without being replaced?

Flow should be maintained at a level as not to become stagnant for an extended period of time leading to low dissolved oxygen levels in both the soil and water. Tidal exchange and base flow rate should be adequate to prevent widespread stagnation.

4. During high flow periods are there ecological considerations related to inundation?

Yes. Care should be taken when establishing flow-through rates during cypress seed dispersal and at peak diversion times to insure that trees and plants are not "swept away". We do not have a definitive answer at this time. Common sense, expert opinion and experience at Caernarvon and Davis Pond should be incorporated to determine and ecological-appropriate peak flow rate.

Adaptively management would be necessary for (1) habitat switching; (2) pulsing to reach target salinity. The environmental team recommends no pulsing in the first 2-3

years (to achieve habitat switching) and then ramp up pulsing toward a two week pulsing cycle (maximum pulsing of no more than 2-3 weeks) to achieve target salinities.

5. How deep can water get inside the Central Wetlands? They are currently working under the assumption that 1 to 2 feet over the cypress swamp elevation as acceptable as per the 18 September meeting.

Cypress seedlings can withstand complete inundation for up to 45 days, but long-term flooding above the foliage results in high mortality. One and two yr old cypress seedlings estimated height range after one year is 8-14 in (20-36 cm) and 16-24 in (40 - 60 cm) after two years. Once established, cypress trees, maidencane, and bulltongue should be able to withstand flooding of 1 to 2 foot on a regular basis. Even though many of the forest species growing in these areas are adapted to prolonged inundation, extended flooding during the growing season can cause mortality of these tree species. Fresh and intermediate marsh can tolerate inundation below 12 inches. Seasonal flooding during the growing season has been shown to stimulate growth and is an integral part of the adaptive lifecycle of wetland trees and plants. Thus a flood stage of one foot should not be detrimental.

6. How long can the water stay at these depths? Weeks? Months? Particular months?

Short periods of flooding are not a problem. Longer periods of flooding should not be a problem once the tree crowns are above the flood levels. Cypress seedlings can withstand complete inundation for up to 45 days, but long-term flooding above the foliage results in high mortality. Saplings need to remain dry between March and November for height growth and regeneration. Established 2 to 3 year old and older trees are more tolerant of long flood durations and relatively deep flooding, even when coupled with low salinity levels of less than 2 to 3 ppt.

Freshwater and intermediate marsh plants are known to tolerate extended periods of flooding. Flooding levels not detrimental to grasses such as maidencane (Panicum hemitomon) ranged from 8 inches (20 cm) up to 24 inches (61 cm) continually for one year and increased water level of +8 inches (+20 cm) was also found to stimulate growth. Intermediate marsh plants such as duck potato, arrowhead, and bull tongue (Sagittaria spp) are also able to tolerate extended periods of flooding such as +8 inches (+20 cm) over a one year period and have been found growing in water up to 30 inches (80cm) in the field. Brackish marsh has been shown to tolerate <64% annual inundation at salinity levels between 6-15 ppt. *Spartina patens*, a dominant brackish marsh plant as well as constituent in intermediate marshes. Flooding levels in excess of +10 cm have been shown to decrease biomass; decreased root specific gravity, while levels greater than 20 cm result in mortality, regardless of salinity level. Salinity range found to not be detrimental to S. patens ranged from 0 to 8 ppt. Levels above 15 ppt resulted in reduced aboveground biomass and root dry weight.

Established length of inundation needs to be determined using the required hydroperiod and depth constraint of bald cypress, seasonal water levels based on the Mississippi River stage and average rainfall, and acceptable inundation levels of fresh and intermediate marsh plants which vary by species, life stage, and season.

Flooding and Bald Cypress Seedling Germination

Cypress tends to grow in even-aged stands because the environmental conditions needed for germination and establishment of young trees occur very infrequently (Lester et al. 2005). Additionally, although some seeds are produced every year, good seed crops occur only at 3- to 5-year intervals (Wilhite and Toliver 1990). One of the most critical environmental factors to consider for successful cypress seedling germination and establishment is the periodic flooding and drying of the swamp. Wet and dry cycles are variable in healthy, sustainable cypress swamps, so producing some variation in cycles is desirable in restored cypress swamps (Chambers, personal communication). Although dry periods are needed for seedling germination, it's important to note that some years of permanent flooding will restrict the growth of other flood tolerant species and thus reduce competition (Chambers, personal communication).

Although mature cypress trees can tolerate long periods of flooding, cypress seedlings are not as flood tolerant. First of all, cypress seedlings will not germinate under water. Furthermore, Myers et al. (1995) showed that there is a large increase in seedling mortality when seedlings are inundated longer than two weeks. Souther and Shaffer (2000) indicated that newly-germinated cypress seedlings (less than two weeks of age) may be capable of surviving up to one and one-half months of submergence, but will suffer complete mortality after a period of submergence longer than 57 days. However, one-year-old seedlings experience up to a 75% survival rate when they are submerged for as long as five months (Souther and Shaffer 2000).

There are some varying opinions about the period of time soils should be un-flooded to allow successful cypress seedling germination and establishment. Wilhite and Tolver (1990) indicated that soils should be saturated, but not flooded, for a period of 1 to 3 months after seed fall for successful germination, and Chambers (personal communication) also stated that a several-month period of non-flooded conditions must occur during the growing season. However, according to Shaffer (personal communication), cypress seedlings and trees should experience many pulses of nutrient-rich fresh water during the growing season, and once the seedlings are above high water, they can handle permanent flooding if the water is fresh and moving. In a combination of these two opinions, Clason (personal communication) stated that the dry period should extend through the growing season (April-October) during the first several years to allow seedlings to develop aggressive root systems, and that variable wet and dry periods during the growing season after the first few years of seedling growth would be acceptable. According to Chambers (personal communication), flooding during dormant seasons probably does not severely impact cypress seedlings, so cypress swamps can be flooded in the winter as long as removal of flood waters occurs early in successive

growing seasons and continues each growing season until the seedlings are one to two feet above the highest flood waters that occur during the growing season. Middleton (1995) suggests a longer dry period is necessary for cypress establishment. According to Middleton (1995), cypress seedlings require a drawdown of two years, and once established saplings will tolerate flooding better than seedlings.

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RESOURCES:

Definition of wetlands

As used by the U.S. Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (EPA) since the 1970s for regulatory purposes. Section 404 of the Clean Water Act: How Wetlands are Defined and Identified is as follows:

"Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Freshwater Swamp Species
***Taxodium distichum* (bald cypress)**

The following information concerning bald cypress can be found in the "Final Report of the Science Working Group to the Governor of Louisiana. Conservation, Protection, and Utilization of Louisiana's Coastal Wetland Forests" that Jim Chambers provided unless otherwise noted. The link is:
http://www.rnr.lsu.edu/SpecialProjects&Activities/SWG_FinalReport.pdf. Specific references are available in the in-depth report. We have condensed the pertinent information for ease of presentation.

Bald cypress cones generally mature in October through December. Seed is released beginning at time of maturation and continuing for several months and are primarily dispersed by water and seeds will float for an extended period of time (studies indicate on average 42 days). Dispersal of seeds is determined by the timing, magnitude and flow direction of floodwater and float for an average of 18 days (cones and scale) to 42 days (seeds). A cold, moist environment is required for stratification of the seeds and germination ensues within 2-2.5 wks in favorable conditions. Seeds require a drawdown period because the seeds cannot germinate in standing water and germination is initiated by exposure to aerobic conditions so to avoid flooding. In addition, a drawdown period is essential to allow seedlings to extend above the water surface to survive flooding during the growing season (March - November). Seedlings can withstand complete inundation for up to 45 days but must grow rapidly to reduce the risk of long-term submergence during the growing season. Young seedlings grow rapidly the first and second growing season (8-14 inches and 16-24 respectively). In artificial restoration it is common to planting one-year-old seedlings that are at least 3.3 feet tall and larger than 0.5 inches in diameter to improve early survival and growth. Estimates of annual growth rate during the first 50yrs of growth were 0.2-0.3 inches in diameter and two feet in height per yr. Bald cypress is tolerant of long flood durations and relatively deep flooding, even when coupled with low salinity levels. Flooding during the growing season is essential to prevent growth of tree species that may shade bald cypress and are will likely become

dominated by the shade-tolerant species. In addition, studies have shown that primary productivity is higher in forested wetlands that are open to flow and have a more "pulsing" hydrologic regime than a stagnant, continually flooded regime. Highest productivity in forested wetlands in Louisiana occurred when the pulsing events followed a seasonal pattern (Conner and Day, 1976, 1982; Conner et al. 1981)

In summation:

- Flooding and flow are required for seed dispersal from around October to January/February. Assuming that a goal of the restoration plan is natural regeneration, ideally flood levels should not overtop last year's germination class that have been estimated to grow at least 8 inches in one year but not fall below the surface.
- A drawdown period should follow dispersal flooding starting sometime in January/February to instigate germination. Flood levels should be reduced to below surface.
- Once germination has occurred, levels of flooding can be increased but should not last more than 45 days to prevent seedling death.
- Bald cypress is tolerant of long flood durations and relatively deep flooding, even when coupled with low salinity levels (< 3 ppt; ideally <2 ppt) except during germination and seedling growth.
- Once established, seasonal flooding and flow-through reduces competition and increases primary productivity.

Freshwater and Intermediate Marsh Species

Two principal factors affecting plant zonation in the coastal plain are salinity and hydrologic regime (Adams 1963; Chabreck 1972; Cowardin et al. 1979; Odum 1988; Day and Templet 1989; Keddy 2000; Mitsch and Gosselink 2000). Four dominant marsh types that closely correlate with salinity level have been identified in the deltaic coastal plain of Louisiana (Penfound and Hathaway 1938, Chabreck 1972):

- fresh (strictly fresh water, salinity < 0.5ppt);
- intermediate (nearly fresh water, salinity range of 0.5 to 5.0 ppt);
- brackish water salinity level range of 5 ppt to 18 ppt; and
- salt (salinity level greater than 18 ppt).

The dominant species of fresh and intermediate marsh were used as indicators of acceptable conditions. The following details salinity and flooding levels.

Maidencane (Panicum hemitomon)

- A dominant fresh water marsh species that is an aquatic or subaquatic perennial often found in water +2 feet (Godfrey and Wooten 1979).

- Increased flooding depth stimulated productivity under fresh and low salinity conditions (Willis and Hester 2004 and Fisher 2003).
- Increased flooding depths of +5 and +20 cm stimulated productivity under fresh and low salinity conditions, even under constant inundation. Under fresh conditions, *P. hemitomon* produced significantly more biomass under flooded conditions. Increased flooding depth also significantly stimulated adventitious root production under fresh conditions with the most adventitious roots per cm water depth being produced in the +20 cm flooding depth (Spalding 2003 and Spalding and Hester 2007).
- *Panicum hemitomon* has been reported to tolerate gradual increases of salinity level in the range of 7 to 12 ppt over the short-term (McKee and Mendelssohn 1989; Hester et al. 1998; Howard and Mendelssohn 1999; Hester et al. 2001).
- Prolonged exposure to increased salinity levels ranging from 4 to 6 ppt (Pezeshki et al. 1987; Hester et al. 2001) and sudden increases in salinity level (Pezeshki et al. 1987; Howard and Mendelssohn 1999; Howard and Mendelssohn 2000) have proved to be detrimental and sometimes fatal.
- Salinity levels of 7.6 – 12 ‰ have proved lethal (Hester et al. 1998) and a salinity level of only 4 ‰ significantly depressed both plant photosynthetic response and (Hester et al. 2001).

Bulltongue (***Sagittaria lancifolia)***

- A dominant fresh water and intermediate marsh species that is often found in fairly deep water along marshy shores and edges (Godfrey and Wooten 1979).
- Germination can occur in water, but is reduced in anaerobic conditions (Collon and Velasquez 1989).
- Seedlings emerged at flooding depths of 4-5 cm and a salinity level of 4 ‰ and biomass production was higher under flooded conditions (+10 cm) (Baldwin et al. 1996).
- Percent cover increased with an increased hydroperiod David (1996).
- Mean height increased with +7.5 and +15 cm of flood waters and that maximum leaf height was attained at +15 cm flooding, (Howard and Mendelssohn 1995).
- Biomass was reduced at 6‰ salinity (Baldwin and Mendelssohn 1998)
- Growth increased at 2 ‰ and decreased at 4 ‰ and 8‰ La Peyre (2001).
- Salinity ranges from 4 ‰-5 ‰ were not detrimental to growth, but the interaction of salt and flooding of +15 cm was detrimental and 15‰ salinity in the field was lethal. (Webb and Mendelssohn 1996).

- Productivity was not affected by increased flooding depths of +5 and +20 cm utilized and prolonged exposure (+ 6 months) to increased flooding depths did not significantly affect productivity (Spalding 2003 and Spalding and Hester 2007).
- Field studies reported another species, *Sagittaria latifolia*, growing in a water depth of 80cm (2.6ft) (Thunhorst 1993, as cited in Field and Philipp 2000).

Spartina patens

- *Spartina patens* has been described a dominant oligohaline marsh plant (Visser et al. 1999; Taylor and Grace 1995; Taylor et al. 1997).
- It inhabits saline to brackish marsh environments but also can be found in infrequently flooded fresh marsh (Oosting and Billings 1942; Godfrey and Wooten 1979). NOTE: Godfrey and Wooten do not use intermediate as a marsh type.
- Flooding levels determined to be detrimental to S. patens: decreased biomass as at +10 cm flooding (Baldwin and Mendelssohn 1998); decreased root specific gravity at +10cm (Naidoo et al. 1992); lowered biomass and death at +30 cm (Broome et al. 1995); and death at +20cm, especially coupled with long-term duration, regardless of salinity level (Spalding and Hester 200??).
- Effect of salinity levels ranged from: no effect from a salinity range of 0 ‰ to 4 ‰ (Taylor and Grace 1995; Taylor et al. 1997); no effect of a salt pulse of up to 6.68‰ (Chabreck and Palmisano 1973); no decrease in growth at 0 ‰, 2 ‰, 4 ‰ and 8 ‰ salinity (La Peyre et al. 2001); plant height, foliage, and root dry weight were reduced at 15 ‰ and 25 ‰ (Pezeshki and DeLaune 1991); and Ewing et al. (1995) found leaf growth and live aboveground biomass to higher in 0 ‰ and 7 ‰ than 21‰ and 28‰. s.

Eleocharis spp.

- *Eleocharis* spp. grow in wet environments, generally flowers in shallow water, and reproduce via vegetative growth in deep water (Godfrey and Wooten 1979).
- They have been reported from fresh, tidal fresh, intermediate and oligohaline marshes and in areas ranging in salinity from 0 ‰ to 12 ‰ (White 1983, McKee and Mendelssohn 1989, Howard and Mendelssohn 1995, Perry and Hershner 1999, Visser et al. 1999).
- Reports of flood tolerance range from: a submerged plant, indicating flood tolerance (Brown 1987); a mean water depth was 24 cm (David 1996); and up to depth of 71 cm (David 1996).

- Reported detrimental effects of increased salinity levels range from: decreased biomass at a salinity of 6‰ and by flooding of +10 cm (Baldwin and Mendelssohn 1998); salinities of 2 ‰, 3.5 ‰, and 5 ‰ resulted in lower plant height and a salinity of 7‰ resulted in death (James and Hart 1993); salinity levels of 3‰ lead to reduced growth rate, 5‰ resulted in zero growth, and 10‰ resulted in death (Wilson et al. 1996).

Scirpus olneyi

- Optimum growth occurred at flooding of +10 cm and growth at -10 cm and +30 cm was nearly equal (Broome et al. 1995).
- Salinity levels above 10 ‰ resulted in reduced growth (Broome et al. 1995).

ATTACHMENT 2

Academic Input

ACADEMIC INPUT

The following Attachment is complied from emails between Cathy Breaux, USFWS, and the following exerts: Andy Nyman, LSU; Mark Hester, LSU; Jenneke Visser, UL-L.

- *Andy Nyman, LSU*
  - In two papers (one is attached as a pdf; I don't have a pdf of the other but the citation is below), we described our unplanned observations of a marsh collapse (it collapsed in the middle of several years of field work). In this marsh, we estimated submergence (global sea-level rise + local subsidence) to be 1.4 cm/year. Marsh vertical accretion was 1.0 cm/yr (the fastest I think ever reported, but not fast enough to keep up with submergence there). I therefore assume that 1.0 cm/yr is the fastest submergence that any marsh can tolerate. I assume that subsidence in the MRGO area is about 0.5 cm/yr (because of the depth-to-Pleistocene, but I could be way off). I assume that global sea-level rise is 0.2 cm/yr. I therefore don't anticipate rapid marsh collapse in the St. Bernard delta like that observed in the Barataria-Terrebonne delta unless global-sea-level rise reaches 0.5 cm/yr. What's the best subsidence measurements in the area? (data published in DeLaune et al. 1994)
  - Citation: DeLaune, R.D., J.A. Nyman, and W.H. Patrick, Jr. 1994. Peat collapse, ponding, and wetland loss in a rapidly submerging coastal marsh. Journal of Coastal Research 10:1021-1030.

- *Mark Hester, LSU*
  - Just a quick response before I leave for Australia. I agree that the upper 30 cm (12") is where living roots would most likely be found in a wetland. Also, Andy's student's data (Tommy) on the upper 20 cm (8") for living roots seems right on for that subsiding environment. I just want to add that the depth of living roots would be correlated with marsh surface elevation. So, in theory, in a healthy accreting marsh you may find living roots down to 30 cm or deeper depending on the marsh surface elevation and hydrogeomorphic setting. However, I think that 30 cm would be max in Louisiana based on personal observation/experience. I'm sure most of you have seen the attached Morris et al. 2002 pdf, but if not, his theoretical maximum for a (salt) marsh to keep pace with relative sea-level rise is 1.2 cm/yr. Regarding peat collapse - dunno - you may want to see if Don Cahoon (USGS) can give some additional insights. I believe he has a paper in review that looks at some healthy and collapsed marshes in LA.

- *Cathy Breaux, USFWS*
  - Following up on the comments that roots only extend downward 8" (or greater in healthy marshes), I'm wondering if we should go ahead and use 8" of post-construction RSLR to restore MC loss rates to background, or, should we attempt to capture other effects (such as bioturbation that might mix deposited mineral material upward in the soil matrix, plus the effects

of MC-related interior pond shoaling and associated reduced shoreline erosion), to increase our loss rate change point to the year when post-construction RSLR reached 10 inches. Any thoughts???

- I have no doubt that plants will accumulate and carry up with them over the decades those elements in the dredged material that are soluble and desirable. N, P, come to mind but there are others too. The proof of this statement is found in some of Ron DeLaune's work in which they consistently noted that the concentration of most elements is higher in the surface sediments than in the underlying sediments. This condition is typical of nutrient poor wetlands. The mechanism for this is the translocation of valuable elements from older roots and leaves that are about to senesce into temporary storage and ultimately into new leaf or root tissue. I don't know of any mechanism or data to suggest that physical attributes of the dredged material could migrate upward as chemicals might, but bioturbation might spread the dredged materials both up and down and thereby maintain sediments in the upper portions longer than if there was no bioturbation. But I don't see a lot of fiddler crab holes in marshes, so I guess this isn't an issue. After thinking about this stuff a little, I guess that 8 inches would apply if there were no plants, but there are plants (that will translocate). So 8 inches is extremely conservative, probably overly conservative. I may modify my thinking after someone else adds something (Mark Hester added something last time that I hadn't thought of), so this is not my final word on the question.

- Jenneke Visser, UL-L
  - As for your questions on land loss, with respect to created marshes and loss rates under different climate change scenarios. This is a fairly complex issue. Sedimentation will increase as the marsh subsides and sea-level increases. Marsh plant productivity will decrease as flooding frequency increases and at a certain point the plants will die. The length of this time, may be less related to the depth of rooting than on the availability of suspended sediments in the area and the probability that these sediments can be transported to the marsh surface. The probability of sedimentation is also what will drive interior loss in areas surrounded by shoreline protection. If the shoreline protection reduces the exchange between the interior marsh and surrounding water bodies, this may actually increase the interior loss, while preventing the shoreline erosion losses and even potentially creation of new marsh with sediments trapped immediately behind shoreline protection features.

ATTACHMENT 3

H & H Diversion Modeling

MASS BALANCE OF FLOW, NUTRIENTS AND SUSPENDED SEDIMENTS

Alternatives

Two Alternative diversion scenarios have been considered:

1. A diversion of an average of 1000 cfs at or near the existing Violet Syphon during all months except April and May when the Diversion would be in the range 5000 to 7000 cfs; the large gap between MRGO and Lake Borgne is left open in this Alternative.
2. A diversion of an average of 1000 cfs at or near the existing Violet Syphon during all months except April and May when the Diversion would be in the range 5000 to 7000 cfs; the large gap between MRGO and Lake Borgne is blocked in this Alternative.

Figure 1 shows a schematic organization chart for the flow distribution from the Violet diversion. It is assumed that the nutrients can be represented by dissolved inorganic nitrogen (DIN) as a surrogate. It is also assumed that the suspended solids are of two types: sand and fines (silt and clay), The sand load is assumed to be deposited near the diversion; only the fines are included in the following computations.

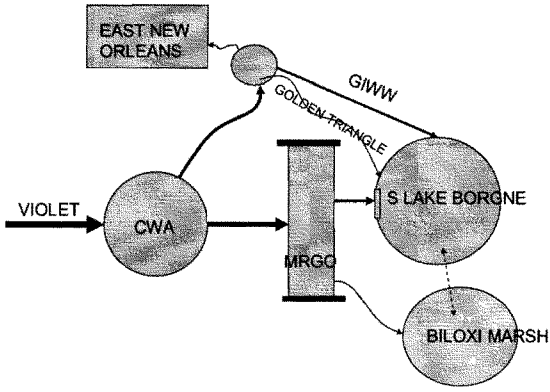


Figure 1. System Compartments

Distribution of Violet Diversion Water

The calibrated link-node model was used to estimate the flow distribution for Alternatives 1 and 2.

Alternative 1: The second column of the first half of Table 1 shows the percentage of the Violet flow that reaches the various compartments for flows up to 2000 cfs for Alternative 1.Table 1 indicates that about 68% of the flow that enters the CWA leaves via the Bayou Dupre structure and 32% leaves by Bayou Bienvenue. The flow from Bayou Bienvenue is split three ways in terms of

the original Violet flow, 9% goes to East New Orleans toward Lake Pontchartrain, 4% goes to the Golden Triangle and 19% travels eastward to Lake Borgne. Of the water that leaves through Bayou Dupre approximately 6% of the Violet flow goes directly to the Biloxi Marsh while the rest goes directly to Lake Borgne (62%). A total of about 85% of the Violet flow eventually enters South Lake Borgne. Table 2 presents similar information for a diversion of about 6000 cfs; the flow distribution is not too sensitive to the magnitude of the diversion up to about 6000 cfs. Figure 2 shows the distribution of the Violet diversion water for Alternative 1.

Alternative 2: The second column of the second half of Table 1 shows the percentage of the Violet flow that reaches the various compartments for flows up to 2000 cfs for Alternative 2. Table 1 indicates that about 68% of the flow that enters the CWA leaves via the Bayou Dupre structure and 32% leaves by Bayou Bienvenue. The flow from Bayou Bienvenue is split three ways in very similar distribution to Alternative 1. Of the water that leaves through Bayou Dupre approximately 34% of the Violet flow goes directly to the Biloxi Marsh while the rest goes directly to Lake Borgne (34%). A total of about 57% of the Violet flow eventually enters South Lake Borgne. Table 2 presents similar information for a diversion of about 6000 cfs. Figure 3 shows the distribution of the Violet diversion water for Alternative 2.

Distribution of DIN in the Violet Diversion

It is assumed that the nutrients are transported by the net flow as calculated by the link-node model which was used to estimate the flow distribution for Alternatives 1 and 2. The delivery of Dissolved Inorganic Nitrogen (DIN) depends on the flow distribution and the uptake or conversion of DIN along the pathway. Based on our modelling of Lake Pontchartrain we made two assumptions: a) flow through wetlands can remove about 50% of the DIN at low flows (Roblin 2008 based on work by Day et al on the 1994 Bonnet Carré experimental opening) and b) the DIN update is reduced as the flow increases above some limit (1000-2000 cfs in this analysis).

Alternative 1: The third column of the first half of Table 1 shows the percentage of the Violet DIN load that reaches the various compartments for flows up to 2000 cfs for Alternative 1. Column 4 shows that estimate percentage loss or update of DIN in a particular compartment in terms of DIN load entering the CWA. Table 1 indicates that about 34% of the DIN that enters the CWA leaves via the Bayou Dupre structure and 16% leaves by Bayou Bienvenue. The flow from Bayou Bienvenue is split three ways and in terms of the original Violet DIN load:

4.5% goes to East New Orleans toward Lake Pontchartrain
2% goes to the Golden Triangle and
9.5% travels eastward along the GIWW to Lake Borgne.

Of the DIN that leaves through Bayou Dupre approximately 3% of the Violet DIN load goes directly to the Biloxi Marsh while the rest goes directly to Lake Borgne (31%). A total of about 41% of the Violet DIN load eventually enters South Lake Borgne. Table 2 shows the estimates for DIN for a diversion of the order of 6000 cfs from Violet. The uptakes are considerably less because the detention times are reduced. Above 2000 cfs, it is assumed that the uptake rates are proportional to the diversion flow divided by the 2000 cfs.

Alternative 2: The third column of the second half of Table 1 shows the percentage of the Violet DIN load that reaches the various compartments for flows up to 2000 cfs for Alternative 2. Column

4 shows that the estimated percentage loss or uptake of DIN in a particular compartment in terms of DIN load entering the CWA. Table 1 indicates that about 34% of the DIN that enters the CWA leaves via the Bayou Dupre structure and 16% leaves by Bayou Bienvenue.

As in Alternative 1, the flow from Bayou Bienvenue is split three ways and in terms of the original Violet DIN load:

4.5% goes to East New Orleans toward Lake Pontchartrain
2% goes to the Golden Triangle and
9.5% travels eastward along the GIWW to Lake Borgne.

Of the DIN that leaves through Bayou Dupre approximately 17% of the Violet DIN load goes directly to the Biloxi Marsh while the rest goes directly to Lake Borgne (~17%). A total of about 27% of the Violet DIN load eventually enters South Lake Borgne through the Bayou Dupre route and the Bayou Bienvenue route. Table 2 shows the estimates for DIN for a diversion of the order of 6000 cfs from Violet.

Distribution of Fine SS in the Violet Diversion

The delivery of SS depends on the flow distribution and the deposition rates along the pathway. Based on our modelling of Lake Pontchartrain, we have estimated that at low flows about 30% of the fine sediment will be deposited in the wetland compartments and at high flows this will be proportional to the diversion flow divided by the 2000 cfs. It is assumed that the deposition in the channels is very small O(1%) or less.

Alternative 1: The fifth column of the first half of Table 1 shows the percentage of the Violet fine suspended sediment (SS) load that reaches the various compartments for flows up to 2000 cfs for Alternative 1. The last column (6) shows the estimated percentage deposition of SS in a particular compartment in terms of SS load entering the CWA. Table 1 indicates that about 48% of the SS that enters the CWA leaves via the Bayou Dupre structure and 22% leaves by Bayou Bienvenue. The flow from Bayou Bienvenue is split three ways and in terms of the original Violet SS load:

6% goes to East New Orleans toward Lake Pontchartrain,

3% goes to the Golden Triangle and

13% travels eastward in the GIWW to Lake Borgne.

Of the water that leaves through Bayou Dupre approximately 3% of the Violet flow goes directly to the Biloxi Marsh while the rest goes directly to Lake Borgne (~45%). A total of about 58% of the Violet SS load eventually enters South Lake Borgne. Table 2 shows that same estimates for SS for a diversion of the order of 6000 cfs from Violet.

Alternative 2: The fifth column of the second half of Table 1 shows the percentage of the Violet fine suspended sediment (SS) load that reaches the various compartments for flows up to 2000 cfs for Alternative 2. The last column (6) shows the estimated percentage deposition of SS in a particular compartment in terms of SS load entering the CWA. Table 1 indicates that about 48% of the SS that enters the CWA leaves via the Bayou Dupre structure and 22% leaves by Bayou Bienvenue. The SS from Bayou Bienvenue is split three ways and in terms of the original Violet SS load:

~6% goes to East New Orleans toward Lake Pontchartrain,

~3% goes to the Golden Triangle and

~13% travels eastward in the GIWW to Lake Borgne.

Of the SS that leaves through Bayou Dupre approximately 23% of the Violet SS load goes directly to the Biloxi Marsh while the rest goes directly to Lake Borgne (~23%). A total of about 38% of the Violet SS load eventually enters South Lake Borgne. Table 2 shows that similar estimates for SS for a diversion of the order of 6000 cfs from Violet.

Alex McCorquodale September 2, 2009

Table 1. Mass Balance of Water, DIN and Fine Suspended Sediments from Violet Diversion for a Diversion of up to 2000 cfs for Alternatives 1 and 2

Alternative	1	Flows <= 2000 cfs			
System Compartment	*% of Violet Flow Delivered*	*% of Violet DIN Delivered*	*DIN Uptake %*	*TSS % Delivered*	*TSS deposited %*
CWA	100	100	50.0	100	30
Bayou Dupre	68.0	34.0	0.0	47.6	0.0
Bayou Bienvenue	32.0	16.0	0.0	22.4	0.0
GIWW E. New Orleans	9.0	4.5	4.5	6.3	6.3
Golden Triangle	4.0	2.0	1.0	2.8	0.8
GIWW East	19.0	9.5	0.2	13.3	1.0
MRGO	68.0	34.0	0.2	47.6	1.0
S. Lake Borgne	85.0	41.1	41.1	57.9	57.9
Biloxi Marsh Direct	6.0	3.0	3.0	2.9	2.9
Uptake %			100.0		100

Alternative	2	Flows <= 2000 cfs			
System Compartment	*% of Violet Flow Delivered*	*% of Violet DIN Delivered*	*DIN Uptake %*	*TSS % Delivered*	*TSS deposited %*
CWA	100	100	50.0	100	30
Bayou Dupre	68.0	34.0	0.0	47.6	0.0
Bayou Bienvenue	32.0	16.0	0.0	22.4	0.0
GIWW E. New Orleans	9.0	4.5	4.5	6.3	6.3
Golden Triangle	4.0	2.0	1.0	2.8	0.8
GIWW East	19.0	9.5	0.2	13.3	1.0
MRGO	68.0	34.0	0.2	47.6	1.0
S. Lake Borgne	57.0	27.1	27.1	37.6	37.6
Biloxi Marsh Direct	34.0	17.0	17.0	23.3	23.3
			100		100
		fDIN	50%	fTSS	30%

Table 2. Mass Balance of Water, DIN and Fine Suspended Sediments from Violet Diversion for a Diversion of approximately 6000 cfs for Alternatives 1 and 2.

Alternative	1	Flows ~ 6000 cfs			
System Compartment	*% of Violet Flow Delivered*	*% of Violet DIN Delivered*	*DIN Uptake %*	*TSS % Delivered*	*TSS deposited %*
CWA	100	100	17	100	10
Bayou Dupre	68.0	56.4	0.0	61.2	0.0
Bayou Bienvenue	32.0	26.6	0.0	28.8	0.0
GIWW E. New Orleans	9.0	7.5	7.5	8.1	8.1
Golden Triangle	4.0	3.3	0.6	3.6	0.4
GIWW East	19.0	15.8	0.5	17.1	0.5
MRGO	68.0	56.4	0.5	61.2	0.5
S. Lake Borgne	85.0	69.0	69.0	75.4	75.4
Biloxi Marsh Direct	6.0	5.0	5.0	5.2	5.2
Uptake %			100		100

Alternative	2	Flows ~ 6000 cfs			
System Compartment	*% of Violet Flow Delivered*	*% of Violet DIN Delivered*	*DIN Uptake %*	*TSS % Delivered*	*TSS deposited %*
CWA	100	100	17	100	10
Bayou Dupre	68.0	56.4	0.0	61.2	0.0
Bayou Bienvenue	32.0	26.6	0.0	28.8	0.0
GIWW E. New Orleans	9.0	7.5	7.5	8.1	8.1
Golden Triangle	4.0	3.3	1.7	3.6	0.4
GIWW East	19.0	15.8	0.5	17.1	0.5
MRGO	68.0	56.4	0.5	61.2	0.5
S. Lake Borgne	57.0	44.7	44.7	50.2	50.2
Biloxi Marsh Direct	34.0	28.2	28.2	30.4	30.4
			100		100
		fDIN	17%	fTSS	10.0%

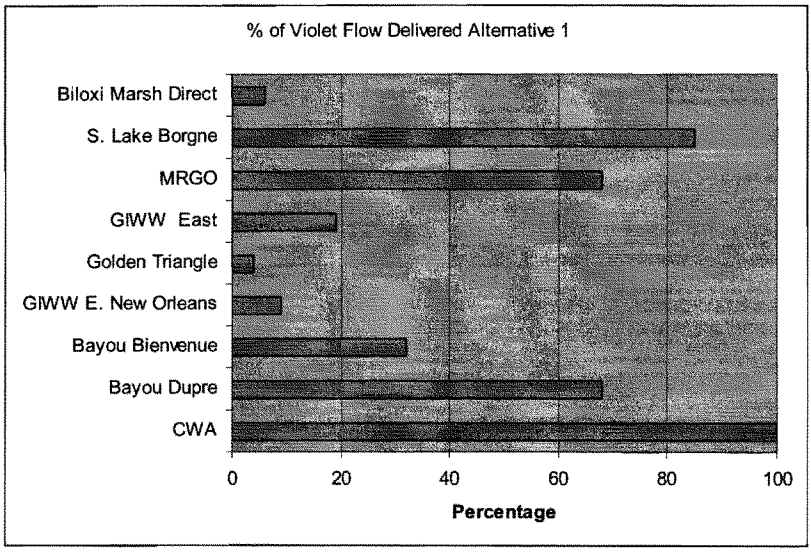


Figure 2 Percent of Flow Delivered in Alternative 1

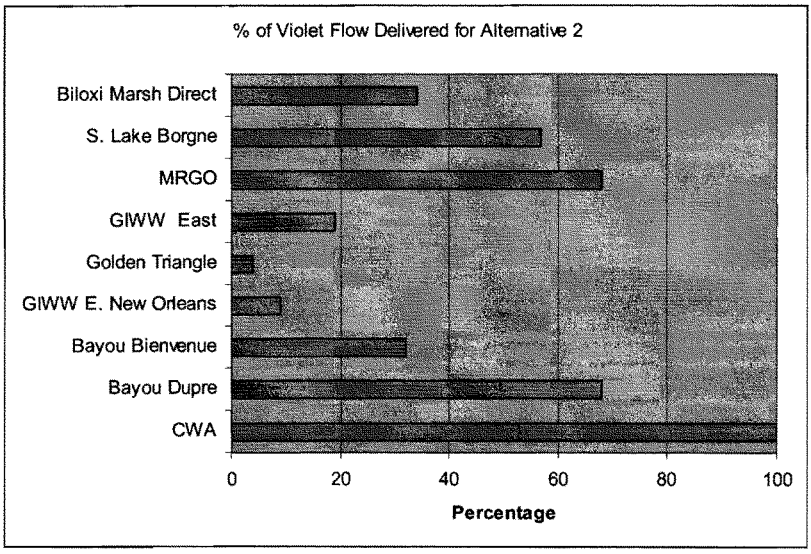


Figure 3 Percent of Flow Delivered in Alternative 2\

ATTACHMENT 4

Methodology for Determining Environmental Benefits For Variable 1, Percent Emergent Marsh

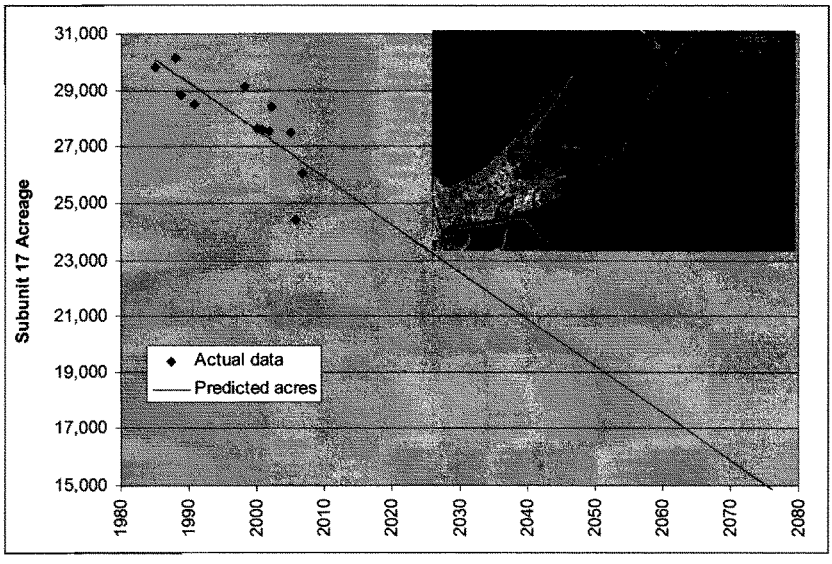
Methodology for Determining Environmental Benefits

The HET agreed that use of the Wetland Value Assessment (WVA) methodology would be most appropriate given considering the tight feasibility study schedule. Use of the WVA, however, requires estimates of FWP and FWOP marsh acreages. Described below are the models and methods were used to determine FWOP marsh acreages and predicted acreages for the proposed project features.

FWOP Wetland Acreage Projections

Wetland acreage data (1985 through 2006) was obtained from the USGS for each of the study area subunits. Future-without-project (FWOP) subunit wetland acreages were determined via a linear trendline through those data (Figure 1). Where applicable, annual net acreage benefits associated with pre-existing or soon to be constructed restoration projects were added to the base subunit FWOP acreages to obtain revised FWOP subunit acreages.

Figure 1. Actual and predicted acreage for subunit 17.



Predicting Wetland Benefits of Mississippi River Diversions - General

Given the short study schedule, a quick and easy-to-use methodology was needed for assessing wetland benefits associated with proposed Mississippi River diversion measures. The SAND2 (Sediment and Nutrient Diversion) model was used. This model is an Engineering Research and Development Center (ERDC) revision of the SAND1 (Boustany-ERDC spreadsheet model) used in the Louisiana Coastal Protection and Restoration Final Technical Report (LACPR). The SAND2

version differs from the SAND1 model by incorporating an improved method for determined nutrient benefits, plus it includes the ability to capture diversion synergies with proposed marsh creation measures constructed within the diversion benefit area.

Given the great uncertainties regarding future subsidence rate changes, sea-level rise changes, and many other factors that might affect future wetland loss rates over the project life, there is considerable uncertainty regarding the accuracy of the predicted river diversion benefits. However, the SAND models do provide an objective means for comparing alternative measures and plans.

Although the project life is 50 years, all environmental assessments were conducted for a 100-yr period to assess the wetland acreage trajectories at and beyond the project life. Utilizing the predicted FWOP wetland acreage as a basis, the SAND2 model calculates FWP benefits (in acres) via the accretion of suspended sediments (land building) together with the effects of nitrogen additions. The nitrogen benefits (in acres) are calculated as the grams of nitrogen required to produce a wetland acre multiplied by the grams of introduced nitrogen (less nitrogen lost to denitrification) = wetland acres created/supported via introduced nitrogen. Inputs required for estimating the nutrient benefits are:

1. Mississippi River Discharge
   All diversion benefit assessments utilized twenty five years of Tarbert's Landing discharge data (1983-2007) repeated 4 times to create a 100-yr input.

2. Diversion Discharge
   The Violet Diversion was assumed to operate year-round at 1,000 cfs, except during the months of April and May, when it would operate at 7,000 cfs.

4. Nutrient Concentrations
   Monthly USGS Belle Chase nitrogen concentration data (1976 through 2007) are used to calculate nitrogen additions to diversion receiving areas.

5. Plant Productivity Rate
   Monthly above-ground emergent vegetation productivity values, by marsh type, are selectable with the model. Productivity values according to the FWOP marsh type were chosen.

6. Emergent Vegetation % Nitrogen
   Percent nitrogen of emergent vegetation biomass (*Chabreck 1972)* is incorporated into the model, and selectable by habitat type. Percent nitrogen based on FWOP habitat type was used.

7. Denitrification Rate
   A literature reported value of 21 $g/m^2/yr$ was used (Delaune and Jugsujinda 2003, Bond 2006, and Day et al. 2004). Denitrification was assumed to reduce the amount of introduced nitrogen available for uptake by emergent wetland vegetation.

Land building benefits under the SAND2 model were estimated utilizing a Belle Chase sediment rating curve, together with the assumed diversion discharge, to compute the volume of introduced sediment. The model's sediment retention module then applied all or a portion of the introduced

suspended toward accretion of new wetland acres. The sediment retention module uses the size and dimensions of the receiving area, and diversion discharge, to calculate velocities within the receiving area. Whenever receiving area velocities drop below the thresholds required to keep any one of the 3 sediment types (fine sand, silts, and clay) in suspension, the model calculates deposition of that sediment type. However, land building is not solely based on the accretion of introduced mineral sediments. The model automatically includes sufficient organic material to achieve the average surface soil bulk density of the selected habitat type (which was always selected as that of the FWOP condition). In addition to using the surface soil bulk density by habitat type, the model also uses depth of fill, and bulk density compaction with depth change rate to calculate a depth-averaged soil bulk density

The previously defined study area subunits were utilized as the diversion receiving areas. Required inputs to calculate acres of diversion-related land-building include; width, acreage, and average water depth, and roughness height of bottom sediments.

1. Mississippi River Sediment Concentrations
   A sediment rating curve using (1991-2004) surface suspended sediment concentration values at Belle Chase relative to Tarbert's Landing discharges (*Snedden et al. 2007)* was incorporated into the model to calculate suspended sediment concentrations at a given river discharge. Belle Chase sediment size fractions were also used (fine sand, silt, clay). Percent flocs were estimated based on the FWOP salinity regime. Higher % flocs are assumed in higher salinity receiving areas, and lower % flocs are assumed in lower salinity receiving areas.

2. Diversion Discharge
   The Violet Diversion was assumed to operate year-round at 1,000 cfs, except during the months of April and May, when it would operate at 5,000 cfs.

3. Receiving Area length
   Using ArcMap, the receiving area length was measured as the length of the primary diversion flow pathway through the receiving area.

4. Receiving Area Width
   This was calculated by dividing the receiving area length into area of the receiving area (i.e., subunit area).

5. Average Depth
   This was obtained through any available data source. If no data source was available, average depth was estimated based on field observations and professional judgment.

6. Roughness Height of Water Bottoms
   Based on *Smith 2007* and *Soulsby 1983*, a roughness height for mud of 0.0006562 feet was used for all model runs.

7. Wetland Soil Bulk Density
   Based on values reported in the published literature, average surface bulk density values are selectable within the model. Surface bulk density values were selected according to the

FWOP habitat type. The model computes a depth-averaged bulk density using surface bulk density, depth of fill, and bulk density change with depth inputs.

8. Maximum Tidal Velocity
   Maximum tidal velocities are required in the model's sediment retention module. Lacking velocity data for all evaluated diversion receiving areas, velocities were estimated to be 1.5 feet per second in receiving areas close to the Gulf, and 1.0 feet per second in middle and upper basin diversion receiving areas.

The application of the SAND2 model to the Violet Diversion was atypical because sediment and nutrient retention and losses within the immediate Central Wetlands receiving area, the deep MRGO channel, and Lake Borgne, would reduce diversion benefits to the more distant influence areas such as the Inner Biloxi marshes and the east Orleans landbridge. Consequently, benefits were determined separately for the Central Wetlands, South Lake Bornge marshes, Inner Biloxi Marshes, and East Orleans Landbridge study area subunits. To assist in this effort, Dr. Alex McCorquodale (University of New Orleans) utilized a simple hydrologic model to provide estimates (attach report?) of diverted water, nutrients, and sediments that would be delivered to and retained within each of the receiving areas at the 1,000 cfs and 5,000 cfs diversion discharges. The reported water, nitrogen, and sediment distributions values used in the SAND2 model were derived with the inclusion of a proposed closure across the Lake Borgne shoreline opening to the MRGO, across the MRGO from Bayou Dupre. Additionally, Dr. McCorquodale's work indicated that all sands would be deposited within the Central Wetlands, and that only fine sediments would travel further. Therefore, sand retention values were manually set to 0 in all receiving areas, except for the Central Wetlands model run.

Use of the SAND2 model also required input of FWOP and FWP wetland loss rates, plus initial marsh and water acreages of the receiving area. FWOP target year 0 (TY0) acreages (year 2014) were determined via application of a linear trendline as described above. The SAND2 model was developed to allow input of up to 3 different FWOP and 3 FWP loss rates. Because Coastal Wetland Planning and Protection, and Restoration Act (CWPPRA) projects have a 20-yr project life, implementation of CWPPRA projects may cause FWOP subunit loss rates to change several times. If several CWPPRA projects occur within a subunit, they may result in more than 3 FWOP loss rate changes over the 100-yr SAND2 analysis period. In such cases, a weighted average was utilized to combine 2 similar loss rate periods. In many cases, FWP marsh creation and marsh nourishment measures also resulted in more than 3 loss rate changes. In such cases, a weighted average was utilized to combine 2 similar loss rate periods.

Predicting Wetland Benefits of the Mississippi River Diversion at Violet

The evaluated Violet Diversion was assumed to operate year-round at 1,000 cfs, except during the months of April and May, when it would operate at 5,000 cfs. Because the diverted water would flow through the Central Wetlands area, that area would receive 100% of the discharge. The McCorquodale report determined that the maximum sediment deposition (at 1,000 cfs) was 30% of the total introduced sediment and the maximum nitrogen uptake was 50% of the total introduced nitrogen. Therefore, input nutrient load in the SAND2 model run for the Central Wetlands was

reduced by 50% and sediment retention within the area was manually set to 30% of the total introduced suspended sediment load.

According to the McCorquodale report, the South Lake Borgne marshes would receive a maximum 61% of the total river water inputs, a maximum 50.6% of the suspended sediment, and a maximum 46.4% of the introduced nitrogen. Therefore, the SAND2 model diversion inputs to this area were reduced to 61% of the total. Because the percent suspended sediment input was less than the percent water input, the sediment input was manually reduced to 83% of introduced water's sediment load (50.6 of the total sediment/61 of the total diversion discharge = 83%). Similarly, the nitrogen load was reduced to 76% (46.4% total nitrogen delivered/61% of the total water delivered).

The East Orleans landbridge marshes were estimated to receive a maximum of 9% of the total diverted discharge, a maximum of 7.5% of the total nitrogen, and a maximum of 8.1% of the total suspended sediment load. For this area, the SAND2 model nitrogen input was reduced to 83.3% (7.5% of the total nitrogen/9% of the total diversion input), and the suspended sediment input was reduced to 90% (8.1% of the sediment/9% of the introduced water).

Although the McCorquodale report indicated that the Inner Biloxi marshes would receive 34% of the total diversion flows, that estimate was reduced to 30% since 70% of the diversion flows were designated as going elsewhere (61% to the South Lake Borngе + Golden Triangle, and 9% to the East Orleans landbridge). Because the McCorquodale report indicated that the maximum sediment delivery would be 30.4% of the total, and the maximum nitrogen delivery would be 28.2% of the total, the SAND2 sediment inputs for the Inner Biloxi marshes were adjusted to 101% (30.4% of sediment/30% of the water), and 94% of the nitrogen (28.2% of introduced nitrogen/30% of the introduced water).

Whenever FWP marsh creation measures were proposed within a diversion receiving area, the acres of created marsh were entered into the SAND2 model as FWP created acres so that the diversion model would predict benefits both the existing and created marshes. In those cases, the SAND2 model would report the benefits of both the diversion and affected marsh creation measures.

In some subunits, FWP shoreline protection measures were proposed within a diversion receiving area. Diversion operations were assumed not to change shoreline loss processes or rates.

Predicting Wetland Benefits of Marsh Creation Projects

A mathematical model or formula was developed to calculate net marsh creation project benefits (net acres = future-with project acres minus future without project acres). Formula inputs include:

1. Created acres – The number of acres of open water filled to create marsh
2. Year constructed – The year in which the marsh creation project is built
3. Loss rate (ac/yr) – The number of created marsh acres being lost each
4. Subsidence – Corps subsidence rate (ft/century)
5. FWP year benefits loss rate reverts – The year in which the reduced post-construction loss rate reverts to the pre-construction or baseline rate.

Model Assumptions:

a) The created marsh loss rate is initially 50% of the loss rate of existing surrounding areas provided post-construction submergence (SLR + subsidence) is less than 10 inches.

b) The created marsh loss rate will revert to background or baseline loss rates when post-construction submergence (SLR + subsidence) is greater than 10 inches. This rate change occurs in years 54 and 79 for projects constructed within 1.0 ft/century and 0.5 ft/century subsidence rate zones, respectively.

Excel Model Formula:
=IF(year>=FWP year benefits loss rate reverts,previous acres+FWP loss rate*2,IF(year<build year,0,IF(year>=build year,IF(created acres+(loss rate*(year-build year))<0,0,created acres+(loss rate*(year-build year))))))

Model Function (See Figure 2):

a) If present year is greater than the year when loss rate reverts to background rate, the loss rate will be doubled
b) If the present year is less than the construction year, then acreage is equal to zero.
c) If present year is equal to year constructed, then the created acres are equal to the net benefits.
d) If the present year is greater than year constructed, then net benefits equals previous years' acres minus the loss rate.

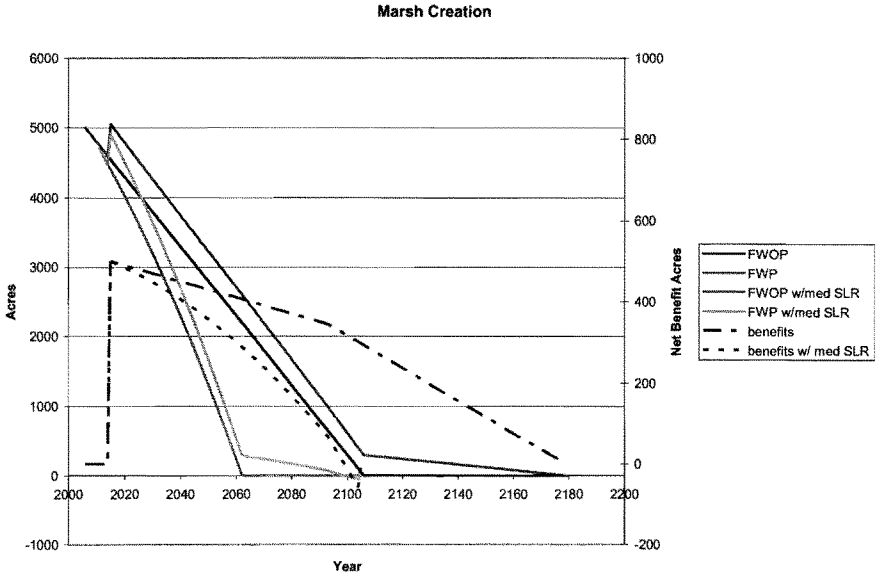


Figure 2. Marsh Creation net benefits, FWOP acres, and FWP acres in relation to time. Acres are added to existing marsh acres in the FWP. The loss rate for the FWOP acres and the created acres will be added together for the FWP acres. After the FWOP acres reach zero, remaining acres will be lost at the loss rate for the created acres.

Predicting Wetland Benefits of Marsh Nourishment Projects

A mathematical model or formula was developed to calculate net marsh nourishment project benefits (net acres = future-with project acres minus future without project acres). Formula inputs include:

1. Total Acres Nourished – Total area of the project
2. Construction year – The year in which the marsh nourishment project is built.
3. Net annual benefit (ac/yr) – The land loss rate for the nourished area (50% of the FWOP rate)
4. FWOP zero – The year when the FWOP marsh acreage has reached zero.
5. Subsidence – Corps subsidence rate (ft/century)
6. FWP year benefits loss rate reverts – The year in which the FWP reduced loss rate reverts to the pre-project rates.

Model Assumptions:

a) No loss of nourished marsh acreage during the year of construction

b) Nourished marsh lost at 50% of FWOP rate provided post-construction submergence (SLR + subsidence) is less than 10 inches

c) Assumes Marsh creation area loss rates will revert to background or baseline loss rates when post-construction submergence (SLR + subsidence) is greater than 10 inches. For projects constructed within 1.0 ft/century or 0.5 ft/century this change

Excel Model Formula:

=IF(FWOP zero>FWP year benefits loss rate reverts, IF((IF(year<build year,0,IF(year>FWOP zero,previous acres+(loss rate*2),IF(year>FWOP year benefits revert,previous acres+0,year-build year+1*-1*loss rate))))<0,0, ((IF(year<build year,0,IF(year>FWOP zero,previous acres+(loss rate*2),IF(year>FWP year benefits loss rate reverts,previous acres+0,year-build year+1*-1*loss rate))))))), IF((IF(year<build year,0,IF(year<FWOP zero, year-build year+1*-1*loss rate,IF(year>FWP year benefits loss rate reverts, previous acres+(loss rate*2),previous acres+loss rate))))<0,0,

((IF(year<build year,0,IF(year<FWOP zero, year-build year+1*-1*loss rate,IF(year> FWP year benefits loss rate reverts, previous acres+(loss rate*2),previous acres+loss rate)))))))

Model Function: (See Figure 3):

a) The plot will look different depending on whether the year when loss rates revert back to the background rate is before or after the future without project zero year
b) If the present year is less than the construction year, then net acreage is equal to zero.
c) If present year is greater than construction year but less than FWOP zero ac yr, then the net annual benefits will be added to the net benefits from the previous year.
d) If the present year is greater than the FWOP zero ac yr, then the net annual benefit will be subtracted from the previous year's net benefits.

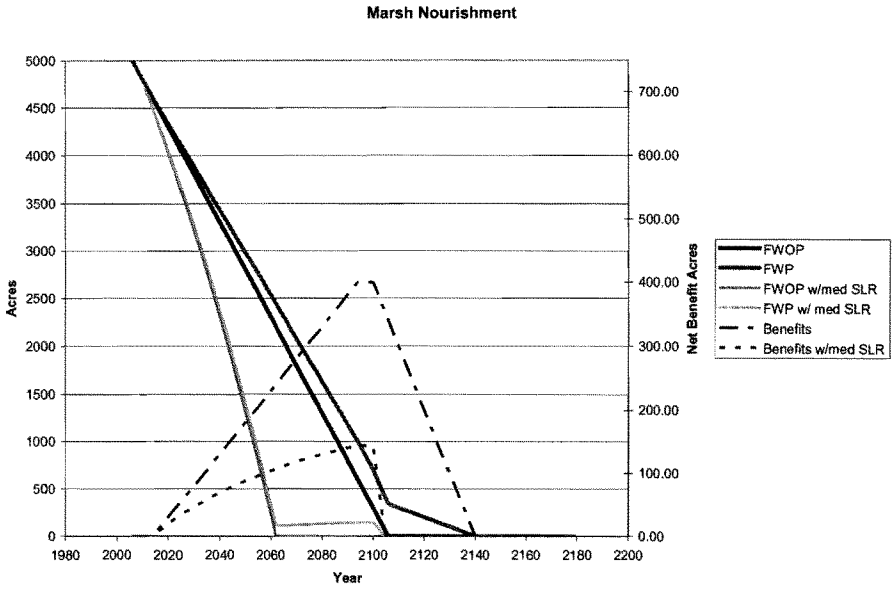


Figure 3. Marsh Nourishment net benefits, FWOP acres, and FWP acres in relation to time. The marsh nourishment project affects the area causing the land loss rate to be reduced by a factor of two. The net benefits are additive until the future without project (FWOP) acreage reaches zero.

Predicting Wetland Benefits of Shoreline Protection Projects

A mathematical model or formula was developed to calculate net shore protection project benefits (net acres = future-with project acres minus future without project acres). Formula inputs include:

1. Number of years benefitted – The number of years the project is expected to function
2. Total acres – the total benefit area of the project
3. Year constructed – The year in which the project is built
4. Max acreage benefitted – The maximum number of acres that will be protected by the project
5. FWOP loss rate – The pre-construction loss rate for the area
6. FWP loss rate – The post-construction reduced loss rate
7. FWOP zero – The year when The FWOP acreage has reached zero

Model Assumptions:

a) Assumes no loss during the year of construction
b) Assumes 100% reduction in loss rate for as long as the project is maintained
c) Projects will be maintained for 25 years

d) No effects from sea level rise as long as the project is maintained

Excel Model Formula:
=IF(IF(year<build year,0,IF(year-build year< # years benefit,((-FWOP loss rate+FWP loss rate)*(year-build year)-(FWOP loss rate-FWP loss rate)), (IF(year>FWOP zero,previous acres+FWOP loss rate,Max acreage benefit calculated))))<0,0,IF(year<build year,0,IF(year-build year<# years benefit,((-FWOP project loss rate+FWP loss rate)*(year-build year)-(FWOP loss rate-FWP loss rate)),(IF(year>FWOP zero,previous acres+FWOP loss rate,Max acreage benefit calculated)))))

Model Function (See Figure 1):

a) If the present year is less than the construction year, then net benefit acreage is equal to zero.
b) If present year is greater than construction year but less than FWOP zero ac yr, then the FWP land loss rate will be reduced for the number of years benefitted.
c) If the present year is greater than the FWOP zero ac yr, then the FWOP annual loss will be subtracted from the previous year's net benefits.

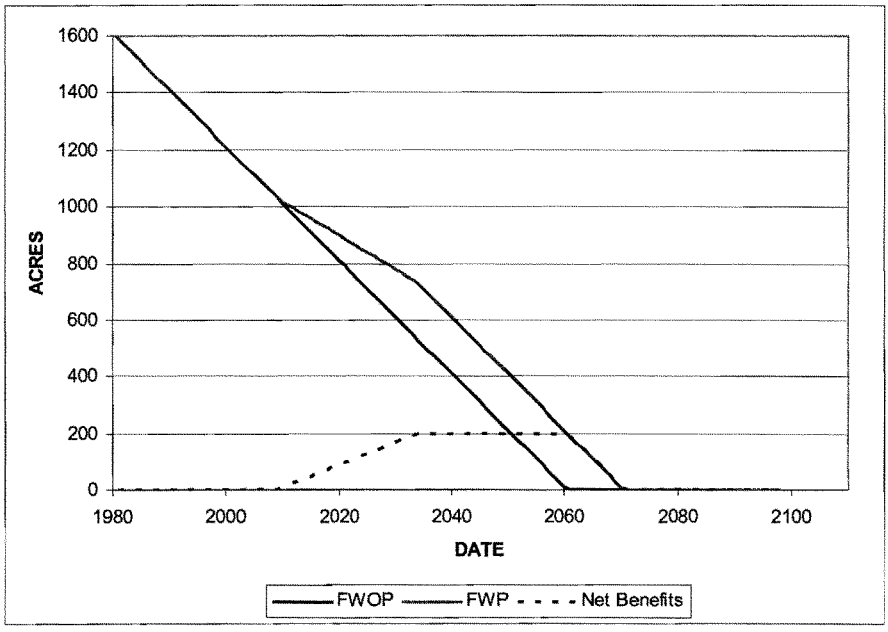


Figure 1. shoreline protection net benefits, FWOP acres, and FWP acres in relation to time. Net benefits will accrue for the set length of time referred to as "years benefitted". Benefits will level out and then decrease at the FWOP land loss rate once the FWOP project acreage reaches zero. Sea level rise is not considered in the shoreline protection models because it is assumed that the project is maintained as needed for 25 years.

Wetland Acreage Predictions Under Increased SLR Rates

The same above-described methods were used, but the future wetland loss rates were increased to simulate effects of increased wetland submergence. Using Corps-predicted future water levels (based on the Shell Beach gage) under medium and high sea-level rise scenarios, those water levels were converted into relative sea level rise (RSLR) rates, assuming that those water levels incorporate both subsidence and sea level rise effects. By subtracting the average accretion value of 7.4 mm/yr (an average of accretion measurements obtained throughout the project area), from the year 2011 baseline RSLR rate of 10.24 mm/yr, a net baseline submergence rate of 2.84 mm/yr was calculated (based on Corps guidance, year 2011 is the baseline year, and increased SLR rates begin in 2012). Likewise, the 7.4 mm/yr average accretion value was subtracted from predicted future submergence rates under both the medium and high SLR scenarios. To calculate future wetland loss rates under increased SLR scenarios, the baseline wetland loss rate, in acres lost per year, was multiplied by the year X submergence rate ratio (i.e., Submergence Rate Year X/Submergence Rate Year 2011).

Based on research conducted at the Madison Bay wetland loss hotspot in the Terrebonne Basin, it appears that when submergence reaches a certain critical threshold, plant productivity decreases rapidly and the marsh undergoes a rapid loss or collapse, when there is there inadequate sediment accretion to counter submergence. According to (Nyman et al. 2006), that threshold is 10 mm/yr. Under the high SLR scenario, this submergence threshold is reached in TY9 (year 2023). It was assumed that once that threshold was reached, the marsh would undergo rapid collapse and be totally converted to open water in 10 years. Consequently, under the high SLR scenario, marshes not receiving additional sediment would totally disappear by year 2033.

Collapse threshold thresholds were not applied to the wetlands receiving increased input of suspended sediment from the proposed Violet Diversion (i.e., the central wetlands, the south Lake Borgne marshes, east Orleans landbridge, and the inner Biloxi marshes). For those areas, FWP project acreages were determined using the SAND2 model benefits with high wetland loss rates due to accelerating submergence.

LITERATURE CITED

Nyman, J.A., Walters, R.J., Delaune, R.D., Patrick, W.H. Jr. 2006. Marsh vertical accretion via vegetative growth. Estuarine, Coastal and Shelf Science. 69, (2006) 370-380.

Snedden, G.A., Cable, J.E., Swarzenshi, C., and E. Swenson. 2006. Sediment discharge Into a subsiding Louisiana deltaic estuary through a Mississippi River diversion, Estuarine, Coastal and Shelf Science (2006), doi:10.1016/j.ecss.2006.06.035.

ATTACHMENT 5

Operations Scheme for Cypress Swamp and Adjacent Marsh

OPERATIONS SCHEMES FOR CYPRESS SWAMP AND ADJACENT MARSH

The yearly operational scheme of the Violet diversion to benefit cypress swamp and marsh restoration as part of the MRGO ecosystem restoration feasibility study is based on the required hydroperiod and depth constraints of bald cypress (*Taxodium distichum* L.) phenology and seasonal water levels based on the Mississippi River stage. Because of the specific requirements of bald cypress, it was used as an indicator of conditions conductive to swamp tupelo (*Nyssa aquatica* L.) and other constituents of forested wetland. In addition, maiden cane (*Panicum hemitomon*) and bull tongue (*Sagittaria lancifolia*) are dominant species of fresh/intermediate marsh and marsh-hay cordgrass (*Spartina patens*) of brackish marsh. These species are often used as indicators of ecosystem health and restoration success.

The Mississippi River follows a general sinusoidal pattern of rise and fall by season in both wet and dry years. Bald cypress and swamp tupelo are adapted to the historical, seasonal changes in hydroperiod due to the River and are able to exploit the natural conditions presented to insure

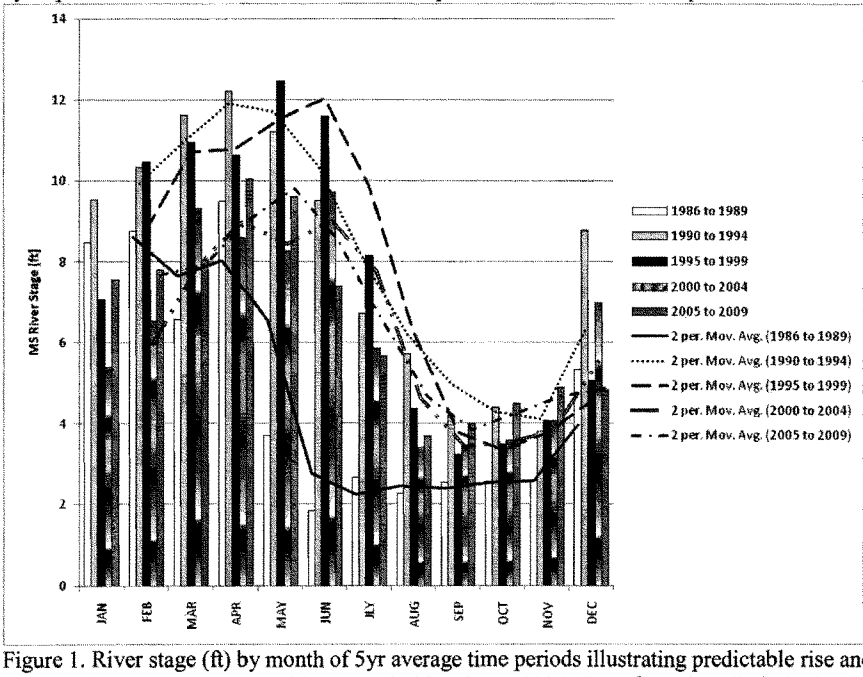


Figure 1. River stage (ft) by month of 5yr average time periods illustrating predictable rise and fall from 1986 to 2009. This pattern holds prior to 1986. Data from the Mississippi River at New Orleans, Carrollton, Gage #01300, gage zero at 0ft. NGVD29, river mile 102.8.

survival. The critical environmental factor for successful cypress seedling germination and establishment is the periodic flooding and drying of the forested wetland consisting of fresh to low-salinity water. Changes in the traditional hydrologic regime due to anthropogenic and natural forces have impacted the ability of southeastern swamps to reproduce successfully.
The Violet diversion presents the opportunity to aid in reestablishment of natural hydrologic cycles conducive to bald cypress and tupelo establishment, growth, and reproduction. The operation regime presented is based on the report "Final Report of the Science Working Group to the Governor of Louisiana. Conservation, Protection, and Utilization of Louisiana's Coastal Wetland Forests" unless otherwise noted. The report is a compilation of academic research and federal, state, and local governmental reports and specific are available within the report.

The Violet diversion is designed so that management of the estimated base flow of 1,000 cfs or greater can provide conditions favorable to bald cypress germination, growth, and reproduction by controlling depth and duration of inundation and salinity levels. Although an estimated 7,000 cfs diversion rate is needed to achieve required salinity levels in May in the Biloxi marsh target area, management of the diversion control structures will allow maintenance of favorable conditions for forested wetlands.

Studies have shown that primary productivity is higher in forested wetlands that are open to flow and have a more "pulsing" hydrologic regime following a seasonal pattern (Figure 1) than a stagnant, continually flooded regime. This also reduces competition from less flood-tolerant species. Bald cypress is tolerant of long flood durations and relatively deep flooding coupled with low salinity levels (< 2ppt) except during germination and seedling growth. Fluctuating water levels within the root zone will aid in preventing constant anoxic conditions. From greenhouse and field studies, it appears that a periodic drawdown of approximately -15 cm is sufficient to periodically aerate the wetland soils. In addition, flow should be maintained at a level as not to become stagnant for an extended period of time leading to low dissolved oxygen levels in both the soil and water. Tidal exchange and base flow rate should be adequate to prevent widespread stagnation. This base level coupled with the seasonal hydroperiod developed for bald cypress should be sufficient, if not advantageous, to restore and maintain swamp and marsh. Bald cypress and swamp tupelo are stimulated by water level and benefit from the lack of competition from less flood-tolerant trees, scrub/shrub, and plants.

General operations scheme
Initially it is advisable to operate the diversion at a reduced level for the first two to three years after swamp plantings to allow for establishment and habitat switching. This scheme presents general depth and duration of flooding and is not dependent upon cyclic climatic events. Wet and dry years should be incorporated into the operations scheme as indicated by river stage. Every 3 to 5 years, a drawdown should be initiated in March (after seed fall and dispersal) to approximately 4 to 6 inches below swamp surface. The drawdown should continue through the growing season until November to aid in reestablishment. An adaptive management plan will further insure sustainability.
The diversion should be operated to achieve a salinity level conducive to fresh swamp and marsh conditions during the growing season with a maximum not to exceed of 2 ppt.
January: low sheet-flow rate and flooding depth <1ft above marsh surface for seed dispersal.
February: begin drawdown to approximately 4 to 6 inches below marsh surface to provide aerobic conditions needed for germination and initial growth
March: continue drawdown to aid in germination and initial growth.

April: continue drawdown to aid in germination and initial growth. Gradually increase water level at or near surface elevation to stimulate seedling growth.

May: although the full diversion scenario of 7,000 cfs will be in effect, the water level in the CWA to be maintained at or near surface elevation.

June: maintain water level near surface and some sheet flow to prevent establishment of undesirable and less flood-tolerant plants that are able to out-compete target species under drier conditions

July: manipulate background flow of 1,000 cfs to maintain water level near surface to prevent establishment of undesirable and less flood-tolerant plants that are able to out-compete and shade bald cypress and swamp tupelo under drier conditions.

August: same as July

September: same as July

October: begin low flow for seed dispersal <1ft above marsh surface. Cypress seedlings are estimated to grow at least 8 inches in one year. Flood level should not overtop seedlings for extended periods of time.

November: low flow for seed dispersal above marsh surface (≤ 1ft)

December: low flow for seed dispersal above marsh surface (≤ 1ft)

Effects of the operation scheme on fresh and intermediate marsh restoration

As with bald cypress and tupelo, many fresh and intermediate marsh plants are adapted to the seasonal hydroperiod of the Mississippi River. Increased flooding depths during the growing season have been shown to stimulate growth in many fresh/intermediate marsh plants and some brackish plants with the exception species like marsh-hay cordgrass. In addition, marsh plants benefit from the lack of competition from less flood-tolerant plants and less fluctuating, lower, salinity levels. Optimal flooding for fresh and intermediate marshes is assumed to occur at 50% inundation per year, whereas optimal flooding for brackish marsh was assumed to occur at 40% (Habitat Switching module). The assumptions of the Habitat Switching Module are well within flood tolerance ranges of fresh and intermediate marsh plants such as maidencane and bull-tongue, as well as brackish marsh plants such as marsh-hay cordgrass. Thus, the operational scheme developed for bald cypress should be sufficient, if not advantageous, to restore and maintain wetland marsh.

ATTACHMENT 6

Master WVA Input Document Spreadsheet For TSP

	LOW RSLR		MEDIUM RSLR		HIGH RSLR	
Feature	AAHU	Net Acres	AAHU	Net Acres	AAHU	Net Acres
Inner Biloxi marsh	2,412	2,809	2,324	2,220	1,739	0
Bayou LaLoutra outer SP	29	49	23	48	4	0
Bayou LaLoutra ridge	10	14	15	25	27	48
Central Wetlands marsh	2,340	6,478	1,693	4,785	733	0
Central Wetlands swamp	5,201	3,793	5,511	4,914	4,686	7,340
Diversion footprint impacts	-220	-325	-192	-224	-88	0
MRGO	10	95	5	75	3	0
East Orleans Landbridge	1,428	819	1,030	642	955	0
Lower Pearl River	851	1,056	764	905	364	0
Lower Lake Borgne marsh	2,882	6,326	2,467	5,031	546	0
Hopedale	186	244	154	181	75	0
Inner Terre Aux Boufs	2,168	2,937	1,834	2,165	674	0
Outer Terre Aux Boufs	3	21	7	21	3	0
TOTAL	17,301	24,316	15,635	20,788	9,720	7,388

For all areas except ridge and Central wetlands swamp, net acres decrease from Low SLR to Med SLR; for Swamp and Ridge they increase from Low to High.

A-18-Ridge-Low (fwp)	37.1	48	37.1	48	35.9028	48
A-18-Sal-Low (fwop)	-26.7	-34	-21.9	-23	-9.17165	0
A- Short RidgeLow Total 133a	10.5	14	15.2	25	26.73115	48
D-13-Brac-Div-Low (Marsh)	-5352.7	-7969	-4533.0	-5038	-2151.82	0
D-13-Int-Low (Marsh)	7692.7	14447	6225.8	9823	2885.131	0
D-13-Total Marsh Low	2340.1	6478	1692.8	4785	733.3116	0
D-13-Brack-Low (Swamp Footprint	-2373.3	-3547	-2063.9	-2426	-1123.91	0
D-13-Swamp-Div-Low FWP	7574.7	7340	7574.7	7340	5809.713	7340
D-13-Total Swamp Low	5201.4	3793	5510.9	4914	4685.8	7340
E-40-Brack-Div-Low-P7	-8258.6	-11531.0	-6396.5	-4292.0	-4077.6	0.0
E-40-Int-Div-Low-P7	11140.7	17857.0	8863.5	9323.0	4623.3	0.0
E-40-Total Low	2882.1	6326.0	2467.0	5031.0	545.8	0.0
MRGO	-266.0	-469.8	-253.4	-426.7	-130.9	0.0
	275.9	564.8	257.9	502.1	133.6	0.0
MRGO total	9.9	95.0	4.6	75.3	2.7	0.0

Negative Impact due to Habitat Switch

	LOW RSLR		MEDIUM RSLR		HIGH RSLR	
Feature	**AAHU**	**Net Acres**	**AAHU**	**Net Acres**	**AAHU**	**Net Acres**
Diversion footprint Impacts	-220	-325	-192	-224	-88	0
Brackish to Swamp	-2373.3	-3547	-2063.9	-2426	-1123.91	0
Saline to Ridge	-26.7	-34	-21.9	-23	-9.17165	0
Brackish to Intermediate	-13877.2	-19969.8	-11182.9	-9756.7	-6360.2	0.0
TOTAL	**-16497.4**	**-23875.8**	**-13460.3**	**-12429.7**	**-7581.6**	**0.0**
Central Wetlands	-5352.7	-7969	-4533.0	-5038	-2151.82	0
Lower Lake Borgne marshes	-8258.6	-11531	-6396.5	-4292	-4077.6	0.0
MRGO	-266.0	-469.8	-253.4	-426.7	-130.9	0.0

	Features	Project Area	FWOP Acres							FWP													
					TY "X"	TY "Y"	TY "Z"					year reach is				TYY FY 5 yrs after reach is	TY "X"			TY "Y"	TY "Z"			
		Project Area	TY0	TY1	1.0cm/ yr acres	1.0cms begin	1.0 cm end year	TY50	TY100	TY1	construction start year	complet ed	TYY year reach is completed		TYE (year diversion is functional)	created (Tye + 5)	50" acres	50" year	TY "Y" 1.0cm/yr acres	1.0cms begin year	1.0 cm end year	TY50	TY100
	28e,28b	868	558	555				413	265	556.62	2015	2035	556.62			551.70	527.14	2043				459.87	314
	28e,28b	868	554	549				279		550.98	2015	2015	551			547.19	485.35	2037				327.37	
	28e,28b	868	548	531	447	2023	2033	0		530.68	2015	2015	531			488.05	294.13	2033	462	2023	2033	48.49	
	128e	46	46	46				34	23														
		46	45	45				23															
		46	44	43	36	2023	2033	0															
	81	8304	6,054	6,028				4,751	3,447	6,758	2015	2016	7,913			7,777	7,225	2043				6,645	4,745
	81	8304	6,020	5,978				3,568		6,708	2015	2016	7,846			7,619	6,823	2037				5,446	
	81	8304	5,908	5,814	5,067	2023	2033	0		6,544	2015	2016	7,627			7,204	6,052	2033	6,895	2023	2033	354	
	22,21,25,104,2	971	537	516				470		581	2015	2015	581			580	574	2043				563	
	22,21,25,104,2	971	516	515				427		579	2015	2015	579			575	560	2037				502	
	22,21,24,104,2	971	532	509	481	2023	2033	386		573	2015	2015	573			559	528	2033	550	2023	2033	547	
	A-07-Brack-Div-Low-P7, P11	86,873	54,908	54,335				41,670	28,749	55,063	2015	2035	55,967	34,951		54,758	50,048	2043				44,601	32,379
	A-07-Brack-Div-Med-P7, P11	86,873	54,757	53,867				29,833		54,547	2015	2016	55,331	33,682		53,285	46,421	2037				32,171	
	A-07-Brack-Div-High-P7, P11	86,873	53,140	52,234	44,606	2023	2033	0		52,966	2015	2016	53,195	49,464		48,547	39,317	2033	46,708	2023	2033	854	
		1129	1,040	1,029				686	0	1029.17	2015	2015	1029.17			979.73	749.78	2043				562.5683	b
		1129	1,026	1,008				0		1,008	2015	2015	1,008			919	597	2037				0	
		1129	978	938	620	2023	2033	0		938	2015	2015	938			739	352	2033	620	2023	2033	0	
	29e, 26e, 29a,	7589	5003	4979				3764	2330	4984	2016	2043	7332			7117	6681	2043				5866	4072
	26e, 26a, 29a,	7589	4930	4930				2645		4984	2016	2018	7332			6909	6196	2037				4268	
	26e, 26a, 26e,	7589	4863	4775	4066	2023	2033	0		4776	2016	2018	6834			6281	5429	2033	6,281	2023	2033	306	
	26c, 26d, 26b,	9253	3,365	3,348				2,241	1,302	3353.69	2018	2019	4345.86			4274.45	4040.88	2043				3549.96	2472
	26c, 26d, 26b,	9253	3,343	3,316				1,779		3319.62	2018	2019	4299.19			4132.49	3714.12	2037				2940.96	
	26c, 26d, 26b,	9253	3,271	3,232	2,735	2023	2033	0		3215.86	2018	2019	4009.32			3574.80	3206.47	2033	3,742	2023	2033	67.33	
	D-13-Brac-Div-Low-all Central Wetlands--P7	22,342	16,202	16,118				11,735	7,258	16,126	2018	2019	18,733	18,803		18,942	19,766	2043				20,318	21,206
	D-13-Brac-Div-Med--all Central Wetlands--P7	22,342	16,084	15,940				7,984		15,948	2018	2019	18,333	19,189		18,078	17,005	2037				14,065	
	D-13-Brac-Div-High--all Central Wetlands--P7	22,342	15,898	15,378	12,819	2023	2033	0		15,882	2018	2019	17,001	19,747		15,670	13,218	2033	15,952	2023	2033	117	
		529	492	490				325	238	490													
		529	515	511				124															
		529	516	508				0															
	8	5180	4066	4061				3790	2523	4500	2015	2015	6500			4460	4285	2043				3894	3,045
	8	5186	4026	4011				2584		4460	2015	2015	6499			4373	3998	2037				3014	
	8	5186	3970	3915	3476	2023	2033	829		4373	2015	2015	4373			4106	3523	2033	3,947	2023	2033	534	
	R-17-Brack-Div-Low-P7	45,637	26,731	26,622				21,242	15,737	27,083	2015	2015	27,091	26,578		26,576	24,517	2043				22,061	18,707
	R-17-Brack-Div-Med-P7	45,637	26,582	26,404				16,127		26,861	2015	2015	26,862	26,003		26,003	23,945	2037				19,466	
	R-17-Brack-Div-High-P7	45,637	26,204	25,907	22,562	2023	2033	99		26,162	2015	2015	26,168	24,326		24,301	19,918	2033	23,034	2023	2033	418	
	10a, 10b	5491	4,211	4,199				3,535	3,059	5295.91	2015	2015	5295.91			5243.78	5023.37	2043				4691.15	3,969
	10a, 10b	5491	4,196	4,177				3,218		5272.75	2015	2015	5272.75			5176.45	4812.17	2037				4017.63	
	10a, 10b	5491	4,146	4,105	3,775	2023	2033	1,411		5199.56	2015	2015	5199.56			4970.64	4461.77	2033	4,833	2023	2033	1513.59	
	14,28,19a, 15c	10254	6,502	6,478				5,273	4,044	6485.33	2020	2021	8875.25			8767.66	8461.14	2043				7704.21	6,014
	14,28,19a, 15c	10254	6,470	6,430				4,159		6435.67	2020	2021	8703.04			8493.38	8000.43	2037				6182.87	
	14,28,19a, 15c	10254	6,364	6,276	5,572	2023	2033	327		6279.24	2020	2021	8176.38			7689.38	7263.78	2033	8,075	2023	2033	1851.82	
	E-40-Brack-Div-Low-P7	28,490	17,878	17,817				11,583	8,145	17,825	2022	2022	23,128	19,795		21,451	20,961	2043				17,857	11,462
	E-40-Brack-Div-Med-P7	28,490	17,827	17,455				4,292		17,467	2021	2022	20,898	18,841		19,729	17,192	2037				9,123	
	E-40-Brack-Div-High-P7	28,490	17,372	17,170	15124	2023	2033	4,115		17,373	2021	2022	20,436	18,455		18,963	17,848	2033	20,144	2023	2033	8,253	
	2e,2b,2c,24f	8879	4,989	4,941				3,544	2,159	4946.35	2019	2020	6121.82			5978.38	7546.70	2043				6491.12	4,156
	2e,2b,2c,24f	8879	4,931	4,886				2,252		4891.10	2019	2020	7056.75			7583.19	6914.55	2037				4416.69	
	2e,2b,2c,24f	8879	4,951	4,849	4,092	2023	2033	0		4851.61	2019	2020	7608.34			6949.32	6258.51	2033	7,218	2023	2033	49.83	
	28	378	144	144				103	62	144.78	2015	2015	144.78			144.38	125.78	2043				113.08	82
	28	378	143	142				65		142.78	2015	2015	139.77			137.26	130.83	2037				86.18	
	28	378	140	137	113	2023	2033	0		137.58	2015	2015	124.75			114.06	103.37	2033	120	2023	2033	20.70	
	190	1795	1369.175	1363.0737				1064.02	758.865	1364.982727	2018	2026	1587.790565			1504.3873	1410.774	2043				1307.93	954
	190	1795	1,361	1,351				787		1,351	2016	2016	1,573			1,524	1,396	2037				968	
	190	1795	1,335	1,311	1,138	2023	2033	0		1,314	2016	2016	1,519			1,404	1,173	2033	1,358	2023	2033	39	

diversion benefits here have incorporated effects of a 6000 cfs pulse flow discharged directly into MPOO and rail flowing pulse discharges through the central wetlands. central wetland assumed to receive diversion flow of 570 cfs (assuming that 130 cfs has been supplied by existing siphon and pump stations).

last modified May 10, 2010

A-18-Sal-Low-P7 Features 029a, 029b

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	558	300	65.0	0	100%-c2	0	13.6	1.0000
858		1	554	304	64.5	0	100%-c2	0	13.6	1.0000
		50	411	447	47.9	0	100%-c4	32	14.6	1.0000
	FWP	1	557	301	64.9	0	100%-c2	0	13.6	1.0000
		6	552	306	64.3	0	100%-c2	5	13.6	1.0000
		27	527	331	61.4	0	50%-c2 50%-c3	13	13.6	1.0000
		50	460	398	53.6	0	100%-c3	26	14.6	1.0000

A-18-Sal-Med-P7 Features 029a, 029b

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	554	304	64.5	0	100%-c2	0	13.6	1.0000
858		1	549	309	64.0	0	100%-c2	0	13.6	1.0000
		50	279	579	32.5	0	100%-c4	47	14.6	1.0000
	FWP	1	551	307	64.2	0	100%-c2	0	13.6	1.0000
		6	537	321	62.6	0	100%-c2	5	13.6	1.0000
		23	485	373	56.6	0	50%-c2 50%-c3	12	13.6	1.0000
		50	327	531	38.1	0	70%-c3 30%c4	37	14.6	1.0000

A-18-Sal-High-P7			Features 029a, 029b							
			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	541	317	63.1	0	100%-c2	0	13.6	1.0000
858		1	531	327	61.9	0	100%-c2	0	13.6	1.0000
		9	447	411	52.1	0	100%-C3	0	13.6	1.0000
		19	0	858	0.0	0	100%-C5	0	14.6	1.0000
		50	0	858	0.0	0	100%-C5	0	15.6	1.0000
	FWP	1	531	327	61.9	0	100%-c2	0	13.6	1.0000
		6	488	370	56.9	0	100%-c2	5	13.6	1.0000
		9	462	396	53.9	0	50%-c2 50%-c3	3	13.6	1.0000
		17	394	464	45.9	0	50%-c4 50%-c5	3	13.6	1.0000
		19	0	858	0.0	0	100%-c5	0	14.6	1.0000
		50	0	858	0.0	0	100%-c5	0	15.6	1.0000
A-18-Ridge-Low (133a only)										
FWP Ridge footprint										
A1-18-Ridge-Low			V1 % canopy cover				V2 %midstory cover		V3 woody sp diversity	
Project Area	FWOP	0	Leave the variables blank for FWOP				0		0	
Project Area		1	0				0		0	
48		50	0				0		0	
	FWP	1					0		0	
		3	0				20		6	
		8	10				75		10	
		25	40				65		13	
		50	80				55		13	
FWOP marshfootprint										
A1-18-Brackish-Low			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	46	2	96.0	0	100%-c1	85	8.4	1.0000
Project Area		1	46	2	95.5	0	100%-c1	85	8.4	1.0000
48		50	34	14	70.8	0	100%-c2	93	9.4	1.0000
Becomes Ridge	FWP	1								
Leave the variables blank in FWP										
		50								

A-18-Ridge-Med (133a only)										
FWP Ridge footprint										
A1-18-Ridge-Med			V1 % canopy cover				V2 %midstory cover		V3 woody sp diversity	
Project Area	FWOP	0	Leave the variables blank for FWOP				0		0	
48		1	0				0		0	
		50	0				0		0	
	FWP	1					0		0	
		3	0				20		6	
		8	10				75		10	
		25	40				65		13	
		50	80				55		13	
FWOP marshfootprint										
A1-18-Brackish-Med			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	45	3	94.3	0	100%-c1	85	8.4	1.0000
48		1	45	3	93.5	0	100%-c1	85	8.4	1.0000
		50	23	25	47.0	0	100%-c2	95	9.4	1.0000
Becomes Ridge	FWP	1								
Leave the variables blank in FWP										
		50								

A-18-Ridge-High (133a only)										
FWP Ridge footprint										
A1-18-Ridge-High			V1 % canopy cover				V2 %midstory cover		V3 woody sp diversity	
Project Area	FWOP	0	Leave the variables blank for FWOP				0		0	
48		1	0				0		0	
0		50	0				0		0	
	FWP	1					0		0	
		3	0				20		6	
		8	10				75		10	
		25	40				65		13	
		50	50				65		8	
FWOP marshfootprint										
A1-18-Brackish-High			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	44	4	92.1	0	100%-c1	85	8.4	1.0000
48		1	43	5	90.3	0	100%-c2	80	8.4	1.0000
		9	36	12	75.0	0	100%-C3	60	8.4	1.0000
		19	0	48	0.0	0	100%-c5	20	9.4	1.0000
0		50	0	48	0.0	0	100%-c5	0	10.4	1.0000
Becomes Ridge	FWP	1								
Leave the variables blank in FWP										
		50								

A-07-Brack-Div-Low-P7

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	54593	31280	63.6	0	20%-c2 80%-c3	23.0	8.4	1.0000
85873		1	54335	31538	63.3	0	20%-c2 80%-c3	23.0	8.4	1.0000
		50	41671	44202	48.5	0	100%-c3	39	9.4	1.0000
	FWP	1	55065	30808	64.1	0	2%-c1 98%-c2	23	7.5	0.1000
		2	55987	29886	65.2	0	2%-c1 90%-C2 8%-c5	30	7.5	1.0000
		6	54982	30891	64.0	5	2%-c1 90%-C2 8%-C1	30	7.5	1.0000
		7	54753	31120	63.8	5	10%-C1 90%-C2	30	7.5	1.0000
		27	50043	35830	58.3	5	50%-c2 50%-c3	30	7.5	1.0000
		50	44481	41392	51.8	10	10%-C2 90%-C3	35	7.5	1.0000

A-07-Brack-Div-Med-P7

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	54252	31621	63.2	0	20%-c2 80%-c3	23.0	8.4	1.0000
85873		1	53837	32036	62.7	0	20%-c2 80%-c3	23.0	8.4	1.0000
		50	29953	55920	34.9	0	100%-c4	51	9.4	1.0000
	FWP	1	54567	31306	63.5	0	2%-c1 98%-c2	23	7.5	0.1000
		2	55331	30542	64.4	0	2%-c1 90%-C2 8%-c5	23	7.5	1.0000
		6	53682	32191	62.5	5	2%-c1 90%-C2 8%-C1	28	7.5	1.0000
		7	53286	32587	62.1	5	100%-C2	28	7.5	1.0000
		23	46422	39451	54.1	5	100%-c3	30	7.5	1.0000
		50	32173	53700	37.5	5	100%-c4	45	8.5	1.0000

A-07-Brack-Div-High-P7

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	53140	32733	61.9	0	20%-c2 80%-c3	23.0	8.4	1.0000
85873		1	52214	33659	60.8	0	20%-c2 80%-c3	23.0	8.4	1.0000
		9	44808	41065	52.2	0	100%-c3	20.0	8.4	1.0000
		19	0	85873	0.0	0	100%-C5	0.0	8.4	1.0000
		50	0	85873	0.0	0	100%-C5	0	10.4	1.0000
	FWP	1	52944	32929	61.7	0	2%-c1 98%-c2	23	7.5	0.1000
		2	53195	32678	61.9	0	2%-c1 90%-C2 8%-c5	23	7.5	1.0000
		6	49466	36407	57.6	0	2%-c1 90%-C2 8%-C1	25	7.5	1.0000
		7	48547	37326	56.5	0	80%-c2 20%-c3	25	7.5	1.0000
		9	46700	39173	54.4	0	50%-c2 50%-c3	20	7.5	1.0000
		17	39317	46556	45.8	0	100%-c4	15	7.5	1.0000
		19	0	85873	0.0	0	100%-c5	0	8.5	1.0000
		50	0	85873	0.0	0	100%-c5	0	9.5	1.0000

last modified May 11, 2010

B-32-Brack-Low-P7

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	517	454	53.3	0	100%-c4	40	6.0	1.0000
971		1	516	455	53.2	0	100%-c4	40	6.0	1.0000
		50	470	501	48.4	0	100%-c4	40	7.0	1.0000
	FWP	1	0	0	0.0	0	90%-c4 10%-c5	40	6.0	0.0001
		6	0	0	0.0	0	10%-c1 90%-c4	60	4.0	1.0000
		27	0	0	0.0	0	10%-c2 90%-c4	60	4.0	1.0000
		50	0	0	0.0	0	10%-c3 90%-c4	60	4.0	1.0000

B-32-Brack-Med-P7

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	516	455	53.2	0	100%-c4	40	6.0	1.0000
971		1	515	456	53.0	0	100%-c4	40	6.0	1.0000
		50	427	544	43.9	0	100%-c4	40	7.0	1.0000
	FWP	1	0	0	0.0	0	90%-c4 10%-c5	40	6.0	0.0001
		6	0	0	0.0	0	10%-c1 90%-c4	55	4.0	1.0000
		23	0	0	0.0	0	10%-c2 90%-c4	55	4.0	1.0000
		50	0	0	0.0	0	10%-c3 90%-c4	55	5.0	1.0000

B-32-Brack-High-P7

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	512	459	52.7	0	100%-c4	40.0	6.0	1.0000
971		1	509	462	52.4	0	100%-c4	40.0	6.0	1.0000
		9	481	490	49.6	0	100%-c4	40.0	7.0	1.0000
		19	0	971	0.0	0	100%-C5	40.0	7.0	1.0000
		50	0	971	0.0	0	100%-C5	40	8.0	1.0000
	FWP	1	0	0	0	0	90%-c4 10%-c5	40	6.0	0.0001
		6	0	0	0	0	10%-c1 90%-c4	50	4.0	1.0000
		9	0	0	0	0	10%-c2 90%-c4	50	4.0	1.0000
		17	0	0	0	0	10%-c3 90%-c4	50	5.0	1.0000
		19	0	0	0	0	100%-c5	50	5.0	1.0000
		50	0	0	0	0	100%-c5	50	6.0	1.0000

last modified May 11, 2010

B-32-Int-Low-P7

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	0	0	0.0	0	100%-c4	40	6.0	1.0000
971		1	0	0	0.0	0	100%-c4	40	6.0	1.0000
		50	0	0	0.0	0	100%-c4	40	7.0	1.0000
	FWP	1	581	390	59.9	0	90%-c4 10%-c5	40	6.0	0.0001
		6	580	391	59.8	0	10%-c1 90%-c4	60	4.0	1.0000
		27	574	397	59.2	0	10%-c2 90%-c4	60	4.0	1.0000
		50	565	406	58.2	0	10%-c3 90%-c4	60	4.0	1.0000

B-32-Int-Med-P7

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	0	0	0.0	0	100%-c4	40	6.0	1.0000
971		1	0	0	0.0	0	100%-c4	40	6.0	1.0000
		50	0	0	0.0	0	100%-c4	40	7.0	1.0000
	FWP	1	579	392	59.7	0	90%-c4 10%-c5	40	6.0	0.0001
		6	575	396	59.3	0	10%-c1 90%-c4	55	4.0	1.0000
		23	560	411	57.6	0	10%-c2 90%-c4	55	4.0	1.0000
		50	502	469	51.7	0	10%-c3 90%-c4	55	5.0	1.0000

B-32-Int-High-P7

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	0	0	0	0	100%-c4	40.0	6.0	1.0000
971		1	0	0	0	0	100%-c4	40.0	6.0	1.0000
		9	0	0	0	0	100%-c4	40.0	7.0	1.0000
		19	0	0	0	0	100%-C5	40.0	7.0	1.0000
		50	0	0	0	0	100%-C5	40	8.0	1.0000
	FWP	1	573	398	59.0	0	90%-c4 10%-c5	40	6.0	0.0001
		6	559	412	57.5	0	10%-c1 90%-c4	50	4.0	1.0000
		9	550	421	56.7	0	10%-c2 90%-c4	50	4.0	1.0000
		17	528	443	54.3	0	10%-c3 90%-c4	50	5.0	1.0000
		19	0	971	0.0	0	100%-c5	50	5.0	1.0000
		50	0	971	0.0	0	100%-c5	50	6.0	1.0000

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D-13-Brack-Low-P7 (Swamp)		Features 026b sw, 026a sw, 025a sw, 025b sw 027a sw, 027b mh from sw								
D-13-Brack-Low (Swamp fwop Footprint)		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
7340	FWOP	0	4783	2557	65.2	45	70%-c2 30%-c5	51	5.0	0.6000
Project Area		1	4759	2581	64.8	45	70%-c2 30%-c5	51	5.0	0.6000
		50	3547	3793	48.3	30	70%-c4 30%-c5	55	6.0	0.6000
	FWP	1	0	0	#DIV/0!	0	0	0	0.0	0.0000
		5	0	0	#DIV/0!	0	0	0	0.0	0.0000
Leave variables blank		50	0	0	#DIV/0!	0	0	#DIV/0!	0.0	0.0000
D-13-Brack-Low FWP			V1 Stand structure	V2 Stand maturity	V3 Water regime	V4 salinity				
	FWOP	0								
Project Area		1					leave blank for FWOP			
7340		50								
	FWP	1	c1	0.000	0.65	5.0				
		4	c1	0.000	0.65	5.0				
		6	c1	0.010	1.00	2.3				
		9	c1	0.017	1.00	2.3				
		50	C5	1.000	1.00	2.3				

D-13-Brack-Med-FP (Swamp)			Features 026e sw, 026a sw, 025a sw, 025b sw 027a sw, 027b mn from sw							
D-13-Brack-Low (Swamp fwop Footprint)		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
	FWOP	0	4751	2589	64.7	45	70%-c2 30%-c5	51	5.0	0.6000
Project Area		1	4711	2629	64.2	45	70%-c2 30%-c5	51	5.0	0.6000
7340		50	2426	4914	33.1	20	50%-c4 50%-c5	45	6.0	0.6000
	FWP	1	0	0	#DIV/0!	0	0	0	0.0	0.0000
		5	0	0	#DIV/0!	0	0	0	0.0	0.0000
Leave variables blank		50	0	0	#DIV/0!	0	0	#DIV/0!	0.0	0.0000
D-13-Brack-Med FWP			V1 Stand structure	V2 Stand maturity	V3 Water regime	V4 salinity				
	FWOP	0								
Project Area		1								
#REF!		50								
	FWP	1	c1	0.000	0.65	5.0				
		4	c1	0.000	0.65	5.0				
		6	c1	0.010	1.00	2.3				
		9	c1	0.017	1.00	2.3				
		50	C5	1.000	1.00	2.3				

D-13-Brack-High (Swamp)			Features 026e sw, 026a sw, 025a sw, 025b sw 027a sw, 027b mn from sw							
D-13-Brack-High (Swamp fwop Footprint)		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
	FWOP	0	4644	2696	63.3	45	70%-c2 30%-c5	51	5.0	0.6000
Project Area		1	4556	2784	62.1	45	70%-c2 30%-c5	51	5.0	0.6000
7340		9	3847	3493	52.4	30	70%-c3 30%-c5	51	5.0	0.6000
		19	0	7340	0.0	10	100%-c5	51	6.0	0.6000
		50	0	7340	0.0	0	100%-c5	34	7.0	0.6000
	FWP	1	0	0	#DIV/0!	0	0	0	0.0	0.0000
		5	0	0	#DIV/0!	0	0	0	0.0	0.0000
Leave variables blank		50	0	0	#DIV/0!	0	0	#DIV/0!	0.0	0.0000
D-13-Brack-High FWP			V1 Stand structure	V2 Stand maturity	V3 Water regime	V4 salinity				
	FWOP	0								
Project Area		1					leave blank for FWOP			
#REF!		50								
	FWP	1	c1	0.000	0.65	5.0				
		4	c1	0.000	0.65	5.0				
		6	c1	0.010	1.00	2.3				
		9	c1	0.017	1.00	2.3				
		50	c3	1.000	0.65	2.3				

D-13-Brac-Low-P7					features 026c mc, 026d mc, 026b mn, 025b mn/mc, 027b mn from					
Marsh footprint										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinity	V6 fish ac
	FWOP	0	11200	3583	75.8	45	40%-c2 45%-c4 15%-c5	21	5.0	0.6000
Project Area		1	10963	3820	74.2	45	40%-c2 45%-c4 15%-c5	21	5.0	0.6000
14783		50	7969	6814	53.9	30	30%-c4 70%-c5	40	6.0	0.6000
	FWP	1	0	0	0.0	0	0	0	0.0	0.0000
		5	0	0	0.0	0	0	0	0.0	0.0000
		10	0	0	0.0	0	0	0	0.0	0.0000
		27	0	0	0.0	0	0	0	0.0	0.0000
		50	0	0	0.0	0	0	0	0.0	0.0000

D-13-Brac-Med-P7					features 026c mc, 026d mc, 026b mn, 025b mn/mc, 027b mn from					
Marsh footprint										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinity	V6 fish ac
	FWOP	0	11114	3669	75.2	45	40%-c2 45%-c4 15%-c5	21	5.0	0.6000
Project Area		1	11011	3772	74.5	45	40%-c2 45%-c4 15%-c5	21	5.0	0.6000
14783		50	5038	9745	34.1	20	100%-c5	30	6.0	0.6000
	FWP	1	0	0	0.0	0	0	0	0.0	0.0000
		5	0	0	0.0	0	0	0	0.0	0.0000
		10	0	0	0.0	0	0	0	0.0	0.0000
		23	0	0	0.0	0	0	0	0.0	0.0000
		50	0	0	0.0	0	0	0	0.0	0.0000

O-13-Brac-High-P7					features 026c mc, 026d mc, 026b mn, 025b mn/mc, 027b mn from					
Marsh footprint										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
	FWOP	0	10836	3947	73.3	45	40%-c2 45%-c4 15%-c5	21	5.0	0.6000
Project Area		1	10605	4178	71.7	45	40%-c2 45%-c4 15%-c5	21	5.0	0.6000
14783		9	8753	6030	59.2	20	50%-c4 50%-c5	21	5.0	0.6000
		19	0	14783	0.0	0	100%-c5	21	6.0	0.6000
		50	0	14783	0.0	0	100%-c5	0	7.0	0.6000
	FWP	1	0	0	0.0	0	0	0	0.0	0.0000
		5	0	0	0.0	0	0	0	0.0	0.0000
		9	0	0	0.0	0	0	0	0.0	0.0000
		10	0	0	0.0	0	0	0	0.0	0.0000
		17	0	0	0.0	0	0	0	0.0	0.0000
		19	0	0	0.0	0	0	0	0.0	0.0000
		50	0	0	0.0	0	0	0	0.0	0.0000

SW											
D-13-Int-Low-P7					features 026c mc, 026d mc, 026b mn, 025b mn/mc, 027b mn from						
Marsh footprint											
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac	
	FWOP	0	0	0	0.0	0	0	0	0.0	0.0000	
Project Area		1	0	0	0.0	0	0	0	0.0	0.0000	
14783		50	0	0	0.0	0	0	0	0.0	0.0000	
	FWP	1	11140	3643	75.4	45	40%-c2 45%-c4 15%-c5	21	5.0	0.6000	
		5	11493	3290	77.7	45	35%-c2 36%-c4 29%-c5	60	5.0	0.0001	
		10	11865	2918	80.3	65	30%-C1 35%-c2 35%-c4	70	2.6	0.6000	
		27	13085	1698	88.5	65	30%-c1 35%-c2 35%-c3	80	2.6	0.6000	
		50	14447	336	97.7	75	30%-c1 70%-c2	90	2.6	0.6000	

SW											
D-13-Int-Med-P7					features 026c mc, 026d mc, 026b mn, 025b mn/mc, 027b mn from						
Marsh footprint											
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac	
	FWOP	0	0	0	0.0	0	0	0	0.0	0.0000	
Project Area		1	0	0	0.0	0	0	0	0.0	0.0000	
14783		50	0	0	0.0	0	0	0	0.0	0.0000	
	FWP	1	11014	3769	74.5	45	40%-c2 45%-c4 15%-c5	21	5.0	0.6000	
		5	11179	3604	75.6	45	35%-c2 36%-c4 29%-c5	60	2.6	0.1000	
		10	11161	3622	75.5	50	30%-C1 40%-c2 30%-c4	70	2.6	0.6000	
		23	11009	3774	74.5	55	50%-c2 50%-c3	70	2.6	0.6000	
		50	9823	4960	66.4	55	100%-c2	80	2.6	0.6000	

D-13-Int-High-P7					features 026c mc, 026d mc, 026b mn, 025b mn/mc, 027b mn from					
Marsh footprint										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
	FWOP	0	0	0	0.0	0	0	0	0.0	0.0000
Project Area		1	0	0	0.0	0	0	0	0.0	0.0000
14783		50	0	0	0.0	0	0	0	0.0	0.0000
	FWP	1	10606	4177	71.7	45	40%-c2 45%-c4 15%-c5	21	5.0	0.6000
		5	10187	4596	68.9	45	35%-c2 38%-c4 27%-c5	60	2.6	0.1000
		9	9671	5112	65.4	45	35%-c2 38%-c4 27%-c3	60	2.6	0.6000
		10	9389	5394	63.5	40	27%-C1 33%-c2 40%-c4	70	2.6	0.6000
		17	8385	6398	56.7	30	50%-c4 50%-c5	70	2.6	0.6000
		19	0	14783	0.0	20	100%-c5	70	2.6	0.6000
		50	0	14783	0.0	0	100%-c5	70	2.6	0.6000

SW

d05-Violet diversion footprint-Low

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Ar	FWOP	0	432	97	81.6	90	80%-c1 20%-c5	42.3	5.0	0.6000
529		1	430	99	81.2	90	80%-c1 20%-c5	50.0	5.0	0.6000
		50	325	204	61.5	75	80%-c2 20%-c5	67	6.0	0.6000
	FWP	1	430	99	81.2	90	80%-c1 20%-c5	42.3	5.0	0.6000
		5			0.0	0	100% c5	2	2.6	0.6000
		50			0.0	0	100% c5	2	2.6	0.6000

SW

d05-Violet diversion footprint-Med

			acres	acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Ar	FWOP	0	425	104	80.3	90	80%-c1 20%-c5	42.3	5.0	0.6000
529		1	421	108	79.7	90	80%-c1 20%-c5	42.3	5.0	0.6000
		50	224	305	42.4	75	80%-c2 20%-c5	75	6.0	0.6000
	FWP	1	430	99	81.2	90	20%-c5	42.3	5.0	0.6000
		5			0.0	0	100% c5	2	2.6	0.6000
		50			0.0	0	100% c5	2	2.6	0.6000

| SW

d05-Violet diversion footprint-High

			V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4%<1.5	V5 salinty	V6 fish ac
Project Ar	FWOP	0	416	113	78.6	90	80%-c1 20%-c5	42.3	5.0	0.6000
529		1	408	121	77.1	90	80%-c1 20%-c5	42.3	5.0	0.6000
		9	347	182	65.6	50	80%-c2 20%-c5	20.0	5.0	0.6000
		19	0	529	0.0	30	100%-c5	0.0	6.0	0.6000
		50	0	529	0.0	20	100%-C5	0	7.0	0.6000
	FWP	1	430	99	81.2	90	80%-c1 20%-c5	42	5.0	0.6000
		5			0.0	0	100% c5	2	5.0	0.6000
		9			0.0	0	100% c5	2	2.6	0.6000
		19			0.0	0	100%-C5	2	2.6	0.6000
		50			0.0	0	100% c5	2	2.6	0.6000

last modified May 10, 2010

E-17-Brack-Div-Low-P7

		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	26731	18906	58.6	30	45%-c2 55%-c3	50	5.3	1.0000
45637		1	26621	19016	58.3	30	45%-c2 55%-c3	50	5.3	1.0000
		50	21242	24395	46.5	30	100%-c4	48	6.3	1.0000
	FWP	1	27081	18556	59.3	30	35%-c2 55%-c3 10%-C5	50	5.3	0.8000
		6	26576	19061	58.2	40	10%-C1 35%-c2 55%-c3	60	4.0	1.0000
		27	24517	21120	53.7	50	10%-C1 35%-c2 55%-c3	60	4.0	1.0000
		50	22061	23576	48.3	60	10%-C1 35%-c2 55%-c3	55	4.0	1.0000

E-17-Brack-Div-Mid-P7

		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	26582	19055	58.2	30	45%-c2 55%-c3	50	5.3	1.0000
45637		1	26404	19233	57.9	30	45%-c2 55%-c3	50	5.3	1.0000
		50	16227	29410	35.6	30	100%-c4	56	6.3	1.0000
	FWP	1	26861	18776	58.9	30	35%-c2 55%-c3 10%-C5	50	5.3	0.8000
		6	26003	19634	57.0	40	35%-c2 55%-c3 10%-C1	60	4.0	1.0000
		23	22945	22692	50.3	40	100%-c3	60	4.0	1.0000
		50	16869	28768	37.0	50	50%-c3 50%-c4	60	4.0	1.0000

E-17-Brack-Div-High-P7										
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	26104	19533	57.2	30	45%-c2 55%-c3	50	5.3	1.0000
45637		1	25707	19930	56.3	30	45%-c2 55%-c3	50	5.3	1.0000
		9	22550	23087	49.4	30	100%-c3	50	5.3	1.0000
		19	0	45637	0.0	15	100%-c5	0	6.3	1.0000
		50	0	45637	0.0	0	100%-c5	0	7.3	1.0000
	FWP	1	26163	19474	57.3	30	35%-c2 55%-c3 10%-C5	50	5.3	0.8000
		6	24201	21436	53.0	40	35%-c2 55%-c3 10%-C5	50	4.0	1.0000
		9	23034	22603	50.5	40	100%-c3	50	4.0	1.0000
		17	19918	25719	43.6	40	70%-c4 30%-c5	30	4.0	1.0000
		19	0	45637	0.0	20	100%-c5	0	4.0	1.0000
		50	0	45637	0.0	0	100%-c5	0	5.0	1.0000

E-36-Brack-Low-P7			features 10a,10b							
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	4211	1280	76.7	66	40-c2 60-c3	12	5.5	1.0000
5491		1	4199	1292	76.5	66	40-c2 60-c3	12	5.5	1.0000
		50	3635	1856	66.2	66	100%-c3	36	6.5	1.0000
	FWP	1	5296	195	96.4	66	100%-c5	62	5.5	0.0001
		6	5244	247	95.5	66	100%-c1	62	4.8	1.0000
		27	5023	468	91.5	66	50%-c1, 50%-c2	62	4.8	1
		50	4691	800	85.4	66	100%-c2	72	4.8	1.0000
E-36-Brack-Med-P7			features 10a,10b							
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	4196	1295	76.4	66	40-c2 60-c3	12	5.5	1.0000
5491		1	4177	1314	76.1	66	40-c2 60-c3	12	5.5	1.0000
		50	3113	2378	56.7	66	100%-c3	49	6.5	1.0000
	FWP	1	5273	218	96.0	66	100%-c5	62	5.5	0.0001
		6	5176	315	94.3	66	100%-c1	60	4.8	1.0000
		23	4812	679	87.6	66	50%-c1, 50% c2	60	4.8	1.0000
		50	4018	1473	73.2	66	80%-c2, 20%-c3	77	5.8	1.0000

E-36-Brack High-P7			features 10a,10b							
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	4146	1345	75.5	66	40-c2 60-c3	12	5.5	1.0000
5491		1	4105	1386	74.8	66	40-c2 60-c3	12	5.5	1.0000
		9	3775	1716	68.7	66	50%-c3 50%-c4	12	5.5	1.0000
		19	0	5491	0.0	0	100%-c5	12	6.5	1.0000
		50	0	5491	0.0	0	100%-c5	0	7.5	1.0000
	FWP	1	5200	291	94.7	70	100%-c5	62	5.5	0.0001
		6	4971	520	90.5	70	100%-c1	62	5.5	1.0000
		9	4833	658	88.0	70	100%-c3	60	5.5	1.0000
		17	4462	1029	81.3	70	70%-c3, 30%-c4	40	5.5	1.0000
		19	0	5491	0.0	0	100%-c5	12	6.5	1.0000
		50	0	5491	0.0	0	100%-c5	0	7.5	1.0000

E-40-Brack-Div-Low-P7

		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	17878	10612	62.8	0	30%-c2 70%-c3	29	5.1	1.0000
28490		1	17817	10673	62.5	0	30%-c2 70%-c3	29	5.1	1.0000
		50	11531	16959	40.5	0	100%-c4	49	6.1	1.0000
			0							
	FWP	1	0	0	0	0	0	0	0	0
		6	0	0	0	0	0	0	0	0
		8	0	0	0	0	0	0	0	0
		13	0	0	0	0	0	0	0	0
		27	0	0	0	0	0	0	0	0
		50	0	0	0	0	0	0	0	0

E-40-Brack-Div-Med-P7

		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	17627	10863	61.9	0	30%-c2 70%-c3	29	5.1	1.0000
28490		1	17455	11035	61.3	0	30%-c2 70%-c3	29	5.1	1.0000
		50	4292	24198	15.1	0	100%-c4	63	6.1	1.0000
	FWP	1	0	0	0	0	0	0	0	0
		6	0	0	0	0	0	0	0	0
		8	0	0	0	0	0	0	0	0
		13	0	0	0	0	0	0	0	0
		23	0	0	0	0	0	0	0	0
		50	0	0	0	0	0	0	0	0

E-40-Brack-Div-High-P7

		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	17572	10918	61.7	0	30%-c2 70%-c3	29	5.1	1.0000
28490		1	17370	11120	61.0	0	30%-c2 70%-c3	29	5.1	1.0000
		9	15124	13366	53.1	0	50%-c3 50%-c4	29	5.1	1.0000
		19	0	28490	0.0	0	100%-c5	29	6.1	1.0000
		50	0	28490	0.0	0	100%-c5	0	7.1	1.0000
	FWP	1	0	0	0	0	0	0	0	0
		6	0	0	0	0	0	0	0	0
		9	0	0	0	0	0	0	0	0
		13	0	0	0	0	0	0	0	0
		17	0	0	0	0	0	0	0	0
		19	0	0	0	0	0	0	0	0
		50	0	0	0	0	0	0	0	0

E-40-Int-Div-Low-P7

		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	0	0	0	0	0	0	0	0
28490		1	0	0	0	0	0	0	0	0
		50	0	0	0	0	0	0	0	0
	FWP	1	11462	17028	40.2	0	30%-c2 70%-c3	29	5.1	1.0000
		6	19788	8702	69.5	20	15%-c2 54%-c3 31%-C5	60	2.9	0.0001
		8	22128	6362	77.7	20	15%-c2 54%-c3 31%-C1	60	2.9	1.0000
		13	21651	6839	76.0	40	30%-c1 70%-c2	60	2.9	1.0000
		27	20361	8129	71.5	50	100%-c2	60	2.9	1
		50	17857	10633	62.7	60	100%-c2	62	2.9	1.0000

E-40-Int-Div-Med-P7

		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	0	0	0	0	0	0	0	0
28490		1	0	0	0	0	0	0	0	0
		50	0	0	0	0	0	0	0	0
	FWP	1	17460	11030	61.3	0	30%-c2 70%-c3	29	5.1	1.0000
		6	18841	9649	66.1	20	15%-c2 54%-c3 31%-C5	50	2.9	0.0001
		8	20898	7592	73.4	20	15%-c2 54%-c3 31%-C1	50	2.9	1.0000
		13	19729	8761	69.3	20	100%-c2	50	2.9	1.0000
		23	17165	11325	60.3	20	50%-c2 50%-c3	50	2.9	1.0000
		50	9323	19167	32.7	20	100%-c3	65	3.9	1.0000

E-40-Int-Div-High-P7

		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	0	0	0	0	0	0	0	0
28490		1	0	0	0	0	0	0	0	0
		9	0	0	0	0	0	0	0	0
		19	0	0	0	0	0	0	0	0
		50	0	0	0	0	0	0	0	0
	FWP	1	17373	11117	61.0	0	30%-c2 70%-c3	29	5.1	1.0000
		6	18495	9995	64.9	20	30%-c2 70%-c3	35	2.9	0.0001
		8	20144	8346	70.7	20	15%-c2 56%-c3 29%-C5	35	2.9	1.0000
		13	18983	9507	66.6	15	71%-c3 29%-C1	35	2.9	1.0000
		17	17840	10650	62.6	10	100%-c4	35	2.9	1.0000
		19	0	28490	0.0	0	100%-c5	0	3.9	1.0000
		50	0	28490	0.0	0	100%-c5	0	4.9	1.0000

last modified May 10, 2010

F-23-Inner Brack-Low-P7			Features 2a,2b,2c,245							
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	4969	3910	56.0	0	80%-c2 20%-c4	35	5.5	1.0000
8879		1	4941	3938	55.6	0	80%-c2 20%-c4	35	5.5	1.0000
		50	3544	5335	39.9	0	100%-c4	43	6.5	1.0000
	FWP	1	4949	3930	55.7	0	80%-c2 20%-c4	35	5.5	1.0000
		6	8122	757	91.5	10	100%-c5	95	5.5	0.0001
		11	7979	900	89.9	20	100%-c1	95	5.5	1.0000
		27	7549	1330	86.0	25	50%-c2, 50% c3	90	5.5	1
		50	6481	2398	73.0	30	100%-c3	86	6.5	1.0000
F-23-Inner Brack-Med-P7			Features 2a,2b,2c,245							
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	4931	3948	55.5	0	80%-c2 20%-c4	35	5.5	1.0000
8879		1	4886	3993	55.0	0	80%-c2 20%-c4	35	5.5	1.0000
		50	2252	6627	25.4	0	100%-c4	54	6.5	1.0000
	FWP	1	4891	3988	55.1	0	80%-c2 20%-c4	35	5.5	1.0000
		6	7957	922	89.6	0	50%-c4 50%-c5	95	5.5	1.0000
		11	7683	1196	86.5	0	50%-c1 50%-c2	95	5.5	1.0000
		23	6915	1964	77.9	0	50%-c2 50%-c3	90	5.5	1.0000
		50	4417	4462	49.7	0	80%-c3 20%-c4	89	6.5	1.0000
F-23-Inner Brack-High-P7			Features 2a,2b,2c,245							
		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	4951	3928	55.8	0	80%-c2 20%-c4	35	5.5	1.0000
8879		1	4849	4030	54.6	0	80%-c2 20%-c4	35	5.5	1.0000
		9	4032	4847	45.4	0	80%-c3 20%-c4	35	5.5	1.0000
		19	0	8879	0.0	0	100%-c5	30	6.5	1.0000
		50	0	8879	0.0	0	100%-c5	20	7.5	1.0000
	FWP	1	4852	4027	54.6	0	80%-c2 20%-c4	35	5.5	1.0000
		6	7608	1271	85.7	0	50%-c4 50%-c5	95	5.5	1.0000
		9	7213	1666	81.2	0	50%-c1 50%-c2	90	5.5	1.0000
		11	6949	1930	78.3	0	50%-c2 50%-c3	80	5.5	1.0000
		17	6159	2720	69.4	0	50%-c3 50%-c4	50	5.5	1.0000
		19	0	8879	0.0	0	100%-c5	0	6.5	1.0000
		50	0	8879	0.0	0	100%-c5	0	7.5	1.0000

last modified March 30

		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	1369	369	78.8	0	100%-c3	75	7.4	0.4000
1738		1	1363	375	78.4	0	100%-c3	75	7.4	0.4000
		50	1064	674	61.2	0	100%-c4	72	8.4	0.4000
	FWP	1	1365	373	78.5	0	100%-c3	75	7.4	0.4000
		3	1588	150	91.4	0	100%-c5	95	7.4	0.0001
		8	1564	174	90.0	0	100%-c1	95	7.4	0.4000
		27	1471	267	84.6	0	100%-c2	95	7.4	0.4000
		50	1308	430	75.3	0	100%-c3	87	8.4	0.4000

		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	1361	377	78.3	0	100%-c3	75	7.4	0.4000
1738		1	1351	387	77.8	0	100%-c3	75	7.4	0.4000
		50	787	951	45.3	0	100%-c4	79	8.4	0.4000
	FWP	1	1353	385	77.8	0	100%-c3	75	7.4	0.4000
		3	1571	167	90.4	0	100%-c5	80	7.4	0.0001
		8	1524	214	87.7	0	100%-c1	80	7.4	0.4000
		23	1356	382	78.0	0	70%-c2 30%-c3	80	7.4	0.4000
		50	968	770	55.7	0	80%-c3 20%-c4	83	8.4	0.4000

		TY	V1 marsh acres	V1 water acres	V1 %	V2 SAV	V3 Inter	V4 %<1.5	V5 salinty	V6 fish ac
Project Area	FWOP	0	1335	403	76.8	0	100%-c3	75	7.4	0.4000
1738		1	1313	425	75.5	0	100%-c3	75	7.4	0.4000
		9	1138	600	65.5	0	100%-c4	60	7.4	0.4000
		19	0	1738	0.0	0	100%-c5	0	8.4	0.4000
		50	0	1738	0.0	0	100%-c5	0	9.4	0.4000
	FWP	1	1314	424	75.6	0	100%-c3	75	7.4	0.4000
		3	1519	219	87.4	0	100%-c5	75	7.4	0.0001
		8	1404	334	80.8	0	100%-c1	75	7.4	0.4000
		9	1358	380	78.1	0	100%-c3	75	7.4	0.4000
		17	1173	565	67.5	0	100%-c4	75	7.4	0.4000
		19	0	1738	0.0	0	100%-c5	20	8.4	0.4000
		50	0	1738	0.0	0	100%-c5	0	9.4	0.4000

ATTACHMENT 7

Individual WVA Variable Assumptions For TSP

Project	Measure	Alternative	TY	Variable	Assumption
Biloxi Marshes	A-18-Sal-Low-P7	FWOP	0	V3	Feature 29b sp is C3 Feature 29a sp is C1
Biloxi Marshes	A-18-Sal-Low-P7	FWOP	0	V4	Based on site visit - average V4 variable (see data collection sheet)
Biloxi Marshes	A-18-Sal-Low-P7	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Biloxi Marshes	A-18-Sal-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Biloxi Marshes	A-18-Sal-Low-P7	FWP	1	V1	Acreage is for Shoreline Protection feature
Biloxi Marshes	A-18-Sal-Low-P7	FWP	1	V6	Shoreline Protection with Fish Dips
Biloxi Marshes	A-18-Sal-Low-P7	FWP	5	V4	Sediment accumulates behind the breakwater shallowing the water.
Biloxi Marshes	A-18-Sal-Low-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Biloxi Marshes	A-18-Sal-Low-P7	FWP	50	V5	Restoration measures counter the effects of relative sea level rise
Biloxi Marshes	A-18-Sal-Med-P7	FWOP	0	V3	Feature 29b sp is C3 Feature 29a sp is C1
Biloxi Marshes	A-18-Sal-Med-P7	FWOP	0	V4	Based on site visit - average V4 variable (see data collection sheet)
Biloxi Marshes	A-18-Sal-Med-P7	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Biloxi Marshes	A-18-Sal-Med-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Biloxi Marshes	A-18-Sal-Med-P7	FWP	1	V1	Acreage is for Shoreline Protection feature
Biloxi Marshes	A-18-Sal-Med-P7	FWP	1	V6	Shoreline Protection with Fish Dips
Biloxi Marshes	A-18-Sal-Med-P7	FWP	5	V4	Sediment accumulates behind the breakwater shallowing the water.
Biloxi Marshes	A-18-Sal-Med-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Biloxi Marshes	A-18-Sal-Med-P7	FWP	50	V5	Restoration measures counter the effects of relative sea level rise
Biloxi Marshes	A-18-Sal-High-P7	FWOP	0	V3	Feature 29b sp is C3 Feature 29a sp is C1
Biloxi Marshes	A-18-Sal-High-P7	FWOP	0	V4	Based on site visit - average V4 variable (see data collection sheet)

Biloxi Marshes	A-18-Sal-High-P7	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Biloxi Marshes	A-18-Sal-High-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Biloxi Marshes	A-18-Sal-High-P7	FWP	1	V1	Acreage is for Shoreline Protection feature
Biloxi Marshes	A-18-Sal-High-P7	FWP	1	V6	Shoreline Protection with Fish Dips
Biloxi Marshes	A-18-Sal-High-P7	FWP	5	V4	Sediment accumulates behind the breakwater shallowing the water.
Biloxi Marshes	A-18-Sal-High-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Biloxi Marshes	A-18-Sal-High-P7	FWP	50	V5	Restoration measures counter the effects of relative sea level rise
Biloxi Marshes	A-18-Ridge-Low	FWP	-	-	Future projections based on Grand Liard PPL18 CWPPRA project (BA-48).
Biloxi Marshes	A-18-Ridge-Low	FWP	1	V3	Assume planting trees after TY1 because dredged material may not be suitable initially. Plant 6 species of trees by TY3. Assume 4 more species will recruit over time.
Biloxi Marshes	A-18-Brackish-Low	FWOP	0	V4	Only 2 ac of water. Assume most of it is shallow except trenasses and canal.
Biloxi Marshes	A-18-Brackish-Low	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Biloxi Marshes	A-18-Brackish-Low	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Biloxi Marshes	A-18-Brackish-Low	FWP	1	V1	All ridge - no water and no marsh
Biloxi Marshes	A-18-Brackish-Low	FWP	1	V4	All ridge - no water and no marsh
Biloxi Marshes	A-18-Brackish-Low	FWP	1	V6	All ridge - no water and no marsh
Biloxi Marshes	A-18-Ridge-Med	FWP	-	-	Future projections based on Grand Liard PPL18 CWPPRA project (BA-48).
Biloxi Marshes	A-18-Ridge-Med	FWP	1	V3	Assume planting trees after TY1 because dredged material may not be suitable initially. Plant 6 species of trees by TY3. Assume 4 more species will recruit over time.
Biloxi Marshes	A-18-Brackish-Med	FWOP	0	V4	Only 2 ac of water. Assume most of it is shallow except trenasses and canal.

Biloxi Marshes	A-18-Brackish-Med	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Biloxi Marshes	A-18-Brackish-Med	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Biloxi Marshes	A-18-Brackish-Med	FWP	1	V1	All ridge - no water and no marsh
Biloxi Marshes	A-18-Brackish-Med	FWP	1	V4	All ridge - no water and no marsh
Biloxi Marshes	A-18-Brackish-Med	FWP	1	V6	All ridge - no water and no marsh
Biloxi Marshes	A-18-Ridge-High	FWP	-	-	Future projections based on Grand Liard PPL18 CWPPRA project (BA-48).
Biloxi Marshes	A-18-Ridge-High	FWP	50	V1	Reduced as ridge subsides
Biloxi Marshes	A-18-Ridge-High	FWP	50	V2	Stays high as overstory doesn't increase substantially with subsidence
Biloxi Marshes	A-18-Ridge-High	FWP	1	V3	Assume planting trees after TY1 because dredged material may not be suitable initially. Plant 6 species of trees by TY3. Assume 4 more species will recruit over time.
Biloxi Marshes	A-18-Ridge-High	FWP	50	V3	Reduced as ridge subsides
Biloxi Marshes	A-18-Brackish-High	FWOP	0	V4	Only 2 ac of water. Assume most of it is shallow except trenasses and canal.
Biloxi Marshes	A-18-Brackish-High	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Biloxi Marshes	A-18-Brackish-High	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Biloxi Marshes	A-18-Brackish-High	FWP	1	V1	All ridge - no water and no marsh
Biloxi Marshes	A-18-Brackish-High	FWP	1	V4	All ridge - no water and no marsh
Biloxi Marshes	A-18-Brackish-High	FWP	1	V6	All ridge - no water and no marsh
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWOP	0	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWOP	0	V4	Based on site visit Oct 2009- average V4 variable (see data collection sheet)
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWOP	1	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt

Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	1	V1	Add difference in FWP w/ and w/o feature 81
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	1	V3	Features make up about 10% (7913 acres) of Subunit. Of the about 10%: 20% c1 for SP; 80% c2 for MC Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	1	V5	Based on mean high for Subunit 73, since this is the saline portion.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	1	V6	Marsh nourishment with retention dikes.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	2	-	Marsh Creation complete at TY2
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	2	V3	Features make up about 10% (7913 acres) of Subunit. Of the about 10%: 20% c1 for SP; 80% c2 for MC Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	6	-	Diversion functional and benefits start accruing at TY6
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	6	V2	Diversion influence begins TY6
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	6	V3	Features make up about 10% (7913 acres) of Subunit. Of the about 10%: 20% c1 for SP; 80% c2 for MC Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	7	-	Marsh creation created plus 5 years for fully functioning marsh.
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	7	V3	Features make up about 10% of Subunit. 10% C1 Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	50	V3	Features make up about 10% of Subunit. 10% C1. Diversion helps maintain nourished marsh. Assume remaining 90% of SU is C3
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Biloxi Marshes	A-07-Brack-Div-Low-P7	FWP	50	V5	Diversion input helps combat RSLR
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWOP	0	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWOP	0	V4	Based on site visit Oct 2009- average V4 variable (see data collection sheet)

Biloxi Marshes	A-07-Brack-Div-Med-P7	FWOP	1	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	1	V1	Add difference in FWP w/ and w/o feature 81
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	1	V3	Features make up about 10% (7913 acres) of Subunit. Of the about 10%: 20% c1 for SP; 80% c2 for MC Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	1	V5	Based on mean high for Subunit 73, since this is the saline portion.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	1	V6	Marsh nourishment with retention dikes.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	2	-	Marsh Creation complete at TY2
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	2	V3	Features make up about 10% (7913 acres) of Subunit. Of the about 10%: 20% c1 for SP; 80% c2 for MC Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	6	-	Diversion functional and benefits start accruing at TY6
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	6	V2	Diversion influence begins TY6
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	6	V3	Features make up about 10% (7913 acres) of Subunit. Of the about 10%: 20% c1 for SP; 80% c2 for MC Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	7	-	Marsh creation created plus 5 years for fully functioning marsh.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	7	V3	Features make up about 10% of Subunit. 10% C1 Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	7	V4	Sediment accumulates behind the breakwater shallowing the water.
Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	50	V3	Features make up about 10% of Subunit. 10% C1. Diversion helps maintain nourished marsh. Assume remaining 90% of SU is C3

Biloxi Marshes	A-07-Brack-Div-Med-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	0	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	0	V4	Based on site visit Oct 2009- average V4 variable (see data collection sheet)
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	1	V3	20% shoreline area is class 2 80% is feature 81 is class 3
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Biloxi Marshes	A-07-Brack-Div-High-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	1	V1	Add difference in FWP w/ and w/o feature 81
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	1	V3	Features make up about 10% (7913 acres) of Subunit. Of the about 10%: 20% c1 for SP; 80% c2 for MC Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	1	V5	Based on mean high for Subunit 73, since this is the saline portion.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	1	V6	Marsh nourishment with retention dikes.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	2	-	Marsh Creation complete at TY2
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	2	V3	Features make up about 10% (7913 acres) of Subunit. Of the about 10%: 20% c1 for SP; 80% c2 for MC Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	6	-	Diversion functional and benefits start accruing at TY6
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	6	V2	Diversion influence begins TY6
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	6	V3	Features make up about 10% (7913 acres) of Subunit. Of the about 10%: 20% c1 for SP; 80% c2 for MC Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	7	-	Marsh creation created plus 5 years for fully functioning marsh.

Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	7	V3	Features make up about 10% of Subunit. 10% C1 Assume remaining 90% of SU is Class 2
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	7	V4	Sediment accumulates behind the breakwater shallowing the water.
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	9	-	Year of marsh collapse
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	17	-	10"/year
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	19	-	Year marsh goes to 0
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	50	V3	Features make up about 10% of Subunit. 10% C1. Diversion helps maintain nourished marsh. Assume remaining 90% of SU is C3
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Biloxi Marshes	A-07-Brack-Div-High-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 2 ppt
Central Wetlands	D-13-Brack-Low (Swamp fwop Footprint)	FWOP	-	-	219 acres was removed from fwop for SWB project.
Central Wetlands	D-13-Brack-Low (Swamp fwop Footprint)	FWOP	0	-	Project area: 219 acres was removed from fwop for SWB project.
Central Wetlands	D-13-Brack-Low (Swamp fwop Footprint)	FWOP	0	V2	Used field data = 52%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brack-Low (Swamp fwop Footprint)	FWOP	0	V3	27b- c2; 25a and 25b-c2, 26a and 26e-c5
Central Wetlands	D-13-Brack-Low (Swamp fwop Footprint)	FWOP	0	V4	Used field data = 56.4%; adjusted for 10% of area west of Paris Rd where no data were collected
Central Wetlands	D-13-Brack-Low (Swamp fwop Footprint)	FWOP	0	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures.
Central Wetlands	D-13-Brack-Low (Swamp fwop Footprint)	FWOP	1	V3	27b- c2; 25a and 25b-c2, 26a and 26e-c5
Central Wetlands	D-13-Brack-Low (Swamp fwop Footprint)	FWOP	50	V2	SAV decreases over time as less open water is shallow and increase in salinity is projected.
Central Wetlands	D-13-Brack-Low (Swamp fwop Footprint)	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow

					water subsiding beyond 1.5 ft.
Central Wetlands	D-13-Brack-Low (Swamp fwop Footprint)	FWOP	50	V5	Because of relative sea level rise, salinity raise 1 ppt.
Central Wetlands	D-13-Brack-Low (Swamp fwop Footprint)	FWP	-	All	All values are zero, or 100% C5, except salinity in FWP to account for conversion to swamp
Central Wetlands	D-13-Swamp-Div-Low FWP	FWOP	0	-	Project area: 219 acres was removed from fwop for SWB project.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWOP	-	All	Leave all values zero (or equivalent) for FWOP to account for conversion from brackish marsh
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	1	V1	No trees planted until after diversion reduces salinity enough to support cypress.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	1	V2	Cypress are not supported until after diversion is active.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	1	V3	Flow/exchange is low and flood duration is temporarily flooded.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	1	V4	Baseline salinity before diversion is active.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	3	-	Marsh creation complete in TY3
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	3	V1	No trees planted until after diversion reduces salinity enough to support cypress.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	3	V3	Flow/exchange is low and flood duration is temporarily flooded.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	6	-	Diversion functional and benefits start accruing in TY6.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	6	V1	Saplings planted <33% overstory closure.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	6	V2	dbh less than or equal to 1 then SI=.01*dbh.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	6	V3	Flow/exchange is high due to diversion- constant flow for most of the year and pulsing. Flood duration-seasonally flooded
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	9	-	TY8 based on 5 years after Marsh creation for fully functioning marsh.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	9	V1	Assume 1"dbh saplings grow to 2.3"dbh by TY5. Still no overstory closure.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	9	V2	If dbh is between 1 and 4, then SI is (0.013*dbh)-0.003. Assume dbh is 1.5 based on growing tree spreadsheet.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	9	V3	Flow/exchange is high due to diversion- constant flow for most of the year and pulsing. Flood duration-seasonally flooded.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	50	V1	Based on healthy swamp existing conditions (IER1 floodside WVA 47%-overstory, 39%-midstory, 64%-understory). Here assume 33%-

					overstory, 40%-midstory, and 40%-understory.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	50	V2	Assume dbh is 21.5 based on healthy swamp from IER1 WVA. If dbh is greater than 16 the SI=1
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	50	V3	Flow/exchange is high due to diversion- constant flow for most of the year and pulsing. Flood duration-seasonally flooded.
Central Wetlands	D-13-Swamp-Div-Low FWP	FWP	50	V4	Restoration measures counter the effects of relative sea level rise
Central Wetlands	D-13-Brack-Med (Swamp fwop Footprint)	FWOP	0	-	Project area: 219 acres was removed from fwop for SWB project.
Central Wetlands	D-13-Brack-Med (Swamp fwop Footprint)	FWOP	0	V2	Used field data = 52%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brack-Med (Swamp fwop Footprint)	FWOP	0	V3	27b- c2; 25a and 25b-c2, 26a and 26e-c5
Central Wetlands	D-13-Brack-Med (Swamp fwop Footprint)	FWOP	0	V4	Used field data = 56.4%; adjusted for 10% of area west of Paris Rd where no data were collected
Central Wetlands	D-13-Brack-Med (Swamp fwop Footprint)	FWOP	0	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures.
Central Wetlands	D-13-Brack-Med (Swamp fwop Footprint)	FWOP	1	V3	27b- c2; 25a and 25b-c2, 26a and 26e-c5
Central Wetlands	D-13-Brack-Med (Swamp fwop Footprint)	FWOP	50	V2	SAV decreases over time as less open water is shallow and increase in salinity is projected.
Central Wetlands	D-13-Brack-Med (Swamp fwop Footprint)	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Central Wetlands	D-13-Brack-Med (Swamp fwop Footprint)	FWOP	50	V5	Because of relative sea level rise, salinity raise 1 ppt.
Central Wetlands	D-13-Brack-Med (Swamp fwop Footprint)	FWP	-	All	All values are zero, or 100% C5, except salinity in FWP to account for conversion to swamp
Central Wetlands	D-13-Swamp-Div-Med FWP	FWOP	0	-	Project area: 219 acres was removed from fwop for SWB project.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWOP	-	All	Leave all values zero (or equivalent) for FWOP to account for conversion from brackish marsh
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	1	V1	No trees planted until after diversion reduces salinity enough to support cypress.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	1	V2	Cypress are not supported until after diversion is active.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	1	V3	Flow/exchange is low and flood duration is temporarily flooded.

Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	1	V4	Baseline salinity before diversion is active.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	3	-	Marsh creation complete in TY3
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	3	V1	No trees planted until after diversion reduces salinity enough to support cypress.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	3	V3	Flow/exchange is low and flood duration is temporarily flooded.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	6	-	Diversion functional and benefits start accruing in TY6.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	6	V1	Saplings planted <33% overstory closure.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	6	V2	dbh less than or equal to 1 then SI=.01*dbh.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	6	V3	Flow/exchange is high due to diversion- constant flow for most of the year and pulsing. Flood duration-seasonally flooded
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	8	-	TY8 based on 5 years after Marsh creation for fully functioning marsh.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	8	V1	Assume 1"dbh saplings grow to 2.3"dbh by TY5. Still no overstory closure.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	8	V2	If dbh is between 1 and 4, then SI is (0.013*dbh)-0.003. Assume dbh is 1.5 based on growing tree spreadsheet.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	8	V3	Flow/exchange is high due to diversion- constant flow for most of the year and pulsing. Flood duration-seasonally flooded.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	50	V1	Based on healthy swamp existing conditions (IER1 floodside WVA 47%-overstory, 39%-midstory, 64%-understory). Here assume 33%-overstory, 40%-midstory, and 40%-understory.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	50	V2	Assume dbh is 21.5 based on healthy swamp from IER1 WVA. If dbh is greater than 16 the SI=1
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	50	V3	Flow/exchange is high due to diversion- constant flow for most of the year and pulsing. Flood duration-seasonally flooded.
Central Wetlands	D-13-Swamp-Div-Med FWP	FWP	50	V4	Restoration measures counter the effects of relative sea level rise
Central Wetlands	D-13-Brack-High (Swamp fwop Footprint)	FWOP	0	-	Project area: 219 acres was removed from fwop for SWB project.
Central Wetlands	D-13-Brack-High (Swamp fwop Footprint)	FWOP	0	V2	Used field data = 52%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brack-High (Swamp fwop Footprint)	FWOP	0	V3	27b- c2; 25a and 25b-c2, 26a and 26e-c5

Central Wetlands	D-13-Brack-High (Swamp fwop Footprint)	FWOP	0	V4	Used field data = 56.4%; adjusted for 10% of area west of Paris Rd where no data were collected
Central Wetlands	D-13-Brack-High (Swamp fwop Footprint)	FWOP	0	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures.
Central Wetlands	D-13-Brack-High (Swamp fwop Footprint)	FWOP	1	V3	27b- c2; 25a and 25b-c2, 26a and 26e-c5
Central Wetlands	D-13-Brack-High (Swamp fwop Footprint)	FWOP	50	V2	SAV decreases over time as less open water is shallow and increase in salinity is projected.
Central Wetlands	D-13-Brack-High (Swamp fwop Footprint)	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Central Wetlands	D-13-Brack-High (Swamp fwop Footprint)	FWOP	50	V5	Because of relative sea level rise, salinity raise 1 ppt.
Central Wetlands	D-13-Brack-High (Swamp fwop Footprint)	FWP			Central Wetlands D-13-Brack-High (Swamp fwop Footprint) FWOP
Central Wetlands	D-13-Brack-High (Swamp fwop Footprint)	FWP	-	All	All values are zero, or 100% C5, except salinity in FWP to account for conversion to swamp
Central Wetlands	D-13-Swamp-Div-High FWP	FWOP	0	-	Project area: 219 acres was removed from fwop for SWB project.
Central Wetlands	D-13-Swamp-Div-High FWP	FWOP	-	All	Leave all values zero (or equivalent) for FWOP to account for conversion from brackish marsh
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	1	V1	No trees planted until after diversion reduces salinity enough to support cypress.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	1	V2	Cypress are not supported until after diversion is active.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	1	V3	Flow/exchange is low and flood duration is temporarily flooded.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	1	V4	Baseline salinity before diversion is active.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	3	-	Marsh creation complete in TY3
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	3	V1	No trees planted until after diversion reduces salinity enough to support cypress.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	3	V3	Flow/exchange is low and flood duration is temporarily flooded.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	6	-	Diversion functional and benefits start accruing in TY6.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	6	V1	Saplings planted <33% overstory closure.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	6	V2	dbh less than or equal to 1 then SI=.01*dbh.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	6	V3	Flow/exchange is high due to diversion- constant flow for most of

					the year and pulsing. Flood duration-seasonally flooded
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	8	-	TY8 based on 5 years after Marsh creation for fully functioning marsh.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	8	V1	Assume 1"dbh saplings grow to 2.3"dbh by TY5. Still no overstory closure.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	8	V2	If dbh is between 1 and 4, then SI is (0.013*dbh)-0.003. Assume dbh is 1.5 based on growing tree spreadsheet.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	8	V3	Flow/exchange is high due to diversion- constant flow for most of the year and pulsing. Flood duration-seasonally flooded.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	50	V1	Based on healthy swamp existing conditions (IER1 floodside WVA 47%-overstory, 39%-midstory, 64%-understory). Here assume 33%-overstory, 40%-midstory, and 40%-understory.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	50	V2	Assume dbh is 21.5 based on healthy swamp from IER1 WVA. If dbh is greater than 16 the SI=1
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	50	V3	Flow/exchange is high due to diversion- constant flow for most of the year and pulsing. Flood duration-seasonally flooded.
Central Wetlands	D-13-Swamp-Div-High FWP	FWP	50	V4	Restoration measures counter the effects of relative sea level rise
Central Wetlands	D-13-Brac-Div-Low-P7	FWOP	0	V2	Used field data = 52%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brac-Div-Low-P7	FWOP	0	V3	27b is 90%-c2 and 10%-c4; 25b is c4; 26b is 60%-c2 and 40%-c4; 26d and 26c are c5
Central Wetlands	D-13-Brac-Div-Low-P7	FWOP	0	V4	Used field data = 23.1%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brac-Div-Low-P7	FWOP	0	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures
Central Wetlands	D-13-Brac-Div-Low-P7	FWOP	1	V3	27b is 90%-c2 and 10%-c4; 25b is c4; 26b is 60%-c2 and 40%-c4; 26d and 26c are c5
Central Wetlands	D-13-Brac-Div-Low-P7	FWOP	50	V2	SAV decrease over time as less open water is shallow and increase salinity due to subsidence.
Central Wetlands	D-13-Brac-Div-Low-P7	FWOP	50	V3	c2 becomes c4, c4becomes c5
Central Wetlands	D-13-Brac-Div-Low-P7	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with

					the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Central Wetlands	D-13-Brac-Div-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Central Wetlands	D-13-Brac-Div-Med-P7	FWOP	0	V2	Used field data = 52%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brac-Div-Med-P7	FWOP	0	V3	27b is 90%-c2 and 10%-c4; 25b is c4; 26b is 60%-c2 and 40%-c4; 26d and 26c are c5
Central Wetlands	D-13-Brac-Div-Med-P7	FWOP	0	V4	Used field data = 23.1%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brac-Div-Med-P7	FWOP	0	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures
Central Wetlands	D-13-Brac-Div-Med-P7	FWOP	1	V3	27b is 90%-c2 and 10%-c4; 25b is c4; 26b is 60%-c2 and 40%-c4; 26d and 26c are c5
Central Wetlands	D-13-Brac-Div-Med-P7	FWOP	50	V2	SAV decrease over time as less open water is shallow and increase salinity due to subsidence.
Central Wetlands	D-13-Brac-Div-Med-P7	FWOP	50	V3	Less than 5% land remaining
Central Wetlands	D-13-Brac-Div-Med-P7	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Central Wetlands	D-13-Brac-Div-Med-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Central Wetlands	D-13-Brac-Div-High-P7	FWOP	0	V2	Used field data = 52%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brac-Div-High-P7	FWOP	0	V3	27b is 90%-c2 and 10%-c4; 25b is c4; 26b is 60%-c2 and 40%-c4; 26d and 26c are c5
Central Wetlands	D-13-Brac-Div-High-P7	FWOP	0	V4	Used field data = 23.1%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Brac-Div-High-P7	FWOP	0	V6	Only two restricted entrances; gates at Bienvenue and Dupre often closed during high water; size of area serviced by the two structures
Central Wetlands	D-13-Brac-Div-High-P7	FWOP	1	V3	27b is 90%-c2 and 10%-c4; 25b is c4; 26b is 60%-c2 and 40%-c4; 26d and 26c are c5
Central Wetlands	D-13-Brac-Div-High-P7	FWOP	19	V3	All marsh gone
Central Wetlands	D-13-Brac-Div-High-P7	FWOP	19	V2	SAV decrease over time as less open water is shallow and increase salinity

					due to subsidence.
Central Wetlands	D-13-Brac-Div-High-P7	FWOP	50	V2	SAV decrease over time as less open water is shallow and increase salinity due to subsidence.
Central Wetlands	D-13-Brac-Div-High-P7	FWOP	50	V3	All marsh gone
Central Wetlands	D-13-Brac-Div-High-P7	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Central Wetlands	D-13-Brac-Div-High-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Central Wetlands	D-13-Int-Div-Low-P7	FWP	-	-	Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Int-Div-Low-P7	FWP	-	-	Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Int-Div-Low-P7	FWP	1	V3	27b is 90%-c2 and 10%-c4; 25b is c4; 26b is 60%-c2 and 40%-c4; 26d and 26c are c5
Central Wetlands	D-13-Int-Div-Low-P7	FWP	1	V4	Used field data = 23.1%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Int-Div-Low-P7	FWP	5	-	Marsh creation completed in TY4
Central Wetlands	D-13-Int-Div-Low-P7	FWP	5	V1	25% of created marsh is functional. Existing marsh is functional.
Central Wetlands	D-13-Int-Div-Low-P7	FWP	5	V3	4346 acres (23%) are created and become C5. Assume remaining existing marsh keeps the same class distributions as adjacent features. 7% taken fromC2, 8% taken from C4, 8% remains in C5.
Central Wetlands	D-13-Int-Div-Low-P7	FWP	6	-	Diversion functional and benefits start accruing in TY6.
Central Wetlands	D-13-Int-Div-Low-P7	FWP	6	V3	4346acres (23%) are created and become C3. Assume remaining existing marsh keeps the same class distributions as adjacent features. 7% taken fromC2, 8% taken from C4, 8% taken from C5.
Central Wetlands	D-13-Int-Div-Low-P7	FWP	10	-	TY9 based on 5 years after Marsh creation for fully functioning marsh.
Central Wetlands	D-13-Int-Div-Low-P7	FWP	10	V3	4346 acres (23%) are created and become C1. Assume remaining existing marsh keeps the same class distributions as adjacent features. 7% taken fromC2, 8% taken from C4, 8% taken from C5.

Central Wetlands	D-13-Int-Div-Low-P7	FWP	27	-	10"/yr
Central Wetlands	D-13-Int-Div-Low-P7	FWP	27	V3	Diversion help sustain marsh. Model projects completely filling in the CW.
Central Wetlands	D-13-Int-Div-Low-P7	FWP	50	V1	With Diversion 100% of area is filled in. We assume there would still be about 5% open water.
Central Wetlands	D-13-Int-Div-Low-P7	FWP	50	V3	Diversion help sustain marsh. Model projects completely filling in the CW.
Central Wetlands	D-13-Int-Div-Low-P7	FWP	50	V4	Diversion is expected to fill in most of the open water in the CW.
Central Wetlands	D-13-Int-Div-Low-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Central Wetlands	D-13-Int-Div-Med-P7	FWP	-	-	Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Int-Div-Med-P7	FWP	1	V3	27b is 90%-c2 and 10%-c4; 25b is c4; 26b is 60%-c2 and 40%-c4; 26d and 26c are c5
Central Wetlands	D-13-Int-Div-Med-P7	FWP	1	V4	Used field data = 23.1%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Int-Div-Med-P7	FWP	5	-	Marsh creation completed in TY4
Central Wetlands	D-13-Int-Div-Med-P7	FWP	5	V1	25% of created marsh is functional. Existing marsh is functional.
Central Wetlands	D-13-Int-Div-Med-P7	FWP	5	V3	4259 acres (23%) are created and become C5. Assume remaining existing marsh keeps the same class distributions as adjacent features. 7% taken fromC2, 8% taken from C4, 8% remains in C5.
Central Wetlands	D-13-Int-Div-Med-P7	FWP	6	-	Diversion functional and benefits start accruing in TY6.
Central Wetlands	D-13-Int-Div-Med-P7	FWP	6	V3	4259 acres (23%) are created and become C3. Assume remaining existing marsh keeps the same class distributions as adjacent features. 7% taken fromC2, 8% taken from C4, 8% taken from C5.
Central Wetlands	D-13-Int-Div-Med-P7	FWP	10	-	TY9 based on 5 years after Marsh creation for fully functioning marsh.
Central Wetlands	D-13-Int-Div-Med-P7	FWP	10	V3	4259 acres (23%) are created and become C1. Assume remaining existing marsh keeps the same class distributions as adjacent features. 7% taken fromC2, 8% taken from C4, 8% taken from C5.
Central Wetlands	D-13-Int-Div-Med-P7	FWP	23	-	10"/yr
Central Wetlands	D-13-Int-Div-Med-P7	FWP	23	V3	Diversion help sustain marsh. Model projects completely filling in the CW.

Central Wetlands	D-13-Int-Div-Med-P7	FWP	50	V1	With Diversion 100% of area is filled in. We assume there would still be about 5% open water.
Central Wetlands	D-13-Int-Div-Med-P7	FWP	50	V3	Diversion help sustain marsh. Model projects completely filling in the CW.
Central Wetlands	D-13-Int-Div-Med-P7	FWP	50	V4	Diversion is expected to fill in most of the open water in the CW.
Central Wetlands	D-13-Int-Div-High-P7	FWP	-	-	Assume diversion channel does not have levees restricting fish access across the subunit.
Central Wetlands	D-13-Int-Div-High-P7	FWP	1	V3	27b is 90%-c2 and 10%-c4; 25b is c4; 26b is 60%-c2 and 40%-c4; 26d and 26c are c5
Central Wetlands	D-13-Int-Div-High-P7	FWP	1	V4	Used field data = 23.1%; adjusted for 10% of area west of Paris Rd where no data collected
Central Wetlands	D-13-Int-Div-High-P7	FWP	5	-	Marsh creation completed in TY4
Central Wetlands	D-13-Int-Div-High-P7	FWP	5	V1	25% of created marsh is functional. Existing marsh is functional.
Central Wetlands	D-13-Int-Div-High-P7	FWP	5	V3	4009 acres (23%) are created and become C5. Assume remaining existing marsh keeps the same class distributions as adjacent features. 7% taken fromC2, 8% taken from C4, 8% remains in C5.
Central Wetlands	D-13-Int-Div-High-P7	FWP	6	-	Diversion functional and benefits start accruing in TY6.
Central Wetlands	D-13-Int-Div-High-P7	FWP	6	V3	4009 acres (23%) are created and become C3. Assume remaining existing marsh keeps the same class distributions as adjacent features. 7% taken fromC2, 8% taken from C4, 8% taken from C5.
Central Wetlands	D-13-Int-Div-High-P7	FWP	10	-	TY9 based on 5 years after Marsh creation for fully functioning marsh.
Central Wetlands	D-13-Int-Div-High-P7	FWP	10	V3	4009 acres (23%) are created and become C1. Assume remaining existing marsh keeps the same class distributions as adjacent features. 7% taken fromC2, 8% taken from C4, 8% taken from C5.
Central Wetlands	D-13-Int-Div-High-P7	FWP	27	-	10"/yr
Central Wetlands	D-13-Int-Div-High-P7	FWP	27	V3	Diversion help sustain marsh. Model projects completely filling in the CW.
Central Wetlands	D-13-Int-Div-High-P7	FWP	19	-	Year marsh acreages go to 0
Central Wetlands	D05-Violet Diversion footprint-Low	FWOP	0	V2	used 5C transect from data collection

Central Wetlands	D05-Violet Diversion footprint-Low	FWOP	0	V3	Most is unbroken marsh except for a few areas of open water within the diversion footprint.
Central Wetlands	D05-Violet Diversion footprint-Low	FWOP	0	V4	used 5C transect from data collection
Central Wetlands	D05-Violet Diversion footprint-Low	FWOP	0	V5	Used other CW estimates
Central Wetlands	D05-Violet Diversion footprint-Low	FWOP	50	V2	decreases as water is deeper due to subsidence.
Central Wetlands	D05-Violet Diversion footprint-Low	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Central Wetlands	D05-Violet Diversion footprint-Low	FWP	1	V3	All becomes open diversion channel.
Central Wetlands	D05-Violet Diversion footprint-Low	FWP	1	V4	Assume channel is deeper than 1.5ft and only the margins are shallow.
Central Wetlands	D05-Violet Diversion footprint-Low	FWP	5	V1	Diversion is built removing all marsh.
Central Wetlands	D05-Violet Diversion footprint-Med	FWOP	0	V2	used 5C transect from data collection
Central Wetlands	D05-Violet Diversion footprint-Med	FWOP	0	V3	Most is unbroken marsh except for a few areas of open water within the diversion footprint.
Central Wetlands	D05-Violet Diversion footprint-Med	FWOP	0	V4	used 5C transect from data collection
Central Wetlands	D05-Violet Diversion footprint-Med	FWOP	0	V5	Used other CW estimates
Central Wetlands	D05-Violet Diversion footprint-Med	FWOP	50	V2	decreases as water is deeper due to subsidence.
Central Wetlands	D05-Violet Diversion footprint-Med	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Central Wetlands	D05-Violet Diversion footprint-Med	FWP	1	V3	All becomes open diversion channel.
Central Wetlands	D05-Violet Diversion footprint-Med	FWP	1	V4	Assume channel is deeper than 1.5ft and only the margins are shallow.
Central Wetlands	D05-Violet Diversion footprint-Med	FWP	5	V1	Diversion is built removing all marsh.

Central Wetlands	D05-Violet Diversion footprint-High	FWOP	0	V2	used 5C transect from data collection
Central Wetlands	D05-Violet Diversion footprint-High	FWOP	0	V3	Most is unbroken marsh except for a few areas of open water within the diversion footprint.
Central Wetlands	D05-Violet Diversion footprint-High	FWOP	0	V4	used 5C transect from data collection
Central Wetlands	D05-Violet Diversion footprint-High	FWOP	0	V5	Used other CW estimates
Central Wetlands	D05-Violet Diversion footprint-High	FWOP	50	V2	decreases as water is deeper due to subsidence.
Central Wetlands	D05-Violet Diversion footprint-High	FWOP	50	V4	Assume all of marsh acres lost become shallow water, and 2/3 of existing shallow water remains shallow, with the remaining 1/3 existing shallow water subsiding beyond 1.5 ft.
Central Wetlands	D05-Violet Diversion footprint-High	FWP	1	V3	Most is unbroken marsh except for a few areas of open water within the diversion footprint.
Central Wetlands	D05-Violet Diversion footprint-High	FWP	1	V4	Assume channel is deeper than 1.5ft and only the margins are shallow.
	D05-Violet Diversion footprint-High	FWP	5	V3	All becomes open diversion channel.
	D05-Violet Diversion footprint-High	FWP	9	V4	Assume channel is deeper than 1.5ft and only the margins are shallow.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	0	V2	Based on Oct 2009 site visit, transects 22 and 23. Looking at whole subunit
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	0	V3	Used only SU17
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	0	V4	50% interior marshes is shallow based on based on June and Oct 2009 site visit of nearby areas. Much of the area is shoreline and has less shallow open water.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	1	V3	Used only SU17
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	1	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	1	V3	4501 acres (10%) are created and become C5.

					Assume remaining existing marsh keeps the same class distributions as adjacent features. 5% taken from 40%-C2, 6% taken from 60%-C3.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	1	V6	50% of project area has features. SP has fish dips, marsh creation has no access in TY1, marsh nourishment has access.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	6	V2	Diversion influence begins at TY6
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	6	V3	4501 acres (10%) are created and become C5. Assume remaining existing marsh keeps the same class distributions as adjacent features. 5% taken from 40%-C2, 6% taken from 60%-C3.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	27	-	10"/yr
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	27	V3	4501 acres (10%) are created and become C5. Assume remaining existing marsh keeps the same class distributions as adjacent features. 5% taken from 40%-C2, 6% taken from 60%-C3.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	50	V3	The diversion helps sustain the marsh
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWOP	0	V2	Based on Oct 2009 site visit, transects 22 and 23. Looking at whole subunit
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWOP	0	V3	Used only SU17
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWOP	0	V4	50% interior marshes is shallow based on based on June and Oct 2009 site visit of nearby areas. Much of the area is shoreline and has less shallow open water.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWOP	1	V3	Used only SU17
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	1	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	1	V3	4470 acres (10%) are created and become C5.

					Assume remaining existing marsh keeps the same class distributions as adjacent features. 5% taken from 40%-C2, 6% taken from 60%-C3.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	1	V6	50% of project area has features. SP has fish dips, marsh creation has no access in TY1, marsh nourishment has access.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	6	V2	Diversion influence begins at TY6
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	6	V3	4470 acres (10%) are created and become C5. Assume remaining existing marsh keeps the same class distributions as adjacent features. 5% taken from 40%-C2, 6% taken from 60%-C3.
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	23		10"/yr
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	50	V3	The diversion helps sustain the marsh
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-17-Brack-Div-Med-P7	FWP	50	V2	assumed that medium water level would result in slightly deeper water, so SAV growth may be reduced from low water level\
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	0	V2	Based on Oct 2009 site visit, transects 22 and 23. Looking at whole subunit
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	0	V3	Used only SU17
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	0	V4	50% interior marshes is shallow based on based on June and Oct 2009 site visit of nearby areas. Much of the area is shoreline and has less shallow open water.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	1	V3	Used only SU17
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	1	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	1	V3	4372 acres (10%) are created and become C5. Assume remaining existing marsh keeps the same class distributions as adjacent features.

					5% taken from 40%-C2, 6% taken from 60%-C3.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	1	V6	50% of project area has features. SP has fish dips, marsh creation has no access in TY1, marsh nourishment has access.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	6	V2	Diversion influence begins at TY6
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	6	V3	4372 acres (10%) are created and become C5. Assume remaining existing marsh keeps the same class distributions as adjacent features. 5% taken from 40%-C2, 6% taken from 60%-C3.
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	9		Year of marsh collapse
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	17		10"/yr
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	19		Year marsh acres go to 0
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	50	V3	The diversion helps sustain the marsh
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-17-Brack-Div-Low-P7	FWP	50	V2	High water levels may limit benefits SAV growth receives from project
East Orleans Land Bridge	E-36-Brack-Low-P7	FWOP	0	V2	based on Oct 2009 site visit, averaging transects 18, 19, 20, 22
East Orleans Land Bridge	E-36-Brack-Low-P7	FWOP	0	V3	SU36-Pearl: 40%-c2, 60%-c3
East Orleans Land Bridge	E-36-Brack-Low-P7	FWOP	0	V4	based on Oct 2009 site visit, averaging transects 18, 19, 20, 22
East Orleans Land Bridge	E-36-Brack-Low-P7	FWOP	1	V3	SU36-Pearl: 40%-c2, 60%-c3
East Orleans Land Bridge	E-36-Brack-Low-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-36-Brack-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
East Orleans Land Bridge	E-36-Brack-Low-P7	FWP	6		TY 5 years after marsh created
East Orleans Land Bridge	E-36-Brack-Low-P7	FWP	27		10"/yr
East Orleans Land Bridge	E-36-Brack-Low-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the

					existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	0	V2	based on Oct 2009 site visit, averaging transects 18, 19, 20, 22
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	0	V3	SU36-Pearl: 40%-c2, 60%-c3
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	0	V4	based on Oct 2009 site visit, averaging transects 18, 19, 20, 22
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	1	V3	SU36-Pearl: 40%-c2, 60%-c3
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-36-Brack-Med-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	6		TY 5 years after marsh created
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	23		10"/yr
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-36-Brack-Med-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	0	V2	based on Oct 2009 site visit, averaging transects 18, 19, 20, 22
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	0	V3	SU36-Pearl: 40%-c2, 60%-c3
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	0	V4	based on Oct 2009 site visit, averaging transects 18, 19, 20, 22
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	1	V3	SU36-Pearl: 40%-c2, 60%-c3
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-36-Brack-High-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	6		TY 5 years after marsh created

East Orleans Land Bridge	E-36-Brack-High-P7	FWP	9		Year of marsh collapse
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	17		10"/yr
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	17		Year marsh goes to 0
East Orleans Land Bridge	E-36-Brack-High-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 2 ppt
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWOP	0	V3	used prior estimate made by Eric Webb et al. "SU40-Lk Borgne marsh: golden triangle - 30%-c2, 70%-c3; proctor point - 50%-c2, 50%-c3; st milo -20%-c2, 80%-c3"
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWOP	0	V4	Based on South Lake Borgne site visits (average was reduced with new data)
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWOP	1	V3	used prior estimate made by Eric Webb et al. "SU40-Lk Borgne marsh: golden triangle - 30%-c2, 70%-c3; proctor point - 50%-c2, 50%-c3; st milo -20%-c2, 80%-c3"
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-40-Brack-Div-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWOP	0	V3	used prior estimate made by Eric Webb et al. "SU40-Lk Borgne marsh: golden triangle - 30%-c2, 70%-c3; proctor point - 50%-c2, 50%-c3; st milo -20%-c2, 80%-c3"
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWOP	0	V4	Based on South Lake Borgne site visits (average was reduced with new data)
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWOP	1	V3	used prior estimate made by Eric Webb et al. "SU40-Lk Borgne marsh: golden triangle - 30%-c2, 70%-c3; proctor point - 50%-c2, 50%-c3; st milo -20%-c2, 80%-c3"
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of

					subsidence
East Orleans Land Bridge	E-40-Brack-Div-Med-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	0	V3	used prior estimate made by Eric Webb et al. "SU40-Lk Borgne marsh: golden triangle - 30%-c2, 70%-c3; proctor point - 50%-c2, 50%-c3; st milo -20%-c2, 80%-c3"
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	0	V4	Based on South Lake Borgne site visits (average was reduced with new data)
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	1	V3	used prior estimate made by Eric Webb et al. "SU40-Lk Borgne marsh: golden triangle - 30%-c2, 70%-c3; proctor point - 50%-c2, 50%-c3; st milo -20%-c2, 80%-c3"
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-40-Brack-Div-High-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 2 ppt
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	1	V3	used prior estimate made by Eric Webb et al. "SU40-Lk Borgne marsh: averaged over three areas: golden triangle - 30%-c2, 70%-c3; proctor point - 50%-c2, 50%-c3; st milo -20%-c2, 80%-c3
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	6	V1	year marsh is created and diversion is functioning
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	6	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	6	V2	Diversion influence begins TY6.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	6	V3	8883 acres (31%) are created and become C5. Assume remaining existing marsh keeps the same class distributions as adjacent features. 15% taken fromC2, 16% taken from C3.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	6	V6	Golden triangle and st. milo are closed; proctor point is open but marsh is too high for access until after

					dewater and compaction.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	8		Year marsh created
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	13	V1	marsh creation created plus 5 years for fully functioning marsh.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	13	V3	8883 acres (31%) are created and become C1. Assume remaining existing marsh keeps the same class distributions as adjacent features. 15% taken fromC2, 16% taken from C3.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	27		10"/yr
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	50	V3	Diversion help sustain marsh. Model projects completely filling in the CW.
East Orleans Land Bridge	E-40-Int-Div-Low-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	1	V3	used prior estimate made by Eric Webb et al. "SU40-Lk Borgne marsh: averaged over three areas: golden triangle - 30%-c2, 70%-c3; proctor point - 50%-c2, 50%-c3; st milo -20%-c2, 80%-c3
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	6	V1	year marsh is created and diversion is functioning
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	6	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	6	V2	Diversion influence begins TY6.
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	6	V3	8711 acres (31%) are created and become C5. Assume remaining existing marsh keeps the same class distributions as adjacent features. 15% taken fromC2, 16% taken from C3.
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	6	V6	Golden triangle and st. milo are closed; proctor point is open but marsh is too high for access until after dewater and compaction.
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	8		Year marsh created

East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	13	V1	marsh creation created plus 5 years for fully functioning marsh.
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	13	V3	8711 acres (31%) are created and become C1. Assume remaining existing marsh keeps the same class distributions as adjacent features. 15% taken fromC2, 16% taken from C3.
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	23		10"/yr
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	50	V3	Diversion help sustain marsh. Model projects completely filling in the CW.
East Orleans Land Bridge	E-40-Int-Div-Med-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	1	V3	used prior estimate made by Eric Webb et al. "SU40-Lk Borgne marsh: averaged over three areas: golden triangle - 30%-c2, 70%-c3; proctor point - 50%-c2, 50%-c3; st milo -20%-c2, 80%-c3
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	6	V1	year marsh is created and diversion is functioning
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	6	V1	25% of created marsh is functional. Existing marsh is functional.
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	6	V2	Diversion influence begins TY6.
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	6	V3	8193acres (31%) are created and become C5. Assume remaining existing marsh keeps the same class distributions as adjacent features. 15% taken fromC2, 16% taken from C3.
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	6	V6	Golden triangle and st. milo are closed; proctor point is open but marsh is too high for access until after dewater and compaction.
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	8		Year marsh created
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	9		Year marsh begins to collapse
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	13	V1	marsh creation created plus 5 years for fully functioning marsh.

East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	13	V3	8193 acres (31%) are created and become C1. Assume remaining existing marsh keeps the same class distributions as adjacent features. 15% taken fromC2, 16% taken from C3.
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	17		10"/yr
East Orleans Land Bridge	E-40-Int-Div-High-P7	FWP	19		Year marsh goes to 0
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWOP	0	V3	feature 245 mostly class 2. Feature 2a, 2b, and 2c mostly class 4.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWOP	0	V4	No new field data so kept the same. (Based on limited data)
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWOP	0	V5	Modeling results grouped this area with Caernarvon influence area and gave it 0.8ppt. Because the existing habitat is brackish will use 5ppt for brackish model (based on box 12 - nearby box- of the salinity model). No CRMS data available for this area. No change in salinity fwop vs fwp based on project features.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWOP	1	V3	feature 245 mostly class 2. Feature 2a, 2b, and 2c mostly class 4.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	1	V2	More interior than above. May have some Caernarvon influence - FWP will have less wave action and shallower water, which may stimulate some SAV growth over time.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	1	V3	feature 245 mostly class 2. Feature 2a, 2b, and 2c mostly class 4.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	1	V4	No new field data so kept the same. (Based on limited data)
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	1	V5	Modeling results grouped this area with Caernarvon influence area and gave it 0.8ppt. Because the existing habitat is brackish will use 5ppt for brackish model (based on box 12 - nearby box- of the salinity model). No

					CRMS data available for this area. No change in salinity fwop vs fwp based on project features.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	6	-	Marsh creation constructed
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	6	V1	25% of created marsh is functional
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	6	V2	More interior than above. May have some Caernarvon influence - FWP will have less wave action and shallower water, which may stimulate some SAV growth over time.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	6	V4	Remaining deep water would be shallow through nourishment
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	11	-	marsh creation created plus 5 years for fully functioning marsh.
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	11	V4	new water is shallow and an equal amount would become deeper
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	27		10"/yr
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Terre Aux Bouef	F-23-Inner-Brack-Low-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	0	V3	feature 245 mostly class 2. Feature 2a, 2b, and 2c mostly class 4.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	0	V4	No new field data so kept the same. (Based on limited data)
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	0	V5	Modeling results grouped this area with Caernarvon influence area and gave it 0.8ppt. Because the existing habitat is brackish will use 5ppt for brackish model (based on box 12 - nearby box- of the salinity model). No CRMS data available for this area. No change in salinity fwop vs fwp based on project features.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	1	V3	feature 245 mostly class 2. Feature 2a, 2b, and 2c mostly class 4.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt

Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	1	V2	More interior than above. May have some Caernarvon influence - FWP will have less wave action and shallower water, which may stimulate some SAV growth over time.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	1	V3	feature 245 mostly class 2. Feature 2a, 2b, and 2c mostly class 4.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	1	V4	No new field data so kept the same. (Based on limited data)
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	1	V5	Modeling results grouped this area with Caernarvon influence area and gave it 0.8ppt. Because the existing habitat is brackish will use 5ppt for brackish model (based on box 12 - nearby box- of the salinity model). No CRMS data available for this area. No change in salinity fwop vs fwp based on project features.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	6	-	Marsh creation constructed
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	6	V1	25% of created marsh is functional
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	6	V2	More interior than above. May have some Caernarvon influence - FWP will have less wave action and shallower water, which may stimulate some SAV growth over time.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	6	V4	Remaining deep water would be shallow through nourishment
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	11	-	marsh creation created plus 5 years for fully functioning marsh.
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	11	V4	new water is shallow and an equal amount would become deeper
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	23		10"/yr
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Terre Aux Bouef	F-23-Inner-Brack-Med-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	0	V3	feature 245 mostly class 2. Feature 2a, 2b, and 2c mostly class 4.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	0	V4	No new field data so kept the same. (Based on limited data)
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	0	V5	Modeling results grouped this area with Caernarvon influence area and gave it 0.8ppt. Because the existing

					habitat is brackish will use 5ppt for brackish model (based on box 12 - nearby box- of the salinity model). No CRMS data available for this area. No change in salinity fwop vs fwp based on project features.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	1	V3	feature 245 mostly class 2. Feature 2a, 2b, and 2c mostly class 4.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	1	V2	More interior than above. May have some Caernarvon influence - FWP will have less wave action and shallower water, which may stimulate some SAV growth over time.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	1	V3	feature 245 mostly class 2. Feature 2a, 2b, and 2c mostly class 4.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	1	V4	No new field data so kept the same. (Based on limited data)
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	1	V5	Modeling results grouped this area with Caernarvon influence area and gave it 0.8ppt. Because the existing habitat is brackish will use 5ppt for brackish model (based on box 12 - nearby box- of the salinity model). No CRMS data available for this area. No change in salinity fwop vs fwp based on project features.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	6	-	Marsh creation constructed
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	6	V1	25% of created marsh is functional
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	6	V2	More interior than above. May have some Caernarvon influence - FWP will have less wave action and shallower water, which may stimulate some SAV growth over time.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	6	V4	Remaining deep water would be shallow through nourishment
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	9		Year of beginning of marsh collapse
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	11	-	marsh creation created plus 5 years for fully functioning marsh.
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	11	V4	new water is shallow and an equal amount would become deeper

Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	17		10"/yr
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	19		Year marsh acres go to 0
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Terre Aux Bouef	F-23-Inner-Brack-High-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 2 ppt
Terre Aux Bouef	F-23-Outer-Brack-Low-P7	FWOP	0	V3	Only SP feature
Terre Aux Bouef	F-23-Outer-Brack-Low-P7	FWOP	0	V4	Assume very little shallow water on marsh edge of small amount of existing marsh.
Terre Aux Bouef	F-23-Outer-Brack-Low-P7	FWOP	0	V5	modeling results grouped this area with Caernarvon influence area and gave it 5.2ppt. B/c the existing habitat is saline will use 9.5ppt based on coastal monitoring from Sonris CRMS0147-P01
Terre Aux Bouef	F-23-Outer-Brack-Low-P7	FWOP	50	V4	no shallow open water left after 50 years at SP feature.
Terre Aux Bouef	F-23-Outer-Brack-Low-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Terre Aux Bouef	F-23-Outer-Brack-Low-P7	FWP	7		Year marsh created
Terre Aux Bouef	F-23-Outer-Brack-Low-P7	FWP	7	V4	No marsh creation. Rock may trap some additional sediment.
Terre Aux Bouef	F-23-Outer-Brack-Low-P7	FWP	12		TY 5 years after marsh created
Terre Aux Bouef	F-23-Outer-Brack-Low-P7	FWP	12	V1	25% of created marsh is functional.
Terre Aux Bouef	F-23-Outer-Brack-Low-P7	FWP	12	V4	No marsh creation. Rock may trap some additional sediment.
Terre Aux Bouef	F-23-Outer-Brack-Low-P7	FWP	27		10"/yr
Terre Aux Bouef	F-23-Outer-Brack-Low-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Terre Aux Bouef	F-23-Outer-Brack-Lowh-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWOP	0	V3	Only SP feature

Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWOP	0	V4	Assume very little shallow water on marsh edge of small amount of existing marsh.
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWOP	0	V5	modeling results grouped this area with Caernarvon influence area and gave it 5.2ppt. B/c the existing habitat is saline will use 9.5ppt based on coastal monitoring from Sonris CRMS0147-P01
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWOP	50	V4	no shallow open water left after 50 years at SP feature.
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWP	7		Year marsh created
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWP	7	V4	No marsh creation. Rock may trap some additional sediment.
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWP	12		TY 5 years after marsh created
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWP	12	V1	25% of created marsh is functional.
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWP	12	V4	No marsh creation. Rock may trap some additional sediment.
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWP	23		10"/yr
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWP	23	V3	SP feature stops shoreline loss.
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWP	50	V3	SP feature stops shoreline loss though interior loss continues.
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Terre Aux Bouef	F-23-Outer-Brack-Med-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWOP	0	V3	Only SP feature
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWOP	0	V4	Assume very little shallow water on marsh edge of small amount of existing marsh.
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWOP	0	V5	modeling results grouped this area with Caernarvon influence area and gave it 5.2ppt. B/c the existing habitat is saline will use 9.5ppt based on coastal monitoring from Sonris CRMS0147-P01

Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWOP	50	V4	no shallow open water left after 50 years at SP feature.
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWP	7		Year marsh created
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWP	7	V4	No marsh creation. Rock may trap some additional sediment.
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWP	9		Year of marsh begins to collapse
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWP	12		TY 5 years after marsh created
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWP	12	V1	25% of created marsh is functional.
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWP	12	V4	No marsh creation. Rock may trap some additional sediment.
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWP	17		10"/yr
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWP	19		Year marsh acres go to 0
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Terre Aux Bouef	F-23-Outer-Brack-High-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Hopedale	H-21-Brack-Low-feature 190-P7	FWOP	0	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than Central Wetlands.
Hopedale	H-21-Brack-Low-feature 190-P7	FWOP	1	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than Central Wetlands.
Hopedale	H-21-Brack-Low-feature 190-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
Hopedale	H-21-Brack-Low-feature 190-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Hopedale	H-21-Brack-Low-feature 190-P7	FWOP	50	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than Central

					Wetlands.
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	1	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than Central Wetlands.
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	3	-	Marsh creation constructed
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	3	V1	25% of created marsh is functional
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	3	V4	Mostly created marsh, some shallowing will occur with marsh nourishment.
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	3	V6	Marsh created is too high until after compaction and dewatering.
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	8	-	marsh creation created plus 5 years for fully functioning marsh.
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	27		10"/yr
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	50	V3	Changes two classes over 50 years
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Hopedale	H-21-Brack-Low-feature 190-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Hopedale	H-21-Brack-Med-feature 190-P7	FWOP	0	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than Central Wetlands.
Hopedale	H-21-Brack-Med-feature 190-P7	FWOP	1	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than Central Wetlands.
Hopedale	H-21-Brack-Med-feature 190-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
Hopedale	H-21-Brack-Med-feature 190-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt

Hopedale	H-21-Brack-Med-feature 190-P7	FWOP	50	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than Central Wetlands.
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	1	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than Central Wetlands.
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	3	-	Marsh creation constructed
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	3	V1	25% of created marsh is functional
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	3	V4	Mostly created marsh, some shallowing will occur with marsh nourishment.
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	3	V6	Marsh created is too high until after compaction and dewatering.
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	8	-	marsh creation created plus 5 years for fully functioning marsh.
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	23		10"/yr
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Hopedale	H-21-Brack-Med-feature 190-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt
Hopedale	H-21-Brack-High-feature 190-P7	FWOP	0	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than Central Wetlands.
Hopedale	H-21-Brack-High-feature 190-P7	FWOP	1	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than Central Wetlands.
Hopedale	H-21-Brack-High-feature 190-P7	FWOP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/3 would become deep based on 0.5 feet of subsidence
Hopedale	H-21-Brack-High-feature 190-P7	FWOP	50	V5	Due to relative seal level rise, after 50 years salinity increases 1 ppt

Hopedale	H-21-Brack-High-feature 190-P7	FWOP	50	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than Central Wetlands.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	1	V6	Restricted to one canal opening with structures that appear to allow small boat access to hunting lease. Appears to be more restrictive than Central Wetlands.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	3	-	Marsh creation constructed
Hopedale	H-21-Brack-High-feature 190-P7	FWP	3	V1	25% of created marsh is functional
Hopedale	H-21-Brack-High-feature 190-P7	FWP	3	V4	Mostly created marsh, some shallowing will occur with marsh nourishment.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	3	V6	Marsh created is too high until after compaction and dewatering.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	8	-	marsh creation created plus 5 years for fully functioning marsh.
Hopedale	H-21-Brack-High-feature 190-P7	FWP	9		Year marsh begins to collapse
Hopedale	H-21-Brack-High-feature 190-P7	FWP	17		10"/yr
Hopedale	H-21-Brack-High-feature 190-P7	FWP	19		Year marsh goes to 0
Hopedale	H-21-Brack-High-feature 190-P7	FWP	50	V4	Marsh lost between TY1 and TY50 would become shallow. Of the existing shallow water, 1/6 would become deep based on 0.5 feet of subsidence
Hopedale	H-21-Brack-High-feature 190-P7	FWP	50	V5	Due to relative seal level rise, after 50 years salinity increases 2 ppt

ATTACHMENT 8

Planting Plan for MRGO Ecosystem Restoration Project

Planting Plan

Two principal factors affecting plant zonation in the coastal plain are salinity and hydrologic regime (Adams 1963; Chabreck 1972; Cowardin, Carter et al. 1979; Odum 1988; Day and Templet 1989; Keddy 2000; Mitsch and Gosselink 2000). Although dependent upon actual site-specific conditions, a general planting scheme can be established based on salinity requirements and depth and duration of flooding. Specific detailed 'plans' will be developed later with appropriate species and applications based on site-specific conditions and criteria and project specifications. Four dominant marsh types that closely correlate with salinity level have been identified in the deltaic coastal plain of Louisiana (Penfound and Hathaway 1938; Chabreck 1972):

fresh (strictly fresh water, salinity < 0.5ppt);
intermediate (nearly fresh water, salinity range of 0.5 to 5.0 ppt);
brackish water salinity level range of 5 ppt to 18 ppt; and
salt (salinity level greater than 18 ppt).

Depth and duration of flooding also determines what species should be utilized. Although not distinct divisions these hydrologic areas have been identified that need to be considered when creating a planting plan:

subtidal – area below mean low tide and is submerged a majority of the time with the exception of low tides associated with moon phases;
intertidal – area between mean low tide and mean high tide that is inundated daily due to tidal cycles; and
supratidal – area above mean high tide and is inundated rarely except during extreme weather events.

It is assumed that borrow material used to restore the marsh, swamps, and ridges is conducive to growth of wetland marsh plants and borrow material has been adequately dewatered after placement. Ridge and possibly other supratidal areas will require site preparation that could include ripping and chemical prep, and possibly pre-establishment of a critical cover application, especially vital for successful woody establishment, in addition to grading and shaping. If borrow is obtained from higher salinity areas than where being placed, additional time may be needed before planting to allow salinity reduction through precipitation and tidal flow. It is assumed that the necessary preparations will be undertaken prior to planting. To the maximum extent possible and practical, Louisiana ecotypes of species will be planted. Applicable planting practices based on prior Louisiana coastal restoration projects will be implemented where necessary to aid in establishment, improve disease resistance and increase growth rate such as utilizing a slow release nitrogen tablet when planting species such as *Panicum amarum*, *Spartina patens*, and *Uniola paniculata*.

Cypress Swamp

The dominant species is bald cypress (*Taxodium distichum*). Swamp tupelo (*Nyssa aquatic)* is also a major component while others such as Drummond's maple (*Acer rubrum* var. *drummondii)* are also interspersed. In areas with preferred salinity levels and hydroperiod, an average of 200 trees/acre with 75% bare-root seedlings/saplings and 25% container-grown should be planted. All should have a nutria protection device.

Restored Marsh

Fresh and Intermediate Marsh

Some of the dominant marsh plants in freshwater and intermediate wetlands are: maidencane (*Panicum hemitomon)*, bull tongue (*Sagittaria lancifolia)*, giant cutgrass (*Zizaniopsis miliacea*) California bulrush (*Schoenoplectus californicus*), coast cockspur (*Echinochloa walteri)*, marshay cordgrass (*Spartina patens*), and roseau cane (*Phragmites australis*). Location within the marsh depends on their ability to withstand depth and length of flooding. CWPPRA estimate for vegetative planting is 625 plants/acre planted on 8ft center on rows 8ft apart. Some are available commercially and can be propagated.

Brackish Marsh
Species usually dominant in a brackish marsh are: marshhay cordgrass (*Spartina patens),* saltgrass (*Distichlis spicata)*, American bulrush (*Schoenoplectus americanus)*, black needle rush (*Juncus roemerianus),* seashore paspalum (*Paspalum vaginatum*), and switchgrass (*Panicum virgatum*) . The low marsh is typically dominated by *Spartina alterniflora.* CWPPRA estimate for vegetative planting is 875 plants/acre planted on 7ft centers on rows 7ft apart. Some are available commercially and can be propagated.

Salt Marsh (not included in restoration plan)
Salt marsh communities are primarily composed of oyster grass (*Spartina alterniflora*), salt grass, black needle rush, gulf cordgrass (*Spartina spartinae*) and marshhay cordgrass. CWPPRA estimate for vegetative planting is 1,250 plants/acre planted 5ft centers on rows 7ft apart. Some are available commercially and can be propagated.

Shoreline Restored Wetlands – with or without shoreline protection.
Because shoreline protection dissipates energy, planting plan for restored marsh landward of shoreline protection will be planted in much the same way as above with species used dependent upon salinity levels and depth and duration of flooding.

In high energy environments such as the intertidal zone, planting estimate consists of 2 rows of trade gallons on 5-foot alternating centers or 2 rows of bare-root vegetative plugs on 3-foot alternating centers.

Ridge Component
Based on the ongoing studies and evaluation of current projects the following guidelines have been developed. A layered, phased approach may be the most suitable to help stabilize the ridge, promote growth of the different tree stories, and create habitat for neotropical migrant birds.

Side slopes of the ridge affected by tides will be seeded for critical area cover and/or planted with herbaceous species in much the same manner as above based on salinity and depth of flooding. Plantings on the bayou-side of the ridge should mimic the pattern outlined for shorelines with no protection while behind the ridge will be planted as applicable marsh is.

Side slopes of the ridge not affected by the tides as well as the ridge top are suitable for midstory/shrub-scrub species such as wax myrtle (*Myrica cerifera*), groundsel bush (*Baccharis halimifolia*), marsh elder (*Iva frutescens*), and yaupon (*Ilex vomitoria*). These will aid in stabilization and provide needed habitat for neo-tropical migrants. It is suggested to plant bare-root seedlings with typically 200-300 plant/acre density. Other woody species such as red mulberry (*Morus rubra*), hackberry/sugarberry (*Celtis laevigata*), California desert-thorn (*Lycium carolinianum*)

and green ash (*Fraxinus pennsylvanica*) could also be used on the high side slopes.

Hardwoods should be planted on upper sides of the ridge slopes and the ridge top. Several species typically grow on ridge tops based on studies of cheniers, spoil banks, and a few natural ridges left in the deltaic plain. Hardwoods such as live oak (*Quercus virginiana)*, sugarberry (*Celtis laevigata*), dwarf palmetto (*Sabal minor*), and red cedar (*Thuja occidentalis*) will likely be suitable for high ridge planting. Seedlings should be planted on 8' x 8' spacing totaling about 680 trees/acre. Chinese Tallow control will be included in operations and management.

Barrier Islands

Because of the landscape features of barrier islands, distinct vegetative zones develop based on wave energy, elevation, wind, and salt spray, as well as poor soils because of low organic matter, nutrients, and water-retention (Hester, Spalding et al. 2005). Species planted and planting plans are determined by the location in the landscape. The following is broken down into distinct zones of a typical barrier island.

The foreshore (beach) is characterized by high wave energy and transitory nature thus planting is not recommended.

The backshore/foredune/dune is also subjected to wave energy during high tides and storm events as well as wind and salt spray. Vegetation commonly found and are commercially available include: bitter panicum (*Panicum amarum*); marshhay cordgrass; and sea oats (*Uniola paniculata*). If using plugs when planting, they will be on 3ft-centers in alternating rows with the exception of sea oats on 1ft-centers. If using container plants, they will be planted on 6 to 8ft centers (depending on container size) in alternating rows. In addition, smaller forbs are common such as sea rocket (*Cakile fusiformis*) and beach morning glory (*Ipomea pes-caprae*) should self-seed. Density per acre will be determined based on site conditions.

The rear dune is less exposed than the foredune and usually subjected to overwash only in storm events. Vegetation commonly found and may be commercially available include: beach tea (*Croton punctatus*), sea oats, bitter panicum, marshhay cordgrass, sedges (*Cyperus spp*) and wax myrtle. The same planting plan as the backshore is applicable. Again, smaller forbs like beach morning glory should self-seed.

The barrier flats and swale include both high marsh and saltpans. Vegetation commonly found and may be commercially available include: marshhay cordgrass, sandrush (*Fimbristylis castanea*), wax myrtle, groundsel bush, marsh elder, and saltgrass. The same planting plan as the backshore is applicable. Shrub /scrub such as groundsel bush and marsh elder will be planted on 8ft centers. Seaside goldenrod (*Solidago sempervirens*) is a major constituent of this zone and will be considered in planting plan but will most likely be self-seeding.

As high marsh grades to low marsh/salt marsh, oyster grass and black mangrove (*Avicennia germinans*) become the dominant species. The planting plan for oyster grass again follows the backshore plan. Black mangroves will be planted in patches 100 to 200ft^2 on 6 to 10ft centers.

On subtidal flats that extend out on the back-barrier platform, turtle grass (*Thalassia testudinum*) is the dominant seagrass along with manatee grass (*Syringodium filiforme*), shoalgrass (*Halodule wrightii*), and star grass (*Halophila engelmannii*). Widgeon grass (*Ruppia maritima*) is also found. Large scale re-establishment may not be feasible due to the scarcity of commercially available plants, the dynamics of the system, and lack of technical experience in the system.

Quality Control
Plants will be purchased from a registered, licensed nursery grower. Trees and plants will be randomly inspected prior to planting, and systematically once planted. Planting work will be inspected at least one daily to ensure proper planting technique, proper configuration, and species. Survival and percent cover are highly dependent on local climatic conditions, salinities, and other factors. Success will be evaluated by determining percent survival and mortality.

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APPENDIX C

Latin Names for Species Discussed in Report

PLANTS

Alligatorweed	*Alternanthera philoxeroides*
American cupscale	*Sacciolepis striata*
American lotus	*Nelumbo lutea*
Bacopa	*Bacopa spp.*
Bald cypress	*Taxodium distichum*
Beach oats	*Uniola paniculata*
Bitter panicum	*Panicum amarum*
Blackberry	*Rubus spp*
Black mangrove	*Avicennia germinans*
Black needlerush	*Juncus roemerianus*
Black willow	*Salix nigra*
Bulltongue	*Sagittaria lancifolia*
California bulrush	*Schoenoplectus californicus*
Cattail	*Typha* spp.
Coontail	*Ceratophyllum demersum*
Deerpea	*Vigna luteola*
Drummond red maple	*Acer rubrum var. drummondii*
Duckweed	*Lemna spp*
Dwarf palmetto	*Sabal minor*
Elderberry	*Sambucus nigra*
Elodea	*Elodea canadensis*
Eurasian milfoil	*Myriophyllum spicatum*
Fall panicum	*Panicum dichotomiflorum*
Fanwort	*Cabomba caroliniana*
Giant cutgrass	*Zizaniopsis miliacea*
Glassworts	*Salicornia depressa*
Green ash	*Fraxinus pennsylvanica*
Groundsel bush	*Baccharis halmnifolia*
Hackberry	*Celtis occidentalis*
Hydrilla	*Hydrilla verticillata*
Leafy three-square	*Schoenoplectus robustus*
Live oak	*Quercus virginiana*
Maidencane	*Panicum hemitomon*
Manatee grass	*Cymodocea manatorum*
Marsh elder	*Iva spp.*
Marsh hay cordgrass	*Spartina patens*
Marsh morning glory	*Ipomoea sagittata*
Naiads	*Najas marin*
Panicum	*Panicum* sp.
Pennywort	*Hydrocotyle* spp.
Pondweeds	*Potamogeton spp.*
Pretty dodder	*Cuscuta spp.*
Roseau cane	*Phragmites australis*
Saltgrass	*Distichlis spicata*

Saltmarsh cordgrass	*Spartina alterniflora*
Saltmeadow cordgrass	*Spartina patens*
Salvinia	*Salvinia spp.*
Sea myrtle	*Baccharis halmnifolia*
Sea oats	*Uniola paniculata*
Sea ox-eye	*Borrichia frutescens*
Sea purslane	*Sesuvium portulacastrum*
Sea rocket	*Cakile edentula*
Seaside heliotrope	*Heliotropium curassavicum*
Seashore paspalum	*Paspalum vaginatum*
Shoalgrass	*Halodule wrightii*
Spikerush	*Eleocharis* spp.
Threecornered grass	*Scirpus olneyi*
Tupelo	*Nyssa aquatica*
Turtle grass	*Thalassia testudinum*
Water lettuce	*Pistia Stratiotes*
Water hyacinth	*Eichornia crassipes*
Water oak	*Quercus nigra*
Water stargrass	*Heteranthera dubia*
White water lily	*Nymphaea alba*
Widgeongrass	*Ruppia maritime*
Wild celery	*Vallisneria americana*
Wild millet	*Echinocloa muricata*
Yaupon	*Ilex vomitoria*

FISH

Alligator gar	*Atractosteus spatula*
Amberjack	*Seriola dumeril*
Anchovies	*Engraulidae*
Atlantic bumper	*Chloroscombrus chrysurus*
Atlantic croaker	*Micropogonias undulatus*
Atlantic needlefish	*Strongylura marina*
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*
Atlantic spadefish	*Chaetodipterus faber*
Black drum	*Pogonias cromis*
Blue catfish	*Ictalurus furcatus*
Bluegill	*Lepomis macrochirus*
Bonnethead shark	*Sphyrna tiburo*
Bowfin	Amia calva
Bull shark	*Carcharhinus leucas*
Carp	*Cyprinus carpio*
Channel catfish	*Ictalurus punctatus*
Cobia	*Rachycentron canadum*
Crappie	*Pomoxis* ssp.

Dog snapper	*Lutjanus novemfasciatus*
Dwarf sand perch	*Diplectrum bivittatum*
Fat sleeper	*Dormitator maculatus*
Florida pompano	*Trachinotus carolinus*
Freshwater drum	*Aplodinotus grunniens*
Gafftopsail catfish	*Bagre marinus*
Gobies	*Gobiosoma spp.*
Grouper	*Epinephelus* ssp.
Gulf menhaden	*Brevoortia patronus*
Gulf pipefish	*Syngnathus scovelli*
Gulf sturgeon	*Acipenser oxyrinchus desotoi*
Inland silversides	*Menidia beryllina*
Jack crevalle	*Caranx hippos*
Killifish	*Funduus* spp.
King mackerel	*Scomberomorus cavalla*
Lady fish	*Elops affinis*
Lane snapper	*Lutjanus synagris*
Largemouth bass	*Micropterus salmoides*
Least puffer	*Sphoeroides parvus*
Mangrove snapper	*Lutjanus griseus*
Marlin	*Makaira mazara*
Pallid sturgeon	*Scaphirhynchus albus*
Red drum	*Sciaenops ocellatus*
Red snapper	*Lutjanus campechanus*
Redear sunfish	*Lepomis microlophus*
Rough silverside	*Membras martinica*
Scaled sardines	*Harengula Jaguana*
Sheepshead minnow	*Cyprinodon variegatus*
Silversides	*Menidia menidia*
Southern flounder	*Paralichthys lethostigma*
Southern Kingfish	*Menticirrhus americanus*
Spanish mackerel	*Scomberomorus maculatus*
Speckled wormeel	*Myrophis punctatus*
Spotfin mojarra	*Eucinostomus argenteus*
Spotted seatrout	*Cynoscion nebulosus*
Striped mullet	*Mugil cephalus*
Tuna	*Thunnus thynnus*
Warmouth	*Lepomis gulosus*
White mullet	*Mugil curema*
Yellow bullhead	*Ameiurus natalis*

CRUSTACEANS AND OTHER INVERTEBRATES

American oyster	*Crassostrea virginica*
Amphipods	
Blue crab	*Callinectes sapidus*
Brown shrimp	*Farfantepenaeus aztecus*
Crawfish	*Procambarus clarkii*
Ctenophores	
Grass shrimp	*Palaemonetes pugio*
Gulf stone crab	*Menippe adina*
Jellyfish	
Mud crab	*Scylla serrata*
Mysid shrimp	*Americamysis bahia*
Pink shrimp	*Farfantepenaeus duorarum*
Polychaetes	
Roughneck shrimp	*Trachypenaeus constrictis*
Royal red shrimp	*Pleoticus robustus*
Seabob	*Xiphopenaeus kroyeri*
White Shrimp	*Litopeneaus setiferus*

AMPHIBIANS

Bullfrog	*Rana catesbeiana*
Gulf coast toad	*Bufo valliceps*
Southern leopard frog	*Rana sphenocephala*

REPTILES

American alligator	*Alligator mississippiensis*
Western cottonmouth	*Agkistrodon piscivorus*
Eastern mud turtle	*Kinosternon subrubrum*
Rat snake	*Elaphe obsoleta*
Speckled kingsnake	*Lampropeltis getulus*
Water snakes	*Neodia* spp.

BIRDS

American avocet	*Recurvirostra americana*
American coot	*Fulica americana*
American widgeon	*Anas americana*
Anhingas	*Anhinga anhinga*
Bald eagle	*Haliaeetus leucocephalus*
Belted kingfisher	*Megaceryle alcyon*
Boat-tailed grackle	*Quiscalus major*
Black skimmer	*Rynchops niger*
Black-crowned night-heron	*Nycticorax nycticorax*

Black-necked stilt	*Himantopus mexicanus*
Blue-winged teal	*Anas discors*
Brown pelican	*Pelecanus occidentalis*
Cattle egret	*Bubulcus ibis*
Clapper rail	*Rallus longirostris*
Common moorhen	*Gallinula chloropus*
Common snipe	*Bubulcus ibis*
Cormorants	*Phalacrocorax auritus*
Dowitchers	*Limnodromus sp*
Gadwall	*Anas strepera*
Great blue heron	*Ardea herodias*
Great egret	*Ardea alba*
Green heron	*Butorides virescens*
Green winged teal	*Anas carolinensis*
Herring gull	*Larus argentatus*
Ibis	*Eudocimus albus*
	Plegadis falcinellus
	Plegadis chihi
Laughing gull	*Leucophaeus atricilla*
Lesser scaup	*Aythya affinis*
Lesser snow geese	*Anser caerulescens caerulescens*
Mallard	*Anas platyrhynchos*
Marsh wrens	*Cistothorus palustris*
Northern harrier	*Circus cyaneus*
Northern shoveler	*Anas clypeata*
Piping plover	*Charadrius melodus*
Redwinged blackbird	*Agelaius phoeniceus*
Ring-necked ducks	*Aythya collaris*
Roseate spoonbills	*Platalea ajaja*
Sandpipers	*Actitis* spp.
Seaside Sparrow	*Ammodramus maritimus*
Snowy egret	*Egretta thula*
Sora rail	*Porzana carolina*
Terns	
Virginia rail	*Rallus limicola*
White ibis	*Eudocimus albus*
White pelican	*Pelecanus erythrorhynchos*
Willet	*Tringa semipalmata*
Yellow-crowned night-heron	*Nyctanassa violacea*

MAMMALS

Armadillo	*Dasypus novemcinctus*
Bats	
Fox squirrel	*Sciurus niger*

Grey squirrel	*Sciurus carolinensis*
Mink	*Mustela vison*
Muskrat	*Ondatra zibethicus rivalicius*
Northern raccoon	*Procyon lotor*
Nutria	*Myocaster coypus*
River Otter	*Lutra canadensis*
Swamp rabbit	*Sylvilagus aquaticus*
Virginia opossum	*Didelphis virginiana*
West Indian Manatee	*Trichechus manatus*

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506

June 16, 2010

Colonel Alvin B. Lee
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel Lee:

Please reference the "Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study." The MRGO Ecosystem Restoration Plan (Plan) is being developed as a supplement to the June 2008 MRGO Deep-Draft De-Authorization Report and is intended to fully meet the requirements of the Water Resources Development Act (WRDA) of 2007, Section 7013. This feasibility study is anticipated to result in a Chief of Engineers' Report containing a recommended MRGO Ecosystem Restoration Plan, which has been conditionally authorized for construction by WRDA 2007, Section 7013. The Plan will address systematic ecosystem restoration and protection of the Lake Borgne ecosystem and areas affected by the former MRGO navigation channel, and will include considerations of measures to reduce or prevent damage from storm surge.

This preliminary draft report contains a description of existing fish and wildlife resources in the project area, discusses future with-project (FWP) and future without-project (FWOP) habitat conditions, identifies fish and wildlife-related impacts, and provides recommendations to improve the proposed MRGO Ecosystem Restoration Project. This document does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The Fish and Wildlife Service (Service) is coordinating with National Marine Fisheries (NMFS) and Louisiana Department of Wildlife and Fisheries (LDWF); their comments will be incorporated into the draft and final reports.

TAKE PRIDE IN AMERICA

We appreciate the cooperation of your staff on this study. Should your staff have any questions regarding the enclosed report, please have them contact Mrs. Catherine Breaux (504/862-2689) of this office.

Sincerely,

James F. Boggs
Supervisor
Louisiana Field Office

Attachment

TAKE PRIDE IN AMERICA

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506
June 16, 2010

Robert Barham
Secretary
Louisiana Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, Louisiana 70898-9000

Dear Mr. Barham:

Attached is the Preliminary Draft Fish and Wildlife Coordination Act Report on the "Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study." This report does not constitute the 2(b) report of the Fish and Wildlife Service (Service). The Service will incorporate your agency's comments into the draft and final reports prior to its submission to the U.S. Army Corps of Engineers. Should your staff have any questions regarding this report, please have them contact Catherine Breaux (504/862-2689) of this office.

Your cooperation in this matter is appreciated.

Sincerely,

James F. Boggs
Supervisor
Louisiana Field Office

Attachment

LAKE PONTCHARTRAIN BASIN FOUNDATION
AMERICA

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506
June 16, 2010

Mr. Richard Hartman
Branch Chief
Habitat Conservation Division
National Marine Fisheries Service
c/o Louisiana State University
Baton Rouge, Louisiana 70803-7535

Dear Mr. Hartman:

Attached is the Preliminary Draft Fish and Wildlife Coordination Act Report on the "Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study." This report does not constitute the 2(b) report of the Fish and Wildlife Service (Service). The Service will incorporate your agency's comments into the draft and final reports prior to its submission to the U.S. Army Corps of Engineers. Should your staff have any questions regarding this report, please have them contact Catherine Breaux (504/862-2689) of this office.

Your cooperation in this matter is appreciated.

Sincerely,

James F. Boggs
Supervisor
Louisiana Field Office

Attachment

TAKE PRIDE IN AMERICA

Preliminary Draft
Fish and Wildlife Coordination Act Report

THE Mississippi River GULF OUTLET (MRGO) ECOSYSTEM RESTORATION PLAN FEASIBILITY STUDY

PROVIDED TO
NEW ORLEANS DISTRICT
U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

PREPARED BY
CATHERINE BREAUX, SENIOR FIELD BIOLOGIST

U.S. FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
LAFAYETTE, LOUISIANA

JUNE 2010

U.S. FISH AND WILDLIFE SERVICE – SOUTHEAST REGION

EXECUTIVE SUMMARY

The "Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study" (MRGO Ecosystem Restoration Plan) is being developed as a supplement to the June 2008 MRGO Deep-Draft De-Authorization Report and is intended to fully meet the requirements of the Water Resources Development Act (WRDA) of 2007, Section 7013. This feasibility study is anticipated to result in a Chief of Engineers' Report containing a recommended MRGO Ecosystem Restoration Plan, which has been conditionally authorized for construction by WRDA 2007, Section 7013. The Plan will address systematic ecosystem restoration and protection of the Lake Borgne ecosystem and areas affected by the former MRGO navigation channel and will also include consideration of measures to reduce or prevent damage from storm surge.

If the Assistant Secretary of the Army, Civil Works determines that the recommendations of the MRGO Ecosystem Restoration Plan are cost-effective, environmentally acceptable, and technically feasible, no further Congressional authorization is needed. However, the execution of the implementation phase is subject to additional funding and appropriations. Cost-sharing for implementation is subject to the rules for ecosystem restoration projects established in Section 210 of WRDA 1996.

The MRGO Ecosystem Restoration Plan would: 1) Restore the Lake Borgne ecosystem and the areas affected by the MRGO navigation channel by restoring historic salinity regimes through reduced saltwater intrusion into the MRGO, restoring and sustaining critical geomorphic structures that serve as salinity barriers, and introducing freshwater; 2) Restore habitat diversity by restoring and sustaining marsh, swamp, bottomland hardwood, and ridge habitats; 3) Restore and sustain historic water quality, hydrologic functions, and circulation patterns; 4) Achieve ecosystem sustainability to the greatest degree possible; and 5) Restore natural features of the ecosystem that will reduce or prevent damage from storm surge by protecting, restoring, or increasing wetlands, forested habitats, and critical geomorphic structures in the study area.

This preliminary draft report contains a description of existing fish and wildlife resources in the project area, discusses future with-project (FWP) and future without-project (FWOP) habitat conditions, identifies fish and wildlife-related impacts, and provides recommendations to improve the proposed MRGO Ecosystem Restoration Project. This document does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The Fish and Wildlife Service (Service) is coordinating with National Marine Fisheries (NMFS) and Louisiana Department of Wildlife and Fisheries (LDWF); their comments will be incorporated into the draft and final reports.

The project area is centered on the Lake Borgne ecosystem, and includes parts of southwestern Mississippi and southeastern Louisiana. This includes St. Bernard, Orleans, and Plaquemines parishes in Louisiana and Hancock and Harrison counties in Mississippi. The project area is bordered to the west by the East Orleans landbridge and continues southward to include the Golden Triangle, Central Wetlands, Proctor Point, the former MRGO, and Terre aux Boeufs ridge. The northern boundary follows the coastline into Mississippi and includes the lower Pearl

River basin and Western Mississippi Sound. The eastern edge of the project area extends to the Chandeleur Islands.

The Tentatively Selected Plan (TSP) would restore approximately 10,431 acres of cypress swamp, 13,890 acres of fresh and intermediate marsh, 33,696 acres of brackish marsh, 466 acres of saline marsh, and 48 acres of ridge habitat. Features in the East Orleans Landbridge and South Lake Borgne subunits include marsh creation and nourishment and shoreline protection. The Terre Aux Boeuf subunits include marsh creation and nourishment. The Central Wetland features include a freshwater diversion at Violet, cypress swamp and marsh restoration and nourishment. Features in the Biloxi Marshes consist of restoring part of the existing subsided ridge on the south bank of Bayou La Loutre, marsh creation and nourishment, and shoreline protection.

The TSP will benefit the fish and wildlife resources of the MRGO Ecosystem Restoration area by providing freshwater, nutrients, and sediments, and restoring ridge, swamp and marsh habitats in the study area thus facilitating increasing organic production, increasing biological productivity, increasing habitat diversity, and reducing wetland loss. Approximately 15,628 AAHUS and 20,767 net acres of fresh/intermediate, brackish, and saline marsh, swamp and ridge habitats would benefit by the proposed project at the end of the project life given a medium sea level rise scenario. The Service supports implementation of the TSP provided the following fish and wildlife recommendations are implemented concurrently with project implementation:

1. The Service recommends the selection of a barrier island component of the MRGO Ecosystem Restoration Plan be a part of the TSP. The Service feels the design and evaluation of the barrier island alternatives was sufficient to warrant selection, though further engineering would be required prior to construction. Breton Island is a National Wildlife Refuge (NWR), managed by the Service and is of National importance. Until recently (Lavoie, D, ed., 2009; Thomson et al., 2009) the Service was unaware of the long-term impacts to this important refuge as a result of the MRGO channel. However, the Service believes restoration of the areal loss of Breton Island due to the construction and maintenance of the MRGO channel should be appropriately addressed in the TSP .

2. The Corps should contact the Service regarding a compatibility determination, Wilderness Act provisions and special use permits that may be necessary to conduct activities on Breton Island NWR. The Corps should establish and continue coordination with the Service until construction of any project feature is complete and prior to any subsequent maintenance. Points of contacts for the Service are: Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Jack Bohannan (985) 822-2000, Refuge Manager for the Breton Island NWR.

3. The Service recommends the operational plans for the Violet Diversion be evaluated to include more flexibility of flow (flows between 1000cfs and 7000cfs) to achieve optimal habitat conditions favorable to nearby intermediate marsh and to bald cypress germination, growth, and reproduction by controlling depth and duration of inundation and salinity levels. As the operational plan for the Violet Diversion is further developed,

future hydrological and fisheries (i.e., CASM) modeling, and updated habitat assessments (i.e., Wetland Value Assessements) should be conducted.

4. The Service recommends the diversion operational plan be developed in a way to avoid or minimize adverse impacts to marine fisheries and Essential Fish Habitat (EFH) while maximizing freshwater and nutrient input to the extent practicable to meet habitat objectives.

5. The Service recommends the diversion be adaptively managed to enhance surrounding wetlands, that habitat switching (as a result of re-introduced river water) is allowed to occur in a manner that is not detrimental or destructive to the ecological processes, and that the diversion allows for draw down periods sufficient for cypress regeneration and cypress growth.

6. The Service recommends a comprehensive examination of the river and all existing and proposed diversions to coordinate their operation and ensure that their operation will maximize their restoration capabilities. The ongoing Mississippi River Hydrodynamic and Delta Management Study should be utilized to address this issue. The Service and other natural resource agencies should be involved in this study.

7. The Service recommends establishment of a committee similar to the Caernarvon Interagency Advisory Committee or Davis Pond Advisory Committee to review the operation and the monitoring and adaptive management results of the Violet diversion and when necessary, provide recommendations regarding any future operational and maintenance changes. The Service and other natural resource agencies should be on this committee.

8. The Service recommends that all shoreline protection features include one fish dip every 1,000 feet (ft) constructed to a 25 ft bottom width to the pre-project elevation. On a case by case basis the 1,000 ft distance can be adjusted, in consultation with National Marie Fisheries Service (NMFS), to incorporate existing exchange points.

9. The Monitoring and Adaptive Management Plan, once developed, should be provided to the Service, NMFS, and Louisiana Department of Wildlife and Fisheries (LDWF) for review, comment, and input.

10. If a proposed project feature is changed significantly or is not implemented within one year of the Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with the Service and NMFS to ensure that the proposed project would not adversely affect any Federally listed threatened or endangered species or their habitat.

11. Avoid adverse impacts to nesting bald eagles, gulls, terns, and/or black skimmers, wading birds, and brown pelicans through the careful design of project features and timing of construction. A qualified biologist should inspect the proposed work area for the presence of undocumented nesting colonies and bald eagles during the nesting season

(i.e., September 15 through March 31 for brown pelican, September 1 through February 15 for wading bird nesting colonies, September 16 through April 1 for colonies containing nesting gulls, terns, and/or black skimmers, and October through mid-May for bald eagles).

- To minimize disturbance to colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present).
- For colonies containing nesting brown pelicans, all activity occurring within 2,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 15 through March 31). Nesting periods vary considerably among Louisiana's brown pelican colonies, however, so it is possible that this activity window could be altered based upon the dynamics of the individual colony.
- For colonies containing nesting gulls, terns, and/or black skimmers, all activity occurring within 650 feet of a rookery should be restricted to the non-nesting period (i.e., September 16 through April 1, exact dates may vary within this window depending on species present).
- If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary and those results should be forwarded to this office.

12. Land clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

13. Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service and other State and Federal natural resource agencies, and shall be provided an opportunity to review and submit recommendations on all work addressed in those reports.

14. A report documenting the status of implementation, maintenance, and adaptive management measures should be prepared every three years by the managing agency and provided to the Corps, the Service, NMFS, U.S. Environmental Protection Agency (EPA), Louisiana Department of Natural Resources (LDNR), Office of Coastal Protection and Restoration (OCPR), and LDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

15. The Service recommends minimizing impacts to marsh from marsh buggy activities. One way is to limit repetitive use of the same marsh buggy route to prevent ruts and lasting damage while at the same time reducing the amount of marsh buggy tracts as much as possible. Another option is to build temporary boardwalks over marsh where

feasible and then backfilling the boardwalk area if needed. In areas with large marsh creation features that have minimal access routes, such as the inner Terre Aux Bouef marsh features, the Service recommends that work begin at the farthest location and proceed to the outer edges of the site to minimize the amount of damage.

16. The large quantity of borrow material proposed to be taken from Lake Borgne for the TSP may have an adverse effect to fisheries, EFH, and the threatened Gulf sturgeon by: 1) alteration in water bottom substrate habitat: 2) direct removal of benthos from a large area which may (at least temporarily) reduces food availability for fishery organisms; 3) other sessile resources, such as oysters could be affected; and 4) by continually moving the dredge, the resuspended sediments will take longer to settle and could prolong the periods of high turbidity associated with dredging operations. The Service recommends careful consideration be given to the affects of taking all borrow from Lake Borgne and consideration should be give to obtaining borrow from other "outside" sources, such as the Mississippi River, and adjacent bays, and offshore areas.

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INTRODUCTION

The "Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study" (MRGO Ecosystem Restoration Plan) is being developed as a supplement to the June 2008 MRGO Deep-Draft De-Authorization Report and is intended to fully meet the requirements of the Water Resources Development Act (WRDA) of 2007, Section 7013. This feasibility study is anticipated to result in a Chief of Engineers' Report containing a recommended MRGO Ecosystem Restoration Plan, which has been conditionally authorized for construction by WRDA 2007, Section 7013. The Plan will address systematic ecosystem restoration and protection of the Lake Borgne ecosystem and areas affected by the former MRGO navigation channel and will also include consideration of measures to reduce or prevent damage from storm surge.

If the Assistant Secretary of the Army, Civil Works determines that the recommendations of the MRGO Ecosystem Restoration Plan are cost-effective, environmentally acceptable, and technically feasible, no further Congressional authorization is needed. However, the execution of the implementation phase is subject to additional funding and appropriations. Cost-sharing for implementation is subject to the rules for ecosystem restoration projects established in Section 210 of WRDA 1996.

The MRGO Ecosystem Restoration Plan would: 1) Restore the Lake Borgne ecosystem and the areas affected by the MRGO navigation channel by restoring historic salinity regimes through reduced saltwater intrusion into the MRGO, restoring and sustaining critical geomorphic structures that serve as salinity barriers, and introducing freshwater; 2) Restore habitat diversity by restoring and sustaining marsh, swamp, bottomland hardwood, and ridge habitats; 3) Restore and sustain historic water quality, hydrologic functions, and circulation patterns; 4) Achieve ecosystem sustainability to the greatest degree possible; and 5) Restore natural features of the ecosystem that will reduce or prevent damage from storm surge by protecting, restoring, or increasing wetlands, forested habitats, and critical geomorphic structures in the study area.

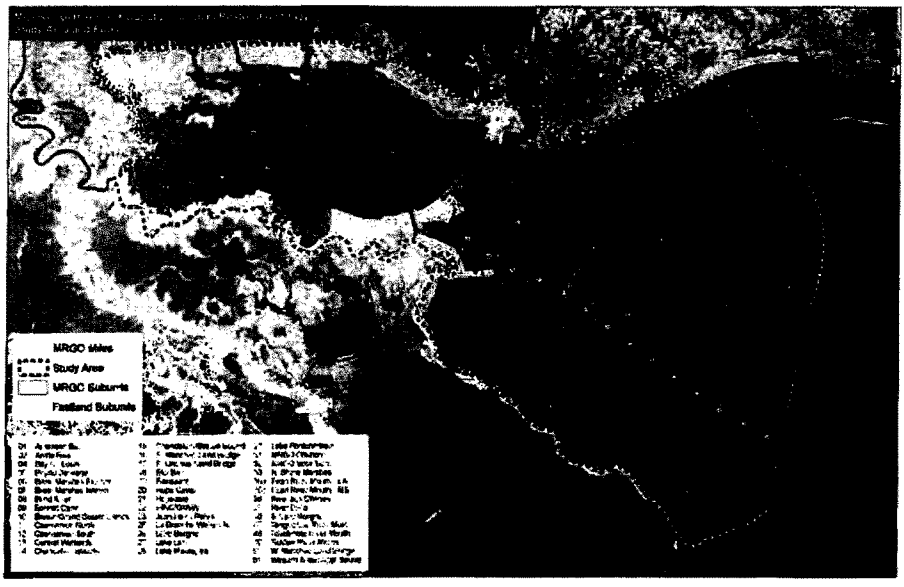
This preliminary draft report contains a description of existing fish and wildlife resources in the project area, discusses future with-project (FWP) and future without-project (FWOP) habitat conditions, identifies fish and wildlife-related impacts, and provides recommendations to improve the proposed MRGO Ecosystem Restoration Project. This document does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The Fish and Wildlife Service (Service) is coordinating with National Marine Fisheries (NMFS) and Louisiana Department of Wildlife and Fisheries (LDWF), their comments will be incorporated into the draft and final reports.

DESCRIPTION OF STUDY AREA

The project area is centered on the Lake Borgne ecosystem, and includes parts of southwestern Mississippi and southeastern Louisiana (Figure 1). This includes St. Bernard, Orleans, and Plaquemines parishes in Louisiana and Hancock and Harrison counties in Mississippi. The project area is bordered to the west by the East Orleans landbridge and continues southward to include the Golden Triangle, Central Wetlands, Proctor Point, the former MRGO, and Terre aux Boeufs ridge. The northern boundary follows the coastline into Mississippi and includes the lower Pearl River basin and Western Mississippi Sound. The eastern edge of the project area extends to the Chandeleur Islands.

The project area suffers from many problems including land loss, shoreline erosion, habitat change and loss, modification of natural hydrology, decreased freshwater, sediment and nutrients, saltwater intrusion, eroding barrier islands, ridge habitat degradation, invasive species, herbivory, and increasing susceptibility to storm surge.

Figure 1. Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Study Area and Subunits.



FISH AND WILDLIFE RESOURCES

Description of Habitats

The eastern Louisiana coast consists of a deltaic system with fronting barrier islands built by the Mississippi River. High, firm land is rare in coastal Louisiana. Elevations of the wetlands are barely above Mean Gulf Level and at best the soils are soft and poorly

consolidated. The portion of the project area in Mississippi consists of broad expanses of emergent tidal marsh and riverine swamps that have suffered from lack of sediment and freshwater flows resulting in increased saltwater intrusion and coastal erosion. The Mississippi saline marsh area includes sandy forested hummocks that are above mean high tide. This marsh area is also well-known for an abundance of waterfowl. The Mississippi Sound is a shallow body of water that separates the Mississippi coast from Cat Island, a barrier island that lies approximately six miles offshore. The Pearl River and its associated river swamp are tidally influenced freshwater habitat with bald-cypress, black gum, and water tupelo forming the swamp canopy.

The deauthorized MRGO traverses wetlands and marshes in Plaquemines, St. Bernard, and eastern Orleans parishes. Construction of the channel altered circulation patterns along its route between Breton Sound and Lake Borgne, resulting in steep salinity increases. Prior to construction, the Bayou La Loutre ridge provided a between basin hydrologic barrier that limited the flow of saline water from Breton Sound into Lake Borgne. Previously, the tidal flow into Lake Borgne was dominated by flow from the Mississippi Sound, but after the construction of MRGO, the dominant tidal flow into Lake Borgne switched to Breton Sound. Changes in vegetation communities in the project area were observed after completion of the MRGO. Prior to construction of the MRGO, the freshwater wetlands had survived nutria "eat-outs", hurricanes, droughts, subsidence, and construction of trenasses for duck hunter and trapper access. However, the construction of MRGO altered the salinity and hydrologic regime beyond the wetlands' tolerance. MRGO changed regional hydrology and affected the flow, type, direction, and salinity of the water in addition to changing the tidal amplitude and duration.

There are approximately 3,845,766 acres within the study area. Louisiana wetlands (forested, marsh, and scrub-shrub) provide 26 percent of the seafood landed in the contiguous United States and over 5 million migratory waterfowl utilize those wetlands every year. Wetlands within the study area provide plant detritus to adjacent coastal waters and thereby contribute to the production of fishes and shellfishes. Wetlands also provide valuable water quality functions such as reducing excessive dissolved nutrient levels, filtering waterborne contaminants, and removing suspending sediment matter. In addition, coastal wetlands buffer storm surges and reduce damaging effects to man-made infrastructure within the coastal area.

Wetlands are being lost because of the loss of Mississippi River sediment due to construction of levees, sea level rise, subsidence, hurricanes and construction of channels and canals. As this habitat is destroyed, it further depletes the species that form the base of the food chain throughout the Gulf of Mexico. Failure to address the loss of this habitat in the Gulf region threatens the long-term health of the entire ecosystem. The ongoing loss of coastal Louisiana wetlands (approximately 1,149 square miles between 1956 and 2004; average loss rate of 24 square miles per year) was recently exacerbated by Hurricanes Katrina and Rita in 2005. Those hurricanes caused an initial loss of wetlands equivalent to 9 years (approximately 217 square miles) of mean annual losses.

Appendix A of this report provides common and scientific names of plants and animals in the study area mentioned throughout this report.

Marshes
Marsh types within the project area include fresh, intermediate, brackish, and saline. Fresh marshes occur at the upper ends of interdistributary basins and are often characterized by floating or semi-floating organic soils and minimal daily tidal action. Vegetation may include maidencane, bulltongue, cattail, California bulrush, pennywort, giant cutgrass, American cupscale, spikerushes, bacopa, and alligatorweed.

Intermediate marshes occur in transitional zones between fresh and brackish marshes and are often characterized by organic, semi-floating soils. Typically, intermediate marshes experience low levels of daily tidal action. Salinities are negligible or low throughout much of the year, with salinity peaks occurring during late summer and fall. Vegetation includes saltmeadow cordgrass, deer pea, three-cornered grass, cattail, bulltongue, seashore paspalum, wild millet, fall panicum, and bacopa.

Brackish marshes are characterized by low to moderate daily tidal energy and soils ranging from firm mineral soils to organic semi-floating soils. Freshwater conditions may prevail for several months during early spring; however, low to moderate salinities occur during much of the year, with peak salinities in the late summer or fall. Vegetation is usually dominated by saltmeadow cordgrass, but also includes saltgrass, three-cornered grass, leafy three-square, and deer pea.

Saline marshes occur along the Gulfward fringe of the coastal wetlands. Those marshes usually exhibit fairly firm mineral soils and experience moderate to high daily tidal energy. Vegetation is dominated by saltmarsh cordgrass but may also include saltgrass, saltmeadow cordgrass, black needlerush, and leafy three-square.

Ridge Habitat
Within the Deltaic Plain narrow alluvial ridges having finger-like patterns, extend toward the Gulf, are higher in elevation and have firmer soils than emergent marsh. These natural levees, formed by overbank processes, occur along active and abandoned Mississippi River distributaries (Coast 2050). Natural and man-made ridges form the skeletal framework to which the coastal wetlands are attached. They form hydrologic basin divides and are more resistant to erosion than the wetlands. Natural factors such as subsidence have contributed to the destruction of the ridges with most of the ridges having subsided below elevations that support the maritime forest community. Part of the Bayou La Loutre ridge, however, has been enhanced with disposed dredged material, but subsidence continues to be the biggest threat. The Bayou La Loutre ridge was directly affected by construction of the MRGO channel through the ridge.

Ridges sustain upland shrubs and trees, providing unique habitat for certain plant and animal species. The dominant species of the forested habitat found on the abandoned distributary ridges in the project area include live and water oaks, and hackberry. Groundsel bush, marsh elder, and yaupon are the dominant shrubs, with dwarf palmetto and elderberry present in the understory. Vines such as blackberry, marsh morning glory, and pretty dodder are common.

Cypress/Tupelo Swamp
Cypress-tupelo swamps were once common throughout the southeastern U.S. but have been significantly reduced in areal extent. Cypress-tupelo swamps are located along the flanks of

larger distributary ridges as a transition zone between bottomland hardwoods and lower-elevation marsh or scrub-shrub habitats. Cypress-tupelo swamps exist where there is little or no salinity, minimal daily tidal action, and are usually flooded throughout most of the growing season. Bald cypress and tupelo gum are the dominant vegetation within this habitat type, but Drummond red maple, green ash, and black willow are also common.

In the project area, cypress swamp used to exist predominately in the Central Wetlands area. These swamps were abundant in parts of the study area but have declined due to extensive logging operations during the late 1800s. In addition, the swamps of the Central Wetlands were maintained by freshwater introduced from the Mississippi River and other natural water sources. The construction of flood protection levees limits the flow of freshwater into the wetlands, and the construction of canals, especially the MRGO, allowed additional saltwater into the estuary. These and other changes have caused the loss of most of the Central Wetland swamps. The MRGO channel and connecting waterways provide a direct route for tidal exchange and allows any freshwater surplus to exit regularly at low tide and be replaced by the inflow of more saline water at high tide.

Barrier Island

The barrier islands in the Louisiana portion of the study area are the remains of an abandoned Mississippi River Delta lobe; their degradation is the result of natural deltaic processes. The formation of Cat Island in Mississippi was also influenced by this abandoned delta, and it is distinct from other Mississippi barrier islands (Schmid 2001). Barrier islands act as buffers to reduce the effects of ocean waves and currents on associated estuaries and wetlands. Louisiana's barrier islands are eroding at a rate of up to 66 feet per year. According to recent U.S. Geological Survey (USGS) estimates, several islands will disappear by the end of the century (USACE 2009). Although Cat Island has lost 39% of the land area it had in 1848, it is the most stable of the Mississippi barrier islands. Interior elevations and the orientation of Cat Island prevent breaching and overwash by storm waves except along spits of the eastern shore (Morton 2005).

Study area barrier islands consist primarily of beach, dune, high marsh (scrub/shrub), and back-barrier saline marsh. Beach vegetation may include sea purslane, marsh hay cordgrass, sea rocket, and seaside heliotrope. Dune plants are dominated by sea oats, but can include marsh hay cordgrass, bitter panicum, Roseau cane (on the Chandeleur islands) and beach croton. Shrub/scrub plants often found on high marsh zones typically behind dunes and include sea myrtle, sea ox-eye and marsh elder (*Iva* and *Baccharis*). Black mangrove occurs as a shrub along the flooded marsh edges of the barrier islands and on the banks of tidal streams, ponds, and bays. Saline back barrier marshes dominant species is saltmarsh cordgrass, although the highly salt-tolerant salt grass, black needle rush, and glassworts are also frequently present.

In the future without the project scenario, the barrier islands will diminish in size greatly while some of the islands, such as Breton Island, are expected to become a shoal that is no longer subareal. Without replenishing sediment in the litoral system, the islands have no chance of recovering. With the loss of the islands; there will be a loss of unique and vital habitat for nesting terns, piping plover, and fisheries.

Open-Water Habitats

Lake Borgne is hydrologically connected to Lake Pontchartrain. The Lake Borgne ecosystem is also influenced by the Pearl River to the north and by areas located as far south as the River Aux Chenes ridge, which is located between the MRGO and the Mississippi River. To the east, the Western Mississippi Sound is an extension of Lake Borgne. The Western Mississippi Sound, Chandeleur Sound, and Breton Sound form the eastern boundary of hydrologic influence of the Lake Borgne ecosystem.

Open-water habitat within the project area consists of ponds, lakes, canals, bays, and bayous. Natural marsh ponds and lakes are typically shallow, ranging in depth from 6 inches to over 2 feet. Typically, the smaller ponds are shallow and the larger lakes and bays are deeper. Canals and larger bayous typically range in depth from 4 or 5 feet, to over 15 feet. Strong tidal flows may occur at times through those waterways, especially where they provide hydrologic connections to other large water bodies.

Major open water and channel areas in the project area include Bayou La Loutre, Bayou St. Malo, Bayou Bienvenue, Bayou Dupre, the former MRGO, the Rigolets, Lake Borgne, Chandeleur Sound, Breton Sound, Mississippi Sound, and Lake Saint Catherine.

Hypoxic/Anoxic zones

Hypoxic/anoxic conditions ("dead zones") occur in Lake Pontchartrain and the Gulf of Mexico. These conditions are caused primarily by excess nitrogen in combination with stratification of more saline waters. Due to the control of the Mississippi River, nutrients pass though the study area and into the northern Gulf rather than into adjacent wetlands, which would absorb these nutrients.

Submerged Aquatic Vegetation

Shallow open water habitats may often support extensive beds of submerged aquatic vegetation (SAV). Within the estuaries, SAVs are typically found in ponds and lakes but they are also associated with sandy substrate around barrier islands where they are often referred to as seagrass beds or marine SAVs. In fresh environments, floating-leafed and submerged SAVs include water hyacinth, *Salvinia*, duckweeds, American lotus, white water lily, water lettuce, coontail, Eurasian milfoil, hydrilla, alligatorweed, hydrocotyle, pondweeds, naiads, fanwort, wild celery, water stargrass, elodea, and others. Ponds and lakes within the intermediate marsh zone often support southern naiad, Eurasian milfoil, and wigeongrass. Shallow brackish marsh ponds occasionally support abundant beds of wigeongrass. SAV growth in saline marsh environments is rare.

As reported by Ritchie et al., 1992, the extensive seagrass beds associated with the Chandeleur Islands occupy the sandy platform along the bay shoreline sheltered by the main arc of the islands from just south of Hewes Point at the northern end to just north of the southern end and extending out to the western bar system. Patches of sea grasses also occur behind Breton Island, within the Freemason Island complex and associated with North and New Harbor islands. None have been observed behind Grand Gosier or Curlew islands probably because of the constantly shifting sediment in these areas. Widgeon grass and shoalgrass are most common in the shallower areas and are usually the first to colonize the subaqueous portions of new washover

fans. Manatee grass prefers somewhat deeper areas that are never threatened by exposure at extreme low tides. *Halophila engelmanii* grows as an understory to the others. Turtle grass colonizes the deepest areas of all the SAVs. All of these species occur at intermediate depths.

Coastal SAV meadows are a rapidly declining habitat that is important for juvenile aquatic species, sea turtles, west Indian Manatee, and wintering migratory waterfowl in the northern Gulf of Mexico (Byron and Heck, 2006; Poirrier and Handley, 2006; Michot, et al. 2008). Aside from their important role in providing habitat, these seagrass meadows provide essential physical benefits to the stability of the Chandeleur Islands by reducing wave energy and current velocity due to the baffling effects of the seagrass. This process results in backbarrier sediment trapping (vertical accretion) and protection of backbarrier marsh shorelines form wave attack in the Chandeleur Sound. The latter is especially important during the passage of winter cold fronts because of the large fetch of the Chandeleur Sound. These seagrass beds are amazingly resistant to hurricanes and recover rapidly after storms when destroyed; however, the occurrence and distribution of seagrass at the Chandeleur Islands is directly related to the presence of a fronting barrier island (Poirier and Handley, 2006; Bethel and Martinez, 2008). The island dissection and rapid land loss associated with Hurricane Katrina has resulted in decreased suitable conditions for seagrass recolonization (Bethel and Martinez, 2008).

The seagrass beds are decreasing in size as the barrier islands they are behind also decrease in size. As the island area is reduced to only subtidal or shoal habitat, waves from the Gulf are able to impact the beds. Therefore, when all intertidal acreage is lost, it is assumed that all of the seagrass beds in that portion of the project area will be lost.

Fisheries Resources

Estuaries are among the most productive habitats in the world because they support high primary and fisheries production (Whittaker and Likens 1973; Walme 1972). The majority of the MRGO Ecosystem Restoration study area is considered estuarine habitat. Most of the economically important saltwater fishes and crustaceans harvested in Louisiana and Mississippi spawn offshore and then use estuarine areas for nursery habitat (Herke 1995). Marine fishes penetrate inland to fresher habitats, while freshwater species are sometimes found in intermediate or brackish environments. In addition, the lower reaches of freshwater streams may serve as nursery areas for the young of some marine species.

Factors that will strongly influence future fish resource conditions include freshwater input and loss of coastal wetlands. Freshwater inputs into the project area wetlands have been limited to rainwater and runoff and a few Mississippi river diversions and siphons. Even though extensive areas of marsh have been lost in coastal Louisiana, commercial harvest and recreational catches of most estuarine fishery species have not diminished (NMFS 2006). One hypothesis to explain continued high fisheries production is that as marshes have deteriorated, tremendous amounts of organic detritus have been released into the estuarine system, consequently driving high levels of primary productivity. High primary productivity increases the resources available for secondary productivity. Additionally, an increase in marsh to water interface (i.e., marsh edge), and the formation of shallow, protected lagoons and ponds, has resulted in areas prime for growth and development of estuarine species (Browder et al., 1985; Browder et al., 1989; Minello and Rozas

2002). At the same time, saltwater intrusion into previously low-salinity areas has increased the amount of estuarine area available to estuarine and marine fishery species (Chesney et al. 2000; Zimmerman et al., 2000). However, this intrusion can exacerbate marsh loss in those areas (Chabreck and Linscombe 1982; McKee and Mendelssohn 1989).

The seagrass beds, as well as the barrier islands they exist behind, provide unique nursery, foraging, predator refugia, and spawning habitat for numerous economically important marine and estuarine species that exhibit a preference for or are dependent on these habitats during a portion of their life (Saucier and Baltz 1993). Seagrass beds, surf zone, intra-island ponds, tidal creeks, and back-bay sand flats associated with these barrier islands support distinct fish and crustacean assemblages in comparison to mainland or inland saline marshes (Williams 1998).

The project area supports both marine and estuarine finfishes and shellfishes. Finfishes occurring or expected in that area include anchovies, scaled sardine, Gulf menhaden, striped mullet, white mullet, black drum, red drum, spot, spotted seatrout, sand seatrout, Atlantic croaker, gaff-topsail catfish, southern flounder, bull shark, ladyfish, Atlantic needlefish, Gulf killifish, longnose killifish, sheepshead minnow, fat sleeper, gobies, speckled wormeel, least puffer, Gulf pipefish, Atlantic spadefish, alligator gar, southern kingfish, Florida pompano, Atlantic bumper, Spotfin mojarra, rough silverside, inland silversides, and mangrove snapper. The Mississippi Sound estuary provides prime habitat for various life stages of red drum, Spanish and king mackerel, grouper, spotted sea trout, jack crevalle, cobia, amberjack, and various species of sharks (MSCIP 2008).

Crustaceans expected to occur in the area include white shrimp, brown shrimp, seabob, roughneck shrimp, grass shrimp, mysid shrimp, Gulf stone crab, blue crab, and mud crab. Other invertebrates found there include American oyster, jellyfish, and ctenophores.

The American oyster is indigenous to coastal Louisiana and Mississippi, and provides a rich ecological and commercial resource. This organism is unique in that it does not migrate like other estuarine species. Salinity plays a key role in oyster sustainability. Typically, they proliferate in salinities ranging from 5 to 15 parts per thousand. Fresher waters fail to support biological functions, and more saline waters promote disease and predation. Production of oysters in Louisiana has been relatively stable for the last 50 years, with harvest from public beds replacing the decreasing harvest from private leases. The Louisiana oyster industry has been experiencing many stressors over the past several decades that threaten the long-term sustainability of both the industry and the resource. Increasing coastal land loss is reducing the amount of marsh that provides shelter to reefs, and saltwater intrusion is exacerbating disease and predation.

The bottom estuarine substrate or benthic zone regulates or modifies most physical, chemical, geological, and biological processes throughout the entire estuarine system via what is commonly called a "benthic effect" (Day et al. 1989). Within a salt marsh, less than ten percent of the above-ground primary production of the salt marsh is grazed by aerial consumers. Most plant biomass dies and decays and its energy is processed through the detrital pathway. The major consumer groups of the benthic habitat include: bacteria and fungi, microalgae, meiofauna, and microfauna (Mitsch and Gosselink 1993).

Benthic community structure is not static; it provides a residence for many sessile, burrowing, crawling, and even swimming organisms. The benthic community is a storehouse of organic matter and inorganic nutrients, as well as a site for many vital chemical exchanges and physical interactions. The benthic assemblage of the study area is dominated by polychaetes (62%), bivalves (14%) and amphipods (11%).

Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; P.L. 104-297) set forth a new mandate for National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS), regional fishery management councils (FMC), and other federal agencies to identify and protect important marine and anadromous fish habitat. The Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Act support one of the nation's overall marine resource management goals-maintaining sustainable fisheries. Essential to achieving this goal is the maintenance of suitable marine fishery habitat quality and quantity. Detailed information on federally managed fisheries and their EFH is provided in the 1999 generic amendment of the Fishery Management Plans for the Gulf of Mexico prepared by the Gulf of Mexico FMC (GMFMC). The generic FMP subsequently was updated and revised in 2005 and became effective in January 2006 (70 FR 76216). NMFS administers EFH regulations. Categories of EFH in the project area include estuarine and marine areas. Estuarine categories include estuarine emergent wetlands, mangrove wetlands (estuarine and barrier island), submerged aquatic vegetation, estuarine water column, and mud, sand and shell water bottoms. Marine areas include water column, vegetated bottoms (seagrass beds of Breton and Chandeleur islands), non-vegetated bottoms, live bottoms (oyster reefs in Lake Borgne and Biloxi marshes), and geologic features (Breton and Chandeleur islands).

EFH has been designated in the project area for Gulf stone crab, brown shrimp, white shrimp, pink shrimp, red drum, lane snapper, dog snapper, dwarf sand perch, king mackerel, Spanish mackerel, cobia, bonnethead shark, and Atlantic sharpnose shark. EFH species and their life stages are presented in Table 1. Coastal wetlands also provide nursery and foraging habitat that supports economically important marine fishery species such as spotted seatrout, sand seatrout, southern flounder, Atlantic croaker, spot, Gulf menhaden, striped mullet, white mullet, silversides, killifish, kingfish, pompano, scaled sardines, anchovies, and blue crab. Some of these species serve as prey for other fish species managed under the Magnuson-Stevens Act by the GMFMC (e.g., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks). These wetlands also produce nutrients and detritus, important components of the aquatic food web, which contribute to the overall productivity of the Pontchartrain basin estuary and nearshore Gulf of Mexico.

FOR CONTINUATION OF HOUSE DOCUMENT 113-78

MRGO ECOSYSTEM RESTORATION PLAN
FEASIBILITY STUDY

SEE PART 3