Appendix F

WETLAND VALUE ASSESSMENT

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
441 G STREET, NW
WASHINGTON, DC 20314-1000

REPLY TO
ATTENTION OF

CECW-P 8 November 2011

MEMORANDUM FOR Director, National Ecosystem Restoration Planning Center of Expertise (ECO-PCX)

SUBJECT: Wetland Value Assessment (WVA) Models – Barrier Headland, Barrier Island, Bottomland Hardwood, Coastal Chenier, and Swamp Models - Model Approval.

1. The HQUSACE Model Certification Panel has reviewed the externally-developed WVA in accordance with EC 1105-2-412 and has determined that the Barrier Headland, Barrier Island, Bottomland Hardwood, Coastal Chenier, and Swamp Models and their accompanying documentation are sufficient to approve the models for regional use. The WVA models were developed by the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Environmental Work Group, an interagency team including US Fish and Wildlife Service, National Marine Fisheries Services, US Environmental Protection Agency, Natural Resources Conservation Service, USACE, and Louisiana Office of Coastal Protection and Restoration.

2. The models were initially developed in the 1990s and have been periodically revised and updated by the CWPPRA Environmental Work Group which is led by the US Fish and Wildlife Service. Models developed by non-Federal government entities, NGOs, or academic institutions which are proposed as part of a Corps planning study can be approved for use based on an assessment of the proponent's documentation demonstrating that the model satisfies the certification criteria.

3. Battelle Memorial Institute conducted an independent review of the procedural manual, community models and associated spreadsheets to assess the technical quality and usability of the model. A number of high significance concerns with the documentation of the model were raised. Further coordination with the ECO-PCX clarified that the ECO-PCX had conducted a detailed review of the model documentation and model spreadsheets to evaluate the degree to which revisions were made based on the model review comments and responses. Adequate technical reviews have been accomplished. This approval is based on the decision of the HQUSACE Model Certification Panel which considered the ECO-PCX assessments of the models.

APPLICABILITY: This approval for use is limited to applicable projects in coastal Louisiana and eastern Texas..

HARRY E. KITCH, P.E.
Deputy Chief, Planning and Policy Division
Directorate of Civil Works

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
441 G STREET, NW
WASHINGTON, DC 20314-1000

REPLY TO
ATTENTION OF

CECW-P

28 February 2012

MEMORANDUM FOR Director, National Ecosystem Restoration Planning Center of Expertise (ECO-PCX)

SUBJECT: Wetland Value Assessment Models – Coastal Marsh Module Version 1.0 – Approval for Use

1. The Coastal Marsh Community model is one of seven WVA community models that were developed by the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Environmental Work Group. Based on information provided by the ECO-PCX, it is the understanding of the HQUSACE Model Certification Panel that this model will be used on the following projects over the next five years:

a. MRGO Ecosystem Restoration
b. Barataria Basin Barrier Shoreline
c. Lake Pontchatrain and Vicinity Hurricane Storm Damage Risk Reduction System (HSDRRS) Mitigation
d. West Bank and Vicinity HSDRRS Mitigation
e. HSDRRS IERS –total number unknown
f. Louisiana Coastal Area (LCA) 4 Davis Pond Modification
g. LCA4 Modification to Caernarvon
h. LCA4 Point Au Fer Island
i. LCA4 Caillou Lake Land Bridge
j. LCA Myrtle Grove
k. LCA White Ditch PED
l. LCA Mississippi River Hydrodynamic and Delta Management
m. LCA Caernarvon
n. Larose to Golden Meadow (LGM) Post-Authorization Change (PAC) Study
o. Larose to Golden Meadow Intracoastal Floodwall Reach 2b (LGM-022C).
p. Larose to Golden Meadow Intracoastal Floodwall Reach 2a (LGM-022B).
q. Larose to Golden Meadow C-North Highway 24 Relocation (LGM-001C).
r. Baptiste Collette Bayou Deepening study
s. Barataria Bay Waterway (CAP 204)
t. Buras Marina (CAP 206)
u. Calcasieu River and Pass (CAP 204)
v. Calcasieu Lock Replacement
w. Morganza to the Gulf PAC
x. Morganza to the Gulf Supplemental NEPA documents –total number unknown
y. Southwest Coastal
z. Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) – West Bay Closure
aa. Houma Navigation Canal Deepening
bb. West Shore Lake Pontchartrain Hurricane & Flood Risk Reduction
cc. LCA Terrebonne Basin Barrier Shoreline Restoration
dd. LCA Demonstration Projects Grand Isle and Vicinity Project
ee. CAP 103 Grand Isle Highway 1 Shoreline Stabilization
ff. Donalsonville to the Gulf
gg. NOV Plaquemines Parish
hh. NFL Plaquemines Parish

2. Version 1.0 of the Coastal Marsh Community model is approved for use for the above projects. This approval for use is based on the decision of the HQUSACE Model Certification Panel which considered the ECO-PCX assessment of the model. Adequate technical reviews have been accomplished and the model meets the certification criteria contained in EC 1105-2-412. As indicated by the ECO-PCX, there are a number of unresolved issues related to the form of suitability graphs for Variables 1, 2 and 3 and the aggregation methods used to combine the marsh habitat units and open water habitat units for each sub-model. To increase the understanding of the sensitivity of the model to the unresolved issues and the impact the model differences may have on decision-making, the ECO-PCX is to work with the project delivery teams to conduct sensitivity analyses for each application of the marsh models. A summary of the sensitivity analyses must be presented in the project documentation and Agency Technical Review teams must be charged with reviewing the adequacy and findings of the sensitivity analyses.

3. It is expected that compiliation of the findings of the multiple sensitivity analyses will lead to updates and improvements of the model. As such, version control is imperative. The PCX must ensure that project delivery teams are are utilizing the most appropriate version of the model for their analyses and that they are properly identifiying the version of the model being used.

APPLICABILITY: This approval for use expires 28 February 2017 and is limited to the above studies with the caveat that updated versions of the model be used if appropriate.

Harry E. Kitch

HARRY E. KITCH, P.E.
Deputy Chief, Planning and Policy Division
Directorate of Civil Works

DEPARTMENT OF THE ARMY
MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P.O. BOX 80
VICKSBURG, MISSISSIPPI 39181-0080

REPLY TO
ATTENTION OF:

CEMVD-PD-N 12 March 2012

MEMORAMDUM FOR CECW-PC (Wes Coleman)

SUBJECT: Wetland Value Assessment Models – Marsh Model, Recommendation for Single Use Approval on Multiple Projects

1. References

a. Engineering Circular 1105-2-412: Assuring Quality of Planning Models, dated 31 March 2011.

b. CEMVN Memorandum Subject: Wetland Value Assessment Models – Marsh Model, Summary of Model Review Results and Recommendation for Interim Approval, dated 6 February 2012.

2. The National Ecosystem Planning Center of Expertise (ECO-PCX) recommended approval of the Wetland Value Assessment (WVA) Coastal Marsh Community Models 1.0 for in Reference a. The Headquarters Model Certification Team discussed the Coastal Marsh Community model on 14 February 2012 and requested a list of projects that plan to use the model over the next 5 years. Below is a list of projects that plan to use the Coastal Marsh Model.

a. MRGO Ecosystem Restoration
b. Barataria Basin Barrier Shoreline
c. Lake Pontchatrain and Vicinity Hurricane Storm Damage Risk Reduction System (HSDRRS) Mitigation
d. West Bank and Vicinity HSDRRS Mitigation
e. HSDRRS IERS – multiple total number unknown
f. Louisiana Coastal Area (LCA)4 Davis Pond Modification
g. LCA4 Modification to Caernarvon
h. LCA4 Point Au Fer Island
i. LCA4 Caillou Lake Land Bridge
j. LCA Myrtle Grove
k. LCA White Ditch PED
l. LCA Mississippi River Hydrodynamic and Delta Management
m. LCA Caernarvon
n. Larose to Golden Meadow (LGM) Post-Authorization Change (PAC) Study and SEIS
o. Larose to Golden Meadow Intracoastal Floodwall Reach 2b (LGM-022C).
p. Larose to Golden Meadow Intracoastal Floodwall Reach 2a (LGM-022B).
q. Larose to Golden Meadow C-North Highway 24 Relocation (LGM-001C).
r. Baptiste Collette Bayou Deepening study (Conducted by local interests under WRDA 86, Section 203)

s. Barataria Bay Waterway (CAP 204)
t. Buras Marina (CAP 206)
u. Calcasieu River and Pass (CAP 204)
v. Calcasieu Lock Replacement
w. Morganza to the Gulf PAC
x. Morganza to the Gulf Supplemental NEPA documents – multiple total number unknown
y. Southwest Coastal
z. Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) – West Bay Closure
aa. Houma Navigation Canal Deepening
bb. West Shore Lake Pontchartrain Hurricane & Flood Risk Reduction
cc. LCA Terrebonne Basin Barrier Shoreline Restoration
dd. LCA Demonstration Projects Grand Isle and Vicinity Project
ee. CAP 103 Grand Isle Highway 1 Shoreline Stabilization
ff. Donalsonville to the Gulf
gg. NOV Plaquemines Parish
hh. NFL Plaquemines Parish

9. The ECO-PCX recommends a single use approval of the Wetland Value Assessment Coastal Marsh Community Model 1.0 on the projects listed above.

Jodi K. Creswell
Operational Director, Ecosystem Restoration
Planning Center of Expertise

CF:
CECW-PC (Matusiak)
CECW-CP (Kitch, Hughes)
CECW-PB (Carlson)
CECW-MVD (Redican, Lucyshyn, Marlowe)
CEMVN-PD (Constance, Young)
CEMVD-PD-N (Wilbanks, Smith, Ruff, Chewning, Kleiss, Creswell, Vigh)
CEMVN-PD-P (Miller)
CEMVN-PDN (Exnicios)
CEMVN- PDN-CEP (Stiles, Klein, Dayan, Behrens)
CEMVN-PM-OR (Bosenberg)
CEERD-EE-E (Fischenich)

Methodology for Quantifying Environmental Benefits/Impacts

The study area was divided into subunits or polygons having similar wetland loss characteristics and loss rates (Figure 1).

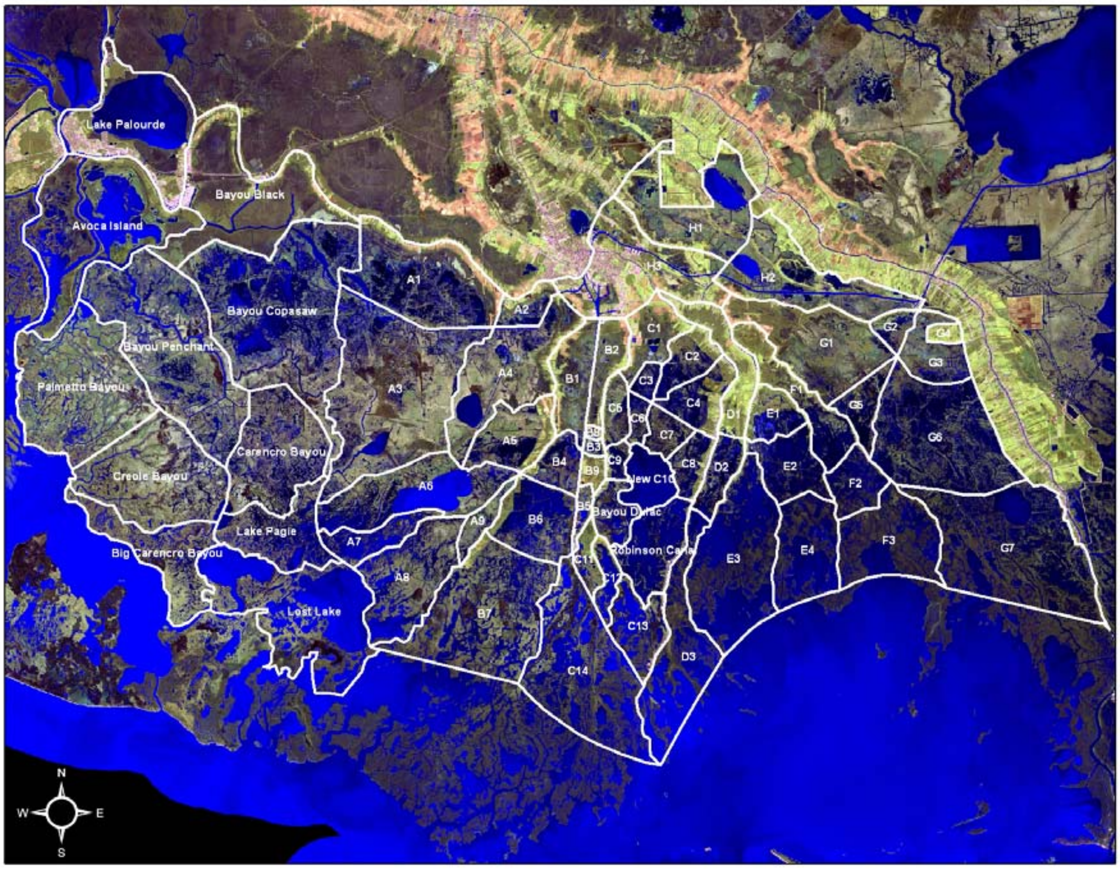


Figure 1. Map delineating study area subunits.

Wetland acreage data (1985 through 2008) was obtained from the USGS from satellite imagery for each of the study area subunits. Future-without-project (FWOP) subunit wetland acreages and marsh loss rates were determined by producing a linear trendline through the data (Figure 2) for each study area subunit. Using the trendline, marsh acreages within each study area subunit were projected from 1985 through the project life (2035 to 2085). This process applies only to coastal marshes. The conversion of forested habitats to open water or other habitat types is a much more complicated process and no simple methods are currently available to predict such habitat type changes.

The trendline projections are assumed to represent a continuation of the historic low sea level rise (SLR) scenario. However, future acreages were also calculated for two additional scenarios characterized by increasing SLR.

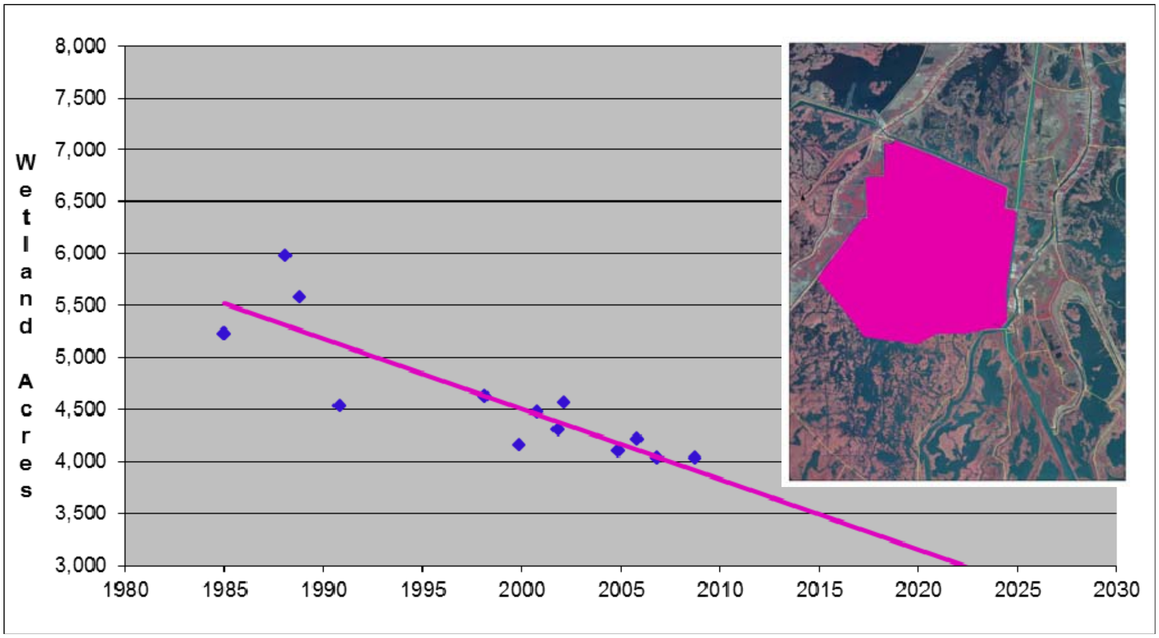


Figure 2. Observed data points and linear trendline for marshes of subunit B13.

Long-term water level gage data from the Leeville, Louisiana gage was utilized per the Corps' Engineering Circular (EC) 1165-2-212 to develop relative sea level rise associated with low (historic), intermediate, and high sea level rise estimates. According to EC guidance, the intermediate and high estimates of eustatic SLR were derived using the National Research Council (NRC) equations NRC I and NRC III, respectively. Based on the Leeville gage, the historic water level rise trend has been 6.995 mm/yr. Subtracting the historic eustatic SLR rate of 1.7 mm/yr yields a subsidence rate of 5.295 mm/yr. By adding the subsidence rate to the eustatic SLR rates associated with each SLR scenario, RSLR rates were determined for those three SLR scenarios (Figure 3).

Recent wetland loss rates (1985-2008) were assumed to have occurred under a constant low SLR rate. Therefore, for the low RSLR scenario (i.e., the continuation of the current 6.995 mm per year RSLR rate observed at the Leeville gage), the historic marsh loss rates were held constant and projected forward to provide yearly land acreages through the life of the project. For the intermediate and high scenarios, the 1985-2008 annual wetland loss rates for each subunit were gradually increased (beginning in 2010), by adding an additional annual increment of loss based on the SLR increase for that year. Those annual wetland loss rate increases were based on the slope of the negative relationship observed between wetland loss rates and RSLR rates from coastwide non-fresh marshes outside of active deltaic influences. In this relationship, RSLR was calculated as the sum of subsidence per statewide subsidence zones (see Figure 4) plus a eustatic SLR rate of 1.7

mm/yr. Recent land loss rates in percent per year were plotted against RSLR determined for those subsidence zones (Figure 5).

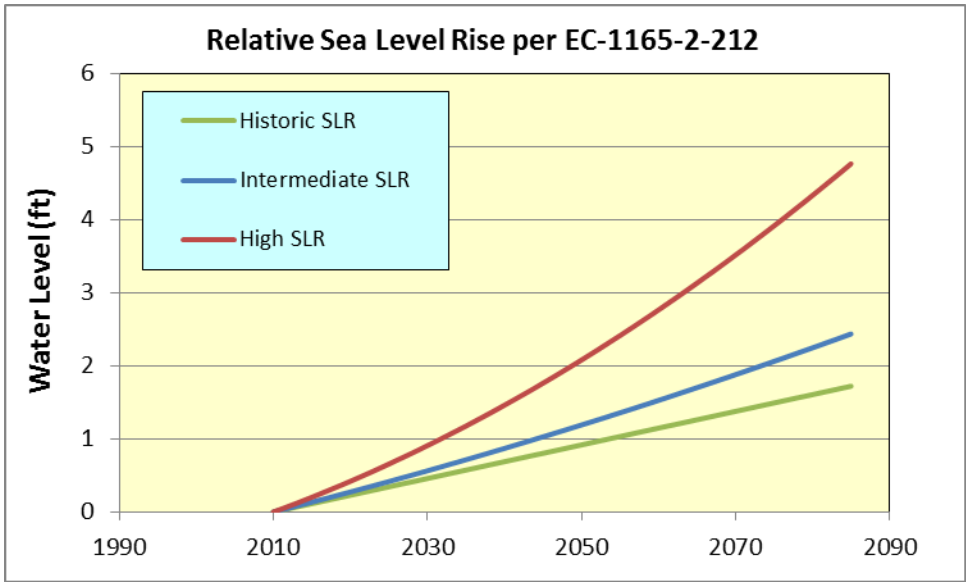


Figure 3. RSLR estimates determined using EC 1165-2-212.

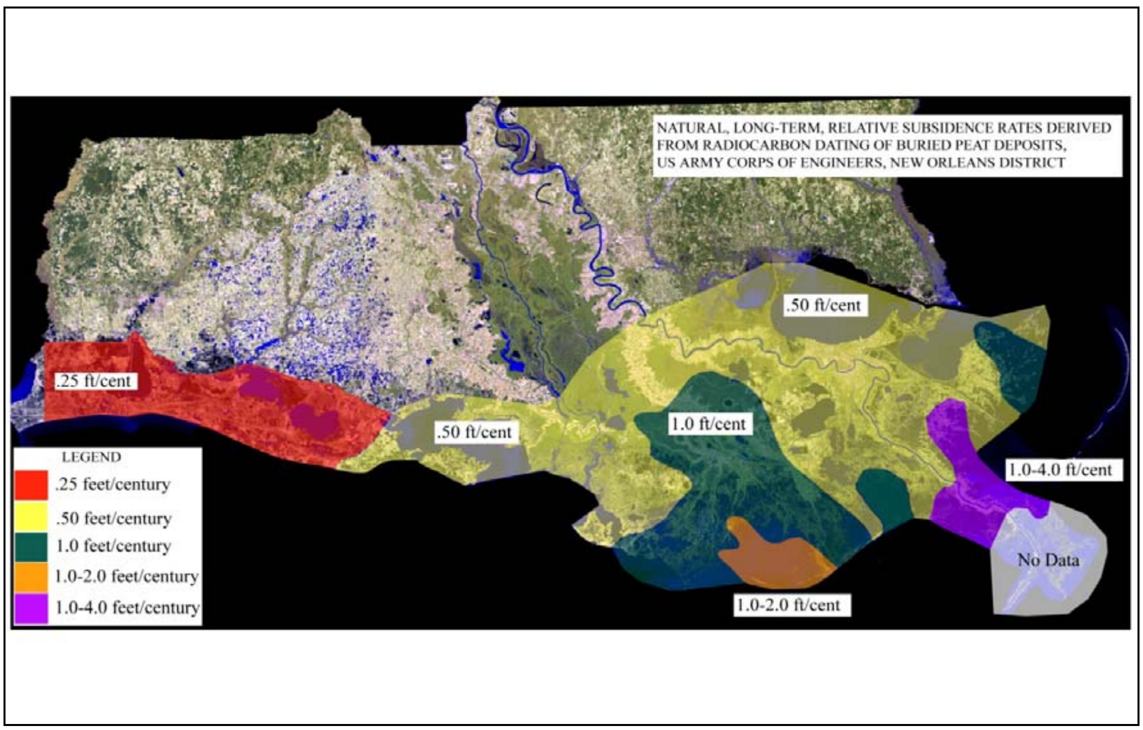


Figure 4. Coastwide subsidence zones from the Corps of Engineers.

According to the slope of this wetland loss vs RSLR relationship, every 1.0 mm/yr increase in RSLR would result in a 0.11%/yr increase in the wetland loss rate. The additional RSLR related wetland loss rate was then added to the baseline or historic loss rate to obtain total annual loss rates for each year, under the increasing sea level rise scenarios.

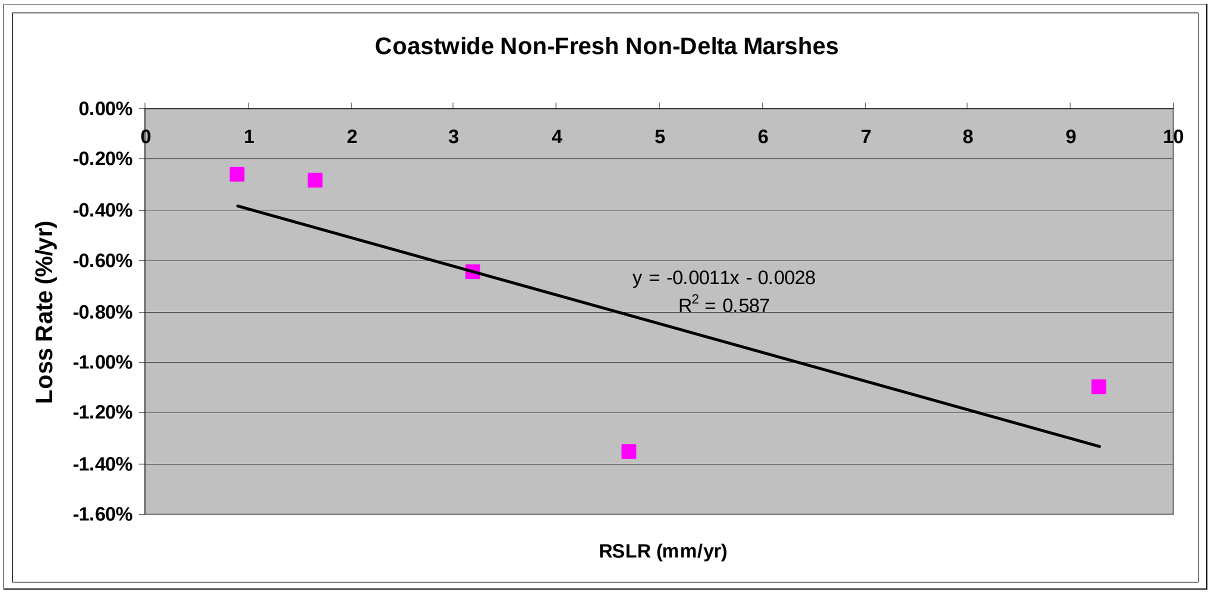


Figure 5. Coastwide wetland loss rates vs. RSLR relationship.

To determine the acreage of construction impacts in the year construction begins, National Wetland Inventory (NWI) 2008 data for the study area were obtained. Using ArcMap software, that NWI data was subdivided by each levee alternative right-of-way footprint, by individual levee reach, and by the study area loss polygons (Figure 6). The resulting data set provided acres of direct impacts in 2008, by habitat type, by levee alternative, levee reach, and loss polygon. Because of wetland loss, wetland loss rates from study area subunits, had to be applied to the 2008 NWI marsh acreages to obtain estimates of construction impacts in the year during which construction would occur.

Given the tight study schedule, the Habitat Evaluation Team (HET) agreed that the for levee segments not seeking immediate construction authorization, a tabulation of impacted habitat type acres would be sufficient for a programmatic evaluation.
However, it is desired that a detailed evaluation of levee reaches F1, F2, G1, the HNC Lock Complex and the Bayou Grand Caillou should be conducted so that those project features could be ready for authorization and construction. Accordingly, the HET decided that those features should be evaluated using the Wetland Value Assessment (WVA v1.1) methodology to assess project impacts to both habitat quantity and quality over time.

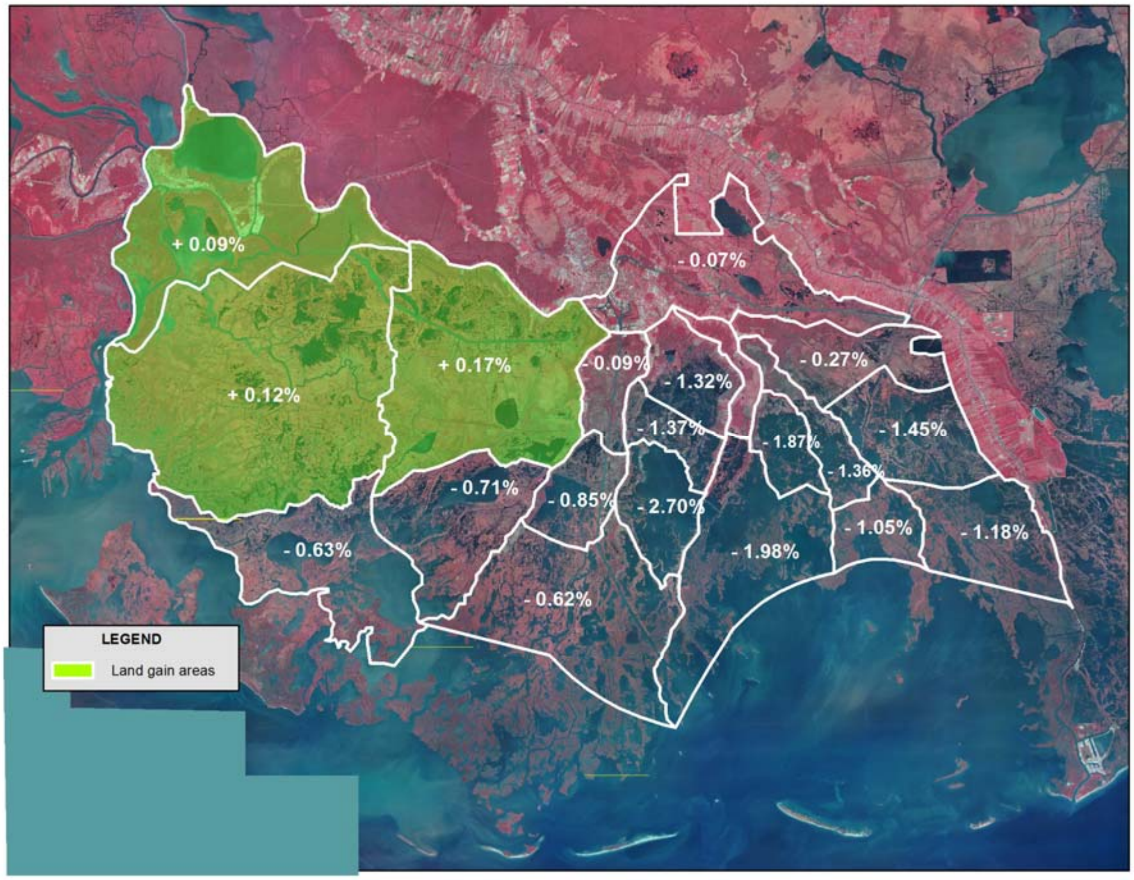


Figure 6. Land Loss Rates for each Study Area Subunit

WVA Methodology

The Wetland Value Assessment (WVA) methodology was initially developed to evaluate proposed Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) projects (LCWCRTF 2006b). The WVA methodology is similar to the Service's Habitat Evaluation Procedures (HEP), in that habitat quality and quantity are measured for baseline conditions and predicted for FWOP and FWP conditions. The Fresh/Intermediate Marsh Model and the Brackish Marsh Model were used for this project. Instead of the species-based approach of HEP, the WVA models use an assemblage of variables considered important to the suitability of a given habitat type for supporting a diversity of fish and wildlife species. As with HEP, the WVA allows a numeric comparison of each future condition and provides a combined quantitative and qualitative estimate of project-related impacts to fish and wildlife resources.

WVA models operate under the assumption that optimal conditions for fish and wildlife habitat within a given coastal wetland type can be characterized, and that existing or predicted conditions can be compared to that optimum to provide an index of habitat quality. Habitat quality is estimated and expressed through the use of a mathematical model developed specifically for each habitat type. Each model consists of: 1) a list of variables that are considered important in characterizing fish and wildlife habitat; 2) a Suitability Index graph for each variable, which defines the assumed relationship between habitat quality (Suitability Indices) and different variable values; and 3) a mathematical formula that combines the Suitability Indices for each variable into a single value for wetland habitat quality, termed the Habitat Suitability Index (HSI).

Emergent marsh habitat models have been developed for fresh, intermediate, brackish and saline marsh types. The habitat variable-habitat suitability relationships within those WVA models have not been verified by field experiments or validated through a rigorous scientific process. However, the variables were originally derived from HEP suitability indices taken from species models for species found in that habitat type. It should also be noted that some aspects of the WVA have been defined by policy and/or functional considerations of CWPPRA. However, habitat variable-habitat suitability relationships are, in most cases, supported by scientific literature and research findings. In other cases, best professional judgment by a team of fisheries biologists, wildlife biologists, ecologists, and university scientists may have been used to determine certain habitat variable-habitat suitability relationships. In addition, the WVA models have undergone a refinement process and habitat variable-habitat suitability relationships, HSIs, and other model aspects are periodically modified as more information becomes available regarding coastal fish and wildlife habitat suitability, coastal processes, and the efficacy of restoration projects being evaluated.

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. This standardized, multi-species, habitat-based methodology facilitates the assessment of project-induced impacts on fish and wildlife resources.

The WVA marsh models consists of six variables: 1) percent of wetland area covered by emergent marsh; 2) percent open water covered by submerged aquatic vegetation; 3) marsh edge and interspersion; 4) percent of the open water area <= 1.5 feet deep; 5) salinity; and 6) aquatic organism access.

Target years were established when significant changes in habitat quality or quantity were expected during the project life, under FWP and FWOP conditions. Because construction of some levee segments would begin in 2015, a 70-year period would be required to evaluate impacts through the entire project life. Therefore, to evaluate project measures consistently, all measures were evaluated over a 70-year period.

The product of an HSI and the acreage of available habitat for a given target year is known as the Habitat Unit (HU). The HU is the basic unit for measuring project effects on fish and wildlife habitat. Future HUs change according to changes in habitat quality and/or quantity. Results are annualized over the period of analysis to determine the Average Annual Habitat Units (AAHUs) available for each habitat type.

The change in AAHUs for each FWP scenario, compared to FWOP project conditions, provides a measure of anticipated impacts. A net gain in AAHUs indicates that the project is beneficial to the habitat being evaluated; a net loss of AAHUs indicates that the project is damaging to that habitat type.

Construction of the proposed levee segments would replace a FWOP functional marsh with a levee and borrow canal under FWP. Because the deep waters of navigation canals and major bayous are assumed to provide little if any habitat value, such waterbodies are typically excluded from the project area. Therefore, the HET assumed that the deep water of the FWP borrow canal would also be of little value, and hence, was excluded from the FWP project area. Since there would be no remaining habitat quantity or quality FWP, the final WVA results were taken as the sum of marsh + water FWOP AAHUs.

Although the WVA methodology is relatively easy to use, the study schedule did not allow for collection of field data for WVA inputs. Instead, best professional judgment (based on past site visits) was used to provide Variable 2 and Variable 4 inputs necessary to the WVA (percent submerged aquatic vegetation and percent shallow open water, respectively). Wetland acreage predictions discussed above were used to provide V1 values. However, one WVA assessed impacts to wetlands under forced drainage along Four Pointe Bayou. Those wetlands were assumed to experience no loss throughout the 70-year evaluation period.

Salinity modeling (conducted using 2004 input data) was assumed to represent baseline and construction year salinity values. The model outputs consisted of average subunit salinities at 15 minute intervals throughout the year for FWOP and for a FWP scenario with all floodgates and structures open year-round. Effects of short-term HNC Lock closures to reduce saltwater intrusion were not incorporated into the project scenarios modeled, and therefore were not reflected in FWP V5 values for the direct impact assessments. The output 15 minute salinity values were averaged as needed to provide V5 inputs. Predicted salinities under future with SLR conditions were not available within the study schedule. Hence, the HET had to assume that future salinities would remain the same as in 2004. For all levee segments, FWOP V6 was assumed to be unrestricted (V6 = 1.0). FWOP WVA variables used to assess direct impacts are listed in Tables A and B.

Table A. FWOP WVA variables for assessing direct impacts of 35-year protection features scheduled for immediate construction.

			35-Year Levee Alternative					35-Year Levee Alternative					35-Year Levee Alternative				
Levee	Loss	Habitat	Low SLR					Medium SLR					High SLR				
Reach	Subunit	Type	TY	0	1	53	70	TY	0	1	47	70	TY	0	1	38	70
F-2	B13	INT	V1	81	79	0	0	V1	81	79	0	0	V1	81	79	0	0
			V2	0	0	0	0	V2	0	0	0	0	V2	0	0	0	0
			V3-1	80	80			V3-1	80	80			V3-1	80	80		
			V3-2	10	10			V3-2	10	10			V3-2	10	10		
			V3-3	10	10			V3-3	10	10			V3-3	10	10		
			V3-4					V3-4					V3-4				
			V3-5			100	100	V3-5			100	100	V3-5			100	100
			V4	35	35	3	0	V4	35	35	3	0	V4	35	35	2	0
			V5	0	0	0	0	V5	0	0	0	0	V5	0	0	0	0
			V5	5	5	5	5	V5	5	5	5	5	V5	5	5	5	5
			V6					V6					V6				
			V6	1.00	1.00	1.00	1.00	V6	1.00	1.00	1.00	1.00	V6	1.00	1.00	1.00	1.00
			TOT Ac	151	151	151	151	TOT Ac	151	151	151	151	TOT Ac	151	151	151	151
			% MF	0	0	0	0	% MF	0	0	0	0	% MF	0	0	0	0
			% INT	100	100	100	100	% INT	100	100	100	100	% INT	100	100	100	100

Levee	Loss	Habitat															
Reach	Subunit	Type	TY	0	1	53	70	TY	0	1	47	70	TY	0	1	38	70
F-1	B13	INT	V1	88	86	0	0	V1	88	86	0	0	V1	88	86	0	0
			V2	0	0	0	0	V2	0	0	0	0	V2	0	0	0	0
			V3-1	100	100			V3-1	100	100			V3-1	100	100		
			V3-2					V3-2					V3-2				
			V3-3					V3-3					V3-3				
			V3-4					V3-4					V3-4				
			V3-5			100	100	V3-5			100	100	V3-5			100	100
			V4	20	20	1	0	V4	20	20	1	0	V4	20	20	1	0
			V5	0	0	5	5	V5	0	0	5	5	V5	0	0	5	5
			V5	5	5	5	5	V5	5	5	5	5	V5	5	5	5	5
			V6	0	0	1	1	V6	0	0	1	1	V6	0	0	1	1
			V6	1	1	1	1	V6	1	1	1	1	V6	1	1	1	1
			TOT Ac	76	76	76	76	TOT Ac	76	76	76	76	TOT Ac	76	76	76	76
			% MF	7	7	7	7	% MF	7	7	7	7	% MF	7	7	7	7
			% INT	93	93	93	93	% INT	93	93	93	93	% INT	93	93	93	93

Levee	Loss	Habitat															
Reach	Subunit	Type	TY	0	1	53	70	TY	0	1	47	70	TY	0	1	38	70
F-1	B13	BR	V1	82	80	0	0	V1	82	80	0	0	V1	82	80	0	0
			V2	0	0	0	0	V2	0	0	0	0	V2	0	0	0	0
			V3-1	100	100			V3-1	100	100			V3-1	100	100		
			V3-2					V3-2					V3-2				
			V3-3					V3-3					V3-3				
			V3-4					V3-4					V3-4				
			V3-5			100	100	V3-5			100	100	V3-5			100	100
			V4	60	60	1	0	V4	60	60	1	0	V4	60	60	1	0
			V5					V5					V5				
			V5	5	5	5	5	V5	5	5	5	5	V5	5	5	5	5
			V6					V6					V6				
			V6	1	1	1	1	V6	1	1	1	1	V6	1	1	1	1
			TOT Ac	11	11	11	11	TOT Ac	11	11	11	11	TOT Ac	11	11	11	11

Table A. FWOP WVA variables for assessing direct impacts of 35-year protection features scheduled for immediate construction – continued.

			35-Year Levee Alternative					35-Year Levee Alternative					35-Year Levee Alternative				
Levee	Loss	Habitat	Low SLR					Medium SLR					High SLR				
Reach	Subunit	Type	TY	0	1		70	TY	0	1		70	TY	0	1		70
F-1	B15	BR	V1	77	77		53	V1	77	77		41	V1	77	77		1
			V2	0	0		0	V2	0	0		0	V2	0	0		0
			V3-1	70	70			V3-1	70	70			V3-1	70	70		
			V3-2				30	V3-2				20	V3-2				
			V3-3	30	30		40	V3-3	30	30		40	V3-3	30	30		
			V3-4				30	V3-4				40	V3-4				
			V3-5					V3-5					V3-5				100
			V4	15	15		6	V4	15	15		5	V4	15	15		0
			V5					V5					V5				
			V5	5	5		5	V5	5	5		5	V5	5	5		5
			V6					V6					V6				
			V6	1	1		1	V6	1	1		1	V6	1	1		1
			TOT Ac	244	244		244	TOT Ac	244	244		244	TOT Ac	244	244		244
Levee	Loss	Habitat															
Reach	Subunit	Type	TY	0	1		70	TY	0	1		70	TY	0	1	60	70
F-1	C21	BR	V1	70	70		32	V1	70	70		20	V1	70	70	0	0
			V2	0	0		0	V2	0	0		0	V2	0	0		0
			V3-1	100	100			V3-1	100	100			V3-1	100	100		
			V3-2					V3-2					V3-2				
			V3-3				20	V3-3				15	V3-3				
			V3-4				80	V3-4				85	V3-4				
			V3-5					V3-5					V3-5			100	100
			V4	25	25		5	V4	25	25		3	V4	25	25	0	0
			V5					V5					V5				
			V5	8	8		8	V5	8	8		8	V5	8	8	8	8
			V6					V6					V6				
			V6	1	1		1	V6	1	1		1	V6	1	1	1	1
			TOT Ac	36	36		36	TOT Ac	36	36		36	TOT Ac	36	36	36	36
Levee	Loss	Habitat															
Reach	Subunit	Type	TY	0	1		70	TY	0	1		70	TY	0	1	60	70
F-1 Ea.	C20	BR	V1	93	93		43	V1	93	93		27	V1	93	92	0	0
			V2	0	0		0	V2	0	0		0	V2	0	0	0	0
			V3-1	70	70			V3-1	70	70			V3-1	70	70		
			V3-2					V3-2					V3-2				
			V3-3	30	30		90	V3-3	30	30			V3-3	30	30		
			V3-4				10	V3-4				30	V3-4				
			V3-5					V3-5				70	V3-5			100	100
			V4	5	5		2	V4	5	5		0	V4	5	5	0	0
			V5					V5					V5				
			V5	6	6		6	V5	6	6		6	V5	6	6	6	6
			V6					V6					V6				
			V6	1	1		1	V6	1	1		1	V6	1	1	1	1
			TOT Ac	4	4		4	TOT Ac	4	4		4	TOT Ac	4	4	4	4

Table A. FWOP WVA variables for assessing direct impacts of 35-year protection features scheduled for immediate construction – continued.

			35-Year Levee Alternative					35-Year Levee Alternative					35-Year Levee Alternative				
Levee	**Loss**	**Habitat**	**Low SLR**					**Medium SLR**					**High SLR**				
Reach	**Subunit**	**Type**	TY	0	1		70	TY	0	1		70	TY	0	1	59	70
G-1	**C20**	**BR**	V1	80	80		36	V1	80	80		22	V1	80	79	0	0
			V2	0	0		0	V2	0	0		0	V2	0	0	0	0
			V3-1					V3-1					V3-1				
			V3-2	100	100			V3-2	100	100			V3-2	100	100		
			V3-3				50	V3-3				30	V3-3				
			V3-4				50	V3-4				70	V3-4				
			V3-5					V3-5					V3-5			100	100
			V4	5	5		1	V4	5	5		1	V4	5	5	0	0
			V5					V5					V5				
			V5	6	6		6	V5	6	6		6	V5	6	6	6	6
			V6					V6					V6				
			V6	1	1		1	V6	1	1		1	V6	1	1	1	1
			TOT Ac	2	2		2	TOT Ac	2	2		2	TOT Ac	2	2	2	2
Levee	**Loss**	**Habitat**															
Reach	**Subunit**	**Type**	TY	0	1		70	TY	0	1		70	TY	0	1	59	70
G1	**C21**	**BR**	V1	77	76		34	V1	77	76		20	V1	77	76	0	0
			V2	5	5		0	V2	5	5		0	V2	5	5	0	0
			V3-1	70	70			V3-1	70	70			V3-1	70	70		
			V3-2					V3-2					V3-2				
			V3-3	30	30			V3-3	30	30			V3-3	30	30		
			V3-4				40	V3-4				30	V3-4				
			V3-5				60	V3-5				70	V3-5			100	100
			V4	7	7		2	V4	7	7		1	V4	7	7	0	0
			V5					V5					V5				
			V5	8	8		8	V5	8	8		8	V5	8	8	8	8
			V6					V6					V6				
			V6	1	1		1	V6	1	1		1	V6	1	1	1	1
			TOT Ac	143	143		143	TOT Ac	143	143		143	TOT Ac	143	143	143	143
Levee	**Loss**	**Habitat**															
Reach	**Subunit**	**Type**	TY	TY	1		70	TY	0	1		70	TY	0	1	70	
G1	**C19**	**FM**	V1	73	73		73	V1	73	73		73	V1	73	73	73	
	Force		V2	10	10		10	V2	10	10		10	V2	10	10	10	
	Drained		V3-1	65	65		65	V3-1	65	65		65	V3-1	65	65	65	
			V3-2	35	35		35	V3-2	35	35		35	V3-2	35	35	35	
			V3-3					V3-3					V3-3				
			V3-4					V3-4					V3-4				
			V3-5					V3-5					V3-5				
			V4	65	65		65	V4	65	65		65	V4	65	65	65	
			V5					V5					V5				
			V5	0	0		0	V5	0	0		0	V5	0	0	0	
			V6					V6					V6				
			V6	0	0		0	V6	0	0		0	V6	0	0	0	
			TOT Ac	19	19		19	TOT Ac	19	19		19	TOT Ac	19	19	19	
			% MF	100	100		100	% MF	100	100		100	% MF	100	100	100	
			% INT	0	0		0	% INT	0	0		0	% INT	0	0	0	

Table B. FWOP WVA variables for assessing direct impacts of 100-year protection features scheduled for immediate construction.

			100-Year Levee Alternative					100-Year Levee Alternative					100-Year Levee Alternative				
Levee	Loss	Habitat	Low SLR					Medium SLR					High SLR				
Reach	Subunit	Type	TY	0	1	53	70	TY	0	1	47	70	TY	0	1	38	70
F-2	B13	INT	V1	79	78	0	0	V1	79	78	0	0	V1	79	78	0	0
			V2	0	0	0	0	V2	0	0	0	0	V2	0	0	0	0
			V3-1	85	85			V3-1	85	85			V3-1	85	85		
			V3-2	7	7			V3-2	7	7			V3-2	7	7		
			V3-3	8	8			V3-3	8	8			V3-3	8	8		
			V3-4					V3-4					V3-4				
			V3-5			100	100	V3-5			100	100	V3-5			100	100
			V4	25	25	1	0	V4	25	25	1	0	V4	25	25	1	0
			V5	0	0	5	5	V5	0	0	5	5	V5	0	0	5	5
			V5	5	5	5	5	V5	5	5	5	5	V5	5	5	5	5
			V6	0.0	0.0	0.0	0.0	V6	0.0	0.0	0.0	0.0	V6	0.0	0.0	0.0	0.0
			V6	1.0	1.0	1.0	1.0	V6	1.0	1.0	1.0	1.0	V6	1.0	1.0	1.0	1.0
			TOT Ac	188	188	188	188	TOT Ac	188	188	188	188	TOT Ac	188	188	188	188
			% FM	0	0	0	0	% FM	0	0	0	0	% FM	0	0	0	0
			% INT	100	100	100	100	% INT	100	100	100	100	% INT	100	100	100	100

Levee	Loss	Habitat															
Reach	Subunit	Type	TY	0	1	53	70	TY	0	1	47	70	TY	0	1	38	70
F-1	B13	INT	V1	86	85	0	0	V1	86	85	0	0	V1	86	85	0	0
			V2	0	0	0	0	V2	0	0	0	0	V2	0	0	0	0
			V3-1	100	100			V3-1	100	100			V3-1	100	100		
			V3-2					V3-2					V3-2				
			V3-3					V3-3					V3-3				
			V3-4					V3-4					V3-4				
			V3-5			100	100	V3-5			100	100	V3-5			100	100
			V4	20	20	1	0	V4	20	20	1	0	V4	20	20	1	0
			V5	0	0	5	5	V5	0	0	5	5	V5	0	0	5	5
			V5	5	5	5	5	V5	5	5	5	5	V5	5	5	5	5
			V6	0	0	1	1	V6	0	0	1	1	V6	0	0	1	1
			V6	1.0	1.0	1.0	1.0	V6	1.0	1.0	1.0	1.0	V6	1.0	1.0	1.0	1.0
			TOT Ac	85	85	85	85	TOT Ac	85	85	85	85	TOT Ac	85	85	85	85
			% FM	4	4	4	4	% FM	4	4	4	4	% FM	4	4	4	4
			% INT	96	96	96	96	% INT	96	96	96	96	% INT	96	96	96	96

Levee	Loss	Habitat															
Reach	Subunit	Type	TY	0	1	53	70	TY	0	1	47	70	TY	0	1	38	70
F-1	B13	BR	V1	81	80	0	0	V1	81	79	0	0	V1	81	79	0	0
			V2	0	0	0	0	V2	0	0	0	0	V2	0	0	0	0
			V3-1	100	100			V3-1	100	100			V3-1	100	100		
			V3-2					V3-2					V3-2				
			V3-3					V3-3					V3-3				
			V3-4					V3-4					V3-4				
			V3-5			100	100	V3-5			100	100	V3-5			100	100
			V4	60	60	1	0	V4	60	60	1	0	V4	60	60	1	0
			V5					V5					V5				
			V5	5	5	5	5	V5	5	5	5	5	V5	5	5	5	5
			V6					V6					V6				
			V6	1.0	1.0	1.0	1.0	V6	1.0	1.0	1.0	1.0	V6	1.0	1.0	1.0	1.0
			TOT Ac	12	12	12	12	TOT Ac	12	12	12	12	TOT Ac	12	12	12	12

Table B. FWOP WVA variables for assessing direct impacts of 100-year protection features scheduled for immediate construction - continued.

			100-Year Levee Alternative					100-Year Levee Alternative					100-Year Levee Alternative				
Levee	Loss	Habitat	Low SLR					Medium SLR					High SLR				
Reach	Subunit	Type	TY	0	1		70	TY	0	1		70	TY	0	1		70
F-1	B15	BR	V1	76	75		52	V1	75	75		40	V1	75	75		1
			V2	0	0		0	V2	0	0		0	V2	0	0		0
			V3-1	70	70			V3-1	70	70			V3-1	70	70		
			V3-2				30	V3-2				20	V3-2				
			V3-3	30	30		40	V3-3	30	30		40	V3-3	30	30		
			V3-4				30	V3-4				40	V3-4				
			V3-5					V3-5					V3-5				100
			V4	15	15		6	V4	15	15		5	V4	15	15		0
			V5					V5					V5				
			V5	5	5		5	V5	5	5		5	V5	5	5		5
			V6					V6					V6				
			V6	1.0	1.0		1.0	V6	1.0	1.0		1.0	V6	1.0	1.0		1.0
			TOT Ac	258	258		258	TOT Ac	258	258		258	TOT Ac	258	258		258
Levee	Loss	Habitat															
Reach	Subunit	Type	TY	0	1		70	TY	0	1		70	TY	0	1	60	70
F-1	C21	BR	V1	86	85		38	V1	86	85		24	V1	86	85	0	0
			V2	0	0		0	V2	0	0		0	V2	0	0	0	0
			V3-1	100	100			V3-1	100	100			V3-1	100	100		
			V3-2					V3-2					V3-2				
			V3-3				20	V3-3				15	V3-3				
			V3-4				80	V3-4				85	V3-4				
			V3-5					V3-5					V3-5			100	100
			V4	25	25		5	V4	25	25		3	V4	25	25	0	0
			V5					V5					V5				
			V5	8	8		8	V5	8	8		8	V5	8	8	8	8
			V6					V6					V6				
			V6	1.0	1.0		1.0	V6	1.0	1.0		1.0	V6	1.0	1.0	1.0	1.0
			TOT Ac	92	92		92	TOT Ac	92	92		92	TOT Ac	92	92	92	92
Levee	Loss	Habitat															
Reach	Subunit	Type	TY	0	1		70	TY	0	1		70	TY	0	1	60	70
F-1 Ea.	C20	BR	V1	93	93		43	V1	93	93		27	V1	93	92	0	0
			V2	0	0		0	V2	0	0		0	V2	0	0	0	0
			V3-1	100	100			V3-1	100	100			V3-1	100	100		
			V3-2					V3-2					V3-2				
			V3-3				90	V3-3					V3-3				
			V3-4				10	V3-4				30	V3-4				
			V3-5					V3-5				70	V3-5			100	100
			V4	5	5		2	V4	5	5		0	V4	5	5	0	0
			V5					V5					V5				
			V5	6	6		6	V5	6	6		6	V5	6	6	6	6
			V6					V6					V6				
			V6	1.0	1.0		1.0	V6	1.0	1.0		1.0	V6	1.0	1.0	1.0	1.0
			TOT Ac	4	4		4	TOT Ac	4	4		4	TOT Ac	4	4	4	4

Table B. FWOP WVA variables for assessing direct impacts of 100-year protection features scheduled for immediate construction - continued.

			100-Year Levee Alternative					100-Year Levee Alternative					100-Year Levee Alternative				
Levee	**Loss**	**Habitat**	**Low SLR**					**Medium SLR**					**High SLR**				
Reach	**Subunit**	**Type**	TY	0	1		70	TY	0	1		70	TY	0	1	59	70
G-1	**C20**	**BR**	V1	69	69		31	V1	69	69		19	V1	69	69	0	0
			V2	0	0		0	V2	0	0		0	V2	0	0	0	0
			V3-1	70	70			V3-1	70	70			V3-1	70	70		
			V3-2					V3-2					V3-2				
			V3-3	30	30		50	V3-3	30	30		30	V3-3	30	30		
			V3-4				50	V3-4				70	V3-4				
			V3-5					V3-5					V3-5			100	100
			V4	10	10		2	V4	10	10		1	V4	10	10	0	0
			V5					V5					V5				
			V5	6	6		6	V5	6	6		6	V5	6	6	6	6
			V6					V6					V6				
			V6	1.0	1.0		1.0	V6	1.0	1.0		1.0	V6	1.0	1.0	1.0	1.0
			TOT Ac	4	4		4	TOT Ac	4	4		4	TOT Ac	4	4	4	4
Levee	**Loss**	**Habitat**															
Reach	**Subunit**	**Type**	TY	0	1		70	TY	0	1		70	TY	0	1	59	70
G1	**C21**	**BR**	V1	78	78		35	V1	78	77		21	V1	78	77	0	0
			V2	5	5		0	V2	5	5		0	V2	5	5	0	0
			V3-1	70	70			V3-1	70	70			V3-1	70	70		
			V3-2					V3-2					V3-2				
			V3-3	30	30			V3-3	30	30			V3-3	30	30		
			V3-4				40	V3-4				30	V3-4				
			V3-5				60	V3-5				70	V3-5			100	100
			V4	7	7		2	V4	7	7		1	V4	7	7	0	0
			V5					V5					V5				
			V5	8	8		8	V5	8	8		8	V5	8	8	8	8
			V6					V6					V6				
			V6	1.0	1.0		1.0	V6	1.0	1.0		1.0	V6	1.0	1.0	1.0	1.0
			TOT Ac	175	175		175	TOT Ac	175	175		175	TOT Ac	175	175	175	175
Levee	**Loss**	**Habitat**															
Reach	**Subunit**	**Type**	TY	0	1		70	TY	0	1		70	TY	0	1	70	
G1	**C19**	**FM**	V1	79	79		79	V1	79	79		79	V1	79	79	79	
	Force		V2	10	10		10	V2	10	10		10	V2	10	10	10	
	Drained		V3-1	65	65		65	V3-1	65	65		65	V3-1	65	65	65	
			V3-2	35	35		35	V3-2	35	35		35	V3-2	35	35	35	
			V3-3					V3-3					V3-3				
			V3-4					V3-4					V3-4				
			V3-5					V3-5					V3-5				
			V4	65	65		65	V4	65	65		65	V4	65	65	65	
			V5					V5					V5				
			V5	0	0		0	V5	0	0		0	V5	0	0	0	
			V6					V6					V6				
			V6	0.0	0.0		0.0	V6	0.0	0.0		0.0	V6	0.0	0.0	0.0	
			TOT Ac	33	33		33	TOT Ac	33	33		33	TOT Ac	33	33	33	
			% FM	100	100		100	% FM	100	100		100	% FM	100	100	100	
			% INT	0	0		0	% INT	0	0		0	% INT	0	0	0	

Indirect Impacts WVAs

In addition to direct construction impacts, project implementation might alter hydroperiod, salinity, and fish access to enclosed wetlands. Exterior wetlands could also be affected through project-induced salinity reductions and/or salinity increases. The HET examined hydrologic model results regarding project-induced water level changes. There was little if any change, and the HET assumed that those changes were not significant. Consequently, the HET did not attempt to assess impacts associated with project-induced changes in hydroperiod.

The HET also examined predicted salinity changes for subunits inside and outside the levee system. Because FWP salinities did not include the anticipated short-term HNC Lock closures to provide saltwater intrusion protection, the HET merged salinity outputs from a model run where the Lock was closed year-round with Plan 1 outputs (all gates open year-round) to create a Modified Plan 1 salinity output. Due to widely varying estimates of Lock closure duration, substantial uncertainty regarding Modified Plan 1 salinities, and the relatively minor change in predicted Modified Plan 1 salinities (which used a liberal estimate of lock closure duration), the HET decided that project-induced salinity reductions were too uncertain to quantify at this time. Predicted salinity increases were noted for marshes south of the Lock, during lock closure periods. However, the salinities remained within the optimal brackish marsh range according to WVA models. As a result, the HET decided not to assess benefits or impacts associated with project-induced salinity increases or decreases.

Because all Morganza floodgates and environmental structures would be closed only upon approach of a tropical storm, fisheries access interruptions would occur on average roughly 1 or 2 days per year. However, the duration of HNC Lock closures to reduce saltwater intrusion would likely be greater, and could result in quantifiable fish access interruptions. However, there were substantial uncertainties regarding the duration of lock closures. Additionally, effects of HNC Lock closures would potentially be reduced because the adjoining Bayou Grand Caillou floodgate would remain open to provide fish access. Lacking more definitive information on project-induced water exchange flux, the HET decided that the uncertainties were too great to propose project-induced reductions in fisheries access. As a result of its evaluations, the HET decided not to quantify any indirect impacts or indirect benefits associated with project implementation due to hydrology changes or fisheries access reductions

Mitgation WVAs.

To compensate for marsh losses associated with construction of levee reaches F1, F2, G1, the HNC Lock, and the Bayou Grand Caillou Floodgate, the HET evaluated several marsh creation projects under the medium SLR scenario. Construction impacts to fresh and intermediate marshes would be mitigated by marsh creation in the intermediate marshes of subunit B13 (open water areas south of Falgout Canal). Construction impacts to brackish marshes would be mitigated via marsh creation in the Felix Lake area (subunit B15 open water area immediately west of the HNC Lock). WVA variables used to quantify benefits of proposed marsh creation measures are provided in Table C.

Table C. WVA variables used to determine benefits of potential marsh creation mitigation projects.

			Medium SLR			Medium SLR					
Loss Subunit	**Habitat Type**		FWOP TY0	FWOP TY1	FWOP TY70	FWP TY1	FWP TY3	FWP TY5	FWP TY6	FWP TY32	FWP TY70
B13	**INT**	V1	0	0	0	10	25	97	96	77	19
		V2	0	0	0	0	0	0	0	0	0
		V3-1						50	100	77	
		V3-2								23	
		V3-3					100	50			
		V3-4									15
		V3-5	100	100	100	100					85
		V4	20	20	0	100	100	100	100	100	5
		V5	0	0	0	0	0	0	0	0	0
		V5	5	5	5	4	4	4	4	4	4
		V6									
		V6	1.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00
		TOT Ac	100	100	100	100	100	100	100	100	100
		% FM	0	0	0	0	0	0	0	0	0
		% INT	100	100	100	100	100	100	100	100	100

Loss Subunit	**Habitat Type**		FWOP TY0	FWOP TY1	FWOP TY70	FWP TY1	FWP TY3	FWP TY5	FWP TY6	FWP TY32	FWP TY70
B15	**BR**	V1	0	0	0	10	25	99	99	90	64
		V2	0	0	0	0	0	0	0	0	0
		V3-1	70	70				50	100	90	
		V3-2			20					10	25
		V3-3	30	30	40		100	50			75
		V3-4			40						
		V3-5				100					
		V4	60	60	0	100	100	100	100	100	70
		V5									
		V5	5	5	5	4	4	4	4	4	4
		V6									
		V6	1	1	1	0.00	0.00	1	1	1	1
		TOT Ac	500	500	500	500	500	500	500	500	500

Predicting Future Acreage of Marsh Creation Mitigation Projects

Mathematical formulas were developed for use in Excel spreadsheets to calculate net marsh creation project acres over time. A number of assumptions regarding loss rate reduction and the rate at which vegetation colonizes the created marsh platform were incorporated into those formulas and calculate the acres of functioning marsh for every year of the project life. To include the additional marsh loss under the medium and high SLR scenarios, the formulas under those scenarios were more complex than the formulas to calculate marsh creation acres under the low SLR scenario.

Marsh Creation Assumptions:

a) The created marsh loss rate is initially 50% of the loss rate of surrounding marshes provided that accretion above the created marsh platform is less than 10 inches.

b) The loss rate of created marsh will revert to background or baseline loss rates once 10 inches or more of post-construction accretion has occurred above the constructed marsh platform.

c) Given a study area average accretion rate of 0.91 cm/yr (Table D), and assuming an initial 3-yr settling period, 31 years is required to accrete 10 inches of soil above the created marsh platform. Prior to that time, loss rate is 50% of the background loss rate. Once 10 inches of soil has accreted, the loss rate reverts back to 100% of the background rate.

d) The FWOP condition is assumed to be all open water. Consequently, no formulas are needed to calculate FWOP marsh loss over time.

e) Functionality/vegetation of the created brackish marsh is per standard planted marsh protocols (TY1 = 10%, TY3=25%, TY5= 100%).

f) Functionality/vegetation of the created intermediate marsh is per standard planted marsh protocols (TY1= 10%, TY3=25%, TY5=100%).

g) Percent functionality for TY2 and TY4 is assumed to be midway between percent functionality values for the year before and after (TY2 is 18% and TY4 is 63%).

h) Loss of constructed marsh platform assumed to occur immediately after construction (at 50% of the marsh loss rate), independent of percent functionality/vegetation.

Formula inputs include:

1. AC – the acres of marsh to be created.
2. YC - year in which the marsh creation project is constructed.
3. MCLR - marsh creation loss rate in acres/yr. Calculated as (Polygon loss rate * Created acres)*50%. A loss rate is indicated by a negative value.
4. RCH - year FWP loss rate reverts from 50% of the polygon loss rate to 100% of the polygon loss rate. This year is calculated as the YC + 31 years.
5. YR – calendar year
6. SLR – additional loss rate due to increased sea level rise under the medium and high SLR scenarios (see Figure 5 and associated discussion above). SLR values increase each year after sea level rise acceleration begins in 2010.
7. PAC - prior year's marsh creation acreage.

Table D. Terrebonne Basin marsh soil accretion measurements from Jarvis (2010).

Location	Time Period	Habitat Type	Method	(cm/yr)	Reference
Deteriorating brackish	1989-1994	Brackish	137Cs	0.96	Nyman et al., 2006
Stable brackish	1989-1994	Brackish	137Cs	0.88	Nyman et al., 2006
N Billy Goat Bay	1963-1990	Brackish/saline	137Cs	1.06	Nyman et al., 1993
N Madison Bay	1963-1990	Brackish/saline	137Cs	1.33	Nyman et al., 1993
SE Madison Bay	1963-1990	Brackish/saline	137Cs	0.67	Nyman et al., 1993
W Madison Bay	1963-1990	Brackish/saline	137Cs	0.78	Nyman et al., 1993
Bay la Peur	1963-1990	Saline	137Cs	0.78	Nyman et al., 1993
Charles Theriot	1963-1990	Saline	137Cs	0.98	Nyman et al., 1993
Chitigue (upstream)	1963-1990	Saline	137Cs	1.22	Nyman et al., 1993
Chitigue (midstream)	1963-1990	Saline	137Cs	0.75	Nyman et al., 1993
Chitigue (downstream)	1963-1990	Saline	137Cs	0.98	Nyman et al., 1993
deMangue (upstream)	1963-1990	Saline	137Cs	0.94	Nyman et al., 1993
deMangue (midstream)	1963-1990	Saline	137Cs	1.28	Nyman et al., 1993
deMangue (downstream)	1963-1990	Saline	137Cs	0.56	Nyman et al., 1993
DuFrene	1963-1990	Saline	137Cs	0.55	Nyman et al., 1993
Fourleauge Bay	1975-1979	Saline	137Cs	0.66	Baumann et al., 1984
Grand Bayou	1963-1990	Saline	137Cs	1.04	Nyman et al., 1993
Lake Barre	1963-1990	Saline	137Cs	1.78	Nyman et al., 1993
Old Oyster Bayou	1992-2000	Saline	137Cs	0.48	Rybczyk and Cahoon, 2002
Stable saline	1989-1994	Saline	137Cs	0.59	Nyman et al., 2006
			Average =	**0.91**	

FWP Excel Formula for Marsh Creation Acres – Low SLR Scenario:
=IF(YR<YC,0,IF(YR=YC,(AC+MCLR)*0.1,IF(YR=YC+1,(AC+2*MCLR)*0.18,IF(YR=YC+2,(AC+3*MCLR)*0.25,IF(YR=YC+3,(AC+4*MCLR)*0.63,IF(YR=YC+4,(AC+5*MCLR),IF(YR<RCH,IF(PAC+MCLR<0,0,PAC+MCLR),IF(PAC+2*MCLR<0,0,PAC+2*MCLR)))))))).

FWP Excel Formula for Marsh Creation Acres – Medium and High Scenario:
=IF(YR<YC,0,IF(YR=YC,(AC+MCLR+SLR*AC)*0.1,IF(YR=YC+1,(AC+2*MCLR+SLR*AC)*0.18, IF(YR=YC+2,(AC+3*MCLR+SLR*AC)*0.25,IF(YR=YC+3,(AC+4*MCLR+SLR*AC)*0.63, IF(YR=YC+4,(AC+5*MCLR+SLR*AC),IF(YR<RCH,IF(PAC+MCLR+AC*SLR<0,0,PAC+MCLR+AC*SLR),IF(PAC+2MCLR+AC*SLR<0,0,PAC+MCLR+AC*SLR)))))))).

LITERATURE CITED

Baumann, R. H., J. W. Day, and C. A. Miller. 1984. Mississippi deltaic wetland survival: Sedimentation versus coastal submergence. *Science* 224: 1093-1095.

Jarvis, J.C. 2010. Vertical accretion rates in coastal Louisiana: a review of the scientific literature. Technical Note ERDC/EL TN-10-5. U.S. Army Engineer Research and Development Center, Vicksburg, MS.,August 2010.

Louisiana Coastal Wetlands Conservation and Restoration Task Force. 2006b. Coastal Wetlands Planning, Protection, and Restoration Act - Wetland Value Assessment Methodology: Procedural Manual. Environmental Work Group. 23 pp.

Nyman, J.A., DeLaune, R.D., Roberts, H.H., Patrick, W.H. Jr. 1993. Relationship between vegetation and soil formation in a rapidly submerging coastal marsh. Marine Ecology Progress Series Vol. 96: 269-279.

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.

Rybczyk, J. M., and D. R. Cahoon. 2002. Estimating the potential for submergence for two wetlands in the Mississippi River delta. *Estuaries* 25(5): 985-998.

Low SLR Scenario - Construction Impacts Summary by Reach and Habitat Type

3% Levee Reach	Fresh Hwds (acres)	Fresh Swamp (acres)	Tidal Habitats Marsh (acres)	Tidal Habitats Water* (acres)	INT Tidal Habitats Marsh (acres)	INT Tidal Habitats Water* (acres)	BR Tidal Habitats Marsh (acres)	BR Tidal Habitats Water* (acres)	SAL Tidal Habitats Marsh (acres)	SAL Tidal Habitats Water* (acres)	Force Drained (non-tidal) Marsh (acres)	Force Drained (non-tidal) Water (acres)	Total Tidal Water* acres	Total Tidal Marsh acres	Total Marsh (acres)	Total Mitigation	Marsh Created with Constr$$	Net marsh	Total Mitigation after marsh created with Constr$$
Barrier	170.00	475.06	157.46	6.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.07	157.46	**157.46**				
A	65.18	50.89	305.59	38.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.51	305.59	**305.59**				
B	0.00	0.00	103.37	14.65	26.73	112.30	0.00	0.00	0.00	0.00	0.00	37.41	126.95	130.10	**130.10**				
E-1	0.00	0.00	0.00	0.00	56.01	135.57	0.00	0.00	0.00	0.00	0.00	0.00	135.57	56.01	**56.01**				
E-2	0.00	0.00	0.00	0.00	9.36	154.43	0.00	0.00	0.00	0.00	0.00	1.38	154.43	9.36	**9.36**				
F-1	0.00	0.00	0.00	0.00	74.58	15.69	216.70	67.68	0.00	0.00	0.00	0.00	83.37	291.28	**291.28**				
F-2	0.00	0.00	0.00	0.00	119.80	31.64	0.00	0.00	0.00	0.00	0.00	0.00	31.64	119.80	**119.80**				
G-1	0.00	0.00	0.00	0.00	0.00	0.00	110.80	34.73	0.00	0.00	14.06	5.10	34.73	110.80	**124.86**				
G-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.53	63.27	0.00	0.00	63.27	28.53	**28.53**				
G-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.40	16.20	0.00	0.00	16.20	33.40	**33.40**				
H-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	83.43	53.35	0.00	0.00	53.35	83.43	**83.43**				
H-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	138.14	71.95	0.00	0.00	71.95	138.14	**138.14**				
H-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	73.74	192.95	0.00	0.00	192.95	73.74	**73.74**				
I-1	0.00	0.00	0.00	0.00	0.00	0.00	74.36	73.47	0.39	0.20	0.00	0.15	73.67	74.75	**74.75**				
I-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	66.00	95.15	0.00	0.91	95.15	66.00	**66.00**				
I-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	69.15	109.55	0.00	0.00	109.55	69.15	**69.15**				
J-1	0.00	0.00	0.00	0.00	39.97	151.21	0.00	0.00	1.56	10.33	0.00	0.25	161.54	41.53	**41.53**				
J-2	0.00	0.00	0.00	0.00	0.00	0.00	25.86	177.14	24.51	157.09	17.25	1.29	334.23	50.37	**67.62**				
J-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.65	89.83	0.00	0.00	89.83	17.65	**17.65**				
K	0.00	0.00	0.00	0.00	0.00	0.00	88.84	413.09	0.00	0.00	0.00	0.20	413.09	88.84	**88.84**				
L	0.00	0.00	0.00	0.00	70.99	35.22	70.80	101.57	0.00	0.00	0.00	5.36	136.79	141.79	**141.79**				
Total previous	235.18	525.95	566.42	59.23	397.44	636.06	587.36	867.68	536.50	859.87	31.31	52.05	2,422.84	2,087.72	2,119.03	2,880.16	1,175.00	944.03	1,705.16
Mitigation	$ 52,209,960	$ 58,380,450													$ 169,522,400	$ 280,112,810		$ 75,522,400	$ 186,112,810
Monitoring	$ 658,504	$ 1,472,660													$ 5,933,284	$ 8,064,448		$ 5,933,284	$ 8,064,448
LG	23.85	0.00	0.00	0.00	18.68	0.70	0.00	0.00	0.00	0.00	0.00	11.13	0.70	18.68	**18.68**	42.53			42.53
Mitigation	$ 5,294,700	$ -													$ 1,494,400	6,789,100.00			$ 6,789,100
Monitoring	$ 66,780	$ -													$ 52,304	119,084.00			$ 119,084
LL	171.06	35.66	85.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84	0.00	85.67	**85.67**	292.39			292.39
Mitigation	$ 37,975,320	$ 3,958,260													$ 6,853,600	$ 48,787,180			$ 48,787,180
Monitoring	$ 478,968	$ 99,848													$ 239,876	$ 818,692			$ 818,692
TOTAL	430.09	561.61	652.09	59.23	416.12	636.76	587.36	867.68	536.50	859.87	31.31	66.02	2,423.54	2,192.07	**2,223.38**	3,215.08			2,040.08
Mitigation	$ 95,479,980	$ 62,338,710													$ 177,870,400	$ 335,689,090			$ 241,689,090
Monitoring	$ 1,204,252	$ 1,572,508													$ 6,225,464	$ 9,002,224			$ 9,002,224

Low SLR Scenario - Construction Impacts Summary by Reach and Habitat Type

1% Levee Reach	Fresh Hwds (acres)	Fresh Swamp (acres)	Tidal Habitats Marsh (acres)	Tidal Habitats Water* (acres)	INT Tidal Habitats Marsh (acres)	INT Tidal Habitats Water* (acres)	BR Tidal Habitats Marsh (acres)	BR Tidal Habitats Water* (acres)	SAL Tidal Habitats Marsh (acres)	SAL Tidal Habitats Water* (acres)	Force Drained (non-tidal) Marsh (acres)	Force Drained (non-tidal) Water (acres)	Total Tidal Water* acres	Total Tidal Marsh acres	Total Marsh (acres)	Total Mitigation	Marsh Created with Constr$$	Net marsh	Total Mitigation after marsh created with Constr$$
Barrier	201.87	547.48	208.82	47.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47.90	208.82	**208.82**				
A	80.52	12.89	361.65	43.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43.00	361.65	**361.65**				
B	0.00	0.00	143.61	19.50	38.71	150.57	0.00	0.00	0.00	0.00	0.00	38.95	170.07	182.32	**182.32**				
E-1	0.00	0.00	0.00	0.00	93.87	191.04	0.00	0.00	0.00	0.00	0.00	0.00	191.04	93.87	**93.87**				
E-2	0.00	0.00	0.00	0.00	38.80	215.69	0.00	0.00	0.00	0.00	0.00	4.16	215.69	38.80	**38.80**				
F-1	0.00	0.00	0.00	0.00	83.58	16.33	275.69	78.16	0.00	0.00	0.00	0.00	94.49	359.27	**359.27**				
F-2	0.00	0.00	0.00	0.00	146.71	41.58	0.00	0.00	0.00	0.00	0.00	0.00	41.58	146.71	**146.71**				
G-1	0.00	0.00	0.00	0.00	0.00	0.00	138.74	40.68	0.00	0.00	26.39	0.00	40.68	138.74	**165.13**				
G-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.67	95.89	0.00	0.00	95.89	52.67	**52.67**				
G-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42.94	28.74	0.00	0.00	28.74	42.94	**42.94**				
H-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	112.08	79.04	0.00	0.00	79.04	112.08	**112.08**				
H-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	186.61	106.34	0.00	0.00	106.34	186.61	**186.61**				
H-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	102.52	119.39	0.00	0.00	119.39	102.52	**102.52**				
I-1	0.00	0.00	0.00	0.00	0.00	0.00	82.63	100.54	0.41	0.22	0.00	0.15	100.76	83.04	**83.04**				
I-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	86.32	139.14	0.00	0.91	139.14	86.32	**86.32**				
I-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90.63	143.58	0.00	0.00	143.58	90.63	**90.63**				
J-1	0.00	0.00	0.00	0.00	79.26	216.48	0.00	0.00	1.96	12.77	2.36	0.76	229.25	81.22	**83.58**				
J-2	0.00	0.00	0.00	0.00	0.00	0.00	40.39	299.67	34.52	200.03	28.28	2.04	499.70	74.91	**103.19**				
J-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.58	123.15	0.00	4.34	123.15	25.58	**25.58**				
K	0.00	0.00	0.00	0.00	0.00	0.00	138.99	551.99	0.00	0.00	0.00	0.37	551.99	138.99	**138.99**				
L	0.00	0.00	0.00	0.00	105.49	69.51	106.92	127.52	0.00	0.00	0.00	6.84	197.03	212.41	**212.41**				
Total previous	282.39	560.37	714.08	110.40	586.42	901.21	783.36	1,198.56	736.24	1,048.29	57.03	58.52	3,258.45	2,820.10	2,877.13	3,719.89	1,175.00	1,702.13	2,544.89
Mitigation	$ 62,690,580	$ 62,201,070													$ 230,170,400	$ 355,062,050		$ 136,170,400	$ 261,062,050
Monitoring	$ 790,692	$ 1,569,036													$ 8,055,964	$ 10,415,692		$ 8,055,964	$ 10,415,692
LG	50.95	0.00	0.00	0.00	29.69	1.11	0.00	0.00	0.00	0.00	0.00	18.39	1.11	29.69	**29.69**	80.64			80.64
Mitigation	$ 11,310,900	$ -													$ 2,375,200	13,686,100.00			$ 13,686,100
Monitoring	$ 142,660	$ -													$ 83,132	225,792.00			$ 225,792
LL	186.92	38.92	88.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84	0.00	88.72	**88.72**	314.56			314.56
Mitigation	$ 41,496,240	$ 4,320,120													$ 7,097,600	$ 52,913,960			$ 52,913,960
Monitoring	$ 523,376	$ 108,976													$ 248,416	$ 880,768			$ 880,768
TOTAL	520.26	599.29	802.80	110.40	616.11	902.32	783.36	1,198.56	736.24	1,048.29	57.03	79.75	3,259.56	2,938.51	**2,995.54**	4,115.09			2,940.09
Mitigation	$ 115,497,720	$ 66,521,190													$ 239,643,200	$ 421,662,110			$ 327,662,110
Monitoring	$ 1,456,728	$ 1,678,012													$ 8,387,512	$ 11,522,252			$ 11,522,252

Intermediate SLR Scenario - Construction Impacts Summary by Reach and Habitat Type

3% Levee Reach	Fresh Hwds (acres)	Swamp (acres)	Marsh (acres)	Tidal Habitats Water* (acres)	INT Habitats Marsh (acres)	Tidal Water* (acres)	BR Habitats Marsh (acres)	Tidal Water* (acres)	SAL Habitats Marsh (acres)	Tidal Water* (acres)	Force Drained Marsh (acres)	(non-tidal) Water (acres)	Total Tidal Water* acres	Total Tidal Marsh acres	Total Marsh (acres)
Barrier	170.00	475.06	157.05	6.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.48	157.05	**157.05**
A	65.18	50.89	305.02	39.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39.08	305.02	**305.02**
B	0.00	0.00	103.31	14.65	26.72	112.37	0.00	0.00	0.00	0.00	0.00	37.41	127.02	130.03	**130.03**
E-1	0.00	0.00	0.00	0.00	55.97	135.61	0.00	0.00	0.00	0.00	0.00	0.00	135.61	55.97	**55.97**
E-2	0.00	0.00	0.00	0.00	9.36	154.43	0.00	0.00	0.00	0.00	0.00	1.38	154.43	9.36	**9.36**
F-1	0.00	0.00	0.00	0.00	74.53	15.74	216.56	67.82	0.00	0.00	0.00	0.00	83.56	291.09	**291.09**
F-2	0.00	0.00	0.00	0.00	119.70	31.74	0.00	0.00	0.00	0.00	0.00	0.00	31.74	119.70	**119.70**
G-1	0.00	0.00	0.00	0.00	0.00	0.00	110.69	34.84	0.00	0.00	14.06	5.10	34.84	110.69	**124.75**
G-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.50	63.30	0.00	0.00	63.30	28.50	**28.50**
G-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.37	16.23	0.00	0.00	16.23	33.37	**33.37**
H-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	83.38	53.40	0.00	0.00	53.40	83.38	**83.38**
H-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	138.02	72.07	0.00	0.00	72.07	138.02	**138.02**
H-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	73.68	193.01	0.00	0.00	193.01	73.68	**73.68**
I-1	0.00	0.00	0.00	0.00	0.00	0.00	74.30	73.53	0.39	0.20	0.00	0.15	73.73	74.69	**74.69**
I-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.89	95.26	0.00	0.91	95.26	65.89	**65.89**
I-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	69.03	109.67	0.00	0.00	109.67	69.03	**69.03**
J-1	0.00	0.00	0.00	0.00	39.94	151.24	0.00	0.00	1.56	10.33	0.00	0.25	161.57	41.50	**41.50**
J-2	0.00	0.00	0.00	0.00	0.00	0.00	25.85	177.15	24.47	157.13	17.25	1.29	334.28	50.32	**67.57**
J-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.61	89.87	0.00	0.00	89.87	17.61	**17.61**
K	0.00	0.00	0.00	0.00	0.00	0.00	88.76	413.17	0.00	0.00	0.00	0.20	413.17	88.76	**88.76**
L	0.00	0.00	0.00	0.00	70.87	35.34	70.67	101.70	0.00	0.00	0.00	5.36	137.04	141.54	**141.54**
Total previous	235.18	525.95	565.38	60.21	397.09	636.47	586.83	868.21	535.90	860.47	31.31	52.05	2,425.36	2,085.20	2,116.51
Mitigation	$ 52,209,960	$ 58,380,450													$ 169,320,800
Monitoring	$ 658,504	$ 1,472,660													$ 5,926,228
LG	23.85	0.00	0.00	0.00	18.67	0.71	0.00	0.00	0.00	0.00	0.00	11.13	0.71	18.67	**18.67**
Mitigation	$ 5,294,700	$ -													$ 1,493,600
Monitoring	$ 66,780	$ -													$ 52,276
LL	171.06	35.66	85.64	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84	0.03	85.64	**85.64**
Mitigation	$ 37,975,320	$ 3,958,260													$ 6,851,200
Monitoring	$ 478,968	$ 99,848													$ 239,792
TOTAL	430.09	561.61	651.02	60.24	415.76	637.18	586.83	868.21	535.90	860.47	31.31	66.02	2,426.10	2,189.51	**2,220.82**
Mitigation	$ 95,479,980	$ 62,338,710													$ 177,665,600
Monitoring	$ 1,204,252	$ 1,572,508													$ 6,218,296

3% alternative

3% Levee Reach	**Total Mitigation**	Marsh Created with Constr$$	Net marsh	Total Mitigation after marsh created with Constr$$
Total previous	2,877.64	1,175.00	941.51	1,702.64
Mitigation	$ 279,911,210		$ 75,320,800	$ 185,911,210
Monitoring	$ 8,057,392		$ 5,926,228	$ 8,057,392
LG	42.52			42.52
Mitigation	6,788,300.00			$ 6,788,300
Monitoring	119,056.00			$ 119,056
LL	292.36			292.36
Mitigation	$ 48,784,780			$ 48,784,780
Monitoring	$ 818,608			$ 818,608
TOTAL	3,212.52			2,037.52
Mitigation	$ 335,484,290			$ 241,484,290
Monitoring	$ 8,995,056			$ 8,995,056

Intermediate SLR Scenario - Construction Impacts Summary by Reach and Habitat Type

1% Levee Reach	Fresh Hwds (acres)	Swamp (acres)	Marsh (acres)	Tidal Habitats Water* (acres)	INT Habitats Marsh (acres)	Tidal Water* (acres)	BR Habitats Marsh (acres)	Tidal Water* (acres)	SAL Marsh (acres)	Tidal Habitats Water* (acres)	Force Drained Marsh (acres)	(non-tidal) Water (acres)	Total Tidal Water* acres	Total Tidal Marsh acres	Total Marsh (acres)
Barrier	201.87	547.48	208.70	48.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48.02	208.70	**208.70**
A	80.52	12.89	361.46	43.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43.19	361.46	**361.46**
B	0.00	0.00	143.53	19.51	38.69	150.66	0.00	0.00	0.00	0.00	0.00	38.95	170.17	182.22	**182.22**
E-1	0.00	0.00	0.00	0.00	93.80	191.11	0.00	0.00	0.00	0.00	0.00	0.00	191.11	93.80	**93.80**
E-2	0.00	0.00	0.00	0.00	38.77	215.72	0.00	0.00	0.00	0.00	0.00	4.16	215.72	38.77	**38.77**
F-1	0.00	0.00	0.00	0.00	83.52	16.39	275.52	78.33	0.00	0.00	0.00	0.00	94.72	359.04	**359.04**
F-2	0.00	0.00	0.00	0.00	146.59	41.70	0.00	0.00	0.00	0.00	0.00	0.00	41.70	146.59	**146.59**
G-1	0.00	0.00	0.00	0.00	0.00	0.00	138.60	40.82	0.00	0.00	26.39	0.00	40.82	138.60	**164.99**
G-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.61	95.95	0.00	0.00	95.95	52.61	**52.61**
G-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42.89	28.79	0.00	0.00	28.79	42.89	**42.89**
H-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	111.99	79.13	0.00	0.00	79.13	111.99	**111.99**
H-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	186.44	106.51	0.00	0.00	106.51	186.44	**186.44**
H-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	102.43	119.48	0.00	0.00	119.48	102.43	**102.43**
I-1	0.00	0.00	0.00	0.00	0.00	0.00	82.56	100.61	0.41	0.22	0.00	0.15	100.83	82.97	**82.97**
I-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	86.18	139.28	0.00	0.91	139.28	86.18	**86.18**
I-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90.47	143.74	0.00	0.00	143.74	90.47	**90.47**
J-1	0.00	0.00	0.00	0.00	79.20	216.54	0.00	0.00	1.96	12.77	2.36	0.76	229.31	81.16	**83.52**
J-2	0.00	0.00	0.00	0.00	0.00	0.00	40.36	299.70	34.46	200.09	28.28	2.04	499.79	74.82	**103.10**
J-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.53	123.20	0.00	4.34	123.20	25.53	**25.53**
K	0.00	0.00	0.00	0.00	0.00	0.00	138.88	552.10	0.00	0.00	0.00	0.37	552.10	138.88	**138.88**
L	0.00	0.00	0.00	0.00	105.40	69.60	106.81	127.63	0.00	0.00	0.00	6.84	197.23	212.21	**212.21**
Total previous	282.39	560.37	713.69	110.72	585.97	901.73	782.73	1,199.19	735.37	1,049.16	57.03	58.52	3,260.79	2,817.76	2,874.79
Mitigation	$ 62,690,580	$ 62,201,070													$ 229,983,200
Monitoring	$ 790,692	$ 1,569,036													$ 8,049,412
LG	50.95	0.00	0.00	0.00	29.67	1.13	0.00	0.00	0.00	0.00	0.00	18.39	1.13	29.67	**29.67**
Mitigation	$ 11,310,900	$ -													$ 2,373,600
Monitoring	$ 142,660	$ -													$ 83,076
LL	186.92	38.92	88.69	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84	0.03	88.69	**88.69**
Mitigation	$ 41,496,240	$ 4,320,120													$ 7,095,200
Monitoring	$ 523,376	$ 108,976													$ 248,332
TOTAL	520.26	599.29	802.38	110.75	615.64	902.86	782.73	1,199.19	735.37	1,049.16	57.03	79.75	3,261.95	2,936.12	2,993.15
Mitigation	$ 115,497,720	$ 66,521,190													$ 239,452,000
Monitoring	$ 1,456,728	$ 1,678,012													$ 8,380,820

1 % alternative

1% Levee Reach	**Total Mitigation**	Marsh Created with Constr$$	Net marsh	Total Mitigation after marsh created with Constr$$
Total previous	3,717.55	1,175.00	1,699.79	2,542.55
Mitigation	$ 354,874,850		$ 135,983,200	$ 260,874,850
Monitoring	$ 10,409,140		$ 8,049,412	$ 10,409,140
LG	80.62			80.62
Mitigation	13,684,500.00			$ 13,684,500
Monitoring	225,736.00			$ 225,736
LL	314.53			314.53
Mitigation	$ 52,911,560			$ 52,911,560
Monitoring	$ 880,684			$ 880,684
TOTAL	4,112.70			2,937.70
Mitigation	$ 421,470,910			$ 327,470,910
Monitoring	$ 11,515,560			$ 11,515,560

High SLR Scenario - Construction Impacts Summary by Reach and Habitat Type

3% Levee Reach	Fresh Hwds (acres)	Swamp (acres)	Tidal Habitats Marsh (acres)	Water* (acres)	INT Habitats Marsh (acres)	Tidal Water* (acres)	BR Habitats Marsh (acres)	Tidal Water* (acres)	SAL Habitats Marsh (acres)	Tidal Water* (acres)	Force Drained Marsh (acres)	(non-tidal) Water (acres)	Total Tidal Water* acres	Total Tidal Marsh acres	Total Marsh (acres)	Total Mitigation	Marsh Created with Constr$$	Net marsh	Total Mitigation after marsh created with Constr$$
Barrier	170.00	475.06	155.71	7.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.82	155.71	**155.71**				
A	65.18	50.89	303.14	40.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.96	303.14	**303.14**				
B	0.00	0.00	103.12	14.68	26.67	112.58	0.00	0.00	0.00	0.00	0.00	37.41	127.26	129.79	**129.79**				
E-1	0.00	0.00	0.00	0.00	55.82	135.76	0.00	0.00	0.00	0.00	0.00	0.00	135.76	55.82	**55.82**				
E-2	0.00	0.00	0.00	0.00	9.34	154.45	0.00	0.00	0.00	0.00	0.00	1.38	154.45	9.34	**9.34**				
F-1	0.00	0.00	0.00	0.00	74.34	15.93	216.14	68.24	0.00	0.00	0.00	0.00	84.17	290.48	**290.48**				
F-2	0.00	0.00	0.00	0.00	119.38	32.06	0.00	0.00	0.00	0.00	0.00	0.00	32.06	119.38	**119.38**				
G-1	0.00	0.00	0.00	0.00	0.00	0.00	110.34	35.19	0.00	0.00	14.06	5.10	35.19	110.34	**124.40**				
G-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.41	63.39	0.00	0.00	63.39	28.41	**28.41**				
G-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.25	16.35	0.00	0.00	16.35	33.25	**33.25**				
H-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	83.18	53.60	0.00	0.00	53.60	83.18	**83.18**				
H-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	137.62	72.47	0.00	0.00	72.47	137.62	**137.62**				
H-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	73.47	193.22	0.00	0.00	193.22	73.47	**73.47**				
I-1	0.00	0.00	0.00	0.00	0.00	0.00	74.11	73.72	0.39	0.20	0.00	0.15	73.92	74.50	**74.50**				
I-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.53	95.62	0.00	0.91	95.62	65.53	**65.53**				
I-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	68.65	110.05	0.00	0.00	110.05	68.65	**68.65**				
J-1	0.00	0.00	0.00	0.00	39.85	151.33	0.00	0.00	1.55	10.34	0.00	0.25	161.67	41.40	**41.40**				
J-2	0.00	0.00	0.00	0.00	0.00	0.00	25.78	177.22	24.33	157.27	17.25	1.29	334.49	50.11	**67.36**				
J-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.49	89.99	0.00	0.00	89.99	17.49	**17.49**				
K	0.00	0.00	0.00	0.00	0.00	0.00	88.51	413.42	0.00	0.00	0.00	0.20	413.42	88.51	**88.51**				
L	0.00	0.00	0.00	0.00	70.47	35.74	70.18	102.19	0.00	0.00	0.00	5.36	137.93	140.65	**140.65**				
Total previous	235.18	525.95	561.97	63.46	395.87	637.85	585.06	869.98	533.87	862.50	31.31	52.05	2,433.79	2,076.77	2,108.08	2,869.21	1,175.00	933.08	1,694.21
Mitigation	$ 52,209,960	$ 58,380,450													$ 168,646,400	$ 279,236,810		$ 74,646,400	$ 185,236,810
Monitoring	$ 658,504	$ 1,472,660													$ 5,902,624	$ 8,033,788		$ 5,902,624	$ 8,033,788
LG	23.85	0.00	0.00	0.00	18.63	0.75	0.00	0.00	0.00	0.00	0.00	11.13	0.75	18.63	**18.63**	42.48			42.48
Mitigation	$ 5,294,700	$ -													$ 1,490,400	6,785,100.00			$ 6,785,100
Monitoring	$ 66,780	$ -													$ 52,164	118,944.00			$ 118,944
LL	171.06	35.66	85.56	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84	0.11	85.56	**85.56**	292.28			292.28
Mitigation	$ 37,975,320	$ 3,958,260													$ 6,844,800	$ 48,778,380			$ 48,778,380
Monitoring	$ 478,968	$ 99,848													$ 239,568	$ 818,384			$ 818,384
TOTAL	430.09	561.61	647.53	63.57	414.50	638.60	585.06	869.98	533.87	862.50	31.31	66.02	2,434.65	2,180.96	**2,212.27**	3,203.97			2,028.97
Mitigation	$ 95,479,980	$ 62,338,710													$ 176,981,600	$ 334,800,290			$ 240,800,290
Monitoring	$ 1,204,252	$ 1,572,508													$ 6,194,356	$ 8,971,116			$ 8,971,116

High SLR Scenario - Construction Impacts Summary by Reach and Habitat Type

1% Levee Reach	Fresh Hwds (acres)	Swamp (acres)	Tidal Habitats Marsh (acres)	Water* (acres)	INT Habitats Marsh (acres)	Tidal Water* (acres)	BR Habitats Marsh (acres)	Tidal Water* (acres)	SAL Marsh (acres)	Tidal Habitats Water* (acres)	Force Drained Marsh (acres)	(non-tidal) Water (acres)	Total Tidal Water* acres	Total Tidal Marsh acres	Total Marsh (acres)	Total Mitigation	Marsh Created with Constr$$	Net marsh	Total Mitigation after marsh created with Constr$$
Barrier	201.87	547.48	208.32	48.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48.40	208.32	**208.32**				
A	80.52	12.89	360.85	43.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43.80	360.85	**360.85**				
B	0.00	0.00	143.28	19.54	38.61	150.96	0.00	0.00	0.00	0.00	0.00	38.95	170.50	181.89	**181.89**				
E-1	0.00	0.00	0.00	0.00	93.55	191.36	0.00	0.00	0.00	0.00	0.00	0.00	191.36	93.55	**93.55**				
E-2	0.00	0.00	0.00	0.00	38.68	215.81	0.00	0.00	0.00	0.00	0.00	4.16	215.81	38.68	**38.68**				
F-1	0.00	0.00	0.00	0.00	83.32	16.59	274.98	78.87	0.00	0.00	0.00	0.00	95.46	358.30	**358.30**				
F-2	0.00	0.00	0.00	0.00	146.19	42.10	0.00	0.00	0.00	0.00	0.00	0.00	42.10	146.19	**146.19**				
G-1	0.00	0.00	0.00	0.00	0.00	0.00	138.16	41.26	0.00	0.00	26.39	0.00	41.26	138.16	**164.55**				
G-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.44	96.12	0.00	0.00	96.12	52.44	**52.44**				
G-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42.72	28.96	0.00	0.00	28.96	42.72	**42.72**				
H-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	111.75	79.37	0.00	0.00	79.37	111.75	**111.75**				
H-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	185.91	107.04	0.00	0.00	107.04	185.91	**185.91**				
H-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	102.13	119.78	0.00	0.00	119.78	102.13	**102.13**				
I-1	0.00	0.00	0.00	0.00	0.00	0.00	82.35	100.82	0.41	0.22	0.00	0.15	101.04	82.76	**82.76**				
I-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	85.71	139.75	0.00	0.91	139.75	85.71	**85.71**				
I-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.97	144.24	0.00	0.00	144.24	89.97	**89.97**				
J-1	0.00	0.00	0.00	0.00	79.02	216.72	0.00	0.00	1.95	12.78	2.36	0.76	229.50	80.97	**83.33**				
J-2	0.00	0.00	0.00	0.00	0.00	0.00	40.26	299.80	34.26	200.29	28.28	2.04	500.09	74.52	**102.80**				
J-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.36	123.37	0.00	4.34	123.37	25.36	**25.36**				
K	0.00	0.00	0.00	0.00	0.00	0.00	138.47	552.51	0.00	0.00	0.00	0.37	552.51	138.47	**138.47**				
L	0.00	0.00	0.00	0.00	105.09	69.91	106.43	128.01	0.00	0.00	0.00	6.84	197.92	211.52	**211.52**				
Total previous	282.39	560.37	712.45	111.74	584.46	903.45	780.65	1,201.27	732.61	1,051.92	57.03	58.52	3,268.38	2,810.17	2,867.20	3,709.96	1,175.00	1,692.20	2,534.96
Mitigation	$ 62,690,580	$ 62,201,070													$ 229,376,000	$ 354,267,650		$ 135,376,000	$ 260,267,650
Monitoring	$ 790,692	$ 1,569,036													$ 8,028,160	$ 10,387,888		$ 8,028,160	$ 10,387,888
LG	50.95	0.00	0.00	0.00	29.61	1.19	0.00	0.00	0.00	0.00	0.00	18.39	1.19	29.61	**29.61**	80.56			80.56
Mitigation	$ 11,310,900	$ -													$ 2,368,800	13,679,700.00			$ 13,679,700
Monitoring	$ 142,660	$ -													$ 82,908	225,568.00			$ 225,568
LL	186.92	38.92	88.60	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84	0.12	88.60	**88.60**	314.44			314.44
Mitigation	$ 41,496,240	$ 4,320,120													$ 7,088,000	$ 52,904,360			$ 52,904,360
Monitoring	$ 523,376	$ 108,976													$ 248,080	$ 880,432			$ 880,432
TOTAL	520.26	599.29	801.05	111.86	614.07	904.64	780.65	1,201.27	732.61	1,051.92	57.03	79.75	3,269.69	2,928.38	**2,985.41**	4,104.96			2,929.96
Mitigation	$ 115,497,720	$ 66,521,190													$ 238,832,800	$ 420,851,710			$ 326,851,710
Monitoring	$ 1,456,728	$ 1,678,012													$ 8,359,148	$ 11,493,888			$ 11,493,888

	Low SLR	Medium SLR	High SLR
B5	2.691	-6.326	-0.169
B4	-139.248	13.575	9.293
B3	1.495	-0.292	-0.249
B1, B2	9.983	-36.465	-29.914
C20 100 Year	1.238	-7.068	-14.780
Bayou Dulac	-0.817	-64.014	-94.552
Robin Canal	0.314	-77.745	-112.631
C8	0.219	-3.029	-4.463
C5-C7, C9	0.390	-24.197	-25.502
C1-C4	4.379	-10.135	-14.122
Total AAHUs	-119.355	-215.694	-287.087

Summary of Morganza Indirect Impacts for Constructable Features ONLY

	Best Case Scenario AAHUs		Worse Case Scenario AAHUs	
	Med SLR	High SLR	Med SLR	High SLR
March 2013 Operation Plan "plan as is"	-216	-287	-577	-331
March 2013 Operation Plan with "foreseeable future change"	-375	-380	-750	-430

Notes

Medium SLR Scenario

			2015	2016	2085		2016	2020	2039	2062	2085	
			FWOP TY0	FWOP TY1	FWOP TY70		FWP TY1	FWP TY5	FWP TY24	FWP TY47	FWP TY70	
B5	INT	V1	66	66	43		66	65			43	
		V2	12	12	5		12	14			5	
		V3-1	35	35	0		35	32			0	
		V3-2	36	36	30		36	38			30	
		V3-3	0	0	11		0	1			11	
		V3-4	29	29	59		29	29			59	
		V3-5	0	0	0		0	0			0	
		V4	10	10	7		10	10			7	
		V5										
		V5	4.1	4.1	6.1		4.1	3.9			6.2	
		V6										
		V6	0.990	0.990	0.990		0.990	0.781			0.577	
		TOT Ac	1,008	1,008	1,008		1,008	1,008			0	
		% FM	0	0	0		0	0			0	
		% INT	100	100	100		100	100			0	

			2015	2016	2085		2016	2020	2039	2062	2085	
			FWOP TY0	FWOP TY1	FWOP TY70		FWP TY1	FWP TY5	FWP TY24	FWP TY47	FWP TY70	
B4	INT	V1	50	49	24		49	48			24	
		V2	6	6	2		6	8			3	
		V3-1	0	0	0		0	0			0	
		V3-2	24	23	0		23	22			0	
		V3-3	50	50	0		50	49			0	
		V3-4	26	27	100		27	29			100	
		V3-5	0	0	0		0	0			0	
		V4	5	5	1		5	4			1	
		V5						0				
		V5	3.4	3.4	4.5		3.4	3.1			4.2	
		V6										
		V6	0.246	0.246	0.246		0.246	0.203			0.162	
		TOT Ac	4,141	4,141	4,141		4,141	4,141	4,141	4,141	4,141	
		% FM	0	0	0		0	0	0	0	0	
		% INT	100	100	100		100	100	100	100	100	

			2015	2016	2077	2085	2016	2020	2039	2062	2077	2085
			FWOP TY0	FWOP TY1	FWOP TY62	FWOP TY70	FWP TY1	FWP TY5	FWP TY24	FWP TY47	FWP TY62	FWP TY70
B3	INT	V1	50	49	0	0	49	46			0	0
		V2	8	8	0	0	8	10			0	0
		V3-1	30	30	0	0	30	23			0	0
		V3-2	10	9	0	0	9	11			0	0
		V3-3	0	0	0	0	0	2			0	0
		V3-4	60	61	0	0	61	64			0	0
0 acres	2077	V3-5	0	0	100	100	0	0			100	100
	TY62	V4	6	6	0	0	6	5			0	0
		V5										
		V5	2.9	3.0	3.9	4.0	3.0	2.8			3.9	4.0
		V6										
		V6	0.980	0.980	0.980	0.980	0.980	0.797			0.683	0.618
		TOT Ac	570	570	570	570	570	570	570	570	570	570
		% FM	0	0	0	0	0	0	0	0	0	0
		% INT	100	100	100	100	100	100	100	100	100	100

HIGH SLR Scenario

		Reach	Polygon		2015	2016	2058	2068	2085	2016	2020	2058	2068	2085
					FWOP TY0	FWOP TY1	FWOP TY43	FWOP TY53	FWOP TY70	FWP TY1	FWP TY5	FWP TY43	FWP TY53	FWP TY70
B5	INT	B5	INT	V1	66	66	40	0	0	66	65	40	0	0
				V2	12	12	5	0	0	12	14	6	0	0
				V3-1	35	35	0	0	0	35	32	0	0	0
				V3-2	36	36	0	0	0	36	38	22	0	0
				V3-3	0	0	0	0	0	0	1	16	0	0
			0	V3-4	29	29	100	0	0	29	29	62	0	0
			high SLR	V3-5	0	0	0	100	100	0	0	0	100	100
				V4	10	10	7	0	0	10	10	7	0	0
				V5										
				V5	4.1	4.2	6.6	7.2	8.2	4.2	4.0	5.6	5.9	7.0
				V6										
				V6	0.990	0.990	0.990	0.990	0.990	0.990	0.778	0.371	0.190	0.190
				TOT Ac	1,008	1,008	1,008	0	1,008	1,008	1,008	1,008	1,008	0
				% FM	0	0	0	0	0	0	0	0	0	0
				% INT	100	100	100	0	100	100	100	100	100	0

		Reach	Polygon		2015	2016	2058	2068	2085	2016	2020	2058	2068	2085
					FWOP TY0	FWOP TY1	FWOP TY43	FWOP TY53	FWOP TY70	FWP TY1	FWP TY5	FWP TY43	FWP TY53	FWP TY70
B4	INT	B4	INT	V1	50	49	25	0	0	49	48	25	0	0
			0	V2	6	6	1	0	0	6	8	2	0	0
				V3-1	0	0	0	0	0	0	0	0	0	0
				V3-2	24	23	0	0	0	23	22	0	0	0
				V3-3	50	50	0	0	0	50	49	0	0	0
			0	V3-4	26	27	100	0	0	27	29	0	0	0
0 acres	2083		high SLR	V3-5	0	0	0	100	100	0	0	100	100	100
	TY68			V4	5	5	1	0	0	5	4	1	0	0
				V5										
				V5	3.4	3.4	5.1	5.5	6.2	3.4	3.2	4.5	4.8	5.5
				V6										
		0.385		V6	0.246	0.246	0.246	0.246	0.246	0.246	0.203	0.120	0.083	0.083
				TOT Ac	4,141	4,141	4,141	0	4,141	4,141	4,141	4,141	0	0
				% FM	0	0	0	0	0	0	0	0	0	0
				% INT	100	100	100	0	100	100	100	100	0	0

		Reach	Polygon		2015	2016	2061	2085	2016	2020	2061	2085
					FWOP TY0	FWOP TY1	FWOP TY46	FWOP TY70	FWP TY1	FWP TY5	FWP TY46	FWP TY70
B3	INT	B3	INT	V1	50	49	0	0	49	46	0	0
			0	V2	8	8	0	0	8	9	0	0
				V3-1	30	30	0	0	30	23	0	0
				V3-2	10	9	0	0	9	11	0	0
				V3-3	0	0	0	0	0	2	0	0
			0	V3-4	60	61	0	0	61	64	0	0
0 acres	2061		high SLR	V3-5	0	0	100	100	0	0	100	100
	TY46			V4	6	6	0	0	6	5	0	0
				V5								
				V5	2.9	3.1	4.9	6.0	3.1	3.0	4.4	5.2
				V6								
				V6	0.980	0.980	0.980	0.980	0.980	0.794	0.436	0.280
				TOT Ac	570	570	570	0	570	570	570	570
				% FM	0	0	0	0	0	0	0	0
				% INT	100	100	100	0	100	100	100	100

		2015	2016	2085		2016	2020	2039	2062	2085
		FWOP TY0	FWOP TY1	FWOP TY70		FWP TY1	FWP TY5	FWP TY24	FWP TY47	FWP TY70
B1,B2 FM	V1	90	90	76		90	90			76
	V2	24	24	21		24	25			21
	V3-1	95	95	47		95	95			47
	V3-2	5	5	29		5	5			29
	V3-3	0	0	24		0	0			24
	V3-4	0	0	0		0	0			0
	V3-5	0	0	0		0	0			0
	V4	35	35	25		35	35			25
	V5 V5	1.7	1.7	2.2		1.7	1.6			2.3
	V6 V6	0.986	0.986	0.986		0.986	0.804			0.625
	TOT Ac	3,965	3,965	3,965		3,965	3,965	3,965	3,965	3,965
	% FM	100	100	100		100	100	100	100	100
	% INT	0	0	0		0	0	0	0	0

	Reach	Polygon		2015	2016	2058	2068	2085	2016	2020	2058	2068	2085
				FWOP TY0	FWOP TY1	FWOP TY43	FWOP TY53	FWOP TY70	FWP TY1	FWP TY5	FWP TY43	FWP TY53	FWP TY70
B1,B2 FM	**B1,B2**	**FM**	V1	90	90	67	0	0	90	89	67	0	0
		0	V2	24	24	17	0	0	24	24	17	0	0
			V3-1	95	95	6	0	0	95	94	6	0	0
			V3-2	5	5	54	0	0	5	6	54	0	0
			V3-3	0	0	40	0	0	0	0	40	0	0
		0	V3-4	0	0	0	0	0	0	0	0	0	0
		high SLR	V3-5	0	0	0	100	100	0	0	0	100	100
			V4	35	35	18	0	0	35	35	18	0	0
			V5 V5	1.7	1.7	2.8	3.0	3.4	1.7	1.7	2.5	2.6	3.1
			V6 V6	0.986	0.986	0.986	0.986	0.986	0.986	0.801	0.445	0.286	0.286
			TOT Ac	3,965	3,965	3,965	0	3,965	3,965	3,965	3,965	3,965	0
			% FM	100	100	100	0	100	100	100	100	100	0
			% INT	0	0	0	0	0	0	0	0	0	0

		2015	2016	2085		2016	2020	2039	2062	2085
		FWOP TY0	FWOP TY1	FWOP TY70		FWP TY1	FWP TY5	FWP TY24	FWP TY47	FWP TY70
C20 BR	V1	54	54	15		54	52			15
35 Yr	V2	6	6	0		6	7			0
	V3-1	0	0	0		0	0			0
	V3-2	58	58	0		58	54			0
	V3-3	0	0	0		0	0			0
	V3-4	42	42	100		42	46			100
	V3-5	0	0	0		0	0			0
	V4	11	11	0		11	10			0
	V5 V5	5.4	5.4	7.5		5.4	5.1			8.1
	V6 V6	0.990	0.990	0.990		0.990	0.596			0.456
	TOT Ac	462	462	462		462	462	462	462	462

	Reach	Polygon		2015	2016	2048	2058	2085	2016	2020	2048	2058	2085
				FWOP TY0	FWOP TY1	FWOP TY33	FWOP TY43	FWOP TY70	FWP TY1	FWP TY5	FWP TY33	FWP TY43	FWP TY70
C20 BR	**C20**	**BR**	V1	54	54	30	0	0	54	52	30	0	0
35 Yr		**0**	V2	6	6	1	0	0	6	7	2	0	0
			V3-1	0	0	0	0	0	0	0	0	0	0
			V3-2	58	58	0	0	0	58	54	0	0	0
			V3-3	0	0	19	0	0	0	0	19	0	0
		0	V3-4	42	42	81	0	0	42	46	81	0	0
		high SLR	V3-5	0	0	0	100	100	0	0	0	100	100
0 acres 2074			V4	11	11	1	0	0	11	10	1	0	0
TY59			V5 V5	5.4	5.5	7.2	7.7	9.1	5.5	5.2	6.8	6.9	8.3
			V6 V6	0.990	0.990	0.990	0.990	0.990	0.990	0.594	0.525	0.314	0.190
			TOT Ac	462	462	462	462	462	462	462	462	462	462

		2015	2016	2085		2016	2020	2039	2062	2085
		FWOP TY0	FWOP TY1	FWOP TY70		FWP TY1	FWP TY5	FWP TY24	FWP TY47	FWP TY70
C20 BR	V1	56	55	15		55	53			15
100 yr	V2	6	6	0		6	7			0
	V3-1	0	0	0		0	0			0
	V3-2	60	57	0		57	53			0
	V3-3	4	6	0		6	6			0
	V3-4	36	37	100		37	41			100
	V3-5	0	0	0		0	0			0
	V4	11	11	1		11	10			1
	V5 V5	5.4	5.4	7.5		5.4	5.1			8.1
	V6 V6	0.990	0.990	0.990	0.000	0.990	0.596			0.456
	TOT Ac	439	439	439		439	439	439	439	439

	Reach	Polygon		2015	2016	2048	2058	2085	2016	2020	2048	2058	2085
				FWOP TY0	FWOP TY1	FWOP TY33	FWOP TY43	FWOP TY70	FWP TY1	FWP TY5	FWP TY33	FWP TY43	FWP TY70
C20 BR	**C20**	**BR**	V1	56	55	31	0	0	55	53	31	0	0
100 yr		**0**	V2	6	6	1	0	0	6	7	2	0	0
			V3-1	0	0	0	0	0	0	0	0	0	0
			V3-2	60	57	0	0	0	57	53	0	0	0
			V3-3	4	6	24	0	0	6	6	24	0	0
		0	V3-4	36	37	76	0	0	37	41	76	0	0
		high SLR	V3-5	0	0	0	100	100	0	0	0	0	100
0 acres 2074			V4	11	11	5	0	0	11	11	2	0	0
TY59			V5 V5	5.4	5.5	7.2	7.7	9.1	5.5	5.2	6.8	6.9	8.3
			V6 V6	0.990	0.990	0.990	0.990	0.990	0.990	0.594	0.525	0.314	0.190
			TOT Ac	439	439	439	439	439	439	439	439	439	439

		2015	2016	2071	2085	2016	2020	2039	2062	2071	2085
		FWOP TY0	FWOP TY1	FWOP TY56	FWOP TY70	FWP TY1	FWP TY5	FWP TY24	FWP TY47	FWP TY56	FWP TY70
Bayou SAL	V1	28	28	0	0	28	26			0	0
Dulac	V2	5	5	0	0	5	5			0	0
	V3-1	0	0	0	0	0	0			0	0
	V3-2	0	0	0	0	0	0			0	0
	V3-3	12	12	0	0	12	4			0	0
	V3-4	88	88	0	0	88	96			0	0
	V3-5	0	0	100	100	0	0			100	100
0 acres 2071	V4	6	5	0	0	5	5			0	0
TY56	V5 V5	8.4	8.4	9.4	9.6	8.4	8.3			9.5	9.7
	V6 V6	0.980	0.980	0.980	0.980	0.980	0.815			0.733	0.670
	TOT Ac	3,865	3,865	3,865	3,865	3,865	3,865	3,865	3,865	3,865	3,865

	Reach	Polygon		2015	2016	2045	2055	2085	2016	2020	2045	2055	2085
				FWOP TY0	FWOP TY1	FWOP TY30	FWOP TY40	FWOP TY70	FWP TY1	FWP TY5	FWP TY30	FWP TY40	FWP TY70
Bayou SAL	**Bayou**	**SAL**	V1	28	28	10	0	0	28	26	10	0	0
Dulac		**0**	V2	5	5	0	0	0	5	5	0	0	0
			V3-1	0	0	0	0	0	0	0	0	0	0
			V3-2	0	0	0	0	0	0	0	0	0	0
			V3-3	12	12	0	0	0	12	4	0	0	0
		0	V3-4	88	88	0	0	0	88	96	0	0	0
		high SLR	V3-5	0	0	100	100	100	0	0	100	100	100
0 acres 2057			V4	6	5	0	0	0	5	5	0	0	0
TY42			V5 V5	8.4	8.4	9.7	10.1	11.4	8.4	8.3	9.2	9.5	10.2
			V6 V6	0.980	0.980	0.980	0.980	0.980	0.980	0.813	0.751	0.676	0.410
			TOT Ac	3,865	3,865	3,865	3,865	3,865	3,865	3,865	3,865	3,865	3,865

Robin Canal SAL
0 acres 2025 TY10

	2015 FWOP TY0	2016 FWOP TY1	2025 FWOP TY10	2085 FWOP TY70	2016 FWP TY1	2020 FWP TY5	2025 FWP TY10	2039 FWP TY24	2062 FWP TY47	2085 FWP TY70
V1	8	7	0	0	7	4	0			0
V2	0	0	0	0	0	0	0			0
V3-1	0	0	0	0	0	0	0			0
V3-2	0	0	0	0	0	0	0			0
V3-3	0	0	0	0	0	0	0			0
V3-4	100	100	0	0	100	100	0			0
V3-5	0	0	100	100	0	0	100			100
V4	1	1	0	0	1	0	0			0
V5 V5	12.0	12.0	12.2	13.2	12.0	11.8	12.0			13.2
V6 V6	0.960	0.960	0.960	0.960	0.960	0.891	0.878			0.831
TOT Ac	9,923	9,923	9,923	9,923	9,923	9,923	9,923	9,923	9,923	9,923

Robin Canal SAL
Reach: Robin
Polygon: SAL 0
0 high SLR
0 acres 2025 TY10

	2015 FWOP TY0	2016 FWOP TY1	2025 FWOP TY10	2085 FWOP TY70	2016 FWP TY1	2020 FWP TY5	2025 FWP TY10	2085 FWP TY70
V1	8	7	0	0	7	4	0	0
V2	0	0	0	0	0	0	0	0
V3-1	0	0	0	0	0	0	0	0
V3-2	0	0	0	0	0	0	0	0
V3-3	0	0	0	0	0	0	0	0
V3-4	100	100	0	0	100	100	0	0
V3-5	0	0	100	100	0	0	100	100
V4	1	1	0	0	1	0	0	0
V5 V5	12.0	12.0	12.6	16.2	12.0	11.9	12.2	14.7
V6 V6	0.960	0.960	0.960	0.960	0.960	0.890	0.888	0.723
TOT Ac	9,923	9,923	9,923	9,923	9,923	9,923	9,923	9,923

C8 BR
0 acres 2036 TY21

	2015 FWOP TY0	2016 FWOP TY1	2036 FWOP TY21	2085 FWOP TY70	2016 FWP TY1	2020 FWP TY5	2036 FWP TY21	2039 FWP TY24	2062 FWP TY47	2085 FWP TY70
V1	20	19	0	0	19	15	0			0
V2	3	3	0	0	3	3	0			0
V3-1	0	0	0	0	0	0	0			0
V3-2	0	0	0	0	0	0	0			0
V3-3	0	0	0	0	0	0	0			0
V3-4	100	100	0	0	100	100	0			0
V3-5	0	0	100	100	0	0	100			100
V4	5	4	0	0	4	3	0			0
V5 V5	8.8	8.8	9.0	9.6	8.8	8.7	9.0			9.6
V6 V6	0.860	0.860	0.860	0.860	0.860	0.819	0.816			0.783
TOT Ac	3,196	3,196	3,196	3,196	3,196	3,196	3,196	3,196	3,196	3,196

C8 BR
Reach: C8
Polygon: BR 0
0 high SLR
0 acres 2034 TY19

	2015 FWOP TY0	2016 FWOP TY1	2034 FWOP TY19	2085 FWOP TY70	2016 FWP TY1	2020 FWP TY5	2034 FWP TY19	2085 FWP TY70
V1	20	19	0	0	19	15	0	0
V2	3	3	0	0	3	3	0	0
V3-1	0	0	0	0	0	0	0	0
V3-2	0	0	0	0	0	0	0	0
V3-3	0	0	0	0	0	0	0	0
V3-4	100	100	0	0	100	100	0	0
V3-5	0	0	100	100	0	0	100	100
V4	5	4	0	0	4	3	0	0
V5 V5	8.8	8.8	9.3	10.8	8.8	8.8	9.3	10.8
V6 V6	0.860	0.860	0.860	0.860	0.860	0.818	0.813	0.718
TOT Ac	3,196	3,196	3,196	3,196	3,196	3,196	3,196	3,196

C5-C7 C9 BR
0 acres 2062 TY47

	2015 FWOP TY0	2016 FWOP TY1	2062 FWOP TY47	2085 FWOP TY70	2016 FWP TY1	2020 FWP TY5	2039 FWP TY24	2062 FWP TY47	2085 FWP TY70
V1	40	39	0	0	39	36		0	0
V2	10	10	0	0	10	11		0	0
V3-1	0	0	0	0	0	0		0	0
V3-2	0	0	0	0	0	0		0	0
V3-3	60	56	0	0	56	44		0	0
V3-4	40	44	0	0	44	56		0	0
V3-5	0	0	100	100	0	0		100	100
V4	6	6	0	0	6	5		0	0
V5 V5	8.0	8.0	8.5	8.8	8.0	7.9		8.6	8.9
V6 V6	0.870	0.870	0.870	0.870	0.870	0.801		0.780	0.741
TOT Ac	8,807	8,807	8,807	8,807	8,807	8,807	8,807	8,807	8,807

C5-C7 C9 BR
Reach: C5-C7
Polygon: BR 0
0 high SLR
0 acres 2052 TY37

	2015 FWOP TY0	2016 FWOP TY1	2052 FWOP TY37	2085 FWOP TY70	2016 FWP TY1	2020 FWP TY5	2052 FWP TY37	2085 FWP TY70
V1	40	39	0	0	39	35	0	0
V2	10	10	0	0	10	8	0	0
V3-1	0	0	0	0	0	0	0	0
V3-2	0	0	0	0	0	0	0	0
V3-3	60	56	0	0	56	40	0	0
V3-4	40	44	0	0	44	60	0	0
V3-5	0	0	100	100	0	0	100	100
V4	6	6	0	0	6	5	0	0
V5 V5	8.0	8.0	9.2	10.3	8.0	8.0	9.0	9.8
V6 V6	0.870	0.870	0.870	0.870	0.870	0.800	0.755	0.633
TOT Ac	8,807	8,807	8,807	8,807	8,807	8,807	8,807	8,807

C1- C4 INT
0 acres 2057 TY42

	2015 FWOP TY0	2016 FWOP TY1	2057 FWOP TY42	2085 FWOP TY70	2016 FWP TY1	2020 FWP TY5	2039 FWP TY24	2057 FWP TY42	2062 FWP TY47	2085 FWP TY70
V1	30	29	0	0	29	27		0		0
V2	12	12	0	0	12	10		0		0
V3-1	0	0	0	0	0	0		0		0
V3-2	0	0	0	0	0	0		0		0
V3-3	20	16	0	0	16	8		0		0
V3-4	80	84	0	0	84	92		0		0
V3-5	0	0	100	100	0	0		100		100
V4	5	5	0	0	5	4		0		0
V5 V5	7.1	7.1	7.3	7.4	7.1	7.0		7.2		7.4
V6 V6	0.870	0.870	0.870	0.870	0.870	0.801		0.786		0.741
TOT Ac	10,301	10,301	10,301	10,301	10,301	10,301	10,301	10,301	10,301	10,301
% FM	0	0	0	0	0	0	0	0	0	0
% INT	100	100	100	100	100	100	100	100	100	100

C1- C4 INT
Reach: C1-
Polygon: INT 0
0 high SLR
0 acres 2049 TY34

	2015 FWOP TY0	2016 FWOP TY1	2049 FWOP TY34	2085 FWOP TY70	2016 FWP TY1	2020 FWP TY5	2049 FWP TY34	2085 FWP TY70
V1	30	29	0	0	29	26	0	0
V2	12	12	0	0	12	10	0	0
V3-1	0	0	0	0	0	0	0	0
V3-2	0	0	0	0	0	0	0	0
V3-3	20	16	0	0	16	8	0	0
V3-4	80	84	0	0	84	92	0	0
V3-5	0	0	100	100	0	0	100	100
V4	5	5	0	0	5	4	0	0
V5 V5	7.1	7.1	7.7	8.3	7.1	7.1	7.7	8.2
V6 V6	0.870	0.870	0.870	0.870	0.870	0.800	0.766	0.633
TOT Ac	10,301	10,301	10,301	10,301	10,301	10,301	10,301	0
% FM	0	0	0	0	0	0	0	0
% INT	100	100	100	100	100	100	100	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B5 Low SLR**

Project Area:	1,008
% Fresh	0
% Intermediate	100

Condition: Future Without Project

Variable		TY	0	TY	1	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	66	0.69	66	0.69	53	0.58
V2	% Aquatic	12	0.21	12	0.21	10	0.19
V3	Interspersion	%		%		%	
	Class 1	35	0.62	35	0.62	10	0.45
	Class 2	36		36		37	
	Class 3	0		0		13	
	Class 4	29		29		40	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	10	0.21	10	0.21	8	0.19
V5	Salinity (ppt)						
	fresh	0	0.68	0	1.00	0	1.00
	intermediate	4.1		0		0	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.20	0.0000	0.20
	intermediate	0.0000		0.0000		0.0000	
	Emergent Marsh HSI =		0.58	EM HSI =	0.62	EM HSI =	0.54
	Open Water HSI =		0.27	OW HSI =	0.30	OW HSI =	0.27

Intermediate Calculations		
Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.68	1.00	1.00
Access Value		
0.30	0.30	0.30
0.20	0.20	0.20

Project: **B5 Low SLR**

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

Project: **B5 Low SLR**

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B5 Low SLR**

Condition: Future With Project

Project Area:	1,008
% Fresh	0
% Intermediate	100

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	66	0.69	66	0.69	65	0.69
V2	% Aquatic	12	0.21	17	0.25	17	0.25
V3	Interspersion	%		%		%	
	Class 1	35	0.62	35	0.62	32	0.61
	Class 2	36		36		38	
	Class 3	0		0		1	
	Class 4	29		29		29	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	10	0.21	10	0.21	10	0.21
V5	Salinity (ppt)						
	fresh	0	0.68	0	1.00	0	1.00
	intermediate	4.1		0		0	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.20	0.0000	0.20
	intermediate	0		0.0000		0.0000	
	Emergent Marsh HSI =		0.58	EM HSI =	0.62	EM HSI =	0.61
	Open Water HSI =		0.27	OW HSI =	0.32	OW HSI =	0.32

Intermediate Calculations		
Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.68	1.00	1.00
Access Value		
0.30	0.30	0.30
0.20	0.20	0.20

Project: **B5 Low SLR**

FWP

Variable		TY	24	TY	47	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	62	0.66	57	0.61	53	0.58
V2	% Aquatic	17	0.25	16	0.24	15	0.24
V3	Interspersion	%		%		%	
	Class 1	28	0.57	20	0.51	10	0.45
	Class 2	36		37		37	
	Class 3	3		3		13	
	Class 4	33		40		40	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	10	0.21	9	0.20	8	0.19
V5	Salinity (ppt)						
	fresh	0	1.00	0	1.00	0	1.00
	intermediate	0		0		0	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.20	0.0000	0.20
	intermediate	0.0000		0.0000		0.0000	
		EM HSI =	0.59	EM HSI =	0.56	EM HSI =	0.54
		OW HSI =	0.32	OW HSI =	0.31	OW HSI =	0.30

Intermediate Calculations		
Interspersion		
1	1	1
0.6	0.6	0.6
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
1.00	1.00	1.00
Access Value		
0.30	0.30	0.30
0.20	0.20	0.20

Project: **B5 Low SLR**

FWP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

AAHU CALCULATION - EMERGENT MARSH

Project: B5 Low SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	665	0.58	388.08	
1	665	0.62	411.73	399.90
70	534	0.54	287.13	23987.66
Max=	70		AAHUs =	348.39

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	665	0.58	388.08	
1	665	0.62	411.73	399.90
5	655	0.61	401.41	1626.22
70	534	0.54	287.13	22278.79
Max=	70		AAHUs	347.21

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	347.21
B. Future Without Project Emergent Marsh AAHUs =	348.39
Net Change (FWP - FWOP) =	-1.18

AAHU CALCULATION - OPEN WATER

Project: B5 Low SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	343	0.27	93.48	
1	343	0.30	101.61	97.54
70	474	0.27	128.67	7982.06
Max=	70		AAHUs =	115.42

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	343	0.27	93.48	
1	343	0.32	110.30	101.89
5	353	0.32	113.15	446.92
70	474	0.30	140.94	8288.32
Max=	70		AAHUs	126.24

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	126.24
B. Future Without Project Open Water AAHUs =	115.42
Net Change (FWP - FWOP) =	10.82

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-1.18
B. Open Water Habitat Net AAHUs =	10.82
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	2.69

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B5 Medium SLR**

Condition: Future Without Project

Project Area:	1,008
% Fresh	0
% Intermediate	100

Variable		TY 0 Value	SI	TY 1 Value	SI	TY 70 Value	SI
V1	% Emergent	66	0.69	66	0.69	43	0.49
V2	% Aquatic	12	0.21	12	0.21	5	0.15
V3	Interspersion	%		%		%	
	Class 1	35	0.62	35	0.62	0	0.34
	Class 2	36		36		30	
	Class 3	0		0		11	
	Class 4	29		29		59	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	10	0.21	10	0.21	7	0.18
V5	Salinity (ppt)						
	fresh	0	0.68	0	0.68	0	0.28
	intermediate	4.1		4.1		6.1	
V6	Access Value						
	fresh	0.0000	0.99	0.0000	0.99	0.0000	0.99
	intermediate	0.9900		0.9900		0.9900	
	Emergent Marsh HSI =		0.72	EM HSI =	0.72	EM HSI =	0.50
	Open Water HSI =		0.35	OW HSI =	0.35	OW HSI =	0.24

Intermediate Calculations

Interspersion		
1	1	0
0.6	0.6	0.6
0	0	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.68	0.68	0.28
Access Value		
0.30	0.30	0.30
0.99	0.99	0.99

Project: **B5 Medium SLR**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

Project: **B5 Medium SLR**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B5 Medium SLR**

Condition: Future With Project

Project Area:	1,008
% Fresh	0
% Intermediate	100

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	66	0.69	66	0.69	65	0.69
V2	% Aquatic	12	0.21	12	0.21	14	0.23
V3	Interspersion	%		%		%	
	Class 1	35	0.62	35	0.62	32	0.61
	Class 2	36		36		38	
	Class 3	0		0		1	
	Class 4	29		29		29	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	10	0.21	10	0.21	10	0.21
V5	Salinity (ppt)						
	fresh	0	0.68	0	0.68	0	0.72
	intermediate	4.1		4.1		3.9	
V6	Access Value						
	fresh	0.0000	0.99	0.0000	0.99	0.0000	0.82
	intermediate	0.99		0.9900		0.7810	
	Emergent Marsh HSI =		0.72	EM HSI =	0.72	EM HSI =	0.70
	Open Water HSI =		0.35	OW HSI =	0.35	OW HSI =	0.36

Intermediate Calculations

Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.68	0.68	0.72
Access Value		
0.30	0.30	0.30
0.99	0.99	0.82

Project: **B5 Medium SLR**

FWP

Variable		TY	24	TY	47	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	43	0.49
V2	% Aquatic	0	0.10	0	0.10	5	0.15
V3	Interspersion	%		%		%	
	Class 1	0	ERR(<100)	0	ERR(<100)	0	0.34
	Class 2	0		0		30	
	Class 3	0		0		11	
	Class 4	0		0		59	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	0	0.10	0	0.10	7	0.18
V5	Salinity (ppt)						
	fresh	0	1.00	0	1.00	0	0.26
	intermediate	0		0		6.2	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.20	0.0000	0.66
	intermediate	0.0000		0.0000		0.5770	
		EM HSI =		EM HSI =		EM HSI =	0.47
		OW HSI =		OW HSI =		OW HSI =	0.22

Intermediate Calculations

Interspersion		
0	0	0
0	0	0.6
0	0	0.4
0	0	0.2
0	0	0
Salinity		
1.00	1.00	1.00
1.00	1.00	0.26
Access Value		
0.30	0.30	0.30
0.20	0.20	0.66

Project: **B5 Medium SLR**

FWP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

AAHU CALCULATION - EMERGENT MARSH

Project: B5 Medium SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	665	0.72	477.33	
1	665	0.72	477.33	477.33
70	433	0.50	214.58	23278.00
Max=	70		AAHUs =	339.36

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	665	0.72	477.33	
1	665	0.72	477.33	477.33
5	655	0.70	456.73	1867.98
70	433	0.47	201.57	20837.33
Max=	70		AAHUs	331.18

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	331.18
B. Future Without Project Emergent Marsh AAHUs =	339.36
Net Change (FWP - FWOP) =	-8.18

AAHU CALCULATION - OPEN WATER

Project: B5 Medium SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	343	0.35	120.53	
1	343	0.35	120.53	120.53
70	575	0.24	138.98	9245.93
Max=	70		AAHUs =	133.81

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	343	0.35	120.53	
1	343	0.35	120.53	120.53
5	353	0.36	126.10	493.22
70	575	0.22	128.03	8582.71
Max=	70		AAHUs	131.38

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	131.38
B. Future Without Project Open Water AAHUs =	133.81
Net Change (FWP - FWOP) =	-2.43

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-8.18
B. Open Water Habitat Net AAHUs =	-2.43
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	-6.33

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

B5 High SLR

Project Area:	1,008
% Fresh	0
% Intermediate	100

Future Without Project

	TY	0	TY	1	TY	43
	Value	SI	Value	SI	Value	SI
% Emergent	66	0.69	66	0.69	40	0.46
% Aquatic	12	0.21	12	0.21	5	0.15
Interspersion	%		%		%	
Class 1	35	0.62	35	0.62	0	0.20
Class 2	36		36		0	
Class 3	0		0		0	
Class 4	29		29		100	
Class 5	0		0		0	
%OW <= 1.5ft	10	0.21	10	0.21	7	0.18
Salinity (ppt)						
fresh	0	0.68	0	0.66	0	0.18
intermediate	4.1		4.2		6.6	
Access Value						
fresh	0.0000	0.99	0.0000	0.99	0.0000	0.99
intermediate	0.9900		0.9900		0.9900	
Emergent Marsh HSI =		0.72	EM HSI =	0.72	EM HSI =	0.45
Open Water HSI =		0.35	OW HSI =	0.35	OW HSI =	0.22

Intermediate Calculations		
Interspersion		
1	1	0
0.6	0.6	0
0	0	0
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.68	0.66	0.18
Access Value		
0.30	0.30	0.30
0.99	0.99	0.99

B5 High SLR

	TY	53	TY	70	TY	
	Value	SI	Value	SI	Value	SI
% Emergent	0	0.10	0	0.10		
% Aquatic	0	0.10	0	0.10		
Interspersion	%		%		%	
Class 1	0	0.10	0	0.10		
Class 2	0		0			
Class 3	0		0			
Class 4	0		0			
Class 5	100		100			
%OW <= 1.5ft	0	0.10	0	0.10		
Salinity (ppt)						
fresh	0	0.10	0	0.10		
intermediate	7.2		8.2			
Access Value						
fresh	0.0000	0.99	0.0000	0.99		
intermediate	0.9900		0.9900			
	EM HSI =	0.14	EM HSI =	0.14	EM HSI =	
	OW HSI =	0.16	OW HSI =	0.16	OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0
Salinity		
1.00	1.00	
0.10	0.10	
Access Value		
0.30	0.30	
0.99	0.99	

B5 High SLR

	TY		TY		TY	
	Value	SI	Value	SI	Value	SI
% Emergent						
% Aquatic						
Interspersion	%		%		%	
Class 1						
Class 2						
Class 3						
Class 4						
Class 5						
%OW <= 1.5ft						
Salinity (ppt)						
fresh						
intermediate						
Access Value						
fresh						
intermediate						
	EM HSI =		EM HSI =		EM HSI =	
	OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B5 High SLR**

Condition: Future With Project

Project Area:	1,008
% Fresh	0
% Intermediate	100

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	66	0.69	66	0.69	65	0.69
V2	% Aquatic	12	0.21	12	0.21	14	0.23
V3	Interspersion	%		%		%	
	Class 1	35	0.62	35	0.62	32	0.61
	Class 2	36		36		38	
	Class 3	0		0		1	
	Class 4	29		29		29	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	10	0.21	10	0.21	10	0.21
V5	Salinity (ppt)						
	fresh	0	0.68	0	0.66	0	0.70
	intermediate	4.1		4.2		4	
V6	Access Value						
	fresh	0.0000	0.99	0.0000	0.99	0.0000	0.82
	intermediate	0.99		0.9900		0.7780	
	Emergent Marsh HSI =		0.72	EM HSI =	0.72	EM HSI =	0.69
	Open Water HSI =		0.35	OW HSI =	0.35	OW HSI =	0.36

Intermediate Calculations		
Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.68	0.66	0.70
Access Value		
0.30	0.30	0.30
0.99	0.99	0.82

Project: **B5 High SLR**

FWP

Variable		TY	43	TY	53	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	40	0.46	0	0.10	0	0.10
V2	% Aquatic	6	0.15	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.32	0	0.10	0	0.10
	Class 2	22		0		0	
	Class 3	16		0		0	
	Class 4	62		0		0	
	Class 5	0		100		100	
V4	%OW <= 1.5ft	7	0.18	0	0.10	0	0.10
V5	Salinity (ppt)						
	fresh	0	0.38	0	0.32	0	0.10
	intermediate	5.6		5.9		7	
V6	Access Value						
	fresh	0.0000	0.50	0.0000	0.35	0.0000	0.35
	intermediate	0.3710		0.1900		0.1900	
		EM HSI =	0.44	EM HSI =	0.14	EM HSI =	0.12
		OW HSI =	0.23	OW HSI =	0.15	OW HSI =	0.13

Intermediate Calculations		
Interspersion		
0	0	0
0.6	0	0
0.4	0	0
0.2	0	0
0	0.1	0.1
Salinity		
1.00	1.00	1.00
0.38	0.32	0.10
Access Value		
0.30	0.30	0.30
0.50	0.35	0.35

Project: **B5 High SLR**

FWP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

AAHU CALCULATION - EMERGENT MARSH

Project: B5 High SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	665	0.72	477.33	
1	665	0.72	475.85	476.59
43	403	0.45	180.90	13302.67
53	0	0.14	0.00	694.51
70	0	0.14	0.00	0.00
Max=	70		AAHUs =	206.77

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	665	0.72	477.33	
1	665	0.72	475.85	476.59
5	655	0.69	455.10	1861.77
43	403	0.44	177.39	11610.99
53	0	0.14	0.00	687.08
70	0	0.12	0.00	0.00
Max=	70		AAHUs	209.09

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	209.09
B. Future Without Project Emergent Marsh AAHUs =	206.77
Net Change (FWP - FWOP) =	2.32

AAHU CALCULATION - OPEN WATER

Project: B5 High SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	343	0.35	120.53	
1	343	0.35	120.02	120.28
43	605	0.22	135.39	5595.01
53	1,008	0.16	161.54	1527.30
70	1,008	0.16	161.54	2746.14
Max=	70		AAHUs =	142.70

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	343	0.35	120.53	
1	343	0.35	120.02	120.28
5	353	0.36	125.51	491.03
43	605	0.23	136.50	5185.56
53	1,008	0.15	146.21	1467.67
70	1,008	0.13	129.79	2346.01
Max=	70		AAHUs	137.29

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	137.29
B. Future Without Project Open Water AAHUs =	142.70
Net Change (FWP - FWOP) =	-5.40

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	2.32
B. Open Water Habitat Net AAHUs =	-5.40
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	-0.17

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B4 Low SLR**

Condition: Future Without Project

Project Area:	4,141
% Fresh	0
% Intermediate	100

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	70 SI
V1	% Emergent	50	0.55	49	0.54	33	0.40
V2	% Aquatic	6	0.15	6	0.15	3	0.13
V3	Interspersion	%		%		%	
	Class 1	0	0.40	0	0.39	0	0.27
	Class 2	24		23		4	
	Class 3	50		50		25	
	Class 4	26		27		71	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	5	0.16	5	0.16	3	0.13
V5	Salinity (ppt)						
	fresh	0	0.82	0	1.00	0	1.00
	intermediate	3.4		0		0	
V6	Access Value						
	fresh	0.0000	0.99	0.0000	0.99	0.0000	0.99
	intermediate	0.9830		0.9830		0.9830	
	Emergent Marsh HSI =		0.61	EM HSI =	0.62	EM HSI =	0.50
	Open Water HSI =		0.29	OW HSI =	0.31	OW HSI =	0.27

Intermediate Calculations

Interspersion		
0	0	0
0.6	0.6	0.6
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.82	1.00	1.00
Access Value		
0.30	0.30	0.30
0.99	0.99	0.99

Project: **B4 Low SLR**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

Project: **B4 Low SLR**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B4 Low SLR**

Condition: Future With Project

Project Area:	4,141
% Fresh	0
% Intermediate	100

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	5 SI
V1	% Emergent	50	0.55	49	0.54	48	0.53
V2	% Aquatic	6	0.15	11	0.20	11	0.20
V3	Interspersion	%		%		%	
	Class 1	0	0.40	0	0.39	0	0.39
	Class 2	24		23		22	
	Class 3	50		50		49	
	Class 4	26		27		29	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	5	0.16	5	0.16	5	0.16
V5	Salinity (ppt)						
	fresh	0	0.82	0	1.00	0	1.00
	intermediate	3.4		0		0	
V6	Access Value						
	fresh	0.0000	0.99	0.0000	0.20	0.0000	0.20
	intermediate	0.983		0.0000		0.0000	
	Emergent Marsh HSI =		0.61	EM HSI =	0.51	EM HSI =	0.51
	Open Water HSI =		0.29	OW HSI =	0.27	OW HSI =	0.27

Intermediate Calculations

Interspersion		
0	0	0
0.6	0.6	0.6
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.82	1.00	1.00
Access Value		
0.30	0.30	0.30
0.99	0.20	0.20

Project: **B4 Low SLR**

FWP

Variable		TY Value	24 SI	TY Value	47 SI	TY Value	70 SI
V1	% Emergent	44	0.50	38	0.44	33	0.40
V2	% Aquatic	10	0.19	8	0.17	6	0.15
V3	Interspersion	%		%		%	
	Class 1	0	0.35	0	0.30	0	0.27
	Class 2	14		5		4	
	Class 3	49		40		25	
	Class 4	37		55		71	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	4	0.15	3	0.13	3	0.13
V5	Salinity (ppt)						
	fresh	0	1.00	0	1.00	0	1.00
	intermediate	0		0		0	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.20	0.0000	0.20
	intermediate	0.0000		0.0000		0.0000	
		EM HSI =	0.48	EM HSI =	0.45	EM HSI =	0.42
		OW HSI =	0.26	OW HSI =	0.25	OW HSI =	0.23

Intermediate Calculations

Interspersion		
0	0	0
0.6	0.6	0.6
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
1.00	1.00	1.00
Access Value		
0.30	0.30	0.30
0.20	0.20	0.20

Project: **B4 Low SLR**

FWP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

AAHU CALCULATION - EMERGENT MARSH

Project: B4 Low SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	2071	0.61	1256.33	
1	2029	0.62	1257.47	1256.99
70	1367	0.50	683.53	66052.93
Max=	70		AAHUs =	961.57

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	2071	0.61	1256.33	
1	2029	0.51	1037.10	1146.05
5	1988	0.51	1004.98	4084.00
70	1367	0.42	568.81	50546.61
Max=	70		AAHUs	796.81

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	796.81
B. Future Without Project Emergent Marsh AAHUs =	961.57
Net Change (FWP - FWOP) =	-164.76

AAHU CALCULATION - OPEN WATER

Project: B4 Low SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,070	0.29	604.85	
1	2,112	0.31	644.66	624.66
70	2,774	0.27	745.06	48224.13
Max=	70		AAHUs =	697.84

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,070	0.29	604.85	
1	2,112	0.27	569.52	587.34
5	2,153	0.27	579.61	2298.27
70	2,774	0.23	642.32	39966.31
Max=	70		AAHUs	612.17

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	612.17
B. Future Without Project Open Water AAHUs =	697.84
Net Change (FWP - FWOP) =	-85.67

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-164.76
B. Open Water Habitat Net AAHUs =	-85.67
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	-139.25

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B4 Medium SLR**

Condition: Future Without Project

Project Area:	4,141
% Fresh	0
% Intermediate	100

Variable		TY	0	TY	1	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	50	0.55	49	0.54	24	0.32
V2	% Aquatic	6	0.15	6	0.15	2	0.12
V3	Interspersion	%		%		%	
	Class 1	0	0.40	0	0.39	0	0.20
	Class 2	24		23		0	
	Class 3	50		50		0	
	Class 4	26		27		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	5	0.16	5	0.16	1	0.11
V5	Salinity (ppt)						
	fresh	0	0.82	0	0.82	0	0.60
	intermediate	3.4		3.4		4.5	
V6	Access Value						
	fresh	0.0000	0.40	0.0000	0.40	0.0000	0.40
	intermediate	0.2460		0.2460		0.2460	
	Emergent Marsh HSI =		0.54	EM HSI =	0.53	EM HSI =	0.34
	Open Water HSI =		0.25	OW HSI =	0.25	OW HSI =	0.19

Intermediate Calculations		
Interspersion		
0	0	0
0.6	0.6	0
0.4	0.4	0
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.82	0.82	0.60
Access Value		
0.30	0.30	0.30
0.40	0.40	0.40

Project: **B4 Medium SLR**

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

Project: **B4 Medium SLR**

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B4 Medium SLR**

Condition: Future With Project

Project Area:	4,141
% Fresh	0
% Intermediate	100

Variable		TY	0	TY	1	TY	5
		Value	**SI**	**Value**	**SI**	**Value**	**SI**
V1	% Emergent	50	0.55	49	0.54	48	0.53
V2	% Aquatic	6	0.15	6	0.15	8	0.17
V3	Interspersion	%		%		%	
	Class 1	0	0.40	0	0.39	0	0.39
	Class 2	24		23		22	
	Class 3	50		50		49	
	Class 4	26		27		29	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	5	0.16	5	0.16	4	0.15
V5	Salinity (ppt)						
	fresh	0	0.82	0	0.82	0	0.88
	intermediate	3.4		3.4		3.1	
V6	Access Value						
	fresh	0.0000	0.40	0.0000	0.40	0.0000	0.36
	intermediate	0.246		0.2460		0.2030	
	Emergent Marsh HSI =		0.54	EM HSI =	0.53	EM HSI =	0.53
	Open Water HSI =		0.25	OW HSI =	0.25	OW HSI =	0.27

Intermediate Calculations		
Interspersion		
0	0	0
0.6	0.6	0.6
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.82	0.82	0.88
Access Value		
0.30	0.30	0.30
0.40	0.40	0.36

Project: **B4 Medium SLR**

FWP

Variable		TY	24	TY	47	TY	70
		Value	**SI**	**Value**	**SI**	**Value**	**SI**
V1	% Emergent	0	0.10	0	0.10	24	0.32
V2	% Aquatic	0	0.10	0	0.10	3	0.13
V3	Interspersion	%		%		%	
	Class 1	0	ERR(<100)	0	ERR(<100)	0	0.20
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	0	0.10	0	0.10	1	0.11
V5	Salinity (ppt)						
	fresh	0	1.00	0	1.00	0	0.66
	intermediate	0		0		4.2	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.20	0.0000	0.33
	intermediate	0.0000		0.0000		0.1620	
		EM HSI =		EM HSI =		EM HSI =	0.34
		OW HSI =		OW HSI =		OW HSI =	0.20

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0.2
0	0	0
Salinity		
1.00	1.00	1.00
1.00	1.00	0.66
Access Value		
0.30	0.30	0.30
0.20	0.20	0.33

Project: **B4 Medium SLR**

FWP

Variable		TY		TY		TY	
		Value	**SI**	**Value**	**SI**	**Value**	**SI**
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

AAHU CALCULATION - EMERGENT MARSH

Project: B4 Medium SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	2071	0.54	1118.82	
1	2029	0.53	1084.01	1101.37
70	994	0.34	342.11	46938.51
Max=	70		AAHUs =	686.28

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	2071	0.54	1118.82	
1	2029	0.53	1084.01	1101.37
5	1988	0.53	1051.25	4270.37
70	994	0.34	341.01	43248.40
Max=	70		AAHUs	694.57

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	694.57
B. Future Without Project Emergent Marsh AAHUs =	686.28
Net Change (FWP - FWOP) =	8.29

AAHU CALCULATION - OPEN WATER

Project: B4 Medium SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,070	0.25	524.54	
1	2,112	0.25	534.56	529.55
70	3,147	0.19	603.54	39994.28
Max=	70		AAHUs =	578.91

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,070	0.25	524.54	
1	2,112	0.25	534.56	529.55
5	2,153	0.27	572.04	2212.85
70	3,147	0.20	620.96	39508.74
Max=	70		AAHUs	603.59

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	603.59
B. Future Without Project Open Water AAHUs =	578.91
Net Change (FWP - FWOP) =	24.68

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	8.29
B. Open Water Habitat Net AAHUs =	24.68
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	13.58

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B4 High SLR**

Condition: Future Without Project

Project Area:	4,141
% Fresh	0
% Intermediate	100

Variable		TY	0	TY	1	TY	43
		Value	SI	Value	SI	Value	SI
V1	% Emergent	50	0.55	49	0.54	25	0.33
V2	% Aquatic	6	0.15	6	0.15	1	0.11
V3	Interspersion	%		%		%	
	Class 1	0	0.40	0	0.39	0	0.20
	Class 2	24		23		0	
	Class 3	50		50		0	
	Class 4	26		27		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	5	0.16	5	0.16	1	0.11
V5	Salinity (ppt)						
	fresh	0	0.82	0	0.82	0	0.48
	intermediate	3.4		3.4		5.1	
V6	Access Value						
	fresh	0.0000	0.40	0.0000	0.40	0.0000	0.40
	intermediate	0.2460		0.2460		0.2460	
	Emergent Marsh HSI =		0.54	EM HSI =	0.53	EM HSI =	0.34
	Open Water HSI =		0.25	OW HSI =	0.25	OW HSI =	0.18

Intermediate Calculations		
Interspersion		
0	0	0
0.6	0.6	0
0.4	0.4	0
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.82	0.82	0.48
Access Value		
0.30	0.30	0.30
0.40	0.40	0.40

Project: **B4 High SLR**

FWOP

Variable		TY	53	TY	70	TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10		
V2	% Aquatic	0	0.10	0	0.10		
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10		
	Class 2	0		0			
	Class 3	0		0			
	Class 4	0		0			
	Class 5	100		100			
V4	%OW <= 1.5ft	0	0.10	0	0.10		
V5	Salinity (ppt)						
	fresh	0	0.40	0	0.26		
	intermediate	5.5		6.2			
V6	Access Value						
	fresh	0.0000	0.40	0.0000	0.40		
	intermediate	0.2460		0.2460			
		EM HSI =	0.15	EM HSI =	0.14	EM HSI =	
		OW HSI =	0.15	OW HSI =	0.14	OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0
Salinity		
1.00	1.00	
0.40	0.26	
Access Value		
0.30	0.30	
0.40	0.40	

Project: **B4 High SLR**

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B4 High SLR**

Condition: Future With Project

Project Area:	4,141
% Fresh	0
% Intermediate	100

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	50	0.55	49	0.54	48	0.53
V2	% Aquatic	6	0.15	6	0.15	8	0.17
V3	Interspersion	%		%		%	
	Class 1	0	0.40	0	0.39	0	0.39
	Class 2	24		23		22	
	Class 3	50		50		49	
	Class 4	26		27		29	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	5	0.16	5	0.16	4	0.15
V5	Salinity (ppt)						
	fresh	0	0.82	0	0.82	0	0.86
	intermediate	3.4		3.4		3.2	
V6	Access Value						
	fresh	0.0000	0.40	0.0000	0.40	0.0000	0.36
	intermediate	0.246		0.2460		0.2030	
	Emergent Marsh HSI =		0.54	EM HSI =	0.53	EM HSI =	0.53
	Open Water HSI =		0.25	OW HSI =	0.25	OW HSI =	0.26

Intermediate Calculations		
Interspersion		
0	0	0
0.6	0.6	0.6
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.82	0.82	0.86
Access Value		
0.30	0.30	0.30
0.40	0.40	0.36

Project: **B4 High SLR**

FWP

Variable		TY	43	TY	53	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	25	0.33	0	0.10	0	0.10
V2	% Aquatic	2	0.12	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	100		100		100	
V4	%OW <= 1.5ft	1	0.11	0	0.10	0	0.10
V5	Salinity (ppt)						
	fresh	0	0.60	0	0.54	0	0.40
	intermediate	4.5		4.8		5.5	
V6	Access Value						
	fresh	0.0000	0.30	0.0000	0.27	0.0000	0.27
	intermediate	0.1200		0.0830		0.0830	
		EM HSI =	0.33	EM HSI =	0.16	EM HSI =	0.15
		OW HSI =	0.18	OW HSI =	0.15	OW HSI =	0.14

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0.1
Salinity		
1.00	1.00	1.00
0.60	0.54	0.40
Access Value		
0.30	0.30	0.30
0.30	0.27	0.27

Project: **B4 High SLR**

FWP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

AAHU CALCULATION - EMERGENT MARSH

Project: B4 High SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	2071	0.54	1118.82	
1	2029	0.53	1084.01	1101.37
43	1035	0.34	348.68	28713.02
53	0	0.15	0.00	1426.90
70	0	0.14	0.00	0.00
Max=	70		AAHUs =	446.30

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	2071	0.54	1118.82	
1	2029	0.53	1084.01	1101.37
5	1988	0.53	1046.83	4261.48
43	1035	0.33	338.08	25106.70
53	0	0.16	0.00	1407.57
70	0	0.15	0.00	0.00
Max=	70		AAHUs	455.39

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	455.39
B. Future Without Project Emergent Marsh AAHUs =	446.30
Net Change (FWP - FWOP) =	9.08

AAHU CALCULATION - OPEN WATER

Project: B4 High SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,070	0.25	524.54	
1	2,112	0.25	534.56	529.55
43	3,106	0.18	545.77	23225.35
53	4,141	0.15	638.62	5959.01
70	4,141	0.14	595.67	10491.48
Max=	70		AAHUs =	574.36

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,070	0.25	524.54	
1	2,112	0.25	534.56	529.55
5	2,153	0.26	568.85	2206.51
43	3,106	0.18	545.40	21705.55
53	4,141	0.15	638.46	5956.24
70	4,141	0.14	595.52	10488.87
Max=	70		AAHUs	584.10

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	584.10
B. Future Without Project Open Water AAHUs =	574.36
Net Change (FWP - FWOP) =	9.73

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B3 Low SLR**

Project Area:	570
% Fresh	0
% Intermediate	100

Condition: Future Without Project

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	70 SI
V1	% Emergent	50	0.55	49	0.54	2	0.12
V2	% Aquatic	8	0.17	8	0.17	0	0.10
V3	Interspersion	%		%		%	
	Class 1	30	0.48	30	0.48	0	0.10
	Class 2	10		9		0	
	Class 3	0		0		0	
	Class 4	60		61		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	6	0.17	6	0.17	0	0.10
V5	Salinity (ppt)						
	fresh	0	0.92	0	1.00	0	1.00
	intermediate	2.9		0		0	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.20	0.0000	0.20
	intermediate	0.0000		0.0000		0.0000	
	Emergent Marsh HSI =		0.52	EM HSI =	0.52	EM HSI =	0.22
	Open Water HSI =		0.26	OW HSI =	0.26	OW HSI =	0.18

Intermediate Calculations		
Interspersion		
1	1	0
0.6	0.6	0
0	0	0
0.2	0.2	0
0	0	0.1
Salinity		
1.00	1.00	1.00
0.92	1.00	1.00
Access Value		
0.30	0.30	0.30
0.20	0.20	0.20

Project: **B3 Low SLR**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1	0					
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

Project: **B3 Low SLR**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B3 Low SLR**

Condition: Future With Project

Project Area:	570
% Fresh	0
% Intermediate	100

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	50	0.55	49	0.54	46	0.51
V2	% Aquatic	8	0.17	13	0.22	13	0.22
V3	Interspersion	%		%		%	
	Class 1	30	0.48	30	0.48	23	0.43
	Class 2	10		9		11	
	Class 3	0		0		2	
	Class 4	60		61		64	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	6	0.17	6	0.17	6	0.17
V5	Salinity (ppt)						
	fresh	0	0.92	0	1.00	0	1.00
	intermediate	2.9		0		0	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.20	0.0000	0.20
	intermediate	0		0.0000		0.0000	
	Emergent Marsh HSI =		0.52	EM HSI =	0.52	EM HSI =	0.50
	Open Water HSI =		0.26	OW HSI =	0.29	OW HSI =	0.28

Intermediate Calculations

Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.92	1.00	1.00
Access Value		
0.30	0.30	0.30
0.20	0.20	0.20

Project: **B3 Low SLR**

FWP

Variable		TY	24	TY	47	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	33	0.40	18	0.26	2	0.12
V2	% Aquatic	10	0.19	3	0.13	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.26	0	0.20	0	0.10
	Class 2	9		0		0	
	Class 3	14		0		0	
	Class 4	77		100		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	2	0.12	1	0.11	0	0.10
V5	Salinity (ppt)						
	fresh	0	1.00	0	1.00	0	1.00
	intermediate	0		0		0	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.20	0.0000	0.20
	intermediate	0.0000		0.0000		0.0000	
		EM HSI =	0.42	EM HSI =	0.33	EM HSI =	0.22
		OW HSI =	0.25	OW HSI =	0.21	OW HSI =	0.18

Intermediate Calculations

Interspersion		
0	0	0
0.6	0	0
0.4	0	0
0.2	0.2	0
0	0	0.1
Salinity		
1.00	1.00	1.00
1.00	1.00	1.00
Access Value		
0.30	0.30	0.30
0.20	0.20	0.20

Project: **B3 Low SLR**

FWP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

AAHU CALCULATION - EMERGENT MARSH

Project: B3 Low SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	285	0.52	147.33	
1	279	0.52	145.21	146.28
70	11	0.22	2.45	4175.67
Max=	70		AAHUs =	61.74

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	285	0.52	147.33	
1	279	0.52	145.21	146.28
5	262	0.50	131.18	552.56
70	11	0.22	2.45	3586.30
Max=	70		AAHUs	61.22

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	61.22
B. Future Without Project Emergent Marsh AAHUs =	61.74
Net Change (FWP - FWOP) =	-0.53

AAHU CALCULATION - OPEN WATER

Project: B3 Low SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	285	0.26	72.68	
1	291	0.26	75.85	74.26
70	559	0.18	101.39	6359.27
Max=	70		AAHUs =	91.91

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	285	0.26	72.68	
1	291	0.29	83.55	78.08
5	308	0.28	87.43	341.99
70	559	0.18	101.39	6415.26
Max=	70		AAHUs	97.65

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	97.65
B. Future Without Project Open Water AAHUs =	91.91
Net Change (FWP - FWOP) =	5.74

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-0.53
B. Open Water Habitat Net AAHUs =	5.74
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	1.50

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B3 Medium SLR**

Condition: Future Without Project

Project Area:	570
% Fresh	0
% Intermediate	100

Variable		TY 0 Value	SI	TY 1 Value	SI	TY 62 Value	SI
V1	% Emergent	50	0.55	49	0.54	0	0.10
V2	% Aquatic	8	0.17	8	0.17	0	0.10
V3	Interspersion	%		%		%	
	Class 1	30	0.48	30	0.48	0	0.10
	Class 2	10		9		0	
	Class 3	0		0		0	
	Class 4	60		61		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	6	0.17	6	0.17	0	0.10
V5	Salinity (ppt)						
	fresh	0	0.92	0	0.90	0	0.72
	intermediate	2.9		3		3.9	
V6	Access Value						
	fresh	0.0000	0.98	0.0000	0.98	0.0000	0.98
	intermediate	0.9800		0.9800		0.9800	
	Emergent Marsh HSI =		0.63	EM HSI =	0.62	EM HSI =	0.20
	Open Water HSI =		0.32	OW HSI =	0.32	OW HSI =	0.21

Intermediate Calculations

Interspersion		
1	1	0
0.6	0.6	0
0	0	0
0.2	0.2	0
0	0	0.1
Salinity		
1.00	1.00	1.00
0.92	0.90	0.72
Access Value		
0.30	0.30	0.30
0.98	0.98	0.98

Project: **B3 Medium SLR**

FWOP

Variable		TY 70 Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)						
	fresh	0	0.70				
	intermediate	4					
V6	Access Value						
	fresh	0.0000	0.98				
	intermediate	0.9800					
		EM HSI =	0.20	EM HSI =		EM HSI =	
		OW HSI =	0.20	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0
Salinity		
1.00		
0.70		
Access Value		
0.30		
0.98		

Project: **B3 Medium SLR**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B3 Medium SLR**

Condition: Future With Project

Project Area:	570
% Fresh	0
% Intermediate	100

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	50	0.55	49	0.54	46	0.51
V2	% Aquatic	8	0.17	8	0.17	10	0.19
V3	Interspersion	%		%		%	
	Class 1	30	0.48	30	0.48	23	0.43
	Class 2	10		9		11	
	Class 3	0		0		2	
	Class 4	60		61		64	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	6	0.17	6	0.17	5	0.16
V5	Salinity (ppt)						
	fresh	0	0.92	0	0.90	0	0.94
	intermediate	2.9		3		2.8	
V6	Access Value						
	fresh	0.0000	0.98	0.0000	0.98	0.0000	0.84
	intermediate	0.98		0.9800		0.7970	
	Emergent Marsh HSI =		0.63	EM HSI =	0.62	EM HSI =	0.59
	Open Water HSI =		0.32	OW HSI =	0.32	OW HSI =	0.33

Intermediate Calculations		
Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.92	0.90	0.94
Access Value		
0.30	0.30	0.30
0.98	0.98	0.84

Project: **B3 Medium SLR**

FWP

Variable		TY	24	TY	47	TY	62
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	ERR(<100)	0	ERR(<100)	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	0	0.10	0	0.10	0	0.10
V5	Salinity (ppt)						
	fresh	0	1.00	0	1.00	0	0.72
	intermediate	0		0		3.9	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.20	0.0000	0.75
	intermediate	0.0000		0.0000		0.6830	
		EM HSI =		EM HSI =		EM HSI =	0.20
		OW HSI =		OW HSI =		OW HSI =	0.20

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0.1
Salinity		
1.00	1.00	1.00
1.00	1.00	0.72
Access Value		
0.30	0.30	0.30
0.20	0.20	0.75

Project: **B3 Medium SLR**

FWP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)						
	fresh	0	0.70				
	intermediate	4					
V6	Access Value						
	fresh	0.0000	0.69				
	intermediate	0.6180					
		EM HSI =	0.20	EM HSI =		EM HSI =	
		OW HSI =	0.19	OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0
Salinity		
1.00		
0.70		
Access Value		
0.30		
0.69		

AAHU CALCULATION - EMERGENT MARSH

Project: B3 Medium SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	285	0.63	178.66	
1	279	0.62	172.36	175.50
62	0	0.20	0.00	4086.06
70	0	0.20	0.00	0.00
Max=	70		AAHUs =	60.88

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	285	0.63	178.66	
1	279	0.62	172.36	175.50
5	262	0.59	153.56	651.49
62	0	0.20	0.00	3415.11
70	0	0.20	0.00	0.00
Max=	70		AAHUs	60.60

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	60.60
B. Future Without Project Emergent Marsh AAHUs =	60.88
Net Change (FWP - FWOP) =	-0.28

AAHU CALCULATION - OPEN WATER

Project: B3 Medium SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	285	0.32	92.06	
1	291	0.32	93.48	92.77
62	570	0.21	117.36	6757.80
70	570	0.20	116.52	935.54
Max=	70		AAHUs =	111.23

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	285	0.32	92.06	
1	291	0.32	93.48	92.77
5	308	0.33	100.82	388.52
62	570	0.20	112.12	6393.97
70	570	0.19	109.97	888.36
Max=	70		AAHUs	110.91

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	110.91
B. Future Without Project Open Water AAHUs =	111.23
Net Change (FWP - FWOP) =	-0.32

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-0.28
B. Open Water Habitat Net AAHUs =	-0.32
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	-0.29

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B3 High SLR**

Condition: Future Without Project

Project Area:	570
% Fresh	0
% Intermediate	100

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 46 Value	TY 46 SI
V1	% Emergent	50	0.55	49	0.54	0	0.10
V2	% Aquatic	8	0.17	8	0.17	0	0.10
V3	Interspersion	%		%		%	
	Class 1	30	0.48	30	0.48	0	0.10
	Class 2	10		9		0	
	Class 3	0		0		0	
	Class 4	60		61		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	6	0.17	6	0.17	0	0.10
V5	Salinity (ppt)						
	fresh	0	0.92	0	0.88	0	0.52
	intermediate	2.9		3.1		4.9	
V6	Access Value						
	fresh	0.0000	0.98	0.0000	0.98	0.0000	0.98
	intermediate	0.9800		0.9800		0.9800	
	Emergent Marsh HSI =		0.63	EM HSI =	0.62	EM HSI =	0.18
	Open Water HSI =		0.32	OW HSI =	0.32	OW HSI =	0.19

Intermediate Calculations

Interspersion		
1	1	0
0.6	0.6	0
0	0	0
0.2	0.2	0
0	0	0.1
Salinity		
1.00	1.00	1.00
0.92	0.88	0.52
Access Value		
0.30	0.30	0.30
0.98	0.98	0.98

Project: **B3 High SLR**

FWOP

Variable		TY 70 Value	TY 70 SI	TY Value	TY SI	TY Value	TY SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)						
	fresh	0	0.30				
	intermediate	6					
V6	Access Value						
	fresh	0.0000	0.98				
	intermediate	0.9800					
		EM HSI =	0.16	EM HSI =		EM HSI =	
		OW HSI =	0.17	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0
Salinity		
1.00		
0.30		
Access Value		
0.30		
0.98		

Project: **B3 High SLR**

FWOP

Variable		TY Value	TY SI	TY Value	TY SI	TY Value	TY SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B3 High SLR**

Condition: Future With Project

Project Area:	570
% Fresh	0
% Intermediate	100

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	50	0.55	49	0.54	46	0.51
V2	% Aquatic	8	0.17	8	0.17	9	0.18
V3	Interspersion	%		%		%	
	Class 1	30	0.48	30	0.48	23	0.43
	Class 2	10		9		11	
	Class 3	0		0		2	
	Class 4	60		61		64	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	6	0.17	6	0.17	5	0.16
V5	Salinity (ppt)						
	fresh	0	0.92	0	0.88	0	0.90
	intermediate	2.9		3.1		3	
V6	Access Value						
	fresh	0.0000	0.98	0.0000	0.98	0.0000	0.84
	intermediate	0.98		0.9800		0.7940	
	Emergent Marsh HSI =		0.63	EM HSI =	0.62	EM HSI =	0.58
	Open Water HSI =		0.32	OW HSI =	0.32	OW HSI =	0.32

Intermediate Calculations		
Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.92	0.88	0.90
Access Value		
0.30	0.30	0.30
0.98	0.98	0.84

Project: **B3 High SLR**

FWP

Variable		TY	46	TY	70	TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10		
V2	% Aquatic	0	0.10	0	0.10		
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10		
	Class 2	0		0			
	Class 3	0		0			
	Class 4	0		0			
	Class 5	100		100			
V4	%OW <= 1.5ft	0	0.10	0	0.10		
V5	Salinity (ppt)						
	fresh	0	0.62	0	0.46		
	intermediate	4.4		5.2			
V6	Access Value						
	fresh	0.0000	0.55	0.0000	0.42		
	intermediate	0.4360		0.2800			
		EM HSI =	0.18	EM HSI =	0.16	EM HSI =	
		OW HSI =	0.18	OW HSI =	0.16	OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0
Salinity		
1.00	1.00	
0.62	0.46	
Access Value		
0.30	0.30	
0.55	0.42	

Project: **B3 High SLR**

FWP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

AAHU CALCULATION - EMERGENT MARSH

Project: B3 High SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	285	0.63	178.66	
1	279	0.62	171.74	175.19
46	0	0.18	0.00	2958.51
70	0	0.16	0.00	0.00
Max=	70		AAHUs =	44.77

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	285	0.63	178.66	
1	279	0.62	171.74	175.19
5	262	0.58	152.34	647.78
46	0	0.18	0.00	2410.21
70	0	0.16	0.00	0.00
Max=	70		AAHUs	46.19

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	46.19
B. Future Without Project Emergent Marsh AAHUs =	44.77
Net Change (FWP - FWOP) =	1.42

AAHU CALCULATION - OPEN WATER

Project: B3 High SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	285	0.32	92.06	
1	291	0.32	93.05	92.55
46	570	0.19	108.92	4813.46
70	570	0.17	99.63	2502.61
Max=	70		AAHUs =	105.84

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	285	0.32	92.06	
1	291	0.32	93.05	92.55
5	308	0.32	97.50	381.14
46	570	0.18	102.48	4344.51
70	570	0.16	91.48	2327.53
Max=	70		AAHUs	102.08

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	102.08
B. Future Without Project Open Water AAHUs =	105.84
Net Change (FWP - FWOP) =	-3.76

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	1.42
B. Open Water Habitat Net AAHUs =	-3.76
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	-0.25

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B1,B2 Low SLR**

Project Area:	3,965
% Fresh	100
% Intermediate	0

Condition: Future Without Project

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	70 SI
V1	% Emergent	90	0.91	90	0.91	86	0.87
V2	% Aquatic	24	0.32	24	0.32	23	0.31
V3	Interspersion	%		%		%	
	Class 1	95	0.98	95	0.98	73	0.89
	Class 2	5		5		27	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	35	0.49	35	0.49	34	0.48
V5	Salinity (ppt)						
	fresh	2	0.76	0	1.00	0	1.00
	intermediate	0		0		0	
V6	Access Value						
	fresh	0.0000	0.30	0.0000	0.30	0.0000	0.30
	intermediate	0.0000		0.0000		0.0000	
	Emergent Marsh HSI =		0.78	EM HSI =	0.81	EM HSI =	0.78
	Open Water HSI =		0.41	OW HSI =	0.43	OW HSI =	0.41

Intermediate Calculations		
Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0
0	0	0
0	0	0
Salinity		
0.76	1.00	1.00
1.00	1.00	1.00
Access Value		
0.30	0.30	0.30
0.20	0.20	0.20

Project: **B1,B2 Low SLR**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

Project: **B1,B2 Low SLR**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B1,B2 Low SLR**

Condition: Future With Project

Project Area:	3,965
% Fresh	100
% Intermediate	0

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	5 SI
V1	% Emergent	90	0.91	90	0.91	90	0.91
V2	% Aquatic	24	0.32	32	0.39	32	0.39
V3	Interspersion	%		%		%	
	Class 1	95	0.98	95	0.98	95	0.98
	Class 2	5		5		5	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	35	0.49	35	0.49	35	0.49
V5	Salinity (ppt)						
	fresh	1.7	0.76	0	1.00	0	1.00
	intermediate	0		0		0	
V6	Access Value						
	fresh	0.0000	0.30	0.0000	0.30	0.0000	0.30
	intermediate	0		0.0000		0.0000	
	Emergent Marsh HSI =		0.78	EM HSI =	0.81	EM HSI =	0.81
	Open Water HSI =		0.41	OW HSI =	0.47	OW HSI =	0.47

Intermediate Calculations

Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0
0	0	0
0	0	0
Salinity		
0.76	1.00	1.00
1.00	1.00	1.00
Access Value		
0.30	0.30	0.30
0.20	0.20	0.20

Project: **B1,B2 Low SLR**

FWP

Variable		TY Value	24 SI	TY Value	47 SI	TY Value	70 SI
V1	% Emergent	89	0.90	87	0.88	86	0.87
V2	% Aquatic	32	0.39	31	0.38	31	0.38
V3	Interspersion	%		%		%	
	Class 1	94	0.98	80	0.92	73	0.89
	Class 2	6		20		27	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	35	0.49	35	0.49	34	0.48
V5	Salinity (ppt)						
	fresh	0	1.00	0	1.00	0	1.00
	intermediate	0		0		0	
V6	Access Value						
	fresh	0.0000	0.30	0.0000	0.30	0.0000	0.30
	intermediate	0.0000		0.0000		0.0000	
		EM HSI =	0.80	EM HSI =	0.79	EM HSI =	0.78
		OW HSI =	0.47	OW HSI =	0.46	OW HSI =	0.45

Intermediate Calculations

Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0
0	0	0
0	0	0
Salinity		
1.00	1.00	1.00
1.00	1.00	1.00
Access Value		
0.30	0.30	0.30
0.20	0.20	0.20

Project: **B1,B2 Low SLR**

FWP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

AAHU CALCULATION - EMERGENT MARSH

Project: B1,B2 Low SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3569	0.78	2789.54	
1	3569	0.81	2884.72	2837.13
70	3410	0.78	2656.51	191118.72
Max=	70		AAHUs =	2770.80

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3569	0.78	2789.54	
1	3569	0.81	2884.72	2837.13
5	3569	0.81	2884.72	11538.87
70	3410	0.78	2656.51	180039.38
Max=	70		AAHUs	2777.36

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	2777.36
B. Future Without Project Emergent Marsh AAHUs =	2770.80
Net Change (FWP - FWOP) =	6.56

AAHU CALCULATION - OPEN WATER

Project: B1,B2 Low SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	396	0.41	161.60	
1	396	0.43	168.64	165.12
70	555	0.41	229.38	13754.41
Max=	70		AAHUs =	198.85

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	396	0.41	161.60	
1	396	0.47	184.62	173.11
5	396	0.47	184.62	738.50
70	555	0.45	251.93	14209.30
Max=	70		AAHUs	216.01

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	216.01
B. Future Without Project Open Water AAHUs =	198.85
Net Change (FWP - FWOP) =	17.16

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B1,B2 Medium SLR**

Condition: Future Without Project

Project Area:	3,965
% Fresh	100
% Intermediate	0

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	70 SI
V1	% Emergent	90	0.91	90	0.91	76	0.78
V2	% Aquatic	24	0.32	24	0.32	21	0.29
V3	Interspersion	%		%		%	
	Class 1	95	0.98	95	0.98	47	0.74
	Class 2	5		5		29	
	Class 3	0		0		24	
	Class 4	0		0		0	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	35	0.49	35	0.49	25	0.38
V5	Salinity (ppt)						
	fresh	2	0.76	2	0.76	2	0.66
	intermediate	0		0		0	
V6	Access Value						
	fresh	0.9860	0.99	0.9860	0.99	0.9860	0.99
	intermediate	0.0000		0.0000		0.0000	
	Emergent Marsh HSI =		0.91	EM HSI =	0.91	EM HSI =	0.79
	Open Water HSI =		0.49	OW HSI =	0.49	OW HSI =	0.44

Intermediate Calculations

Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0.4
0	0	0
0	0	0
Salinity		
0.76	0.76	0.66
1.00	1.00	1.00
Access Value		
0.99	0.99	0.99
0.20	0.20	0.20

Project: **B1,B2 Medium SLR**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

Project: **B1,B2 Medium SLR**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B1,B2 Medium SLR**

Condition: Future With Project

Project Area:	3,965
% Fresh	100
% Intermediate	0

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	5 SI
V1	% Emergent	90	0.91	90	0.91	90	0.91
V2	% Aquatic	24	0.32	24	0.32	25	0.33
V3	Interspersion	%		%		%	
	Class 1	95	0.98	95	0.98	95	0.98
	Class 2	5		5		5	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	35	0.49	35	0.49	35	0.49
V5	Salinity (ppt)						
	fresh	1.7	0.76	2	0.76	1.6	0.78
	intermediate	0		0		0	
V6	Access Value						
	fresh	0.9860	0.99	0.9860	0.99	0.8040	0.86
	intermediate	0		0.0000		0.0000	
	Emergent Marsh HSI =		0.91	EM HSI =	0.91	EM HSI =	0.90
	Open Water HSI =		0.49	OW HSI =	0.49	OW HSI =	0.49

Intermediate Calculations

Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0
0	0	0
0	0	0
Salinity		
0.76	0.76	0.78
1.00	1.00	1.00
Access Value		
0.99	0.99	0.86
0.20	0.20	0.20

Project: **B1,B2 Medium SLR**

FWP

Variable		TY Value	24 SI	TY Value	47 SI	TY Value	70 SI
V1	% Emergent	0	0.10	0	0.10	76	0.78
V2	% Aquatic	0	0.10	0	0.10	21	0.29
V3	Interspersion	%		%		%	
	Class 1	0	ERR(<100)	0	ERR(<100)	47	0.74
	Class 2	0		0		29	
	Class 3	0		0		24	
	Class 4	0		0		0	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	0	0.10	0	0.10	25	0.38
V5	Salinity (ppt)						
	fresh	0	1.00	0	1.00	2.3	0.64
	intermediate	0		0		0	
V6	Access Value						
	fresh	0.0000	0.30	0.0000	0.30	0.6250	0.74
	intermediate	0.0000		0.0000		0.0000	
		EM HSI =		EM HSI =		EM HSI =	0.76
		OW HSI =		OW HSI =		OW HSI =	0.41

Intermediate Calculations

Interspersion		
0	0	1
0	0	0.6
0	0	0.4
0	0	0
0	0	0
Salinity		
1.00	1.00	0.64
1.00	1.00	1.00
Access Value		
0.30	0.30	0.74
0.20	0.20	0.20

Project: **B1,B2 Medium SLR**

FWP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

AAHU CALCULATION - EMERGENT MARSH

Project: **B1,B2 Medium SLR**

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3569	0.91	3251.88	
1	3569	0.91	3251.88	3251.88
70	3013	0.79	2378.86	193482.75
Max=	70		AAHUs =	2810.49

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3569	0.91	3251.88	
1	3569	0.91	3251.88	3251.88
5	3569	0.90	3201.67	12907.10
70	3013	0.76	2280.63	177330.53
Max=	70		AAHUs	2764.14

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	2764.14
B. Future Without Project Emergent Marsh AAHUs =	2810.49
Net Change (FWP - FWOP) =	-46.36

AAHU CALCULATION - OPEN WATER

Project: **B1,B2 Medium SLR**

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	396	0.49	195.02	
1	396	0.49	195.02	195.02
70	952	0.44	416.75	21455.65
Max=	70		AAHUs =	309.30

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	396	0.49	195.02	
1	396	0.49	195.02	195.02
5	396	0.49	193.88	777.80
70	952	0.41	394.66	19579.76
Max=	70		AAHUs	293.61

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	293.61
B. Future Without Project Open Water AAHUs =	309.30
Net Change (FWP - FWOP) =	-15.69

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-46.36
B. Open Water Habitat Net AAHUs =	-15.69
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	-36.46

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B1,B2 High SLR**

Condition: Future Without Project

Project Area:	3,965
% Fresh	100
% Intermediate	0

Variable		TY	0	TY	1	TY	43
		Value	SI	Value	SI	Value	SI
V1	% Emergent	90	0.91	90	0.91	67	0.70
V2	% Aquatic	24	0.32	24	0.32	17	0.25
V3	Interspersion	%		%		%	
	Class 1	95	0.98	95	0.98	6	0.54
	Class 2	5		5		54	
	Class 3	0		0		40	
	Class 4	0		0		0	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	35	0.49	35	0.49	18	0.30
V5	Salinity (ppt)						
	fresh	1.7	0.76	1.7	0.76	2.8	0.54
	intermediate	0		0		0	
V6	Access Value						
	fresh	0.9860	0.99	0.9860	0.99	0.9860	0.99
	intermediate	0.0000		0.0000		0.0000	
	Emergent Marsh HSI =		0.91	EM HSI =	0.91	EM HSI =	0.70
	Open Water HSI =		0.49	OW HSI =	0.49	OW HSI =	0.38

Intermediate Calculations

Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0.4
0	0	0
0	0	0
Salinity		
0.76	0.76	0.54
1.00	1.00	1.00
Access Value		
0.99	0.99	0.99
0.20	0.20	0.20

Project: **B1,B2 High SLR**

FWOP

Variable		TY	53	TY	70	TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10		
V2	% Aquatic	0	0.10	0	0.10		
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10		
	Class 2	0		0			
	Class 3	0		0			
	Class 4	0		0			
	Class 5	100		100			
V4	%OW <= 1.5ft	0	0.10	0	0.10		
V5	Salinity (ppt)						
	fresh	3	0.50	3.4	0.42		
	intermediate	0		0			
V6	Access Value						
	fresh	0.9860	0.99	0.9860	0.99		
	intermediate	0.0000		0.0000			
		EM HSI =	0.18	EM HSI =	0.17	EM HSI =	
		OW HSI =	0.19	OW HSI =	0.18	OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0
Salinity		
0.50	0.42	
1.00	1.00	
Access Value		
0.99	0.99	
0.20	0.20	

Project: **B1,B2 High SLR**

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **B1,B2 High SLR**

Condition: Future With Project

Project Area:	3,965
% Fresh	100
% Intermediate	0

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	5 SI
V1	% Emergent	90	0.91	90	0.91	89	0.90
V2	% Aquatic	24	0.32	24	0.32	24	0.32
V3	Interspersion	%		%		%	
	Class 1	95	0.98	95	0.98	94	0.98
	Class 2	5		5		6	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	35	0.49	35	0.49	35	0.49
V5	Salinity (ppt)						
	fresh	1.7	0.76	1.7	0.76	1.7	0.76
	intermediate	0		0		0	
V6	Access Value						
	fresh	0.9860	0.99	0.9860	0.99	0.8010	0.86
	intermediate	0		0.0000		0.0000	
	Emergent Marsh HSI =		0.91	EM HSI =	0.91	EM HSI =	0.89
	Open Water HSI =		0.49	OW HSI =	0.49	OW HSI =	0.48

Intermediate Calculations

Interspersion		
1	1	1
0.6	0.6	0.6
0	0	0
0	0	0
0	0	0
Salinity		
0.76	0.76	0.76
1.00	1.00	1.00
Access Value		
0.99	0.99	0.86
0.20	0.20	0.20

Project: **B1,B2 High SLR**

FWP

Variable		TY Value	43 SI	TY Value	53 SI	TY Value	70 SI
V1	% Emergent	67	0.70	0	0.10	0	0.10
V2	% Aquatic	17	0.25	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	6	0.54	0	0.10	0	0.10
	Class 2	54		0		0	
	Class 3	40		0		0	
	Class 4	0		0		0	
	Class 5	0		100		100	
V4	%OW <= 1.5ft	18	0.30	0	0.10	0	0.10
V5	Salinity (ppt)						
	fresh	2.5	0.60	2.6	0.58	3.1	0.48
	intermediate	0		0		0	
V6	Access Value						
	fresh	0.4450	0.61	0.2860	0.50	0.2860	0.50
	intermediate	0.0000		0.0000		0.0000	
		EM HSI =	0.66	EM HSI =	0.18	EM HSI =	0.17
		OW HSI =	0.35	OW HSI =	0.17	OW HSI =	0.17

Intermediate Calculations

Interspersion		
1	0	0
0.6	0	0
0.4	0	0
0	0	0
0	0.1	0.1
Salinity		
0.60	0.58	0.48
1.00	1.00	1.00
Access Value		
0.61	0.50	0.50
0.20	0.20	0.20

Project: **B1,B2 High SLR**

FWP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

AAHU CALCULATION - EMERGENT MARSH

Project: B1,B2 High SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3569	0.91	3251.88	
1	3569	0.91	3251.88	3251.88
43	2657	0.70	1858.16	105958.75
53	0	0.18	0.00	6993.82
70	0	0.17	0.00	0.00
Max=	70		AAHUs =	1660.06

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3569	0.91	3251.88	
1	3569	0.91	3251.88	3251.88
5	3529	0.89	3134.96	12773.07
43	2657	0.66	1757.15	91696.35
53	0	0.18	0.00	6642.17
70	0	0.17	0.00	0.00
Max=	70		AAHUs	1633.76

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	1633.76
B. Future Without Project Emergent Marsh AAHUs =	1660.06
Net Change (FWP - FWOP) =	-26.30

AAHU CALCULATION - OPEN WATER

Project: B1,B2 High SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	396	0.49	195.02	
1	396	0.49	195.02	195.02
43	1,308	0.38	496.36	15240.17
53	3,965	0.19	752.65	7084.88
70	3,965	0.18	729.15	12595.26
Max=	70		AAHUs =	501.65

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	396	0.49	195.02	
1	396	0.49	195.02	195.02
5	436	0.48	209.68	809.69
43	1,308	0.35	461.07	13453.41
53	3,965	0.17	690.28	6546.84
70	3,965	0.17	660.91	11485.18
Max=	70		AAHUs	464.14

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	464.14
B. Future Without Project Open Water AAHUs =	501.65
Net Change (FWP - FWOP) =	-37.50

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-26.30
B. Open Water Habitat Net AAHUs =	-37.50
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	-29.91

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C20 35 Year Low SLR** Project Area: 462

Condition: Future Without Project

Variable		TY	0	TY	1	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	54	0.59	54	0.59	25	0.33
V2	% Aquatic	6	0.15	6	0.15	2	0.12
V3	Interspersion	%		%		%	
	Class 1	0	0.43	0	0.43	0	0.20
	Class 2	58		58		0	
	Class 3	0		0		0	
	Class 4	42		42		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	11	0.24	11	0.24	2	0.13
V5	Salinity (ppt)	5	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
	Emergent Marsh HSI =		0.46	EM HSI =	0.46	EM HSI =	0.33
	Open Water HSI =		0.22	OW HSI =	0.22	OW HSI =	0.18

Intermediate Calculations

Interspersion

0	0	0
0.6	0.6	0
0	0	0
0.2	0.2	0.2
0	0	0

Project: **C20 35 Year Low SLR** Project Area: 462

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Project: **C20 35 Year Low SLR** Project Area: 462

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C20 35 Year Low SLR** Project Area: 462

Condition: Future With Project

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	5 SI
V1	% Emergent	54	0.59	54	0.59	52	0.57
V2	% Aquatic	6	0.15	8	0.17	8	0.17
V3	Interspersion	%		%		%	
	Class 1	0	0.43	0	0.43	0	0.42
	Class 2	58		58		54	
	Class 3	0		0		0	
	Class 4	42		42		46	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	11	0.24	11	0.24	10	0.23
V5	Salinity (ppt)	5.4	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
	Emergent Marsh HSI =		0.46	EM HSI =	0.46	EM HSI =	0.45
	Open Water HSI =		0.22	OW HSI =	0.23	OW HSI =	0.23

Intermediate Calculations

Interspersion

0	0	0
0.6	0.6	0.6
0	0	0
0.2	0.2	0.2
0	0	0

Project: **C20 35 Year Low SLR** Project Area: 462

FWP

Variable		TY Value	24 SI	TY Value	47 SI	TY Value	70 SI
V1	% Emergent	44	0.50	34	0.41	25	0.33
V2	% Aquatic	7	0.16	5	0.15	4	0.14
V3	Interspersion	%		%		%	
	Class 1	0	0.35	0	0.27	0	0.20
	Class 2	30		0		0	
	Class 3	16		37		0	
	Class 4	54		63		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	8	0.20	6	0.18	2	0.13
V5	Salinity (ppt)	0	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
		EM HSI =	0.42	EM HSI =	0.37	EM HSI =	0.33
		OW HSI =	0.22	OW HSI =	0.20	OW HSI =	0.19

Intermediate Calculations

Interspersion

0	0	0
0.6	0	0
0.4	0.4	0
0.2	0.2	0.2
0	0	0

Project: **C20 35 Year Low SLR** Project Area: 462

FWP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: C20 35 Year Low SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	249	0.46	115.08	
1	249	0.46	115.08	115.08
70	116	0.33	37.81	5066.27
Max TY=	70		AAHUs =	74.02

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	249	0.46	115.08	
1	249	0.46	115.08	115.08
5	240	0.45	108.77	447.66
70	116	0.33	37.81	4592.79
Max TY=	70		AAHUs	73.65

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	73.65
B. Future Without Project Emergent Marsh AAHUs =	74.02
Net Change (FWP - FWOP) =	-0.37

AAHU CALCULATION - OPEN WATER

Project: C20 35 Year Low SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	213	0.22	47.87	
1	213	0.22	47.87	47.87
70	346	0.18	63.70	3911.25
Max TY=	70		AAHUs =	56.56

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	213	0.22	47.87	
1	213	0.23	49.34	48.61
5	222	0.23	50.95	200.60
70	346	0.19	66.34	3862.76
Max TY=	70		AAHUs	58.74

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	58.74
B. Future Without Project Open Water AAHUs =	56.56
Net Change (FWP - FWOP) =	2.18

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-0.37
B. Open Water Habitat Net AAHUs =	2.18
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	0.34

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C20 35 Year Medium SLR** Project Area: 462

Condition: Future Without Project

Variable		TY	0	TY	1	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	54	0.59	54	0.59	15	0.24
V2	% Aquatic	6	0.15	6	0.15	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.43	0	0.43	0	0.20
	Class 2	58		58		0	
	Class 3	0		0		0	
	Class 4	42		42		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	11	0.24	11	0.24	0	0.10
V5	Salinity (ppt)	5	1.00	5.4	1.00	7.5	1.00
V6	Access Value	0.9900	0.99	0.9900	0.99	0.9900	0.99
	Emergent Marsh HSI =		0.67	EM HSI =	0.67	EM HSI =	0.39
	Open Water HSI =		0.38	OW HSI =	0.38	OW HSI =	0.29

Intermediate Calculations		
Interspersion		
0	0	0
0.6	0.6	0
0	0	0
0.2	0.2	0.2
0	0	0

Project: **C20 35 Year Medium SLR** Project Area: 462

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Project: **C20 35 Year Medium SLR** Project Area: 462

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C20 35 Year Medium SLR** Project Area: 462

Condition: Future With Project

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	54	0.59	54	0.59	52	0.57
V2	% Aquatic	6	0.15	6	0.15	7	0.16
V3	Interspersion	%		%		%	
	Class 1	0	0.43	0	0.43	0	0.42
	Class 2	58		58		54	
	Class 3	0		0		0	
	Class 4	42		42		46	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	11	0.24	11	0.24	10	0.23
V5	Salinity (ppt)	5.4	1.00	5.4	1.00	5.1	1.00
V6	Access Value	0.9900	0.99	0.9900	0.99	0.5960	0.64
	Emergent Marsh HSI =		0.67	EM HSI =	0.67	EM HSI =	0.61
	Open Water HSI =		0.38	OW HSI =	0.38	OW HSI =	0.34

Intermediate Calculations

Interspersion

0	0	0
0.6	0.6	0.6
0	0	0
0.2	0.2	0.2
0	0	0

Project: **C20 35 Year Medium SLR** Project Area: 462

FWP

Variable		TY	24	TY	47	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	15	0.24
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	ERR(<100)	0	ERR(<100)	0	0.20
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	0	0.10	0	0.10	0	0.10
V5	Salinity (ppt)	0	1.00	0	1.00	8.1	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.4560	0.51
		EM HSI =		EM HSI =		EM HSI =	0.35
		OW HSI =		OW HSI =		OW HSI =	0.25

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0.2
0	0	0

Project: **C20 35 Year Medium SLR** Project Area: 462

FWP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: C20 35 Year Medium SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	249	0.67	167.74	
1	249	0.67	167.74	167.74
70	69	0.39	26.78	6119.74
Max TY=	70		AAHUs =	89.82

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	249	0.67	167.74	
1	249	0.67	167.74	167.74
5	240	0.61	146.61	628.31
70	69	0.35	24.28	5074.25
Max TY=	70		AAHUs	83.86

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	83.86
B. Future Without Project Emergent Marsh AAHUs =	89.82
Net Change (FWP - FWOP) =	-5.96

AAHU CALCULATION - OPEN WATER

Project: C20 35 Year Medium SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	213	0.38	80.13	
1	213	0.38	80.13	80.13
70	393	0.29	114.35	6885.84
Max TY=	70		AAHUs =	99.51

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	213	0.38	80.13	
1	213	0.38	80.13	80.13
5	222	0.34	75.57	311.62
70	393	0.25	96.51	5768.59
Max TY=	70		AAHUs	88.00

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	88.00
B. Future Without Project Open Water AAHUs =	99.51
Net Change (FWP - FWOP) =	-11.51

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-5.96
B. Open Water Habitat Net AAHUs =	-11.51
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	-7.50

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C20 35 Year High SLR** Project Area: 462

Condition: Future Without Project

Variable		TY	0	TY	1	TY	33
		Value	SI	Value	SI	Value	SI
V1	% Emergent	54	0.59	54	0.59	30	0.37
V2	% Aquatic	6	0.15	6	0.15	1	0.11
V3	Interspersion	%		%		%	
	Class 1	0	0.43	0	0.43	0	0.24
	Class 2	58		58		0	
	Class 3	0		0		19	
	Class 4	42		42		81	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	11	0.24	11	0.24	1	0.11
V5	Salinity (ppt)	5.4	1.00	5.5	1.00	7.2	1.00
V6	Access Value	0.9900	0.99	0.9900	0.99	0.9900	0.99
	Emergent Marsh HSI =		0.67	EM HSI =	0.67	EM HSI =	0.50
	Open Water HSI =		0.38	OW HSI =	0.38	OW HSI =	0.31

Intermediate Calculations

Interspersion

0	0	0
0.6	0.6	0
0	0	0.4
0.2	0.2	0.2
0	0	0

Project: **C20 35 Year High SLR** Project Area: 462

FWOP

Variable		TY	43	TY	70	TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10		
V2	% Aquatic	0	0.10	0	0.10		
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10		
	Class 2	0		0			
	Class 3	0		0			
	Class 4	0		0			
	Class 5	100		100			
V4	%OW <= 1.5ft	0	0.10	0	0.10		
V5	Salinity (ppt)	7.7	1.00	9.1	1.00		
V6	Access Value	0.9900	0.99	0.9900	0.99		
		EM HSI =	0.25	EM HSI =	0.25	EM HSI =	
		OW HSI =	0.28	OW HSI =	0.28	OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0

Project: **C20 35 Year High SLR** Project Area: 462

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C20 35 Year High SLR** Project Area: 462

Condition: Future With Project

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	54	0.59	54	0.59	52	0.57
V2	% Aquatic	6	0.15	6	0.15	7	0.16
V3	Interspersion	%		%		%	
	Class 1	0	0.43	0	0.43	0	0.42
	Class 2	58		58		54	
	Class 3	0		0		0	
	Class 4	42		42		46	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	11	0.24	11	0.24	10	0.23
V5	Salinity (ppt)	5.4	1.00	5.5	1.00	5.2	1.00
V6	Access Value	0.9900	0.99	0.9900	0.99	0.5940	0.63
	Emergent Marsh HSI =		0.67	EM HSI =	0.67	EM HSI =	0.61
	Open Water HSI =		0.38	OW HSI =	0.38	OW HSI =	0.34

Intermediate Calculations		
Interspersion		
0	0	0
0.6	0.6	0.6
0	0	0
0.2	0.2	0.2
0	0	0

Project: **C20 35 Year High SLR** Project Area: 462

FWP

Variable		TY	33	TY	43	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	30	0.37	0	0.10	0	0.10
V2	% Aquatic	2	0.12	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.24	0	0.10	0	0.10
	Class 2	0		0		0	
	Class 3	19		0		0	
	Class 4	81		0		0	
	Class 5	0		100		100	
V4	%OW <= 1.5ft	1	0.11	0	0.10	0	0.10
V5	Salinity (ppt)	6.8	1.00	6.9	1.00	8.3	1.00
V6	Access Value	0.5250	0.57	0.3140	0.38	0.1900	0.27
		EM HSI =	0.46	EM HSI =	0.23	EM HSI =	0.22
		OW HSI =	0.27	OW HSI =	0.22	OW HSI =	0.20

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0.4	0	0
0.2	0	0
0	0.1	0.1

Project: **C20 35 Year High SLR** Project Area: 462

FWP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: C20 35 Year High SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	249	0.67	167.74	
1	249	0.67	167.74	167.74
33	139	0.50	69.33	3690.53
43	0	0.25	0.00	290.01
70	0	0.25	0.00	0.00
Max TY=	70		AAHUs =	59.26

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	249	0.67	167.74	
1	249	0.67	167.74	167.74
5	240	0.61	146.53	628.16
33	139	0.46	63.36	2865.60
43	0	0.23	0.00	264.08
70	0	0.22	0.00	0.00
Max TY=	70		AAHUs	56.08

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	56.08
B. Future Without Project Emergent Marsh AAHUs =	59.26
Net Change (FWP - FWOP) =	-3.18

AAHU CALCULATION - OPEN WATER

Project: C20 35 Year High SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	213	0.38	80.13	
1	213	0.38	80.13	80.13
33	323	0.31	98.53	2900.33
43	462	0.28	131.00	1152.66
70	462	0.28	131.00	3537.04
Max TY=	70		AAHUs =	109.57

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	213	0.38	80.13	
1	213	0.38	80.13	80.13
5	222	0.34	75.52	311.51
33	323	0.27	88.08	2322.17
43	462	0.22	102.53	964.78
70	462	0.20	94.61	2661.32
Max TY=	70		AAHUs	90.57

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	90.57
B. Future Without Project Open Water AAHUs =	109.57
Net Change (FWP - FWOP) =	-19.00

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-3.18
B. Open Water Habitat Net AAHUs =	-19.00
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	-7.58

3/24/2013

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C20 100 Year Low SLR** Project Area: 439

Condition: Future Without Project

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	70 SI
V1	% Emergent	56	0.60	55	0.60	25	0.33
V2	% Aquatic	6	0.15	6	0.15	2	0.12
V3	Interspersion	%		%		%	
	Class 1	0	0.45	0	0.44	0	0.20
	Class 2	60		57		0	
	Class 3	4		6		0	
	Class 4	36		37		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	11	0.24	11	0.24	4	0.15
V5	Salinity (ppt)	5.4	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
	Emergent Marsh HSI =		0.47	EM HSI =	0.47	EM HSI =	0.33
	Open Water HSI =		0.23	OW HSI =	0.23	OW HSI =	0.19

Intermediate Calculations

Interspersion

0	0	0
0.6	0.6	0
0.4	0.4	0
0.2	0.2	0.2
0	0	0

Project: **C20 100 Year Low SLR** Project Area: 439

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Project: **C20 100 Year Low SLR** Project Area: 439

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C20 100 Year Low SLR** Project Area: 439

Condition: Future With Project

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	5 SI
V1	% Emergent	56	0.60	55	0.60	54	0.59
V2	% Aquatic	6	0.15	8	0.17	8	0.17
V3	Interspersion	%		%		%	
	Class 1	0	0.45	0	0.44	0	0.43
	Class 2	60		57		55	
	Class 3	4		6		6	
	Class 4	36		37		39	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	11	0.24	11	0.24	10	0.23
V5	Salinity (ppt)	5.4	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
	Emergent Marsh HSI =		0.47	EM HSI =	0.47	EM HSI =	0.46
	Open Water HSI =		0.23	OW HSI =	0.23	OW HSI =	0.23

Intermediate Calculations

Interspersion

0	0	0
0.6	0.6	0.6
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0

Project: **C20 100 Year Low SLR** Project Area: 439

FWP

Variable		TY Value	24 SI	TY Value	47 SI	TY Value	70 SI
V1	% Emergent	45	0.51	35	0.42	25	0.33
V2	% Aquatic	7	0.16	5	0.15	4	0.14
V3	Interspersion	%		%		%	
	Class 1	0	0.36	0	0.28	0	0.20
	Class 2	32		0		0	
	Class 3	16		40		0	
	Class 4	52		60		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	8	0.20	6	0.18	4	0.15
V5	Salinity (ppt)	0	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
		EM HSI =	0.42	EM HSI =	0.37	EM HSI =	0.33
		OW HSI =	0.22	OW HSI =	0.21	OW HSI =	0.19

Intermediate Calculations

Interspersion

0	0	0
0.6	0	0
0.4	0.4	0
0.2	0.2	0.2
0	0	0

Project: **C20 100 Year Low SLR** Project Area: 439

FWP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: C20 100 Year Low SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	246	0.47	115.89	
1	241	0.47	112.46	114.17
70	110	0.33	35.85	4904.76
Max TY=	70		AAHUs =	71.70

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	246	0.47	115.89	
1	241	0.47	112.46	114.17
5	237	0.46	109.54	443.99
70	110	0.33	35.85	4537.62
Max TY=	70		AAHUs	72.80

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	72.80
B. Future Without Project Emergent Marsh AAHUs =	71.70
Net Change (FWP - FWOP) =	1.10

AAHU CALCULATION - OPEN WATER

Project: C20 100 Year Low SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	193	0.23	43.60	
1	198	0.23	44.62	44.11
70	329	0.19	61.20	3709.73
Max TY=	70		AAHUs =	53.63

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	193	0.23	43.60	
1	198	0.23	45.98	44.79
5	202	0.23	46.60	185.17
70	329	0.19	63.71	3636.03
Max TY=	70		AAHUs	55.23

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	55.23
B. Future Without Project Open Water AAHUs =	53.63
Net Change (FWP - FWOP) =	1.60

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	1.10
B. Open Water Habitat Net AAHUs =	1.60
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	1.24

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C20 100 Year Medium SLR** Project Area: 439

Condition: Future Without Project

Variable		TY	0	TY	1	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	56	0.60	55	0.60	15	0.24
V2	% Aquatic	6	0.15	6	0.15	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.45	0	0.44	0	0.20
	Class 2	60		57		0	
	Class 3	4		6		0	
	Class 4	36		37		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	11	0.24	11	0.24	1	0.11
V5	Salinity (ppt)	5.4	1.00	5.4	1.00	7.5	1.00
V6	Access Value	0.9900	0.99	0.9900	0.99	0.9900	0.99
	Emergent Marsh HSI =		0.69	EM HSI =	0.68	EM HSI =	0.39
	Open Water HSI =		0.38	OW HSI =	0.38	OW HSI =	0.29

Intermediate Calculations

Interspersion

0	0	0
0.6	0.6	0
0.4	0.4	0
0.2	0.2	0.2
0	0	0

Project: **C20 100 Year Medium SLR** Project Area: 439

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Project: **C20 100 Year Medium SLR** Project Area: 439

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C20 100 Year Medium SLR** Project Area: 439

Condition: Future With Project

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	56	0.60	55	0.60	53	0.58
V2	% Aquatic	6	0.15	6	0.15	7	0.16
V3	Interspersion	%		%		%	
	Class 1	0	0.45	0	0.44	0	0.42
	Class 2	60		57		53	
	Class 3	4		6		6	
	Class 4	36		37		41	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	11	0.24	11	0.24	10	0.23
V5	Salinity (ppt)	5.4	1.00	5.4	1.00	5.1	1.00
V6	Access Value	0.9900	0.99	0.9900	0.99	0.5960	0.64
	Emergent Marsh HSI =		0.69	EM HSI =	0.68	EM HSI =	0.62
	Open Water HSI =		0.38	OW HSI =	0.38	OW HSI =	0.34

Intermediate Calculations		
Interspersion		
0	0	0
0.6	0.6	0.6
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0

Project: **C20 100 Year Medium SLR** Project Area: 439

FWP

Variable		TY	24	TY	47	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	15	0.24
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	ERR(<100)	0	ERR(<100)	0	0.20
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	0	0.10	0	0.10	1	0.11
V5	Salinity (ppt)	0	1.00	0	1.00	8.1	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.4560	0.51
		EM HSI =		EM HSI =		EM HSI =	0.35
		OW HSI =		OW HSI =		OW HSI =	0.25

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0.2
0	0	0

Project: **C20 100 Year Medium SLR** Project Area: 439

FWP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: C20 100 Year Medium SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	246	0.69	169.13	
1	241	0.68	164.02	166.57
70	66	0.39	25.62	5953.90
Max TY=	70		AAHUs =	87.44

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	246	0.69	169.13	
1	241	0.68	164.02	166.57
5	233	0.62	143.82	615.35
70	66	0.35	23.23	4949.11
Max TY=	70		AAHUs	81.87

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	81.87
B. Future Without Project Emergent Marsh AAHUs =	87.44
Net Change (FWP - FWOP) =	-5.56

AAHU CALCULATION - OPEN WATER

Project: C20 100 Year Medium SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	193	0.38	72.83	
1	198	0.38	74.60	73.72
70	373	0.29	108.88	6501.08
Max TY=	70		AAHUs =	93.93

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	193	0.38	72.83	
1	198	0.38	74.60	73.72
5	206	0.34	70.25	289.90
70	373	0.25	91.96	5442.69
Max TY=	70		AAHUs	82.95

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	82.95
B. Future Without Project Open Water AAHUs =	93.93
Net Change (FWP - FWOP) =	-10.98

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-5.56
B. Open Water Habitat Net AAHUs =	-10.98
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	-7.07

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C20 100 Year High SLR** Project Area: 439

Condition: Future Without Project

Variable		TY	0	TY	1	TY	33
		Value	SI	Value	SI	Value	SI
V1	% Emergent	56	0.60	55	0.60	31	0.38
V2	% Aquatic	6	0.15	6	0.15	1	0.11
V3	Interspersion	%		%		%	
	Class 1	0	0.45	0	0.44	0	0.25
	Class 2	60		57		0	
	Class 3	4		6		24	
	Class 4	36		37		76	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	11	0.24	11	0.24	5	0.16
V5	Salinity (ppt)	5.4	1.00	5.5	1.00	7.2	1.00
V6	Access Value	0.9900	0.99	0.9900	0.99	0.9900	0.99
	Emergent Marsh HSI =		0.69	EM HSI =	0.68	EM HSI =	0.51
	Open Water HSI =		0.38	OW HSI =	0.38	OW HSI =	0.31

Intermediate Calculations

Interspersion

0	0	0
0.6	0.6	0
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0

Project: **C20 100 Year High SLR** Project Area: 439

FWOP

Variable		TY	43	TY	70	TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10		
V2	% Aquatic	0	0.10	0	0.10		
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10		
	Class 2	0		0			
	Class 3	0		0			
	Class 4	0		0			
	Class 5	100		100			
V4	%OW <= 1.5ft	0	0.10	0	0.10		
V5	Salinity (ppt)	7.7	1.00	9.1	1.00		
V6	Access Value	0.9900	0.99	0.9900	0.99		
		EM HSI =	0.25	EM HSI =	0.25	EM HSI =	
		OW HSI =	0.28	OW HSI =	0.28	OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0

Project: **C20 100 Year High SLR** Project Area: 439

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C20 100 Year High SLR** Project Area: 439

Condition: Future With Project

Variable		TY 0 Value	SI	TY 1 Value	SI	TY 5 Value	SI
V1	% Emergent	56	0.60	55	0.60	53	0.58
V2	% Aquatic	6	0.15	6	0.15	7	0.16
V3	Interspersion	%		%		%	
	Class 1	0	0.45	0	0.44	0	0.42
	Class 2	60		57		53	
	Class 3	4		6		6	
	Class 4	36		37		41	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	11	0.24	11	0.24	11	0.24
V5	Salinity (ppt)	5.4	1.00	5.5	1.00	5.2	1.00
V6	Access Value	0.9900	0.99	0.9900	0.99	0.5940	0.63
	Emergent Marsh HSI =		0.69	EM HSI =	0.68	EM HSI =	0.62
	Open Water HSI =		0.38	OW HSI =	0.38	OW HSI =	0.34

Intermediate Calculations

Interspersion

0	0	0
0.6	0.6	0.6
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0

Project: **C20 100 Year High SLR** Project Area: 439

FWP

Variable		TY 33 Value	SI	TY 43 Value	SI	TY 70 Value	SI
V1	% Emergent	31	0.38	0	0.10	0	0.10
V2	% Aquatic	2	0.12	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.25	0	ERR(<100)	0	0.10
	Class 2	0		0		0	
	Class 3	24		0		0	
	Class 4	76		0		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	2	0.13	0	0.10	0	0.10
V5	Salinity (ppt)	6.8	1.00	6.9	1.00	8.3	1.00
V6	Access Value	0.5250	0.57	0.3140	0.38	0.1900	0.27
		EM HSI =	0.46	EM HSI =		EM HSI =	0.22
		OW HSI =	0.27	OW HSI =		OW HSI =	0.20

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0.4	0	0
0.2	0	0
0	0	0.1

Project: **C20 100 Year High SLR** Project Area: 439

FWP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: C20 100 Year High SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	246	0.69	169.13	
1	241	0.68	164.02	166.57
33	136	0.51	68.90	3629.43
43	0	0.25	0.00	287.31
70	0	0.25	0.00	0.00
Max TY=	70		AAHUs =	58.33

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	246	0.69	169.13	
1	241	0.68	164.02	166.57
5	233	0.62	143.75	615.21
33	136	0.46	62.95	2824.11
43	0		0.00	209.84
70	0	0.22	0.00	0.00
Max TY=	70		AAHUs	54.51

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	54.51
B. Future Without Project Emergent Marsh AAHUs =	58.33
Net Change (FWP - FWOP) =	-3.82

AAHU CALCULATION - OPEN WATER

Project: C20 100 Year High SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	193	0.38	72.83	
1	198	0.38	74.60	73.72
33	303	0.31	93.81	2732.25
43	439	0.28	124.48	1097.36
70	439	0.28	124.48	3360.95
Max TY=	70		AAHUs =	103.78

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	193	0.38	72.83	
1	198	0.38	74.60	73.72
5	206	0.34	70.40	290.18
33	303	0.27	83.14	2179.93
43	439		0.00	477.88
70	439	0.20	89.90	1213.62
Max TY=	70		AAHUs	60.50

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	60.50
B. Future Without Project Open Water AAHUs =	103.78
Net Change (FWP - FWOP) =	-43.27

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-3.82
B. Open Water Habitat Net AAHUs =	-43.27
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	-14.78

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Saline Marsh

Project: **Bayou Dulac Low SLR** Project Area: 3,865

Condition: Future Without Project

Variable		TY	0	TY	1	TY	65
		Value	SI	Value	SI	Value	SI
V1	% Emergent	28	0.35	28	0.35	0	0.10
V2	% Aquatic	5	0.34	5	0.34	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	0.22	0	0.22	0	0.10
	Class 2	0		0		0	
	Class 3	12		12		0	
	Class 4	88		88		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	6	0.18	5	0.16	0	0.10
V5	Salinity (ppt)	8.4	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
	Emergent Marsh HSI =		0.34	EM HSI =	0.34	EM HSI =	0.20
	Open Water HSI =		0.21	OW HSI =	0.21	OW HSI =	0.20

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0.4	0.4	0
0.2	0.2	0
0	0	0.1

Project: **Bayou Dulac Low SLR** Project Area: **3865**

FWOP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.30				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	0	1.00				
V6	Access Value	0.0000	0.10				
		EM HSI =	0.20	EM HSI =		EM HSI =	
		OW HSI =	0.20	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

Project: **Bayou Dulac Low SLR** Project Area: **3865**

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Saline Marsh

Project: **Bayou Dulac Low SLR** Project Area: **3865**

Condition: Future With Project

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 5 Value	TY 5 SI
V1	% Emergent	28	0.35	28	0.35	26	0.33
V2	% Aquatic	5	0.34	6	0.34	6	0.34
V3	Interspersion	%		%		%	
	Class 1	0	0.22	0	0.22	0	0.21
	Class 2	0		0		0	
	Class 3	12		12		4	
	Class 4	88		88		96	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	6	0.18	5	0.16	5	0.16
V5	Salinity (ppt)	8.4	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
	Emergent Marsh HSI =		0.34	EM HSI =	0.34	EM HSI =	0.33
	Open Water HSI =		0.21	OW HSI =	0.21	OW HSI =	0.21

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0

Project: **Bayou Dulac Low SLR** Project Area: **3865**

FWP

Variable		TY 24 Value	TY 24 SI	TY 47 Value	TY 47 SI	TY 65 Value	TY 65 SI
V1	% Emergent	18	0.26	8	0.17	0	0.10
V2	% Aquatic	3	0.32	0	0.30	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	3	0.14	1	0.11	0	0.10
V5	Salinity (ppt)	0	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
		EM HSI =	0.29	EM HSI =	0.25	EM HSI =	0.20
		OW HSI =	0.21	OW HSI =	0.20	OW HSI =	0.20

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0.2	0.2	0
0	0	0.1

Project: **Bayou Dulac Low SLR** Project Area: **3865**

FWP

Variable		TY 70 Value	TY 70 SI	TY Value	TY SI	TY Value	TY SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.30				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	0	1.00				
V6	Access Value	0.0000	0.10				
		EM HSI =	0.20	EM HSI =		EM HSI =	
		OW HSI =	0.20	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: Bayou Dulac Low SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	1082	0.34	363.42	
1	1082	0.34	363.42	363.42
65	0	0.20	0.00	10061.20
70	0	0.20	0.00	0.00
Max=	70		AAHUs =	148.92

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	1082	0.34	363.42	
1	1082	0.34	363.42	363.42
5	1005	0.33	328.02	1382.38
65	0	0.20	0.00	8570.30
70	0	0.20	0.00	0.00
Max=	70		AAHUs	147.37

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	147.37
B. Future Without Project Emergent Marsh AAHUs =	148.92
Net Change (FWP - FWOP) =	-1.55

AAHU CALCULATION - OPEN WATER

Project: Bayou Dulac Low SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,783	0.21	594.61	
1	2,783	0.21	591.96	593.28
65	3,865	0.20	755.01	43303.36
70	3,865	0.20	755.01	3775.07
Max=	70		AAHUs =	681.02

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,783	0.21	594.61	
1	2,783	0.21	593.77	594.19
5	2,860	0.21	606.81	2401.21
65	3,865	0.20	755.01	41023.69
70	3,865	0.20	755.01	3775.07
Max=	70		AAHUs	682.77

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	682.77
B. Future Without Project Open Water AAHUs =	681.02
Net Change (FWP - FWOP) =	1.75

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-1.55
B. Open Water Habitat Net AAHUs =	1.75
Net Benefits= (3.5xEMAAHUs+OWAAHUs)/4.5	-0.82

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Saline Marsh

Project: **Bayou Dulac Medium SLR** Project Area: 3,865

Condition: Future Without Project

Variable		TY	0	TY	1	TY	56
		Value	SI	Value	SI	Value	SI
V1	% Emergent	28	0.35	28	0.35	0	0.10
V2	% Aquatic	5	0.34	5	0.34	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	0.22	0	0.22	0	0.10
	Class 2	0		0		0	
	Class 3	12		12		0	
	Class 4	88		88		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	6	0.18	5	0.16	0	0.10
V5	Salinity (ppt)	8.4	1.00	8.4	1.00	9.4	1.00
V6	Access Value	0.9800	0.98	0.9800	0.98	0.9800	0.98
	Emergent Marsh HSI	=	0.49	EM HSI =	0.49	EM HSI =	0.26
	Open Water HSI	=	0.67	OW HSI =	0.66	OW HSI =	0.63

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0.4	0.4	0
0.2	0.2	0
0	0	0.1

Project: **Bayou Dulac Medium SLR** Project Area: **3865**

FWOP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.30				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	9.6	1.00				
V6	Access Value	0.9800	0.98				
		EM HSI =	0.26	EM HSI =		EM HSI =	
		OW HSI =	0.63	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

Project: **Bayou Dulac Medium SLR** Project Area: **3865**

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Saline Marsh

Project: **Bayou Dulac Medium SLR** Project Area: **3865**

Condition: Future With Project

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	5 SI
V1	% Emergent	28	0.35	28	0.35	26	0.33
V2	% Aquatic	5	0.34	5	0.34	5	0.34
V3	Interspersion	%		%		%	
	Class 1	0	0.22	0	0.22	0	0.21
	Class 2	0		0		0	
	Class 3	12		12		4	
	Class 4	88		88		96	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	6	0.18	5	0.16	5	0.16
V5	Salinity (ppt)	8.4	1.00	8.4	1.00	8.3	1.00
V6	Access Value	0.9800	0.98	0.9800	0.98	0.8150	0.83
	Emergent Marsh HSI	=	0.49	EM HSI =	0.49	EM HSI =	0.46
	Open Water HSI	=	0.67	OW HSI =	0.66	OW HSI =	0.60

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0

Project: **Bayou Dulac Medium SLR** Project Area: **3865**

FWP

Variable		TY Value	24 SI	TY Value	47 SI	TY Value	56 SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	0	0.30	0	0.30	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	ERR(<100)	0	ERR(<100)	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	0	0.10	0	0.10	0	0.10
V5	Salinity (ppt)	0	1.00	0	1.00	9.5	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.7330	0.76
		EM HSI =		EM HSI =		EM HSI =	0.25
		OW HSI =		OW HSI =		OW HSI =	0.54

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0.1

Project: **Bayou Dulac Medium SLR** Project Area: **3865**

FWP

Variable		TY Value	70 SI	TY Value	SI	TY Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.30				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	9.7	1.00				
V6	Access Value	0.6700	0.70				
		EM HSI =	0.25	EM HSI =		EM HSI =	
		OW HSI =	0.52	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: Bayou Dulac Medium SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	1082	0.49	529.99	
1	1082	0.49	529.99	529.99
56	0	0.26	0.00	12294.36
70	0	0.26	0.00	0.00
Max=	70		AAHUs =	183.21

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	1082	0.49	529.99	
1	1082	0.49	529.99	529.99
5	1005	0.46	463.03	1984.56
56	0	0.25	0.00	10018.70
70	0	0.25	0.00	0.00
Max=	70		AAHUs	179.05

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	179.05
B. Future Without Project Emergent Marsh AAHUs =	183.21
Net Change (FWP - FWOP) =	-4.16

AAHU CALCULATION - OPEN WATER

Project: Bayou Dulac Medium SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,783	0.67	1852.11	
1	2,783	0.66	1849.46	1850.79
56	3,865	0.63	2447.22	118469.97
70	3,865	0.63	2447.22	34261.08
Max=	70		AAHUs =	2208.31

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,783	0.67	1852.11	
1	2,783	0.66	1849.46	1850.79
5	2,860	0.60	1719.70	7141.56
56	3,865	0.54	2094.84	97777.08
70	3,865	0.52	2000.44	28666.96
Max=	70		AAHUs	1934.81

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	1934.81
B. Future Without Project Open Water AAHUs =	2208.31
Net Change (FWP - FWOP) =	-273.51

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-4.16
B. Open Water Habitat Net AAHUs =	-273.51
Net Benefits= (3.5xEMAAHUs+OWAAHUs)/4.5	-64.01

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Saline Marsh

Project: **Bayou Dulac High SLR** Project Area: 3,865

Condition: Future Without Project

Variable		TY	0	TY	1	TY	30
		Value	SI	Value	SI	Value	SI
V1	% Emergent	28	0.35	28	0.35	10	0.19
V2	% Aquatic	5	0.34	5	0.34	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	0.22	0	0.22	0	0.10
	Class 2	0		0		0	
	Class 3	12		12		0	
	Class 4	88		88		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	6	0.18	5	0.16	0	0.10
V5	Salinity (ppt)	8.4	1.00	8.4	1.00	9.7	1.00
V6	Access Value	0.9800	0.98	0.9800	0.98	0.9800	0.98
	Emergent Marsh HSI	=	0.49	EM HSI =	0.49	EM HSI =	0.35
	Open Water HSI	=	0.67	OW HSI =	0.66	OW HSI =	0.63

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0.4	0.4	0
0.2	0.2	0
0	0	0.1

Project: **Bayou Dulac High SLR** Project Area: **3865**

FWOP

Variable		TY	40	TY	70	TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10		
V2	% Aquatic	0	0.30	0	0.30		
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10		
	Class 2	0		0			
	Class 3	0		0			
	Class 4	0		0			
	Class 5	100		100			
V4	%OW <= 1.5ft	0	0.10	0	0.10		
V5	Salinity (ppt)	10.1	1.00	11.4	1.00		
V6	Access Value	0.9800	0.98	0.9800	0.98		
		EM HSI =	0.26	EM HSI =	0.26	EM HSI =	
		OW HSI =	0.63	OW HSI =	0.63	OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0

Project: **Bayou Dulac High SLR** Project Area: **3865**

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Saline Marsh

Project: **Bayou Dulac High SLR** Project Area: **3865**

Condition: Future With Project

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	28	0.35	28	0.35	26	0.33
V2	% Aquatic	5	0.34	5	0.34	5	0.34
V3	Interspersion	%		%		%	
	Class 1	0	0.22	0	0.22	0	0.21
	Class 2	0		0		0	
	Class 3	12		12		4	
	Class 4	88		88		96	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	6	0.18	5	0.16	5	0.16
V5	Salinity (ppt)	8.4	1.00	8.4	1.00	8.3	1.00
V6	Access Value	0.9800	0.98	0.9800	0.98	0.8130	0.83
	Emergent Marsh HSI	=	0.49	EM HSI =	0.49	EM HSI =	0.46
	Open Water HSI	=	0.67	OW HSI =	0.66	OW HSI =	0.60

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0

Project: **Bayou Dulac High SLR** Project Area: **3865**

FWP

Variable		TY	30	TY	40	TY	70
		Value	SI	Value	SI	Value	SI
V1	% Emergent	10	0.19	0	0.10	0	0.10
V2	% Aquatic	0	0.30	0	0.30	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	100		100		100	
V4	%OW <= 1.5ft	0	0.10	0	0.10	0	0.10
V5	Salinity (ppt)	9.2	1.00	9.5	1.00	10.2	1.00
V6	Access Value	0.7510	0.78	0.6760	0.71	0.4100	0.47
		EM HSI =	0.33	EM HSI =	0.25	EM HSI =	0.24
		OW HSI =	0.55	OW HSI =	0.52	OW HSI =	0.41

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0.1

Project: **Bayou Dulac High SLR** Project Area: **3865**

FWP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: Bayou Dulac High SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	1082	0.49	529.99	
1	1082	0.49	529.99	529.99
30	387	0.35	133.53	9134.71
40	0	0.26	0.00	612.74
70	0	0.26	0.00	0.00
Max=	70		AAHUs =	146.82

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	1082	0.49	529.99	
1	1082	0.49	529.99	529.99
5	1005	0.46	462.86	1984.19
30	387	0.33	128.60	7062.91
40	0	0.25	0.00	589.34
70	0	0.24	0.00	0.00
Max=	70		AAHUs	145.23

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	145.23
B. Future Without Project Emergent Marsh AAHUs =	146.82
Net Change (FWP - FWOP) =	-1.59

AAHU CALCULATION - OPEN WATER

Project: Bayou Dulac High SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,783	0.67	1852.11	
1	2,783	0.66	1849.46	1850.79
30	3,478	0.63	2202.18	58854.22
40	3,865	0.63	2447.22	23247.01
70	3,865	0.63	2447.22	73416.60
Max=	70		AAHUs =	2248.12

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,783	0.67	1852.11	
1	2,783	0.66	1849.46	1850.79
5	2,860	0.60	1717.49	7137.19
30	3,478	0.55	1909.01	45464.28
40	3,865	0.52	2009.53	19611.36
70	3,865	0.41	1584.45	53909.62
Max=	70		AAHUs	1828.19

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	1828.19
B. Future Without Project Open Water AAHUs =	2248.12
Net Change (FWP - FWOP) =	-419.93

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-1.59
B. Open Water Habitat Net AAHUs =	-419.93
Net Benefits= (3.5xEMAAHUs+OWAAHUs)/4.5	-94.55

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Saline Marsh

Project: **Robin Canal Low SLR** Project Area: 9,923

Condition: Future Without Project

Variable		TY	0	TY	1	TY	11
		Value	SI	Value	SI	Value	SI
V1	% Emergent	8	0.17	7	0.16	0	0.10
V2	% Aquatic	0	0.30	0	0.30	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	2	0.13	2	0.13	0	0.10
V5	Salinity (ppt)	12	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
	Emergent Marsh HSI =		0.25	EM HSI =	0.25	EM HSI =	0.20
	Open Water HSI =		0.20	OW HSI =	0.20	OW HSI =	0.20

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0.2	0.2	0
0	0	0.1

Project: **Robin Canal Low SLR** Project Area: **9923**

FWOP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.30				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	0	1.00				
V6	Access Value	0.0000	0.10				
		EM HSI =	0.20	EM HSI =		EM HSI =	
		OW HSI =	0.20	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

Project: **Robin Canal Low SLR** Project Area: **9923**

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Saline Marsh

Project: **Robin Canal Low SLR** Project Area: **9923**

Condition: Future With Project

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	5 SI
V1	% Emergent	8	0.17	7	0.16	4	0.14
V2	% Aquatic	0	0.30	0	0.30	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.20
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	2	0.13	2	0.13	1	0.11
V5	Salinity (ppt)	12	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
	Emergent Marsh HSI	=	0.25	EM HSI =	0.25	EM HSI =	0.23
	Open Water HSI	=	0.20	OW HSI =	0.20	OW HSI =	0.20

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0.2	0.2	0.2
0	0	0

Project: **Robin Canal Low SLR** Project Area: **9923**

FWP

Variable		TY Value	11 SI	TY Value	24 SI	TY Value	47 SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	0	0.30	0	0.30	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	100		100		100	
V4	%OW <= 1.5ft	0	0.10	0	0.10	0	0.10
V5	Salinity (ppt)	0	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
		EM HSI =	0.20	EM HSI =	0.20	EM HSI =	0.20
		OW HSI =	0.20	OW HSI =	0.20	OW HSI =	0.20

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0.1

Project: **Robin Canal Low SLR** Project Area: **9923**

FWP

Variable		TY Value	70 SI	TY Value	SI	TY Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.30				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	0	1.00				
V6	Access Value	0.0000	0.10				
		EM HSI =	0.20	EM HSI =		EM HSI =	
		OW HSI =	0.20	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

AAHU CALCULATION - OPEN WATER

Project: Robin Canal Low SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	9,129	0.20	1868.33	
1	9228	0.20	1888.59	1878.46
11	9923	0.20	1938.42	19145.85
70	9923	0.20	1938.42	114366.86
Max=	70		AAHUs =	1934.16

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	9,129	0.20	1868.33	
1	9228	0.20	1888.59	1878.46
5	9526	0.20	1940.51	7658.39
11	9923	0.20	1938.42	11640.10
70	9923	0.20	1938.42	114366.86
Max=	70		AAHUs	1936.34

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	1936.34
B. Future Without Project Open Water AAHUs =	1934.16
Net Change (FWP - FWOP) =	2.18

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-0.22
B. Open Water Habitat Net AAHUs =	2.18
Net Benefits= (3.5xEMAAHUs+OWAAHUs)/4.5	0.31

3/24/2013

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Saline Marsh

Project: **Robin Canal Medium SLR** Project Area: 9,923

Condition: Future Without Project

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	10 SI
V1	% Emergent	8	0.17	7	0.16	0	0.10
V2	% Aquatic	0	0.30	0	0.30	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	1	0.11	1	0.11	0	0.10
V5	Salinity (ppt)	12	1.00	12	1.00	12.2	1.00
V6	Access Value	0.9600	0.96	0.9600	0.96	0.9600	0.96
	Emergent Marsh HSI =		0.34	EM HSI =	0.33	EM HSI =	0.26
	Open Water HSI =		0.63	OW HSI =	0.63	OW HSI =	0.63

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0.2	0.2	0
0	0	0.1

Project: **Robin Canal Medium SLR** Project Area: **9923**

FWOP

Variable		TY Value	70 SI	TY Value	SI	TY Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.30				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	13.2	1.00				
V6	Access Value	0.9600	0.96				
		EM HSI =	0.26	EM HSI =		EM HSI =	
		OW HSI =	0.63	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

Project: **Robin Canal Medium SLR** Project Area: **9923**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Saline Marsh

Project: **Robin Canal Medium SLR** Project Area: **9923**

Condition: Future With Project

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	8	0.17	7	0.16	4	0.14
V2	% Aquatic	0	0.30	0	0.30	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.20
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	1	0.11	1	0.11	0	0.10
V5	Salinity (ppt)	12	1.00	12	1.00	11.8	1.00
V6	Access Value	0.9600	0.96	0.9600	0.96	0.8910	0.90
	Emergent Marsh HSI	=	0.34	EM HSI =	0.33	EM HSI =	0.30
	Open Water HSI	=	0.63	OW HSI =	0.63	OW HSI =	0.61

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0.2	0.2	0.2
0	0	0

Project: **Robin Canal Medium SLR** Project Area: **9923**

FWP

Variable		TY	10	TY	24	TY	47
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	0	0.30	0	0.30	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	ERR(<100)	0	ERR(<100)
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	100		0		0	
V4	%OW <= 1.5ft	0	0.10	0	0.10	0	0.10
V5	Salinity (ppt)	12	1.00	0	1.00	0	1.00
V6	Access Value	0.8780	0.89	0.0000	0.10	0.0000	0.10
		EM HSI =	0.26	EM HSI =		EM HSI =	
		OW HSI =	0.60	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

Project: **Robin Canal Medium SLR** Project Area: **9923**

FWP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.30				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	13.2	1.00				
V6	Access Value	0.8310	0.85				
		EM HSI =	0.25	EM HSI =		EM HSI =	
		OW HSI =	0.58	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: Robin Canal Medium SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	794	0.34	269.30	
1	695	0.33	230.07	249.55
10	0	0.26	0.00	960.50
70	0	0.26	0.00	0.00
Max=	70		AAHUs =	17.29

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	794	0.34	269.30	
1	695	0.33	230.07	249.55
5	397	0.30	120.32	695.23
10	0	0.26	0.00	285.42
70	0	0.25	0.00	0.00
Max=	70		AAHUs	17.57

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	17.57
B. Future Without Project Emergent Marsh AAHUs =	17.29
Net Change (FWP - FWOP) =	0.29

AAHU CALCULATION - OPEN WATER

Project: Robin Canal Medium SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	9,129	0.63	5791.34	
1	9228	0.63	5854.15	5822.74
10	9923	0.63	6212.09	54306.79
70	9923	0.63	6212.09	372725.49
Max=	70		AAHUs =	6183.64

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	9,129	0.63	5791.34	
1	9228	0.63	5854.15	5822.74
5	9526	0.61	5796.45	23306.34
10	9923	0.60	5917.33	29288.48
70	9923	0.58	5745.25	349877.32
Max=	70		AAHUs	5832.78

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	5832.78
B. Future Without Project Open Water AAHUs =	6183.64
Net Change (FWP - FWOP) =	-350.86

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	0.29
B. Open Water Habitat Net AAHUs =	-350.86
Net Benefits= (3.5xEMAAHUs+OWAAHUs)/4.5	-77.74

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Saline Marsh

Project: **Robin Canal High SLR** Project Area: 9,923

Condition: Future Without Project

Variable		TY	0	TY	1	TY	10
		Value	SI	Value	SI	Value	SI
V1	% Emergent	8	0.17	7	0.16	0	0.10
V2	% Aquatic	0	0.30	0	0.30	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	1	0.11	1	0.11	0	0.10
V5	Salinity (ppt)	12	1.00	12	1.00	12.6	1.00
V6	Access Value	0.9600	0.96	0.9600	0.96	0.9600	0.96
	Emergent Marsh HSI	=	0.34	EM HSI =	0.33	EM HSI =	0.26
	Open Water HSI	=	0.63	OW HSI =	0.63	OW HSI =	0.63

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0.2	0.2	0
0	0	0.1

Project: **Robin Canal High SLR** Project Area: **9923**

FWOP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.30				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	16.2	1.00				
V6	Access Value	0.9600	0.96				
		EM HSI =	0.26	EM HSI =		EM HSI =	
		OW HSI =	0.63	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

Project: **Robin Canal High SLR** Project Area: **9923**

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Saline Marsh

Project: **Robin Canal High SLR** Project Area: **9923**

Condition: Future With Project

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	8	0.17	7	0.16	4	0.14
V2	% Aquatic	0	0.30	0	0.30	0	0.30
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.20
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	1	0.11	1	0.11	0	0.10
V5	Salinity (ppt)	12	1.00	12	1.00	11.9	1.00
V6	Access Value	0.9600	0.96	0.9600	0.96	0.8900	0.90
	Emergent Marsh HSI	=	0.34	EM HSI =	0.33	EM HSI =	0.30
	Open Water HSI	=	0.63	OW HSI =	0.63	OW HSI =	0.61

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0.2	0.2	0.2
0	0	0

Project: **Robin Canal High SLR** Project Area: **9923**

FWP

Variable		TY	10	TY	70	TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10		
V2	% Aquatic	0	0.30	0	0.30		
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10		
	Class 2	0		0			
	Class 3	0		0			
	Class 4	0		0			
	Class 5	100		100			
V4	%OW <= 1.5ft	0	0.10	0	0.10		
V5	Salinity (ppt)	12.2	1.00	14.7	1.00		
V6	Access Value	0.8880	0.90	0.7230	0.75		
		EM HSI =	0.26	EM HSI =	0.25	EM HSI =	
		OW HSI =	0.60	OW HSI =	0.54	OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0

Project: **Robin Canal High SLR** Project Area: **9923**

FWP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: Robin Canal High SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	794	0.34	269.30	
1	695	0.33	230.07	249.55
10	0	0.26	0.00	960.50
70	0	0.26	0.00	0.00
Max=	70		AAHUs =	17.29

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	794	0.34	269.30	
1	695	0.33	230.07	249.55
5	397	0.30	120.31	695.19
10	0	0.26	0.00	285.50
70	0	0.25	0.00	0.00
Max=	70		AAHUs	17.57

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	17.57
B. Future Without Project Emergent Marsh AAHUs =	17.29
Net Change (FWP - FWOP) =	0.29

AAHU CALCULATION - OPEN WATER

Project: Robin Canal High SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	9,129	0.63	5791.34	
1	9228	0.63	5854.15	5822.74
10	9923	0.63	6212.09	54306.79
70	9923	0.63	6212.09	372725.49
Max=	70		AAHUs =	6183.64

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	9,129	0.63	5791.34	
1	9228	0.63	5854.15	5822.74
5	9526	0.61	5792.97	23299.45
10	9923	0.60	5953.64	29369.23
70	9923	0.54	5340.17	338814.29
Max=	70		AAHUs	5675.80

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	5675.80
B. Future Without Project Open Water AAHUs =	6183.64
Net Change (FWP - FWOP) =	-507.85

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	0.29
B. Open Water Habitat Net AAHUs =	-507.85
Net Benefits= (3.5xEMAAHUs+OWAAHUs)/4.5	-112.63

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C8 Low SLR** Project Area: 3,196

Condition: Future Without Project

Variable		TY	0	TY	1	TY	22
		Value	SI	Value	SI	Value	SI
V1	% Emergent	20	0.28	19	0.27	0	0.10
V2	% Aquatic	4	0.14	4	0.14	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	5	0.16	5	0.16	0	0.10
V5	Salinity (ppt)	8.8	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
	Emergent Marsh HSI =		0.31	EM HSI =	0.30	EM HSI =	0.20
	Open Water HSI =		0.19	OW HSI =	0.19	OW HSI =	0.17

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0.2	0.2	0
0	0	0.1

Project: **C8 Low SLR** Project Area: 3196

FWOP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	0	1.00				
V6	Access Value	0.0000	0.10				
		EM HSI =	0.20	EM HSI =		EM HSI =	
		OW HSI =	0.17	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

Project: **C8 Low SLR** Project Area: 3196

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C8 Low SLR** Project Area: 3196

Condition: Future With Project

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	20	0.28	19	0.27	15	0.24
V2	% Aquatic	4	0.14	4	0.14	4	0.14
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.20
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	5	0.16	5	0.16	3	0.14
V5	Salinity (ppt)	8.8	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
	Emergent Marsh HSI =		0.31	EM HSI =	0.30	EM HSI =	0.28
	Open Water HSI =		0.19	OW HSI =	0.19	OW HSI =	0.19

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0.2	0.2	0.2
0	0	0

Project: **C8 Low SLR** Project Area: 3196

FWP

Variable		TY	22	TY	24	TY	47
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	100		100		100	
V4	%OW <= 1.5ft	0	0.10	0	0.10	0	0.10
V5	Salinity (ppt)	0	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
		EM HSI =	0.20	EM HSI =	0.20	EM HSI =	0.20
		OW HSI =	0.17	OW HSI =	0.17	OW HSI =	0.17

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0.1

Project: **C8 Low SLR** Project Area: 3196

FWP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	0	1.00				
V6	Access Value	0.0000	0.10				
		EM HSI =	0.20	EM HSI =		EM HSI =	
		OW HSI =	0.17	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: C8 Low SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	639	0.31	194.93	
1	607	0.30	182.58	188.73
22	0	0.20	0.00	1702.97
70	0	0.20	0.00	0.00
Max TY=	70		AAHUs =	27.02

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	639	0.31	194.93	
1	607	0.30	182.58	188.73
5	479	0.28	135.75	635.18
22	0	0.20	0.00	1040.68
70	0	0.20	0.00	0.00
Max TY=	70		AAHUs	26.64

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	26.64
B. Future Without Project Emergent Marsh AAHUs =	27.02
Net Change (FWP - FWOP) =	-0.39

AAHU CALCULATION - OPEN WATER

Project: C8 Low SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,557	0.19	497.58	
1	2,589	0.19	503.81	500.69
22	3,196	0.17	532.67	10942.31
70	3,196	0.17	532.67	25568.00
Max TY=	70		AAHUs =	528.73

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,557	0.19	497.58	
1	2,589	0.19	503.81	500.69
5	2,717	0.19	523.54	2054.85
22	3,196	0.17	532.67	9013.07
70	3,196	0.17	532.67	25568.00
Max TY=	70		AAHUs	530.52

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	530.52
B. Future Without Project Open Water AAHUs =	528.73
Net Change (FWP - FWOP) =	1.79

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-0.39
B. Open Water Habitat Net AAHUs =	1.79
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	0.22

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C8 Medium SLR** Project Area: 3,196

Condition: Future Without Project

Variable		TY	0	TY	1	TY	21
		Value	SI	Value	SI	Value	SI
V1	% Emergent	20	0.28	19	0.27	0	0.10
V2	% Aquatic	3	0.13	3	0.13	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	5	0.16	4	0.15	0	0.10
V5	Salinity (ppt)	8.8	1.00	8.8	1.00	9	1.00
V6	Access Value	0.8600	0.87	0.8600	0.87	0.8600	0.87
	Emergent Marsh HSI =		0.42	EM HSI =	0.41	EM HSI =	0.25
	Open Water HSI =		0.31	OW HSI =	0.31	OW HSI =	0.27

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0.2	0.2	0
0	0	0.1

Project: **C8 Medium SLR** Project Area: 3196

FWOP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	9.6	1.00				
V6	Access Value	0.8600	0.87				
		EM HSI =	0.25	EM HSI =		EM HSI =	
		OW HSI =	0.27	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

Project: **C8 Medium SLR** Project Area: 3196

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C8 Medium SLR** Project Area: 3196

Condition: Future With Project

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	20	0.28	19	0.27	15	0.24
V2	% Aquatic	3	0.13	3	0.13	3	0.13
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.20
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	5	0.16	4	0.15	3	0.14
V5	Salinity (ppt)	8.8	1.00	8.8	1.00	8.7	1.00
V6	Access Value	0.8600	0.87	0.8600	0.87	0.8190	0.84
	Emergent Marsh HSI =		**0.42**	**EM HSI =**	**0.41**	**EM HSI =**	**0.38**
	Open Water HSI =		**0.31**	**OW HSI =**	**0.31**	**OW HSI =**	**0.31**

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0.2	0.2	0.2
0	0	0

Project: **C8 Medium SLR** Project Area: 3196

FWP

Variable		TY	21	TY	24	TY	47
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	ERR(<100)	0	ERR(<100)
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	100		0		0	
V4	%OW <= 1.5ft	0	0.10	0	0.10	0	0.10
V5	Salinity (ppt)	9	1.00	0	1.00	0	1.00
V6	Access Value	0.8160	0.83	0.0000	0.10	0.0000	0.10
		EM HSI =	**0.25**	**EM HSI =**		**EM HSI =**	
		OW HSI =	**0.27**	**OW HSI =**		**OW HSI =**	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

Project: **C8 Medium SLR** Project Area: 3196

FWP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	9.6	1.00				
V6	Access Value	0.7830	0.80				
		EM HSI =	**0.25**	**EM HSI =**		**EM HSI =**	
		OW HSI =	**0.27**	**OW HSI =**		**OW HSI =**	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: C8 Medium SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	639	0.42	266.17	
1	607	0.41	248.57	257.33
21	0	0.25	0.00	2163.96
70	0	0.25	0.00	0.00
Max TY=	70		AAHUs =	34.59

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	639	0.42	266.17	
1	607	0.41	248.57	257.33
5	479	0.38	181.24	856.97
21	0	0.25	0.00	1284.84
70	0	0.25	0.00	0.00
Max TY=	70		AAHUs	34.27

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	34.27
B. Future Without Project Emergent Marsh AAHUs =	34.59
Net Change (FWP - FWOP) =	-0.32

AAHU CALCULATION - OPEN WATER

Project: C8 Medium SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,557	0.31	804.76	
1	2,589	0.31	812.37	808.57
21	3,196	0.27	875.74	16961.54
70	3,196	0.27	875.74	42911.34
Max TY=	70		AAHUs =	866.88

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,557	0.31	804.76	
1	2,589	0.31	812.37	808.57
5	2,717	0.31	840.01	3305.15
21	3,196	0.27	864.87	13688.29
70	3,196	0.27	856.51	42173.80
Max TY=	70		AAHUs	856.80

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	856.80
B. Future Without Project Open Water AAHUs =	866.88
Net Change (FWP - FWOP) =	-10.08

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-0.32
B. Open Water Habitat Net AAHUs =	-10.08
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	-3.03

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C8 High SLR** Project Area: 3,196

Condition: Future Without Project

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	19 SI
V1	% Emergent	20	0.28	19	0.27	0	0.10
V2	% Aquatic	3	0.13	3	0.13	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	5	0.16	4	0.15	0	0.10
V5	Salinity (ppt)	8.8	1.00	8.8	1.00	9.3	1.00
V6	Access Value	0.8600	0.87	0.8600	0.87	0.8600	0.87
	Emergent Marsh HSI =		0.42	EM HSI =	0.41	EM HSI =	0.25
	Open Water HSI =		0.31	OW HSI =	0.31	OW HSI =	0.27

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0.2	0.2	0
0	0	0.1

Project: **C8 High SLR** Project Area: 3196

FWOP

Variable		TY Value	70 SI	TY Value	SI	TY Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	10.8	0.88				
V6	Access Value	0.8600	0.87				
		EM HSI =	0.24	EM HSI =		EM HSI =	
		OW HSI =	0.27	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

Project: **C8 High SLR** Project Area: 3196

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C8 High SLR** Project Area: 3196

Condition: Future With Project

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	5 SI
V1	% Emergent	20	0.28	19	0.27	15	0.24
V2	% Aquatic	3	0.13	3	0.13	3	0.13
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.20
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		100	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	5	0.16	4	0.15	3	0.14
V5	Salinity (ppt)	8.8	1.00	8.8	1.00	8.8	1.00
V6	Access Value	0.8600	0.87	0.8600	0.87	0.8180	0.84
	Emergent Marsh HSI =		0.42	EM HSI =	0.41	EM HSI =	0.38
	Open Water HSI =		0.31	OW HSI =	0.31	OW HSI =	0.31

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0.2	0.2	0.2
0	0	0

Project: **C8 High SLR** Project Area: 3196

FWP

Variable		TY Value	19 SI	TY Value	70 SI	TY Value	SI
V1	% Emergent	0	0.10	0	0.10		
V2	% Aquatic	0	0.10	0	0.10		
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10		
	Class 2	0		0			
	Class 3	0		0			
	Class 4	0		0			
	Class 5	100		100			
V4	%OW <= 1.5ft	0	0.10	0	0.10		
V5	Salinity (ppt)	9.3	1.00	10.8	0.88		
V6	Access Value	0.8130	0.83	0.7180	0.75		
		EM HSI =	0.25	EM HSI =	0.23	EM HSI =	
		OW HSI =	0.27	OW HSI =	0.25	OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0

Project: **C8 High SLR** Project Area: 3196

FWP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: C8 High SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	639	0.42	266.17	
1	607	0.41	248.57	257.33
19	0	0.25	0.00	1947.57
70	0	0.24	0.00	0.00
Max TY=	70		AAHUs =	31.50

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	639	0.42	266.17	
1	607	0.41	248.57	257.33
5	479	0.38	181.21	856.90
19	0	0.25	0.00	1124.00
70	0	0.23	0.00	0.00
Max TY=	70		AAHUs	31.97

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	31.97
B. Future Without Project Emergent Marsh AAHUs =	31.50
Net Change (FWP - FWOP) =	0.48

AAHU CALCULATION - OPEN WATER

Project: C8 High SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,557	0.31	804.76	
1	2,589	0.31	812.37	808.57
19	3,196	0.27	875.74	15265.38
70	3,196	0.27	847.33	43938.40
Max TY=	70		AAHUs =	857.32

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	2,557	0.31	804.76	
1	2,589	0.31	812.37	808.57
5	2,717	0.31	839.76	3304.66
19	3,196	0.27	864.12	11970.43
70	3,196	0.25	811.08	42717.47
Max TY=	70		AAHUs	840.02

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	840.02
B. Future Without Project Open Water AAHUs =	857.32
Net Change (FWP - FWOP) =	-17.30

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	0.48
B. Open Water Habitat Net AAHUs =	-17.30
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	-4.46

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C5-C7, C9 Low SLR** Project Area: 8,807

Condition: Future Without Project

Variable		TY	0	TY	1	TY	53
		Value	SI	Value	SI	Value	SI
V1	% Emergent	40	0.46	39	0.45	0	0.10
V2	% Aquatic	15	0.24	15	0.24	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.32	0	0.31	0	0.10
	Class 2	0		0		0	
	Class 3	60		56		0	
	Class 4	40		44		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	6	0.18	6	0.18	0	0.10
V5	Salinity (ppt)	8	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
	Emergent Marsh HSI =		0.40	EM HSI =	0.39	EM HSI =	0.20
	Open Water HSI =		0.24	OW HSI =	0.24	OW HSI =	0.17

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0.4	0.4	0
0.2	0.2	0
0	0	0.1

Project: **C5-C7, C9 Low SLR** Project Area: 8807

FWOP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	0	1.00				
V6	Access Value	0.0000	0.10				
		EM HSI =	0.20	EM HSI =		EM HSI =	
		OW HSI =	0.17	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

Project: **C5-C7, C9 Low SLR** Project Area: 8807

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C5-C7, C9 Low SLR** Project Area: 8807

Condition: Future With Project

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	40	0.46	39	0.45	36	0.42
V2	% Aquatic	15	0.24	15	0.24	14	0.23
V3	Interspersion	%		%		%	
	Class 1	0	0.32	0	0.31	0	0.29
	Class 2	0		0		0	
	Class 3	60		56		44	
	Class 4	40		44		56	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	6	0.18	6	0.18	5	0.16
V5	Salinity (ppt)	8	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
	Emergent Marsh HSI =		0.40	EM HSI =	0.39	EM HSI =	0.38
	Open Water HSI =		0.24	OW HSI =	0.24	OW HSI =	0.23

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0

Project: **C5-C7, C9 Low SLR** Project Area: 8807

FWP

Variable		TY	24	TY	47	TY	53
		Value	SI	Value	SI	Value	SI
V1	% Emergent	21	0.29	4	0.14	0	0.10
V2	% Aquatic	10	0.19	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.20	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		100		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	3	0.14	0	0.10	0	0.10
V5	Salinity (ppt)	0	1.00	0	1.00	0	1.00
V6	Access Value	0.0000	0.10	0.0000	0.10	0.0000	0.10
		EM HSI =	0.31	EM HSI =	0.23	EM HSI =	0.20
		OW HSI =	0.21	OW HSI =	0.17	OW HSI =	0.17

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0.2	0.2	0
0	0	0.1

Project: **C5-C7, C9 Low SLR** Project Area: 8807

FWP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	0	1.00				
V6	Access Value	0.0000	0.10				
		EM HSI =	0.20	EM HSI =		EM HSI =	
		OW HSI =	0.17	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: C5-C7, C9 Low SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3523	0.40	1403.01	
1	3435	0.39	1351.87	1377.37
53	0	0.20	0.00	29386.50
70	0	0.20	0.00	0.00
Max TY=	70		AAHUs =	439.48

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3523	0.40	1403.01	
1	3435	0.39	1351.87	1377.37
5	3171	0.38	1203.08	5107.42
53	0	0.20	0.00	24322.88
70	0	0.20	0.00	0.00
Max TY=	70		AAHUs	440.11

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	440.11
B. Future Without Project Emergent Marsh AAHUs =	439.48
Net Change (FWP - FWOP) =	0.63

AAHU CALCULATION - OPEN WATER

Project: C5-C7, C9 Low SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	5,284	0.24	1272.21	
1	5,372	0.24	1290.22	1281.22
53	8,807	0.17	1467.83	73897.63
70	8,807	0.17	1467.83	24953.17
Max TY=	70		AAHUs =	1430.46

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	5,284	0.24	1272.21	
1	5,372	0.24	1290.22	1281.22
5	5,636	0.23	1321.28	5224.01
53	8,807	0.17	1467.83	68658.02
70	8,807	0.17	1467.83	24953.17
Max TY=	70		AAHUs	1430.23

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	1430.23
B. Future Without Project Open Water AAHUs =	1430.46
Net Change (FWP - FWOP) =	-0.22

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	0.63
B. Open Water Habitat Net AAHUs =	-0.22
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	0.39

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C5-C7, C9 Medium SLR** Project Area: 8,807

Condition: Future Without Project

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 47 Value	TY 47 SI
V1	% Emergent	40	0.46	39	0.45	0	0.10
V2	% Aquatic	10	0.19	10	0.19	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.32	0	0.31	0	0.10
	Class 2	0		0		0	
	Class 3	60		56		0	
	Class 4	40		44		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	6	0.18	6	0.18	0	0.10
V5	Salinity (ppt)	8	1.00	8	1.00	8.5	1.00
V6	Access Value	0.8700	0.88	0.8700	0.88	0.8700	0.88
	Emergent Marsh HSI =		0.56	EM HSI =	0.56	EM HSI =	0.25
	Open Water HSI =		0.38	OW HSI =	0.38	OW HSI =	0.27

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0.4	0.4	0
0.2	0.2	0
0	0	0.1

Project: **C5-C7, C9 Medium SLR** Project Area: 8807

FWOP

Variable		TY 70 Value	TY 70 SI	TY Value	TY SI	TY Value	TY SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	8.8	1.00				
V6	Access Value	0.8700	0.88				
		EM HSI =	0.25	EM HSI =		EM HSI =	
		OW HSI =	0.27	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

Project: **C5-C7, C9 Medium SLR** Project Area: 8807

FWOP

Variable		TY Value	TY SI	TY Value	TY SI	TY Value	TY SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C5-C7, C9 Medium SLR** Project Area: 8807

Condition: Future With Project

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	5 SI
V1	% Emergent	40	0.46	39	0.45	36	0.42
V2	% Aquatic	10	0.19	10	0.19	11	0.20
V3	Interspersion	%		%		%	
	Class 1	0	0.32	0	0.31	0	0.29
	Class 2	0		0		0	
	Class 3	60		56		44	
	Class 4	40		44		56	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	6	0.18	6	0.18	5	0.16
V5	Salinity (ppt)	8	1.00	8	1.00	7.9	1.00
V6	Access Value	0.8700	0.88	0.8700	0.88	0.8010	0.82
	Emergent Marsh HSI =		0.56	EM HSI =	0.56	EM HSI =	0.53
	Open Water HSI =		0.38	OW HSI =	0.38	OW HSI =	0.38

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0

Project: **C5-C7, C9 Medium SLR** Project Area: 8807

FWP

Variable		TY Value	24 SI	TY Value	47 SI	TY Value	70 SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	ERR(<100)	0	0.10	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	0		100		100	
V4	%OW <= 1.5ft	0	0.10	0	0.10	0	0.10
V5	Salinity (ppt)	0	1.00	8.6	1.00	8.9	1.00
V6	Access Value	0.0000	0.10	0.7800	0.80	0.7410	0.77
		EM HSI =		EM HSI =	0.25	EM HSI =	0.25
		OW HSI =		OW HSI =	0.27	OW HSI =	0.26

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0.1	0.1

Project: **C5-C7, C9 Medium SLR** Project Area: 8807

FWP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: C5-C7, C9 Medium SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3523	0.56	1981.85	
1	3435	0.56	1907.75	1944.69
70	0	0.25	0.00	53785.23
Max TY=	70		AAHUs =	796.14

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3523	0.56	1981.85	
1	3435	0.56	1907.75	1944.69
5	3171	0.53	1671.76	7154.05
70	0	0.25	0.00	44695.57
Max TY=	70		AAHUs	768.49

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	768.49
B. Future Without Project Emergent Marsh AAHUs =	796.14
Net Change (FWP - FWOP) =	-27.65

AAHU CALCULATION - OPEN WATER

Project: C5-C7, C9 Medium SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	5,284	0.38	2029.63	
1	5,372	0.38	2060.24	2044.94
70	8,807	0.27	2419.92	158861.17
Max TY=	70		AAHUs =	2298.66

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	5,284	0.38	2029.63	
1	5,372	0.38	2060.24	2044.94
5	5,636	0.38	2143.95	8408.93
70	8,807	0.26	2330.16	149387.28
Max TY=	70		AAHUs	2283.45

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	2283.45
B. Future Without Project Open Water AAHUs =	2298.66
Net Change (FWP - FWOP) =	-15.21

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	-27.65
B. Open Water Habitat Net AAHUs =	-15.21
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	-24.20

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C5-C7, C9 High SLR** Project Area: 8,807

Condition: Future Without Project

Variable		TY	0	TY	1	TY	37
		Value	SI	Value	SI	Value	SI
V1	% Emergent	40	0.46	39	0.45	0	0.10
V2	% Aquatic	10	0.19	10	0.19	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.32	0	0.31	0	0.10
	Class 2	0		0		0	
	Class 3	60		56		0	
	Class 4	40		44		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	6	0.18	6	0.18	0	0.10
V5	Salinity (ppt)	8	1.00	8	1.00	9.2	1.00
V6	Access Value	0.8700	0.88	0.8700	0.88	0.8700	0.88
	Emergent Marsh HSI =		0.56	EM HSI =	0.56	EM HSI =	0.25
	Open Water HSI =		0.38	OW HSI =	0.38	OW HSI =	0.27

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0.4	0.4	0
0.2	0.2	0
0	0	0.1

Project: **C5-C7, C9 High SLR** Project Area: 8807

FWOP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)	10.3	0.96				
V6	Access Value	0.8700	0.88				
		EM HSI =	0.25	EM HSI =		EM HSI =	
		OW HSI =	0.27	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0

Project: **C5-C7, C9 High SLR** Project Area: 8807

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Brackish Marsh

Project: **C5-C7, C9 High SLR** Project Area: 8807

Condition: Future With Project

Variable		TY 0 Value	SI	TY 1 Value	SI	TY 5 Value	SI
V1	% Emergent	40	0.46	39	0.45	35	0.42
V2	% Aquatic	10	0.19	10	0.19	8	0.17
V3	Interspersion	%		%		%	
	Class 1	0	0.32	0	0.31	0	0.28
	Class 2	0		0		0	
	Class 3	60		56		40	
	Class 4	40		44		60	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	6	0.18	6	0.18	5	0.16
V5	Salinity (ppt)	8	1.00	8	1.00	8	1.00
V6	Access Value	0.8700	0.88	0.8700	0.88	0.8000	0.82
	Emergent Marsh HSI =		0.56	EM HSI =	0.56	EM HSI =	0.52
	Open Water HSI =		0.38	OW HSI =	0.38	OW HSI =	0.36

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0

Project: **C5-C7, C9 High SLR** Project Area: 8807

FWP

Variable		TY 37 Value	SI	TY 70 Value	SI	TY Value	SI
V1	% Emergent	0	0.10	0	0.10		
V2	% Aquatic	0	0.10	0	0.10		
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10		
	Class 2	0		0			
	Class 3	0		0			
	Class 4	0		0			
	Class 5	100		100			
V4	%OW <= 1.5ft	0	0.10	0	0.10		
V5	Salinity (ppt)	9	1.00	9.8	1.00		
V6	Access Value	0.7550	0.78	0.6330	0.67		
		EM HSI =	0.25	EM HSI =	0.24	EM HSI =	
		OW HSI =	0.27	OW HSI =	0.26	OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0

Project: **C5-C7, C9 High SLR** Project Area: 8807

FWP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
V6	Access Value						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

AAHU CALCULATION - EMERGENT MARSH

Project: C5-C7, C9 High SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3523	0.56	1981.85	
1	3435	0.56	1907.75	1944.69
37	0	0.25	0.00	28061.86
70	0	0.25	0.00	0.00
Max TY=	70		AAHUs =	428.67

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3523	0.56	1981.85	
1	3435	0.56	1907.75	1944.69
5	3082	0.52	1602.43	7012.00
37	0	0.25	0.00	21155.05
70	0	0.24	0.00	0.00
Max TY=	70		AAHUs	430.17

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	430.17
B. Future Without Project Emergent Marsh AAHUs =	428.67
Net Change (FWP - FWOP) =	1.50

AAHU CALCULATION - OPEN WATER

Project: C5-C7, C9 High SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	5,284	0.38	2029.63	
1	5,372	0.38	2060.24	2044.94
37	8,807	0.27	2419.92	82884.09
70	8,807	0.27	2390.56	79372.86
Max TY=	70		AAHUs =	2347.17

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	5,284	0.38	2029.63	
1	5,372	0.38	2060.24	2044.94
5	5,725	0.36	2042.94	8212.65
37	8,807	0.27	2340.28	71629.28
70	8,807	0.26	2248.51	75715.07
Max TY=	70		AAHUs	2251.46

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	2251.46
B. Future Without Project Open Water AAHUs =	2347.17
Net Change (FWP - FWOP) =	-95.71

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	1.50
B. Open Water Habitat Net AAHUs =	-95.71
Net Benefits= (2.6xEMAAHUs+OWAAHUs)/3.6	-25.50

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **C1-C4 Low SLR**

Condition: Future Without Project

Project Area:	10,301
% Fresh	0
% Intermediate	100

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	46 SI
V1	% Emergent	30	0.37	29	0.36	0	0.10
V2	% Aquatic	12	0.21	12	0.21	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.24	0	0.23	0	0.10
	Class 2	0		0		0	
	Class 3	20		16		0	
	Class 4	80		84		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	5	0.16	5	0.16	0	0.10
V5	Salinity (ppt)						
	fresh	0	0.10	0	1.00	0	1.00
	intermediate	7.1		0		0	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.20	0.0000	0.20
	intermediate	0.0000		0.0000		0.0000	
	Emergent Marsh HSI =		0.30	EM HSI =	0.39	EM HSI =	0.21
	Open Water HSI =		0.20	OW HSI =	0.26	OW HSI =	0.18

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0.4	0.4	0
0.2	0.2	0
0	0	0.1
Salinity		
1.00	1.00	1.00
0.10	1.00	1.00
Access Value		
0.30	0.30	0.30
0.20	0.20	0.20

Project: **C1-C4 Low SLR**

FWOP

Variable		TY Value	70 SI	TY Value	SI	TY Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)						
	fresh	0	1.00				
	intermediate	0					
V6	Access Value						
	fresh	0.0000	0.20				
	intermediate	0.0000					
		EM HSI =	0.21	EM HSI =		EM HSI =	
		OW HSI =	0.18	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0
Salinity		
1.00		
1.00		
Access Value		
0.30		
0.20		

Project: **C1-C4 Low SLR**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **C1-C4 Low SLR**

Condition: Future With Project

Project Area:	10,301
% Fresh	0
% Intermediate	100

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	30	0.37	29	0.36	27	0.34
V2	% Aquatic	12	0.21	12	0.21	11	0.20
V3	Interspersion	%		%		%	
	Class 1	0	0.24	0	0.23	0	0.22
	Class 2	0		0		0	
	Class 3	20		16		8	
	Class 4	80		84		92	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	5	0.16	5	0.16	4	0.15
V5	Salinity (ppt)						
	fresh	0	0.10	0	1.00	0	1.00
	intermediate	7.1		0		0	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.20	0.0000	0.20
	intermediate	0		0.0000		0.0000	
	Emergent Marsh HSI =		0.30	EM HSI =	0.39	EM HSI =	0.38
	Open Water HSI =		0.20	OW HSI =	0.26	OW HSI =	0.26

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.10	1.00	1.00
Access Value		
0.30	0.30	0.30
0.20	0.20	0.20

Project: **C1-C4 Low SLR**

FWP

Variable		TY	24	TY	46	TY	47
		Value	SI	Value	SI	Value	SI
V1	% Emergent	14	0.23	0	0.10	0	0.10
V2	% Aquatic	5	0.15	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.20	0	0.10	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	100		0		0	
	Class 5	0		100		100	
V4	%OW <= 1.5ft	1	0.11	0	0.10	0	0.10
V5	Salinity (ppt)						
	fresh	0	1.00	0	1.00	0	1.00
	intermediate	0		0		0	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.20	0.0000	0.20
	intermediate	0.0000		0.0000		0.0000	
		EM HSI =	0.31	EM HSI =	0.21	EM HSI =	0.21
		OW HSI =	0.22	OW HSI =	0.18	OW HSI =	0.18

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0.2	0	0
0	0.1	0.1
Salinity		
1.00	1.00	1.00
1.00	1.00	1.00
Access Value		
0.30	0.30	0.30
0.20	0.20	0.20

Project: **C1-C4 Low SLR**

FWP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)						
	fresh	0	1.00				
	intermediate	0					
V6	Access Value						
	fresh	0.0000	0.20				
	intermediate	0.0000					
		EM HSI =	0.21	EM HSI =		EM HSI =	
		OW HSI =	0.18	OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0
Salinity		
1.00		
1.00		
Access Value		
0.30		
0.20		

AAHU CALCULATION - EMERGENT MARSH

Project: C1-C4 Low SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3090	0.30	919.31	
1	2987	0.39	1168.95	1045.74
46	0	0.21	0.00	22228.19
70	0	0.21	0.00	0.00
Max=	70		AAHUs =	332.48

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3090	0.30	919.31	
1	2987	0.39	1168.95	1045.74
5	2781	0.38	1053.86	4443.93
46	0	0.21	0.00	18384.51
70	0	0.21	0.00	0.00
Max=	70		AAHUs	341.06

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	341.06
B. Future Without Project Emergent Marsh AAHUs =	332.48
Net Change (FWP - FWOP) =	8.58

AAHU CALCULATION - OPEN WATER

Project: C1-C4 Low SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	7,211	0.20	1420.27	
1	7,314	0.26	1923.82	1670.91
46	10,301	0.18	1868.42	87154.66
70	10,301	0.18	1868.42	44842.18
Max=	70		AAHUs =	1909.54

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	7,211	0.20	1420.27	
1	7,314	0.26	1923.82	1670.91
5	7,520	0.26	1923.52	7695.67
46	10,301	0.18	1868.42	79148.70
70	10,301	0.18	1868.42	44842.18
Max=	70		AAHUs	1905.11

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	1905.11
B. Future Without Project Open Water AAHUs =	1909.54
Net Change (FWP - FWOP) =	-4.43

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	8.58
B. Open Water Habitat Net AAHUs =	-4.43
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	4.38

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **C1-C4 Medium SLR**

Project Area:	10,301
% Fresh	0
% Intermediate	100

Condition: Future Without Project

Variable		TY	0	TY	1	TY	42
		Value	SI	Value	SI	Value	SI
V1	% Emergent	30	0.37	29	0.36	0	0.10
V2	% Aquatic	12	0.21	12	0.21	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.24	0	0.23	0	0.10
	Class 2	0		0		0	
	Class 3	20		16		0	
	Class 4	80		84		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	5	0.16	5	0.16	0	0.10
V5	Salinity (ppt)						
	fresh	0	0.10	0	0.10	0	0.10
	intermediate	7.1		7.1		7.3	
V6	Access Value						
	fresh	0.0000	0.90	0.0000	0.90	0.0000	0.90
	intermediate	0.8700		0.8700		0.8700	
	Emergent Marsh HSI =		0.37	EM HSI =	0.36	EM HSI =	0.13
	Open Water HSI =		0.27	OW HSI =	0.27	OW HSI =	0.16

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0.4	0.4	0
0.2	0.2	0
0	0	0.1
Salinity		
1.00	1.00	1.00
0.10	0.10	0.10
Access Value		
0.30	0.30	0.30
0.90	0.90	0.90

Project: **C1-C4 Medium SLR**

FWOP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)						
	fresh	0	0.10				
	intermediate	7.4					
V6	Access Value						
	fresh	0.0000	0.90				
	intermediate	0.8700					
		EM HSI =	0.13	EM HSI =		EM HSI =	
		OW HSI =	0.16	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0
Salinity		
1.00		
0.10		
Access Value		
0.30		
0.90		

Project: **C1-C4 Medium SLR**

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **C1-C4 Medium SLR**

Condition: Future With Project

Project Area:	10,301
% Fresh	0
% Intermediate	100

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	30	0.37	29	0.36	27	0.34
V2	% Aquatic	12	0.21	12	0.21	10	0.19
V3	Interspersion	%		%		%	
	Class 1	0	0.24	0	0.23	0	0.22
	Class 2	0		0		0	
	Class 3	20		16		8	
	Class 4	80		84		92	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	5	0.16	5	0.16	4	0.15
V5	Salinity (ppt)						
	fresh	0	0.10	0	0.10	0	0.10
	intermediate	7.1		7.1		7	
V6	Access Value						
	fresh	0.0000	0.90	0.0000	0.90	0.0000	0.84
	intermediate	0.87		0.8700		0.8010	
	Emergent Marsh HSI =		0.37	EM HSI =	0.36	EM HSI =	0.34
	Open Water HSI =		0.27	OW HSI =	0.27	OW HSI =	0.25

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.10	0.10	0.10
Access Value		
0.30	0.30	0.30
0.90	0.90	0.84

Project: **C1-C4 Medium SLR**

FWP

Variable		TY	24	TY	42	TY	47
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	0	0.10	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	ERR(<100)	0	0.10	0	ERR(<100)
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	0		100		0	
V4	%OW <= 1.5ft	0	0.10	0	0.10	0	0.10
V5	Salinity (ppt)						
	fresh	0	1.00	0	0.10	0	1.00
	intermediate	0		7.2		0	
V6	Access Value						
	fresh	0.0000	0.20	0.0000	0.83	0.0000	0.20
	intermediate	0.0000		0.7860		0.0000	
		EM HSI =		EM HSI =	0.13	EM HSI =	
		OW HSI =		OW HSI =	0.15	OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0.1	0
Salinity		
1.00	1.00	1.00
1.00	0.10	1.00
Access Value		
0.30	0.30	0.30
0.20	0.83	0.20

Project: **C1-C4 Medium SLR**

FWP

Variable		TY	70	TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)						
	fresh	0	0.10				
	intermediate	7.4					
V6	Access Value						
	fresh	0.0000	0.79				
	intermediate	0.7410					
		EM HSI =	0.13	EM HSI =		EM HSI =	
		OW HSI =	0.15	OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0
Salinity		
1.00		
0.10		
Access Value		
0.30		
0.79		

AAHU CALCULATION - EMERGENT MARSH

Project: C1-C4 Medium SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3090	0.37	1147.20	
1	2987	0.36	1086.07	1116.50
42	0	0.13	0.00	17584.47
70	0	0.13	0.00	0.00
Max=	70		AAHUs =	267.16

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3090	0.37	1147.20	
1	2987	0.36	1086.07	1116.50
5	2781	0.34	959.13	4087.84
42	0	0.13	0.00	14107.92
70	0	0.13	0.00	0.00
Max=	70		AAHUs	275.89

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	275.89
B. Future Without Project Emergent Marsh AAHUs =	267.16
Net Change (FWP - FWOP) =	8.73

AAHU CALCULATION - OPEN WATER

Project: C1-C4 Medium SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	7,211	0.27	1945.71	
1	7,314	0.27	1969.17	1957.45
42	10,301	0.16	1615.07	75772.04
70	10,301	0.16	1615.07	45221.86
Max=	70		AAHUs =	1756.45

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	7,211	0.27	1945.71	
1	7,314	0.27	1969.17	1957.45
5	7,520	0.25	1868.60	7678.39
42	10,301	0.15	1588.31	65569.88
70	10,301	0.15	1573.30	44262.60
Max=	70		AAHUs	1706.69

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	1706.69
B. Future Without Project Open Water AAHUs =	1756.45
Net Change (FWP - FWOP) =	-49.76

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	8.73
B. Open Water Habitat Net AAHUs =	-49.76
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	-10.14

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **C1-C4 High SLR**

Project Area:	10,301
% Fresh	0
% Intermediate	100

Condition: Future Without Project

Variable		TY Value	0 SI	TY Value	1 SI	TY Value	34 SI
V1	% Emergent	30	0.37	29	0.36	0	0.10
V2	% Aquatic	12	0.21	12	0.21	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.24	0	0.23	0	0.10
	Class 2	0		0		0	
	Class 3	20		16		0	
	Class 4	80		84		0	
	Class 5	0		0		100	
V4	%OW <= 1.5ft	5	0.16	5	0.16	0	0.10
V5	Salinity (ppt)						
	fresh	0	0.10	0	0.10	0	0.10
	intermediate	7.1		7.1		7.7	
V6	Access Value						
	fresh	0.0000	0.90	0.0000	0.90	0.0000	0.90
	intermediate	0.8700		0.8700		0.8700	
	Emergent Marsh HSI =		0.37	EM HSI =	0.36	EM HSI =	0.13
	Open Water HSI =		0.27	OW HSI =	0.27	OW HSI =	0.16

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0.4	0.4	0
0.2	0.2	0
0	0	0.1
Salinity		
1.00	1.00	1.00
0.10	0.10	0.10
Access Value		
0.30	0.30	0.30
0.90	0.90	0.90

Project: **C1-C4 High SLR**

FWOP

Variable		TY Value	70 SI	TY Value	SI	TY Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	0	0.10				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	0	0.10				
V5	Salinity (ppt)						
	fresh	0	0.10				
	intermediate	8.3					
V6	Access Value						
	fresh	0.0000	0.90				
	intermediate	0.8700					
		EM HSI =	0.13	EM HSI =		EM HSI =	
		OW HSI =	0.16	OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0	0
Salinity		
1.00		
0.10		
Access Value		
0.30		
0.90		

Project: **C1-C4 High SLR**

FWOP

Variable		TY Value	SI	TY Value	SI	TY Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations

Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: **C1-C4 High SLR**

Condition: Future With Project

Project Area:	10,301
% Fresh	0
% Intermediate	100

Variable		TY	0	TY	1	TY	5
		Value	SI	Value	SI	Value	SI
V1	% Emergent	30	0.37	29	0.36	26	0.33
V2	% Aquatic	12	0.21	12	0.21	10	0.19
V3	Interspersion	%		%		%	
	Class 1	0	0.24	0	0.23	0	0.22
	Class 2	0		0		0	
	Class 3	20		16		8	
	Class 4	80		84		92	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	5	0.16	5	0.16	4	0.15
V5	Salinity (ppt)						
	fresh	0	0.10	0	0.10	0	0.10
	intermediate	7.1		7.1		7.1	
V6	Access Value						
	fresh	0.0000	0.90	0.0000	0.90	0.0000	0.84
	intermediate	0.87		0.8700		0.8000	
	Emergent Marsh HSI =		0.37	EM HSI =	0.36	EM HSI =	0.34
	Open Water HSI =		0.27	OW HSI =	0.27	OW HSI =	0.25

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0.4	0.4	0.4
0.2	0.2	0.2
0	0	0
Salinity		
1.00	1.00	1.00
0.10	0.10	0.10
Access Value		
0.30	0.30	0.30
0.90	0.90	0.84

Project: **C1-C4 High SLR**

FWP

Variable		TY	34	TY	70	TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10		
V2	% Aquatic	0	0.10	0	0.10		
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10		
	Class 2	0		0			
	Class 3	0		0			
	Class 4	0		0			
	Class 5	100		100			
V4	%OW <= 1.5ft	0	0.10	0	0.10		
V5	Salinity (ppt)						
	fresh	0	0.10	0	0.10		
	intermediate	7.7		8.2			
V6	Access Value						
	fresh	0.0000	0.81	0.0000	0.71		
	intermediate	0.7660		0.6330			
		EM HSI =	0.13	EM HSI =	0.13	EM HSI =	
		OW HSI =	0.15	OW HSI =	0.15	OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0.1	0.1	0
Salinity		
1.00	1.00	
0.10	0.10	
Access Value		
0.30	0.30	
0.81	0.71	

Project: **C1-C4 High SLR**

FWP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
	Class 5						
V4	%OW <= 1.5ft						
V5	Salinity (ppt)						
	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

Intermediate Calculations		
Interspersion		
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
Salinity		
Access Value		

AAHU CALCULATION - EMERGENT MARSH

Project: C1-C4 High SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3090	0.37	1147.20	
1	2987	0.36	1086.07	1116.50
34	0	0.13	0.00	14153.36
70	0	0.13	0.00	0.00
Max=	70		AAHUs =	218.14

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	3090	0.37	1147.20	
1	2987	0.36	1086.07	1116.50
5	2678	0.34	905.30	3977.48
34	0	0.13	0.00	10466.40
70	0	0.13	0.00	0.00
Max=	70		AAHUs	222.29

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	222.29
B. Future Without Project Emergent Marsh AAHUs =	218.14
Net Change (FWP - FWOP) =	4.15

AAHU CALCULATION - OPEN WATER

Project: C1-C4 High SLR

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	7,211	0.27	1945.71	
1	7,314	0.27	1969.17	1957.45
34	10,301	0.16	1615.07	60987.25
70	10,301	0.16	1615.07	58142.39
Max=	70		AAHUs =	1729.82

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	7,211	0.27	1945.71	
1	7,314	0.27	1969.17	1957.45
5	7,623	0.25	1893.80	7730.23
34	10,301	0.15	1581.70	51622.95
70	10,301	0.15	1535.07	56101.99
Max=	70		AAHUs	1677.32

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	1677.32
B. Future Without Project Open Water AAHUs =	1729.82
Net Change (FWP - FWOP) =	-52.49

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	4.15
B. Open Water Habitat Net AAHUs =	-52.49
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	-14.12

Appendix G

MAPBOOK

Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

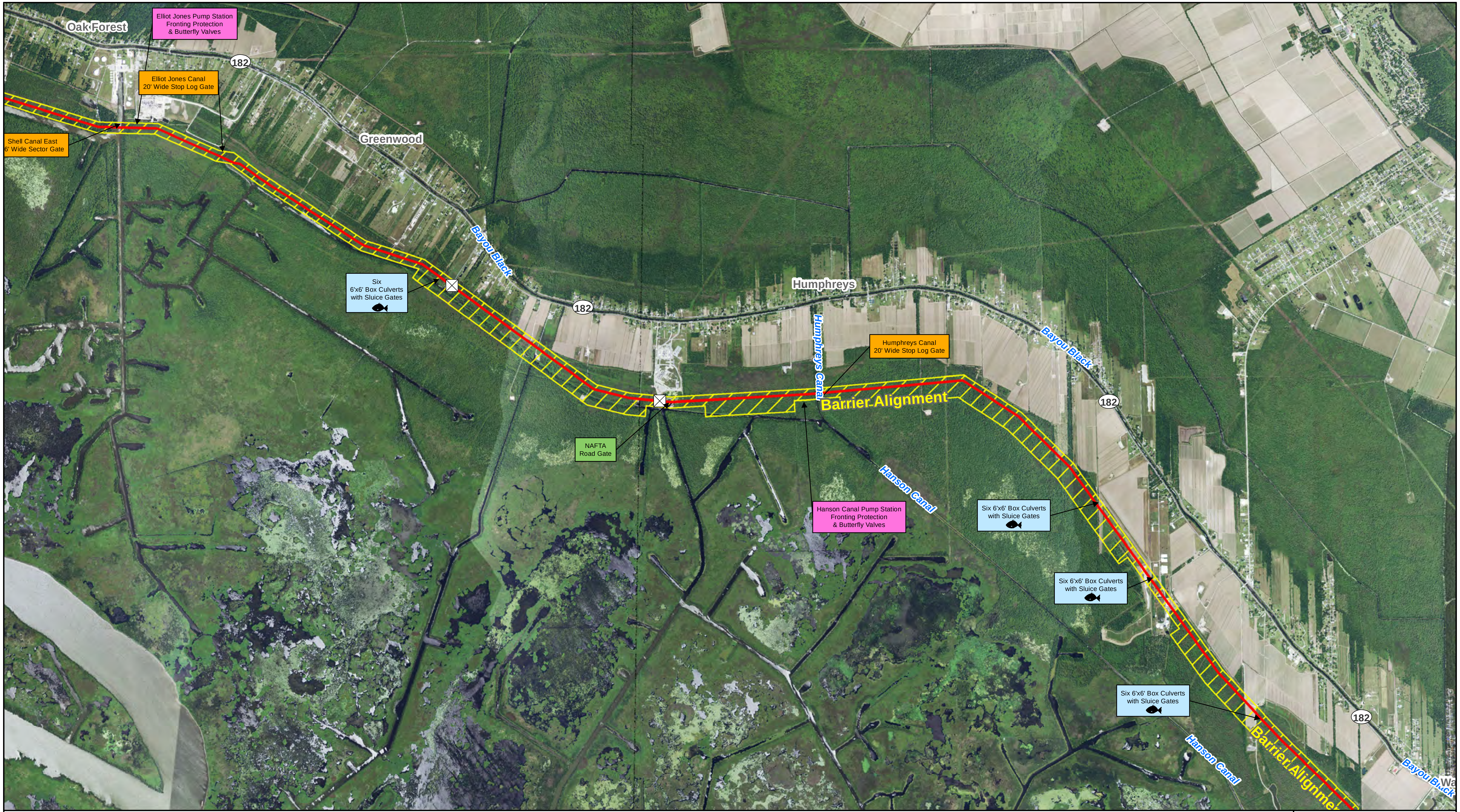
2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400
Feet

GEC
Gulf Engineers & Consultants

Figure: 01 of 14
Date: June 2012
Scale: 1:36,000
Source: USDA/GEC
Map ID: 273160010-3004



Legend

PumpStations
Centerline
Right of Way
NWR or WMA
Mitigation Area
Borrow Pits
1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

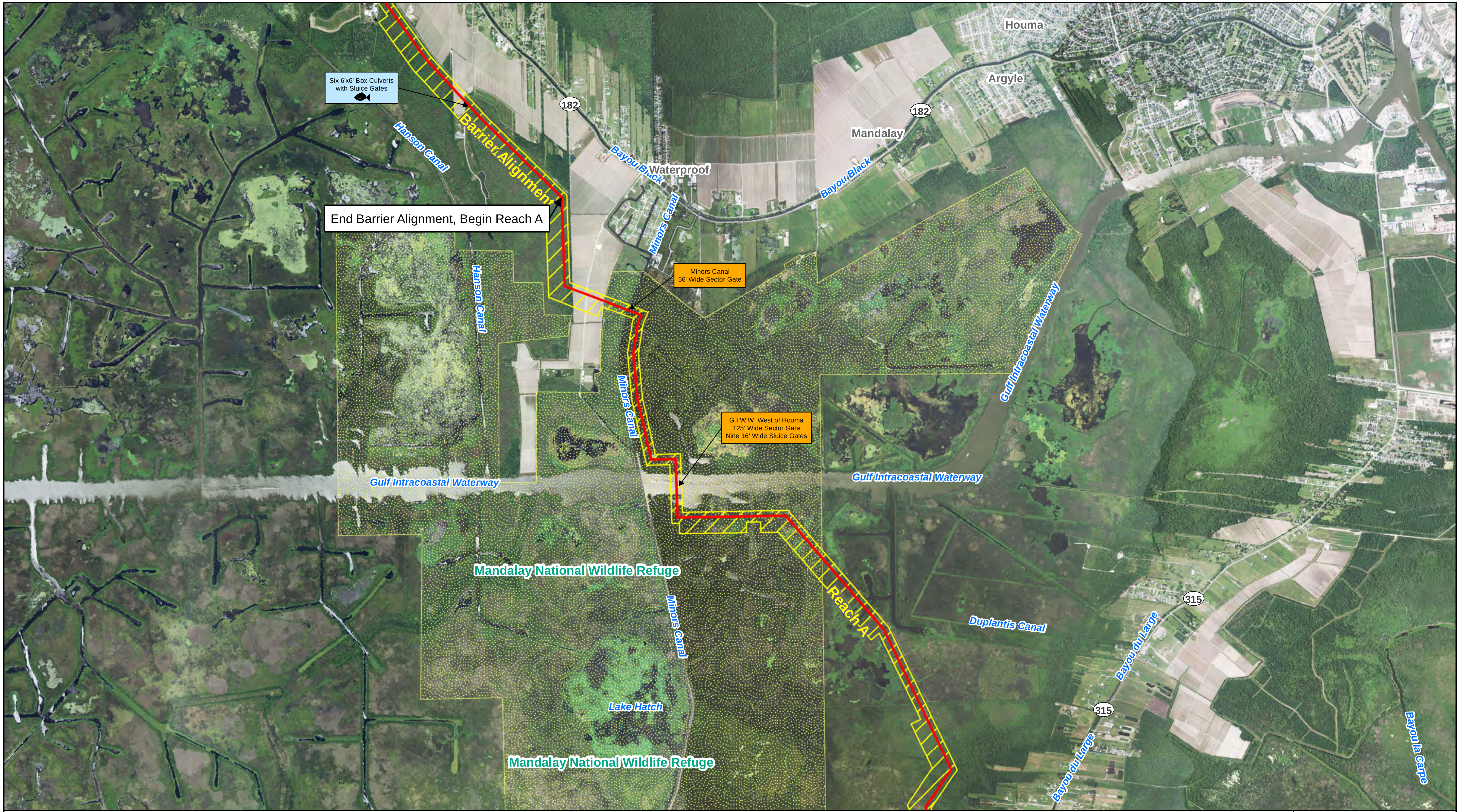
2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC Gulf Engineers & Consultants

Figure: 02 of 14
Date: June 2012
Scale: 1:36,000
Source: USDA/GEC
Map ID: 273160010-3004



Legend
- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

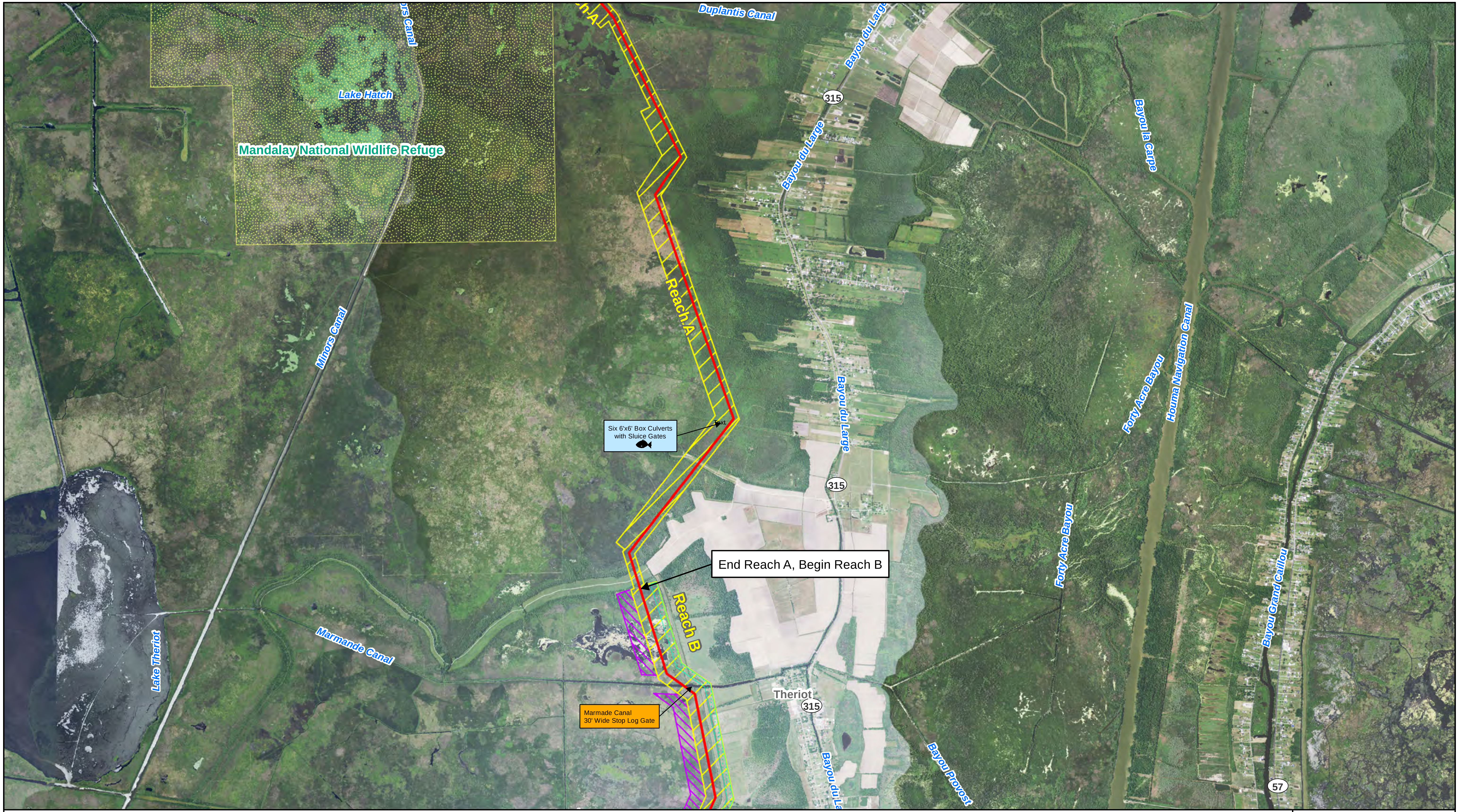
2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC Gulf Engineers & Consultants

Figure: 03 of 14
Date: June 2012
Scale: 1:36,000
Source: USDA/GEC
Map ID: 273160010-3004



Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

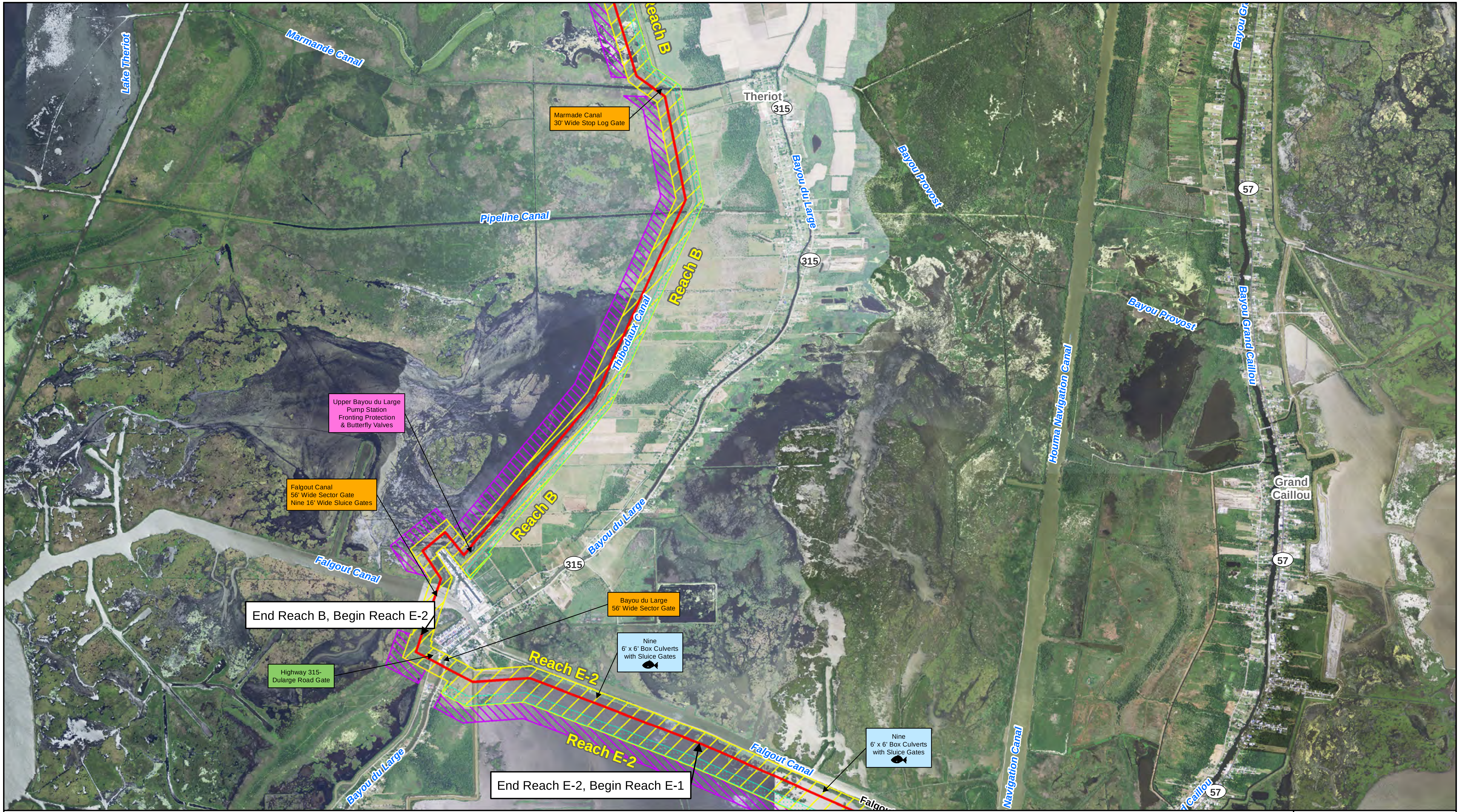
2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC Gulf Engineers & Consultants

Figure: 04 of 14
Date: June 2012
Scale: 1:36,000
Source: USDA/GEC
Map ID: 273160010-3004



Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

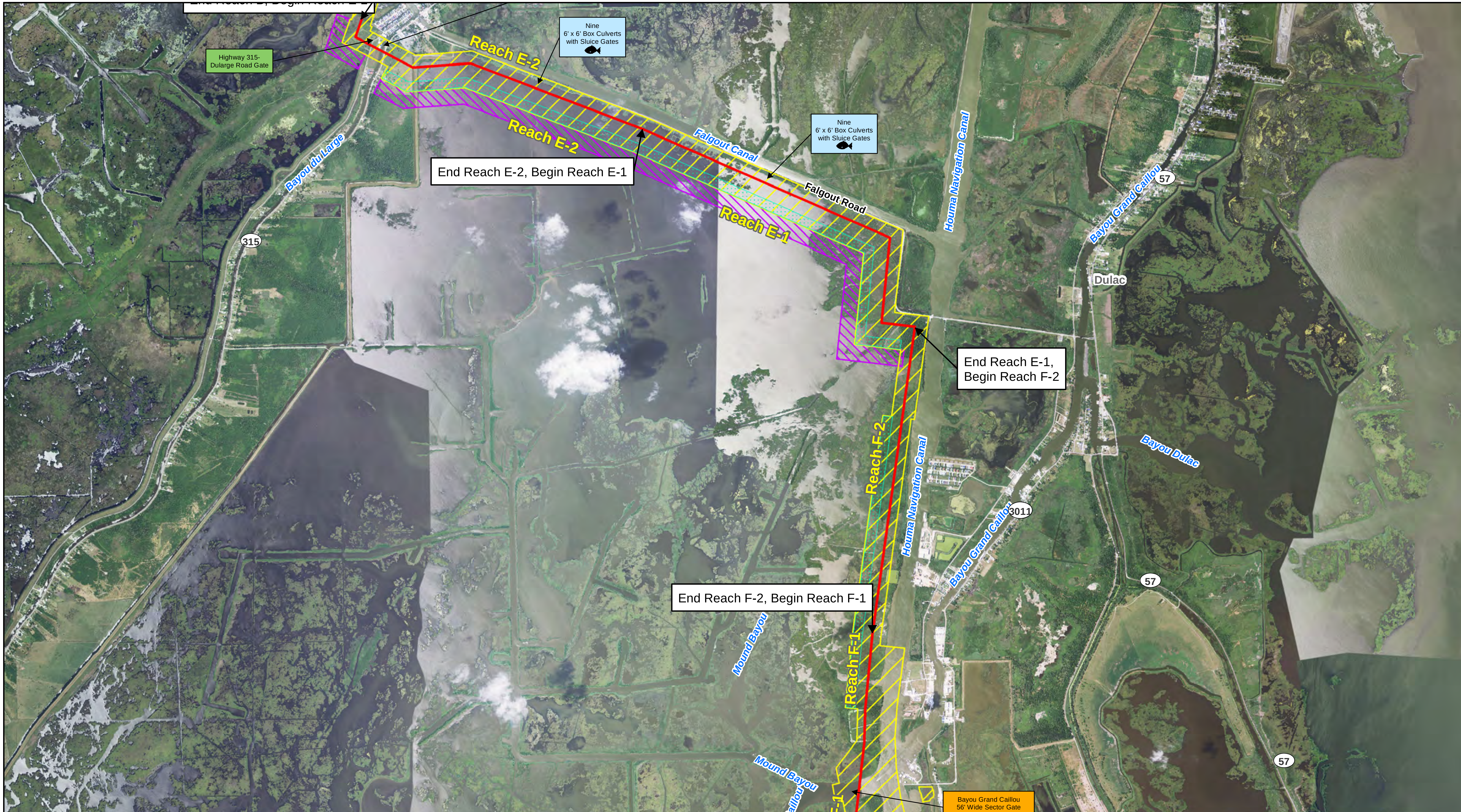
2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC
Gulf Engineers & Consultants

Figure: 05 of 14
Date: June 2012
Scale: 1:36,000
Source: USDA/GEC
Map ID: 273160010-3004



Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

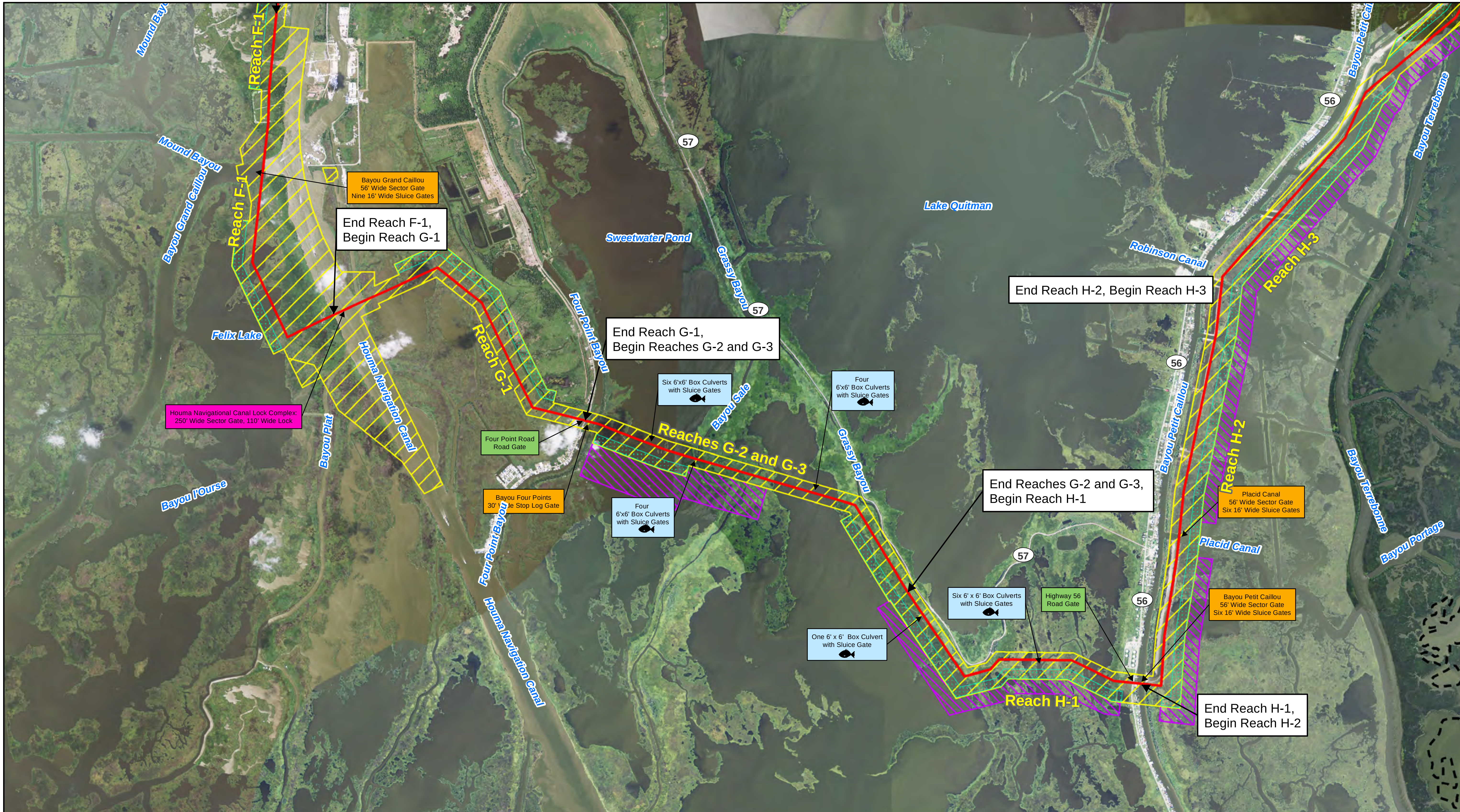
2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400
Feet

GEC
Gulf Engineers & Consultants

Figure: 06 of 14
Date: June 2012
Scale: 1:36,000
Source: USDA/GEC
Map ID: 273160010-3004



Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC Gulf Engineers & Consultants

Figure: 07 of 14	
Date: June 2012	
Scale: 1:36,000	
Source: USDA/GEC	
Map ID: 273160010-3004	

Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- Environmental Water Control Structure (1 Sluice Gate, 6 Box Culverts)

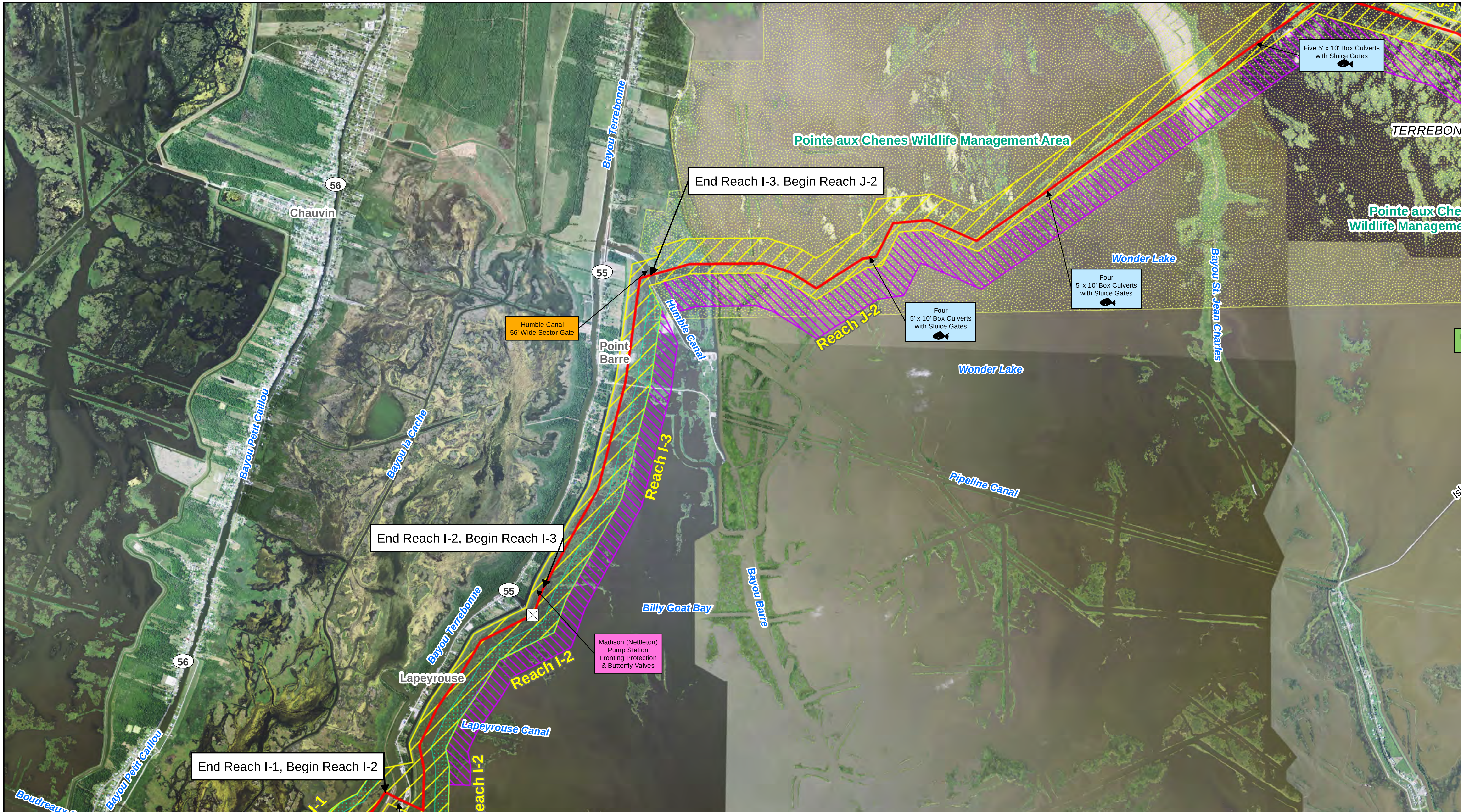
1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

GEC
Gulf Engineers & Consultants

Figure: 08 of 14
Date: June 2012
Scale: 1:36,000
Source: USDA/GEC
Map ID: 273160010-3004



Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

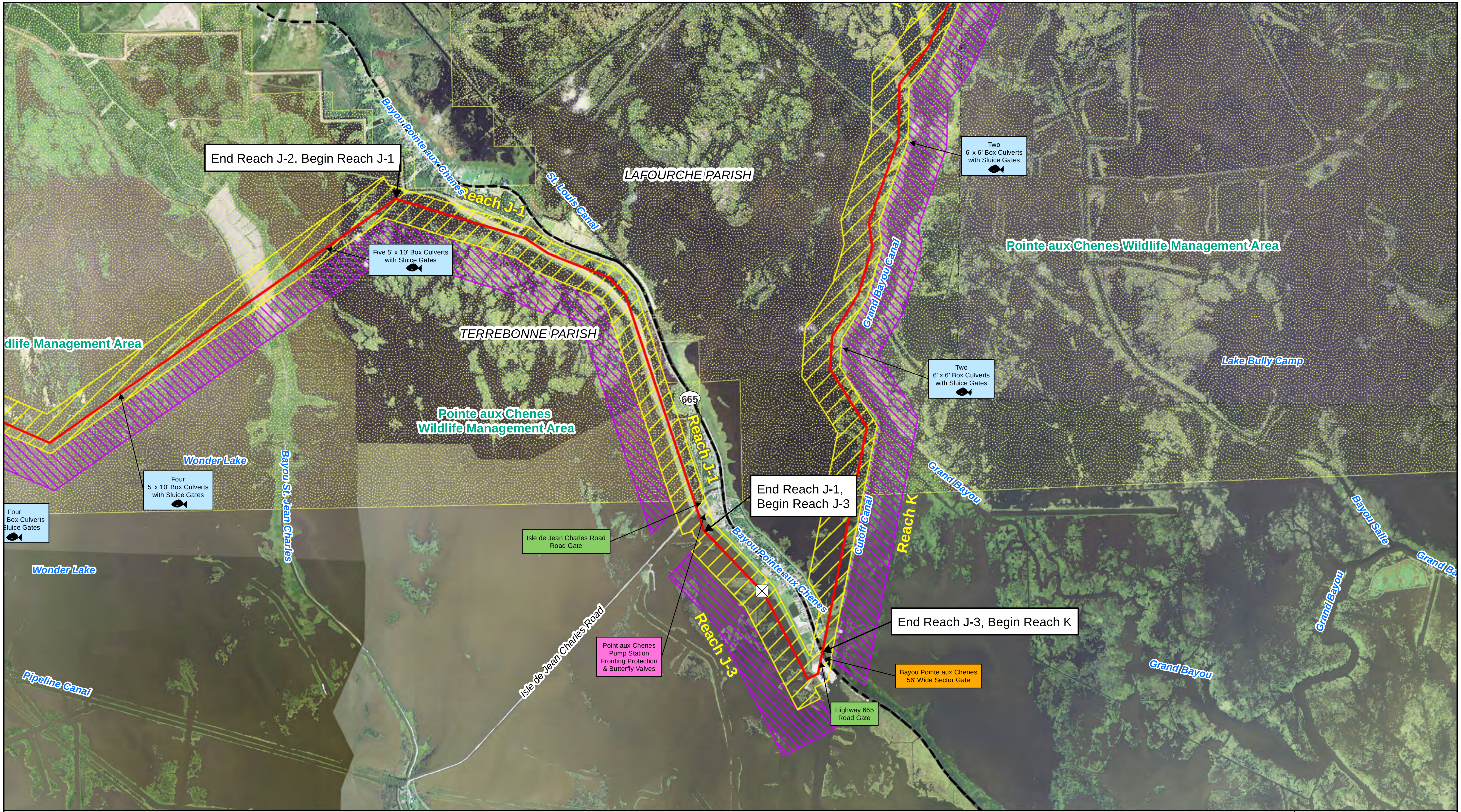
2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC Gulf Engineers & Consultants

Figure: 09 of 14
Date: June 2012
Scale: 1:36,000
Source: USDA/GEC
Map ID: 273160010-3004



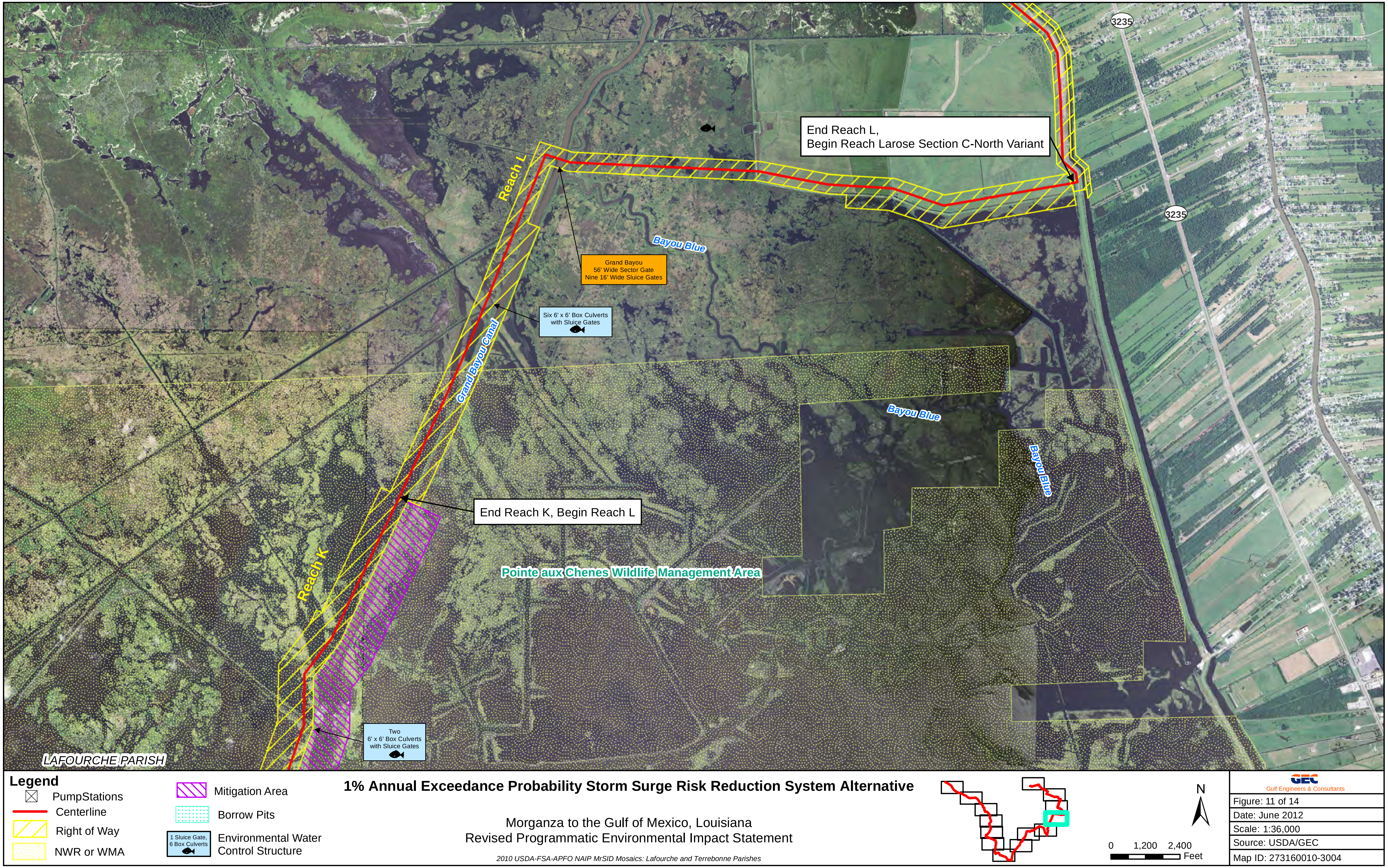
1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

GEC
Gulf Engineers & Consultants

Figure: 10 of 14
Date: June 2012
Scale: 1:36,000
Source: USDA/GEC
Map ID: 273160010-3004



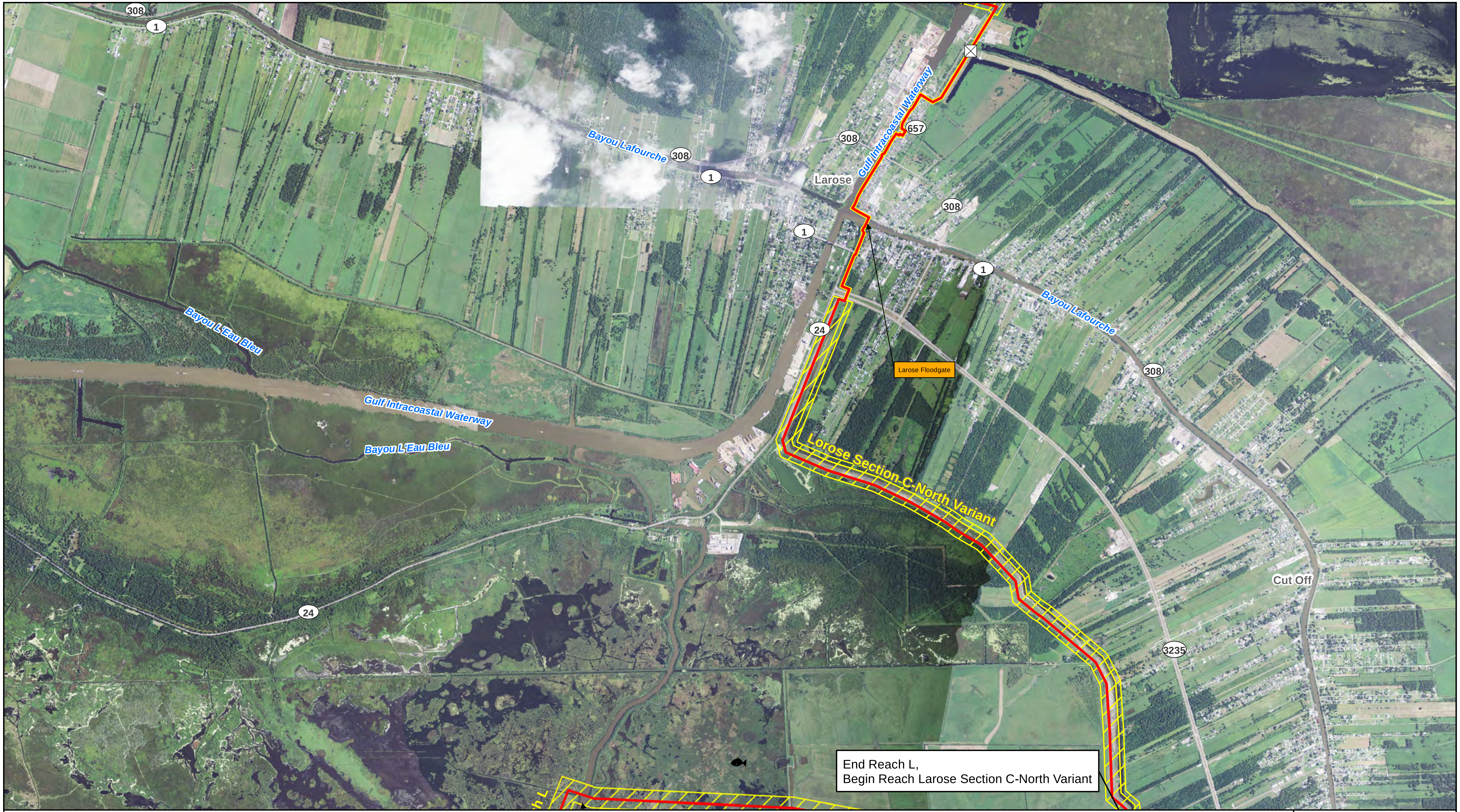
1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

GEC
Gulf Engineers & Consultants

Figure: 11 of 14
Date: June 2012
Scale: 1:36,000
Source: USDA/GEC
Map ID: 273160010-3004



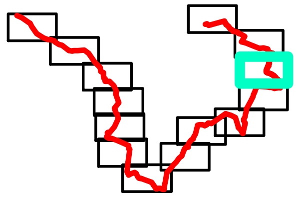
Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

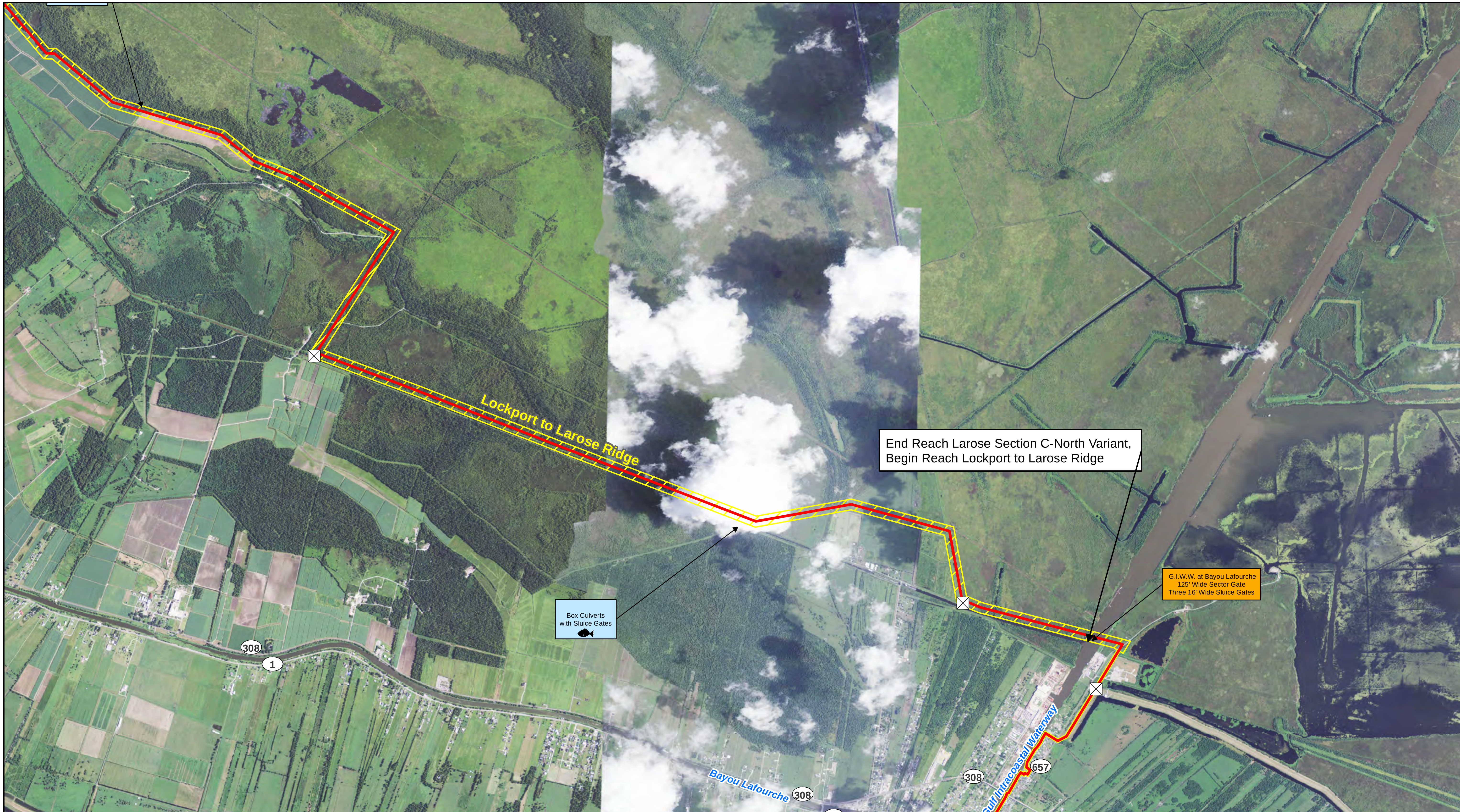


N

0 1,200 2,400 Feet

GEC Gulf Engineers & Consultants

Figure: 12 of 14
Date: June 2012
Scale: 1:36,000
Source: USDA/GEC
Map ID: 273160010-3004



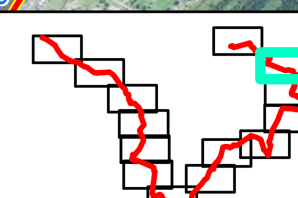
Legend

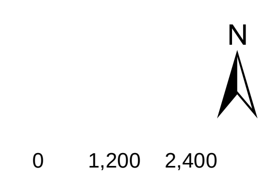
- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes





Gulf Engineers & Consultants

Figure: 13 of 14
Date: June 2012
Scale: 1:36,000
Source: USDA/GEC
Map ID: 273160010-3004

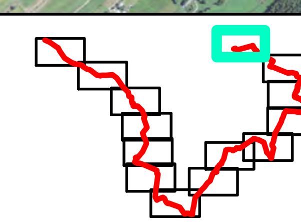
Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

1% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes



N

0 1,200 2,400 Feet

GEC
Gulf Engineers & Consultants

Figure: 14 of 14	
Date: June 2012	
Scale: 1:36,000	
Source: USDA/GEC	
Map ID: 273160010-3004	

Legend

PumpStations
Centerline
Right of Way
NWR or WMA
Mitigation Area
Borrow Pits
1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

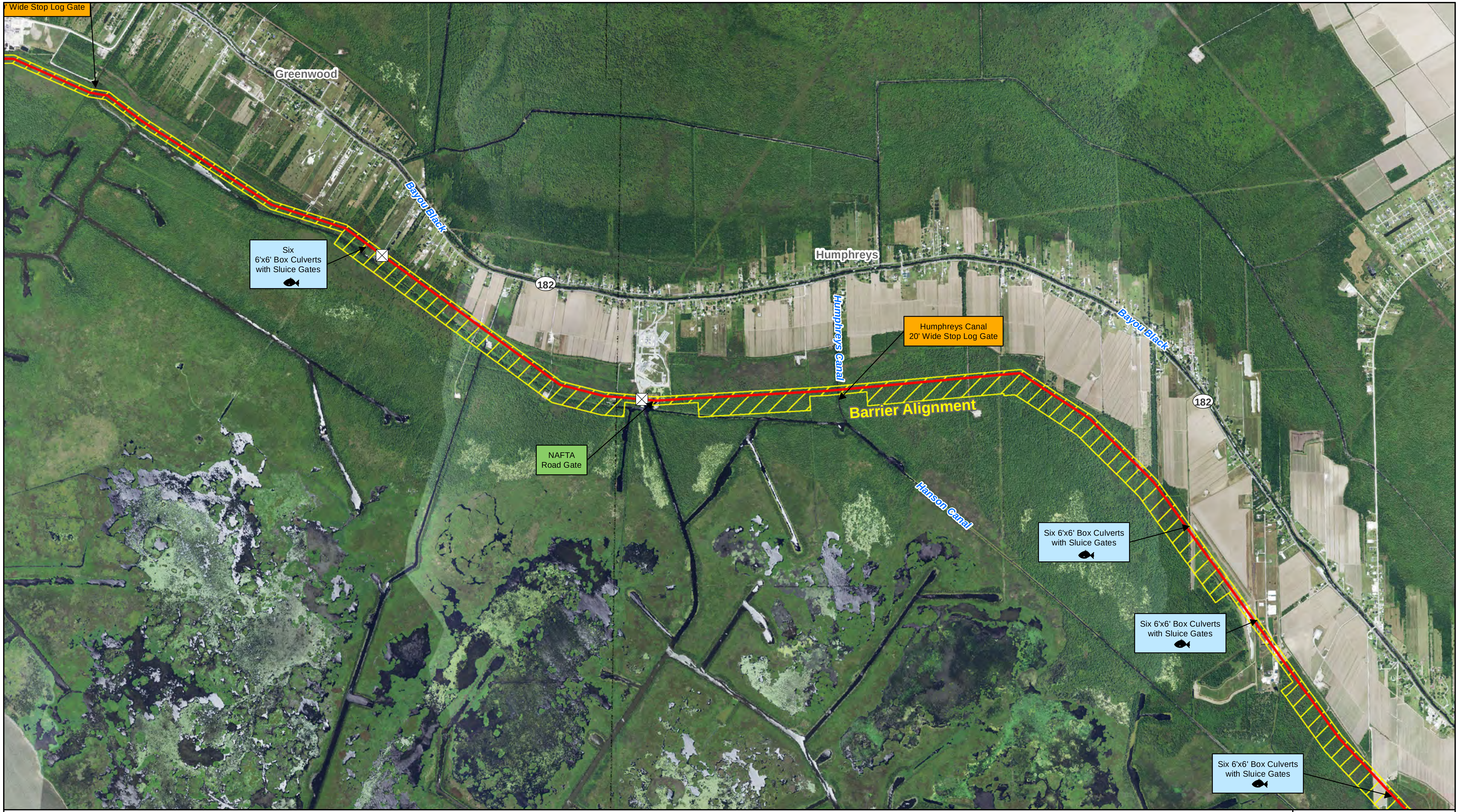
2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC
Gulf Engineers & Consultants

Figure: 01 of 12
Date: June 2012
Scale: 1:28,800
Source: USDA/GEC
Map ID: 273160010-3004



Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC
Gulf Engineers & Consultants

Figure: 02 of 12
Date: June 2012
Scale: 1:28,800
Source: USDA/GEC
Map ID: 273160010-3004

Legend

PumpStations
Centerline
Right of Way
NWR or WMA
Mitigation Area
Borrow Pits
1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

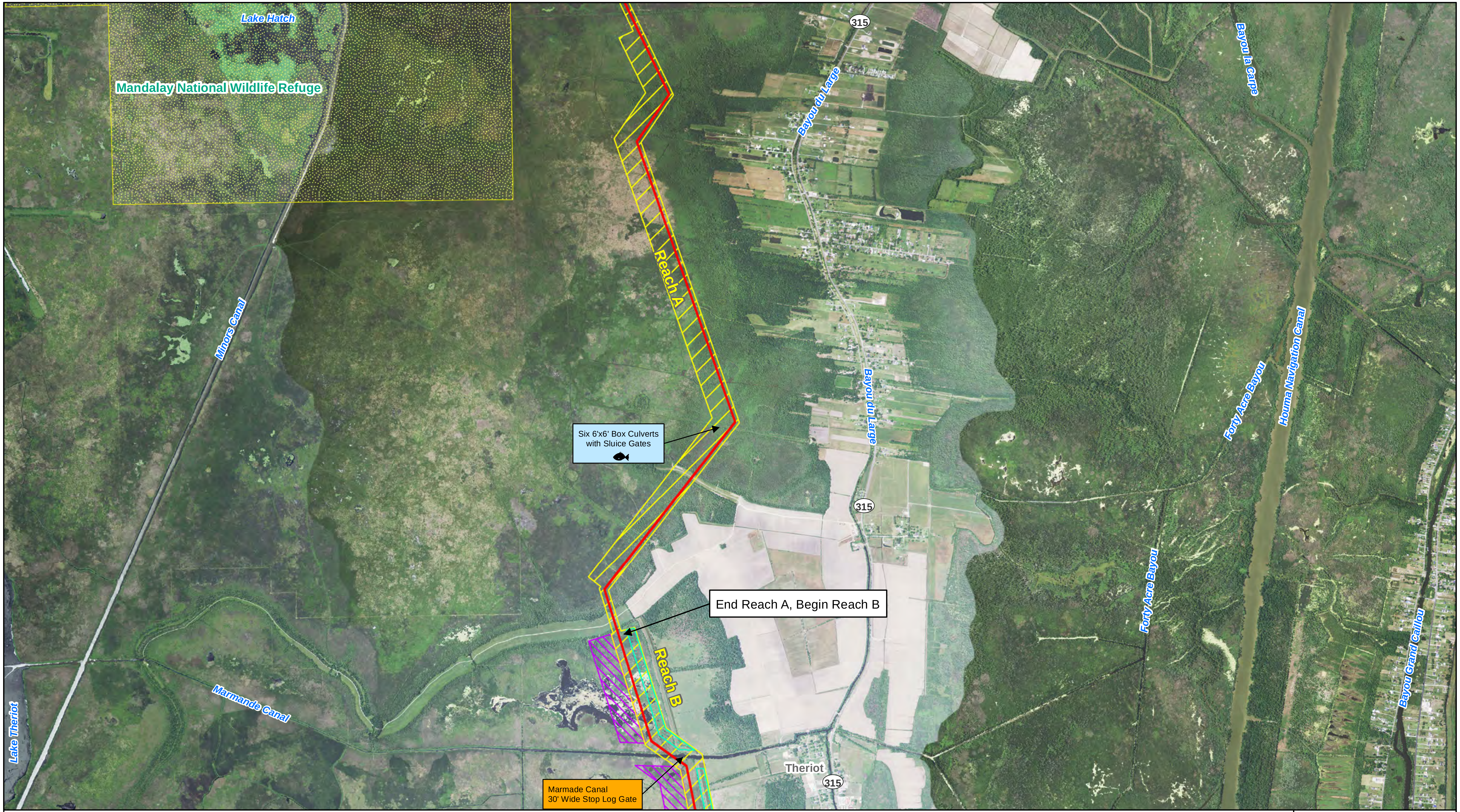
3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N
0 1,200 2,400 Feet

GEC Gulf Engineers & Consultants
Figure: 03 of 12
Date: June 2012
Scale: 1:28,800
Source: USDA/GEC
Map ID: 273160010-3004



Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

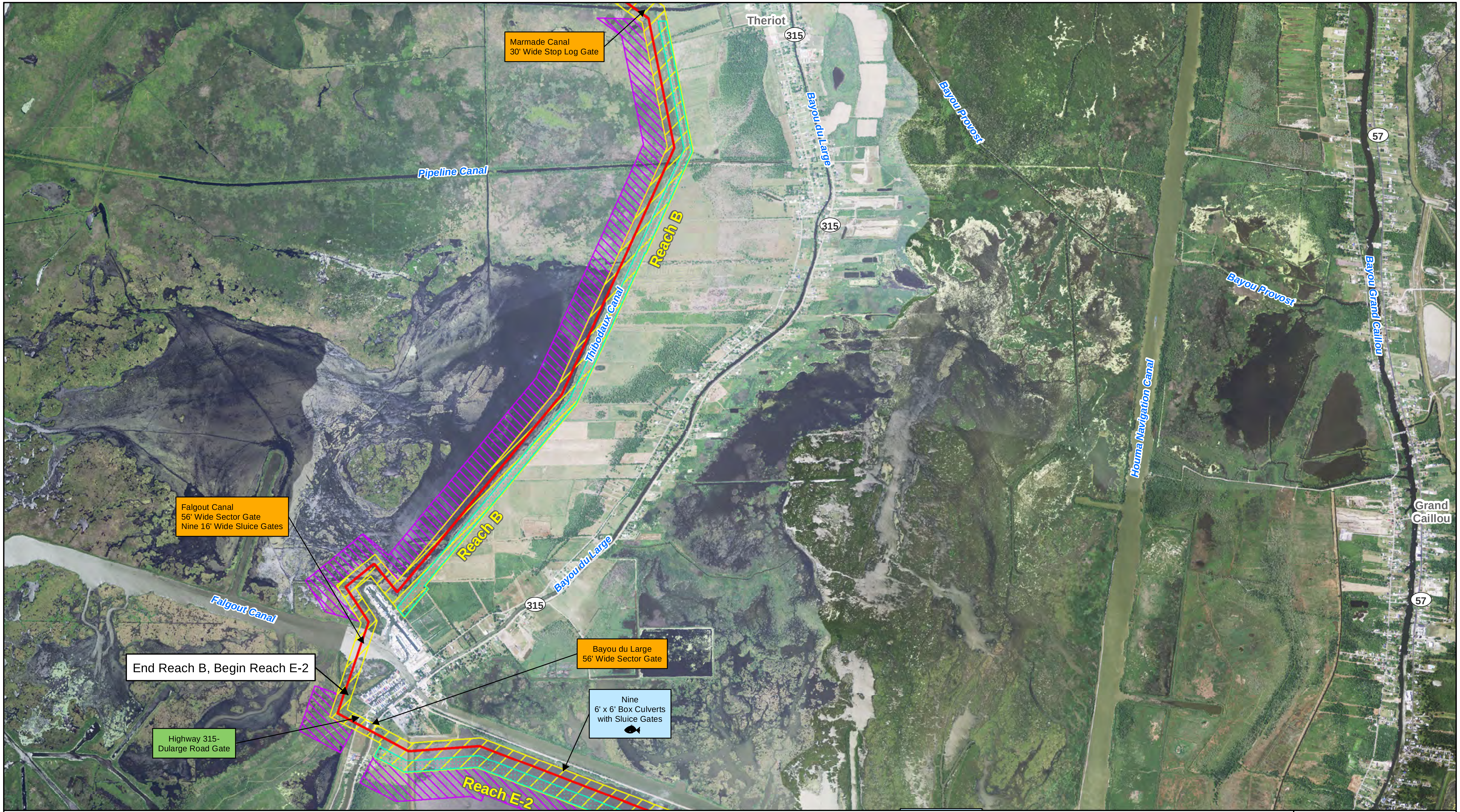
2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC
Gulf Engineers & Consultants

Figure:	04 of 12
Date:	June 2012
Scale:	1:28,800
Source:	USDA/GEC
Map ID:	273160010-3004



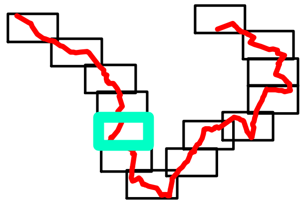
Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

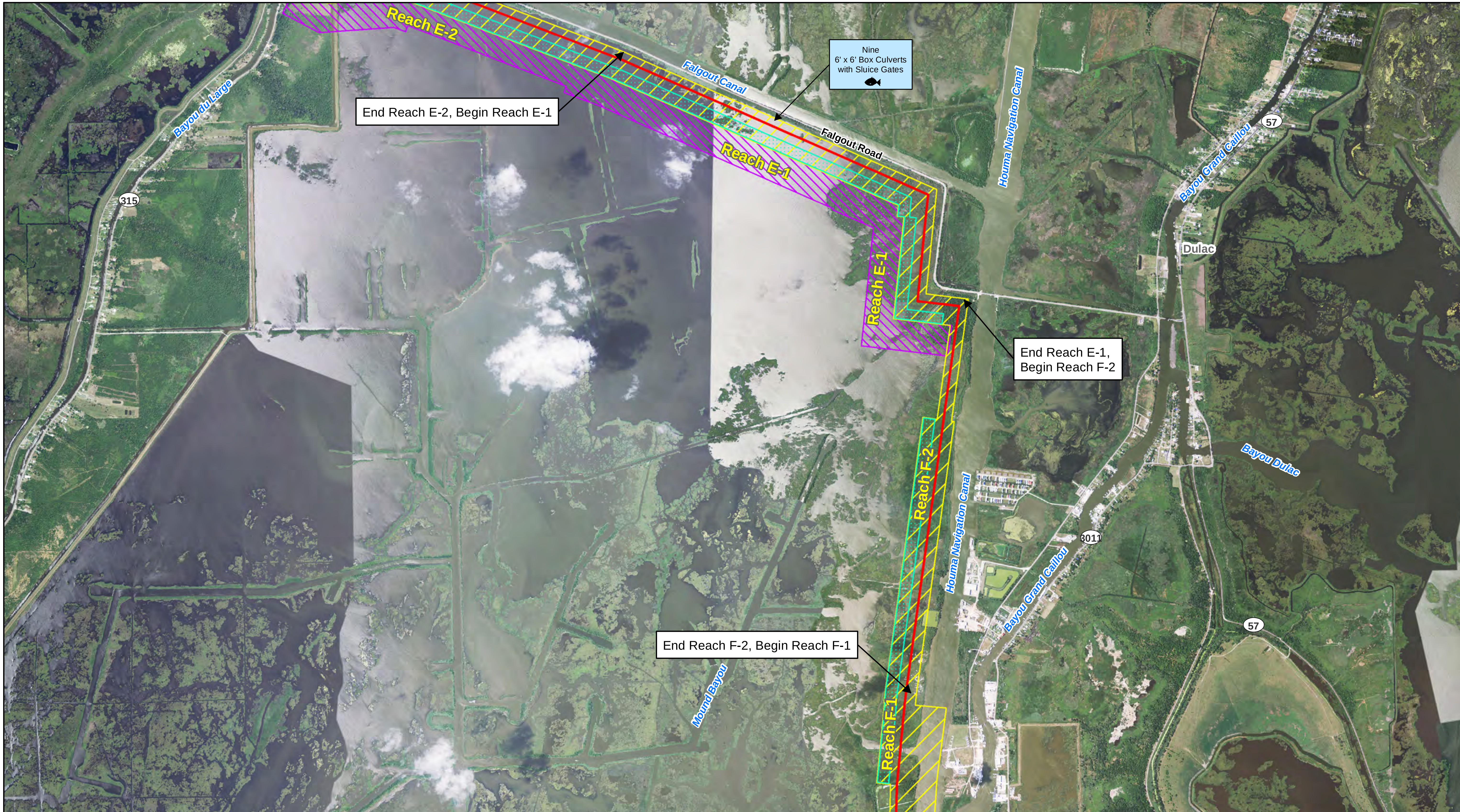


N

0 1,200 2,400 Feet

GEC
Gulf Engineers & Consultants

Figure: 05 of 12
Date: June 2012
Scale: 1:28,800
Source: USDA/GEC
Map ID: 273160010-3004



Legend

PumpStations	Mitigation Area
Centerline	Borrow Pits
Right of Way	1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure
NWR or WMA	

3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC
Gulf Engineers & Consultants

Figure: 06 of 12
Date: June 2012
Scale: 1:28,800
Source: USDA/GEC
Map ID: 273160010-3004

Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- Environmental Water Control Structure (1 Sluice Gate, 6 Box Culverts)

3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

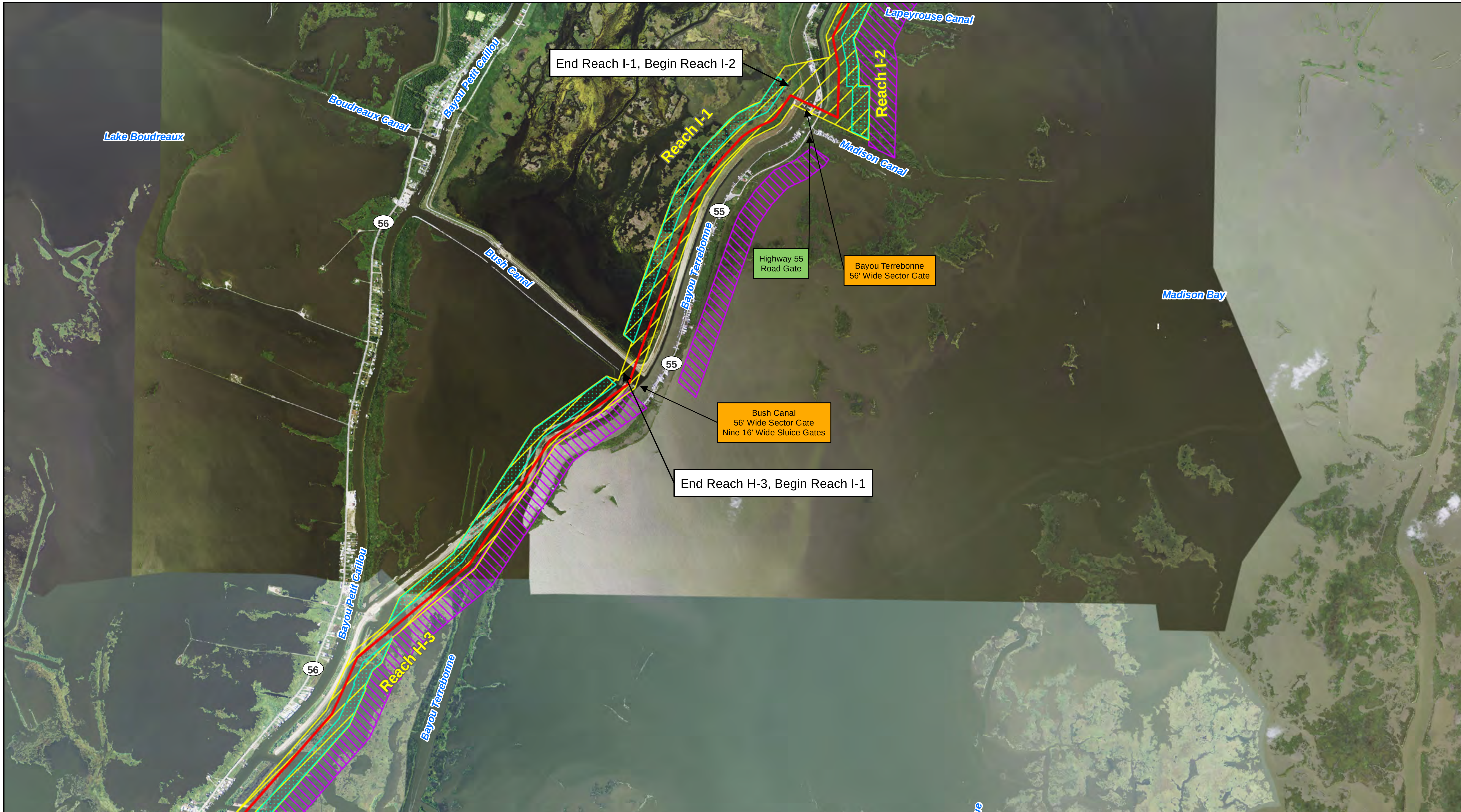
2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC
Gulf Engineers & Consultants

Figure: 07 of 12
Date: June 2012
Scale: 1:28,800
Source: USDA/GEC
Map ID: 273160010-3004



Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

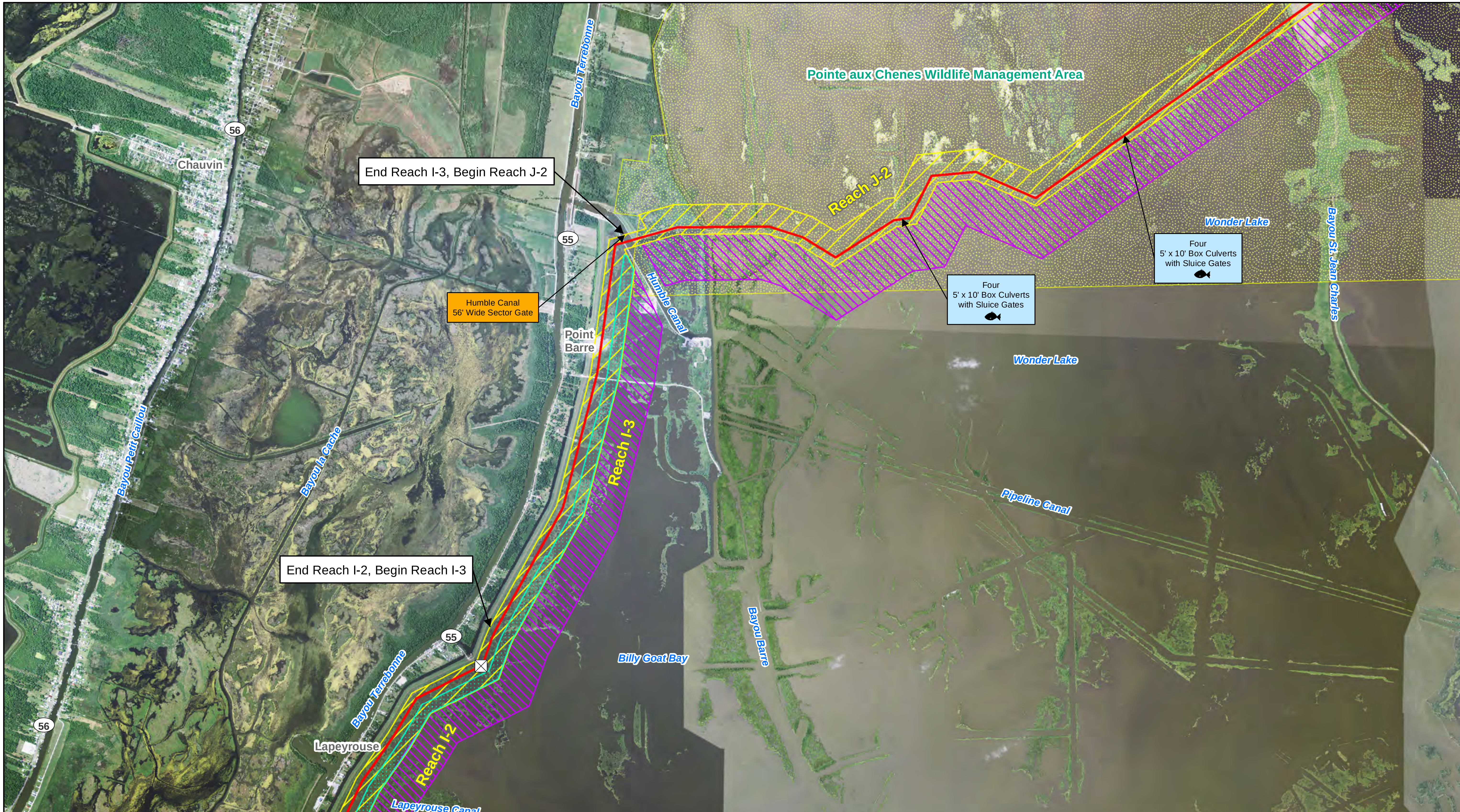
2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC Gulf Engineers & Consultants

Figure: 08 of 12
Date: June 2012
Scale: 1:28,800
Source: USDA/GEC
Map ID: 273160010-3004



Legend

PumpStations
Centerline
Right of Way
NWR or WMA
Mitigation Area
Borrow Pits
1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

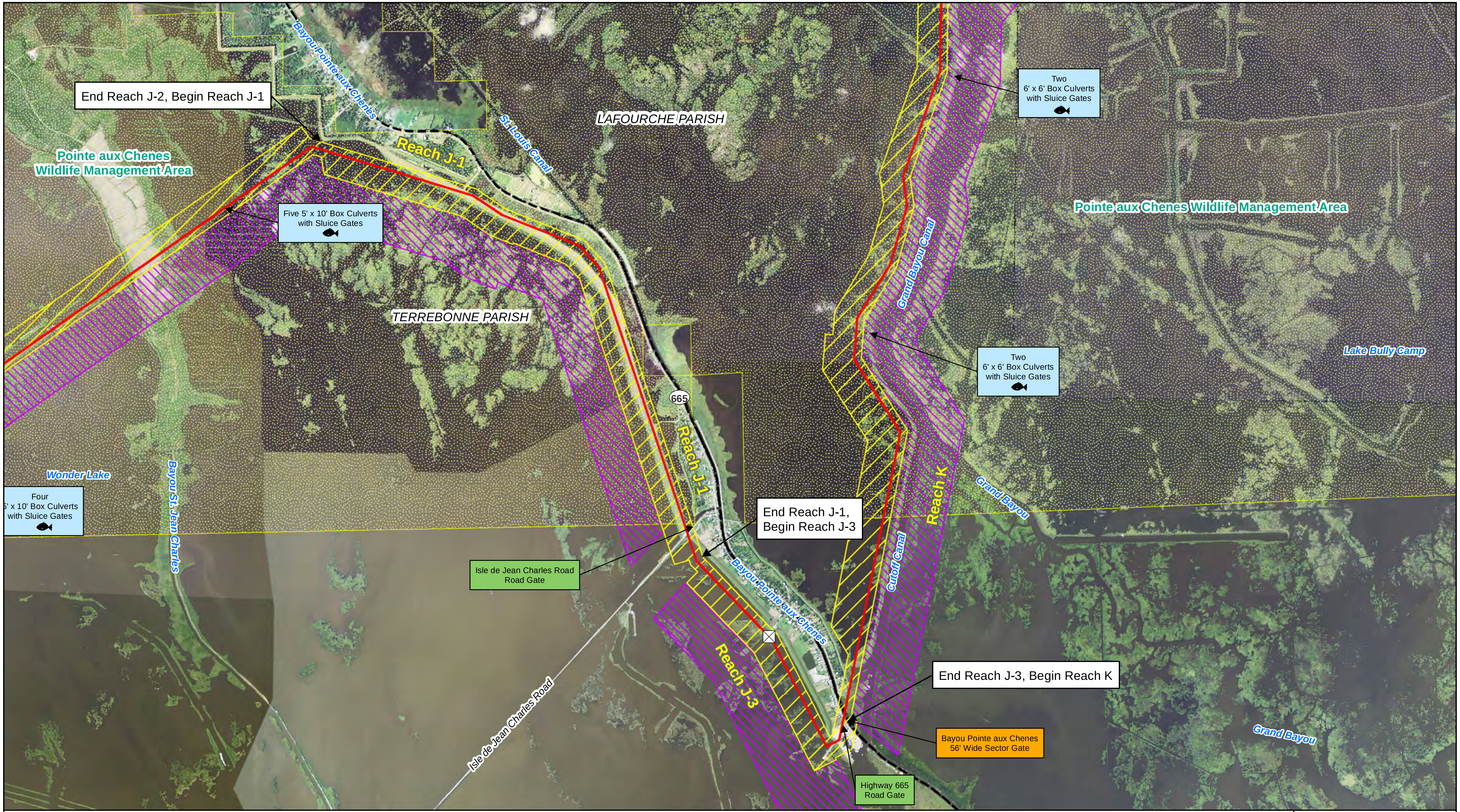
2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC Gulf Engineers & Consultants

Figure: 09 of 12
Date: June 2012
Scale: 1:28,800
Source: USDA/GEC
Map ID: 273160010-3004



Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- Environmental Water Control Structure (1 Sluice Gate, 6 Box Culverts)

3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

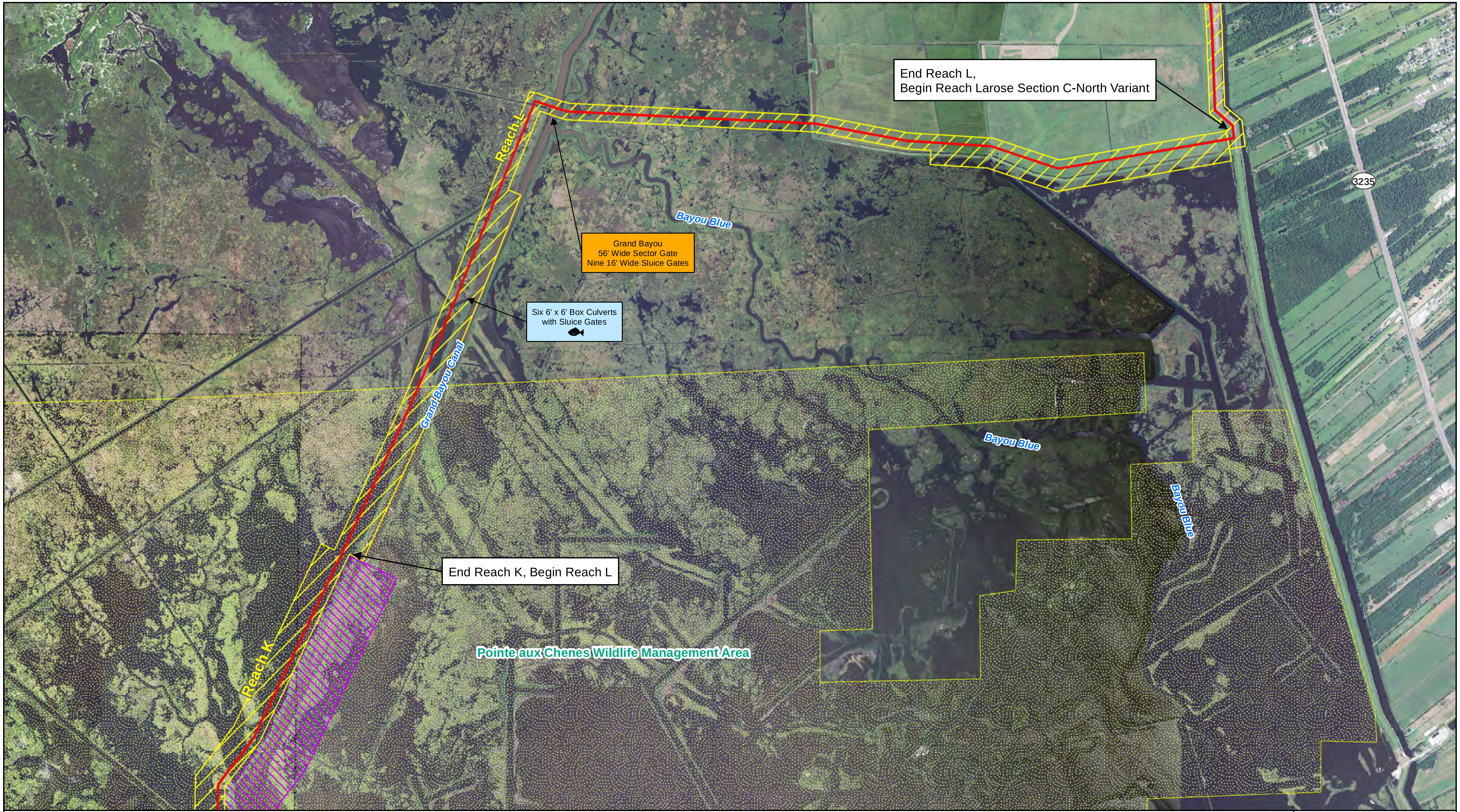
2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC
Gulf Engineers & Consultants

Figure: 10 of 12
Date: June 2012
Scale: 1:28,800
Source: USDA/GEC
Map ID: 273160010-3004



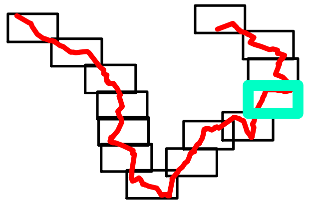
Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes



N

0 1,200 2,400 Feet

GEC
Gulf Engineers & Consultants

Figure: 11 of 12
Date: June 2012
Scale: 1:28,800
Source: USDA/GEC
Map ID: 273160010-3004

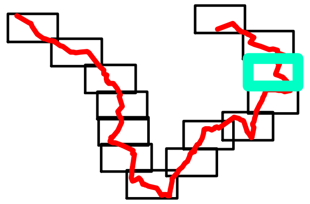
Legend

PumpStations	Mitigation Area
Centerline	Borrow Pits
Right of Way	Environmental Water Control Structure (1 Sluice Gate, 6 Box Culverts)
NWR or WMA	

3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes



N

0 1,200 2,400 Feet

GEC
Gulf Engineers & Consultants

Figure: 12 of 12
Date: June 2012
Scale: 1:28,800
Source: USDA/GEC
Map ID: 273160010-3004

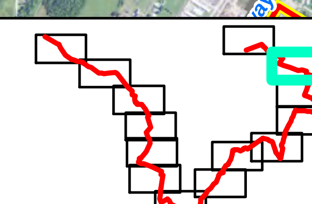
Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes



N

0 1,200 2,400 Feet

Gulf Engineers & Consultants

Figure: 13 of 12
Date: June 2012
Scale: 1:28,800
Source: USDA/GEC
Map ID: 273160010-3004

Legend

- PumpStations
- Centerline
- Right of Way
- NWR or WMA
- Mitigation Area
- Borrow Pits
- 1 Sluice Gate, 6 Box Culverts — Environmental Water Control Structure

3% Annual Exceedance Probability Storm Surge Risk Reduction System Alternative

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

2010 USDA-FSA-APFO NAIP MrSID Mosaics: Lafourche and Terrebonne Parishes

N

0 1,200 2,400 Feet

GEC
Gulf Engineers & Consultants

Figure: 14 of 12
Date: June 2012
Scale: 1:28,800
Source: USDA/GEC
Map ID: 273160010-3004

Appendix H

AGENCY COORDINATION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

February 19, 2013

U.S. Army USACE of Engineers
New Orleans District
Attention: Nathan Dayan
P.O. Box 60267
New Orleans, LA 70160-0267

Dear Mr. Dayan,

In accordance with our responsibilities under Section 309 of the Clean Air Act (CAA), the National Environmental Policy Act (NEPA), and the Council on Environmental Quality (CEQ) regulations for implementing NEPA, the U.S. Environmental Protection Agency (EPA) Region 6 office in Dallas, Texas, has completed its review of the Draft Revised Programmatic Environmental Impact Statement (DRPEIS) prepared by the U.S. Army USACE of Engineers (USACE). The USACE proposes to make changes and improvements in the planning, design, construction, operation, and maintenance of the Morganza to the Gulf hurricane and storm damage risk reduction system project to prevent future disasters to the greatest extent possible.

EPA rates the DRPEIS as "**EO-2**" i.e., EPA has "identified significant environmental impacts and we request additional information in the Final RPEIS (FRPEIS)". The EPA's Rating System Criteria can be found here: http://www.epa.gov/oecaerth/nepa/comments/ratings.html. The "EO" rating is based on the potential for significant adverse impacts to environmental justice communities, tribal communities, and coastal wetlands. These significant adverse impacts include the direct, indirect, and cumulative effects of the proposed project. The "2" indicates the DRPEIS does not contain sufficient information to fully assess direct, indirect, and cumulative impacts to environmental justice communities, identified Tribes, and coastal wetlands. Detailed comments are enclosed with this letter which identifies our concerns and informational needs requested for incorporation into the FRPEIS.

EPA appreciates the opportunity to review the DRPEIS. Please send our office one copy of the FRPEIS and an internet link or CD when it is sent to the Office of Federal Activities, EPA (Mail Code 2252A), Ariel Rios Federal Building, 1200 Pennsylvania Ave, N.W., Washington, D.C. 20004. Our classification will be published on the EPA website, http://www.epa.gov/compliance/nepa/comments/ratings.html, according to our responsibility under Section 309 of the CAA to inform the public of our views on the proposed Federal action.

If you have any questions or concerns, please contact me at 214-665-8126 or John MacFarlane of my staff at macfarlane.john@epa.gov or 214-665-7491 for assistance.

Sincerely,

Debra A. Griffin
Associate Director
Compliance Assurance and
Enforcement Division

Enclosure

DETAILED COMMENTS ON THE
U.S. ARMY USACE OF ENGINEERS'
DRAFT REVISED PROGRAMMATIC
ENVIRONMENTAL IMPACT STATEMENT
FOR THE
MORGANZA TO THE GULF OF MEXICO PROJECT
TERREBONNE AND LAFOURCHE PARISH, LOUISIANA

BACKGROUND: The U.S. Army Corps of Engineers (USACE) proposes to make changes and improvements in the planning, design, construction, operation, and maintenance of the Morganza to the Gulf hurricane and storm damage risk reduction system project to prevent future disasters to the greatest extent possible. The purpose of this project is to reduce the risk of damage caused by hurricane storm surges.

GENERAL COMMENTS:

The Environmental Protection Agency (EPA) has identified known environmental justice (EJ) communities and areas within the study area. The communities of Isle de Jean Charles and Point au Chien are associated with state-recognized tribes, where a large percentage of the population is minority and financially disadvantaged. Additionally, there are several communities of special concern outside of the proposed levee system. These communities include, but may not be limited to, Gibson, Bayou Dularge, Dulac, and Cocodrie.

The Isle de Jean Charles community has been previously identified as an EJ community with significant EJ concerns. Because of their special vulnerability, the proposed action, directly or indirectly, is likely to have disproportionate impacts on the Isle de Jean Charles community. Additional tribal communities could be similarly impacted due to effects on subsistence activities or cultural integrity, but are not mentioned in the Draft Revised Programmatic Environmental Impact Statement (DRPEIS), such as the Point au Chien Indian Tribe and United Houma Nation. The residents of these communities, and possibly other communities, are likely dependent, directly or indirectly, through their family or income sources, upon harvests of aquatic life for subsistence and livelihood.

In view of these special circumstances, EPA recommends that the USACE perform an appropriately detailed EJ analysis, immediately begin additional outreach and public involvement, consider alternatives to a buyout, and provide a detailed analysis of how buyout alternatives would avoid additional or cumulative, disproportionate impacts on EJ areas and communities.

In accordance with Executive Order (E.O.) 13175 and applicable federal laws and policies, all federally recognized tribes that may be affected by the proposed project through potential impacts upon their citizens, resources, lands, culture, or traditional lifeways, should be identified and offered formal government to government consultation. Compliance with E.O. 13175 was not documented in the DRPEIS. If this consultation has not been done, the USACE should immediately contact the Chitimacha Tribe of Louisiana and other federally recognized tribes for both government-to-government (E.O. 13175) and National Historic Preservation Act (NHPA) consultation. Although the USACE is not required to contact state-recognized tribes for consultation under E.O. 13175, the EPA encourages the USACE to engage these and other stakeholders, especially since these communicates are already overburdened and may have additional cultural sites of interest.

Utilizing information obtained through coordination with residents, stakeholders, and consultation with federally recognized tribes, the USACE should develop and refine its preliminary buyout plan. Buyout options should include relocation of intact communities where the potential for irreparable harm exists for unique cultures, languages, and traditions that may be lost if the community is broken up, such as in the case of the Isle de Jean Charles. The USACE should provide a schedule and detailed information for the proposed sequence of construction and buyout alternatives.

Approximately 85 miles of this proposed 98-mile levee system would be built on or adjacent to existing hydrologic barriers, including natural ridges, roads, and existing levees. This helps minimize the potential for indirect adverse impacts to wetlands and other aquatic resources. Nevertheless, tens of thousands of acres of wetlands and open waters would be enclosed within the levee system, and thus could be indirectly affected. In addition to avoiding and minimizing direct wetland impacts, the design and implementation of this levee system must focus on the larger and more complex challenge of minimizing indirect impacts to these valuable aquatic resources.

The USACE is planning to minimize adverse indirect impacts from this project by designing gates and water control structures to allow sufficient ingress and egress of aquatic organisms and to reduce wetland degradation due to prolonged impoundment and/or other hydrologic changes. To that end, the gates and water control structures in the levee system are intended to remain open except when the project area is threatened by a storm surge. In the long term, however, subsidence combined with sea level rise will likely lead to a significant increase in the frequency of closure of these gates and water control structures. For example, the Draft Post Authorization Change (PAC) Report and DRPEIS state that by the year 2085, the Houma Navigation Canal floodgate could be closed between 168 and 365 days per year, depending on the assumed rate of relative sea level rise. Such increased closure could significantly impact wetlands, water quality, fisheries, and navigation – and would in effect be a profound deviation from the design intent of this levee system. What is proposed as an open levee system would increasingly become a closed one, with potentially significant socioeconomic and environmental consequences.

The potential for increased frequency of gate and water control structure closure appears to be a major long-term environmental and socioeconomic risk of this proposed levee system. The Final Revised PEIS (FRPEIS) should ensure that the public and decision-makers are adequately apprised of this risk. The potential adverse environmental and socioeconomic impacts of increased structure closure should be assessed in the section on environmental consequences. Given the long-term and potentially significant ramifications of this issue, we would also recommend that it be highlighted in the summary sections of both documents. The FRPEIS should also provide more detail on ways this challenge might be addressed in the future.

For example, the Draft PAC Report discusses the possibility of converting the proposed gates to locks and installing “additional pumps behind the levee system”. Does this suggest that portions of the proposed project could be converted to forced drainage? Finally, the USACE should consider discussing this issue in the FRPEIS section regarding “unresolved issues”, as there does not appear to be a clear path forward identified for addressing this concern and ensuring adequate hydrology and navigation in the long term.

Reducing flood risk in the study area is certainly in the public interest. For such benefits to be realized, the public must fully understand the level of risk reduction afforded by the proposed project. It would be counterproductive if construction of the proposed project were to provide residents of the area with a false sense of security, thereby possibly affecting evacuation rates and/or decisions regarding how and where to build homes and businesses. As part of its ongoing work on this project, the USACE should endeavor to ensure that residents in the area understand the residual flood risk that would remain while the project is being constructed and when it is complete, and work to ensure that flood risk in the area does not increase as a result of further development in high risk areas.

Following are detailed comments and recommendations pertaining to specific portions of the DRPEIS and Draft PAC Report. We thank the USACE for its ongoing coordination with EPA on this important matter and for its consideration of these recommendations. We remain committed to working with the USACE and other stakeholders to address these matters as expeditiously as possible.

DETAILED COMMENTS:

3.7.2 Wetland Loss, page 3-12

This section states “Principal impacts to the marshes in the study area are due to storm surge and associated erosion and saltwater intrusion.” No mention is made to the many miles of oil and gas canals and navigation channels which allow for increased saltwater intrusion, while also disrupting natural surface hydrology throughout the study area. As currently worded, this section could suggest to the reader that the severe wetland loss in the study area is solely a natural phenomenon.

Recommendation:

This section should be revised to include all actions, past and present, that have led to coastal wetland loss. These actions include oil and gas extraction, pipeline canals, navigational projects, commercial and residential development, and global sea level rise.

3.8.2 Coastal Restoration Opportunities, page 3-13

The Draft PAC Report and DRPEIS state that the proposed levee system “would complement state and Federal coastal restoration projects” by providing protection against coastal erosion and the adverse effects of storm surge (Draft PAC Report, pages ix and 60; DRPEIS, Abstract-i). We recognize that aspects of this system may have the potential to provide environmental benefits, particularly the proposed lock on the Houma Navigation Canal. As discussed above, however, the proposed levee system could also result in long-term negative environmental effects which could be counter to coastal restoration goals. In particular, relative sea level rise would likely result in an increase in the frequency of closure of the system's floodgates and water control structures, potentially reducing ingress and egress of aquatic organisms, increasing impoundment of enclosed wetlands, harming water quality, and interfering with navigation and commerce.

Recommendation:

Although the full extent of such negative impacts has not been adequately assessed, statements regarding the net indirect environmental effects of this levee system should at a minimum indicate that there is the potential for negative effects in the future – effects which might outweigh any potential near-term environmental benefits.

4. ALTERNATIVES

<u>4.3.7 Induced Flooding Impacts, page 4-20 and 6.14.1 Population and Housing, page 6-33</u>

Section 4.3.7 discusses "constructible features" and "programmatic project features" of the overall levee system. The document is intended to provide sufficient detail such that no further NEPA documentation is needed for the constructible features, whereas the programmatic project features would require further NEPA analysis at some later date. Hydrologic modeling indicates that the proposed levee system could potentially increase storm surge flooding in areas outside of the levee. For this reason, the DRPEIS, Draft PAC Report, and the Real Estate Plan discuss a preliminary nonstructural buyout plan for approximately 1,000 structures and 2,500 people potentially affected by induced surge.

This preliminary buyout plan does not appear to be a constructible feature – meaning that further analysis would be needed before it could be implemented. In addition, the Real Estate Plan states on page 20 "Relocations will be accomplished in phases along with project construction…" and calculates 15 year time frame for property acquisition. This raises the question as to whether implementation of the constructible levee features could increase flood risks outside the levee system prior to implementation of a buyout program or some other non-structural response. If portions of the levee are built prior to addressing the risks associated with induced surge, then people and properties, including EJ communities, outside of the levee system are potentially exposed to increased flood risk, with no certainty as to whether or when a non-structural risk reduction program would actually be implemented. This has the potential to create a direct disproportionate impact on EJ communities.

Recommendation:

EPA recommends the USACE assess whether implementation of the constructible features would result in increased surge risk to properties and people outside the proposed levee system. If so, we recommend that the FRPEIS include as constructible features those non-structural measures needed to address such increased risk and assess this disproportionate impact in the EJ analysis.

5. AFFECTED ENVIROMENT

5.2.9 Air Quality, page 5-38

This section discusses the nonattainment/maintenance history of Lafourche Parish for both the 1-hour ozone and 8-hour ozone National Ambient Air Quality Standards (NAAQS). It is correctly noted that Lafourche Parish has an EPA-approved 110(a)(1) maintenance plan for ozone.

Recommendation:

Please include a discussion to clarify that 110(a)(1) maintenance areas are not subject to the air quality conformity requirements of Clean Air Act Section 176(c). Also include the distinction that EPA's March 24, 2008 approval of the Lafourche Parish 110(a)(1) maintenance plan pertains to the 1997 8-hour ozone NAAQS. EPA completed the designations process under the 2008 8-hour ozone NAAQS on April 30, 2012 (77 FR 30088), and Lafourche Parish was designated as unclassifiable/attainment for this standard.

5.2.13 Socioeconomics

The location of the proposed project occurs in EPA-identified EJ areas, including Isle de Jean Charles. The EJ assessment for the DRPEIS is inadequate, provides little detail, and has no in-depth analysis. The DRPEIS fails to identify with any specificity, the communities that are likely to be impacted or their characteristics, and it fails to identify particular minorities or ethnic groups impacted.

Recommendation:

The FRPEIS should include a detailed socioeconomic analysis for potential EJ impacts comparing the demographics and potential environmental impact of those inside the levees with those who are outside the system. In addition, the USACE should consider the potential impacts of increased storm surge and flooding due to the timing of levee construction in the EJ analysis.

Community Cohesion, page 5-47

The discussion of "community cohesion" is inadequate in that it fails to identify, discuss, or address unique community attributes associated with tribes, such as language, culture, religion, tradition, governance, and other necessary attributes for continuing survival of a tribe or band of Indians, some of which are known to reside in this area (for example the Isle de Jean Charles band of Biloxi-Chitimacha, Point au Chien Indian Tribe, and United Houma Nation). If these attributes are not identified, then it is not possible to consider direct, indirect, or cumulative impacts of the alternatives on these communities. It is well known that intrusion by non-natives into traditional communities can lead to erosion of tradition and loss of language. If a traditional community is physically relocated, impacts will be even more severe. If a traditional community is split up, the culture, language, and traditions are most likely going to be irretrievably lost.

Recommendation:

The USACE should develop additional alternatives for residents that are outside the proposed levee system (e.g., Isle de Jean Charles). This should include the buyouts as stated in the DRPEIS, but should also include non buyout alternatives like ring levees, house elevation, etc. Alternatives should recognize and protect the uniqueness of the Isle de Jean Charles community and maximize community cohesion by developing alternatives that have a concerted effort to protect, buyout, or move Isle de Jean Charles residents as an intact community. USACE should also determine whether the Point au Chien Indian Tribe and United Houma Nation would experience similar potential impacts.

Environmental Justice, page 5-48

Page 5-48 states "For purposes of this analysis, all census tracts within the project footprint are defined as the EJ study area. Lafourche Parish and Terrebonne Parish are considered as reference communities of comparison." It is unclear why U.S. Census Bureau Census Tracts were used as base assessment units instead of smaller geographic units such as Census Block Groups. There are fourteen Census Tracts that were the basis of the EJ assessment. Of these fourteen, five were considered low income by the USACE, approximately 35.7% of the tracts. The USACE states that the tracts considered low income are not within the path of levee construction, are sparsely populated, or are similarly affected and therefore, there are no potential EJ impacts. EPA is concerned that the geographic unit selected for analysis does not accurately reflect the demographics of the area, and in particular the poverty level. There are 142 Block Groups within the two parishes identified for this project. Of those 142 Block Groups, 119 Block Groups, or 83.8%, meet the definition of low income/poverty as stated in the DRPEIS. Additionally, 39.4% of the Block Groups in the project area fall within the census definition of "extremely low income," that is, Block Groups that are greater than 40% low income.

Recommendation:

The USACE should use Census Block Groups or a geographic unit smaller than Tracts, to perform socioeconomic and EJ assessments in order to obtain a more accurate estimate of the demographics of the area and thus a more accurate depiction of the potential impacts of the proposed project. The USACE should discuss its rationale for the criteria used (e.g., 50% minority, etc.). A more in-depth analysis is needed in order to describe the minority make-up of the communities (e.g, Asian, Native American, etc.) and analyze the potential impacts of the proposed project that may affect each ethnic group differently.

Environmental Justice, page 5-48

Page 5-48 also states "All residents, irrespective of minority status or income level, are expected to be similarly impacted by construction activities." EPA strongly disagrees with this statement since the USACE did not compare residents inside the proposed levee system with residents outside the levee system and how they may be potentially impacted by the timing of construction and the lack of details concerning the buyout.

Recommendation:

The USACE should perform an EJ analysis characterizing and comparing these two populations. The DRPEIS should provide a similar level of detail on the buyout activities as it does for the engineering and economic aspects of levee construction.

Tribal Issues, page 5-49

It is stated on page 5-49 "Additionally, approximately 230 members of the state recognized Biloxi-Chitimacha tribe are located on Isle de Jean Charles, which is outside of the southern boundary of the project alignment in Terrebonne Parish. While this raises a potential EJ issue, with respect to alternative protection alignments, neither of the alternatives to the No Action Alternative authorized for study under the PAC represents a separate alignment that includes this community. Providing hurricane risk reduction for these residents has been determined in previous Corps of Engineers analyses to be cost prohibitive." The DRPEIS does not reflect any attempt by the USACE to contact the Biloxi-Chitimacha tribe as an interested stakeholder. This Tribe has lived in this area for over 130 years and they have lost most of their land through a history of war, disease, displacement and poverty, erosion, and past governmental decisions. They are very much in danger of losing their "community cohesion," including their language, culture, and traditions. EPA is concerned that this "potential EJ issue" has not been analyzed in detail as several of our comments suggest. In addition, it is unclear whether the USACE contacted the federally-recognized Chitimacha Tribe of Louisiana regarding cultural resources in southern Louisiana or whether the USACE contacted them under E.O. 13175 for government-to-government consultation.

The USACE does not describe when it determined that hurricane risk reduction for the residents of Isle de Jean Charles was cost prohibitive and whether options other than buyouts were developed or considered.

Recommendation:

The USACE should directly contact the Chief of the Isle de Jean Charles Band of the Biloxi-Chitimacha-Choctaw Indians, the Point au Chien Indian Tribe, and United Houma Nation, and appropriate residents of these communities, so they can have meaningful participation in the NEPA and buyout processes. Given the remote and rural nature of these locations, solely advertising a public meeting in the Houma newspaper is inadequate. A more concerted effort to contact individuals in these communities is necessary because people may not speak English, receive local newspapers, and/or may have a fear of governmental authorities.

6. ENVIRONMENTAL CONSEQUENCES

General Comments

EPA believes that a majority of the resources were not properly evaluated for their environmental consequences. In most cases, impacts are stated in generalities and only the magnitude (the amount of change) is specified. However, the extent (how vast is the change), direction (how dynamic is the change), duration (how lasting is the change), and speed (how rapid is the change) of the impact should be disclosed as well. Otherwise stated, the Environmental Consequences chapter should discuss and analyze how and why the proposed project affects the overall health of the resources within the study area.

Indirect Impacts

EPA believes that the indirect impacts analysis has not fully disclosed the entirety of indirect impacts. The following are examples of how the indirect impacts analysis should be strengthened.

The Draft PAC Report asserts that the proposed environmental control structures in the levee system "mitigate for indirect impacts of the levee system by matching and/or enhancing existing drainage patterns during non-storm conditions" (Draft PAC Report, page ii). This statement should be amended to account for the potential long-term indirect impacts associated with the projected increase in the closure frequency of the system's gates and water control structures.

The Draft PAC Report states on page 83 that "The Habitat Evaluation Team determined that no indirect impacts to wetlands would result from the project." A similar statement is made on page 6-62 of the DRPEIS. EPA takes issue with this assertion. While potential near-term hydrologic effects of the levee system could theoretically be negligible, the USACE's own analysis regarding the frequency of gate and water control structure closure in the future strongly suggests that the project could result in significant long-term adverse impacts to wetlands, water quality, and fisheries (along with navigation).

The last sentence on page 19 of Appendix C states that "…the project would not induce significant changes on the hydrology of the estuary." It is not clear how this could be consistent with the USACE's projections regarding increased closure frequency of gates and water control structures in the long-term. While this section does discuss the possibility that the sponsor might wish to modify the closure criteria to address non-storm water stages, there is no discussion of the potentially significant changes in circulation that could occur with the increased closure frequency projected using the current closure criteria. As with other portions of the DRPEIS, EPA recommends the USACE describe the potential indirect impacts that could occur due to increased closure frequency of gates and water control structures due to relative sea level rise, with the focus in this section being on estuarine flow and current patterns.

The discussion of cumulative effects on the aquatic ecosystem on page 37 of Appendix C states that "No long-term, negative cumulative impacts are anticipated." Here again, it is unclear how the projections regarding future frequency of gate and structure closure could support such a conclusion.

Recommendation:

The FRPEIS should include a comprehensive indirect impacts analysis and fully disclose all effects caused by the action that occur later in time or are farther removed in distance.

Cumulative Impacts

Due to the expansive nature of this project and the environmental sensitivity of the study area, EPA believes a more comprehensive and wide-ranging cumulative impacts analysis should be completed. The purpose of a cumulative impacts analysis is to ensure federal decisions consider the full range of consequences of actions. Without a thorough cumulative impacts analysis, the full range of environmental consequences is impossible to quantify. The study area is an ecologically sensitive area that is rapidly degrading. Past actions such as oil and gas extraction, including pipeline canals, navigational projects, federal and local levee construction, and industrial, commercial, and residential development, along with storm surge, have led to the degradation of coastal wetlands. These same actions would continue the alteration of the natural hydrology, leading to additional coastal wetland loss. Future projects, such as the Houma Navigation Canal project, Coastal Impact Assistance Program projects, Louisiana Coastal Area Plan projects, and Coastal Wetlands Planning, Protection, and Restoration Act projects, along with the actions listed above, should be analyzed for their potential impacts to coastal Louisiana. In addition, the global issue of sea level rise should be incorporated into this discussion.

Recommendation:

The FRPEIS should include a comprehensive cumulative impacts analysis by establishing spatial and temporal boundaries for significant resources and including a list and description of past, present, and reasonably foreseeable future projects. An attempt was made to establish boundaries and list projects; however, much more detail is required. The analysis should include the overall impacts to the environment that can be expected if the individual projects and their impacts, including the proposed project, are allowed to accumulate.

We refer you to the Council on Environmental Quality's "Considering Cumulative Effects Under the National Environmental Policy Act" and EPA's "Consideration Of Cumulative Impacts In EPA Review of NEPA Documents" for assistance with writing a more comprehensive cumulative impacts analysis.

6.2 Coastal Vegetation and Wetlands

Table 6-1 of the DRPEIS indicates that, assuming intermediate sea level rise, a total of 670 and 3,443 acres of wetlands would be directly impacted by the constructible and programmatic features, respectively. In the same table, there appears to be an error in the calculation of total wetland impacts, which is currently listed at 2,993 acres, again assuming intermediate sea level rise. These direct wetland impact numbers are inconsistent with those provided in Appendix C, which on pages 4 and 5 indicates that the constructible features would result in direct impacts to 721 acres of marsh. Page 35 of the same appendix contains a table showing 4,104 acres of wetland impacts from the programmatic features. These numbers should be reconciled in the FRPEIS.

Borrow Sources

According to Appendix C of the DRPEIS, borrow material for the proposed project would come from a combination of adjacent and offsite borrow locations. The appendix states that offsite borrow sources would not come from wetland areas, but provides no such commitment with respect to adjacent borrow sources. Indeed, it appears from the figures in Appendix G that some portion of the borrow material for the constructible and programmatic levee features would come from adjacent wetlands.

In order to comply with the Clean Water Act Section 404(b)(1) Guidelines, the USACE would need to demonstrate that there is no less environmentally damaging practicable alternative to using wetlands as a source of borrow material. Page 38 of Appendix C indicates that no less environmentally damaging practicable alternatives to the proposed discharges could be identified. However, there does not appear to be any information to adequately substantiate this claim with respect to the analysis of potentially less environmentally damaging borrow sites. The FRPEIS should include information demonstrating that there are no less environmentally damaging borrow sources for the constructible levee reaches. This same analysis of borrow site alternatives would also be needed for subsequent environmental reviews of the programmatic features. On this point, we would note that the avoidance of jurisdictional wetlands for borrow material is one of the significant environmental accomplishments of the expedited NEPA process for the Greater New Orleans Hurricane and Storm Damage Risk Reduction System. We would encourage the USACE to work to repeat this important precedent.

<u>6.10.2 Air Quality - Action Alternatives, page 6-26</u>

This section states that direct project impacts to ambient air quality will be temporary and localized, primarily due to construction equipment emissions and airborne particulate matter/fugitive dust.

Recommendation:

In addition to all applicable local, state, or federal requirements, the following mitigation measures should be included in a construction emissions mitigation plan or similar document in order to reduce air quality impacts associated with emissions of NOx, CO, PM, SO_2, and other pollutants from construction-related activities:

Fugitive Dust Source Controls:

- Stabilize open storage piles and disturbed areas by covering and/or applying water or chemical/organic dust palliative where appropriate at active and inactive sites during workdays, weekends, holidays, and windy conditions;

- Install wind fencing and phase grading operations where appropriate, and operate water trucks for stabilization of surfaces under windy conditions; and
- Prevent spillage when hauling material and operating non-earthmoving equipment and limit speeds to 15 miles per hour. Limit speed of earth-moving equipment to 10 mph.

Mobile and Stationary Source Controls:

- Plan construction scheduling to minimize vehicle trips;
- Limit idling of heavy equipment to less than 5 minutes and verify through unscheduled inspections;
- Maintain and tune engines per manufacturer's specifications to perform at EPA certification levels, prevent tampering, and conduct unscheduled inspections to ensure these measures are followed;
- If practicable, utilize new, clean equipment meeting the most stringent of applicable Federal or State Standards. In general, commit to the best available emissions control technology. Tier 4 engines should be used for project construction equipment to the maximum extent feasible;
- Lacking availability of non-road construction equipment that meets Tier 4 engine standards, the responsible agency should commit to using EPA-verified particulate traps, oxidation catalysts and other appropriate controls where suitable to reduce emissions of diesel particulate matter and other pollutants at the construction site; and
- Consider alternative fuels and energy sources such as natural gas and electricity (plug-in or battery).

Administrative Controls:

- Prepare an inventory of all equipment prior to construction and identify the suitability of add-on emission controls for each piece of equipment before groundbreaking;
- Develop a construction traffic and parking management plan that maintains traffic flow and plan construction to minimize vehicle trips; and
- Identify sensitive receptors in the project area, such as children, elderly, and infirmed, and specify the means by which impacts to these populations will be minimized (e.g. locate construction equipment and staging zones away from sensitive receptors and building air intakes).

<u>6.14.8 Environmental Justice, page 6-41</u>

Page 6-41 states "we have determined that there is no disproportionate impact to a minority or low income community."

EPA strongly disagrees with this statement. There is not adequate information in the DRPEIS to determine how the USACE came to the conclusion that there are no potentially disproportionate impacts to minority and/or low income communities. When one segment of the population benefits from the proposed action, but another absorbs the negative impacts of the action (i.e., increased storm surge and flooding as levee segments are constructed) in addition to historical actions/events (i.e. an already overburdened community), it can create a potentially disproportionate EJ impact. The USACE did not perform an adequate EJ assessment 1) comparing the potential impacts of those inside and outside the levees and 2) comparing the timing of construction with potential increased storm surge and flooding impacts to minority and/or low income communities. The DRPEIS does not fully describe the indirect and cumulative impacts on EJ issues. These communities have experienced negative impacts due to the BP oil spill, floods, hurricanes, and loss of subsistence fishing (including crabs, oysters, shrimp, etc), gathering, and hunting opportunities.

Recommendation:

In addition to our comments regarding obtaining a more accurate estimate of the demographics of the area, the USACE should consider the potential EJ impacts of the timing of levee construction on minority and/or low income populations that may be directly, indirectly, or cumulatively impacted by the proposed action. In order to avoid disproportionate impacts to the Isle de Jean Charles tribal community, any buyout would need to relocate the community intact in an appropriate location with access to subsistence resources and with other attributes agreeable to the tribe. The tribal leader should be contacted immediately to begin appropriate discussions. Although not mentioned in the DRPEIS, USACE should also determine whether the Point au Chien Indian Tribe and United Houma Nation would experience similar potential impacts. As discussed in our Cumulative Impacts comments on page 9, the FRPEIS should include a more thorough cumulative impacts analysis and include those impacts on minority and/low income populations.

6.15 Cultural Resources

The DRPEIS does not provide enough information to determine whether the USACE is in full compliance with National Historic Preservation Act (NHPA), E.O. 12898, and others.

Recommendation:

The USACE should initiate consultation with Tribes regarding NHPA and initiate formal consultation with any federally-recognized Tribes under E.O. 13175 before finalizing the EIS.

6.19 Mitigation

Table 4-1 of the Draft PAC Report includes a reference to marsh impacts from the levee which are “self mitigated”. It is not clear what this means, but it appears to be a reference to the idea that indirect hydrologic effects of the proposed levee project could provide wetland benefits that compensate for wetland impacts due to levee construction. EPA does not support such an assertion, given the uncertainties and challenges of accurately assessing hydrologic impacts from the levee, as well as the potential for long-term adverse impacts due to changes in the operation of the levee system in response to relative sea level rise.

Table 4-4 states that more than 3,000 acres of wetlands would be “displaced” by the preferred alternative. This wording suggests that fully compensating for wetland impacts is a simple endeavor with guaranteed success. We would suggest using more accurate wording such as “permanently eliminated” or “destroyed” instead of “displaced”, followed by the caveat that the USACE will seek to provide full compensatory mitigation to offset such impacts.

Page 6-71 of the DRPEIS states that “In most cases, the establishment of mitigation sites would be done at the same time as construction of the levees and other project features.” This statement is somewhat vague and may fall short of an explicit commitment to provide mitigation in advance of or concurrent with project implementation. For example, what is meant by “establishment of mitigation sites”? And what is meant by “In most cases…”? This statement should be re-written to include a commitment to provide mitigation in advance of or concurrent with project implementation, to the maximum extent practicable. This would ensure consistency with the standard for mitigation timing set forth in the April 10, 2008, Department of Defense and EPA regulations regarding compensatory mitigation for losses of aquatic resources. (According to Section 2036 of the Water Resources Act of 2007, the Secretary shall ensure that the mitigation plan for each water resource project complies with the mitigation standards and policies established pursuant to the regulatory programs administered by the Secretary.)

Mitigation efforts should be developed and described that avoid potential disproportionate impacts of the proposed action that could result in the loss of community cohesion in all of the potentially affected communities south of the proposed levee system, in particular, the tribal community of Biloxi-Chitimacha on Isle de Jean Charles.

8.0 PUBLIC INVOLVEMENT

8.1 Scoping and Interagency Coordination

It appears that the latest project scoping meetings took place in and around May of 1993 in Houma, Louisiana. There is not enough information to determine whether the USACE completed any more recent scoping and other public meetings besides the meeting held in January 2013, and whether communities, tribes, and other stakeholders directly regarding the project were contacted. EPA is concerned that the USACE did not obtain the views and ideas of affected residents and general public when the last record of communication and public involvement occurred almost 20 years ago.

Recommendation:

The FRPEIS should provide documentation of recent scoping and public involvement events and actions. If scoping and public involvement did not take place for this revised action, the USACE should directly and immediately engage all interested, concerned, and affected stakeholders, including low income, minority, and tribal populations, including the Biloxi-Chitimacha tribal community of Isle de Jean Charles, Point au Chien Indian Tribe, and United Houma Nation, before finalizing the EIS.

EPA emphasizes that there is a need for continued interagency coordination on the constructible and programmatic features of the proposed project to ensure that wetland impacts are avoided and minimized in the subsequent NEPA processes. This is particularly the case for those levee reaches that would enclose wetland areas that are currently un-impounded and new portions of the overall levee alignment (e.g., the proposed Lockport to Larose Ridge levee extension).

Letter 34

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, FL 33702
(727) 570-5312; Fax 570-5517
http://caldera.sero.nmfs.gov

MAR 18 2002 F/SER3:DLK:mdh

Mr. Nathan Dayan
Planning, Programs, and Compliance Branch
CEMVN-PM-RS
U.S. Army Corps of Engineers
P.O. Box 60267
New Orleans, LA 70160-0267

Dear Mr. Dayan:

This correspondence is in reply to the letter and Draft Feasibility Report (Volume I), received November 29, 2001, and Volumes II and III (including the Biological Assessment), received January 8, 2002, from the U.S. Army Corps of Engineers (Corps), New Orleans District. The feasibility study is for a plan to provide additional protection from hurricane surge flooding for portions of the Terrebonne and Lafourche Parishes in southeast Louisiana. National Marine Fisheries Service (NMFS) comments are rendered pursuant to the Endangered Species Act of 1973 (ESA). The NMFS consultation number for this project is I/SER/2001/01141; please refer to this number in future correspondence on this project.

The proposed project consists of the construction of a system of levees and floodgates designed to provide protection from a 100-year hurricane event. Two versions of the plan have been proposed. The original included 87 miles of levees, 11 floodgates, a lock, 12 fish and wildlife structures, and several drainage structures, while the modified plan has 72 miles of levees and the same number of structures. The strategy is to provide flood control and wetland protection through this project, with its primary feature being a levee/flood wall that starts at the western side of the Terrebonne Parish, traverses the southern portion of the parish, and connects with the south Lafourche hurricane protection system at Larose.

ESA listed species under NMFS' purview which potentially occur in the Gulf of Mexico off Louisiana include: the Gulf sturgeon (*Acipenser oxyrinchus desotoi*); five species of sea turtles including the green (*Chelonia mydas*), loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*); and five species of whales including the northern right (*Eubalaena glacialis*), finback (*Balaenoptera physalus*), humpback (*Megaptera novaeangliae*), sei (*Balaenoptera borealis*), and sperm (*Physeter catodon*).

None of the whale species are expected to be found near the project area. Leatherback and hawksbill turtles are highly unlikely to occur near the project area. The work is going to occur in coastal waters and coastal marsh areas, with construction occurring "several miles from Gulf edge marshes" where it is unlikely that loggerhead, Kemp's ridley or green turtles will occur. There are no nesting beaches in the area that would be impacted directly or indirectly. The construction activity, levees, and floodgates are not planned in Gulf sturgeon spawning sites and should not significantly impact other sturgeon habitat. Based upon this review, NMFS believes that the proposed action is not likely to adversely affect any listed species under NMFS' purview for any of the plan alternatives.

This concludes the Corps' consultation responsibilities under section 7 of the ESA for the proposed actions for federally listed species, and their critical habitat, under NMFS' purview. Consultation should be reinitiated if there is a take, new information reveals impacts of the proposed actions that may affect listed species or their critical habitat, a new species is listed, the identified action is subsequently modified, or critical habitat designated that may be affected by the proposed activity.

Pursuant to the essential fish habitat consultation requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1855(b)(2) and 50 CFR 600.905-.930, Subpart K), the NMFS Habitat Conservation Division (HCD) is being copied with this letter. The HCD biologist for this region is Richard Hartman. If you have any questions about consultation regarding essential fish habitat for this project, please contact Mr. Hartman at (225) 389-0508.

If you have any questions, please contact Dennis Klemm, fishery biologist, at the number above or by e-mail at Dennis.Klemm@noaa.gov.

Sincerely,

for, Joseph E. Powers, Ph.D.
Acting Regional Administrator

cc: F/PR3
F/SER44- R. Hartman

File: 1514-22 f.1 LA
O:\section 7\informal\ACOELA.wpd

State of Louisiana

JAY DARDENNE
LIEUTENANT GOVERNOR

OFFICE OF THE LIEUTENANT GOVERNOR
DEPARTMENT OF CULTURE, RECREATION & TOURISM
OFFICE OF CULTURAL DEVELOPMENT
DIVISION OF ARCHAEOLOGY

CHARLES R. DAVIS
DEPUTY SECRETARY

PAM BREAUX
ASSISTANT SECRETARY

February 26, 2013

Ms. Joan M. Exnicios
Department of the Army
New Orleans District, Corps of Engineers
P.O. Box 60267
New Orleans, LA 70160-0267

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Ms. Exnicios:

This in response to your letter dated June 15, 2012, concerning the above referenced Programmatic EIS. First, we apologize for our delayed response. We have reviewed the enclosed documentation and concur that no historic properties were identified within the constructible features of Reaches F1, F2, G1, the Houma Navigation Canal Lock Complex and the Bayou Grand Caillou Floodgate. Therefore, we have no objections to the implementation of this portion of the project. However, the documentation provided does not meet the State of Louisiana's standards for archaeological reports. We would like to receive the proper documentation when the contract for the remaining cultural resources is complete.

We look forward to reviewing the archaeological report for the National Register Testing and Evaluation of site 16TR71 and an uncharacterized shell concentration on Reach E near Falgout Canal. If you have any questions, please contact Rachel Watson in the Division of Archaeology at (225)342-8165 or rwatson@crt.la.gov.

Sincerely,

Pam Breaux

Pam Breaux
State Historic Preservation Officer

PB:RW:s

P.O. BOX 44247 • BATON ROUGE, LOUISIANA 70804-4247
PHONE (225) 342-8170 • FAX (225) 342-4480 • WWW.CRT.LA.GOV/ARCHAEOLOGY

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

February 14, 2013

Ms. Joan M Exnicios, Chief
Regional Planning and Environmental Division South
New Orleans District Environmental Branch
U.S. Army Corps of Engineers
CEMVN-PDN-CEP
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Ms. Exnicios:

NOAA's National Marine Fisheries Service (NMFS) has reviewed the Post Authorization Change Report and draft revised programmatic environmental impact statement (RPEIS) for the Mississippi River and Tributaries-Morganza to the Gulf of Mexico, Louisiana Project. The RPEIS assesses potential impacts to the environment associated with hurricane and storm damage risk reduction for portions of Terrebonne and Lafourche Parishes. The transmittal letter indicates the draft RPEIS represents the U.S. Army Corps of Engineers' (USACE) initiation of essential fish habitat (EFH) consultation under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

The tentatively selected plan (TSP) consists of storm risk reduction for water levels having a one percent chance of occurring annually. Features for the TSP include 98 miles of levees, 22 floodgates, and 23 environmental water control structures. Approximately 85 miles of the proposed levees in part overlay existing hydrologic barriers such as natural ridges, roadbeds, and existing local levees. Earthen levees would be constructed with adjacent and/or hauled in borrow. Marsh creation mitigation is proposed to be constructed adjacent to the levees utilizing organic overburden soils which are unacceptable for levee foundation. The USACE's intent is for the RPEIS to have sufficient detail and impact analyses to designate some features as "constructible" and requiring no subsequent National Environmental Policy Act disclosure. The constructible features identified include: (1) levee reaches F1, F2, and G1, (2) the Houma Navigation Canal (HNC) Lock Complex; and (3) the Bayou Grand Caillou (BGC) floodgate.

Contrary to statements and details in the RPEIS, indirect impacts for both the programmatic and constructible features are unknown. NMFS does not concur with the RPEIS statements that: (1) a levee project would benefit estuarine-dependent marine fisheries or EFH, (2) there would be no indirect impacts to enclosed wetlands, or, (3) impacts, whether direct or indirect, are self-mitigating. Direct impacts resulting from construction are presently estimated to be 645 acres of tidal wetlands from constructible features and 3,413 acres of tidal wetlands from programmatic features. For constructible direct impacts, the USACE proposes 916 acres of marsh creation. Neither the indirect impacts nor their offsetting mitigation have yet to be quantified for either the constructible or programmatic features of this project.

To be clear, NMFS does not object to hurricane protection to reduce risks to life or property; however, we do have environmental concerns with the process proposed and described in the RPEIS. The RPEIS provides insufficient information, incomplete impact assessments, and inadequate descriptions of mitigation. Consequently, NMFS requests additional information be included in the Final RPEIS and/or Record of Decision (ROD). The enclosed comments identify areas of concern and where additional information is necessary.

In addition, section 305(b)(4)(A) of the Magnuson-Stevens Act requires NMFS provide EFH conservation recommendations for any federal action which may result in adverse impacts to EFH. Therefore, NMFS recommends the following to ensure the conservation of EFH and associated marine fishery resources:

EFH Conservation Recommendations

1. Impacts, including frequency and duration of closure for all water control structures, should be assessed for reasonably foreseeable future actions. Such an analysis should include operation for non-storm closures at +2.5 ft. NAVD88 at low, intermediate, and high sea level rise scenarios.

2. Indirect impacts should be determined for constructible and programmatic features through coordination with NMFS and other interested natural resource agencies. System-wide modeling should be conducted on features and structure sizes included in the TSP to complete impact assessments. Modeling results of the low sea level rise scenario at the end of the project life should be included in the final RPEIS.

3. A clarified operation plan for the HNC lock, floodgates, and environmental water control structures should be developed through coordination with NMFS and other natural resource agencies. Those operation plans should be clarified to show:

    a. The environmental water control structures along Falgout Canal in Reach E1 would be operated to discharge fresh water southward only.
    b. The BG C floodgate would remain open during the HNC lock saltwater closure periods.
    c. Operation plans for floodgates and water control structures, excluding the Falgout Canal environmental water control structures and the HNC lock, would maximize the open cross sectional area as often and long as possible.

4. An adequate mitigation plan for constructible and programmatic features should be developed to offset updated direct and indirect impacts through coordination with NMFS and other interested natural resource agencies. The mitigation should consist of marsh creation in open water on the flood side of the proposed levee. The mitigation should be planned, fully funded, and implemented in a concurrent timely manner such that functional and temporal losses of EFH are offset. Revised mitigation details should be made available for public and agency review and comment prior to issuing the Final RPEIS or signing the ROD. Specific mitigation details we recommend be included in the Final REIS include:

    a. Final sizing of mitigation
    b. The specific limits of constructible mitigation features
    c. Spill boxes should be directed into adjacent deteriorating marsh to the greatest extent practicable.
    d. Construction staging areas should be located to avoid impacts to wetlands.
    e. Target fill elevations should be based upon a determination of average healthy marsh in the vicinity of the mitigation project in accordance to bio-benchmark surveying methods used for restoration programs. The version of geoid height model used when selecting target elevations should be documented. Target elevations and monitoring elevation data should be presented with the same geoid height model correction.

5. An acceptable gapping/degrading plan for containment dikes constructed for marsh creation mitigation should be included through developmental coordination with NMFS. General design for dike gapping should include:

    a. If total dike degradation is not feasible, one 25-ft gap (bottom width) every 500 ft. is recommended. Depth of gap is dependent on if it is into open water or adjacent marsh. If into open water, gaps should be to the pre-project water depth. If gaps lead into marsh, gap should be to average marsh elevation.
    b. If scour aprons are included, the bottom should be grubbed out so the gap depth is the pre-project elevation as measured to the top of the armoring.
    c. Degraded material should be placed on adjacent remaining dikes and not marsh.
    d. Field adjustments in spacing and dimension based on developing site conditions should be accomplished through coordination with NMFS.

6. Performance standards, monitoring requirements, long-term management, and the adaptive management plan should be revised to be consistent with those currently under development for the Greater New Orleans Hurricane Surge Damage Risk Reduction System.

7. The USACE should remain responsible for mitigation until the mitigation is demonstrated to be compliant with success and performance criteria. At a minimum, this should include compliance with the requisite vegetation, elevation, acreage, and gapping criteria. An acceptable adaptive management plan should be developed through coordination with NMFS and other interested natural resource agencies to cover operation and maintenance of the levees and structures, and mitigation. Sufficient appropriated funds should be set aside to fulfill the plan especially as it relates to mitigation compliance.

Consistent with Section 305(b)(4)(B) of the Magnuson-Stevens Act and NMFS' implementing regulation at 50 CFR 600.920(k), the USACE is required to provide a written response to our EFH conservation recommendations within 30 days of receipt. If the USACE's response is inconsistent with our EFH conservation recommendations, the USACE must provide a substantive discussion justifying the reasons for not implementing the recommendations. If it is not possible to provide a substantive response within 30 days, the USACE should provide an interim response to NMFS, to be followed by the detailed response. The detailed response should be provided in a manner to ensure that it is received by NMFS at least 10 days prior to the final approval of the action (i.e., signing of the ROD).

NMFS appreciates the opportunity to review the RPEIS and remains committed to working with the USACE to resolve issues. If you have questions regarding the above or attached comments, please contact Patrick Williams at 225-389-0508, (extension 208) for assistance.

Sincerely,

Virginia M. Fay

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division

Enclosures

cc:

COE, New Orleans District, Dayan
FWS, Lafayette, Paille, Walther
EPA, Ettinger
LDWF, Bourgeois, Hebert
LA DNR, Consistency, Lovell
F/SER46, Swafford
F/SER4, Dale, Rolfes
NOAA PPI, Nunenkamp
Files

ENCLOSURE 1

NOAA's National Marine Fisheries Service (NMFS) Comments on the Draft Revised Programmatic Environmental Impact Statement (RPEIS) entitled "Mississippi River and Tributaries-Morganza to the Gulf of Mexico, Louisiana"

NMFS understands submittal of the RPEIS for our review represents the U.S. Army Corps of Engineers' (USACE) intent to initiate essential fish habitat (EFH) consultation as required by provisions of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Our response is submitted in accordance with section 600.920(i)(4) of the EFH rules and regulations and includes whether sections of the RPEIS adequately fulfill the requirements of an EFH assessment.

General Comments

As conceived, analyzed and disclosed, this storm damage risk reduction project was intended to keep structures open the majority of the time with the exception for storm events that risk life or property. As a result, open or "leaky" levee descriptors for the project were developed. However in response to future sea level rise predications, it is probable structures would have to be closed more frequently and for a longer duration over the project life. As closures increase in frequency and duration, substantial socio-economic and environmental risks would likely result. Such impacts should be disclosed in the Final RPEIS.

Operation plans, direct and indirect impact assessments, and mitigation are primary natural resource topics of concern with the RPEIS. NMFS believes resolution of issues associated with these matters is necessary to complete an acceptable environmental impact statement and to develop an appropriate mitigation plan.

Operation/Impacts

Clarity of the operation plan for the Tentatively Selected Plan (TSP) is lacking and impact assessments are incomplete. Information necessary to complete impact analyses have not been provided. Enclosure 2 is a list of information needs to help complete an impact assessment. Items listed in Enclosure 2 have been identified by the draft Fish and Wildlife Coordination Act Report (CAR) and through electronic mail correspondence from the Habitat Evaluation Team (HET) with staff of the USACE.

The operation plan for the project is unclear. The Post-Authorization Change (PAC) Report and RPEIS both are internally inconsistent to determine if the structures would be operated under storm conditions to protect from storm flooding only, or also under non-storm conditions to protect from tidal flooding. The frequency and duration of structure closures in the future and the associated impacts to the environment would change drastically, if the system was operated to reduce non-storm related flooding. No discussion of likely impacts related to non-storm closures is included in the RPEIS. However given predictions of sea level rise, NMFS believes it is reasonably foreseeable that the structures would be operated in the future under non-storm conditions to protect from tidal flooding.

As an example, permits have been issued to the non-Federal sponsor and construction is underway on a number of levee reaches authorized to close structures whenever water levels reach +2.5 ft. NAVD88. The non-Federal sponsor has acknowledged publically the frequency of closing existing structures has increased over time. Further, the USACE predicts in the RPEIS that based on the +2.5 ft. NAVD88 closure at the end of the project life, the HNC floodgate to be closed 168, 354, and 365 days per year under the low, intermediate, and high sea level rise scenarios, respectively. The expectation of future operation for non-storm closures at +2.5 ft. NAVD88 has been established with ongoing operations, funds, and permit authority. Therefore, NMFS recommends the Final RPEIS include an assessment of likely impacts of sea level rise on the frequency and duration of water control structure closures under storm and non-storm operations and include environmental impacts from these reasonably foreseeable actions. Assessments based on increasing amount and length of structure closures should also include socio-economic impacts to communities within the proposed levee system which have cultural and economic dependency on water-dependent commerce.

The TSP is the one percent Annual Exceedence Probability Alternative, which includes 125-ft wide sector gates in the Gulf Intracoastal Waterway (GIWW) both west of Houma and at Larose. Prior to release of the PAC Report and draft RPEIS, the sector gates at both of those locations were to be 175-ft wide. Accordingly, the system-wide hydrology and hydraulic modeling conducted to assess environmental impacts and assist in project design was run with the 175-ft wide sector gates. Therefore, the accuracy and usefulness of presently available modeling to assess impacts from the TSP is questionable. A smaller GIWW sector gate west of Houma may influence flows and associated freshwater distribution west of, and within, the levee system and may elevate salinities inside and south of the levee system. In order to assess the environmental impacts of the TSP, the model should be rerun with the 125-ft wide sector gates in both GIWW locations as included in the TSP. The updated impact analysis should be coordinated with the HET and included in the Final RPEIS. Figures throughout the RPEIS depicting salinity projections for the TSP should be updated in the Final RPEIS accordingly. Alternatively, the number of sluice gates in both GIWW structures could be increased in the TSP to ensure flows are not impacted and presently available modeling results are applicable.

NMFS does not concur enclosing wetlands behind levees would benefit marsh or estuarine-dependent marine fishery resources. Prior to the 2002 PEIS, system-wide modeling was determined to be a necessity to assess impacts of this project. Once system-wide model results were made available in December 2012, the HET concluded indirect impacts for both constructible and programmatic features must be evaluated. Impact analyses and associated conclusions in the RPEIS are represented as if they are final, while the analyses are actually preliminary and subject to change based on pending modeling results. Furthermore, the sizes of the GIWW sector gates in the TSP were reduced after the modeling. Therefore, the presently available modeling is not of the actual TSP. System-wide modeling should be conducted with the TSP-sized GIWW sector gates and consider non-storm closures in the future with sea level rise. Indirect and cumulative impacts to wetlands, fisheries, and EFH likely would result from potential degradation of water quality, ponding stress on wetland vegetation, and reduction or elimination of estuarine dependent fishery species' access to nursery and foraging habitat.

Indirect and cumulative impacts to wetlands, fisheries, and EFH, as well as the mitigation necessary to offset such impacts should be discussed in the Final RPEIS prior to signature of the ROD. Conclusions of: (1) benefits to marsh and estuarine dependent fisheries, (2) the project being self-mitigating, or, (3) lack of impacts to hydrology from enclosure within a levee system should be removed where stated throughout the document (e.g., PAC Report Table 4-1, RPEIS Sections 6.5.2 Indirect, 6.16.12 Indirect Impacts, and Appendix C). Those sections of the RPEIS should be revised based upon pending indirect impact assessments once necessary data are made available by the USACE.

Mitigation

The mitigation plan proposed for constructible and programmatic features is unacceptable as drafted in the RPEIS. NMFS believes the amount of mitigation is indeterminable at this time because impact assessments are incomplete. Sidecast disposal of overburden material on existing marsh should not be considered as mitigation. In addition, the mitigation plan is incompletely developed for the identified constructible features.

Section 6.19 and maps in Appendix G of the RPEIS indicate mitigation construction for constructible features would consist of filling existing wetlands and open water from near continuous sidecast disposal of organic overburden unsuitable for the levee foundation. Fill placement impacting existing marsh is unacceptable as mitigation. The locations and amount of fill placement in open water to create marsh as mitigation exclusively for the constructible features is not specified or substantiated with a functional based analysis. The only mitigation analyses conducted by the HET to determine the amount of mitigation necessary, evaluated marsh creation in open water constructed by hydraulic dredging. Because this included no fill on existing marsh, development of wetland functions were projected accordingly. Therefore, the only results available thus far did not evaluate the USACE's currently proposed mitigation and no analyses have been undertaken to quantify performance over the life of the project. NMFS recommends marsh creation be conducted in open water areas only and the siting and sizing of the mitigation areas be coordinated with the HET and substantiated with a functional based analysis.

The quantification of mitigation necessary to offset indirect impacts is contingent upon the reasonably foreseeable non-storm operation plan and modeling of the frequency and duration of closures. Signature of the ROD should be held in abeyance until issues related to mitigation for both direct and indirect impacts are resolved, in particular for the constructible features, through coordination with NMFS.

NMFS finds the "12 items" required by the 2008 mitigation regulations are insufficient as included in the RPEIS. The mitigation plan in Section 6.19 and cost details related to financial assurances in Appendix G need updating based on revised mitigation design, sizing, siting, and performance and monitoring provisions.

EFH Assessment

Based on our review of the RPEIS, we have determined that although the document contains the four items required of an EFH assessment, the details in those items are insufficient. An EFH assessment includes an analysis of effects, including mitigation, to determine the net and cumulative impact to EFH. NMFS finds TSP impacts have not been quantified at this time. Therefore, the amount of compensatory mitigation is unknown and the net effects on EFH are undeterminable. However, we acknowledge project effects on EFH could be offset, if impacts are adequately quantified and a sufficient acreage of tidally influenced marsh is created in open water. Such cannot be accomplished until indirect impacts are determined for reasonably foreseeable operation including non-storm closures.

Fish and Wildlife CAR

NMFS provided comments on the draft CAR on January 8, 2013. Those comments should be addressed and resolved through coordination with NMFS prior to proceeding to the final RPEIS. When corrected impact analyses are available, a final CAR should be prepared. Recommendations in the final CAR should be resolved in the Final RPEIS.

Specific Comments

Unresolved Issues Section.

Triggers for closing structures are unclear. Although the USACE's intent may be to close structures only under storm conditions (whether named or un-named storms), departure from the present level of protection and operation would be a significant change for the non-Federal sponsor. This section should be revised to disclose that water control structure operation over the project life is an unresolved issue.

Table 1-1.

The Magnuson-Stevens Act should be added under the Federal Statutes section.

Section 3.11.3 Coastal Wetlands Planning, Protection and Restoration Act

The North Lake Boudreaux Project (TE-32a) should be added to the list of CWPPRA projects in the study area. The project is sponsored by the U.S. Fish and Wildlife Service.

Section 4.3.8 Operation of Structures

The draft RPEIS and PAC Report are inconsistent regarding operation plans for the floodgates and environmental water control structures. "Section 1.0 Summary, Purpose" stipulates hurricanes and storms exclusively, and "Section 4.3.8 Operation of Structures" stipulates closures at +2.5 ft. NAVD88 is restricted to named tropical storms for the HNC lock, floodgates, and environmental water control structures. However, Sections 7.4.4 of the PAC Report and 4.3.8.4 of the RPEIS indicate structures would be closed as outlined in recent permits including closures when water levels approach +2.5 ft. NAVD88 for "other extreme tidal events", which would be non-storm events. Section 4.3.8.5 of the RPEIS and 7.4.5 of the PAC Report discuss adapting operations for sea level rise and predict closures for the HNC floodgate at 168 days, 354 days, and 365 days per year by the year 2085 based upon low, intermediate, and high sea level rise scenarios for the +2.5-ft closure exclusively. Therefore, NMFS recommends the documents be revised throughout to include the potential for non-storm operation and to evaluate likely impacts of such actions on resources of concern.

Section 4.3.8.1 Operation of the HNC Lock Complex

Data are needed to complete impact assessments. The closure trigger is identified as, "If a gage on the outside of the HNC Lock exceeds a salinity value that has been correlated with preventing exceedance of the maximum allowable chloride level…"; however, it does not identify the specific salinity trigger, thereby leaving impacts indeterminable until specified. Opening is identified as occurring once salinity falls below 13 parts per thousand at Cocodrie. There are limited to no salinity data presently available from the Cocodrie gage to determine the likely frequency of closure of the lock based on salinity triggers. The USACE should provide the exact closure and opening triggers, the locations where they are measured, and sufficient salinity data on which to base impact projections. For post construction operations and monitoring purposes, a salinity gage should be established on the flood side of the HNC.

Section 4.3.9 Mitigation

To compensate for impacts to marsh, NMFS prefers marsh creation (i.e., fill placement in open water) on the flood side of the proposed levee. The map details in Appendix G are generic concepts. The design, location, and amount of mitigation have not been coordinated with the interagency HET and are in need of substantial revision both for programmatic and constructible features, as well as to offset direct and indirect impacts. Marsh creation in open water should be the primary focus and filling existing marsh should be avoided. Also, the layout of the mitigation should be revised to avoid altering hydrology and impeding flow from environmental water control structures under Falgout Canal Road in Reach E-1. A thorough analysis of direct and indirect impacts of the constructible features should be completed and this section of the Final RPEIS should be revised by including corrected plats identifying the specific limits for the mitigation work. Construction access corridors, staging areas, and borrow areas to supplement any shortfalls from sidecast disposal of organic overburden should be identified and discussed. Any dedicated dredging borrow sites to create marsh should be sited and designed to avoid inducing erosion (e.g., wave or slope-failure) of existing marsh bank lines. If borrow is expected from bayous, the borrow sites should be segmented with undredged reaches to serve as under water plugs to minimize saltwater intrusion. The borrow areas should be designed to minimize adverse impacts to water quality to the extent practicable. The implications of borrow sites on water quality should be discussed. The USACE is encouraged to include dissolved oxygen monitoring to assess if impacts occur and to identify the potential need to alter borrow designs in the future. These matters should be resolved and discussed in the Final RPEIS and ROD.

Section 4.4 Comparison of Environmental Consequences of Alternatives
Table 4-4.

For the one percent and three percent alternatives, wetland impacts in the table should be revised from "displaced" to "destroyed". Impacts to aquatic habitat, fisheries, and EFH should be revised to include indirect impacts from increasing closures of floodgates and water control structures. The Hydrology section should be augmented to indicate localized increases in flooding and salinity are expected on the protected and flood side of the levees and to provide a description of where that is projected to occur.

Section 5.2.4 Fisheries

This section should be expanded to include a description of the existing marsh management projects, their operation, and limitations structural marsh management have on estuarine-dependent fishery species. This information previously was provided to staff of the USACE for consideration in the system-wide modeling and is available again, upon request.

Section 5.2.5 Essential Fish Habitat

Gulf stone crab and gray snapper should be removed from the discussion and Table 5-7.

Section 6.1 Environmental Consequences Introduction and Appendix F.

These sections should be expanded to make clear the period of analysis captures temporal losses of wetland function from the time impacts occur from levee construction until functional mitigation is achieved. The starting and ending points of the period of analysis by levee reach and mitigation would illustrate how temporal losses are considered. In addition, the USACE should clarify if the end year to calculate the amount of sea level rise included in the system-wide modeling was 2085 and included years 2004 to 2015. This section acknowledges constructed CWPPRA projects are within the project area, but does not describe how they are handled in the impact assessment or Appendix F on the Wetland Value Assessment analysis. This section should be revised to discuss potential impacts to CWPPRA constructed restoration projects.

Section 6.2.2 1% AEP Alternative Direct Impacts

A table and discussion should be added disclosing a breakdown of wetland impacts by habitat type.

Section 6.5.1.2 1% AEP Alternative

This section indicates direct impacts would be minimized with the use of Best Management Practices (BMP); however, no description or reference to the BMPs are provided. The document should be revised to include BMPs or to indicate supplemental National Environmental Policy Act documents will disclose BMPs.

Section 6.5 Fisheries

The direct, indirect, and cumulative impact sections need revision. These sections should include impacts based on the projected frequency and duration of structure closures in the future under the three sea level rise scenarios and under storm and non-storm operations. These sections should specifically describe the likely impacts of frequent and extended water control structure closures on estuarine-dependent fishery resources.

Table 6.3

The information pertaining to Reach F should be revised. Specifically, the HNC Lock is projected to be closed frequently due to salinity and storm provisions, which would limit fisheries access north of the lock to Bayou Grand Caillou. Further, the levee alignment eliminates access from the HNC into the Bayou Platte drainage area from its drainage point south near Deep Bayou. Fisheries access with Reach K in place would not be improved over existing conditions because water control structures already allow fisheries access into the marsh management units on the Point aux Chenes Wildlife Management Area.

Section 6.6 EFH

NMFS does not concur with the impact assessments to EFH. Indirect and cumulative impacts are incomplete at this time. Impacts presented were based on preliminary and in progress assessments. Indirect and cumulative impacts to EFH should be assessed and described in the Final RPEIS based on revised system-wide modeling for the TSP and include foreseeable non-storm structure closures. The amounts of flooding and salinity changes have not been substantiated at this time and cannot be concluded as minimal. BMPs are not defined. The EFH section should include acres of open water impacted. Revised analysis should assess potential impacts to water quality, ponding stress on wetland vegetation, and reduction or elimination of estuarine fisheries access with increases in structure closures in the future.

Section 6.14 Socioeconomics

The direct, indirect, and cumulative impact sections need revision. These sections should include impacts based on the projected frequency and duration of structure closures in the future under the three sea level rise scenarios and under storm and non-storm operations. These sections should specifically describe the likely impacts of frequent and extended water control structure closures on navigation to ports and marinas enclosed within the project area. In addition, this section should evaluate how storm water drainage will be accomplished in the future with various sea level rise projections.

Section 6.19 Mitigation

NMFS finds the mitigation plan is unacceptable for constructible features and for programmatic considerations for reasons discussed both above and below.

Section 6.19.4 Wetland Mitigation Plan for Constructible Features

The method to convert from impact Average Annual Habitat Units (AAHUs) to mitigation acres is not disclosed and has not been coordinated with the HET. The acreage of necessary mitigation can be determined based upon the mitigation potential (AAHUs/acre) by type of mitigation project. The mitigation potential provides an initial scaling that must be refined based upon a final WVA conducted on Preliminary Engineering and Design (PED) level information for the mitigation. PED level information for the constructible feature mitigation has not been disclosed and therefore final scaling to ensure a one to one functional replacement is not possible at this time.

Table 6-5

This table presents the 12 components of the compensatory mitigation plan. Some of those items are incomplete and/or unacceptable. Site selection for marsh creation in many reaches overlaps existing marsh, which itself could require separate mitigation actions. NMFS is concerned the layout of the mitigation sites may be presently determined based on the need for sidecast disposal of overburden and not the best layout to compensate for lost ecological services. In addition, the USACE has not conducted an analysis of how such a use of overburden will perform over the life of the project. For the final RPEIS, the site plan should be revised substantially by relocating all overburden disposal and marsh creation to open water areas only, and to include an analysis of likely performance over the life of the project.

The mitigation work plan should be resolved through coordination with the natural resource agencies to resize the mitigation sites after they have been relocated to open water to ensure adequate compensation is provided. Draft marsh creation work plans developed for the Greater New Orleans Hurricane Surge Damage Risk Reduction System (HSDRRS) should be used for the Morganza to the Gulf Project. Greater specificity and clarity commensurate with constructible features are provided in the HSDRRS performance, success, and monitoring/reporting criteria. Because it was only developed for fresh, intermediate, and brackish marsh, the HSDRRS mitigation work plan should be expanded to address needs for salt marsh mitigation associated with the Morganza to the Gulf Project. In addition, performance standards, monitoring requirements, long-term management plan, and adaptive management provisions should be revised to be consistent with the most current standards developed for HSDRRS.

Section 6 of this table discusses access corridors, construction staging areas, and target elevations. Regarding target elevations, this section recommends use of geotechnical analyses and elevations surveys to determine appropriate target elevation ranges. No specific plans have been disclosed for the constructible features mitigation. Settlement curves and survey data have not been provided to substantiate the mitigation plan for the constructible features. Detailed plats identifying the limits of the constructible feature mitigation including access corridors and staging areas have not been disclosed. The vegetation section is unclear as to whether marsh vegetation would be planted. If plantings are proposed, then clarification is needed on what species would be planted and when planting would occur under the proposed plan.

Section 8 of this table discusses performance standards. Inclusion of a gapping plan is noted and appreciated. However, we request the spacing and gap dimensions in the plan be revised to increase potential tidal function. Also, a provision should be included for field adjustments in spacing for site conditions. The final RPEIS should be revised throughout to indicate gapping/degrading would occur manually rather than dependent on sufficient erosion and settlement of dikes over time. The basis for the proposed target (initial and settled) fill elevation for the marsh creation site is not provided. Target elevations should be based upon a determination of average healthy marsh in the vicinity of proposed mitigation sites. It is recommended those elevations be determined by surveys in accordance to bio-benchmark survey protocols used for marsh creation designs under restoration programs. That methodology includes:

> Average marsh elevation (NAVD88) should be determined from no less than three locations in the vicinity of a mitigation project. The marsh surface is reached when the survey rod is resting among living stems or is supported by soil containing living roots. In order to get a consistent reading, it may be necessary to cut vegetation stems where stem density is extremely high. A minimum of 20 elevations (each separated by 20 to 40 ft.) at each of the sites should be required for this determination.

The vertical datum, monuments and version of geoid height model can introduce differences in the reported target and monitoring elevations. Elevations measured during the design surveys and all monitoring should indicate the geoid height model used and be corrected to the same geoid if it differs during the monitoring period to ensure like comparisons.

The proposed duration of the construction phase is unclear. The USACE should remain responsible for marsh mitigation until such mitigation is demonstrated to be compliant with success and performance criteria. At a minimum, this should include compliance with the requisite vegetation, elevation, acreage, and gapping criteria.

Section 11 of this table discusses an Adaptive Management Plan. This section specifies corrective actions if openings do not develop in a "continuous breakwater." A "continuous breakwater" is not a component of the project and that statement should be deleted from the text. In addition, this section should be revised to include gapping of marsh creation containment dikes.

Section 12 of this table discusses financial assurances and describes responsible parties, but not the amount of financial assurances. The amount should be developed based on the acreage of mitigation, operations, and monitoring to ensure sufficient funds are programmed to accomplish the mitigation. Furthermore, funds (contingency or otherwise) should be included to ensure completion of the Adaptive Management Plan.

Appendix F

The dollar amounts listed relate to the amount of funds necessary for financial assurance to complete mitigation. It is unclear if the dollar amounts for monitoring are estimated based upon the scope of details in Table 6-5. Dollar amounts included for mitigation construction and monitoring should be revised based on necessary revisions to the mitigation plan consistent with HSDRRS.

ENCLOSURE 2

NOAA's National Marine Fisheries Service (NMFS) Comments on the Draft Revised Programmatic Environmental Impact Statement (RPEIS) entitled "Mississippi River and Tributaries-Morganza to the Gulf of Mexico, Louisiana" - Preliminary List of Pending Information Needed to Complete Impact Analyses

1. Operation Plan
    a. Operation for non-storms
    b. Verification of the elevation trigger for closures
    c. Determine the frequency and duration of structures closures both under storm and non-storms conditions at +2.5 ft. NAVD88 in the future under the low, intermediate, and high sea level rise scenario; reconcile differences projected by the USACE and the U.S. Fish and Wildlife Service
    d. HNC Lock salinity closure criteria should be established
    e. HNC Lock opening criteria needs to be defined for a location outside of the lock
    f. Determine when structures on the southeast side of the project area would be closed more frequently
    g. Operation for water control structures in the constructible features should be provided

2. Data Needs
    a. Determination by the USACE if the system-wide model results based on 175-ft wide sector gates in the GIWW remain valid for the TSP that has 125-ft wide gates
    b. System-wide model runs for the TSP (i.e., 125-ft sector gates in the GIWW structures)
    c. Stage data needed for locations other than HNC at Dulac
    d. Need salinity data under low sea level rise at the end of the project life (e.g., system-wide modeling of Future Without Project, Plan1, and Plan3, under low SLR scenario at the end of the project life)
    e. Tidal exchange flux or equivalent from system-wide model (re: WVA Variable 6, Average Tidal Flux method)
    f. Salinity data for HNC opening criteria to assess if data are available to base 1) a 13 ppt opening criteria and 2) measured at Bayou Petite Caillou at Cocodrie is feasible

3. Impact Analyses
    a. Updated indirect impacts based upon non-storm operation in the future under the three sea level rise scenarios
    b. Updated indirect impacts based upon 125-ft sector gates in the GIWW structures and revise all indirect and cumulative impacts.
    c. Assess the frequency of the +2.5 ft. NAVD88 threshold on the SE side of the project area

d. Updated impacts based on the HNC lock operation for the closure and opening criteria
e. AdH without-project baseline salinities are low consider TABS baseline salinities
f. Complete revisions for fish access, Variable 6
    i. Resolve Method(s) selection
    ii. Assigning values under selected method(s)
    iii. FWOP values for existing marsh management structures

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

MARCH 25, 2013

REPLY TO
ATTENTION OF

Regional Planning and
Environmental Division, South
Environmental Planning Branch

Virginia M. Fay, Assistant Regional Administrator
National Oceanic and Atmospheric Administration (NOAA)
National Marine Fisheries Service (NMFS)
Southeast Regional Office
263 13th Avenue, South
St. Petersburg, FL 33701-5505

Dear Ms. Fay:

Please reference your consultation letter dated February 14, 2013 under the Magnuson-Stevens Fishery Conservation and Management Act providing Essential Fish Habitat (EFH) conservation recommendations on the draft revised programmatic environmental impact statement (RPEIS) for the Mississippi River and Tributaries-Morganza to the Gulf of Mexico, Louisiana Project.

The U. S. Army Corps of Engineers, New Orleans District appreciates your input and provides the enclosed responses to NOAA's EFH conservation recommendations.

If you have any questions or require additional information please contact Mr. Nathan Dayan at U.S. Army Corps of Engineers; Regional Planning and Environmental Division South; Environmental Planning Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267. Mr. Dayan can also be reached at (504) 862-2530 or by email at nathan.s.dayan@usace.army.mil.

Sincerely,

Sandra Stiles
for Joan M. Exnicios
Chief, Environmental Planning Branch

Enclosures

Copies Furnished
NMFS Baton Rouge office
USFWS

NMFS EFH Conservation Recommendations

NMFS Recommendation: Impacts, including frequency and duration of closure for all water control structures, should be assessed for reasonably foreseeable future actions. Such an analysis should include operation for non-storm closures at +2.5 ft. NA VD88 at low, intermediate, and high sea level rise scenarios.

USACE Response: In coordination with the HET, USACE and non-Federal sponsors refined the structure operation plan closure criteria assumptions for storm surge and salinity criteria to the point where the HET agreed that indirect impacts could be assessed. This revised "Operation Plan" would be included in the Final RPEIS.

NMFS Recommendation: Indirect impacts should be determined for constructible and programmatic features through coordination with NMFS and other interested natural resource agencies. System-wide modeling should be conducted on features and structure sizes included in the TSP to complete impact assessments. Modeling results of the low sea level rise scenario at the end of the project life should be included in the final RPEIS.

USACE Response: For the programmatic features, the Final RPEIS will include a qualitative analysis of indirect and cumulative impacts. The Final RPEIS will better explain the potential near-term and long-term indirect hydrologic impacts of the proposed levee on wetlands and other significant resources (wetlands, fisheries, water quality, navigation, etc). RPEIS will describe what the adverse impacts to each of these resources could be under different sea level rise scenarios. Re-analysis would consider the types and number of floodgates and control structures present in levee design; how structures would be operated; how structures could affect fish access and how structures could affect recruitment of commercially and recreationally important aquatic species. For the constructible features, the HET has run full WVAs for 4 scenarios to give a possible range of AAHU impacts: (1) Intermediate RSLR holding closure existing condition closure frequency constant into the future (2) High RSLR holding existing condition closure frequency constant into the future (3) Intermediate RSLR & more frequent closures in the future. (4) High RSLR & more frequent closure in the future. Currently, the system wide model cannot address RSLR. If the project is re-authorized, additional system wide modeling can be conducted to quantify RSLR impacts.

NMFS Recommendation: A clarified operation plan for the HNC lock, floodgates, and environmental water control structures should be developed through coordination with NMFS and other natural resource agencies. Those operation plans should be clarified to show:

a. The environmental water control structures along Falgout Canal in Reach E 1 would be operated to discharge fresh water southward only.

b. The BG C floodgate would remain open during the HNC lock saltwater closure periods.

c. Operation plans for floodgates and water control structures, excluding the Falgout Canal environmental water control structures and the HNC lock, would maximize the open cross sectional area as often and long as possible.

USACE Response: In coordination with the HET, USACE and non-Federal sponsors refined the structure operation plan closure criteria assumptions for storm surge and salinity criteria to the point where the HET agreed that indirect impacts could be assessed. This revised "Operation Plan" will be included in the Final RPEIS.

NMFS Recommendation: An adequate mitigation plan for constructible and programmatic features should be developed to offset updated direct and indirect impacts through coordination with NMFS and other interested natural resource agencies. The mitigation should consist of marsh creation in open water on the flood side of the proposed levee. The mitigation should be planned, fully funded, and implemented in a concurrent timely manner such that functional and temporal losses of EFH are offset. Revised mitigation details should be made available for public and agency review and comment prior to issuing the Final RPEIS or signing the ROD. Specific mitigation details we recommend be included in the Final REIS include:

a. Final sizing of mitigation
b. The specific limits of constructible mitigation features
c. Spill boxes should be directed into adjacent deteriorating marsh to the greatest extent practicable.
d. Construction staging areas should be located to avoid impacts to wetlands.
e. Target fill elevations should be based upon a determination of average healthy marsh in the vicinity of the mitigation project in accordance to bio-benchmark surveying methods used for restoration programs. The version of geoid height model used when selecting target elevations should be documented. Target elevations and monitoring elevation data should be presented with the same geoid height model correction.

USACE Response: The mitigation plan proposed for the constructible elements of the project has been revised. It now accounts for mitigation of both direct and indirect habitat impacts and contains specific limits of proposed mitigation features, which consist of marsh restoration (creation) features located in open water areas on the flood side of the proposed levee system. These revisions were coordinated with the HET. This revised plan now also addresses your comments "a" through "e". However, this revised plan does not yet identify specific staging areas, borrow sites, and construction access corridors, nor are the target marsh elevations based on field surveys of nearby healthy marshes. The revised mitigation plan for the constructible elements would be included in the final RPEIS and can be reviewed during the 30-day state and agency review period. Further refinements to this mitigation plan would occur during the PED phase in close coordination with the HET, other PDT members, and the non-Federal Sponsors. During this phase: survey data would be gathered to establish marsh target elevations in accordance with your recommendation; spill box locations would be identified; staging areas would be located to avoid wetland impacts to the extent practicable; borrow sites and construction access corridors would be located to avoid wetland impacts to the extent practicable. More specific mitigation plans for habitat impacts associated with the programmatic project elements would be prepared as part of future supplemental NEPA documents.

NMFS Recommendation: An acceptable gapping/degrading plan for containment dikes constructed for marsh creation mitigation should be included through developmental coordination with NMFS. General design for dike gapping should include:

a. If total dike degradation is not feasible, one 25-ft gap (bottom width) every 500 ft. is recommended. Depth of gap is dependent on if it is into open water or adjacent marsh. If into open water, gaps should be to the pre-project water depth. If gaps lead into marsh, gap should be to average marsh elevation.

b. If scour aprons are included, the bottom should be grubbed out so the gap depth is the pre-project elevation as measured to the top of the armoring.

c. Degraded material should be placed on adjacent remaining dikes and not marsh.

d. Field adjustments in spacing and dimension based on developing site conditions should be accomplished through coordination with NMFS.

USACE Response: Engineering design criteria would be refined with consideration of your suggestions and coordinated with NMFS and the other resource agencies. This will be clearly documented in the final RPEIS. Note that the revised mitigation plan for the constructible elements of the project may not require any "gapping" of temporary retention (containment) dikes since all such dikes would be manually degraded to equal the final target elevations of the proposed marsh restoration features where practicable without causing adverse impacts. This approach will be documented in the final RPEIS.

NMFS Recommendation: Performance standards, monitoring requirements, long-term management, and the adaptive management plan should be revised to be consistent with those currently under development for the Greater New Orleans Hurricane Surge Damage Risk Reduction System.

USACE Response: The proposed mitigation plan for impacts associated with the constructible elements of the project was revised to be more consistent with the current Greater New Orleans HSDRRS mitigation standards you mention. The adaptive management plan has been revised consistent with applicable laws, regulations and policy. More detailed mitigation performance standards, monitoring requirements, long-term management activities, and adaptive management plans would be developed during PED phase of constructible elements as well as provided in future supplemental NEPA documents prepared for the programmatic elements of the project. The revised plans will be contained in the final RPEIS.

NMFS Recommendation: The USACE should remain responsible for mitigation until the mitigation is demonstrated to be compliant with success and performance criteria. At a minimum, this should include compliance with the requisite vegetation, elevation, acreage, and gapping criteria. An acceptable adaptive management plan should be developed through coordination with NMFS and other interested natural resource agencies to cover operation and maintenance of the levees and structures, and mitigation. Sufficient appropriated funds should be set aside to fulfill the plan especially as it relates to mitigation compliance.

USACE Response: The USACE will execute its responsibilities, consistent with all applicable laws, regulations and policies, regarding mitigation compliance, adaptive management and monitoring, and funding consistent. This would include, but is not limited to meeting vegetation, elevation, acreage, gapping and other developed performance standards and criteria for the mitigation plan. The USACE will coordinate with the NMFS and other resource agencies for development of more detailed mitigation, adaptive management and monitoring plans during the PED phase for constructible project features as well as during future development of programmatic project features. In accordance with WRDA 2007 Section 2036 and 2039 the project has developed a monitoring and adaptive management for the mitigation plan not the entire project. The project is not required to develop monitoring and adaptive management for the other project features included since it is not an ecosystem restoration project. In accordance with the project's statutory authority, the proposed mitigation actions will include construction, with the Non-Federal Sponsor (NFS) responsible for operation, maintenance, repair, restoration, and rehabilitation (OMRR&R) of functional portions of work as they are completed. On a cost-shared basis, USACE will monitor completed mitigation to determine whether additional activities (ex. further construction efforts, additional plantings, etc.) are necessary to achieve mitigation success. USACE will undertake additional actions necessary to achieve mitigation success in accordance with cost-sharing applicable to the project and subject to the availability of funds. Once USACE determines that the mitigation has achieved specified initial success criteria, monitoring & maintenance would be performed by the NFS as part of its OMRR&R obligations. If, after meeting initial success criteria, the mitigation fails to meet subsequent success criteria, USACE will consult with other agencies, including NMFS and the NFS to determine whether operational/management changes would be sufficient to achieve ecological success criteria.

Mitigation plans for compensating habitat impacts associated with the programmatic project elements would be provided in future supplemental NEPA documents. These mitigation plans would include AMPs if necessary and would be developed by USACE in coordination with NMFS, other interested resource agencies, the Project Delivery Team (PDT), and the NFS.

An Operation and Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) Manual will be prepared by USACE for completed habitat mitigation elements. Preparation of this document would be coordinated with NMFS, other resource agencies, the PDT, and the NFS. It will cover an array of mitigation topics including, but not necessarily limited to; monitoring and reporting requirements, success criteria, maintenance/management/operational requirements and guidelines, and applicable AMPs. The final mitigation OMRR&R Manual will be provided to the NFS once USACE transfers mitigation responsibilities to the NFS.

The USACE will prepare Water Control Plans (WCPs) regarding the operation of proposed levee system structures that control water movement/flows and will provide such WCPs to the NFS upon construction completion of levee reaches. The proposed project may include water control structures that are integral to the success of proposed habitat mitigation features and/or whose proper operation is critical to avoiding, minimizing, or mitigating potential adverse impacts to Essential Fish Habitats or fisheries resources. In such cases, preparation of the WCP would be coordinated with NMFS, other appropriate resource agencies, the PDT, and the NFS.

The Project Partnership Agreement between the NFS and the Federal Government provides the required financial assurance for the proposed mitigation. In the event that the NFS fails to perform, the USACE has the right to complete, operate, maintain, repair, rehabilitate or replace any project feature, including mitigation features, but such action would not relieve NFS of its responsibility to meet its obligations and would not preclude the USACE from pursuing any remedy at law or equity to ensure the NFS's performance.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
3737 Government Street
Alexandria, LA 71302

(318) 473-7751
Fax: (318) 473-7626

January 4, 2013

Joan Exnicious
DOA
P.O. Box 60267
New Orleans, LA 70160-0267

RE: Mississippi River & Tributaries – Morganza to the Gulf of Mexico, Louisiana

Dear Ms. Exnicious:

I have reviewed the above referenced project for potential requirements of the Farmland Protection Policy Act (FPPA) and potential impact to Natural Resource Conservation Service projects in the immediate vicinity.

Projects are subject to FPPA requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a federal agency or with assistance from a federal agency. For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements can be forest land, pastureland, cropland, or other land, but not water or urban built-up land.

The project map submitted with your request indicates that the proposed construction areas will not impact prime farmland and therefore is exempt from the rules and regulations of the Farmland Protection Policy Act (FPPA)—Subtitle I of Title XV, Section 1539-1549. Furthermore, we do not predict impacts to NRCS work in the vicinity.

For specific information about the soils found in the project area, please visit our Web Soil Survey at the following location:

http://websoilsurvey.nrcs.usda.gov/

Please direct all future correspondence to me at the address shown above.

Respectfully,

Sarah Haymaker

Kevin D. Norton ACTING FOR
State Conservationist

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

REPLY TO
ATTENTION OF:

January 03, 2013

Regional Planning and
Environment Division, South

Ms. Rhonda Smith
EPA, Region VI - Off. of Planning and
Coord. / Mail Code 6EN-XP
1445 Ross Avenue
Dallas, TX 75202-2733

Dear Ms. Smith:

A draft revised programmatic environmental impact statement (RPEIS) for the MISSISSIPPI RIVER & TRIBUTARIES-MORGANZA TO THE GULF OF MEXICO, LOUISIANA, Louisiana, project prepared by the U.S. Army Corps of Engineers, New Orleans District is available for your review.

Please review the enclosed documents and provide comments within 45 days of the date that the notice is published in the Federal Register. Comments should be mailed to the attention of Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; New Orleans Environmental Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

Comments may also be provided by E-Mail to Morganza.Comments@usace.army.mil, or by fax to (504) 862-2088. Mr. Dayan may be contacted at (504) 862-2530, if questions arise.

Sincerely,

Joan M. Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch
Regional Planning and Environment Division, South

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

REPLY TO
ATTENTION OF:

January 03, 2013

Regional Planning and
Environment Division, South

Mr. Gary Zimmerer
FEMA - Region VI, Federal Center
800 North Loop 288
Denton, TX 76201-3698

Dear Mr. Zimmerer:

A draft revised programmatic environmental impact statement (RPEIS) for the MISSISSIPPI RIVER & TRIBUTARIES-MORGANZA TO THE GULF OF MEXICO, LOUISIANA, Louisiana, project prepared by the U.S. Army Corps of Engineers, New Orleans District is available for your review.

Please review the enclosed documents and provide comments within 45 days of the date that the notice is published in the Federal Register. Comments should be mailed to the attention of Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; New Orleans Environmental Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

Comments may also be provided by E-Mail to Morganza.Comments@usace.army.mil, or by fax to (504) 862-2088. Mr. Dayan may be contacted at (504) 862-2530, if questions arise.

Sincerely,

Joan M. Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch
Regional Planning and Environment Division, South

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

REPLY TO
ATTENTION OF:

January 03, 2013

Regional Planning and
Environment Division, South

Melvin C. Mitchell, Sr.
Louisiana Dept. of Env. Quality
Water Quality Certifications Section
P.O. Box 4313
Baton Rouge, LA 70821-4313

Dear Mr. Mitchell, Sr.:

An application for a State Water Quality Certificate, prepared by the U.S. Army Corps of Engineers, New Orleans District (MVN) is enclosed. MVN staff request that a water quality certification be completed, pursuant to Section 401 of the Clean Water Act of 1977, as amended (33 U.S.C., Section 1341). A draft revised programatic environmental impact statement (RPEIS) for the MISSISSIPPI RIVER & TRIBUTARIES-MORGANZA TO THE GULF OF MEXICO, LOUISIANA, project prepared by the U.S. Army Corps of Engineers, New Orleans District is enclosed for your review and comment.

Please review the enclosed documents and provide comments within 45 days of the date that the notice is published in the Federal Register. Comments should be mailed to the attention of Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; New Orleans Environmental Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

To the best of our knowledge any dredge/fill material will be free of contaminants. Please provide the public notice for publication in the Advocate of Baton Rouge to the person listed below, as soon as possible. In addition to sending us a hard copy of the public notice documents, we request that you send a complete electronic copy via E-Mail to nathan.s.dayan@usace.army.mil.

Comments may also be provided by E-Mail to Morganza.Comments@usace.army.mil, or by fax to (504) 862-2088. Mr. Dayan may be contacted at (504) 862-2530, if questions arise.

Sincerely,

Joan M. Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch
Regional Planning and Environment Division, South

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

REPLY TO
ATTENTION OF:

January 03, 2013

Regional Planning and
Environment Division, South

Mr. Keith Lovell
Interagency Affairs - LADNR
Field Services Division
P.O. Box 44487, Capital Station
Baton Rouge, LA 70804-4487

Dear Mr. Lovell:

A draft revised programmatic environmental impact statement (RPEIS) for the MISSISSIPPI RIVER & TRIBUTARIES-MORGANZA TO THE GULF OF MEXICO, LOUISIANA, Louisiana, project prepared by the U.S. Army Corps of Engineers, New Orleans District is available for your review. We request your concurrence with the enclosed Consistency Determination, which addresses the applicable Coastal Use Guidelines. Based on the enclosed information, we believe that the proposed action is consistent, to the maximum extent practicable, with the State of Louisisana's approved Coastal Resources Program.

Please review the enclosed documents and provide comments within 45 days of the date that the notice is published in the Federal Register. Comments should be mailed to the attention of Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; New Orleans Environmental Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

Comments may also be provided by E-Mail to Morganza.Comments@usace.army.mil, or by fax to (504) 862-2088. Mr. Dayan may be contacted at (504) 862-2530, if questions arise.

Sincerely,

Joan M. Exnicios
Chief, Environmental Planning Branch
Regional Planning and Environment Division, South

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

REPLY TO
ATTENTION OF:

January 03, 2013

Regional Planning and
Environment Division, South

David Bernhart
NMFS - Protected Species Division
263 13th Avenue South
St. Petersburg, FL 33701

Dear Mr. Bernhart:

A draft revised programatic environmental impact statement (RPEIS) for the MISSISSIPPI RIVER & TRIBUTARIES-MORGANZA TO THE GULF OF MEXICO, LOUISIANA, project prepared by the U.S. Army Corps of Engineers, New Orleans District is enclosed for your review and comment.

Coordination of The Endangered Species Act was accomplished with U.S. Fish and Wildlife Service (FWS) staff. U.S. Fish and Wildlife Service staff concurred with our finding that the proposed activities would not significantly affect listed or proposed threatened or endangered species at the time of the 2002 report. A reconcurance is being requested of FWS per this report.

As part of the ESA Section 7 consultation process associated with the 2002 feasibility report, the NMFS concluded, by letter of March 18, 2002 (Appendix H), " . . .the proposed action is not likely to adversely affect any listed species under NMFS' purview for any of the plan alternatives."

Please review the enclosed documents and provide comments within 45 days of the date that the notice is published in the Federal Register. Comments should be mailed to the attention of Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; New Orleans Environmental Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

Comments may also be provided by E-Mail to Morganza.Comments@usace.army.mil, or by fax to (504) 862-2088. Mr. Dayan may be contacted at (504) 862-2530, if questions arise.

Sincerely,

Joan M. Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch
Regional Planning and Environment Division, South

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

REPLY TO
ATTENTION OF:

January 03, 2013

Regional Planning and
Environment Division, South

Mr. Richard D. Hartman
NMFS - Habitat Conservation Division
Louisiana State University
Baton Rouge, LA 70803-7535

Dear Mr. Hartman:

A draft revised programatic environmental impact statement (RPEIS) for the MISSISSIPPI RIVER & TRIBUTARIES-MORGANZA TO THE GULF OF MEXICO, LOUISIANA, project prepared by the U.S. Army Corps of Engineers, New Orleans District is enclosed for your review and comment.

The enclosed RPEIS represents MVN's initiation of essential fish habitat consultation as required under the Magnuson-Stevens Fishery Conservation and Management Act.

Please review the enclosed documents and provide comments within 45 days of the date that the notice is published in the Federal Register. Comments should be mailed to the attention of Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; New Orleans Environmental Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

Comments may also be provided by E-Mail to Morganza.Comments@usace.army.mil, or by fax to (504) 862-2088. Mr. Dayan may be contacted at (504) 862-2530, if questions arise.

Sincerely,

Joan M. Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch
Regional Planning and Environment Division, South

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

REPLY TO
ATTENTION OF:

January 03, 2013

Regional Planning and
Environment Division, South

Kevin Norton
State Conservationist - NRCS
3737 Government Street
Alexandria, LA 71302

Dear Mr. Norton:

A draft revised programatic environmental impact statement (RPEIS) for the MISSISSIPPI RIVER & TRIBUTARIES-MORGANZA TO THE GULF OF MEXICO, LOUISIANA, project prepared by the U.S. Army Corps of Engineers, New Orleans District is enclosed for your review and comment.

Please review the enclosed documents and provide comments within 45 days of the date that the notice is published in the Federal Register. Comments should be mailed to the attention of Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; New Orleans Environmental Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

Comments may also be provided by E-Mail to Morganza.Comments@usace.army.mil, or by fax to (504) 862-2088. Mr. Dayan may be contacted at (504) 862-2530, if questions arise.

Sincerely,

Joan M. Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch
Regional Planning and Environment Division, South

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

REPLY TO
ATTENTION OF:

January 03, 2013

Regional Planning and
Environment Division, South

Mr. Michael Trusclair
NRCS District Conservationist
Boutte Field Office
P.O. Box 531
Boutte, LA 70039

Dear Mr. Trusclair:

A draft revised programatic environmental impact statement (RPEIS) for the MISSISSIPPI RIVER & TRIBUTARIES-MORGANZA TO THE GULF OF MEXICO, LOUISIANA, project prepared by the U.S. Army Corps of Engineers, New Orleans District is enclosed for your review and comment.

Please review the enclosed documents and provide comments within 45 days of the date that the notice is published in the Federal Register. Comments should be mailed to the attention of Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; New Orleans Environmental Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

Comments may also be provided by E-Mail to Morganza.Comments@usace.army.mil, or by fax to (504) 862-2088. Mr. Dayan may be contacted at (504) 862-2530, if questions arise.

Sincerely,

Joan M. Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch
Regional Planning and Environment Division, South

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

REPLY TO
ATTENTION OF:

January 03, 2013

Regional Planning and
Environment Division, South

Mr. Phil Boggan
SHPO, Dept. of Culture
Recreation and Tourism
P.O. Box 44247
Baton Rouge, LA 70804

Dear Mr. Boggan:

A draft revised programatic environmental impact statement (RPEIS) for the MISSISSIPPI RIVER & TRIBUTARIES-MORGANZA TO THE GULF OF MEXICO, LOUISIANA, project prepared by the U.S. Army Corps of Engineers, New Orleans District is enclosed for your review and comment.

Please review the enclosed documents and provide comments within 45 days of the date that the notice is published in the Federal Register. Comments should be mailed to the attention of Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; New Orleans Environmental Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

Comments may also be provided by E-Mail to Morganza.Comments@usace.army.mil, or by fax to (504) 862-2088. Mr. Dayan may be contacted at (504) 862-2530, if questions arise.

Sincerely,

Joan M. Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch
Regional Planning and Environment Division, South

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

REPLY TO
ATTENTION OF:

January 03, 2013

Regional Planning and
Environment Division, South

Jeff Weller
Field Supervisor
U.S. Fish and Wildlife Service
646 Cajundome Blvd - Suite 400
Lafayette, LA 70506

Dear Mr. Weller:

A draft revised programatic environmental impact statement (RPEIS) for the MISSISSIPPI RIVER & TRIBUTARIES-MORGANZA TO THE GULF OF MEXICO, LOUISIANA, project prepared by the U.S. Army Corps of Engineers, New Orleans District is enclosed for your review and comment.

Coordination of The Endangered Species Act was accomplished with a finding that the proposed activities would not significantly affect listed or proposed threatened or endangered species. Concurrence with this finding was received from your office for the 2002 report. We reques a reconcurrence per this letter.

Please review the enclosed documents and provide comments within 45 days of the date that the notice is published in the Federal Register. Comments should be mailed to the attention of Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; New Orleans Environmental Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

Comments may also be provided by E-Mail to Morganza.Comments@usace.army.mil, or by fax to (504) 862-2088. Mr. Dayan may be contacted at (504) 862-2530, if questions arise.

Sincerely,

Joan M. Exnicios
Chief, Environmental Planning Branch
Regional Planning and Environment Division, South

JAY DARDENNE
LIEUTENANT GOVERNOR

State of Louisiana

OFFICE OF THE LIEUTENANT GOVERNOR
DEPARTMENT OF CULTURE, RECREATION & TOURISM
OFFICE OF CULTURAL DEVELOPMENT
DIVISION OF ARCHAEOLOGY

CHARLES R. DAVIS
DEPUTY SECRETARY

PAM BREAUX
ASSISTANT SECRETARY

February 26, 2013

Ms. Joan M. Exnicios
Department of the Army
New Orleans District, Corps of Engineers
P.O. Box 60267
New Orleans, LA 70160-0267

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Ms. Exnicios:

This in response to your letter dated June 15, 2012, concerning the above referenced Programmatic EIS. First, we apologize for our delayed response. We have reviewed the enclosed documentation and concur that no historic properties were identified within the constructible features of Reaches F1, F2, G1, the Houma Navigation Canal Lock Complex and the Bayou Grand Caillou Floodgate. Therefore, we have no objections to the implementation of this portion of the project. However, the documentation provided does not meet the State of Louisiana's standards for archaeological reports. We would like to receive the proper documentation when the contract for the remaining cultural resources is complete.

We look forward to reviewing the archaeological report for the National Register Testing and Evaluation of site 16TR71 and an uncharacterized shell concentration on Reach E near Falgout Canal. If you have any questions, please contact Rachel Watson in the Division of Archaeology at (225)342-8165 or rwatson@crt.la.gov.

Sincerely,

Pam Breaux

Pam Breaux
State Historic Preservation Officer

PB:RW:s

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

REPLY TO
ATTENTION OF

JUN 15 2012

Regional Planning and
Environmental Division, South
New Orleans Environmental Branch

Ms. Pam Breaux
State Historic Preservation Officer
Department of Culture, Recreation and Tourism
Office of Cultural Development
P.O. Box 44247
Baton Rouge, Louisiana 70804

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Ms. Breaux:

The U.S. Army Corps of Engineers, New Orleans District (USACE), has been involved for many years in developing the Morganza to the Gulf Hurricane Protection Project (MtoG) in order to protect low lying populated areas of Terrebonne and Lafourche Parishes, Louisiana. Numerous reports and correspondence, involving background research, probability models, and field work, have been coordinated with your office as the project has developed, from approximately 1997 (Brown et al. 1997) until the present day (Moreno et al. 2011).

Currently, USACE has prepared a Programmatic Environmental Impact Statement (PEIS) in compliance with the National Environmental Policy Act (NEPA) outlining the continuing development of specific knowledge for different reaches of the entire MtoG levee. This EIS specifies that further Environmental Assessments (EA) will be prepared to discuss any potential environmental impacts as each new levee reach is prepared for construction. Your office will receive separate notice of the availability of this PEIS from USACE. The Corps has utilized the many cultural resources studies referenced above to gain general and specific understanding of potential cultural resources impacts within the MtoG as it is currently known, and has completed cultural resources investigation for the constructible features that are outlined in the PEIS for immediate construction. These constructible features include Reaches F1, F2, G1, the Houma Navigational Canal Lock Complex, and the Bayou Grand Caullou Floodgate. The Corps will continue with cultural resources surveys that include not only the remaining levee alignments that have not yet received cultural resources survey, but also any borrow areas and any mitigation areas (related to NEPA requirements) as the specifics of such are better identified.

The Corps has a current cultural resources survey contract with Goodwin and Associates, Inc. (RCGA) for survey of the constructible features presented in the PEIS, as well as some other areas. Because this contract is not complete, no draft report has yet been prepared. However, a letter report (Boyko 2012) has been prepared to present the findings of the field survey for the constructible features, and concludes that no cultural resources are affected. This letter report is included with this letter, for your knowledge of progress and development with the Morganza to Gulf project.

The Corps concludes that the constructible features examined by RCGA and presented in the PEIS will have no impacts to cultural resources. The PEIS discusses the broad outline of remaining future developments to bring protection to people and property and resources located in Terrebonne and Lafourche parishes. We ask that you provide any comments within 30 days. Please contact Dr. Paul Hughbanks at (504) 862-1100 if you have any questions.

Sincerely,

H. DeMarcay

for Joan M. Exnicios
Chief, New Orleans Environmental Branch

Enclosure

Boyko, Wayne C. J.
2012 *Update on the Cultural Resource Investigations for Morganza to the Gulf, Hurricane Protection Extending Through Terrebonne and LaFourche Parishes in Southeast Louisiana, Constructible Features, Phase I Cultural Resources Survey of Reaches F1, F2, G1, the Houma Navigational Canal Lock Complex, and the Bayou Grand Caillou Floodgate and National Register Testing and Evaluation at Site 16TR71 and an Uncharacterized Shell Concentration on Reach E near Falgout Canal.* R. Christopher Goodwin and Associates, Inc., New Orleans, Louisiana for the United States Army Corps of Engineers, New Orleans District, New Orleans, Louisiana.

Brown, Clifford T., Dave D. Davis, Julian Granberry, Roger Saucier, Lynn A. Berg, Christine Herman, J. Cinder Griffin Miller, Jeremy Pincoske, Susan Barrett Smith, Patrick P. Robblee, and William P. Athens
2000 *Morganza to the Gulf Feasibility Study: Cultural Resources Literature and Records Review, Terrebonne and Lafourche Parishes, Louisiana (Volume I and II)*. Report prepared by R. Christopher Goodwin and Associates, Inc., New Orleans, Louisiana for the United States Army Corps of Engineers, New Orleans District, New Orleans, Louisiana. (22-2133)

Moreno, Meredith A., Susan Barrett Smith, Dave D. Davis, and R. Christopher Goodwin
2011 *Phase Ia Literature Search and Records Review of Previously Recorded Cultural Resources Located within the Proposed Areas Associated with the Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.* Report prepared by R. Christopher Goodwin and Associates, Inc., New Orleans, Louisiana for the United States Army Corps of Engineers, New Orleans District, New Orleans, Louisiana. (22-3291)

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

REPLY TO
ATTENTION OF

JUN 15 2012

Regional Planning and
Environmental Division, South
New Orleans Environmental Branch

Principal Chief Carlos Bullock
Alabama Coushatta Tribe of Texas
571 State Park Road 56
Livingston, Texas 77351

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Chief Bullock:

The U.S. Army Corps of Engineers, New Orleans District (USACE), has been involved for many years in developing the Morganza to the Gulf Hurricane Protection Project (MtoG) in order to protect low lying populated areas of Terrebonne and Lafourche Parishes, Louisiana. Numerous reports and correspondence, involving background research, probability models, and field work, have been coordinated with the Louisiana State Historic Preservation Officer (SHPO) and with your office as the project has developed, from approximately 1997 (Brown et al. 1997) until the present day (Moreno et al. 2011).

Currently, USACE has prepared a Programmatic Environmental Impact Statement (PEIS) in compliance with the National Environmental Policy Act (NEPA) outlining the continuing development of specific knowledge for different reaches of the entire MtoG levee. This EIS specifies that further Environmental Assessments (EA) will be prepared to discuss any potential environmental impacts as each new levee reach is prepared for construction. Your office will receive separate notice of the availability of this PEIS from USACE. The Corps has utilized the many cultural resources studies referenced above to gain general and specific understanding of potential cultural resources impacts within the MtoG as it is currently known, and has completed cultural resources investigation for the constructible features that are outlined in the PEIS for immediate construction. These constructible features include Reaches F1, F2, G1, the Houma Navigational Canal Lock Complex, and the Bayou Grand Caullou Floodgate. The Corps will continue with cultural resources surveys that include not only the remaining levee alignments that have not yet received cultural resources survey, but also any borrow areas and any mitigation areas (related to NEPA requirements) as the specifics of such are better identified.

The Corps has a current cultural resources survey contract with Goodwin and Associates, Inc. (RCGA) for survey of the constructible features presented in the PEIS, as well as some other areas. Because this contract is not complete, no draft report has yet been prepared. However, a letter report (Boyko 2012) has been prepared to present the findings of the field survey for the constructible features, and concludes that no cultural resources are affected. This letter report is

included with this letter, for your knowledge of progress and development with the Morganza to Gulf project.

The Corps concludes that the constructible features examined by RCGA and presented in the PEIS will have no impacts to cultural resources. The PEIS discusses the broad outline of remaining future developments to bring protection to people and property and resources located in Terrebonne and Lafourche parishes. We ask that you provide any comments within 30 days. Please contact Dr. Paul Hughbanks at (504) 862-1100 if you have any questions.

Sincerely,

Joan M. Exnicios
Chief, Environmental Planning
and Compliance Branch

Copy Furnished:
Mr. Bryant J. Celestine, Historic Preservation Officer

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

REPLY TO
ATTENTION OF

JUN 15 2012

Regional Planning and
Environmental Division, South
New Orleans Environmental Branch

Chairperson Brenda Shemayme Edwards
Caddo Nation of Oklahoma
P.O. Box 487
Binger, Oklahoma 73009

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Chairperson Edwards:

The U.S. Army Corps of Engineers, New Orleans District (USACE), has been involved for many years in developing the Morganza to the Gulf Hurricane Protection Project (MtoG) in order to protect low lying populated areas of Terrebonne and Lafourche Parishes, Louisiana. Numerous reports and correspondence, involving background research, probability models, and field work, have been coordinated with the Louisiana State Historic Preservation Officer (SHPO) and with your office as the project has developed, from approximately 1997 (Brown et al. 1997) until the present day (Moreno et al. 2011).

Currently, USACE has prepared a Programmatic Environmental Impact Statement (PEIS) in compliance with the National Environmental Policy Act (NEPA) outlining the continuing development of specific knowledge for different reaches of the entire MtoG levee. This EIS specifies that further Environmental Assessments (EA) will be prepared to discuss any potential environmental impacts as each new levee reach is prepared for construction. Your office will receive separate notice of the availability of this PEIS from USACE. The Corps has utilized the many cultural resources studies referenced above to gain general and specific understanding of potential cultural resources impacts within the MtoG as it is currently known, and has completed cultural resources investigation for the constructible features that are outlined in the PEIS for immediate construction. These constructible features include Reaches F1, F2, G1, the Houma Navigational Canal Lock Complex, and the Bayou Grand Caullou Floodgate. The Corps will continue with cultural resources surveys that include not only the remaining levee alignments that have not yet received cultural resources survey, but also any borrow areas and any mitigation areas (related to NEPA requirements) as the specifics of such are better identified.

The Corps has a current cultural resources survey contract with Goodwin and Associates, Inc. (RCGA) for survey of the constructible features presented in the PEIS, as well as some other areas. Because this contract is not complete no draft report has yet been prepared. However, a letter report (Boyko 2012) has been prepared to present the findings of the field survey for the constructible features, and concludes that no cultural resources are affected. This letter report is

included with this letter, for your knowledge of progress and development with the Morganza to Gulf project.

The Corps concludes that the constructible features examined by RCGA and presented in the PEIS will have no impacts to cultural resources. The PEIS discusses the broad outline of remaining future developments to bring protection to people and property and resources located in Terrebonne and Lafourche parishes. We ask that you provide any comments within 30 days. Please contact Dr. Paul Hughbanks at (504) 862-1100 if you have any questions.

Sincerely,

for Joan M. Exnicios
Chief, Environmental Planning
and Compliance Branch

Copy Furnished:
Mr. Robert Cast, Historic Preservation Officer

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

REPLY TO
ATTENTION OF

JUN 15 2012

Regional Planning and
Environmental Division, South
New Orleans Environmental Branch

Chairman John Paul Darden
Chitimacha Tribe of Louisiana
P.O. Box 661
Charenton, Louisiana 70523

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Chairman Darden:

The U.S. Army Corps of Engineers, New Orleans District (USACE), has been involved for many years in developing the Morganza to the Gulf Hurricane Protection Project (MtoG) in order to protect low lying populated areas of Terrebonne and Lafourche Parishes, Louisiana. Numerous reports and correspondence, involving background research, probability models, and field work, have been coordinated with the Louisiana State Historic Preservation Officer (SHPO) and with your office as the project has developed, from approximately 1997 (Brown et al. 1997) until the present day (Moreno et al. 2011).

Currently, USACE has prepared a Programmatic Environmental Impact Statement (PEIS) in compliance with the National Environmental Policy Act (NEPA) outlining the continuing development of specific knowledge for different reaches of the entire MtoG levee. This EIS specifies that further Environmental Assessments (EA) will be prepared to discuss any potential environmental impacts as each new levee reach is prepared for construction. Your office will receive separate notice of the availability of this PEIS from USACE. The Corps has utilized the many cultural resources studies referenced above to gain general and specific understanding of potential cultural resources impacts within the MtoG as it is currently known, and has completed cultural resources investigation for the constructible features that are outlined in the PEIS for immediate construction. These constructible features include Reaches F1, F2, G1, the Houma Navigational Canal Lock Complex, and the Bayou Grand Caullou Floodgate. The Corps will continue with cultural resources surveys that include not only the remaining levee alignments that have not yet received cultural resources survey, but also any borrow areas and any mitigation areas (related to NEPA requirements) as the specifics of such are better identified.

The Corps has a current cultural resources survey contract with Goodwin and Associates, Inc. (RCGA) for survey of the constructible features presented in the PEIS, as well as some other areas. Because this contract is not complete no draft report has yet been prepared. However, a letter report (Boyko 2012) has been prepared to present the findings of the field survey for the constructible features, and concludes that no cultural resources are affected. This letter report is

included with this letter, for your knowledge of progress and development with the Morganza to Gulf project.

The Corps concludes that the constructible features examined by RCGA and presented in the PEIS will have no impacts to cultural resources. The PEIS discusses the broad outline of remaining future developments to bring protection to people and property and resources located in Terrebonne and Lafourche parishes. We ask that you provide any comments within 30 days. Please contact Dr. Paul Hughbanks at (504) 862-1100 if you have any questions.

Sincerely,

for Joan M. Exnicios
Chief, Environmental Planning
and Compliance Branch

Copy Furnished:
Ms. Kimberly S. Walden, Cultural Director

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

REPLY TO
ATTENTION OF

JUN 15 2012

Regional Planning and
Environmental Division, South
New Orleans Environmental Branch

Dr. Ian Thompson
Tribal Historic Preservation Officer
Choctaw Nation of Oklahoma
P.O. Box Drawer 1210
Durant, Oklahoma 74702-1210

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Dr. Thompson:

The U.S. Army Corps of Engineers, New Orleans District (USACE), has been involved for many years in developing the Morganza to the Gulf Hurricane Protection Project (MtoG) in order to protect low lying populated areas of Terrebonne and Lafourche Parishes, Louisiana. Numerous reports and correspondence, involving background research, probability models, and field work, have been coordinated with the Louisiana State Historic Preservation Officer (SHPO) and with your office as the project has developed, from approximately 1997 (Brown et al. 1997) until the present day (Moreno et al. 2011).

Currently, USACE has prepared a Programmatic Environmental Impact Statement (PEIS) in compliance with the National Environmental Policy Act (NEPA) outlining the continuing development of specific knowledge for different reaches of the entire MtoG levee. This EIS specifies that further Environmental Assessments (EA) will be prepared to discuss any potential environmental impacts as each new levee reach is prepared for construction. Your office will receive separate notice of the availability of this PEIS from USACE. The Corps has utilized the many cultural resources studies referenced above to gain general and specific understanding of potential cultural resources impacts within the MtoG as it is currently known, and has completed cultural resources investigation for the constructible features that are outlined in the PEIS for immediate construction. These constructible features include Reaches F1, F2, G1, the Houma Navigational Canal Lock Complex, and the Bayou Grand Caullou Floodgate. The Corps will continue with cultural resources surveys that include not only the remaining levee alignments that have not yet received cultural resources survey, but also any borrow areas and any mitigation areas (related to NEPA requirements) as the specifics of such are better identified.

The Corps has a current cultural resources survey contract with Goodwin and Associates, Inc. (RCGA) for survey of the constructible features presented in the PEIS, as well as some other areas. Because this contract is not complete no draft report has yet been prepared. However, a letter report (Boyko 2012) has been prepared to present the findings of the field survey for the constructible features, and concludes that no cultural resources are affected. This letter report is

included with this letter, for your knowledge of progress and development with the Morganza to Gulf project.

The Corps concludes that the constructible features examined by RCGA and presented in the PEIS will have no impacts to cultural resources. The PEIS discusses the broad outline of remaining future developments to bring protection to people and property and resources located in Terrebonne and Lafourche parishes. We ask that you provide any comments within 30 days. Please contact Dr. Paul Hughbanks at (504) 862-1100 if you have any questions.

Sincerely,

M DeMarcay

for Joan M. Exnicios
Chief, Environmental Planning
and Compliance Branch

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

REPLY TO
ATTENTION OF

JUN 15 2012

Regional Planning and
Environmental Division, South
New Orleans Environmental Branch

Chief Kevin Sickey
Coushatta Tribe of Louisiana
P.O. Box 818
Elton, Louisiana 70532

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Chief Sickey:

The U.S. Army Corps of Engineers, New Orleans District (USACE), has been involved for many years in developing the Morganza to the Gulf Hurricane Protection Project (MtoG) in order to protect low lying populated areas of Terrebonne and Lafourche Parishes, Louisiana. Numerous reports and correspondence, involving background research, probability models, and field work, have been coordinated with the Louisiana State Historic Preservation Officer (SHPO) and with your office as the project has developed, from approximately 1997 (Brown et al. 1997) until the present day (Moreno et al. 2011).

Currently, USACE has prepared a Programmatic Environmental Impact Statement (PEIS) in compliance with the National Environmental Policy Act (NEPA) outlining the continuing development of specific knowledge for different reaches of the entire MtoG levee. This EIS specifies that further Environmental Assessments (EA) will be prepared to discuss any potential environmental impacts as each new levee reach is prepared for construction. Your office will receive separate notice of the availability of this PEIS from USACE. The Corps has utilized the many cultural resources studies referenced above to gain general and specific understanding of potential cultural resources impacts within the MtoG as it is currently known, and has completed cultural resources investigation for the constructible features that are outlined in the PEIS for immediate construction. These constructible features include Reaches F1, F2, G1, the Houma Navigational Canal Lock Complex, and the Bayou Grand Caullou Floodgate. The Corps will continue with cultural resources surveys that include not only the remaining levee alignments that have not yet received cultural resources survey, but also any borrow areas and any mitigation areas (related to NEPA requirements) as the specifics of such are better identified.

The Corps has a current cultural resources survey contract with Goodwin and Associates, Inc. (RCGA) for survey of the constructible features presented in the PEIS, as well as some other areas. Because this contract is not complete no draft report has yet been prepared. However, a letter report (Boyko 2012) has been prepared to present the findings of the field survey for the constructible features, and concludes that no cultural resources are affected. This letter report is

included with this letter, for your knowledge of progress and development with the Morganza to Gulf project.

The Corps concludes that the constructible features examined by RCGA and presented in the PEIS will have no impacts to cultural resources. The PEIS discusses the broad outline of remaining future developments to bring protection to people and property and resources located in Terrebonne and Lafourche parishes. We ask that you provide any comments within 30 days. Please contact Dr. Paul Hughbanks at (504) 862-1100 if you have any questions.

Sincerely,

for Joan M. Exnicios
Chief, Environmental Planning
and Compliance Branch

Copy Furnished:
Miss Bertney Langley, Cultural Contact

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

REPLY TO
ATTENTION OF

JUN 15 2012

Regional Planning and
Environmental Division, South
New Orleans Environmental Branch

Principal Chief B. Cheryl Smith
Jena Band of the Choctaw Indians
P.O. Box 14
Jena, Louisiana 71342

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Principal Chief Smith:

The U.S. Army Corps of Engineers, New Orleans District (USACE), has been involved for many years in developing the Morganza to the Gulf Hurricane Protection Project (MtoG) in order to protect low lying populated areas of Terrebonne and Lafourche Parishes, Louisiana. Numerous reports and correspondence, involving background research, probability models, and field work, have been coordinated with the Louisiana State Historic Preservation Officer (SHPO) and with your office as the project has developed, from approximately 1997 (Brown et al. 1997) until the present day (Moreno et al. 2011).

Currently, USACE has prepared a Programmatic Environmental Impact Statement (PEIS) in compliance with the National Environmental Policy Act (NEPA) outlining the continuing development of specific knowledge for different reaches of the entire MtoG levee. This EIS specifies that further Environmental Assessments (EA) will be prepared to discuss any potential environmental impacts as each new levee reach is prepared for construction. Your office will receive separate notice of the availability of this PEIS from USACE. The Corps has utilized the many cultural resources studies referenced above to gain general and specific understanding of potential cultural resources impacts within the MtoG as it is currently known, and has completed cultural resources investigation for the constructible features that are outlined in the PEIS for immediate construction. These constructible features include Reaches F1, F2, G1, the Houma Navigational Canal Lock Complex, and the Bayou Grand Caullou Floodgate. The Corps will continue with cultural resources surveys that include not only the remaining levee alignments that have not yet received cultural resources survey, but also any borrow areas and any mitigation areas (related to NEPA requirements) as the specifics of such are better identified.

The Corps has a current cultural resources survey contract with Goodwin and Associates, Inc. (RCGA) for survey of the constructible features presented in the PEIS, as well as some other areas. Because this contract is not complete no draft report has yet been prepared. However, a letter report (Boyko 2012) has been prepared to present the findings of the field survey for the constructible features, and concludes that no cultural resources are affected. This letter report is

included with this letter, for your knowledge of progress and development with the Morganza to Gulf project.

The Corps concludes that the constructible features examined by RCGA and presented in the PEIS will have no impacts to cultural resources. The PEIS discusses the broad outline of remaining future developments to bring protection to people and property and resources located in Terrebonne and Lafourche parishes. We ask that you provide any comments within 30 days. Please contact Dr. Paul Hughbanks at (504) 862-1100 if you have any questions.

Sincerely,

M DeMarcay

for Joan M. Exnicios
Chief, Environmental Planning
and Compliance Branch

Copy Furnished:
Dana Masters, Tribal Historic Preservation Officer

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

REPLY TO
ATTENTION OF

JUN 15 2012

Regional Planning and
Environmental Division, South
New Orleans Environmental Branch

Chief Phyllis J. Anderson
Mississippi Band of Choctaw Indians
P.O. Box 6257
Choctaw, Mississippi 39350

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Chief Anderson:

The U.S. Army Corps of Engineers, New Orleans District (USACE), has been involved for many years in developing the Morganza to the Gulf Hurricane Protection Project (MtoG) in order to protect low lying populated areas of Terrebonne and Lafourche Parishes, Louisiana. Numerous reports and correspondence, involving background research, probability models, and field work, have been coordinated with the Louisiana State Historic Preservation Officer (SHPO) and with your office as the project has developed, from approximately 1997 (Brown et al. 1997) until the present day (Moreno et al. 2011).

Currently, USACE has prepared a Programmatic Environmental Impact Statement (PEIS) in compliance with the National Environmental Policy Act (NEPA) outlining the continuing development of specific knowledge for different reaches of the entire MtoG levee. This EIS specifies that further Environmental Assessments (EA) will be prepared to discuss any potential environmental impacts as each new levee reach is prepared for construction. Your office will receive separate notice of the availability of this PEIS from USACE. The Corps has utilized the many cultural resources studies referenced above to gain general and specific understanding of potential cultural resources impacts within the MtoG as it is currently known, and has completed cultural resources investigation for the constructible features that are outlined in the PEIS for immediate construction. These constructible features include Reaches F1, F2, G1, the Houma Navigational Canal Lock Complex, and the Bayou Grand Caullou Floodgate. The Corps will continue with cultural resources surveys that include not only the remaining levee alignments that have not yet received cultural resources survey, but also any borrow areas and any mitigation areas (related to NEPA requirements) as the specifics of such are better identified.

The Corps has a current cultural resources survey contract with Goodwin and Associates, Inc. (RCGA) for survey of the constructible features presented in the PEIS, as well as some other areas. Because this contract is not complete no draft report has yet been prepared. However, a letter report (Boyko 2012) has been prepared to present the findings of the field survey for the constructible features, and concludes that no cultural resources are affected. This letter report is

included with this letter, for your knowledge of progress and development with the Morganza to Gulf project.

The Corps concludes that the constructible features examined by RCGA and presented in the PEIS will have no impacts to cultural resources. The PEIS discusses the broad outline of remaining future developments to bring protection to people and property and resources located in Terrebonne and Lafourche parishes. We ask that you provide any comments within 30 days. Please contact Dr. Paul Hughbanks at (504) 862-1100 if you have any questions.

Sincerely,

for Joan M. Exnicios
Chief, Environmental Planning
and Compliance Branch

Copy Furnished:
Mr. Kenneth H. Carleton, Historic Preservation Officer

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

REPLY TO
ATTENTION OF

JUN 15 2012

Regional Planning and
Environmental Division, South
New Orleans Environmental Branch

Chairman John Berrey
Quapaw Tribe of Oklahoma
P.O. Box 765
Quapaw, Oklahoma 74363

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Chairman Berrey:

The U.S. Army Corps of Engineers, New Orleans District (USACE), has been involved for many years in developing the Morganza to the Gulf Hurricane Protection Project (MtoG) in order to protect low lying populated areas of Terrebonne and Lafourche Parishes, Louisiana. Numerous reports and correspondence, involving background research, probability models, and field work, have been coordinated with the Louisiana State Historic Preservation Officer (SHPO) and with your office as the project has developed, from approximately 1997 (Brown et al. 1997) until the present day (Moreno et al. 2011).

Currently, USACE has prepared a Programmatic Environmental Impact Statement (PEIS) in compliance with the National Environmental Policy Act (NEPA) outlining the continuing development of specific knowledge for different reaches of the entire MtoG levee. This EIS specifies that further Environmental Assessments (EA) will be prepared to discuss any potential environmental impacts as each new levee reach is prepared for construction. Your office will receive separate notice of the availability of this PEIS from USACE. The Corps has utilized the many cultural resources studies referenced above to gain general and specific understanding of potential cultural resources impacts within the MtoG as it is currently known, and has completed cultural resources investigation for the constructible features that are outlined in the PEIS for immediate construction. These constructible features include Reaches F1, F2, G1, the Houma Navigational Canal Lock Complex, and the Bayou Grand Caullou Floodgate. The Corps will continue with cultural resources surveys that include not only the remaining levee alignments that have not yet received cultural resources survey, but also any borrow areas and any mitigation areas (related to NEPA requirements) as the specifics of such are better identified.

The Corps has a current cultural resources survey contract with Goodwin and Associates, Inc. (RCGA) for survey of the constructible features presented in the PEIS, as well as some other areas. Because this contract is not complete no draft report has yet been prepared. However, a letter report (Boyko 2012) has been prepared to present the findings of the field survey for the constructible features, and concludes that no cultural resources are affected. This letter report is

included with this letter, for your knowledge of progress and development with the Morganza to Gulf project.

The Corps concludes that the constructible features examined by RCGA and presented in the PEIS will have no impacts to cultural resources. The PEIS discusses the broad outline of remaining future developments to bring protection to people and property and resources located in Terrebonne and Lafourche parishes. We ask that you provide any comments within 30 days. Please contact Dr. Paul Hughbanks at (504) 862-1100 if you have any questions.

Sincerely,

GDeMarcay
for
Joan M. Exnicios
Chief, Environmental Planning
and Compliance Branch

Copy Furnished:
Jean Ann Lambert, Historic Preservation Officer

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

REPLY TO
ATTENTION OF

JUN 15 2012

Regional Planning and
Environmental Division, South
New Orleans Environmental Branch

Principal Chief Leonard M. Harjo
Seminole Nation of Oklahoma
P.O. Box 1498
Wewoka, Oklahoma 74884

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Principal Chief Harjo:

The U.S. Army Corps of Engineers, New Orleans District (USACE), has been involved for many years in developing the Morganza to the Gulf Hurricane Protection Project (MtoG) in order to protect low lying populated areas of Terrebonne and Lafourche Parishes, Louisiana. Numerous reports and correspondence, involving background research, probability models, and field work, have been coordinated with the Louisiana State Historic Preservation Officer (SHPO) and with your office as the project has developed, from approximately 1997 (Brown et al. 1997) until the present day (Moreno et al. 2011).

Currently, USACE has prepared a Programmatic Environmental Impact Statement (PEIS) in compliance with the National Environmental Policy Act (NEPA) outlining the continuing development of specific knowledge for different reaches of the entire MtoG levee. This EIS specifies that further Environmental Assessments (EA) will be prepared to discuss any potential environmental impacts as each new levee reach is prepared for construction. Your office will receive separate notice of the availability of this PEIS from USACE. The Corps has utilized the many cultural resources studies referenced above to gain general and specific understanding of potential cultural resources impacts within the MtoG as it is currently known, and has completed cultural resources investigation for the constructible features that are outlined in the PEIS for immediate construction. These constructible features include Reaches F1, F2, G1, the Houma Navigational Canal Lock Complex, and the Bayou Grand Caullou Floodgate. The Corps will continue with cultural resources surveys that include not only the remaining levee alignments that have not yet received cultural resources survey, but also any borrow areas and any mitigation areas (related to NEPA requirements) as the specifics of such are better identified.

The Corps has a current cultural resources survey contract with Goodwin and Associates, Inc. (RCGA) for survey of the constructible features presented in the PEIS, as well as some other areas. Because this contract is not complete no draft report has yet been prepared. However, a letter report (Boyko 2012) has been prepared to present the findings of the field survey for the constructible features, and concludes that no cultural resources are affected. This letter report is

included with this letter, for your knowledge of progress and development with the Morganza to Gulf project.

The Corps concludes that the constructible features examined by RCGA and presented in the PEIS will have no impacts to cultural resources. The PEIS discusses the broad outline of remaining future developments to bring protection to people and property and resources located in Terrebonne and Lafourche parishes. We ask that you provide any comments within 30 days. Please contact Dr. Paul Hughbanks at (504) 862-1100 if you have any questions.

Sincerely,

for Joan M. Exnicios
Chief, Environmental Planning
and Compliance Branch

Copy Furnished:
Ms. Natalie Deere, Tribal Historic Preservation Officer

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

REPLY TO
ATTENTION OF

JUN 15 2012

Regional Planning and
Environmental Division, South
New Orleans Environmental Branch

Chairman James Billie
Seminole Tribe of Florida
6300 Sterling Road
Hollywood, Florida 33024

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Chairman Billie:

The U.S. Army Corps of Engineers, New Orleans District (USACE), has been involved for many years in developing the Morganza to the Gulf Hurricane Protection Project (MtoG) in order to protect low lying populated areas of Terrebonne and Lafourche Parishes, Louisiana. Numerous reports and correspondence, involving background research, probability models, and field work, have been coordinated with the Louisiana State Historic Preservation Officer (SHPO) and with your office as the project has developed, from approximately 1997 (Brown et al. 1997) until the present day (Moreno et al. 2011).

Currently, USACE has prepared a Programmatic Environmental Impact Statement (PEIS) in compliance with the National Environmental Policy Act (NEPA) outlining the continuing development of specific knowledge for different reaches of the entire MtoG levee. This EIS specifies that further Environmental Assessments (EA) will be prepared to discuss any potential environmental impacts as each new levee reach is prepared for construction. Your office will receive separate notice of the availability of this PEIS from USACE. The Corps has utilized the many cultural resources studies referenced above to gain general and specific understanding of potential cultural resources impacts within the MtoG as it is currently known, and has completed cultural resources investigation for the constructible features that are outlined in the PEIS for immediate construction. These constructible features include Reaches F1, F2, G1, the Houma Navigational Canal Lock Complex, and the Bayou Grand Caullou Floodgate. The Corps will continue with cultural resources surveys that include not only the remaining levee alignments that have not yet received cultural resources survey, but also any borrow areas and any mitigation areas (related to NEPA requirements) as the specifics of such are better identified.

The Corps has a current cultural resources survey contract with Goodwin and Associates, Inc. (RCGA) for survey of the constructible features presented in the PEIS, as well as some other areas. Because this contract is not complete no draft report has yet been prepared. However, a letter report (Boyko 2012) has been prepared to present the findings of the field survey for the constructible features, and concludes that no cultural resources are affected. This letter report is

included with this letter, for your knowledge of progress and development with the Morganza to Gulf project.

The Corps concludes that the constructible features examined by RCGA and presented in the PEIS will have no impacts to cultural resources. The PEIS discusses the broad outline of remaining future developments to bring protection to people and property and resources located in Terrebonne and Lafourche parishes. We ask that you provide any comments within 30 days. Please contact Dr. Paul Hughbanks at (504) 862-1100 if you have any questions.

Sincerely,

for Joan M. Exnicios
Chief, Environmental Planning
and Compliance Branch

Copy Furnished:
Paul N. Backhouse, Acting Tribal Historic Preservation Officer

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

REPLY TO
ATTENTION OF

JUN 15 2012

Regional Planning and
Environmental Division, South
New Orleans Environmental Branch

Chairman Earl J. Barbry, Sr.
Tunica-Biloxi Tribe of Louisiana
P.O. Box 1589
Marksville, Louisiana 71351

Re: Programmatic EIS Constructible Features for Morganza to the Gulf Hurricane Protection Project, Terrebonne and Lafourche Parishes, Louisiana.

Dear Chairman Barbry:

The U.S. Army Corps of Engineers, New Orleans District (USACE), has been involved for many years in developing the Morganza to the Gulf Hurricane Protection Project (MtoG) in order to protect low lying populated areas of Terrebonne and Lafourche Parishes, Louisiana. Numerous reports and correspondence, involving background research, probability models, and field work, have been coordinated with the Louisiana State Historic Preservation Officer (SHPO) and with your office as the project has developed, from approximately 1997 (Brown et al. 1997) until the present day (Moreno et al. 2011).

Currently, USACE has prepared a Programmatic Environmental Impact Statement (PEIS) in compliance with the National Environmental Policy Act (NEPA) outlining the continuing development of specific knowledge for different reaches of the entire MtoG levee. This EIS specifies that further Environmental Assessments (EA) will be prepared to discuss any potential environmental impacts as each new levee reach is prepared for construction. Your office will receive separate notice of the availability of this PEIS from USACE. The Corps has utilized the many cultural resources studies referenced above to gain general and specific understanding of potential cultural resources impacts within the MtoG as it is currently known, and has completed cultural resources investigation for the constructible features that are outlined in the PEIS for immediate construction. These constructible features include Reaches F1, F2, G1, the Houma Navigational Canal Lock Complex, and the Bayou Grand Caullou Floodgate. The Corps will continue with cultural resources surveys that include not only the remaining levee alignments that have not yet received cultural resources survey, but also any borrow areas and any mitigation areas (related to NEPA requirements) as the specifics of such are better identified.

The Corps has a current cultural resources survey contract with Goodwin and Associates, Inc. (RCGA) for survey of the constructible features presented in the PEIS, as well as some other areas. Because this contract is not complete no draft report has yet been prepared. However, a letter report (Boyko 2012) has been prepared to present the findings of the field survey for the constructible features, and concludes that no cultural resources are affected. This letter report is

included with this letter, for your knowledge of progress and development with the Morganza to Gulf project.

The Corps concludes that the constructible features examined by RCGA and presented in the PEIS will have no impacts to cultural resources. The PEIS discusses the broad outline of remaining future developments to bring protection to people and property and resources located in Terrebonne and Lafourche parishes. We ask that you provide any comments within 30 days. Please contact Dr. Paul Hughbanks at (504) 862-1100 if you have any questions.

Sincerely,

Joan M. Exnicios
Chief, Environmental Planning
and Compliance Branch

Copy Furnished:
Mr. Earl Barbry, Jr., Cultural Director

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

REPLY TO ATTENTION OF:

March 5, 2013

Regional Planning and
Environment Division, South

Carlos Bullock, Chairman
Alabama-Coushatta Tribe of Texas
571 State Park Rd 56
Livingston, TX 77351

Dear Chairman Bullock:

The U.S. Army Corps of Engineers, New Orleans District (CEMVN), has prepared a draft Revised Programmatic Environmental Impact Statement (RPEIS) for the Mississippi River and Tributaries – Morganza to the Gulf of Mexico, Louisiana project to evaluate the potential impacts to the environment associated with the proposed Morganza to the Gulf of Mexico, Louisiana hurricane and storm damage risk reduction project in Terrebonne and Lafourche parishes. The RPEIS is available for your review and comment.

The RPEIS is a revision to the 2002 Final Programmatic EIS for the project, which was not finalized with the signing of a Record of Decision. A revision is required because project alternatives have been modified as a result of new hurricane and storm damage risk reduction design guidelines issued after hurricanes Katrina and Rita.

The project is located approximately 60 miles southwest of New Orleans, Louisiana, and includes most of Terrebonne Parish, excluding the barrier islands, and the portion of Lafourche Parish between the Terrebonne Parish eastern boundary and Bayou Lafourche. A project fact sheet is enclosed.

The tentatively selected plan would include the construction of 98 miles of earthen levee, approximately 85 miles of which would overlay existing hydrologic barriers such as natural ridges, roadbeds, and existing levees. The remaining levee alignment would be constructed in unprotected coastal wetlands. Construction would include 22 floodgates on navigable waterways, including the Houma Navigation Canal (HNC) lock complex, and 23 environmental water control structures designed to allow tidal exchange through the levee. The structural features would be integrated into the levee alignment to provide hurricane and storm damage risk reduction, drainage, and navigational passage.

Although programmatic in nature, this RPEIS has sufficient details and impact analyses for some features so that construction can proceed on those features. The four features that are expected to be identified as constructible include: Levee Reach F1 and F2, Levee Reach G1, the HNC lock complex, and the Bayou Grand Caillou Floodgate. The remaining components of the

project are programmatic features that will require additional NEPA investigations before construction can occur.

CEMVN concluded that "the constructible features will have no impacts to cultural resources," and this finding was coordinated with the Louisiana State Historic Preservation Officer (SHPO) and federally-recognized Tribes on June 15, 2012. In the enclosed letter dated February 26, 2013, the SHPO concurred that "no historic properties were identified within the constructible features of Reaches F1, F2, G1, the Houma Navigation Canal Lock Complex and the Bayou Grand Caillou Floodgate," and as such "have no objections to the implementation of this portion of the project." Site 16TR71 and the uncharacterized shell concentration on Reach E near Falgout Canal referenced in the SHPO letter are not within the Area of Potential Effects for the constructible features, and Section 106 consultation will continue as additional features are planned for construction.

In an effort to continue government-to-government consultation in partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, the CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in the draft RPEIS to significantly affect protected tribal resources, tribal rights, or Indian lands.

A copy of the draft RPEIS is available online at http://1.usa.gov/ZVel3A. Please contact Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; Environmental Planning Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267; to request a hard copy. Requests may also be made by email to Nathan.S.Dayan@usace.army.mil or by phone to (504) 862-2530.

As always, should you have any questions about the proposed action, you may contact Ms. Rebecca Hill; Archeologist/Tribal Liaison; U.S. Army Corps of Engineers, New Orleans District; (504) 862-1474; rebecca.hill@usace.army.mil. An electronic copy of this letter with the enclosures will be provided to Mr. Bryant J. Celestine, Historic Preservation Officer, Alabama Coushatta Tribe of Texas, celestine.bryant@actribe.org.

Sincerely,

Joan M. Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch

Enclosures

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

REPLY TO ATTENTION OF:

March 5, 2013

Regional Planning and
Environment Division, South

Brenda Shemayme Edwards, Chairwoman
Caddo Nation of Oklahoma
P.O. Box 487
Binger, OK 73009

Dear Chairwoman Edwards:

The U.S. Army Corps of Engineers, New Orleans District (CEMVN), has prepared a draft Revised Programmatic Environmental Impact Statement (RPEIS) for the Mississippi River and Tributaries – Morganza to the Gulf of Mexico, Louisiana project to evaluate the potential impacts to the environment associated with the proposed Morganza to the Gulf of Mexico, Louisiana hurricane and storm damage risk reduction project in Terrebonne and Lafourche parishes. The RPEIS is available for your review and comment.

The RPEIS is a revision to the 2002 Final Programmatic EIS for the project, which was not finalized with the signing of a Record of Decision. A revision is required because project alternatives have been modified as a result of new hurricane and storm damage risk reduction design guidelines issued after hurricanes Katrina and Rita.

The project is located approximately 60 miles southwest of New Orleans, Louisiana, and includes most of Terrebonne Parish, excluding the barrier islands, and the portion of Lafourche Parish between the Terrebonne Parish eastern boundary and Bayou Lafourche. A project fact sheet is enclosed.

The tentatively selected plan would include the construction of 98 miles of earthen levee, approximately 85 miles of which would overlay existing hydrologic barriers such as natural ridges, roadbeds, and existing levees. The remaining levee alignment would be constructed in unprotected coastal wetlands. Construction would include 22 floodgates on navigable waterways, including the Houma Navigation Canal (HNC) lock complex, and 23 environmental water control structures designed to allow tidal exchange through the levee. The structural features would be integrated into the levee alignment to provide hurricane and storm damage risk reduction, drainage, and navigational passage.

Although programmatic in nature, this RPEIS has sufficient details and impact analyses for some features so that construction can proceed on those features. The four features that are expected to be identified as constructible include: Levee Reach F1 and F2, Levee Reach G1, the HNC lock complex, and the Bayou Grand Caillou Floodgate. The remaining components of the

project are programmatic features that will require additional NEPA investigations before construction can occur.

CEMVN concluded that "the constructible features will have no impacts to cultural resources," and this finding was coordinated with the Louisiana State Historic Preservation Officer (SHPO) and federally-recognized Tribes on June 15, 2012. In the enclosed letter dated February 26, 2013, the SHPO concurred that "no historic properties were identified within the constructible features of Reaches F1, F2, G1, the Houma Navigation Canal Lock Complex and the Bayou Grand Caillou Floodgate," and as such "have no objections to the implementation of this portion of the project." Site 16TR71 and the uncharacterized shell concentration on Reach E near Falgout Canal referenced in the SHPO letter are not within the Area of Potential Effects for the constructible features, and Section 106 consultation will continue as additional features are planned for construction.

In an effort to continue government-to-government consultation in partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, the CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in the draft RPEIS to significantly affect protected tribal resources, tribal rights, or Indian lands.

A copy of the draft RPEIS is available online at http://1.usa.gov/ZVel3A. Please contact Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; Environmental Planning Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267; to request a hard copy. Requests may also be made by email to Nathan.S.Dayan@usace.army.mil or by phone to (504) 862-2530.

As always, should you have any questions, you may contact Ms. Rebecca Hill; Archeologist/Tribal Liaison; U.S. Army Corps of Engineers, New Orleans District; (504) 862-1474; rebecca.hill@usace.army.mil. An electronic copy of this letter with the enclosures will be provided to Mr. Robert Cast, Tribal Historic Preservation Officer, Caddo Nation of Oklahoma, rcast@caddonation.org.

Sincerely,

Joan M Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch

Enclosures

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

REPLY TO
ATTENTION OF:

March 5, 2013

Regional Planning and
Environment Division, South

John Paul Darden, Chairman
Chitimacha Tribe of Louisiana
P.O. Box 661
Charenton, LA 70523

Dear Chairman Darden:

The U.S. Army Corps of Engineers, New Orleans District (CEMVN), has prepared a draft Revised Programmatic Environmental Impact Statement (RPEIS) for the Mississippi River and Tributaries – Morganza to the Gulf of Mexico, Louisiana project to evaluate the potential impacts to the environment associated with the proposed Morganza to the Gulf of Mexico, Louisiana hurricane and storm damage risk reduction project in Terrebonne and Lafourche parishes. The RPEIS is available for your review and comment.

The RPEIS is a revision to the 2002 Final Programmatic EIS for the project, which was not finalized with the signing of a Record of Decision. A revision is required because project alternatives have been modified as a result of new hurricane and storm damage risk reduction design guidelines issued after hurricanes Katrina and Rita.

The project is located approximately 60 miles southwest of New Orleans, Louisiana, and includes most of Terrebonne Parish, excluding the barrier islands, and the portion of Lafourche Parish between the Terrebonne Parish eastern boundary and Bayou Lafourche. A project fact sheet is enclosed.

The tentatively selected plan would include the construction of 98 miles of earthen levee, approximately 85 miles of which would overlay existing hydrologic barriers such as natural ridges, roadbeds, and existing levees. The remaining levee alignment would be constructed in unprotected coastal wetlands. Construction would include 22 floodgates on navigable waterways, including the Houma Navigation Canal (HNC) lock complex, and 23 environmental water control structures designed to allow tidal exchange through the levee. The structural features would be integrated into the levee alignment to provide hurricane and storm damage risk reduction, drainage, and navigational passage.

Although programmatic in nature, this RPEIS has sufficient details and impact analyses for some features so that construction can proceed on those features. The four features that are expected to be identified as constructible include: Levee Reach F1 and F2, Levee Reach G1, the HNC lock complex, and the Bayou Grand Caillou Floodgate. The remaining components of the

project are programmatic features that will require additional NEPA investigations before construction can occur.

CEMVN concluded that "the constructible features will have no impacts to cultural resources," and this finding was coordinated with the Louisiana State Historic Preservation Officer (SHPO) and federally-recognized Tribes on June 15, 2012. In the enclosed letter dated February 26, 2013, the SHPO concurred that "no historic properties were identified within the constructible features of Reaches F1, F2, G1, the Houma Navigation Canal Lock Complex and the Bayou Grand Caillou Floodgate," and as such "have no objections to the implementation of this portion of the project." Site 16TR71 and the uncharacterized shell concentration on Reach E near Falgout Canal referenced in the SHPO letter are not within the Area of Potential Effects for the constructible features, and Section 106 consultation will continue as additional features are planned for construction.

In an effort to continue government-to-government consultation in partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, the CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in the draft RPEIS to significantly affect protected tribal resources, tribal rights, or Indian lands.

A copy of the draft RPEIS is available online at http://1.usa.gov/ZVel3A. Please contact Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; Environmental Planning Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267; to request a hard copy. Requests may also be made by email to Nathan.S.Dayan@usace.army.mil or by phone to (504) 862-2530.

As always, should you have any questions, you may contact Ms. Rebecca Hill; Archeologist/Tribal Liaison; U.S. Army Corps of Engineers, New Orleans District; (504) 862-1474; rebecca.hill@usace.army.mil. An electronic copy of this letter with the enclosures will be provided to Ms. Kimberly Walden, M. Ed., Cultural Director, Chitimacha Tribe of Louisiana, kswalden@chitimacha.gov.

Sincerely,

Joan M Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch

Enclosures

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

REPLY TO
ATTENTION OF:

March 5, 2013

Regional Planning and
Environment Division, South

Gregory E. Pyle, Chief
Choctaw Nation of Oklahoma
P.O. Box 1210
Durant, OK 74702-1210

Dear Chief Pyle:

The U.S. Army Corps of Engineers, New Orleans District (CEMVN), has prepared a draft Revised Programmatic Environmental Impact Statement (RPEIS) for the Mississippi River and Tributaries – Morganza to the Gulf of Mexico, Louisiana project to evaluate the potential impacts to the environment associated with the proposed Morganza to the Gulf of Mexico, Louisiana hurricane and storm damage risk reduction project in Terrebonne and Lafourche parishes. The RPEIS is available for your review and comment.

The RPEIS is a revision to the 2002 Final Programmatic EIS for the project, which was not finalized with the signing of a Record of Decision. A revision is required because project alternatives have been modified as a result of new hurricane and storm damage risk reduction design guidelines issued after hurricanes Katrina and Rita.

The project is located approximately 60 miles southwest of New Orleans, Louisiana, and includes most of Terrebonne Parish, excluding the barrier islands, and the portion of Lafourche Parish between the Terrebonne Parish eastern boundary and Bayou Lafourche. A project fact sheet is enclosed.

The tentatively selected plan would include the construction of 98 miles of earthen levee, approximately 85 miles of which would overlay existing hydrologic barriers such as natural ridges, roadbeds, and existing levees. The remaining levee alignment would be constructed in unprotected coastal wetlands. Construction would include 22 floodgates on navigable waterways, including the Houma Navigation Canal (HNC) lock complex, and 23 environmental water control structures designed to allow tidal exchange through the levee. The structural features would be integrated into the levee alignment to provide hurricane and storm damage risk reduction, drainage, and navigational passage.

Although programmatic in nature, this RPEIS has sufficient details and impact analyses for some features so that construction can proceed on those features. The four features that are expected to be identified as constructible include: Levee Reach F1 and F2, Levee Reach G1, the HNC lock complex, and the Bayou Grand Caillou Floodgate. The remaining components of the

project are programmatic features that will require additional NEPA investigations before construction can occur.

CEMVN concluded that "the constructible features will have no impacts to cultural resources," and this finding was coordinated with the Louisiana State Historic Preservation Officer (SHPO) and federally-recognized Tribes on June 15, 2012. In the enclosed letter dated February 26, 2013, the SHPO concurred that "no historic properties were identified within the constructible features of Reaches F1, F2, G1, the Houma Navigation Canal Lock Complex and the Bayou Grand Caillou Floodgate," and as such "have no objections to the implementation of this portion of the project." Site 16TR71 and the uncharacterized shell concentration on Reach E near Falgout Canal referenced in the SHPO letter are not within the Area of Potential Effects for the constructible features, and Section 106 consultation will continue as additional features are planned for construction.

In an effort to continue government-to-government consultation in partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, the CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in the draft RPEIS to significantly affect protected tribal resources, tribal rights, or Indian lands.

A copy of the draft RPEIS is available online at http://1.usa.gov/ZVel3A. Please contact Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; Environmental Planning Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267; to request a hard copy. Requests may also be made by email to Nathan.S.Dayan@usace.army.mil or by phone to (504) 862-2530.

As always, should you have any questions about the proposed undertaking, you may contact Ms. Rebecca Hill; Archeologist/Tribal Liaison; U.S. Army Corps of Engineers, New Orleans District; (504) 862-1474; rebecca.hill@usace.army.mil. An electronic copy of this letter with the enclosures will be provided to Mr. Ian Thompson, Director/Tribal Historic Preservation Officer, Choctaw Nation of Oklahoma, ithompson@choctawnation.com.

Sincerely,

Joan M Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch

Enclosures

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

REPLY TO
ATTENTION OF:

March 5, 2013

Regional Planning and
Environment Division, South

Kevin Sickey, Chief
Coushatta Tribe of Louisiana
P.O. Box 818
Elton, LA 70532

Dear Chief Sickey:

The U.S. Army Corps of Engineers, New Orleans District (CEMVN), has prepared a draft Revised Programmatic Environmental Impact Statement (RPEIS) for the Mississippi River and Tributaries – Morganza to the Gulf of Mexico, Louisiana project to evaluate the potential impacts to the environment associated with the proposed Morganza to the Gulf of Mexico, Louisiana hurricane and storm damage risk reduction project in Terrebonne and Lafourche parishes. The RPEIS is available for your review and comment.

The RPEIS is a revision to the 2002 Final Programmatic EIS for the project, which was not finalized with the signing of a Record of Decision. A revision is required because project alternatives have been modified as a result of new hurricane and storm damage risk reduction design guidelines issued after hurricanes Katrina and Rita.

The project is located approximately 60 miles southwest of New Orleans, Louisiana, and includes most of Terrebonne Parish, excluding the barrier islands, and the portion of Lafourche Parish between the Terrebonne Parish eastern boundary and Bayou Lafourche. A project fact sheet is enclosed.

The tentatively selected plan would include the construction of 98 miles of earthen levee, approximately 85 miles of which would overlay existing hydrologic barriers such as natural ridges, roadbeds, and existing levees. The remaining levee alignment would be constructed in unprotected coastal wetlands. Construction would include 22 floodgates on navigable waterways, including the Houma Navigation Canal (HNC) lock complex, and 23 environmental water control structures designed to allow tidal exchange through the levee. The structural features would be integrated into the levee alignment to provide hurricane and storm damage risk reduction, drainage, and navigational passage.

Although programmatic in nature, this RPEIS has sufficient details and impact analyses for some features so that construction can proceed on those features. The four features that are expected to be identified as constructible include: Levee Reach F1 and F2, Levee Reach G1, the HNC lock complex, and the Bayou Grand Caillou Floodgate. The remaining components of the

project are programmatic features that will require additional NEPA investigations before construction can occur.

CEMVN concluded that "the constructible features will have no impacts to cultural resources," and this finding was coordinated with the Louisiana State Historic Preservation Officer (SHPO) and federally-recognized Tribes on June 15, 2012. In the enclosed letter dated February 26, 2013, the SHPO concurred that "no historic properties were identified within the constructible features of Reaches F1, F2, G1, the Houma Navigation Canal Lock Complex and the Bayou Grand Caillou Floodgate," and as such "have no objections to the implementation of this portion of the project." Site 16TR71 and the uncharacterized shell concentration on Reach E near Falgout Canal referenced in the SHPO letter are not within the Area of Potential Effects for the constructible features, and Section 106 consultation will continue as additional features are planned for construction.

In an effort to continue government-to-government consultation in partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, the CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in the draft RPEIS to significantly affect protected tribal resources, tribal rights, or Indian lands.

A copy of the draft RPEIS is available online at http://1.usa.gov/ZVel3A. Please contact Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; Environmental Planning Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267; to request a hard copy. Requests may also be made by email to Nathan.S.Dayan@usace.army.mil or by phone to (504) 862-2530.

As always, should you have any questions about the proposed undertaking, you may contact Ms. Rebecca Hill; Archeologist/Tribal Liaison; U.S. Army Corps of Engineers, New Orleans District; (504) 862-1474; rebecca.hill@usace.army.mil. An electronic copy of this letter with the enclosures will be provided to Dr. Linda Langley, THPO, Coushatta Tribe of Louisiana, lllangley@mcneese.edu, and Mr. Michael Tarpley, Deputy THPO, Coushatta Tribe of Louisiana, kokua.aina57@gmail.com.

Sincerely,

Joan M Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch

Enclosures

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

REPLY TO
ATTENTION OF:

March 5, 2013

Regional Planning and
Environment Division, South

B. Cheryl Smith, Principal Chief
Jena Band of Choctaw Indians
P.O. Box 14
Jena, LA 71342

Dear Principal Chief Smith:

The U.S. Army Corps of Engineers, New Orleans District (CEMVN), has prepared a draft Revised Programmatic Environmental Impact Statement (RPEIS) for the Mississippi River and Tributaries – Morganza to the Gulf of Mexico, Louisiana project to evaluate the potential impacts to the environment associated with the proposed Morganza to the Gulf of Mexico, Louisiana hurricane and storm damage risk reduction project in Terrebonne and Lafourche parishes. The RPEIS is available for your review and comment.

The RPEIS is a revision to the 2002 Final Programmatic EIS for the project, which was not finalized with the signing of a Record of Decision. A revision is required because project alternatives have been modified as a result of new hurricane and storm damage risk reduction design guidelines issued after hurricanes Katrina and Rita.

The project is located approximately 60 miles southwest of New Orleans, Louisiana, and includes most of Terrebonne Parish, excluding the barrier islands, and the portion of Lafourche Parish between the Terrebonne Parish eastern boundary and Bayou Lafourche. A project fact sheet is enclosed.

The tentatively selected plan would include the construction of 98 miles of earthen levee, approximately 85 miles of which would overlay existing hydrologic barriers such as natural ridges, roadbeds, and existing levees. The remaining levee alignment would be constructed in unprotected coastal wetlands. Construction would include 22 floodgates on navigable waterways, including the Houma Navigation Canal (HNC) lock complex, and 23 environmental water control structures designed to allow tidal exchange through the levee. The structural features would be integrated into the levee alignment to provide hurricane and storm damage risk reduction, drainage, and navigational passage.

Although programmatic in nature, this RPEIS has sufficient details and impact analyses for some features so that construction can proceed on those features. The four features that are expected to be identified as constructible include: Levee Reach F1 and F2, Levee Reach G1, the HNC lock complex, and the Bayou Grand Caillou Floodgate. The remaining components of the

project are programmatic features that will require additional NEPA investigations before construction can occur.

CEMVN concluded that "the constructible features will have no impacts to cultural resources," and this finding was coordinated with the Louisiana State Historic Preservation Officer (SHPO) and federally-recognized Tribes on June 15, 2012. In the enclosed letter dated February 26, 2013, the SHPO concurred that "no historic properties were identified within the constructible features of Reaches F1, F2, G1, the Houma Navigation Canal Lock Complex and the Bayou Grand Caillou Floodgate," and as such "have no objections to the implementation of this portion of the project." Site 16TR71 and the uncharacterized shell concentration on Reach E near Falgout Canal referenced in the SHPO letter are not within the Area of Potential Effects for the constructible features, and Section 106 consultation will continue as additional features are planned for construction.

In an effort to continue government-to-government consultation in partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, the CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in the draft RPEIS to significantly affect protected tribal resources, tribal rights, or Indian lands.

A copy of the draft RPEIS is available online at http://1.usa.gov/ZVel3A. Please contact Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; Environmental Planning Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267; to request a hard copy. Requests may also be made by email to Nathan.S.Dayan@usace.army.mil or by phone to (504) 862-2530.

As always, should you have any questions about the proposed undertaking, you may contact Ms. Rebecca Hill; Archeologist/Tribal Liaison; U.S. Army Corps of Engineers, New Orleans District; (504) 862-1474; rebecca.hill@usace.army.mil. An electronic copy of this letter with the enclosures will be provided to Ms. Dana Masters, Tribal Historic Preservation Officer, Jena Band of Choctaw Indians, jbc.thpo106@aol.com, and Ms. Lillie McCormick, Environmental Director, Jena Band of Choctaw Indians, lmmccormickjbc@centurytel.net.

Sincerely,

Joan M Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch

Enclosures

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

REPLY TO
ATTENTION OF:

March 5, 2013

Regional Planning and
Environment Division, South

Phyliss J. Anderson, Chief
Mississippi Band of Choctaw Indians
P.O. Box 6257
Choctaw, MS 39350

Dear Chief Anderson:

The U.S. Army Corps of Engineers, New Orleans District (CEMVN), has prepared a draft Revised Programmatic Environmental Impact Statement (RPEIS) for the Mississippi River and Tributaries – Morganza to the Gulf of Mexico, Louisiana project to evaluate the potential impacts to the environment associated with the proposed Morganza to the Gulf of Mexico, Louisiana hurricane and storm damage risk reduction project in Terrebonne and Lafourche parishes. The RPEIS is available for your review and comment.

The RPEIS is a revision to the 2002 Final Programmatic EIS for the project, which was not finalized with the signing of a Record of Decision. A revision is required because project alternatives have been modified as a result of new hurricane and storm damage risk reduction design guidelines issued after hurricanes Katrina and Rita.

The project is located approximately 60 miles southwest of New Orleans, Louisiana, and includes most of Terrebonne Parish, excluding the barrier islands, and the portion of Lafourche Parish between the Terrebonne Parish eastern boundary and Bayou Lafourche. A project fact sheet is enclosed.

The tentatively selected plan would include the construction of 98 miles of earthen levee, approximately 85 miles of which would overlay existing hydrologic barriers such as natural ridges, roadbeds, and existing levees. The remaining levee alignment would be constructed in unprotected coastal wetlands. Construction would include 22 floodgates on navigable waterways, including the Houma Navigation Canal (HNC) lock complex, and 23 environmental water control structures designed to allow tidal exchange through the levee. The structural features would be integrated into the levee alignment to provide hurricane and storm damage risk reduction, drainage, and navigational passage.

Although programmatic in nature, this RPEIS has sufficient details and impact analyses for some features so that construction can proceed on those features. The four features that are expected to be identified as constructible include: Levee Reach F1 and F2, Levee Reach G1, the HNC lock complex, and the Bayou Grand Caillou Floodgate. The remaining components of the

project are programmatic features that will require additional NEPA investigations before construction can occur.

CEMVN concluded that "the constructible features will have no impacts to cultural resources," and this finding was coordinated with the Louisiana State Historic Preservation Officer (SHPO) and federally-recognized Tribes on June 15, 2012. In the enclosed letter dated February 26, 2013, the SHPO concurred that "no historic properties were identified within the constructible features of Reaches F1, F2, G1, the Houma Navigation Canal Lock Complex and the Bayou Grand Caillou Floodgate," and as such "have no objections to the implementation of this portion of the project." Site 16TR71 and the uncharacterized shell concentration on Reach E near Falgout Canal referenced in the SHPO letter are not within the Area of Potential Effects for the constructible features, and Section 106 consultation will continue as additional features are planned for construction.

In an effort to continue government-to-government consultation in partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, the CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in the draft RPEIS to significantly affect protected tribal resources, tribal rights, or Indian lands.

A copy of the draft RPEIS is available online at http://1.usa.gov/ZVel3A. Please contact Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; Environmental Planning Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267; to request a hard copy. Requests may also be made by email to Nathan.S.Dayan@usace.army.mil or by phone to (504) 862-2530.

As always, should you have any questions about the proposed undertaking, you may contact Ms. Rebecca Hill; Archeologist/Tribal Liaison; U.S. Army Corps of Engineers, New Orleans District; (504) 862-1474; rebecca.hill@usace.army.mil. An electronic copy of this letter with the enclosures will be provided to Mr. Kenneth H. Carleton, Tribal Historic Preservation Officer/ Archaeologist, Mississippi Band of Choctaw Indians, kcarleton@choctaw.org.

Sincerely,

Joan M Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch

Enclosures

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

REPLY TO
ATTENTION OF:

March 5, 2013

Regional Planning and
Environment Division, South

John Berrey, Chairman
Quapaw Tribe of Oklahoma
P.O. Box 765
Quapaw, OK 74363

Dear Chairman Berrey:

The U.S. Army Corps of Engineers, New Orleans District (CEMVN), has prepared a draft Revised Programmatic Environmental Impact Statement (RPEIS) for the Mississippi River and Tributaries – Morganza to the Gulf of Mexico, Louisiana project to evaluate the potential impacts to the environment associated with the proposed Morganza to the Gulf of Mexico, Louisiana hurricane and storm damage risk reduction project in Terrebonne and Lafourche parishes. The RPEIS is available for your review and comment.

The RPEIS is a revision to the 2002 Final Programmatic EIS for the project, which was not finalized with the signing of a Record of Decision. A revision is required because project alternatives have been modified as a result of new hurricane and storm damage risk reduction design guidelines issued after hurricanes Katrina and Rita.

The project is located approximately 60 miles southwest of New Orleans, Louisiana, and includes most of Terrebonne Parish, excluding the barrier islands, and the portion of Lafourche Parish between the Terrebonne Parish eastern boundary and Bayou Lafourche. A project fact sheet is enclosed.

The tentatively selected plan would include the construction of 98 miles of earthen levee, approximately 85 miles of which would overlay existing hydrologic barriers such as natural ridges, roadbeds, and existing levees. The remaining levee alignment would be constructed in unprotected coastal wetlands. Construction would include 22 floodgates on navigable waterways, including the Houma Navigation Canal (HNC) lock complex, and 23 environmental water control structures designed to allow tidal exchange through the levee. The structural features would be integrated into the levee alignment to provide hurricane and storm damage risk reduction, drainage, and navigational passage.

Although programmatic in nature, this RPEIS has sufficient details and impact analyses for some features so that construction can proceed on those features. The four features that are expected to be identified as constructible include: Levee Reach F1 and F2, Levee Reach G1, the HNC lock complex, and the Bayou Grand Caillou Floodgate. The remaining components of the

project are programmatic features that will require additional NEPA investigations before construction can occur.

CEMVN concluded that "the constructible features will have no impacts to cultural resources," and this finding was coordinated with the Louisiana State Historic Preservation Officer (SHPO) and federally-recognized Tribes on June 15, 2012. In the enclosed letter dated February 26, 2013, the SHPO concurred that "no historic properties were identified within the constructible features of Reaches F1, F2, G1, the Houma Navigation Canal Lock Complex and the Bayou Grand Caillou Floodgate," and as such "have no objections to the implementation of this portion of the project." Site 16TR71 and the uncharacterized shell concentration on Reach E near Falgout Canal referenced in the SHPO letter are not within the Area of Potential Effects for the constructible features, and Section 106 consultation will continue as additional features are planned for construction.

In an effort to continue government-to-government consultation in partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, the CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in the draft RPEIS to significantly affect protected tribal resources, tribal rights, or Indian lands.

A copy of the draft RPEIS is available online at http://1.usa.gov/ZVel3A. Please contact Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; Environmental Planning Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267; to request a hard copy. Requests may also be made by email to Nathan.S.Dayan@usace.army.mil or by phone to (504) 862-2530.

As always, should you have any questions about the proposed undertaking, you may contact Ms. Rebecca Hill; Archeologist/Tribal Liaison; U.S. Army Corps of Engineers, New Orleans District; (504) 862-1474; rebecca.hill@usace.army.mil. An electronic copy of this letter with the enclosures will be provided to Ms. Jean Ann Lambert, Tribal Historic Preservation Officer, Quapaw Tribe of Oklahoma, jlambert@quapawtribe.com.

Sincerely,

Joan M. Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch

Enclosures

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

REPLY TO
ATTENTION OF:

March 5, 2013

Regional Planning and
Environment Division, South

Leonard M. Harjo, Principal Chief
Seminole Nation of Oklahoma
P.O. Box 1498
Wewoka, OK 74884

Dear Principal Chief Harjo:

The U.S. Army Corps of Engineers, New Orleans District (CEMVN), has prepared a draft Revised Programmatic Environmental Impact Statement (RPEIS) for the Mississippi River and Tributaries – Morganza to the Gulf of Mexico, Louisiana project to evaluate the potential impacts to the environment associated with the proposed Morganza to the Gulf of Mexico, Louisiana hurricane and storm damage risk reduction project in Terrebonne and Lafourche parishes. The RPEIS is available for your review and comment.

The RPEIS is a revision to the 2002 Final Programmatic EIS for the project, which was not finalized with the signing of a Record of Decision. A revision is required because project alternatives have been modified as a result of new hurricane and storm damage risk reduction design guidelines issued after hurricanes Katrina and Rita.

The project is located approximately 60 miles southwest of New Orleans, Louisiana, and includes most of Terrebonne Parish, excluding the barrier islands, and the portion of Lafourche Parish between the Terrebonne Parish eastern boundary and Bayou Lafourche. A project fact sheet is enclosed.

The tentatively selected plan would include the construction of 98 miles of earthen levee, approximately 85 miles of which would overlay existing hydrologic barriers such as natural ridges, roadbeds, and existing levees. The remaining levee alignment would be constructed in unprotected coastal wetlands. Construction would include 22 floodgates on navigable waterways, including the Houma Navigation Canal (HNC) lock complex, and 23 environmental water control structures designed to allow tidal exchange through the levee. The structural features would be integrated into the levee alignment to provide hurricane and storm damage risk reduction, drainage, and navigational passage.

Although programmatic in nature, this RPEIS has sufficient details and impact analyses for some features so that construction can proceed on those features. The four features that are expected to be identified as constructible include: Levee Reach F1 and F2, Levee Reach G1, the HNC lock complex, and the Bayou Grand Caillou Floodgate. The remaining components of the

project are programmatic features that will require additional NEPA investigations before construction can occur.

CEMVN concluded that "the constructible features will have no impacts to cultural resources," and this finding was coordinated with the Louisiana State Historic Preservation Officer (SHPO) and federally-recognized Tribes on June 15, 2012. In the enclosed letter dated February 26, 2013, the SHPO concurred that "no historic properties were identified within the constructible features of Reaches F1, F2, G1, the Houma Navigation Canal Lock Complex and the Bayou Grand Caillou Floodgate," and as such "have no objections to the implementation of this portion of the project." Site 16TR71 and the uncharacterized shell concentration on Reach E near Falgout Canal referenced in the SHPO letter are not within the Area of Potential Effects for the constructible features, and Section 106 consultation will continue as additional features are planned for construction.

In an effort to continue government-to-government consultation in partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, the CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in the draft RPEIS to significantly affect protected tribal resources, tribal rights, or Indian lands.

A copy of the draft RPEIS is available online at http://1.usa.gov/ZVel3A. Please contact Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; Environmental Planning Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267; to request a hard copy. Requests may also be made by email to Nathan.S.Dayan@usace.army.mil or by phone to (504) 862-2530.

As always, should you have any questions about the proposed undertaking, you may contact Ms. Rebecca Hill; Archeologist/Tribal Liaison; U.S. Army Corps of Engineers, New Orleans District; (504) 862-1474; rebecca.hill@usace.army.mil. An electronic copy of this letter with the enclosures will be provided to Ms. Natalie Harjo, Tribal Historic Preservation Officer, Seminole Nation of Oklahoma, harjo.n@sno-nsn.gov.

Sincerely,

Joan M Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch

Enclosures

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

REPLY TO ATTENTION OF:

March 5, 2013

Regional Planning and
Environment Division, South

James Billie, Chairman
Seminole Tribe of Florida
6300 Stirling Road
Hollywood, FL 33024

Dear Chairman Billie:

The U.S. Army Corps of Engineers, New Orleans District (CEMVN), has prepared a draft Revised Programmatic Environmental Impact Statement (RPEIS) for the Mississippi River and Tributaries – Morganza to the Gulf of Mexico, Louisiana project to evaluate the potential impacts to the environment associated with the proposed Morganza to the Gulf of Mexico, Louisiana hurricane and storm damage risk reduction project in Terrebonne and Lafourche parishes. The RPEIS is available for your review and comment.

The RPEIS is a revision to the 2002 Final Programmatic EIS for the project, which was not finalized with the signing of a Record of Decision. A revision is required because project alternatives have been modified as a result of new hurricane and storm damage risk reduction design guidelines issued after hurricanes Katrina and Rita.

The project is located approximately 60 miles southwest of New Orleans, Louisiana, and includes most of Terrebonne Parish, excluding the barrier islands, and the portion of Lafourche Parish between the Terrebonne Parish eastern boundary and Bayou Lafourche. A project fact sheet is enclosed.

The tentatively selected plan would include the construction of 98 miles of earthen levee, approximately 85 miles of which would overlay existing hydrologic barriers such as natural ridges, roadbeds, and existing levees. The remaining levee alignment would be constructed in unprotected coastal wetlands. Construction would include 22 floodgates on navigable waterways, including the Houma Navigation Canal (HNC) lock complex, and 23 environmental water control structures designed to allow tidal exchange through the levee. The structural features would be integrated into the levee alignment to provide hurricane and storm damage risk reduction, drainage, and navigational passage.

Although programmatic in nature, this RPEIS has sufficient details and impact analyses for some features so that construction can proceed on those features. The four features that are expected to be identified as constructible include: Levee Reach F1 and F2, Levee Reach G1, the HNC lock complex, and the Bayou Grand Caillou Floodgate. The remaining components of the

project are programmatic features that will require additional NEPA investigations before construction can occur.

CEMVN concluded that "the constructible features will have no impacts to cultural resources," and this finding was coordinated with the Louisiana State Historic Preservation Officer (SHPO) and federally-recognized Tribes on June 15, 2012. In the enclosed letter dated February 26, 2013, the SHPO concurred that "no historic properties were identified within the constructible features of Reaches F1, F2, G1, the Houma Navigation Canal Lock Complex and the Bayou Grand Caillou Floodgate," and as such "have no objections to the implementation of this portion of the project." Site 16TR71 and the uncharacterized shell concentration on Reach E near Falgout Canal referenced in the SHPO letter are not within the Area of Potential Effects for the constructible features, and Section 106 consultation will continue as additional features are planned for construction.

In an effort to continue government-to-government consultation in partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, the CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in the draft RPEIS to significantly affect protected tribal resources, tribal rights, or Indian lands.

A copy of the draft RPEIS is available online at http://1.usa.gov/ZVel3A. Please contact Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; Environmental Planning Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267; to request a hard copy. Requests may also be made by email to Nathan.S.Dayan@usace.army.mil or by phone to (504) 862-2530.

As always, should you have any questions about the proposed undertaking, you may contact Ms. Rebecca Hill; Archeologist/Tribal Liaison; U.S. Army Corps of Engineers, New Orleans District; (504) 862-1474; rebecca.hill@usace.army.mil. An electronic copy of this letter with the enclosures will be provided to Mr. Paul N. Backhouse, Tribal Historic Preservation Officer, Seminole Tribe of Florida, paulbackhouse@semtribe.com; Ms. Anne Mullins, Project Coordinator, annemullins@semtribe.com; and Mr. Elliott York, Compliance Review and Data Analyst, elliottyork@semtribe.com; and Ms. Alison Swing, Compliance Review Data Analyst, alisonswing@semtribe.com.

Sincerely,

Joan M Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch

Enclosures

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

REPLY TO
ATTENTION OF:

March 5, 2013

Regional Planning and
Environment Division, South

Earl J. Barbry, Sr., Chairman
Tunica-Biloxi Tribe of Louisiana
P.O. Box 1589
Marksville, LA 71351

Dear Chairman Barbry:

The U.S. Army Corps of Engineers, New Orleans District (CEMVN), has prepared a draft Revised Programmatic Environmental Impact Statement (RPEIS) for the Mississippi River and Tributaries – Morganza to the Gulf of Mexico, Louisiana project to evaluate the potential impacts to the environment associated with the proposed Morganza to the Gulf of Mexico, Louisiana hurricane and storm damage risk reduction project in Terrebonne and Lafourche parishes. The RPEIS is available for your review and comment.

The RPEIS is a revision to the 2002 Final Programmatic EIS for the project, which was not finalized with the signing of a Record of Decision. A revision is required because project alternatives have been modified as a result of new hurricane and storm damage risk reduction design guidelines issued after hurricanes Katrina and Rita.

The project is located approximately 60 miles southwest of New Orleans, Louisiana, and includes most of Terrebonne Parish, excluding the barrier islands, and the portion of Lafourche Parish between the Terrebonne Parish eastern boundary and Bayou Lafourche. A project fact sheet is enclosed.

The tentatively selected plan would include the construction of 98 miles of earthen levee, approximately 85 miles of which would overlay existing hydrologic barriers such as natural ridges, roadbeds, and existing levees. The remaining levee alignment would be constructed in unprotected coastal wetlands. Construction would include 22 floodgates on navigable waterways, including the Houma Navigation Canal (HNC) lock complex, and 23 environmental water control structures designed to allow tidal exchange through the levee. The structural features would be integrated into the levee alignment to provide hurricane and storm damage risk reduction, drainage, and navigational passage.

Although programmatic in nature, this RPEIS has sufficient details and impact analyses for some features so that construction can proceed on those features. The four features that are expected to be identified as constructible include: Levee Reach F1 and F2, Levee Reach G1, the HNC lock complex, and the Bayou Grand Caillou Floodgate. The remaining components of the

project are programmatic features that will require additional NEPA investigations before construction can occur.

CEMVN concluded that "the constructible features will have no impacts to cultural resources," and this finding was coordinated with the Louisiana State Historic Preservation Officer (SHPO) and federally-recognized Tribes on June 15, 2012. In the enclosed letter dated February 26, 2013, the SHPO concurred that "no historic properties were identified within the constructible features of Reaches F1, F2, G1, the Houma Navigation Canal Lock Complex and the Bayou Grand Caillou Floodgate," and as such "have no objections to the implementation of this portion of the project." Site 16TR71 and the uncharacterized shell concentration on Reach E near Falgout Canal referenced in the SHPO letter are not within the Area of Potential Effects for the constructible features, and Section 106 consultation will continue as additional features are planned for construction.

In an effort to continue government-to-government consultation in partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, the CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in the draft RPEIS to significantly affect protected tribal resources, tribal rights, or Indian lands.

A copy of the draft RPEIS is available online at http://1.usa.gov/ZVel3A. Please contact Mr. Nathan Dayan; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; Environmental Planning Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267; to request a hard copy. Requests may also be made by email to Nathan.S.Dayan@usace.army.mil or by phone to (504) 862-2530.

As always, should you have any questions about the proposed undertaking, you may contact Ms. Rebecca Hill; Archeologist/Tribal Liaison; U.S. Army Corps of Engineers, New Orleans District; (504) 862-1474; rebecca.hill@usace.army.mil. An electronic copy of this letter with the enclosures will be provided to Mr. Earl Barbry, Jr., Cultural Director, Tunica-Biloxi Tribe of Louisiana, earlii@tunica.org.

Sincerely,

Joan M Exnicios

Joan M. Exnicios
Chief, Environmental Planning Branch

Enclosures

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

March 28, 2013

Ms. Joan Exnicios
Regional Planning and Environmental Division South
New Orleans District Environmental Branch
U.S. Army Corps of Engineers
CEMVN-PDN-CEP
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Ms. Exnicios:

NOAA's National Marine Fisheries Service (NMFS) has received your letter dated March 25, 2013, pertaining to the U.S. Army Corps of Engineers' (USACE) draft revised programmatic environmental impact statement (RPEIS) for the Mississippi River and Tributaries-Morganza to the Gulf of Mexico, Louisiana Project.

By letter dated February 14, 2013, NMFS provided comments to the USACE on the draft RPEIS including seven essential fish habitat (EFH) conservation recommendations pursuant to consultation under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). In abbreviated summary, the EFH conservation recommendations requested: (1) reassessment of indirect impacts for constructible and programmatic features included in the Tentatively Selected Plan; (2) development of a clarified operation plan including non-storm closures; and, (3) development of a complete and adequate mitigation plan with reconciliation of the items included in the final RPEIS prior to signing the Record of Decision (ROD).

The USACE's March 25, 2013, letter provided responses to our EFH conservation recommendations. By electronic mail on March 25 and March 26, 2013, revisions to Section 6.19 and Appendix K for the final RPEIS pertaining to mitigation were transmitted to NMFS as additive information to supplement the USACE's March 25th response. A revised operation plan was prepared with the Non-Federal Sponsor and the USACE committed to a qualitative assessment of programmatic indirect impacts. Also, there was a commitment to quantitatively assess indirect impacts for constructible features, which since have been completed. However, there has been limited quality assurance/quality control review due to time constraints required by the USACE. The USACE has agreed to incorporate explanations in the final RPEIS of the indirect impacts on wetlands, fisheries, water quality, and navigation including the degree those impacts would vary under different sea level rise scenarios. Due to the rapid rate of revisions with limited review, NMFS recommends any discrepancies or inconsistencies identified be corrected at the time of discovery leading up to signature of the ROD or subsequently during the Preliminary Engineering and Design (PED).

The overall mitigation plan, specifically the type and acres proposed for impacts from both constructible and programmatic features, is now a substantial improvement from the 2002 PEIS and the 2013 draft RPEIS. Notably, the USACE has committed in the revisions to constructing marsh mitigation for indirect impacts for constructible features. NMFS appreciates this substantive step. Acknowledging uncertainty, a range of indirect impacts for constructible features were projected based on different operation plans and sea level rise scenarios. At this time, the USACE has scaled mitigation to offset the middle of the range of impacts projected. Because of the uncertainty of indirect impacts, NMFS is willing to revisit the indirect impacts and correspondingly scaled mitigation for constructible features, if information becomes available to justify a change.

The revised mitigation plan descriptions acknowledge if a source for additional fill, other than organic overburden excavated from the levees and the lock, is needed to construct the marsh creation mitigation then additional borrow areas will be identified later. NMFS recommends the ROD commit to supplemental environmental clearance if additional borrow areas not presently identified in the draft RPEIS are deemed necessary during the PED phase.

Due to the ecosystem level of potential project impacts, continued early and often coordination with NMFS is requested through future phases of the project. Given the USACE commitments summarized above, our EFH conservation recommendations have been satisfactorily addressed at this time. This satisfies the consultation procedures outlined in 50 CFR Section 600.920, the regulation to implement the EFH provisions of the Magnuson-Stevens Act. Assuming the project is not further revised, this concludes the consultation requirements pursuant to the EFH regulations of the Magnuson-Stevens Act.

Thank you for your staff endeavoring to resolve matters at the local level. We appreciate the efforts of your staff to address our concerns on this project. Please provide a copy of the final RPEIS and signed ROD to our Baton Rouge Field Office for their files.

Sincerely,

Virginia M. Fay

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division

c:
COE, New Orleans District, Dayan
FWS Lafayette, Paille, Walther
EPA, Ettinger
LDWF, Bourgeois, Hebert
LA DNR, Consistency, Lovell
F/SER46, Swafford
F/SER4, Dale, Rolfes
F/SER, Keys, Silverman
NOAA PPI, Nunekamp
Files

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

REPLY TO
ATTENTION OF

March 25, 2013

Regional Planning and
Environmental Division, South
Environmental Planning Branch

Jeff Weller, Field Supervisor
U.S. Fish and Wildlife Service
646 Cajundome Blvd - Suite 400
Lafayette, LA 70506

Dear Mr. Weller:

Please reference your letter dated February 14, 2013 providing comments on the draft revised programmatic environmental impact statement (RPEIS) for the Mississippi River and Tributaries-Morganza to the Gulf of Mexico, Louisiana Project. The USACE appreciates your input. The following statement has been added to the final PEIS and Biological Assessment.

It is the USACE determination that there would be No Affect to Threatened or Endangered Species or their critical habitat due to the Morganza to the Gulf Risk Reduction Project.

We are seeking your concurrence with this determination. If you have any questions or require additional information please contact Mr. Nathan Dayan at U.S. Army Corps of Engineers; Regional Planning and Environmental Division South; Environmental Planning Branch; CEMVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267. Mr. Dayan can also be reached at (504) 862-2530 or by email at nathan.s.dayan@usace.army.mil.

Sincerely,

for Sandra Stiles

Joan M. Exnicios
Chief, Environmental Planning Branch

Appendix I

WATER QUALITY CERTIFICATE

BOBBY JINDAL
GOVERNOR

PEGGY M. HATCH
SECRETARY

State of Louisiana

DEPARTMENT OF ENVIRONMENTAL QUALITY
ENVIRONMENTAL SERVICES

MAR 2 5 2013

U.S. Army Corps of Engineers- New Orleans District
P.O. Box 60267
New Orleans, LA 70160-0267

Attention: Nathan Dayan

RE: Water Quality Certification (WQC 031021-01/AI 90947/CER 20130001)
Morganza to the Gulf Hurricane & Storm Damage Risk Reduction Project
Revised Programmatic Environmental Impact Statement
Terrebonne Parish

Dear Mr. Dayan:

The Department has reviewed your draft revised programmatic environmental impact statement (RPEIS) to construct the Morganza to the Gulf hurricane and storm damage risk reduction project.

Based on the information provided in the application, the Department made a determination that the requirements for a Water Quality Certification have been met and concludes that the placement of the fill material will not violate water quality standards of Louisiana as provided for in LAC 33:IX.Chapter 11.

If you have any questions, please call Jamie Phillippe at 225-219-3225.

Sincerely,

Scott Guilliams

Scott Guilliams
Administrator
Water Permits Division

SG/jjp

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT (33 CFR 325)	*OMB APPROVAL NO. 0710-003* *Expires October 1996*

Public reporting burden for this collection of information is estimated to average 5 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003), Washington, DC 20503. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authority: 33 USC 401, Section 10; 1413, Section 404. Principal Purpose: These laws require permits authorizing activities in, or affecting, navigable waters of the United States, the discharge of dredged of fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Routine Uses: Information provided on this form will be used in evaluating the application or a permit. Disclosure: Disclosure of requested information is voluntary. If information is not provided, however, the permit application cannot be processed nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	*2. FIELD OFFICE CODE*	*3. DATE RECEIVED*	*4. DATE APPLICATION COMPLETED*

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME US Army Corps of Engineers, New Orleans District	*8. AUTHORIZED AGENT'S NAME AND TITLE (an agent is not required)* Same as Applicant
6. APPLICANT'S ADDRESS Regional Planning Division South CEMVN-PDN-CEP P.O. Box 60267 New Orleans, LA 70160-0267 ATTN: *Nathan Dayan*	***9. AGENT'S ADDRESS***
7. APPLICANT'S PHONE NOS. W/AREA CODE	*10. AGENT'S PHONE NOS. W/AREA CODE*
a. Residence ***b. Business*** (504) 862-2530	*a. Residence* *b. Business*

11. STATEMENT OF AUTHORIZATION

The study is authorized by: House Resolution, Docket 2376, April 30, 1992; and WRDA 96 (PL 104-303, Sec 425) the Energy and Water Development Appropriation Act of 1995 (PL 103-316), Section 425 of WRDA 96 (PL 104-303), Section 158 of the Energy and Water Development Appropriations Act, 2004 (PL 108-137), and Section 1001 of WRDA 2007 (Public Law 110-114) authorized construction for the project for:

> *hurricane and storm damage reduction, Morganza to the Gulf of Mexico, Louisiana: Reports of the Chief of Engineers dated August 23, 2002, and July 22, 2003, at a total cost of $886,700,000, with an estimated Federal cost of $576,355,000and an estimated non-Federal cost of $310,345,000. The operation, maintenance, repair, rehabilitation, and replacement of the Houma Navigation Canal lock complex and the Gulf Intracoastal Waterway floodgate features of the project described in subparagraph (A) that provide for inland waterway transportation shall be a Federal responsibility in accordance with section 102 of the Water Resources Development Act of 1986 (33 U.S.C. 2212).*

The Post Authorization Change (PAC) report and Revised Programmatic Environmental Impact Statement have been prepared.

Sandra Stiles, Ch Coastal Env. Section — 3/26/12

APPLICANT'S SIGNATURE *DATE*

NAME, LOCATION AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)
Mississippi River and Tributaries Morganza to the Gulf of Mexico, Louisiana Project

13. NAME OF WATERBODY, IF KNOWN (if applicable)

Multiple – Houma Navigation Canal, Bayou Black, GIWW, Bayou du Large, Bayou Grand Caillou, Bayou Terrebonne, Bayou Petit Caillou, Bayou Blue, Bayou Petit Caillou, Lake Boudreaux, Grand Bayou, Sweet Water Pond, etc

14. PROJECT STREET ADDRESS (if applicable)

See attached figure

15. LOCATION OF PROJECT

Terrebonne	Louisiana
COUNTY	*STATE*

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN, (see instructions)

See attached figure

17. DIRECTIONS TO THE SITE

See attached figure

18. Nature of Activity (Description of project, include all features.)

1% Annual Exceedance Probability Storm Surge Risk Reduction System (1% AEP Alternative) provides risk reduction for water levels that have a 1% chance of occurring each year (see figure). This alternative includes programmatic elements that would be further investigated in the future and constructible elements for which this water quality application is requested. The features that have been to be identified as constructible include, Levee Reach F1 and F2, Levee Reach G1, HNC Lock Complex (HNC Lock), and Bayou Grand Caillou Floodgate (BGC floodgate).

The 98-mile levee system would extend from high ground along US 90 near the town of Gibson and tie into Highway 1 near Lockport, LA in Lafourche Parish. Planned levee elevations range from 15.0 to 26.5 feet NAVD88. Toe-to-toe levee widths range from 282 feet to 725 feet. Twenty-two navigable floodgate structures, ranging in elevation from 17.0 to 33 feet (NAVD88), would be located on waterways throughout the levee system, including a lock complex on the HNC. Additionally, environmental water control structures would allow tidal exchange at 23 locations through the levee through sluice gates and box culverts.

Nine road gates would be located at the following levee/road crossings: NAFTA, Four Pointe Road, Highway 315 (DuLarge), Highway 55, Highway 56, Hwy 24, Hwy 3235, Union Pacific RR and Highway 665. Fronting protection would be provided for four pumping stations, including the Madison, Pointe aux Chenes, Elliot Jones (Bayou Black), and Hanson Canal pump stations.

Levees would be constructed using a combination of sidecast and hauled-in borrow materials. Adjacent side cast was planned for the pre-load section only. Borrow pits are oversized to offset the potential for encountering organics, expected losses, etc. The project would involve constructing 22 navigable floodgates, 23 environmental water control structures, six road gates, and fronting protection for four existing pumping stations. Structures on Federally maintained navigation channels include the Houma Navigation Canal Lock Complex (and 250-ft sector gate) and two 125-ft sector gates on the GIWW east and west of Houma. In addition, thirteen 56-ft sector gates and five 20- to 30-ft stop log gates are located on various waterways that cross the levee system.

19. Project Purpose (Describe the reason or purpose of the project, (see instruction.)

The purpose of this project is to provide hurricane and storm damage risk reduction for the communities located within the levee system. The goal is to maximize the number of residential and commercial structures protected from damage caused by hurricane storm surges.

USE BLOCKS 20-22 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

To build a levee system and required compensatory mitigation.

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Years.

Approximate 126 million cubic yards of earthen material (quality based on post-Katrina standards) would be used to build the complete levee alignment to its full height.

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

The constructible components of the 1% AEP Alternative would result in the filling of brackish and intermediate marshes and their conversion to uplands and open water. Table 6-1 summarizes the acres affected by the project's constructible and programmatic features.

Acres of Wetlands Directly Effected			
Features	**Tidal Wetlands**	**Force Drained Wetlands**	**Total wetlands**
Constructible Features	644.35	25.98	670.33
Programmatic Features*	3,017	31	3,048
Total Impact	3,661	57	3,718

23. Is Any Portion of the Work Already Complete? Yes _X____ No _____ IF YES, DESCRIBE THE COMPLETED WORK

Reach J1 was built covered in EA-406 and Water Quality Certificate #TR 031021-01 / AI 90947 / CER 2003000

24. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (If more than can be entered here, please attach a supplemental list.

Multiple

25. List of Other Certifications or Approvals/Denials Received from other Federal, State or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL	IDENTIFICATION NO.	DATE APPLIED	DATE APPROVED	DATE DENIED

To the best of my knowledge the proposed activity described in my permit application complies with and will be conducted in a manner that is consistent with the LA Coastal management Program.
**Would include but is not restricted to zoning, building and flood plain permits.*

26. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

Sandra Stiles — 3/23/12

SIGNATURE OF APPLICANT — DATE — SIGNATURE OF AGENT — DATE

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency The United States knowingly and willfully falsifies, conceals, or covers up by any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than five years, or both.

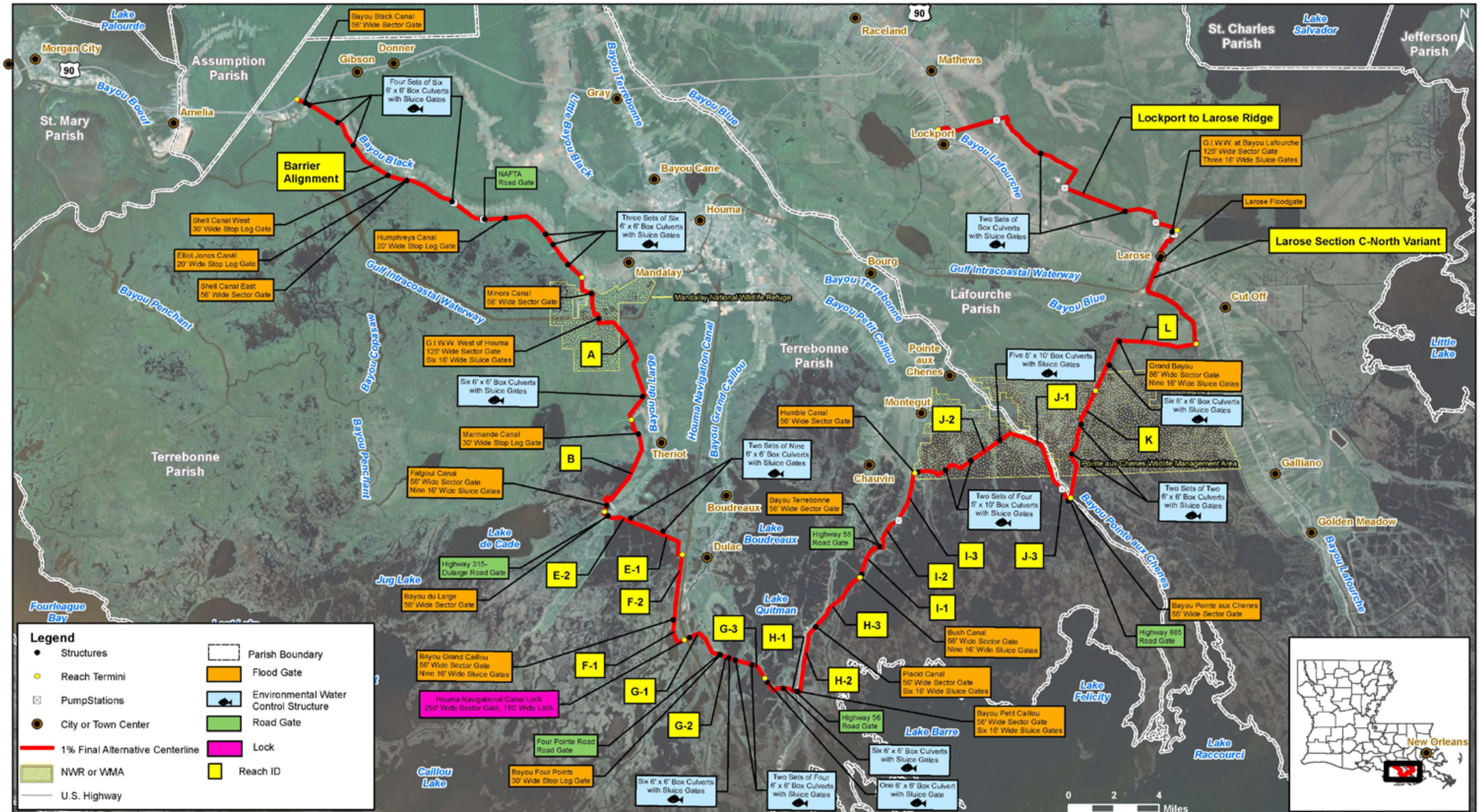


Figure 1. ALIGNMENT AND STRUCTURES OF THE 1% ANNUAL EXCEEDANCE PROBABILITY STORM SURGE RISK REDUCTION SYSTEM ALTERNATIVE

Morganza to the Gulf of Mexico, Louisiana
Revised Programmatic Environmental Impact Statement

Image: I3 USA Prime Imagery

GEC Gulf Engineers & Consultants

Figure: 1
Date: June 2012
Scale: 1:256,000
Source: USACE/GEC
Map ID: 273160010-2811

Appendix J

ENVIRONMENTAL JUSTICE REPORT

Morganza to the Gulf PEIS: Environmental Justice Appendix

An environmental justice analysis was conducted which focused on the potential for disproportionately high and adverse impacts to minority and low-income populations during the construction and normal operation of the proposed risk-reduction system. While the assessment identified the occurrence of minority and low-income populations within the project area, both inside and outside of the proposed system, no disproportionately high and adverse effects to environmental or human resources are evident with any of the alternatives. Overall, at the tract level, the assessment found comparable impacts for communities outside the system regardless of socioeconomic status or race/ethnicity.

A disproportionately high and adverse effect means the impact is appreciably more severe or greater in magnitude on minority or low-income populations than the adverse effect suffered by the non-minority or non-low-income populations after taking offsetting benefits into account.

The initial EJ analysis specifically included consideration of environmental justice concerns to include an assessment of the potential for disproportionately high and adverse effects to minority and/or low-income populations, as further described in Section 6.14.8 of the PEIS. Project impacts among minority and/or low-income populations were compared at the tract level to the impacts on the overall population within the project area using United States Census American Community Survey (ACS) data from 2005 and 2009. The impacts were found to be fairly distributed. Because the block group level data defines more EJ communities than the tract level data, the tract level data represents a more conservative evaluation of EJ communities and is useful in the analysis of EJ impacts in order to provide a consistent evaluation.

This appendix will provide additional information on EJ analysis methodology at the PEIS level. In future supplemental NEPA documents more details would be provided on EJ analysis including:

- Outreach and public involvement details
- Details of socioeconomic analysis for potential EJ impacts (demographics from the 2010 US Census at the census block level for race/ethnicity, and the 2007 – 2011 US Census American Community Survey at the census tract level for income/poverty) of residents both inside and outside of the levee system
- More details of buyout and buyout alternatives
    - Uniformed relocation assistance for communities to preserve cultures/languages/traditions

Methodology

For purposes of this analysis, EJ communities were identified when the percentage of minorities in a census block either exceeded 50 percent or was meaningfully greater than in the general population, and/or when low-income population percentage of census tracts was 20% or greater. Low-income populations of 20% or greater were considered a “poverty area” and populations of 40% or greater were defined as an “extreme poverty area”. Initially, the aggregate analysis used for EJ was at the census tract level. However, to provide a meaningful comparison, the analysis was refined at the recommendation of the US Environmental Protection Agency, Region 6 to include data at the census tract for income/poverty and census block level for race/ethnicity. Personal communication with Sharon Osowski, EPA Region 6, on March 1, 2013 confirmed this approach and level of analysis.

Analysis of the 2010 U.S. Census and the 2007 - 2011 ACS data indicates that 73 census blocks are located within 0.25 miles of the proposed 98-mile alignment ROW and residents could be affected by dust, noise and other construction-related activities. Approximately 32% of the residents living in the 73 census blocks are minority. Approximately 28% of the residents of the reference study areas of Lafourche and Terrebonne Parishes are minority. Residents of the census tracts around the proposed alignment, irrespective of income level, are expected to be similarly impacted by construction activities. Construction activities associated with the alignment are considered temporary in nature would not cause disproportionately high and adverse effects on any minority or low-income populations in accordance with the provisions of E.O. 12898.

Table 1. Induced Flood Area Community Data

Community Name	**Census Tract/Block**	**EJ Community**	**Percent Total Minority***	**Percent Households Below Poverty Level****
Gibson	16/2093, 2122	Yes	3%	21%
Bayou Du Large	14/1070, 1117, 1088	Yes	32%	42%
Dulac	13/1030, 1031, 1034	Yes	54%	31%
Cocodrie	12/1103, 1334, 1197, 1346-1350, 1232, 1329, 1330, 1076	No	15%	15%
Isle de Jean Charles	11/3061, 3064, 3080, 3084	Yes	90%	23%
*Source: US Census 2010 *Block Data, US Census ACS 2007 - 2011 **Tract Data*				

In the five communities (shown in Table 1) expected to experience induced flooding due to the proposed action, there are 24 census blocks. Of those 24 census blocks, 6 have a minority population of 50% or greater. The communities of Gibson and Bayou du Large consist of 5 block groups that could have induced flooding from the proposed alignment. None of those are predominately minority populations and they would not be identified as EJ communities. The communities of Dulac and Cocodrie have 15 census blocks and 2 of those are comprised of a minority population greater than 50%. Each of the 4 census blocks in the community of Isle de Jean Charles is comprised of a minority population greater than 50%. Two communities, Gibson and Dulac, meet the U.S. Census criteria for a poverty area while one, Bayou Du Large, meets the extreme poverty area designation.

The community of Dulac is bisected by the constructible features of the proposed alignment. The constructible feature cuts through one census block in Dulac which is comprised of a minority population of 56%. The constructible features would not result in induced flooding to the community of Dulac or other communities located outside of the proposed levee alignment. Residents of Dulac would be consulted at the time of Planning and Engineering Design (PED) to determine effective methods for minimizing construction related impacts and other potential impacts to the community.

An indirect impact of the construction of the project is the potential to raise water levels outside the levees by several feet during storm events causing induced flooding to several communities located outside of the proposed levee alignment. These areas include portions of the communities of Gibson, Bayou Dularge, Dulac, and all of Cocodrie and Isle de Jean Charles. As this is a Programmatic Environmental Impact Statement, additional analysis and outreach to identified EJ communities would be conducted during PED and documented in supplemental NEPA reports in order to minimize any potential disproportionate impacts, and develop appropriate mitigation strategies if necessary.

Mitigation for Adverse Impacts

A potential disproportionate impact may occur when the impact is appreciably more severe or greater in magnitude on minority or low-income populations than the adverse effect suffered by the non-minority or non-low-income populations after taking offsetting benefits into account. Regulations require that mitigation measures be developed to address environmental effects, including cumulative impacts, threatened by proposed actions (40 CFR 1502.14(f) and 1502.16(h)). In addition, mitigation measures should be developed specifically to address potential disproportionately high and adverse effects to minority and/or low-income communities. Potential mitigation measure for addressing adverse effects of construction of M2G could include:

- Providing assistance to the affected communities to ensure they receive a fair share of the anticipated benefits of the proposed action (infrastructure improvements)
- Providing uniform relocation assistance to the affected communities, with their concurrence

When identifying and developing potential mitigation measures to address environmental justice concerns, members of the affected communities would be consulted. Enhanced public participation efforts would also be conducted to ensure that effective mitigation measures are identified and that the effects of any potential mitigation measures are fully analyzed and compared. Mitigation measures may include a variety of approaches for addressing potential effects and balancing the needs and concerns of the affected community with the requirements of the action or activity. These details would be further identified and documented in supplemental NEPA documents to the RPEIS.

Appendix K

MITIGATION PLAN FOR CONSTRUCTIBLE ELEMENTS

APPENDIX K

MITIGATION PLAN FOR CONSTRUCTIBLE ELEMENTS

1. INTRODUCTION

A mitigation program (wetland mitigation plan) was developed by the USACE, in coordination with the Habitat Evaluation Team (HET), to compensate for both direct and indirect impacts to wetland habitats associated with the constructible elements of the proposed 1% AEP alternative (the 1% AEP project). These constructible elements (constructible components; constructible features) include project levee reaches F1, F2, and G1, the HNC Lock Complex, and the Bayou Grand Caillou Floodgate. This appendix provides detailed information concerning the proposed mitigation program.

All figures cited herein are provided at the end of this appendix. Section 10 contains definitions of certain terms used in this appendix. All elevations mentioned herein are expressed in feet NAVD88(2004.65).

2. MITIGATION OBJECTIVES

The primary objective of the proposed mitigation project is to restore approximately 394 acres of intermediate marsh habitat, 358 acres of brackish marsh habitat, and 883 acres of saline marsh habitat in order to fully compensate for direct and indirect impacts to fresh marsh, intermediate marsh, brackish marsh, and saline marsh habitats, as well as indirect impacts to open water habitats, that would result from building the constructible elements of the 1% AEP alternative. The proposed marsh restoration features are shown in Figures K1 through K4. More area then needed has been identified in the figures to allow for potential shift in the location due to unforeseen reasons such as pipelines.

Wetland Value Assessment (WVA) models (refer to Appendix F) were run for the cited impacts to determine the wetland functions and values that would be lost. Such functions/values are expressed in terms of Average Annual Habitat Units (AAHUs). As indicated in Table K-1 below, these models predicted that approximately 115.112 AAHUs would be lost due to direct and indirect impacts to existing fresh and intermediate marsh habitats combined, while approximately 534.07 AAHUs would be lost due to direct and indirect impacts to existing brackish and saline marsh habitats combined, over the course of the 50-year period of analysis.

Table K-1. Project wetland (habitat) impacts for constructible elements of the project.

Habitat	Direct Impacts		Indirect Impacts		Total Impacts	
	Acres	AAHUs	Acres*	AAHUs	Acres	AAHUs
Fresh Marsh	26	12.74	3,965	39.73	**3,991**	**52.47**
Intermediate Marsh	230	28.04	16,020	34.602	**16,250**	**62.64**
Total Fresh Marsh & Intermediate Marsh	***256***	***40.78***	***19,985***	***74.332***	***20,241***	***115.112***
Brackish Marsh	414	350.98	12,442	41.33	**12,856**	**392.31**
Saline Marsh	0	0	13,788	141.76	**13,788**	**141.76**
Total Brackish Marsh & Saline Marsh	***414***	***350.98***	***26,230***	***183.09***	***26,644***	***534.07***
GRAND TOTALS	**671**	**391.76**	**46,215**	**257.442**	**46,886**	**649.182**

Note: The AAHUs indicated are the net loss of AAHUs resulting from the project impacts, and thus should be viewed as negative values.
* The acres of indirect impacts to a particular marsh habitat type include the total acres of that type of marsh impacted, together with the total acres of open water habitats having the same salinity regime as the type of marsh impacted. For example, the table indicates 16,250 acres of intermediate marsh affected by indirect impacts. This acreage is not to intermediate marsh alone; instead it includes the acres of intermediate marsh impacted together with the acres of open water habitats having the same salinity range as intermediate marsh habitats.

CEMVN Regulatory Division considers fresh marsh and intermediate marsh habitats to essentially be equivalent habitat types. CEMVN Regulatory Division also considers brackish marsh and saline marsh habitats to essentially be equivalent habitat types. In accordance with these policies, mitigation for impacts to fresh marsh habitats can take the form of restoration of intermediate marsh habitats and vice versa to meet the requirement of “in-kind” mitigation. Similarly, mitigation for impacts to brackish marsh habitats can take the form of restoration of saline marsh habitats and vice versa. These policies have also been approved by the HET on a case by case basis.

The proposed mitigation plan was based on the policies mentioned above as regards achieving in-kind mitigation for project impacts. In other words, compensation for impacts to fresh marsh and intermediate marsh habitats is achieved through the restoration of intermediate marshes while compensation for impacts to brackish marsh and saline marsh habitats is achieved through restoration of both brackish marsh and saline marsh habitats.

WVA models on a generic site in the general project area were run to produce a mitigation potential number by habitat type (e.g. models predicted the average net gain in AAAHUs that would be produced by restoring the various marsh habitat types; mitigation potential = net gain in AAHUs/acre of marsh restoration). These model results were then used to determine the needed acres of mitigation. Individual WVA models will be run on the proposed mitigation features during the PED phase to verify that the proposed mitigation features can indeed produce the required AAHUs, and the proposed mitigation features will be adjusted as necessary to yield the required AAHUs.

Table K-2 lists each of the four intermediate marsh features proposed, the acreage of each feature, and the speculated net gain in AAHUs (e.g. net gain in wetland functions/values) that would be derived from each feature over the course of the 50-year period of analysis. Table K-3 provides similar data for each of the three brackish marsh features proposed and for each of the three saline marsh features proposed.

Table K-2. Proposed mitigation for fresh marsh and intermediate marsh impacts.

Mitigation Feature ID	Proposed Habitat	Acres	Net Gain AAHUs
IM2	Intermediate Marsh	293	84.68
IM4	Intermediate Marsh	134	38.73
Totals		**427**	**123.41**

Table K-3. Proposed mitigation for brackish marsh and saline marsh impacts.

Mitigation Feature ID	Proposed Habitat	Acres	Net Gain AAHUs
BM1	Brackish Marsh	129	58.05
BM2	Brackish Marsh	170	76.5
BM3	Brackish Marsh	59	26.55
Total Brackish Marsh		***358***	***161.10***

SM1	Saline Marsh	241	92.30
SM2	Saline Marsh	342	130.99
SM3	Saline Marsh	392	150.14
Total Saline Marsh		***975***	***373.43***
GRAND TOTALS		**1,333**	**534.53**

The use of these mitigation potentials indicate that the total net gain in AAHUs derived from the proposed intermediate marsh restoration features will be 123.41 AAHUs, while the total net loss of AAHUs resulting from impacts to both fresh marsh and intermediate marsh habitats combined would be 115.112 AAHUs. This demonstrates that the proposed intermediate marsh restoration should fully compensate for the fresh marsh and intermediate marsh functions/values lost due to the constructible project elements.

The this method indicate that the total net gain in AAHUs derived from the proposed brackish marsh and saline marsh restoration features combined will be 534.53 AAHUs, while the total net loss of AAHUs resulting from impacts to both brackish marsh and saline marsh habitats combined would be 534.07 AAHUs. This demonstrates that the proposed brackish and saline marsh restoration should fully compensate for the brackish marsh and saline marsh functions/values lost due to the constructible project elements.

One of the secondary objectives of the proposed mitigation project is to eradicate invasive and nuisance plant species within the mitigation features and to control re-infestation of the mitigation features by such plants. Invasive/nuisance plant species have the potential for jeopardizing the growth and development of native marsh species, thereby reducing typical functions and values associated with marsh habitats. The eradication and control of invasive/nuisance plant species will help ensure the restored marshes provide habitat and habitat functions/values typical of such marshes.

3. MITIGATION WORK PLAN

The proposed mitigation work plan consists of three primary components. These include the construction of the proposed marsh restoration features (refer to Figures K-1 through K-4), planting of the marsh restoration features, and eradication of invasive and nuisance plant species in the marsh restoration features.

3.1 CONSTRUCTION OF MARSH RESTORATION FEATURES

Earthen containment dikes (retention dikes) would first be constructed along the outer perimeter of each marsh feature to contain earthen materials (typically a slurry of sediments and water) placed within the marsh feature until these materials have consolidated and settled to desired final target grade elevation.

The earthen retention dikes would be built to an elevation that allows storage of both the borrow material and water needed to transport the material. In addition, the crest of the dikes would include a minimum one foot of freeboard to prevent overflow of effluent over the freshly constructed earthen dikes. Effluent discharge points (effluent returns, constructed as spill boxes or weirs) would be established at one or more locations along the course of the retention dikes at the time of construction to allow for effluent water release from within the mitigation feature. The freeboard of the dikes would act as a training dike to direct effluent waters over the effluent return locations. These locations would be determined during the PED phase. If practicable, the effluent returns would be positioned such that the effluent would flow into existing adjacent marsh habitats and thereby help nourish the adjacent marshes.

The earthen retention dikes would have a crown (top or crest) width of 5 feet and would have 1V:3H (Vertical:Horizontal) or 1V:4H side slopes depending on characteristics of the material used to construct the dikes. Borrow necessary to construct the retention dikes would be obtained from within the boundaries of the mitigation feature being established. The borrow ditch would be offset a minimum of 40 feet from the interior toe of the dike to ensure dike stability. If deemed necessary by the construction contractor, low level interior weirs could be constructed within a particular mitigation feature to assist in vertical stacking of the material used to establish the feature platform. During the PED phase, it may be determined that one or more retention (containment) dike segments may need to be constructed as armored earthen dikes or as rock dikes. The specific dimensions and characteristics of such dike segments would be specified in the PED phase.

Once construction of the containment dikes is completed, fill (borrow material) would be placed within the containment dikes to establish the marsh platform. Initial fill elevations (initial target grade elevations) within the features would be higher than the proposed final target grade elevations (desired final grades) due to expected dewatering and foundation settlement. Settlement curves based on onsite geotechnical data would be developed during the PED phase to finalize the amount of overbuild needed. Generally speaking, the initial target grade elevations would likely range from roughly 2 feet to 2.5 feet above the final target grade elevations.

The final target grade elevations desired within each proposed marsh feature would be determined during the PED phase. This determination would be based on bio-benchmark surveys of existing healthy marsh habitats in the general vicinity of the proposed marsh features. The protocol used in these surveys would be to determine the average elevation of at least 3 healthy marsh locations near each of the three groups of mitigation features (e.g. the intermediate marsh restoration feature group, the brackish marsh restoration feature group, and the saline marsh restoration feature group). The marsh surface elevation would be based on when the survey rod is resting among living stems or is supported by soil containing living roots. In order to get a consistent reading, it might be necessary to cut vegetation stems where stem density is extremely high. A minimum of approximately 20 elevations (each separated by roughly 20 to 40 feet) at each of the representative healthy marsh sites would be collected during the survey efforts.

Preliminary estimates of the desired final target elevations in the proposed marsh restoration features are as follows: Intermediate marsh features IM1 through IM4 = elevation 1.0; Brackish marsh features BM1 through BM3 = elevation 1.0 to 1.5; Saline marsh features SM1 through SM3 = elevation 1.5 or slightly higher. It is emphasized that these are preliminary estimates based on examination of existing LiDAR topography covering existing marshes near the proposed marsh features.

It is anticipated that it would take approximately 9 to 12 months to complete construction of the containment dikes and placement of fill in the marsh restoration features, although it could take longer depending on the availability of construction contractors. It is estimated that it would take an additional 9 to 12 months for the fill placed in the marsh restoration features to settle to the desired final target grade elevations. Once the fill has settled to the final target grade, the containment dikes would, to the extent practicable, be mechanically degraded such that the elevation of the degraded dike crest is the same as the elevation of the marsh feature. However, it may be necessary to create "gaps" in these dikes rather than completely degrading them. It is also possible that some dikes may be designed as armored earthen dikes or as rock dikes to help protect created marsh features. In such cases, leaving the dike crest elevation higher than the marsh platform elevation would be desirable and provision of dike gaps or "fish dips" in the dike would be necessary. General design criteria for dike gapping would include:

- If total dike degradation is not feasible, one 25-foot gap (bottom width) approximately every 500 linear feet of dike would be provided. The depth of a gap would be dependent upon whether the marsh is bordered by open water or existing marsh. Gaps adjacent to open water would have a depth equivalent to the pre-project water depth. Gaps adjacent to pre-existing marsh would have a depth equivalent to the average marsh elevation.
- If scour aprons are included, the bottom would be grubbed out so the gap depth is the pre-project elevation as measured to the top of the armoring.
- Degraded containment dike material would typically be placed either in remaining depressions within the marsh mitigation feature formed by excavation when building the dikes, or immediately adjacent to exterior side of the dike in open water areas. Degraded material would not be placed in pre-existing marshes.
- Field adjustments in the typical spacing and dimensions of gaps would be allowed based on conditions developing in the marsh restoration feature; however, such adjustments would only be made in coordination with NMFS and the rest of the HET and as approved by NMFS.

The proposed marsh restoration features could potentially block water exchange between adjacent existing marsh habitats and waterbodies, and could also reduce the ability of aquatic organisms to access these marsh habitats. To help reduce such effects, trenasses (tidal creeks, shallow flowways/channels) would be constructed through certain marsh restoration features.

These primary trenasses would be constructed in conjunction with the degrading of the retention dikes. The trenasses would have a bottom width of approximately 25 feet and a bottom elevation of approximately 1 foot deep in relation to the final target marsh grade. In addition to the primary trenasses, additional smaller trenasses would be constructed within proposed marsh features to serve as tidal creeks to facilitate water exchange and create shallow water interspersion features. In conjunction with the dike degrading efforts, these smaller trenasses would be rutted to a lower- than-marsh elevation by performing two passes of a marsh buggy along the desired alignment. The acceptable trenasse width, if constructed in this fashion, would be the width of the marsh buggy. If the resulting depression is not adequate for minimal water flow, the marsh equipment could excavate material along the proposed alignment, not to exceed a 5-foot bottom width by 1-foot to 1.5-feet deep channel. The locations, alignments, and dimensions of all trenasses would be determined during the PED phase.

Once the fill placed in the marsh restoration features has settled to the final target grade, each marsh feature would be planted with native marsh plant species as soon as feasible. Section 3.2 provides information concerning proposed marsh plantings.

One should also note that Figures K-1 through K-4 do not illustrate any additional potential borrow sites that may be needed to build the marsh restoration features. The USACE proposes to use organic overburden acquired within the levee borrow right-of-way (limited to the right-of-way encompassing the constructible project elements), the lock complex foot print, and the bypass channel as some of the fill needed to establish the marsh platforms. However, it is unknown if this overburden will be insufficient to completely build all the marsh features. Additional borrow material would be obtained from other areas; most likely from dredging existing open water areas. Such borrow areas (borrow sites) would be located to avoid and minimize wetland and shoreline impacts to the extent practicable, as would be other areas needed for mitigation construction such as access corridors and staging areas. Any unavoidable wetland impacts would be fully compensated as part of the proposed mitigation plan.

Borrow sites in open water areas would be excavated via hydraulic dredging, typically using a cutter-head dredge. The maximum depth of dredging would typically be limited to 15 to 20 feet below the existing water bottom. If portions of the existing Houma Navigation Canal are dredged for borrow, the depth of dredging would be limited to the depth previously authorized for maintenance dredging. Borrow acquired via dredging would typically be transported to the proposed marsh features via hydraulic pump and pipelines that would carry the slurry to the features. In certain cases, the dredged material would be transported to marsh features via barge and mechanically placed in the marsh feature.

The pipelines used to carry material from the borrow sites to the marsh restoration features could be routed: as submerged pipelines (laid along existing water bottoms; trenching used where needed to not impede navigation or recreational uses); as pontoon lines (pipelines suspended near surface of water by pontoons, with safety marker signs installed every 150 linear feet of pipeline); by running pipelines along existing shoreline/canal bank; using a combination of these approaches.

Flotation access corridors (channels) would be excavated as needed in shallow open water areas to allow construction equipment to access the mitigation features and borrow sites. If necessary, flotation access channels would be excavated by a mechanical dredge to maximum dimensions of approximately 80 feet wide and 10 feet deep. Flotation access channel material would be used in dike/closure construction or refurbishment, to backfill flotation access channels, or be placed adjacent to and behind the containment dikes and closures in shallow open water to an 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 bottoms adjacent to the flotation access channels.

Access corridors to marsh restoration features and borrow sites would be a maximum of about 200 feet wide and would cross over uplands, wetlands, and shallow open water as necessary. Access corridors also may be placed across or along the crown of existing levees in the project vicinity. If existing canals are used for access, they may be dredged to facilitate the flotation of pipelines and the transport of other necessary equipment to material discharge sites. Material removed from existing canals would be placed on adjacent levees and/or into shallow open water on either side of canals. Canal dredged material placed in shallow open water areas would be placed at a height conducive for wetlands development.

If construction equipment and discharge pipelines are placed across or along the crown of existing levees in the project vicinity, the levees may be refurbished using borrow material from adjacent shallow open water to facilitate their use as access corridors for construction equipment and discharge pipelines. Access corridors crossing existing levees would be no wider than about 100 feet.

Existing levees near the proposed marsh features may be degraded as necessary to provide mitigation construction access. Levees degraded for construction access may be rebuilt following completion of disposal activities. Degraded levee material would be placed/stockpiled in shallow open water adjacent to the degraded levee sections or on adjacent levees. Material degraded from levees may be used to rebuild degraded levee sections. Borrow material required to rebuild degraded levee sections would be excavated from adjacent shallow water. If levees are not to be rebuilt using material removed during levee degradation activities, any levee material that was placed in shallow open water would be degraded, if necessary, to a height conducive to wetlands development.

The construction or designation of staging areas may be necessary for mitigation construction equipment and for the unloading of pipeline and other equipment necessary to perform disposal operations. Staging areas would have a maximum area of about 300 feet by 300 feet. If necessary, materials such as gravel, sand, dirt, shell, or some combination of earthen materials would be permanently placed over existing upland, wetland, and shallow open water habitat to construct staging areas.

Temporary board roads may be constructed along access corridor alignments and staging areas wherever emergent marsh exists. Board roads would be removed when work is completed. Fill material may be deposited where the board road would be located to offset damage to the underlying marsh caused by soil compression. Board road fill material may be degraded to adjacent marsh elevations following completion of disposal activities either by placing excess material into nearby shallow open water to elevations conducive to wetlands development, by placing material on existing uplands/levees, or by removing material from the project vicinity.
Details of borrow sites, construction access corridors, flotation access corridors, levee access corridors, and construction staging areas will be developed during the PED phase. Every effort would be made to design these work plan components so as to avoid and minimize environmental impacts to the extent practicable. Any unavoidable impacts to wetland habitats would be mitigated through the expansion of one or more of the proposed marsh restoration features, depending on the type of habitat affected.

The USACE will be responsible for conducting all the mitigation construction activities, although the costs associated with these activities will be cost-shared with the NFS.

The construction activities listed in this section would be implemented concurrent with the construction of the constructible project elements (constructible elements of the 1% AEP alternative). To the extent practicable, the initial mitigation construction activities would be completed within 18 months of the start of mitigation construction. These initial mitigation construction activities would include construction of the containment/retention dikes and the initial placement of all fill (borrow) material necessary to establish the marsh restoration features. The initial construction activities (initial construction phase) would <u>not</u> include the time period necessary for the borrow material to settle to the final target marsh platform elevation and would not include subsequent construction activities, such as degrading or gapping the containment dikes, or completion of initial plantings.

Risk and Uncertainty

At this stage, some aspects of the proposed mitigation plan have not been determined. For example, the locations and limits of additional borrow sites, if needed, to obtain fill to construct the proposed mitigation features are unknown as are other mitigation construction components such as construction access corridors and staging areas.

Given uncertainties such as those above, several aspects of the mitigation program discussed herein could be refined and modified during the Preconstruction Engineering & Design (PED) phase of the project. USACE will coordinate closely with the HET, the Non-Federal Sponsor (NFS), and other members of the Project Delivery Team (PDT) during the PED phase in making any refinements and modifications to the mitigation program. It is possible that further investigations and analyses conducted during this phase could reveal potential environmental impacts not previously considered or could mandate substantial changes to the mitigation plan. Under such circumstances, it may be determined that a supplemental NEPA document addressing the mitigation plan is warranted. This supplemental NEPA document would be prepared by USACE if necessary, in coordination with the HET, NFS, and PDT.

3.2 INITIAL PLANTING OF MITIGATION FEATURES

Herbaceous species will be planted on 7-foot centers (average) to achieve a minimum density of 889 plants per acre. Stock will typically be either 4-inch container size or bare-root or liner stock, depending on the species involved. Plants will be obtained from a registered licensed regional nursery/grower and of a regional eco-type species properly stored and handled to ensure viability. The plants will typically be installed during the period from March 15 through June 15. Planting should not be undertaken later than approximately July 15, although planting during the early fall may be deemed acceptable on a case-by-case basis if necessary. The plants will be installed in a manner that avoids monotypic rows of the same species (goal is to have spatial diversity and mixture of planted species).

It may be determined that the initial planting of brackish and/or saline marsh features would best be conducted in phases. Using this approach, a certain percentage of the total number of plants required would be installed in the year that final marsh construction activities are completed while the remainder would be installed in the following year. The determination of whether to use phased planting or to install all the necessary plants upon completion of construction activities will be made during the PED phase.

Species installed in proposed intermediate marsh habitats will be selected from the species list provided in Table K-4. Plantings will consist of at least 2 different species. Species installed in proposed brackish marsh habitats will be selected from the species list provided in Table K-5. Plantings will consist of at least 2 different species. Species installed in proposed saline marsh habitats will be selected from the species list provided in Table K-6. Plantings will consist of at least 2 different species. The species used and the proportion of the total plantings represented by each species will be determined during the PED phase. Various factors such as site conditions and planting stock availability could alter the plant species proposed by the time a contract is awarded for these plantings. Any deviations from the final planting lists determined in the PED phase would have to first be approved by the USACE in coordination with the HET and NFS.

Table K-4: Preliminary Planting List for Intermediate Marsh Habitats

Common Name	Scientific Name
California bulrush	*Schoenoplectus californicus*
Black needle rush	*Juncus roemerianus*
Giant cutgrass	*Zizaniopsis miliacea*
Marsh-hay cordgrass	*Spartina patens*
Maidencane	*Panicum hemitomon*
Common threesquare	*Shoenoplectus americanus*
Big cordgrass	*Spartina cynosuroides*
Seashore paspalum	*Paspalum vaginatum*

Table K-5: Preliminary Planting List for Brackish Marsh Habitats

Common Name	Scientific Name

Marsh-hay cordgrass	*Spartina patens*
Black needle rush	*Juncus roemerianus*
Smooth cordgrass	*Spartina alterniflora* var. *Vermilion*
Saltmarsh bulrush	*Schoenoplectus robustus*
Common threesquare	*Shoenoplectus americanus*
Salt grass	*Distchilis spicata*

Table K-6: Preliminary Planting List for Saline Marsh Habitats

Common Name	Scientific Name
Smooth cordgrass	*Spartina alterniflora* var. *Vermilion*
Salt grass	*Distchilis spicata*
Marsh-hay cordgrass	*Spartina patens*
Gulf cordgrass	*Spartina spartinae*
Saltwort	*Batis maritima*

Also during the PED phase, it may be determined that planting of black mangroves ((*Avicennia germinans*) in certain portions of the proposed saline marsh restoration features is desirable. Such plantings would be limited to relatively narrow bands/swaths in the marshes along or near the marsh "shorelines" (e.g. perimeter marsh areas bordering open water areas). Typically such plantings would use 1-gallon stock installed on 7-foot centers, but this generalization could be revised during the PED phase if black mangroves are indeed added to the planting list for certain saline marsh areas.

The initial planting of the mitigation features will be the responsibility of the USACE. Costs associated with this initial planting will be cost-shared with the NFS.

One should note that it was assumed that one re-planting event would be necessary to meet native vegetation success criterion 3.B (refer to Section 7). It was assumed that roughly 50% of the total number of plants initially installed would have to be re-planted to meet this criterion. This re-planting event, which is considered a maintenance action, would be the responsibility of the USACE although the costs associated with this re-planting would be cost-shared with the NFS. Keep in mind, however, this particular re-planting event would be performed if the cited success criterion is satisfied.

3.3 ERADICATION OF INVASIVE AND NUSIANCE PLANT SPECIES

Shortly before starting the initial plantings discussed in Section 3.2, invasive and nuisance plant species would be eradicated throughout each of the marsh restoration features. Such plants would be eradicated using ground-based applications of appropriate herbicides as discussed in Section 4. Invasive and nuisance plant eradication events (follow-up events) would take place at various intervals following completion of the initial installation of native plants in each marsh restoration feature as warranted. A preliminary schedule for these "follow-up" events will be developed in the PED phase. However, this schedule could be altered based on the results of mitigation monitoring activities.

The USACE will be responsible for conducting the invasive and nuisance plant eradication events until such time that the following mitigation success criteria are achieved (refer to Section 7): General construction criteria 1.A and 1.B; Topography criteria 2.A and 2.B; Native vegetation criteria 3.A and 3.B; Invasive & nuisance vegetation criterion 4.A. Costs associated with these events (e.g. those that are the responsibility of USACE) will be cost-shared with the NFS.

4. MAINTENANCE AND MANAGEMENT PLAN

One of the maintenance and management activities anticipated involves the short-term and long-term eradication and control of invasive and nuisance plant species. It is anticipated that there will be 1 invasive/nuisance plant eradication event during the year final mitigation construction activities are completed, 2 such events during the year the mitigation features are first planted, and at least 2 such events during each of the three years following the year of initial planting. It is anticipated that there will be at least 1 invasive/nuisance plant eradication event per year in the fourth and fifth year following the year of initial planting. Thereafter, it is anticipated that there will be one invasive/nuisance plant eradication event every three to five years.

One should note that the actual frequency of invasive/nuisance plant eradication events may differ from the frequency discussed above. The frequency and intensity of these events will largely be determined based on the degree of invasive/nuisance plant infestation observed during mitigation monitoring activities, as well as that observed during periodic inspections of the mitigation features conducted outside the framework of prescribed mitigation monitoring events.

The methods used to eradicate invasive and nuisance plant species may vary. Invasive/nuisance plants will likely be eradicated using ground-based applications of appropriate herbicides to the target plants. The specific equipment (e.g. backpack sprayers, wick applicators, hand application, etc.) used to apply the herbicides will be determined by the contractor to maximize effectiveness. Regardless of the methods involved, care will be exercised to avoid damage to desirable native species to the greatest extent practicable. Ground-based herbicide applications will typically occur during the early part of the growing season in cases where there will be 1 or 2 application events during a given year, and will typically occur again during the latter part of the growing season in cases where there will be 2 application events during a given year.

The USACE will be responsible for performing invasive/nuisance plant eradication events until mitigation success criteria 1.A, 1.B, 2.A, 3.A, 3.B, and 4.A and are all satisfied (refer to Section 7). During this period of responsibility, the USACE will also be responsible for ensuring mitigation success criterion 4.B. is satisfied (refer to Section 7). The cost of performing the activities conducted as the responsibility of the USACE will be cost-shared with the NFS. The NFS will be responsible for performing invasive/nuisance plant eradication events once the cited success criteria are satisfied. The costs for performing these events will be borne solely by the NFS.

As mentioned in Section 4, maintenance/management activities will include one re-planting event conducted after the initial planting of native canopy and midstory species. It was assumed that this event, involving the re-planting of approximately 50% of the total number of plants first installed, would be necessary to satisfy native vegetation success criterion 3.B (see Section 7). However if the referenced success criterion is satisfied, this re-planting event will not be performed. It is not anticipated that subsequent re-plantings will be necessary, with the potential exception of re-planting required for adaptive management (see Section 5). Should additional re-plantings be necessary to satisfy applicable mitigation success criteria, then these re-plantings would become part of the management/maintenance activities.

The USACE will be responsible for performing the single re-planting event discussed above, including provision of the necessary plants, and the cost of this re-planting will be cost-shared with the NFS. The NFS will be responsible for any subsequent re-plantings required to meet applicable mitigation success criteria and the cost for such re-plantings will be borne solely by the NFS, with the exception of re-plantings covered under the Adaptive Management Plan. Re-plantings covered under this plan would be cost-shared with the NFS.

As previously discussed, certain containment dikes along the perimeter of one or more marsh features may be built as armored earthen dikes or as rock dikes. Should this be the case, maintenance activities would likely include periodic repair and/or rehabilitation of such dike segments, including dike gaps and fish-dips, to ensure their integrity and help prevent erosion/loss of adjacent restored marsh habitats. It is assumed that at least one maintenance event would be necessary during the period of mitigation monitoring. However, additional maintenance events may be necessary to help ensure applicable mitigation success criteria are achieved. The NFS would be responsible for conducting all maintenance activities and the cost of the single maintenance event anticipated would be borne solely by the NFS. Any dike maintenance activities conducted pursuant to the Adaptive Management Plan would be cost-shared with the NFS.

5. ADAPTIVE MANAGEMENT PLAN

Adaptive Management (AM) activities during the life-cycle of the mitigation project will address ecological and other uncertainties that could prevent successful implementation of the mitigation features as described within this appendix. AM also establishes a framework for decision making that utilizes monitoring results and other information, as it becomes available, to update project knowledge and adjust management/mitigation actions. Hence, early implementation of AM and monitoring allows for a project that can succeed under a wide range of conditions and can be adjusted as necessary. Furthermore, careful monitoring of project outcomes both advances scientific understanding and helps adjust the project as part of an iterative learning process. This AM plan allows for taking corrective actions in cases where monitoring demonstrates that mitigation measures are not achieving ecological success.

WRDA 2007, Section 2036(a) requires an AM plan for all mitigation plans and specifies:

- an AM plan will be developed for all mitigation plans.
- the AM plan must be appropriately scoped to project scale;
- if the need for a specified adjustment is anticipated due to high uncertainty the nature and costs for actions should be explicitly described as part of the decision document;
- the information provided by the monitoring plan will be used by the District Engineer and Division Commander to guide decisions on operational and or structural changes that may be needed to insure the mitigation measures meet success criteria;
- identified physical modifications will be cost-shared and must be agreed upon by the local non-Federal sponsor;
- adaptive management plan costs should be shown in 06 feature code of the cost estimate;
- changes to the AM plan approved in the decision document must be coordinated with USACE Headquarters; and
- significant changes needed to achieve ecological success that cannot be addressed through operational changes or are not included in the approved AM plan may be examined under other authorities.

Independent of AM, an effective monitoring program is required to determine if the mitigation project outcomes are consistent with performance standards. Mitigation success criteria were developed as the basis of determining ecological success and to determine if adaptive management actions are required. Upon completion of the mitigation project, monitoring for ecological success will be initiated and will continue until ecological success is achieved, as defined by the mitigation success criteria. The following objectives: performance measures, and adaptive management triggers would be further refined during the PED phase.

Objective 1: Mitigate for project-induced impacts by creating 2,842 acres of intermediate, brackish and saline marsh.
Performance Measure: Marsh elevation (topography).
Threshold/Trigger: If the marsh elevations described in the success criteria/desired outcomes are not maintained, supplemental topographic alterations through adaptive management may be necessary. Additional thresholds/triggers will be developed during PED.

Performance Measure 2: Species composition and percent cover for vegetation plantings.
Threshold/Trigger: If the identified success criteria are not met there may be a need for an adaptive management actions including replanting of areas that no longer meet success criteria and/or replanting of areas that required topographic alterations. Additional thresholds/triggers will be developed during PED.

Objective 3: Control of invasive and nuisance plant species.
Desired Outcome: Maintain all marsh restoration features such that they are essentially free from invasive and nuisance plant species immediately following a given maintenance event. The total average vegetative cover accounted for by invasive and nuisance plant species are each less than 5% of the total plant cover in each marsh feature throughout the duration of the monitoring period.

Threshold/Trigger: No adaptive management is expected to be needed as maintenance of invasive species is part of the O&M for the project. If a large amount of invasive species are removed through O&M efforts, potential AM actions include replanting of the areas previously covered by invasive species. Additional thresholds/triggers will be developed during PED.

The USACE and the NFS will be responsible for any adaptive management determined to be needed to attain the identified success criteria until such time as ecological success is determined and a notice of construction completion (NCC) is provided to the non-Federal sponsor for the mitigation project. In the event the monitoring reports submitted to CEMVN reveal that any success criteria have not been met after the project is turned over and in the OMRR&R phase, the NFS, or its assigns after consultation with CEMVN and other appropriate agencies, will take all necessary measures to modify management practices in order to achieve these criteria in the future.

To better ensure successful performance of the implementation of identified mitigation features the following future scenarios for mitigation features were considered based on critical uncertainties (e.g., salinities, wetland hydrology, inundation, increased subsidence, reduced accretion, tidal amplitude, and Relative Sea Level Rise, etc. The most likely AM action involves wetland renourishment of areas (add additional sediment) or replanting should project monitoring reports indicate success criteria are not being achieved and adjustment of mitigation feature(s) is needed. The following best case, worst case and most likely scenarios are not AM triggers; rather, they were developed to estimate overall AM costs for mitigation projects based upon the potential resiliency of the constructed mitigation projects to the above described uncertainties related to marsh degradation or loss:

- Best Case – Assume 3% loss of 1,760 acres or 53 acres. Replace 53 acres at $30,000/acre for $1,590,000
- Worst Case – assume 12% loss of 1,760 acres or 211 acres. Replace 211 acres at $30,000/acre for $6,330,000
- Most Likely – Assume approximately 6% loss of 1,760 acres or 106 acres. Replace 106 acres at $30,000/acre for $3,180,000

Based upon the above comparison, the most likely scenario (i.e. a total of $3,180,000) would be allocated for AM actions including potential wetland creation, restoration and renourishment actions over the cost-shared portion of the mitigation projects. Additional costs for AM include data management ($364,000) and AM Program Planning and Management ($250,000) for a total Adaptive Management cost of $3,794,000.

It should be noted that many factors such as ecosystem dynamics, engineering design, institutional requirements, and many other key uncertainties can change and/or evolve over a project's life. The adaptive management and monitoring elements will be updated to reflect monitoring-acquired and other new information, as well as enabling continued resolution of and progress on resolving existing key uncertainties or identification of any new uncertainties that might emerge. The AM plan will be used during and after project construction to adjust the mitigation project, as necessary, to better achieve mitigation success criteria outputs/results.

6. LAND ACQUISITION & PRESERVATION/PROTECTION OF MITIGATION FEATURES

Various lands must be acquired for the proposed mitigation features themselves, for areas required for mitigation construction access, for areas required for borrow sites, and for future mitigation maintenance/management access. Such lands (properties) will be acquired by the Non-Federal Sponsor. Presently the exact locations and types of lands to be acquired have not been identified for all the lands needed. This will be determined during the PED phase.

Properties required could be privately owned or owned by a governmental agency. For areas that are owned by a governmental agency, the Non-Federal Sponsor will sign an inter-agency agreement that will allow the USACE to construct the mitigation features. Areas that are privately owned will be acquired in accordance with the requirements of Public Law 91-646. Each property to be acquired will be appraised and the owner will be offered the market value of his/her property. The owner will be given an opportunity to negotiate the sale price of the property. If the Non-Federal Sponsor and the owner are not able to come to an amicable agreement as to price or if the title of the property is not clear, the acquisition will be completed through the expropriation process.

In order to accomplish the integrity of the mitigation project, the Non-Federal sponsor will acquire fee excluding minerals over the identified marsh restoration features. This estate allows the owner to retain the mineral rights, but prohibits the use of the surface for exploration or development of the minerals. Depending on the size of the ownership and the size of the mitigation feature to be acquired, the owner may be able to explore and develop minerals through directional drilling. In the development of the appraisal, the appraiser will consider the impact of the acquisition on the remaining property. In some instances, mineral rights may need to be subordinated. Until the final boundaries of the proposed marsh restoration features are identified and ownership search is conducted, this cannot be determined.

Access routes to the marsh restoration features as well as areas for equipment/contractor staging will be acquired by the Non-Federal Sponsor as temporary work area easements. The same could be true for certain borrow sites. Such easements allow the Government the exclusive use of the property for a specified duration of time. These areas would also be appraised and the owner would negotiate with the Non-Federal sponsor the sale price of these temporary acquisitions.

All real estate acquisitions will be accomplished in the name of the Non-Federal Sponsor. The Sponsor in turn will grant the USACE right of entry to accomplish the work. The marsh restoration features will remain in the ownership of the Sponsor who will be responsible for OMRR&R. Ownership of the sites acquired for temporary use will revert to the landowner upon expiration of the easement.

The Non-Federal Sponsor will be required to preserve and protect the marsh restoration features in perpetuity. This requirement will be assured via the existing Project Partnership Agreement (PPA) between the USACE and the Non-Federal Sponsor, as well as through appropriate language in the Operation and Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) manual that will be prepared for this project by CEMVN and provided to the Non-Federal Sponsor.

7. MITIGATION SUCCESS CRITERIA

The ecological success (performance) criteria applicable to the proposed mitigation are described in the sub-sections that follow. The year numbers cited are based on the initiation of mitigation construction activities beginning in year 1.

1. General Construction

A. Within approximately 9 to 12 months following the start of mitigation construction, complete all initial mitigation construction activities (e.g. construction of perimeter retention/containment dikes, placement of fill (borrow material/dredged material) into mitigation feature, construction of perimeter rock dikes and/or armoring of perimeter containment dikes if applicable, etc.).

B. Approximately 1 year following completion of all initial mitigation construction activities (when the restored marsh feature has attained the desired final target soil surface elevation) complete all final mitigation construction activities. Such activities could include, but are not limited to: degrading perimeter containment dikes such that the areas occupied by these dikes have a surface elevation equivalent to the desired final target marsh elevation; completion of armoring, if required, of any containment dikes; “gapping” of perimeter containment dikes and/or installation of “fish dips” in perimeter containment dikes, if necessary; and construction of trenasses or similar features within marsh features as a means of establishing shallow water interspersion areas within the marsh. Finishing the aforementioned construction components will be considered as the “completion of final mitigation construction activities”. As noted, this is anticipated to occur approximately 1 year after placement of fill material in the mitigation feature is completed.

2. Topography

A. Upon completion of final mitigation construction activities (near end of Year 2) –
- Demonstrate that at least 80% of each mitigation feature has a surface elevation that is within 0.5 feet of the desired final target surface elevation.

B. 1 year following completion of final mitigation construction activities (Year 3) –
- Demonstrate that at least 80% of the mitigation site has a surface elevation that is within 0.5 feet of the desired final target surface elevation.

C. 3 years following completion of final mitigation construction activities (Year 5) –
- Demonstrate that at least 90% of the mitigation site has a surface elevation that is within the functional marsh elevation range.

Notes: The desired final target elevation for each marsh feature would be determined during the final PED phase. The "functional marsh elevation range", e.g. the range of the marsh surface elevation that is considered adequate to achieve proper marsh functions and values, would also be determined during the PED phase. These determinations will apply to the topographic success criteria above and could potentially alter the marsh area percentages set forth in these criteria.

<u>3. Native Vegetation</u>

A. Complete initial plantings in each marsh feature in accordance with the applicable marsh planting specifications (early in Year 3).

B. 1 year following completion of initial plantings (Year 4) –
- Within each marsh feature, attain at least 80% survival of planted species, <u>or</u>; Achieve a minimum average cover of 50%, comprised of native herbaceous species (includes planted species and volunteer species). As regards survival of planted species, the surviving plants must approximate the species composition and the species percentages specified in the initial plantings component of the Mitigation Work Plan. These criteria will apply to the initial plantings as well as any subsequent replantings necessary to achieve this initial success requirement. Note that if black mangroves were installed in a particular mitigation feature, then survival of at least 80% of the installed mangroves is also required in addition to the typical success criteria indicated above.
- Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

C. 3 years following completion of initial plantings (Year 6) –
- Within each marsh feature, achieve a minimum average cover of 75%, comprised of native herbaceous species (includes planted species and volunteer species). Note that if black mangroves were initially planted in a particular mitigation feature, then survival of at least 50% of the installed mangroves is also required in addition to this typical vegetative cover success criterion.

D. For the period beginning 4 years following completion of initial plantings and continuing through 20 years following completion of initial plantings (Years 7 through 27) –
- Within each marsh feature, maintain a minimum average cover of 80%, comprised of native herbaceous species.

<u>4. Invasive and Nuisance Vegetation</u>

A. Complete the initial eradication of invasive and nuisance plant species within 1 year of completion of final mitigation construction activities.

B. Maintain all marsh features such that they are essentially free from invasive and nuisance plant species immediately following a given maintenance event and such that the total average vegetative cover accounted for by invasive and by nuisance species each constitutes less than 5% of the total average plant cover in each marsh feature during periods between maintenance events. These criteria must be satisfied throughout the duration of the overall monitoring period.

8. MITIGATION MONITORING AND REPORTING

8.1 STANDARD MITIGATION MONITORING AND MITIGATION MONITORING REPORTS

8.1.1 "Time Zero" Monitoring Report (Monitoring Report #1)

Shortly after completion of the final mitigation construction activities the mitigation features will be monitored and a "time zero" or "baseline" monitoring report prepared. Information provided will include the following items:

- A discussion of all mitigation activities completed.

- A description of the various mitigation features (the marsh restoration features).

- Plan view drawings of the mitigation features showing their approximate boundaries as well as significant interspersion features established within the marshes (as applicable), and the locations of permanent photo stations and staff gages installed.

- An as-built survey of finished grades in the mitigation features (topographic survey), along with an assessment of whether the applicable topography success criterion (criterion 2.A) has been satisfied and an assessment of whether the general construction success criteria (criteria 1.A and 1.B) have been satisfied. This survey will also contain survey information for any "gaps" or "fish dips" established in the perimeter containment dikes, as well as survey information for any rock dikes or armored earthen dikes. The as-built survey will be conducted using LiDAR supplemented by conventional ground-survey methods. Note that this survey would be performed prior to the initial planting of mitigation features and would be evaluated by the USACE prior to installing plants. If this evaluation indicates the topography success criterion has been achieved, then plants would be installed. However, if this evaluation indicates success has not been achieved, then supplemental topographic alterations would be performed by the USACE, a second as-built topographic survey of the affected areas would be conducted following completing of the supplemental topographic alterations, and plants would not be installed until the topography success criterion is achieved. Should this scenario arise, the time-zero monitoring report would not be submitted until the year plants are installed.

- Photographs documenting conditions in each restored marsh feature at the time of monitoring. Photos will be taken at permanent photo stations within the marsh features. At least two photos will be taken at each station with the view of each photo always oriented in the same general direction from one monitoring event to the next. The number of photo stations required as well as the locations of these stations will vary depending on the mitigation feature. The USACE will make this determination in coordination with the HET and NFS during the PED phase. At a minimum, there will be at least 4 photo stations established within each marsh feature.

- Water level elevation readings collected at the time of monitoring from staff gages installed within some of the restored marsh features. The number of staff gages and their locations will be determined by the USACE in coordination with the HET and NFS during the PED phase. The monitoring report will provide the staff gage data along with mean high and mean low water elevation data as gathered from a tidal elevation recording station in the general vicinity of the mitigation sites. The report will further address estimated mean high and mean low water elevations at the mitigation sites based on field indicators.

- Various qualitative observations will be made in the mitigation features to help assess the status and success of mitigation and maintenance activities. These observations will include: general estimate of the average percent cover by native plant species; general estimates of the average percent cover by invasive and nuisance plant species; general observations concerning colonization of the mitigation features by volunteer native plant species; general condition of native vegetation; trends in the composition of the plant community; wildlife utilization as observed during monitoring (including fish species and other aquatic organisms); the condition of interspersion features (tidal channels, trenasses, depressions, etc.) constructed within the marsh features, noting any excessive scouring and/or siltation occurring within such features; the natural formation of interspersion features within restored marshes; observations regarding general surface water flow characteristics within marsh interspersion features; the general condition of “gaps”, “fish dips”, or similar features constructed in containment dikes; if present, the general condition of any armoring installed on permanent dikes. General observations made during the course of monitoring will also address potential problem zones and other factors deemed pertinent to the success of the mitigation program.

- A summary assessment of all data and observations along with recommendations as to actions necessary to help meet mitigation and management/maintenance goals and mitigation success criteria.

- A brief description of anticipated maintenance/management work to be conducted during the period from the current monitoring report to the next monitoring report.

8.1.2 Additional Monitoring Reports

All monitoring reports generated after the initial “time zero” report will provide the following information unless otherwise noted:

- A plan view drawing of the mitigation sites showing the approximate boundaries of the different mitigation features (marsh restoration features), monitoring transect locations, sampling plot locations, photo station locations, and staff gage locations.

- A brief description of maintenance and/or management and/or mitigation work performed since the previous monitoring report along with a discussion of any other significant occurrences.

- Photographs documenting conditions in the mitigation site at the time of monitoring. Photos will be taken at permanent photo stations within the mitigation site. At least two photos will be taken at each station with the view of each photo always oriented in the same general direction from one monitoring event to the next.

- Quantitative data concerning plants in the ground cover stratum. Data will be collected from permanent sampling quadrats established at approximately equal intervals along permanent monitoring transects established within each marsh feature. Each sampling quadrat will be approximately 2 meters X 2 meters in size, although the dimensions of each quadrat may be increased if necessary to provide better data. The number of monitoring transects and number of sampling quadrats per transect will vary depending on the mitigation feature. This will be determined by the USACE in coordination with the HET and NFS during the PED phase. Data recorded from the sampling quadrats will include: average percent cover by native plant species; average percent cover by invasive plant species; average percent cover by nuisance plant species; composition of plant species and the wetland indicator status of each species. The average percent survival of planted species (i.e. number of living planted species as a percentage of total number of plants installed) will also be recorded. However, data for percent survival of planted species will only be recorded until such time as it is demonstrated that applicable success criteria for plant survivorship have been achieved.

- A summary of water level elevation data collected from the staff gages installed within the marsh restoration features as collected at the time of monitoring. Each monitoring report will also provide mean high and mean low water elevation data as gathered from a tidal elevation recording station in the general vicinity of the mitigation sites. The report will further address estimated mean high and mean low water elevations at the mitigation sites based on field indicators.

- Various qualitative observations will be made in the mitigation features to help assess the status and success of mitigation and maintenance activities. These observations will include: general estimate of the average percent cover by native plant species; general estimates of the average percent cover by invasive and nuisance plant species; general observations concerning colonization of the mitigation features by volunteer native plant species; general condition of native vegetation; trends in the composition of the plant community; wildlife utilization as observed during monitoring (including fish species and other aquatic organisms); the condition of interspersion features constructed within the marsh features, noting any excessive scouring and/or siltation occurring within such features; the natural formation of interspersion features within restored marshes; observations regarding general surface water flow characteristics within marsh interspersion features; the general condition of "gaps", "fish dips", or similar features constructed in containment dikes; if present, the general condition of any armoring installed on permanent dikes. General observations made during the course of monitoring will also address potential problem zones and other factors deemed pertinent to the success of the mitigation program.

- A summary assessment of all data and observations along with recommendations as to actions necessary to help meet mitigation and management/maintenance goals and mitigation success criteria.

- A brief description of anticipated maintenance/management work to be conducted during the period from the current monitoring report to the next monitoring report.

- For monitoring report #2 only, a detailed inventory of all species planted in each mitigation feature, including the number of each species planted and the stock size planted.

- For any monitoring report conducted in a year when one or more marsh restoration features must be re-planted, a detailed inventory of all species installed in the applicable mitigation feature(s), including the number of each species planted and the stock size planted. A depiction of the areas re-planted will also be provided.

- For monitoring report #2 and monitoring report #5, a survey of surface grades in the mitigation features (topographic survey), along with an assessment of whether the applicable topography success criteria have been satisfied (e.g. success criterion 2.B for monitoring report #2, success criterion 2.C for monitoring report #5). These surveys will be conducted using LiDAR supplemented by conventional ground-survey methods. A given survey indicates topographic success criteria have not been achieved and supplemental topographic alterations are necessary, then another topographic survey may be required following completion of the supplemental alterations. This determination will be made by USACE in coordination with the HET and NFS.

8.2 DISTRICT CONSULTATION REPORTS & USACE CIVIL WORKS PROJECT MITIGATION DATABASE REPORTS

Section 2036(a) of WRDA 2007 requires the USACE to conduct annual consultation with appropriate Federal and State agencies to assess the success of mitigation plans and to prepare annual reports summarizing the results of the consultations. To satisfy these requirements, annual consultation reports (District Consultation Reports) will be prepared and submitted to the USACE Mississippi Valley Division (MVD), or the reports will be submitted as directed by MVD. Each report will provide the following information:

- List of the types of mitigation implemented.
- Brief description of the mitigation, including acres implemented and acres remaining to be implemented (if any).
- Description of the consultation process (steps taken to consult with other Federal agencies and State agencies).
- Discussion of the status of consultation, identifying the agencies involved and the outcome. If consultation is complete, a listing of the outcome as one of the following: no action needed; no response from Federal or state agencies on consultation; on schedule with no adaptive management implemented due to consultation, or on schedule with adaptive management implemented due to consultation; behind schedule with adaptive management implemented due to consultation, or; behind schedule for reasons not related to consultation.
- Discussion of the outcome of consultation (if completed). This discussion will include: an assessment of the likelihood that the mitigation will achieve the success criteria specified in the

mitigation plan (copy of plan provided); the projected timeline for achieving mitigation success, and; any recommendations for improving the likelihood of success.

In addition to the District Consultation Reports discussed above, data and information concerning the mitigation will be entered into the USACE's Civil Works Project Mitigation Database on an annual basis. The data and information required for entry into this database are specified within the database itself (website URL: https://sam-db01mob.sam.ds.usace.army.mil:4443/pls/apex/f?p=107).

8.3 MITIGATION MONITORING & REPORTING SCHEDULE AND RESPONSIBILITIES: STANDARD MONITORING AND REPORTING

Monitoring will typically take place in late summer of the year of monitoring, but may be delayed until later in the growing season due to site conditions or other unforeseen circumstances. Monitoring reports will be submitted by November 30 of each year of monitoring. Monitoring reports will be provided to the USACE, the NFS, and the agencies comprising the HET.

The USACE will be responsible for conducting the monitoring events and preparing the associated monitoring reports until such time that the following mitigation success criteria are achieved (criteria follow numbering system used in success criteria section):

1. General Construction – A and B (e.g. criteria 1.A and 1.B).
2. Topography – A and B (e.g. criteria 2.A and 2.B).
3. Native Vegetation – A and B (e.g. criteria 3.A and 3.B).
4. Invasive & Nuisance Vegetation – A (e.g. criterion 4.A), plus B (e.g. criterion 4.B) until such time as project is transferred to the NFS.

Monitoring events associated with the above will include the "time zero" (first or baseline) monitoring event plus annual monitoring events thereafter until the mitigation project is transferred to the NFS. Unless otherwise indicated herein, the NFS will be responsible for conducting the required monitoring events and preparing the associated monitoring reports after the USACE has demonstrated the mitigation success criteria listed above have been achieved.

Once monitoring responsibilities have been transferred to the NFS, the next monitoring event will typically take place during the year that attainment of success criterion 2.C (topography criterion applicable 3 years after completion of final mitigation construction activities) must be demonstrated, and the immediately subsequent monitoring event will typically take place during the year that attainment of success criterion 3.C (native vegetation criterion applicable 3 years after completion of initial plantings) must be demonstrated. Thereafter, monitoring will typically be conducted every 5 years until success criterion 3.D (native vegetation criterion applicable 4 years through 20 years following completion of initial marsh plantings) is fully satisfied.

If certain success criteria are not achieved, failure to attain these criteria would trigger the need for additional monitoring events not addressed in the preceding paragraphs. The USACE would be responsible for conducting such additional monitoring and preparing the associated monitoring reports under the following circumstances:

(A) If the initial survival criterion for planted species or the initial vegetative cover criterion are not achieved (i.e. the criteria specified in native vegetation success criterion 3.B), a monitoring report will be required for each consecutive year until two sequential annual reports indicate that the applicable survival criterion or vegetative cover criteria have been satisfied (e.g. that corrective actions were successful). The USACE would also be responsible for the purchase and installation of supplemental plants needed to attain the success criteria.

(B) If topographic success criteria 2.A or 2.B are not achieved, a monitoring report will be required for each consecutive year until two sequential annual reports indicate the applicable criteria have been satisfied. Since failure to meet topographic success criteria would mandate corrective actions such as addition of fill, removal of fill, or other actions to change grades within the subject marsh feature, the USACE would also be responsible for performing the necessary corrective actions.

There could also be cases where failure to attain certain success criteria would trigger the need for additional monitoring events for which the NFS would be responsible. The NFS would be responsible for conducting such additional monitoring and preparing the associated monitoring reports under the following circumstances:

(A) If the vegetative cover criterion specified for 3 years after the initial planting of marsh features is not achieved (e.g. native vegetation success criterion 3.C), a monitoring report will be required for each consecutive year until two sequential annual reports indicate that the vegetative cover criterion has been satisfied. The NFS would also be responsible for the purchase and installation of supplemental plants needed to attain the success criterion.

(B) If the topographic success criterion 2.C is not achieved, a monitoring report will be required for each consecutive year until two sequential annual reports indicate success criterion has been satisfied. Since failure to meet this topographic success criterion would mandate corrective actions such as addition of fill, removal of fill, or other actions to change grades within the subject marsh feature, the NFS would also be responsible for performing the necessary corrective actions.

(C) Native vegetation success criterion 3.D is applicable to the period extending from 4 years through 20 years following completion of the initial marsh plantings and is applicable to all marsh features. If this criterion is not satisfied at the time of monitoring, the NFS would be responsible for implementing corrective actions. Such actions could include installing additional plants in the subject marsh (probable course of action), adding sediment to the subject marsh in problem zones (marsh nourishment), or a combination of these activities. Under this scenario, a monitoring report will be required for each consecutive year following completion of the corrective actions until two sequential annual reports indicate that the vegetative cover criterion has been attained. The NFS would be responsible for conducting these additional monitoring events and preparing the associated monitoring reports.

(D) Various unforeseen circumstances besides those above could severely threaten mitigation success. If one or more NFS monitoring reports called for in Table K-7 indicate mitigation success is severely threatened, as determined by the USACE in coordination with the HET and the NFS, then significant corrective actions (adaptive management) would be necessary. The need for such actions could trigger the need for additional monitoring/reporting events not listed in Table K-7, including the need to extend monitoring beyond the time period indicated in said table. The NFS would be responsible for conducting these additional monitoring events, preparing the associated monitoring reports, and conducting the required corrective actions. Necessary corrective actions would be determined by the USACE in coordination with the HET and NFS.

The following table indicates the currently anticipated monitoring report schedule and the party responsible for conducting the monitoring and preparing the report.

Table K-7. Standard mitigation monitoring report schedule and monitoring responsibility.

Year	Monitoring Report Number	Party Responsible for Monitoring and Reporting
1 (begin & complete initial construction activities; completion near end of year)	N/A	N/A
2 (begin & complete final construction activities; filled areas settle to final target grades near end of year)	1 (Time Zero Report)	USACE
3 (complete initial plantings early in year; complete initial invasive/nuisance plant eradication)	2	USACE
4 (1 year after initial plantings; 2 years after completion of final construction activities)	3	USACE
5 (Re-planting if necessary; 3 years after completion of final construction activities)	4	USACE if replanting necessary; NFS if replanting not necessary
6 (1 year after re-planting if re-planting needed)	5A*	USACE if replanting necessary in year 5. No report needed if replanting not necessary in year 5.
7 (2 years after re-planting if re-planting needed; 5 years after initial plantings)	5B	USACE if replanting necessary in year 5; NFS if replanting not necessary in year 5
12	6	NFS
17	7	NFS
22	8	NFS
27	9	NFS
32	10	NFS

It is noted that monitoring report 5A indicated in the preceding table will only be necessary if the third monitoring report indicates that native vegetation success criterion #3.B pertaining to the survival of planted species/percent cover by native plant species has not been achieved, thereby requiring re-planting in Year #5. If re-planting is unnecessary, there would be no monitoring in year 6. However, it has been assumed that some re-planting will be necessary. The schedule provided in the table does not account for the need to physically adjust topography in the mitigation features once final construction activities have been completed. Should such adjustments be necessary to achieve applicable topographic success criteria, then the monitoring schedule presented would likely require adjustments. The schedule provided also does not account for other unforeseen circumstances that may severely threaten mitigation success. Such circumstances would likely require corrective actions and could also require adjustments to the monitoring schedule, including extending the overall monitoring period.

Although the USACE will be responsible for conducting the monitoring necessary for monitoring reports 1 through 4 (as well as reports 5A and 5B if re-planting is necessary in year 5) and will be responsible for preparing these reports, the costs for these activities will be cost-shared with the NFS. The costs associated with conducting the monitoring and preparing all monitoring reports following report 5B will be solely borne by the NFS. The same is true for conducting the monitoring and preparing the report called for in year 7 (report 5B) if no re-planting is required in year 5.

It is not feasible at this time to accurately estimate the actual calendar year when mitigation construction activities will be initiated. This explains why the years indicated in the preceding table are not actual calendar years. The mitigation construction schedule will be determined during the PED phase.

Once monitoring responsibilities have transferred to the NFS, the NFS will retain the ability to modify the monitoring plan and the monitoring schedule should this become necessary due to unforeseen events or to improve the information provided through monitoring. Fifteen years following completion of initial plantings, the number of monitoring plots and/or monitoring transects that must be sampled during monitoring events may be reduced if it is clear that mitigation success is proceeding as anticipated. Any significant modifications to the monitoring plan or the monitoring schedule must first be approved by the USACE in coordination with the HET and NFS.

8.4 MITIGATION MONITORING & REPORTING SCHEDULE AND RESPONSIBILITIES: DISTRICT CONSULTATION REPORTS AND USACE CIVIL WORKS PROJECT MITIGATION DATABASE REPORTS

The USACE will be responsible for preparing and submitting all District Consultation Reports. These reports will be submitted on annual basis beginning in the year the mitigation plan is implemented (i.e. start of mitigation construction) and continuing throughout the life of the mitigation monitoring period addressed in Section 8.3. The date for submittal of each report will be in accordance with guidance provided by MVD and/or HQUSACE (USACE Headquarters). Presently, MVD guidance is each annual report must be submitted at least 14 working days prior to October 1st each year; however, this guidance is subject to change.

The agencies involved in the consultation process will include, at a minimum: USACE, Mississippi Valley Division, New Orleans District (CEMVN); the Non-Federal Sponsor; US Fish and Wildlife Service (USFWS); National Marine Fisheries Service (NMFS); Louisiana Department of Wildlife and Fisheries (LDWF); Louisiana Department of Natural Resources (LDNR). The USACE will be responsible for conducting the consultation until the mitigation project is transferred to the Non-Federal Sponsor. Thereafter, the Non-Federal Sponsor will be responsible for conducting the consultation and for providing results of the consultation to USACE (i.e. Non-Federal Sponsor will be responsible for obtaining and providing to USACE all information necessary for preparing the District Consultation Report).

The USACE will be responsible for inputting all information required for the USACE's Civil Works Mitigation Project Database as regards this mitigation project. This information will be input by CEMVN on an annual basis beginning in the year the mitigation is implemented and continuing throughout the monitoring period addressed in Section 8.3. The information will be input by the deadline(s) established by HQUSACE. The USACE will be responsible for gathering the information necessary for database input until the mitigation monitoring responsibilities are transferred to the Non-Federal Sponsor. Thereafter, the Non-Federal Sponsor will be responsible for gathering this information and providing it to CEMVN for input.

8.5 COST OF MITIGATION MONITORING AND REPORTING

The total cost of mitigation monitoring and reporting activities addressed herein is currently estimated to be approximately $7,660,800. This estimate includes all mitigation monitoring and reporting costs throughout the monitoring period addressed in Section 8.3. This estimate also includes the cost of conducting the additional monitoring required due to the need for one re-planting event following the initial planting event. It was assumed that one re-planting event would be necessary to meet the initial survival/cover success criteria for planted native vegetation. If this assumption is erroneous, the estimated monitoring and reporting cost would decrease. This cost estimate does not account for any further topographic alterations following completion of the final mitigation construction activities since it is not anticipated that such physical alterations will be necessary. If this assumption is violated, the estimated mitigation monitoring and reporting cost would increase due to the need for additional monitoring/reporting events. Note that this cost estimate also does not include additional monitoring and reporting costs that would be incurred should the adaptive management plan need to be implemented.

9. FINANCIAL ASSURANCES

Financial assurances are required to ensure that the compensatory mitigation project would be successful. In this case the Project Partnership Agreement (PPA) between the Non-Federal Sponsor and the Federal Government provides the required financial assurance for this mitigation project. In the event that the Non-Federal Sponsor fails to perform, the CEMVN has the right to complete, operate, maintain, repair, rehabilitate or replace any project feature, including mitigation features, but such action would not relieve the Non-Federal Sponsor of its responsibility to meet its obligations and would not preclude the US from pursuing any remedy at law or equity to ensure the Non-Federal Sponsor's performance.

10. DEFINITION OF TERMS

Certain terms used herein shall have the meaning discussed in the following subsections.

Habitat Evaluation Team (HET)
This interagency team consists of various staff from the following resource agencies: USACE, U.S. Fish and Wildlife Service (USFWS, or FWS), U.S Environmental Protection Agency (EPA), U.S. Geological Survey (USGS), Natural Resources Conservation Service (NRCS), Louisiana Coastal Protection and Restoration Authority (CPRA), Louisiana Department of Wildlife and Fisheries (LDWF), and Louisiana Department of Natural Resources (LDNR).

Non-Federal Sponsor (NFS)
This term refers to the Non-Federal Sponsor for the project. The Louisiana Coastal Protection and Restoration Authority Board (CPRAB) and the Terrebonne Levee and Conservation District (TLCD) intend to be the non-Federal co-sponsors for the project. Despite there really being two non-Federal sponsors in this case, the singular term "Non-Federal Sponsor" (NFS) is used herein to refer to the two co-sponsors.

Invasive Plant Species
All plant species identified as invasive or as non-indigenous (exotic) in the following two sources:

> Louisiana Aquatic Invasive Species Task Force. 2005. State Management Plan for Aquatic Invasive Species in Louisiana, Appendix B. Invasive Species in Louisiana (plants). Center for Bioenvironmental Research, Tulane & Xavier Universities, New Orleans, LA.
> (Website - http://is.cbr.tulane.edu/docs_IS/LAISMP7.pdf)
>
> Barataria-Terrebonne National Estuary Program (BTNEP). 2012. Exotic Invasive Species of the Barataria-Terrebonne, Invasive Species in Louisiana. BTNEP, Thibodaux, LA. (Website - http://invasive.btnep.org/invasivesvsnatives/invasivesinla2list.aspx)

In addition, invasive plant species include; Japanese climbing fern (*Lygodium japonicum*), tall fescue (*Festuca arundinacea*), chinaberry (*Miscanthus sinensis*), Brazilian vervain (*Verbena litoralis* var. *brevibrateata*), coral ardisia (*Ardisia crenata*), Japanese ardisia (*Ardisia japonica*), cogon grass (*Imperata cylindrical*), golden bamboo (*Phyllostachys aurea),* and rescuegrass (*Bromus catharticus*).

Nuisance Plant Species
Nuisance plant species will include native species deemed detrimental due to their potential adverse competition with desirable native species. Nuisance plant species identified for the mitigation project include; dog-fennel (*Eupatorium* spp.), ragweed (*Ambrosia* spp.), cattail (*Typha* spp.), grapevine (*Vitis* spp.), wild balsam apple (*Momordica charantia*), climbing hempvine (*Mikania scandens, M. micrantha*), pepper vine (*Ampelopsis arborea*), common reed (*Phragmites australis*), catbrier (*Smilax* spp.), blackberry (*Rubus* spp.), black willow (*Salix nigra*), and box elder (*Acer negundo*). Following completion of the initial mitigation

activities (e.g. placement of fill, initial plantings), the preceding list may be expanded to include other nuisance plant species. Any such addition to the list would be based on the results of the standard monitoring reports. The determination of whether a particular new plant species should be considered as a nuisance species and therefore eradicated or controlled would be determined by the USACE in coordination with the Non-Federal Sponsor and Interagency Team.

Native Plant Species
This category includes all plant species that are not classified as invasive plant species and are not considered to be nuisance plant species.

USACE Hydrophytic Vegetation Criteria
Reference to satisfaction of USACE hydrophytic vegetation criteria (i.e. plant community is dominated by hydrophytic vegetation) shall mean that sampling of the plant community demonstrates that one or more of the hydrophytic vegetation indicators set forth in the following reference is achieved:

> USACE. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0); ERDC/EL TR-10-20. USACE Engineer Research and Development Center, Vicksburg, MS.

Wetland Indicator Status of Plant Species
The wetland indicator status of plants is a means of classifying the estimated probability of a species occurring in wetlands versus non-wetlands. Indicator categories include; obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), and obligate upland (UPL). The wetland indicator status of a particular plant species shall be as it is set forth in the following reference (the “2012 National Wetland Plant List”) using the Region 2 listing contained therein. However, if the USACE approves and adopts a new list in the future, then the currently approved list will apply.

> Lichvar, Robert W. and J.T. Kartesz. 2009. North American Digital Flora: National Wetland Plant List, version 2.4.0 (https://wetland_plants.usace.army.mil). USACE, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH and BONAP, Chapel Hill, NC.

Growing Season
As used herein, the growing season is considered to be the period from April through October of any given year, although some deviation from this typical range is allowed.

Interspersion Features
This term refers to shallow open water features situated within marsh habitats. Examples include tidal channels, creeks, trenasses, and relatively small, isolated ponds. Emergent vegetation is typically absent in such features although they may contain submerged aquatic vegetation. They provide areas of foraging and nursery habitat for fish and shellfish along with associated predators, and provide loafing areas for waterfowl and other waterbirds. The marsh/open water interface forms an ecotone where post-larval and juvenile organisms can find cover and where prey species frequently concentrate.

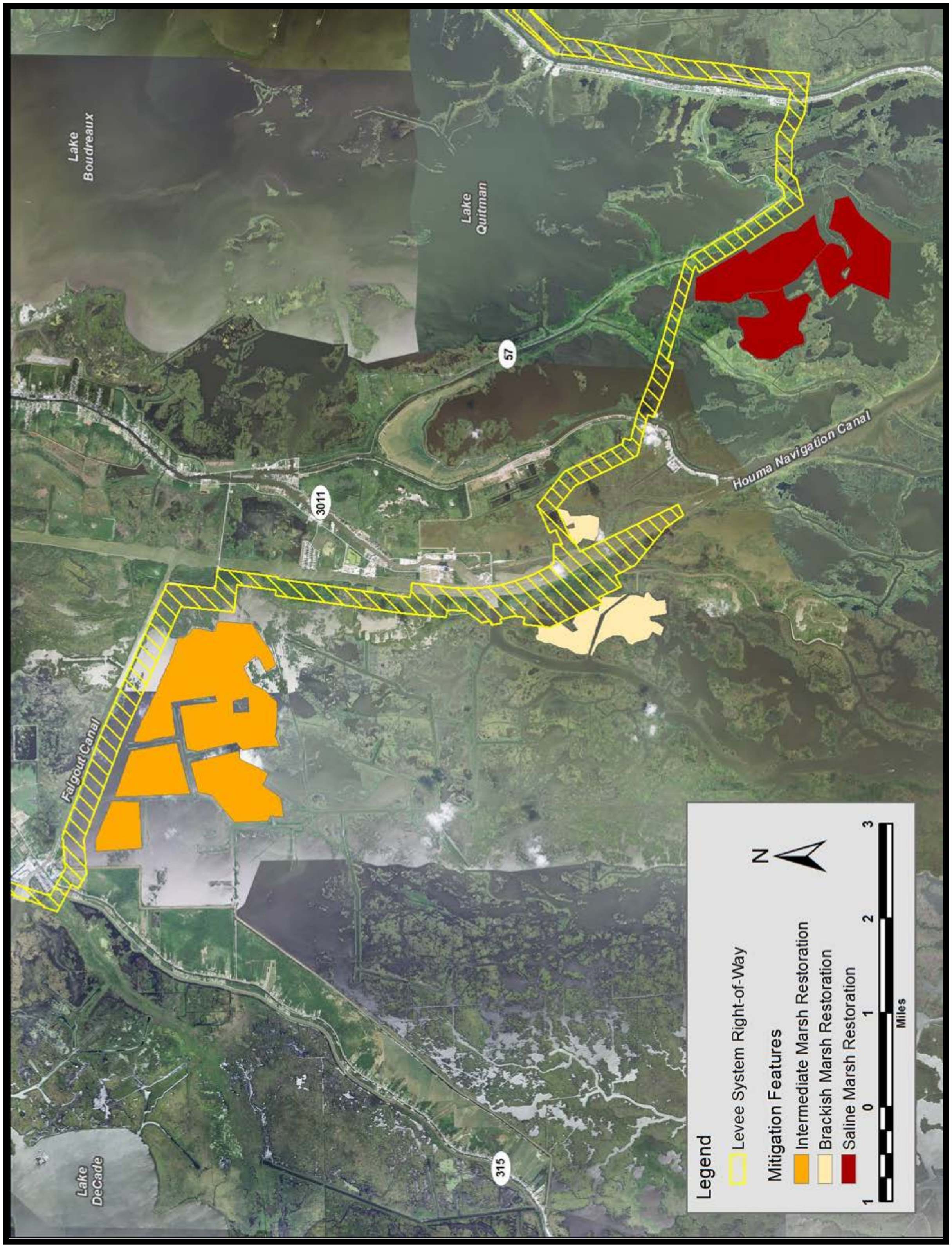


Figure K1. Overview of all proposed mitigation features.

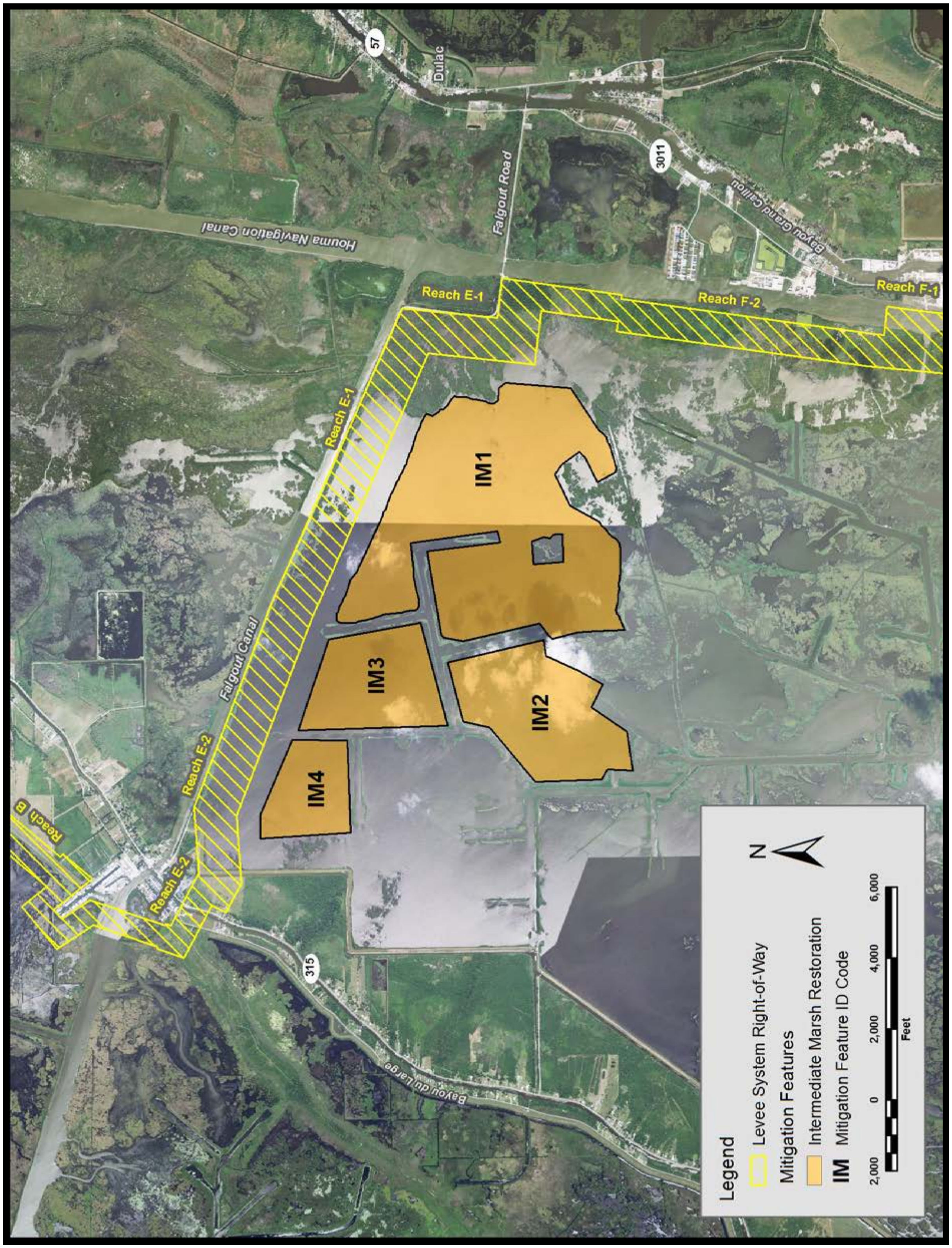


Figure K2. Proposed mitigation features: Intermediate marsh restoration features IM2 (293 ac.), and IM4 (134 ac.). IM1 and IM3 will not be used as part of the mitigation plan at this time.

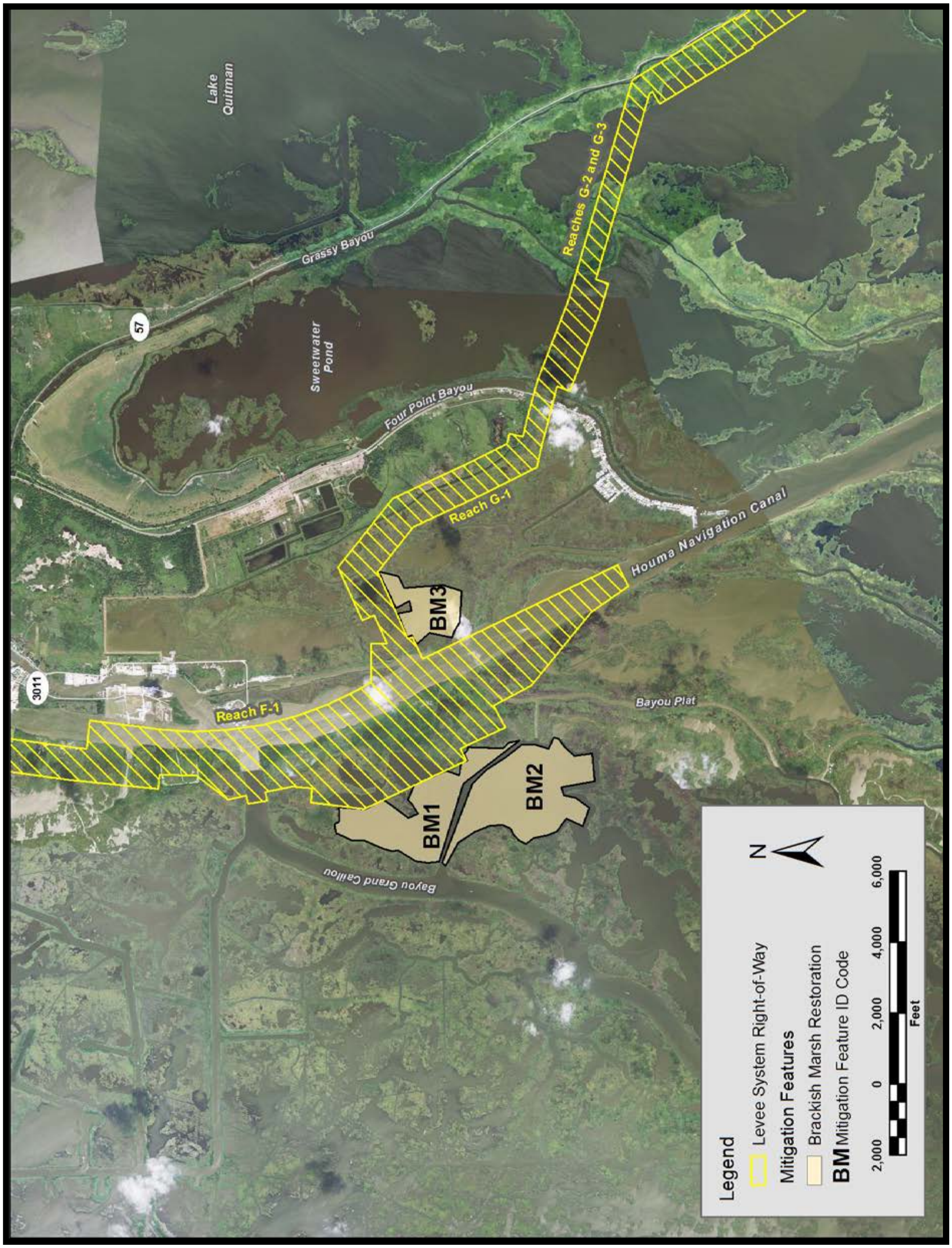


Figure K3. Proposed mitigation features: Brackish marsh restoration features BM1 (129 ac.), BM2 (170 ac.), And BM3 (59 ac.).

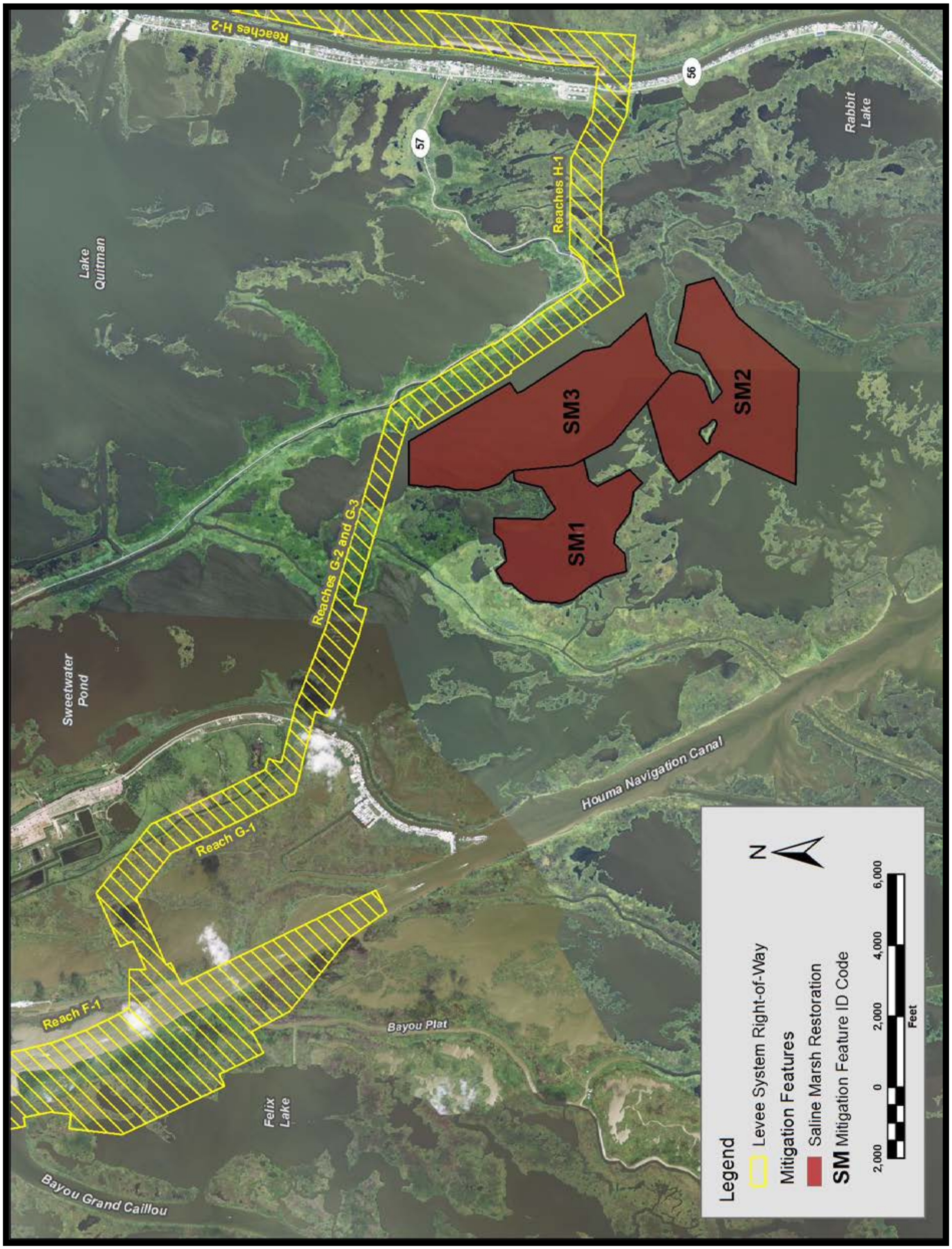


Figure K4. Proposed mitigation features: Saline marsh restoration features SM1 (241 ac.), SM2 (342 ac.), and SM3 (392 ac.). Note that these features would likely be built as a single saline marsh totaling 832

Appendix L

PHASE I ENVIRONMENTAL SITE ASSESSMENT

FINAL
PHASE I ENVIRONMENTAL SITE ASSESSMENT
MORGANZA, LOUISIANA TO THE GULF OF MEXICO
TERREBONNE AND LAFOURCHE PARISHES, LOUISIANA
CONTRACT NUMBER: W-912P8-07-D-0057
TASK ORDER NUMBER: 0047

PREPARED FOR:

US Army Corps of Engineers

United States Army Corps of Engineers, Mississippi Valley Division,
New Orleans District (USACE-MVN)
7400 Leake Avenue
New Orleans, Louisiana 70118

PREPARED BY:

AEROSTAR ENVIRONMENTAL SERVICES, INC.

Aerostar Environmental Services, Inc.
11181 St. Johns Industrial Parkway North
Jacksonville, Florida 32246
(904) 565-2820

AES Project Number 0810-265-02

May 3, 2011

TABLE OF CONTENTS

APPENDICES

LIST OF ABBREVIATIONS

AAI	All Appropriate Inquiry
AEROSTAR	Aerostar Environmental Services, Inc.
AI#	Agency Interest Number
AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
AULs	Activity and Use Limitations
BLS	Below Land Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response Compensation and Liability Information System
CORRACTS	RCRA Corrective Action
EPA	Environmental Protection Agency
ERNS	Emergency Response Notification System
ESA	Environmental Site Assessment
ESRI	Environmental Systems Research Institute
FTC	FirstSearch Technology Corporation
GIWW	Gulf Intracoastal Waterway
IC/EC	Institutional Controls/Engineering Controls
LDEQ	Louisiana Department of Environmental Quality
LDNR	Louisiana Department of Natural Resources
LPDES	Louisiana Pollutant Discharge Elimination System
LSU	Louisiana State University
LUST	Leaking Underground Storage Tank
MCL	Maximum Contaminant Level
NFA-ATT	No Further Action at This Time
NFRAP	No Further Remedial Action Planned
NGVD	National Geodetic Vertical Datum
NPHC	Non-Petroleum Hydrocarbons
NPL	National Priority List
NRCS	Natural Resource Conservation Services
PCB	Polychlorinated Biphenyls
PRC	Property Record Card
RCRA	Resource Conservation and Recovery Act
RCRA CESQG	RCRA Conditionally Exempt Small Quantity Generator
RCRAGN	RCRA Generator
RCRA-LQG	RCRA Large Quantity Generators
RCRA-SQG	RCRA Small Quantity Generators
RCRA TSD	RCRA Treatment, Storage and Disposal
SWF/LF	Solid Waste Facilities/Landfills
SWF	Solid Waste Facilities
SHWS	State Hazardous Waste Sites
TSD	Treatment, Storage and Disposal
USACE-MVN	United States Army Corps of Engineers, Mississippi Valley Division, New Orleans District
USGS	United States Geological Survey
UST	Underground Storage Tank
VCP	Voluntary Cleanup Program
VOC	Volatile Organic Compounds

1.0 EXECUTIVE SUMMARY

1.1 Site Name

Morganza, Louisiana to the Gulf of Mexico
Terrebonne and Lafourche Parish, Louisiana

1.2 Inspection Date(s)

July 19-23, 2010

1.3 Name of Inspector(s)

Cherie O'Riordan, Samuel Stuart, and Christopher Whitehead

1.4 Client and User

Client: United States Army Corps of Engineers, Mississippi Valley Division, New Orleans District
User: United States Army Corps of Engineers, Mississippi Valley Division, New Orleans District

1.5 Site Description and General Observations

At the request of the United States Army Corps of Engineers, Mississippi Valley Division, New Orleans District (USACE-MVN), the site corridor consisted of the existing levee and proposed levee 500 feet on either side of the centerline of the alignment. AEROSTAR subdivided the site corridor into three segments titled Section A, Section B, and Section C. Under these designations, Section A consisted of USACE Reaches A and B as well as the alignment entitled the Barrier Plan; Section B consisted of USACE Reaches E-1, E-2, F-1, F-2, G-1, G-2 (Alternative Alignment 1), G-3 (Alternative Alignment 2), H-1, H-2, H-3, I-1, I-2, and I-3; and Section C consisted of USACE Reaches J-1, J-2, J-3, K, and L.

1.5.1 Section A

From 29° 40' 19.62" N, 91° 0' 28.22 W, to 29° 24' 32.20" N, 90° 46' 48.18" W, Section A consisted of an approximate 30.8-mile corridor of levee and undeveloped land located in USACE Reach A and B west of Bayou Dularge Road (Parish Road 315) as well as the Barrier Plan alignment west of Bayou Black Drive (Parish Road 182). The northern terminus of Section A is located at Bayou Black and is occupied by undeveloped land. The southern terminus of Section A is located south of the Falgout Canal Marina at Bayou Dularge. The Barrier Plan alignment consists of undeveloped land, commercial-industrial with mixed rural-residential properties, and the Northeast Gibson Oil and Gas Field. Reach A consists of agricultural land, the GIWW, the Sunrise Oil and Gas Field and undeveloped wetland. Reach B consists of agricultural land, existing levee, the Marmande Canal, the Falgout Canal, the Falgout Canal Marina and the Upper Bayou Dularge Pump Station.

The Barrier Plan is bordered by US Highway 90 followed by undeveloped land to the northwest; commercial-industrial and mixed rural-residential land to the northeast; Reach A to the southeast; and undeveloped wetlands to the southwest, except the Gibson Oil and Gas Field in the central portion, and the Humphreys Oil and Gas Field and Orange Grove Oil and Gas Field in the southern portion.

Reach A is bordered by the Barrier Plan alignment to the north; rural-residential and agricultural land to the east, except for undeveloped wetlands and the Sunrise Oil Field in the central portion; Reach B to the south; and undeveloped wetlands to the west, except the Sunrise Oil Field in the central portion.

Reach B is bordered by Reach A to the north; rural-residential and agricultural land to the east; and undeveloped wetlands to the west and south.

Based on the review of aerial photographs and historical topographic maps, the historical development of Section A appeared as primarily undeveloped land and wetlands in 1892 in the northern portion and 1894 in the southern portion. Section A appeared as undeveloped wetlands with agricultural development along the eastern portion to the north and center of the segment while still undeveloped in the southern portion of the segment in 1940. The North Terrebonne Gas Plant, the Falgout Canal, and Brady Road have been visible since 1944 in the southern portion of the segment. The Transcontinental Pipeline Company, the Northeast Gibson Oil and Gas Field, Waterproof Ridge Farm and the Sunrise Oil and Gas Field have been developed at the site since at least 1964. The Falgout Canal Marina has been developed since at least 1971. Bob's Bayou Black Marina and the existing levees have been developed since at least 1981.

1.5.2 Section B

From 29° 24' 32.20" N, 90° 46' 48.18" W, to 29° 26' 14.97" N, 90° 33' 54.52" W, Section B consisted of an approximate 28-mile segment of levee and proposed levee located in Reaches E, F, G, H, and I. The western terminus of Section B is located on the east side of Bayou Dularge, Bayou Dularge Road and Brady Road. The eastern terminus of Section B is located south of Humble Canal and Humble Canal Road. Reaches E-1 and E-2 adjoin Falgout Canal in the western portion of the segment. Reaches F-1 and F-2 adjoin the Houma Navigational Canal with Reach F-2 crossing the Houma Navigational Canal. Two alternate alignments, Alternate Alignment 1 and Alternate Alignment 2, extend eastward from Reach G-1. Alternate Alignment 1, the northerly alternate alignment, crosses Sweetwater Pond and connects to Reach G-3. Alternate Alignment 2, the southerly alternate alignment, extends from Reach G-2 in the middle of Sweetwater Pond to Reach G-3 along State Highway 57 (Bayou Sale Road). Reaches G-3 and H-1 follow a portion of Highway 57. Reach H-1 includes a small Federal Aviation Administration (FAA) air traffic control facility and crosses a Plains All American Pipeline oil/gas facility, located on State Highway 56 (Little Caillou Road). Reaches H-2 and H-3 follow Bayou Petite Caillou in a northeasterly direction and include residential and commercial properties along State Highway 56 (Little Caillou Road). Reaches H-3, I-1, I-2 and I-3 generally follow Bayou Terrebonne. Reaches I-2 and I-3 include residential and commercial properties along State Highway 55 (Montegut Road). Reach I-2 includes the Bayou Terrebonne Floodgate. Reach I-3 terminates south of Humble Canal and Humble Canal Road.

The reaches of the Section B segment are bordered by the following:

Reach E-1 is bordered by undeveloped land and wetlands to the north, east, south and west.

Reach E-2 is bordered by residential and undeveloped land and wetlands to the north and south; wetlands to the east; and undeveloped land and wetlands to the west.

Reach F-2 is bordered by undeveloped land and wetlands to the north; undeveloped land, wetlands, Falgout Canal Road and the Houma Navigational Canal to the east; and undeveloped land and wetlands to the south and west.

Reach F-1 is bordered by undeveloped land and wetlands to the north; Houma Navigational Canal to the east; undeveloped land, wetlands, and the Houma Navigational Canal to the south; and undeveloped land and wetlands to the west.

Reach G-1 is bordered by undeveloped land and wetlands to the north; undeveloped land, wetlands, Four Point Road, and residences to the east; undeveloped land, wetlands, and residence to the south; and undeveloped land and wetlands to the west.

Reach G-2 is bordered by undeveloped land, wetlands, residences and Four Point Road to the north; undeveloped land, wetlands and State Highway 57 (Bayou Sale Road) to the east: undeveloped land, wetlands, residences and Four Point Road to the south; and undeveloped land and wetlands to the west.

Alternate Alignment 1 is bordered by State Highway 57 (Bayou Sale Road), Sweetwater Pond, undeveloped land and wetlands to the north; undeveloped land and wetlands to the east; State Highway 57 (Bayou Sale Road), undeveloped land, wetlands and Sweetwater Pond to the south; and undeveloped land and wetlands to the west.

Alternate Alignment 2 is bordered by undeveloped land, Sweetwater Pond and wetlands to the north and south; State Highway 57 (Bayou Sale Road), undeveloped land and wetlands to the east; and Sweetwater Pond to the west.
Reach G-3 is bordered by State Highway 57 (Bayou Sale Road), undeveloped land and wetlands to the north and south; and undeveloped land and wetlands to the east and west.

Reach H-1 is bordered by Highway 57 (Bayou Sale Road), residential land, undeveloped land and wetlands to the north; undeveloped land and marsh land to the east; part of the Plains All American Pipeline Facility, Cocodrie Station, undeveloped land and wetlands to the south; and undeveloped land and wetlands to the west.

Reach H-2 is bordered by undeveloped land and wetlands, residential land, and Lapeyrouse Seafood Bar and Restaurant to the north; undeveloped land and wetlands to the east; part of the Plains All American Pipeline Facility, Cocodrie Station, undeveloped land and wetlands to the south; and residential and commercial land and Lapeyrouse Campground to the west.

Reach H-3 is bordered by residential and commercial land, undeveloped land, wetlands, and Bayou Terrebonne to the north; undeveloped land and wetlands to the east; residential and commercial land and Lapeyrouse Campground to the south; and Lapeyrouse Seafood Bar and Grocery, residences, Castex Energy - Lapeyrouse Commingling Facility, La Butte Indian Mound and Elpege Picou cemetery, and residential and commercial land to the west.

Reach I-1 is bordered by Bayou Terrebonne Floodgate to the north; undeveloped land, wetlands, and residential land to the east; undeveloped land, wetlands and Bayou Terrebonne to the south; and undeveloped land and wetlands to the west.

Reach I-2 is bordered by undeveloped land and wetlands land to the north; undeveloped land and wetlands to the east; undeveloped land and wetlands, residential land, Bayou Terrebonne Floodgate, undeveloped land and wetlands to the south; and undeveloped land, wetlands, State Highway 55 (Montegut Road) and Bayou Terrebonne to the west.

Reach I-3 is bordered by Humble Canal Road, Humble Canal, and undeveloped land to the north; undeveloped land and wetlands, Humble Canal, and Humble Canal Road to the east; undeveloped land, wetlands and residential land to the south; State Highway 55 (Montegut Road), residential land, a fire station, and a vacant community center to the west.

Based on the review of aerial photographs and historical topographic maps, the historical development of Section B appeared as primarily undeveloped land and wetlands with Four Point Road, State Highways

55, 56 and 57, Bayou Dularge, and Bayou Terrebonne crossing or adjoining the segment since at least 1893. Falgout Canal and Brady Road, in the western portion of the segment, and Humble Canal and Point Barre Road, in the eastern portion of the segment, have been visible since 1944. Falgout Canal Road was under construction by 1964 and completed by 1971. Houma Navigational Canal, which crosses and adjoins Section B in the western portion of the segment, has been visible since 1964. The present-day Plains All American crude oil pipeline transportation facility, located where Reaches H-1 and H-2 meet, has been visible since 1971. The present-day FAA Air Traffic Control facility has been visible since 1990. The Bayou Terrebonne Floodgate, in the eastern portion of the segment, has been visible since 1998. The present-day Shell Pipeline Co. Lake Barre Booster Station has been visible since 1998.

1.5.3 Section C

From, 29° 26' 7.35" N, 90° 33' 49.73" W to 29° 30' 55.66" N, 90° 21' 18.32" W, Section C consisted of an approximate 21-mile corridor of levees and proposed levees located in Reaches J, K, and L. The western terminus of Section C is located at Humble Canal. The eastern terminus of Section C is located at the Lafourche Parish levee near State Highway 3235. The central portion of Reach J-2 extends across undeveloped land and wetlands, north of Wonder Lake. The eastern portion of Reach J-2 adjoins Reach J-1 near the Bayou Pointe aux Chenes along State Highway 665 (Pointe Aux Chene Road). Reach J-1 extends southeast following Bayou Pointe aux Chenes and State Highway 665. Reach J-1 terminates at a pump station and Island Road. Reaches J-2 and J-1 include residential and commercial properties along State Highway 665. Reach J-3 extends south from Island Road, intersecting a pump station and terminating at the Pointe Aux Chene Marina. Reach J-3 includes both residential and commercial properties along Bayou Pointe aux Chenes and State Highway 665. Reaches K and L extend northeast from the Pointe Aux Chene Marina following the Grand Bayou Canal and Cut Off Canal. Reach L-3 extends east from Grand Bayou Canal and terminates along the Lafourche Parish levee, west of State Highway 3235.

The reaches of Section C are bordered by the following:

The western portion of Reach J-2 is bordered by gas platforms and undeveloped land and wetlands to the north and south. Reach J-2 is bordered by residential properties, undeveloped land, and wetlands to the east and west.

Reach J-1 is bordered by undeveloped land and wetlands to the north and south; residential properties to the east, followed by State Highway 665 and Bayou Pointe aux Chenes; and undeveloped land to the west.

Reach J-3 is bordered by undeveloped land and wetlands to the north, south, and west; and residential and commercial properties to the east.

Reach K is bordered by the Pointe Aux Chene Marina, undeveloped land, and wetlands to the south; and undeveloped land and wetlands to the north, east, and west.

Reach L is bordered by undeveloped land and wetlands to the north, east, south, and west.

Reach L-3 is bordered by undeveloped land and wetlands to the north, east, south, and west.

Based on the review of aerial photographs and historical topographic maps, the historical development of Section C appeared as primarily undeveloped land and wetlands from 1894 to at least 1941. Levees along State Highway 665, located within Reaches J-1, J-2, and J-3, have been visible since 1980. Reaches K, L, and L-3 have been undeveloped and wetlands since at least 1894. Reaches J-1, J-3, and the eastern portion of J-2 have been developed residentially and commercially since at least 1953.

1.6 Findings and Conclusions

AEROSTAR has performed a Phase I ESA in conformance with the scope and limitations of ASTM Standard E 1527-05 of the proposed Morganza, Louisiana to the Gulf of Mexico project area located in Terrebonne and Lafourche Parishes, Louisiana, hereafter referred to as the site. Any exceptions to, or deletions from, this practice are described in Section 2 of this report. The Executive Summary serves as a summary of this report and presents the significant findings, conclusions and recommendations. The Executive Summary should not be considered a stand-alone document and must be evaluated in conjunction with the discussions, supporting documentation, and limitations within this ESA report.

The recognized environmental conditions are summarized in Tables 1A through 1C. AEROSTAR recommends that these conclusions be reviewed again as soon as 60% construction plans are available.

1.6.1 Section A

This assessment has revealed no evidence of recognized environmental conditions in connection with Section A, except for the following:

- Section A, Site 1 (29° 38' 33.90" N, 90° 57' 48.82" W): The facility is an off-site RCRA-SQG and AST facility identified in the LDEQ EDMS as containing large volumes of several hazardous materials or petroleum products; soil and groundwater sampling is on-going at the facility.

- Section A, Site 2 (29° 38' 15.9" N, 90° 57' 44.5" W): One approximate 250-gallon AST was observed at an unnamed pumping station.

- Section A, Site 3 (29° 37' 52" N, 90° 57' 1.4" W): An approximate 250-gallon AST was observed at a residence along an outfall canal associated with existing levee; an abandoned drum was observed in the canal adjacent to the AST.

- Section A, Site 4 (29° 37' 43.76" N, 90° 56' 40.39" W): Three fuel storage tanks ranging in size from approximately 250 gallons to 1,000 gallons were observed at Bob's Bayou Black Marina.

- Section A, Site 5 (29° 37' 44.52" N, 90° 56' 43.01" W): Approximately 26 steel and polycarbonate drums were observed at the Petro Quest Energy, LLC facility; three drums were observed buried under heavy brush approximately 100 feet northwest of this facility.

- Section A, Site 6 (29° 37' 46.29" N, 90° 55' 57.27" W): Multiple storage tanks, including three bulk storage tanks approximately 100,000 gallons in size containing crude oil; and several unidentified storage tanks ranging from approximately 500 gallons to 10,000 gallons in size; were observed on the property. Distillation columns, as well as several thousand linear feet of pipeline, were observed at this RCRA-LQG.

- Section A, Site 7 (29° 36' 8.11" N, 90° 52' 33.88" W): Two high-pressure tanks approximately 5,000 and 10,000 gallons in size, four vertical storage tanks approximately 2,000 gallons in size, and several thousand linear feet of pipeline were observed at this RCRA-CESQG and AST facility; groundwater and soil sampling is on-going based on an existing consent decree against the facility.

- Section A, Site 8 (29° 34' 54.31" N, 90° 49' 28.34” W): Two 5,000-gallon and two 1,000-gallon ASTs containing Avgas, gas, and diesel are listed for this facility.

- Section A, Site 9 (29° 32' 46.35" N, 90° 48' 3.81" W): An on-site concern was noted from the Waterproof Ridge Farm, an AST facility, located in the northern portion of the segment.

- Section A, Site 10 (29° 28' 51.60" N, 90° 45' 40.90” W): An on-site concern was noted from nuisance dumping consisting of household appliances, cabinetry, a 55-gallon drum, and paint and household cleaners, totaling in aggregate less than 10 gallons, which appeared to have been burned, in the central portion of the segment.

- Section A, Site 11 (29° 27' 42.48" N, 90° 45' 49.49" W): An on-site concern was noted from six weathered, empty 55-gallon drums observed in the vicinity of a proposed culvert with sluice gates in the central portion of the segment.

- Section A, Site 12 (29° 25' 2.76" N, 90° 47' 3.56" W): An on-site concern was noted from the Upper Bayou Dularge Pump Station, an AST facility, located in the southern portion of the segment.

- Section A, Site 13 (29° 24' 47.95" N, 90° 47' 1.24" W): An on-site concern was noted from the Falgout Canal Marina, an AST facility, located in the southern portion of the segment.

- Section A, Site 14 (29° 24' 37.70" N, 90° 47' 13.21" W): An on-site concern was noted from an unlabeled, approximate 5,000-gallon AST observed outside the Frogco Amphibious Equipment facility. The AST appeared to be stored on the grass.

- Section A: On-site concerns were noted from 17 former and present oil and/or gas well locations identified within Section A.

- Section A: Off-site concerns were noted from eight former and present oil and/or gas well locations identified within 500 feet of Section A (1,000 feet from the centerline of the alignment).

1.6.2 Section B

This assessment has revealed no evidence of recognized environmental conditions in connection with Section B, except for the following:

- Section B, Site 1 (29° 24' 36.41" N, 90° 47' 11.46" W). An on-site concern was noted from the presence of an approximate 5,000-gallon, unlabeled AST observed within a roofed, secondary containment area outside a building without signage on Janet Lynn Drive within Reach E-2.

- Section B, Site 2 (29° 17' 54.89" N, 90° 38' 58.85" W): An on-site concern was noted from six ASTs, approximately 300,000 gallons each, observed from the road at Plains All American Pipeline, Cocodrie Station, 7394 Highway 56, within Reach H-1. The facility is listed as a crude oil pipeline transportation facility.

- Section B, Site 3 (29° 17' 56.76" N, 90° 38' 55.55" W): An on-site concern was noted from an AST and two 55-gallon drums at the Shell Pipeline Company, LP, Lake Barre Booster Station Dock, within Reach H-1. The approximate 5,000-gallon AST was observed from the road and the 55-gallon drums, labeled heavy engine oil and oil, were observed adjoining the facility’s entrance.

- Section B, Site 4 (29° 18' 27.36" N, 90° 38' 50.55" W): An on-site concern was noted from three ASTs observed at Cecil Lapeyrouse Grocery, 7243 Shoreline Drive, within Reach H-2. One AST, approximately 1,500-gallons in size, contained diesel. Two ASTs, approximately 5,000 gallons each, contained unleaded gasoline. The tanks were stored on the gravel parking lot.

- Section B, Site 5 (29° 18' 37.93" N, 90° 38' 48.86" W): An on-site concern was noted from an approximate 1,500-gallon, unlabeled, rusted AST observed from the road outside a building without signage on Shoreline Drive, within Reach H-2.

- Section B, Site 6 (29° 19' 30.68" N, 90° 38' 38.38" W): An on-site concern was noted from an approximate 2,000-gallon, unlabeled, AST observed from the road at a building without signage in the southeastern quadrant of Riggio Street and Driftwood Street, within Reach H-2.

- Section B, Site 7 (29° 19' 58.90" N, 90° 38' 35.26" W): An on-site concern was noted from an approximate 7,500-gallon, unlabeled AST, stored inside a concrete vault, at the Lapeyrouse Seafood Bar and Grocery on Little Caillou Road, within Reach H-3.

- Section B, Site 8 (29° 20' 12.86" N, 90° 38' 20.44" W): An on-site concern was noted from an approximate 1,500-gallon, unlabeled AST observed at Sportsman’s Paradise, 6830 Highway 56 (Little Caillou Road), within Reach H-3.

- Section B, Site 9 (29° 21' 12.07" N, 90° 37' 33.94" W): An on-site concern was noted from two unlabeled ASTs, approximately 1,000 and 5,000 gallons each in size, observed from the road outside a building without signage on Little Caillou Road, within Reach H-3.

- Section B, Site 10 (29° 23' 25.70" N, 90° 35' 13.59" W): An on-site concern was noted from three ASTs, labeled diesel and unleaded gasoline, approximately 20,000 gallons each in size, and an approximate 500-gallon, unlabeled AST observed outside Madison Seafood, 2166 Highway 55 (Montegut Road), within Reach I-2.

- Section B, Site 11 (29° 23' 46.92" N, 90° 35' 09.72" W): An on-site concern was noted from four, approximate 7,500-gallon, unlabeled ASTs observed from the road at the Castex Energy, Inc. facility on State Highway 55 (Montegut Road), within Reach I-2.

- Section B, Site 12 (29° 23' 59.69" N, 90° 35' 01.39" W): An on-site concern was noted from dumped debris observed in the marsh along State Highway 55 (Montegut Road) and Bayou Terrebonne, within Reach I-2.

- Section B, Site 13 (29° 24' 09.36" N, 90° 34' 55.43" W): An on-site concern was noted from numerous five-gallon containers, labeled hydraulic oil and engine oil, observed along State Highway 55 (Montegut Road) and Bayou Terrebonne, within Reach I-2.

- Section B, Site 14 (29° 24' 19.30" N, 90° 34' 29.38" W): An on-site concern was noted from an approximate 2,000-gallon AST for the Madison Pump Station, observed by helicopter on a levee, within Reach I-2.

- Section B, Site 15 (29° 25' 30.07" N, 90° 34' 01.75" W): An on-site concern was noted from a marked petroleum pipeline observed crossing State Highway 55 (Montegut Road), within Reach I-3.

- Section B, Site 16 (29° 18' 28.29" N, 90° 38' 49.44" W): An on-site concern was noted from Little Caillou Packing Company, identified as an Emergency Response Notification System (ERNS) facility, located at 7241 Shoreline Drive, within Reach H-2. A 600-gallon discharge of a petroleum product from a portable tank discharge line was reported at this facility on December 14, 1995. Database information indicates the leak was "secured;" however, no additional information was available concerning this incident.

- Section B, Site 17 (29° 20' 19.15" N, 90° 38' 13.71" W): An on-site concern was noted from an unnamed facility, identified as an ERNS facility, located at 6809 Highway 56, within Reach H-3. A transformer oil leak was reported at this address. No additional information was available about the incident.

- Section B, Site 18: An on-site concern was noted from a dump site previously identified along Falgout Canal Road in a September 1997 *Final Report for Hazardous, Toxic, and Radioactive (HTRW) Investigations* that covered portions of the corridor. While the exact location of the dump site was not noted in the report, it was notated on a small scale map and appears to have been located within Reaches E-1 or E-2. At the time of the 1997 assessment, the dump consisted of automobile tires, metal and wood construction debris, six, unlabeled, empty 55-gallon drums, several, empty five-gallon containers, and some areas of distressed vegetation and stained soil. AEROSTAR did not locate this dump during the current site investigation.

- Section B, Site 19 (29° 20' 08.58" N, 90° 38' 29.07" W): An off-site concern was noted from several large ASTs, approximately 50,000 gallons each in size, observed from the road at the Castex Energy, Inc., Lapeyrouse Commingling Facility on 6848 State Highway 56 (Little Caillou Road), adjoining Reach H-3 to the north.

- Section B: On-site concerns were noted from 17 former and present oil and/or gas well locations identified within the Section B segment (500 feet from the centerline of the alignment).

- Section B: Off-site concerns were noted from 19 former and present oil and/or gas well locations identified within 500 feet of the Section B segment (1,000 feet from the centerline of the alignment).

- Section B: On-site concerns were noted from 19 pipeline permits identified within the Section B segment (500 feet from the centerline of the alignment).

1.6.3 Section C

This assessment has revealed no evidence of recognized environmental conditions in connection with Section C, except for the following:

- Section C, Site 1 (29° 25 '20.64" N, 90° 26' 47.76" W): An on-site concern was noted from an approximate 1,500-gallon, abandoned AST observed along the levee, within Reach K.

- Section C, Site 2 (29° 25' 53.76" N, 90° 27' 39.60" W): An on-site concern was noted from an unlabeled 55-gallon poly-drum observed in the drainage canal near Island Road, within Reach J-3.

- Section C, Site 3 (29° 25' 59.17" N, 90° 27' 38.54" W): An on-site concern was noted from an approximate 2,000-gallon, diesel AST observed outside a drainage canal pump station, within Reach J-1.

- Section C, Site 4 (29° 25' 29.27" N, 90° 27' 15.17" W): An on-site concern was noted from an approximate 500-gallon, diesel AST observed outside a drainage canal pump station, within Reach J-3.

- Section C, Site 5 (29° 25' 41.91" N, 90° 27' 21.94" W): An on-site concern was noted from two ASTs, approximately 10,000 gallons each in size, observed outside a commercial fishing business, along State Highway 665 and Bayou Pointe aux Chenes, within Reach J-3.

- Section C, Site 6 (29° 30' 55.10" N, 90° 22' 30.86" W): An on-site concern was noted from three diesel ASTs, approximately 500 gallons, 1,000 gallons, and 2,000 gallons in size, observed outside a drainage canal pump station, within Reach L-3.

- Section C, Site 7 (29° 24' 59.60" N, 90° 26' 51.62" W): An on-site concern was noted from three diesel ASTs, approximately 1,000 gallons and two 2,000 gallons in size, observed in the Pointe Aux Chene Marina.

- Section C, Site 8 (29° 25' 56.46" N, 90° 27' 40.24" W): An on-site concern was noted from a marked petroleum pipeline observed extending northwest to southeast, within Reach J-1 and J-3.

- Section C: On-site concerns were noted from 14 former and present oil and/or gas well locations identified within the Section C segment.

- Section C: Off-site concerns were noted from 19 former and present oil and/or gas well locations identified within 500 feet of the Section C segment (1,000 feet from the centerline of the alignment).

- Section C: On-site concerns were noted from 15 pipeline permits identified within the Section C segment (500 feet from the centerline of the alignment).

1.7 Recommendations

During the site investigation, existing levees were observed in various locations along the site corridor. The sources of the fill material used to construct the levees were not identified during this investigation and may present a non-scope consideration under ASTM E 1527-05. Therefore, while the existing levees were not assessed as a recognized environmental condition, due to the unknown quality of the fill material it is recommended any off-site transport or disposal actions involving this material follow associated non-scope guidelines.

1.7.1 Section A

Based on the information reviewed during this assessment, no additional investigation is recommended at this time. During the project's pre-construction phase and parcel right-of-way acquisition, soil and groundwater assessment may be warranted at that time to address the recognized environmental conditions identified during this investigation.

1.7.2 Section B

Based on the information reviewed during this assessment, no additional investigation is recommended at this time. During the project's pre-construction phase and parcel right-of-way acquisition, soil and groundwater assessment may be warranted at that time to address the recognized environmental conditions identified during this investigation.

1.7.3 Section C

Based on the information reviewed during this assessment, no additional investigation is recommended at this time. During the project's pre-construction phase and parcel right-of-way acquisition, soil and groundwater assessment may be warranted at that time to address the recognized environmental conditions identified during this investigation.

The remainder of this report is organized as follows: Section 2 describes the scope of work and limitations for this report; Section 3 presents a site description; Section 4 presents user provided information; Section 5 presents a records review; Section 6 presents a summary of the site reconnaissance; Section 7 presents a summary of interviews; Section 8 presents a summary of AEROSTAR's findings and opinions; Section 9 presents a summary of AEROSTAR's conclusions; Section 10 presents any deviations from the ASTM standard; Section 11 provides additional services conducted as part of this Phase I ESA; Section 12 presents the references; Section 13 presents the signatures of environmental professionals preparing and reviewing the report; and Section 14 presents the qualifications of the environmental professionals participating in this Phase I ESA. Figures are included in Appendix A. Site photographs are included in Appendix B. A computerized regulatory agency database search is included in Appendix C. Historical research documentation is included in Appendix D. Interview documentation is included in Appendix E. A list of references is included in Appendix F. The qualifications and resumes of the environmental professionals performing this investigation are included in Appendix G.

TABLE 1A
SECTION A PARCELS WITH RECOGNIZED ENVIRONMENTAL CONDITIONS

Morganza, Louisiana to the Gulf of Mexico
Terrebonne and Lafourche Parishes, Louisiana

SITE NUMBER/ FACILITY NAME	FIGURE	LAT/ LONG	OBSERVATIONS
Site 1/Crosstex Liquids LIG	3-1	29° 38' 33.90" N, 90° 57' 48.82" W	The facility is an off-site RCRA-SQG and AST facility identified in the LDEQ EDMS as containing large volumes of several hazardous materials or petroleum products; soil and groundwater sampling is on-going at the facility.
Site 2/Unnamed Pumping Station	3-1	29° 38' 15.9" N, 90° 57' 44.5" W	One approximate 250-gallon AST was observed at an unnamed pumping station.
Site 3/Residence storing AST	3-1	29° 37' 52" N, 90° 57' 1.4" W	An approximate 250-gallon AST was observed at a residence along an outfall canal associated with existing levee; an abandoned drum was observed in the canal adjacent to the AST.
Site 4/Bob's Bayou Black Marina	3-1	29° 37' 43.76" N, 90° 56' 40.39" W	Three fuel storage tanks ranging in size from approximately 250 gallons to 1,000 gallons were observed at Bob's Bayou Black Marina.
Site 5/Petro Quest Energy, LLC	3-1	29° 37' 44.52" N, 90° 56' 43.01" W	Approximately 26 steel and polycarbonate drums were observed at the Petro Quest Energy, LLC facility; three drums were observed buried under heavy brush approximately 100 feet northwest of this facility.
Site 6/North Terrebonne Gas Plant	3-1	29° 37' 46.29" N, 90° 55' 57.27" W	Multiple storage tanks, including three bulk storage tanks approximately 100,000 gallons in size containing crude oil; and several unidentified storage tanks ranging from approximately 500 gallons to 10,000 gallons in size; were observed on the property. Distillation columns, as well as several thousand linear feet of pipeline, were observed at this RCRA-LQG.
Site 7/ Transcontinental Pipeline Company	3-2	29° 36' 8.11" N, 90° 52' 33.88" W	Two high-pressure tanks approximately 5,000 and 10,000 gallons in size, four vertical storage tanks approximately 2,000 gallons in size, and several thousand linear feet of pipeline were observed at this RCRA-CESQG and AST facility; groundwater and soil sampling is on-going based on an existing consent decree against the facility.
Site 8/Daneco Alligator Farm	3-2	29° 34' 54.31" N, 90° 49' 28.34" W	Two 5,000-gallon and two 1,000-gallon ASTs containing Avgas, gas, and diesel are listed for this facility.

SITE NUMBER/ FACILITY NAME	FIGURE	LAT/ LONG	OBSERVATIONS
Site 9/Waterproof Ridge Farm	3-3	29° 32' 46.35" N, 90° 48' 3.81" W	Two approximate 1,000-gallon ASTs were observed resting on bare earth containing unknown product at the facility.
Site 10/Nuisance dumping	3-4	29° 28' 36.1" N, 90° 45' 57.4" W	Nuisance dumping, consisting of household appliances, cabinetry, a 55-gallon drum, and paint and household cleaners, totaling in aggregate less than 10 gallons, which appeared to have been burned, was observed in the central portion of the segment.
Site 11/Abandoned drums	3-5	29° 27' 42.48" N 90° 45' 49.49" W	Six weathered, empty 55-gallon drums were observed in the vicinity of a proposed culvert with sluice gates in the central portion of the segment.
Site 12/Upper Bayou Dularge Pump Station	3-5	29° 25' 2.76" N 90° 47' 3.56" W	An approximate 250-gallon AST containing unknown product was observed at the facility.
Site 13/Falgout Canal Marina	3-5	29° 24' 47.95" N 90° 47' 1.24" W	Two approximate 1,000-gallon ASTs containing unknown product were observed along the Falgout Canal. The facility operates as a boat launch and fueling facility and has been permitted to operate a waste water treatment system consisting of activated sludge with chlorination.
Site 14/Frogco Amphibious Equipment	3-5	29° 24' 37.70" N, 90° 47' 13.21" W	An unlabeled, approximate 5,000-gallon AST was observed outside the Frogco Amphibious Equipment facility. The AST appeared to be stored on the grass.
On-site Oil and Gas Wells	NA	Multiple Locations	A total of 30 former and present oil and/or gas well locations were identified within Section A. Please refer to Appendix C for the latitude/longitude and additional information about these locations.
Off-site Oil and Gas Wells	NA	Multiple Locations	A total of 36 former and present oil and/or gas well locations were identified within 500 feet of Section A (1,000 feet from the centerline of the alignment). Please refer to Appendix C for the latitude/longitude and additional information about these locations.

TABLE 1B
SECTION B PARCELS WITH RECOGNIZED ENVIRONMENTAL CONDITIONS

Morganza, Louisiana to the Gulf of Mexico
Terrebonne and Lafourche Parishes, Louisiana

SITE NUMBER/ FACILITY NAME	FIGURE	LAT/ LONG	OBSERVATIONS
Site 1/Building without signage	3-5	29° 24' 36.41" N 90° 47' 11.46" W	An approximate 5,000-gallon, unlabeled AST was observed under a canopy within secondary containment. No signs identified the facility.
Site 2/Plains All American Pipeline	3-7	29° 17' 54.89" N, 90° 38' 58.85" W	Six ASTs, approximately 300,000 gallons each in size, were observed from the road at this crude oil pipeline transportation facility. The facility is fenced. The facility is listed as a RCRA generator.
Site 3/Shell Pipeline Co. – Lake Barre Booster Station Dock	3-7	29° 17' 56.76" N, 90° 38' 55.55" W	An approximate 5,000-galllon AST was observed from the road at this booster station. Two 55-gallon drums, labeled heavy engine oil and oil, were observed at the entrance to this facility. The AST was stored on a low concrete surface.
Site 4/Cecil Lapeyrouse Grocery	3-7	29° 18' 27.36" N, 90° 38' 50.55" W	One approximate 1,500-gallon AST, labeled diesel, and two approximate 5,000-gallon ASTs, labeled unleaded gasoline was observed. The tanks were stored on a gravel parking lot without secondary containment.
Site 5/Building without signage	3-7	29° 18' 37.93" N, 90° 38' 48.86" W	An approximate 1,500-gallon, unlabeled, rusted AST was observed from the road. No signs identified the facility.
Site 6/Building without signage	3-7	29° 19' 30.68" N, 90° 38' 38.38" W	An approximate 2,000-gallon, unlabeled AST was observed from the road. No signs identified the facility.
Site 7/Lapeyrouse Seafood Bar and Grocery	3-7	29° 19' 58.90" N, 90° 38' 35.26" W	An approximate 7,500-gallon, unlabeled, AST was observed inside a concrete vault at the edge of a canal.
Site 8/Sportsman's Paradise	3-7	29° 20' 12.86" N, 90° 38' 20.44" W	An approximate 1,500-gallon, unlabeled AST was observed from the road. The AST was stored on a small area of concrete, surrounded by bare ground.
Site 9/Building without signage	3-7	29° 21' 12.07" N, 90° 37' 33.94" W	Two unlabeled ASTs, approximately 1,000 and 5,000 gallons in size, were observed from the road. No signs identified the facility.

SITE NUMBER/ FACILITY NAME	FIGURE	LAT/ LONG	OBSERVATIONS
Site 10/Madison Seafood (closed)	3-8	29° 23' 25.70" N, 90° 35' 13.59" W	Three ASTs, labeled diesel and unleaded gasoline, approximately 20,000 gallons each in size, and one approximate 500-gallon, unlabeled AST were observed from the road. The larger ASTs were stored on a wooden platform adjoining Bayou Terrebonne.
Site 11/Castex Energy, Inc.	3-8	29° 23' 46.92" N, 90° 35' 09.72" W	Four, unlabeled, approximate 7,500-gallon ASTs were observed from the road behind a locked fence. The ASTs appeared to be stored on concrete.
Site 12/Dumped Debris	3-8	29° 23' 59.69" N, 90° 35' 01.39" W	Discarded debris was observed in the marsh along State Highway 55.
Site 13/Discarded five-gallon containers	3-8	29° 24' 09.36" N, 90° 34' 55.43" W	Numerous, discarded five-gallon hydraulic oil and engine oil containers were observed in the marsh along State Highway 55. The containers were stored on bare ground and on a wooden dock.
Site 14/Madison Pump Station	3-8	29° 24' 19.30" N, 90° 34' 29.38" W	An approximate 2,000-gallon AST was observed by helicopter on the levee next to Bayou Terrebonne at the Madison Pump Station. The AST appeared to be stored on a support structure.
Site 15/Marked petroleum pipeline	3-9	29° 25' 30.07" N, 90° 34' 01.75" W	Marked, buried petroleum pipeline right-of-way was observed crossing State Highway 55.
Site 16/Little Caillou Packing Company	3-7	29° 18' 28.29" N, 90° 38' 49.44" W	This facility was identified in the database report as an ERNS facility, located at 7241 Shoreline Drive. A 600-gallon petroleum product discharge from a portable tank discharge line was reported at this facility on December 14, 1995. No additional information was available about this incident.
Site 17/Unnamed facility	3-7	29° 20' 19.15" N, 90° 38’ 13.71" W	This unnamed facility was identified in the database report as an ERNS facility, located at 6809 Highway 56. A transformer oil leak was reported at this address. No additional information was available about the incident.

SITE NUMBER/ FACILITY NAME	FIGURE	LAT/ LONG	OBSERVATIONS
Site 18/Falgout Road Dump	3-6	unknown	A dump site previously was identified along Falgout Canal Road in a September 1997 *Final Report for HTRW Investigations* that covered portions of the corridor. While the exact location of the dump site was not noted in the report, it was notated on a small scale map and appears to have been located within Reaches E-1 or E-2. At the time of the 1997 assessment, the dump consisted of automobile tires, metal and wood construction debris, six, unlabeled, empty 55-gallon drums, several, empty five-gallon containers, and some areas of distressed vegetation and stained soil. AEROSTAR did not locate this dump during the current site investigation.
Site 19/Castex Energy Inc., Lapeyrouse Commingling Facility	3-7	29° 20' 08.58" N, 90° 38' 29.07" W	At least five ASTs were observed from the road for this facility. Each AST was approximately 50,000 gallons in size. No secondary containment structures were observed.
Oil/Gas Wells	NA	Multiple locations	A total of 17 former and present oil and/or gas well locations were identified within the Section B segment. A total of 19 pipeline permits were identified within the Section B segment. Please refer to Appendix C for the latitude/longitude and additional information about these locations.
Oil/Gas Wells	NA	Multiple locations	A total of 19 former and present oil and/or gas well locations were identified within 500 feet of the Section B segment. Please refer to Appendix C for the latitude/longitude and additional information about these locations.
Gas Pipelines	NA	Multiple Locations	A total of 19 pipeline permits identified within the Section B segment (500 feet from the centerline of the alignment). Please refer to Appendix C for additional information about these locations.

TABLE 1C
SECTION C PARCELS WITH RECOGNIZED ENVIRONMENTAL CONDITIONS

Morganza, Louisiana to the Gulf of Mexico
Terrebonne and Lafourche Parishes, Louisiana

SITE NUMBER/ FACILITY NAME	FIGURE	LAT/ LONG	OBSERVATIONS
Site 1/Abandoned AST	3-9	29° 25' 20.64" N 90° 26' 47.76" W	An approximate 1,500-gallon, abandoned AST was observed along the levee, within Reach K.
Site 2/Discarded Drum	3-9	29° 25' 53.76" N 90° 27' 39.60" W	An unlabeled 55-gallon poly-drum was observed in the drainage canal near Island Road.
Site 3/Pointe aux Chenes Pump Station	3-9	29° 25' 59.17" N 90° 27' 38.54" W	An approximate 2,000 gallon diesel AST was observed outside a drainage canal pump station. Secondary containment was observed.
Site 4/Northern Pump Station	3-9	29° 25' 29.27" N 90° 27' 15.17" W	An approximate 500 gallon diesel AST was observed outside a drainage canal pump station. Secondary containment was observed.
Site 5/Seafood Company ASTs	3-9	29° 25' 41.91" N 90° 27' 21.94" W	Two ASTs, approximately 10,000 gallons each in size, were observed outside a commercial seafood company, along State Highway 665 and Bayou Pointe aux Chenes. Secondary containment was observed.
Site 6/Lafourche Levee Pump Station	3-10	29° 30' 55.10" N 90° 22' 30.86" W	Three diesel ASTs, approximately 500 gallons, 1,000 gallons, and a 2,000 gallons in size, were observed outside a drainage canal pump station. No secondary containment was observed.
Site 7/Pointe Aux Chene Marina	3-9	29° 24' 59.60" N 90° 26' 51.62" W	Three diesel ASTs, approximately 1,000 gallon and two 2,000 gallon in size, were observed in the Pointe Aux Chene Marina.
Site 8/North-South Petroleum Pipeline	NA	29° 25' 56.46" N 90° 27' 40.24" W	A petroleum pipeline was observed extending northwest to southeast.
Oil/Gas Wells	NA	Multiple locations	A total of 14 former and present oil and/or gas well locations were identified within the Section C segment. Please refer to Appendix C for the latitude/longitude and additional information about these locations.
Oil/Gas Wells	NA	Multiple locations	A total of 19 former and present oil and/or gas well locations were identified within 500 feet of the Section C segment. Please refer to Appendix C for the latitude/longitude and additional information about these locations.
Gas Pipelines	NA	Multiple locations	On-site concerns were noted from 15 pipeline permits identified within the Section C segment (500 feet from the centerline of the alignment). Please refer to Appendix C for additional information about these locations

2.0 INTRODUCTION

2.1 Purpose

The purpose of this Phase I ESA is to identify, to the extent feasible pursuant to ASTM Standard E 1527-05, recognized environmental conditions in connection with the site. The term recognized environmental conditions means the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater or surface water of the property. The term includes hazardous substances or petroleum products even under conditions in compliance with laws. The term is not intended to include *de minimis* conditions that generally do not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies. Conditions determined to be *de minimis* are not recognized environmental conditions.

Although performance of this investigation in a manner that is generally consistent with the ASTM Standard E 1527-05 Standard is of benefit, it should be recognized that the Standard of “All Appropriate Inquiry” or “good commercial or customary practice” can only be made on a case-by-case basis and is subject to judicial interpretation.

2.2 Scope of Work

This Phase I ESA was conducted in general accordance with ASTM Standard E 1527-05, “Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.” The assessment consisted of four components: records review, site reconnaissance, interviews, and report preparation.

The scope of work does not include an evaluation of asbestos containing building materials, lead based paint, lead in drinking water, regulatory compliance, soil or groundwater sampling and analysis, cultural and historical resources, industrial hygiene, health and safety, ecological resources, indoor air quality, radon, site geotechnics (soils, foundations, site retention, etc.), wetlands, endangered species, or construction materials testing. AEROSTAR can provide these additional services, if requested.

2.2.1 Records Review

Historical Research: Sources such as historical aerial photographs, city directories, and fire insurance maps were reviewed, if reasonably ascertainable, to evaluate the historical usage of the site and surrounding properties. Additionally, a chain-of-title and an environmental lien search were reviewed if provided by the User.

Physical Setting Sources: Various maps, reports, and technical publications were reviewed and observations of site conditions were made to evaluate the hydrogeological/geological conditions associated with the site and surrounding properties. This data can provide pertinent information about the site, including soil classification, surface water flow directions, and possibly, an indication of the local directions of surficial aquifer groundwater flow.

Environmental Public Records Review: Reasonably ascertainable local, state, tribal and federal environmental records and the regulatory database search were reviewed to help assess the likelihood of problems from migrating hazardous substance or petroleum products. Public records identifying these facilities can provide indications of the potential for recognized environmental conditions to be present at the site.

AEROSTAR obtained, reviewed and evaluated reasonably ascertainable information from the Client, User, site owner; local, state, tribal, or federal entities; and the environmental regulatory database search. The conclusions and recommendations of this report are based, in part, on this information. The data reviewed during this investigation appeared to be accurate; however, the provided services do not include the verification of the accuracy or authenticity of information provided by others.

2.2.2 Site Reconnaissance

On-Site Reconnaissance: Visual and physical inspections conducted as part of this investigation included walking the entire length of the corridor and visually observing the site from the current levee right-of-way. Additionally, observations of access to and egress from the site were noted, as well as the presence and condition of any on-site buildings, utilities, or other improvements. During the site inspection, an emphasis was placed on observing the operations or conditions exhibiting the potential for recognized environmental conditions. All phases of the site reconnaissance were documented and photographs were taken.

Off-Site Reconnaissance: Off-site reconnaissance conducted as part of this investigation included visual and physical inspections of the adjoining properties from the site boundary and from publicly accessible areas. Additionally, a vehicular reconnaissance of the surrounding properties was conducted. During these inspections, an emphasis was placed on observing the operations or conditions exhibiting the potential for recognized environmental conditions. If any sources were identified, the inspector would document the name and location of the facility.

2.2.3 Interviews

AEROSTAR conducted interviews with available individuals familiar with the site, as well as local, state, tribal or federal agency representatives, regarding issues which could have an adverse effect on the environmental status of the subject site. Site owners and site occupants were not interviewed as part of this investigation.

AEROSTAR depends on the Client, tenant, and other site personnel to provide data pertinent to determining the environmental status of the site, which may or may not exist within public records. Site owners and site occupants were not interviewed as part of this investigation. The conclusions and recommendations of this report are based, in part, on available public information. The data obtained during this investigation appeared to be accurate; however, the provided services do not include the verification of the accuracy or authenticity of information provided by others.

2.2.4 Report Preparation

This report was prepared based upon the information provided by the Client and the User, the observations made during the site reconnaissance, and the information obtained from a review of readily available records. Given the inherent limitations of environmental assessment work, AEROSTAR will not guarantee that any site is free of hazardous or potentially hazardous materials or that latent or undiscovered conditions will not become evident in the future. This report was prepared within the professional conduct of the industry and in accordance with the proposal and the standard terms and conditions presented in the contract. No other warranties, representations or certifications are made.

2.3 Limitations

AEROSTAR has prepared this assessment for the Client and User. AEROSTAR's assessment represents a review of certain information relating to the site that was obtained by methods described above and does not include sampling or other monitoring activities at the property. While AEROSTAR has used reasonable care to avoid reliance upon data and information that is inaccurate, AEROSTAR is not able to verify the accuracy or completeness of all data and information available during the investigation. Some of the conclusions in this report would be different if the information upon which they are based is determined to be false, inaccurate or incomplete.

AEROSTAR makes no legal representations whatsoever concerning any matter including, but not limited to, ownership of any property or the interpretation of any law. AEROSTAR further disclaims any obligations to update the report for events taking place after the time during which the assessment was conducted.

This report is not a comprehensive site characterization and should not be construed as such. The opinions presented in this report are based upon the findings derived from a site reconnaissance, a limited review of specified regulatory records and historical sources, and comments made by the interviewees.

Phase I ESAs, by their very nature, are limited. AEROSTAR has endeavored to meet what it believes is the applicable standard of care, and, in doing so, is obliged to advise the Client and User of Phase I ESA limitations. AEROSTAR believes that providing information about limitations is essential to help the Client and User identify and thereby manage its risks. Through additional research, these risks can be mitigated - but they cannot be eliminated. AEROSTAR will, upon request, advise the Client and User of the additional research opportunities available, their impact, and their cost.

As noted above, the Phase I ESA was conducted at the referenced site, and this report was prepared for the sole use of the Client and User. This report shall not be relied upon by or transferred to any other party without the express written authorization of AEROSTAR.

Along with all of the limitations set forth in various sections of the ASTM Standard E 1527-05 protocol, the accuracy and completeness of this report is necessarily limited by the following:

- At the request of the client, a chain-of-title and environmental lien search were not conducted.
- At the request of the client, AEROSTAR did not conduct interviews with the owner or operators at the sites along the corridor.
- At the request of the client, historical city directories were not researched for this investigation
- AEROSTAR was unable to gain access to the interior of the site buildings during the site inspection.

2.3.1 Data Gaps

Data gaps are the lack or inability to obtain information required by ASTM Standard E 1527-05 despite good faith efforts to gather such information, such as, but not limited to, the inability to conduct a site visit, inability to conduct interviews, and the inability to establish historical uses of the site or surrounding properties. Not all data gaps are significant, and a data gap will only be discussed in this section if: 1) a data gap occurs during investigation, and 2) the data gap impairs AEROSTAR's ability to meet the objectives of ASTM Standard E 1527-05.

Historical Data Source Failures: Aerial photographs were not available for review prior to 1940. Sanborn Fire Insurance Maps did not cover the site vicinity. The historical records researched did not allow the property's history to be traced back to 1940 or to the property's first developed use, whichever came first, which constitutes historical data failure per ASTM Standard E 1527-05 § 8.3.2.3.

The following significant data gaps were noted: site owners and site occupants were not interviewed; and an environmental lien search was not performed for the site.

No other apparent significant data gaps were noted during the investigation of the site.

2.4 Special Terms and Conditions

This report, and the information contained herein, shall be the sole property of AEROSTAR until payment of any unpaid balance is made in full. The Client and User agree that until payment is made in full, the Client and User shall not have a proprietary interest in this report or the information contained herein. AEROSTAR shall have the absolute right to request the return of any and all copies of this report submitted to other parties, public or private, on behalf of the Client and User in the event of nonpayment of outstanding fees by the Client pursuant to AEROSTAR's proposal.

2.5 User Reliance

This report is intended for the sole use of Client and User. Its contents may not be relied upon by other parties without the explicit written consent of AEROSTAR. This is not a statement of suitability of the property for any use or purpose.

3.0 SITE DESCRIPTION

3.1 Section A

3.1.1 Location

Section A consists of an approximate 30.8-mile corridor of the existing levee and undeveloped land located in Gibson, Waterproof and Theriot, Terrebonne Parish, Louisiana, as shown in Appendix A, Figure 1 (Street Site Location Map). The subject corridor is 1,000 feet wide (500 feet on each side of the proposed alignment). Section A is referenced in the following USGS topographic quadrangles: "Gibson, Louisiana," dated 1998, "Bayou Cocodrie, Lousiana," dated 1980, "Humphreys, Louisiana," dated 1998, and "Lake Theriot, Louisiana," dated 1994, presented in Appendix A, Figures 2-1 and 2-2 (Topographic Site Location Map). Please also refer to the Site Plans presented in Appendix A, Figures 3-1 through 3-5.

3.1.2 Site and Vicinity General Characteristics

At the time of our investigation, Section A consisted of an approximate 30.8-mile corridor developed with two marinas, the existing levee, two oil and gas fields, two oil and gas facilities, and a pump station located in the southern portion of the segment. The immediate vicinity surrounding the segment is primarily characterized by commercial-industrial, rural-residential and agricultural properties to the east and undeveloped wetlands to the west. Please refer to the Street Site Location Map in Figure 1, the Topographic Site Location Map in Figure 2-1 and 2-2, and the Site Plans in Figures 3-1 through 3-5 for additional details.

3.1.3 Current Use(s) of the Site

Section A consists of commercial-industrial land and wetlands with an existing levee, a public marina, two industrial facilities, two oil and gas fields, and the Daneco Alligator Farm in the northern and central portion of the segment; and primarily agricultural land and wetlands, a pump station, and the Falgout Canal Marina located in the southern portion of the segment. The GIWW, used as a navigable waterway for shipping and commerce, intersects the site in the central portion of the segment with the Mandalay National Wildlife Refuge located north of the GIWW. During the site inspection, there was evidence of the use, storage, disposal, and generation of hazardous substances and petroleum products along the corridor, specifically at the North Terrebonne Gas Plant, the Transcontinental Pipeline Company – Williams Facility, the Waterproof Ridge Farm., the the Falgout Canal Marina, and the Upper Bayou Dularge Pump Station. Petroleum products and hazardous materials were observed primarily in various-sized ASTs and 55-gallon drums. Observations made during the site reconnaissance are further discussed in Section 6 of this report.

3.1.4 Structures, Roads, and Other Improvements on the Site

3.1.4.1 Existing Structures

Section A is developed with Bob's Bayou Black Marina, the North Terrebonne Gas Plant, the Transcontinental Pipeline Company – Williams Facility, the Daneco Alligator Farm and the Waterproof Ridge Farm in the northern portion. The Falgout Canal Marina and associated camps and the Upper Bayou Dularge Pump Station are developed in the southern portion of the segment.

3.1.4.2 Existing Roads

US Highway 90 is located at the northern terminus of the Barrier Plan alignment. Old Spanish Trail (Parish Road 11) and Geraldine Road intersect the Barrier Plan alignment in the northern portion of the segment. Bayou Black Road (Parish Road 182) is located approximately 1,000 feet east along the Barrier Plan alignment. Vega Court, Marina Drive, Shell E and P Road, and Daneco Court terminate or are located within the Barrier Plan alignment. Bayou Black Road (Parish Road 182) is located approximately 1,000 feet north of Section A. Gabi Court and Dr. Beatrous Road (Parish Road 59) are located within Section A of the alignment. Brady Drive (Parish Road 111) and Bayou Dularge Road (LA Highway 315) intersect Section A in the southern portion of the alignment.

3.1.4.3 Heating/Cooling System

Heat is provided to the vicinity by natural gas and electrical heating units, and cooling is provided by electrically powered central and window air conditioning units.

3.1.4.4 Utilities (including Sewage Disposal)

In the vicinity of Section A, electricity is provided by Entergy and the South Louisiana Electric Cooperative Association; natural gas is provided by the Terrebonne Parish Consolidated Government and Atmos Energy; and sanitary sewer is provided by the Consolidated Waterworks District No. 1 of Terrebonne Parish.

3.1.4.5 Potable Water

Potable water is provided to the area of Section A by the Consolidated Waterworks District No. 1 of Terrebonne Parish.

3.1.5 Current Uses of the Adjoining Properties

The current uses of the adjoining properties are as follows:

Table 2A-1
Description of Adjoining Parcels – Section A, Barrier Plan

Direction From Site	Address	Description of Current Use
Northwest	NA	US Highway 90 followed by undeveloped land
Northeast	Bayou Black Road 5609 Bayou Black Drive	Commercial-industrial and rural-residential property Crosstex LIG Liquids – Gibson Gas Plant
Southeast	NA	Reach A
Southwest	NA	Undeveloped wetlands Gibson Oil and Gas Field Orange Grove Oil and Gas Field

Table 2A-2
Description of Adjoining Parcels – Section A, Reach A

Direction From Site	Address	Description of Current Use
North	NA	Barrier Plan alignment
East	NA	Agricultural and rural-residential property Sunrise Oil and Gas Field
South	NA	Reach B

West	NA	Undeveloped wetlands Sunrise Oil and Gas Field

Table 2A-3 **Description of Adjoining Parcels – Section A, Reach B**		
Direction From Site	**Address**	**Description of Current Use**
North	NA	Reach A
East	NA	Agricultural and rural-residential property
South	NA	Undeveloped wetland
West	NA	Undeveloped wetland

Based on the information reviewed as part of this assessment, the current uses of adjoining properties are not suspected of having the potential to negatively impact the site, except the Crosstex LIG Liquids – Gibson Gas Plant facility and wellpoints associated with the Orange Grove Oil and Gas Field.

3.2 Section B

3.2.1 Location

Section B consists of an approximate 28-mile corridor located in Dulac, Chauvin, and Montegut, in Terrebonne Parish, Louisiana, and is shown in Appendix A, Figure 1 (Street Site Location Map). The entire subject corridor is 1,000 feet wide (500 feet on each side of the proposed alignment). Section B is referenced in the following USGS topographic quadrangles: "Lake Theriot, Louisiana," dated 1998, "Dulac, Louisiana," dated 1994, "Lake Quitman, Louisiana," dated 1994, "Lake Tambour, Louisiana," dated 1994, and "Montegut, Louisiana," dated 1994, presented in Appendix A, Figure 2-3 (Topographic Site Location Map). Please also refer to the Site Plans presented in Appendix A, Figures 3-6 through 3-8.

3.2.2 Site and Vicinity General Characteristics

At the time of our investigation, Section B consisted of an approximate 28-mile segment with Bayou Dularge, Bayou Dularge Road and Brady Road at the western terminus of the segment and Humble Canal and Humble Canal Road at the eastern terminus of the segment. The Section B segment consists of undeveloped land, wetlands, existing levee and roadways, residential and commercial properties, crude oil pipeline transportation facilities, a crude oil pipeline booster station, natural and petroleum pipeline right-of-ways, the Bayou Terrebonne Floodgate, the Madison Pump Station, and a Native American mound and cemetery. The immediate vicinity surrounding Section B is primarily characterized by undeveloped land, wetlands, and residential and commercial properties. Please refer to the Street Site Location Map in Figure 1, the Topographic Site Location Map in Figure 2-3, and the Site Plans in Figures 3-6 through 3-8 for additional details.

3.2.3 Current Uses(s) of the Site

Section B consists of undeveloped land, wetlands, existing levee and roadways, residential and commercial properties, crude oil pipeline transportation facilities, a crude oil pipeline booster station, natural and petroleum pipeline right-of-ways, Bayou Terrebonne Floodgate, The Madison Pump Station, Falgout Canal Bridge, FAA Air Traffic Control facility, and a Native American mound and cemetery. Dump trucks and heavy machinery were observed on the levee within Reach I-1, apparently conducting earth-moving activities. During the site inspection, there was evidence of the use, storage, and transportation of petroleum products along the segment. Petroleum products were observed primarily in various-sized ASTs, pipelines, five-gallon containers and 55-gallon drums. Observations made during the site reconnaissance are further discussed in Section 6 of this report.

3.2.4 Structures, Roads, and Other Improvements on the Site

3.2.4.1 Existing Structures

Structures along Section B consist of residential and commercial structures, Falgout Canal Bridge, Bayou Terrebonne Floodgate, Madison Pump Station, buried natural gas and petroleum pipelines, the FAA Air Traffic Control facility, Plains All American Pipeline crude oil transportation facility, Shell Pipeline Co., LP – Lake Barre Booster Station dock facility, and a small Castex Energy booster station facility.

3.2.4.2 Existing Roads

Falgout Canal Road (Parrish Road 10), Brady Road, and Bayou Dularge Road (State Highway 315) are located in Reach E-2. Falgout Canal Road is located in Reach E-1. Four Point Road is located in Reach G-2 and Alternate Alignment 1. Bayou Sale Road (State Highway 57) is located in Reaches G-2, G-3 and H-1. Little Caillou Road (State Highway 56) is located in Reaches H-1, H-2, and H-3. Montegut Road (State Highway 55) is located in Reaches I-1, I-2 and I-3. Pointe Barre Road is located in Reach I-3. Humble Canal Road is located in Reach I-3. Shoreline Drive and Touloulou Street, located east of Little Caillou Road, and other smaller roads, are located in Reaches H-2 and H-3. Madison Canal Road is located in Reach I-2.

3.2.4.3 Heating/Cooling System

Heat is provided to the strutures in the subject site area by natural gas and electrical heating units, and cooling is provided by electrically powered central and window air conditioning units.

3.2.4.4 Utilities (including Sewage Disposal)

Sewage disposal is supplied to the area by the Consolidated Waterworks District No. 1 of Terrebonne Parish; electricity is supplied by the South Louisiana Electric Cooperative Association. Additionally, natural gas is provided through the area by South Coast, Atmos Energy and Terrebonne Parish Consolidated Government.

3.2.4.5 Potable Water

Potable water is provided to the area of Section B by the Consolidated Waterworks District 1 of Terrebonne Parish.

3.2.5 Current Uses of the Adjoining Properties

The current uses of the adjoining properties are as follows:

Table 2B-1
Description of Adjoining Parcels – Section B, Reaches E-1 and E2

Direction From Site	Address	Description of Current Use
North	NA NA Janet Lynn Drive Janet Lynn Drive	Residential property Undeveloped land and wetlands Boat Storage facility Frogco Amphibious Equipment warehouse

East	NA NA	Undeveloped land Houma Navigational Canal
South	NA	Wetlands
West	NA	Undeveloped land

Table 2B-2
Description of Adjoining Parcels – Section B, Reaches F-1 and F-2

Direction From Site	Address	Description of Current Use
North	NA NA	Undeveloped land and wetlands Falgout Canal
East	NA Shrimpers Row Shrimpers Row, Trosclair Lane	Houma Navigational Canal Residential property Commercial property
South	NA	Wetlands
West	NA	Wetlands

Table 2B-3
Description of Adjoining Parcels – Section B, Reaches G-1, G-2 and G-3

Direction From Site	Address	Description of Current Use
North	NA Four Point Road	Undeveloped land and wetlands Residential land
East	NA	Undeveloped land and wetlands
South	NA	Undeveloped land and wetlands Bayou Sale Road (State Highway 55)
West	NA	Undeveloped land and wetlands

Table 2B-4
Description of Adjoining Parcels – Section B, Alternate Alignment 1

Direction From Site	Address	Description of Current Use
North	NA	Undeveloped land and wetlands Four Point Road
East	NA	Undeveloped land and wetlands Bayou Sale Road (State Highway 55)
South	NA	Undeveloped land and wetlands Four Point Road
West	NA	Undeveloped land and wetlands

Table 2B-5
Description of Adjoining Parcels – Section B, Alternate Alignment 2

Direction From Site	Address	Description of Current Use
North	NA	Undeveloped land and wetlands
East	NA	Undeveloped land and wetlands Bayou Sale Road (State Highway 55)
South	NA	Undeveloped land and wetlands
West	NA	Undeveloped land and wetlands

Table 2B-6 Description of Adjoining Parcels – Section B, Reach H-1		
Direction From Site	**Address**	**Description of Current Use**
North	NA Little Caillou Road	Undeveloped land and wetlands Residential land Little Caillou Road (State Highway 56) Bayou Sale Road (State Highway 55)
East	NA	Undeveloped land and wetlands
South	NA 7394 State Highway 56	Undeveloped land and wetlands Portion of Plains All American Pipeline facility
West	NA	Undeveloped land and wetlands

Table 2B-7 Description of Adjoining Parcels – Section B, Reach H-2		
Direction From Site	**Address**	**Description of Current Use**
North	NA Little Caillou Road	Undeveloped land and wetlands Residential land Little Caillou Road (State Highway 56) Bayou Sale Road (State Highway 55)
East	NA	Undeveloped land and wetlands
South	NA 7394 State Highway 56	Undeveloped land and wetlands Portion of Plains All American Pipeline facility
West	7394 State Highway 56 State Highway 56 (Little Caillou Rd.)	Portion of Plains All American Pipeline facility Residential and commercial properties, campground

Table 2B-8 Description of Adjoining Parcels – Section B, Reach H-3		
Direction From Site	**Address**	**Description of Current Use**
North	NA NA	Undeveloped land and wetlands Montegut Road (State Highway 55)
East	NA	Undeveloped land and wetlands
South	NA Little Caillou Road	Undeveloped land and wetlands Residential and commercial properties, Lapeyrouse Campground
West	Little Caillou Road Little Caillou Road NA 6858 State Highway 56	Residential and commercial properties, Lapeyrouse campground; La Butte Native American Mound and cemetery Undeveloped land and wetlands Castex Energy, Lapeyrouse Commingling Facility

Table 2B-9 Description of Adjoining Parcels – Section B, Reach I-1		
Direction From Site	**Address**	**Description of Current Use**
North	NA NA NA	Undeveloped land and wetlands Residential land Bayou Terrebonne Floodgate

East	Montegut Road (State Highway 55)	Undeveloped land and wetlands Residential land
South	NA	Undeveloped land and wetlands
West	NA	Undeveloped land and wetlands

Table 2B-10
Description of Adjoining Parcels – Section B, Reach I-2

Direction From Site	Address	Description of Current Use
North	NA Montegut Road	Undeveloped land and wetlands Residential land
East	NA	Undeveloped land and wetlands
South	NA NA Montegut Road	Undeveloped land and wetlands Bayou Terrebonne Floodgate Residential land
West	NA Montegut Road	Undeveloped land and wetlands Residential land

Table 2B-11
Description of Adjoining Parcels – Section B, Reach I-3

Direction From Site	Address	Description of Current Use
North	NA Montegut Road	Undeveloped land and wetlands Residential land
East	NA	Undeveloped land and wetlands
South	NA Montegut Road	Undeveloped land and wetlands Residential land
West	NA Montegut Road Montegut Road Montegut Road	Undeveloped land and wetlands Residential land Volunteer fire station Montegut Community Center

Based on the information reviewed as part of this assessment, the current uses of adjoining properties are not suspected of having the potential to negatively impact the site, except for the Castex Energy, Inc., Lapeyrouse Commingling Facility, located at 6848 State Highway 56 (Little Caillou Road), adjoining Reach H-3 to the north.

3.3 Section C

3.3.1 Location

Section C consists of an approximate 21-mile segment located in Cut Off and Montegut, within Lafourche and Terrebonne Parishes, Louisiana, and is shown in Appendix A, Figure 1 (Street Site Location Map). The entire subject corridor is 1,000 feet wide (500 feet on each side of the proposed alignment). Section C is referenced in the following USGS topographic quadrangles: "Cut Off, Louisiana," dated 1998, "Lake Bully Camp, Louisiana," dated 1994, "Larose, Louisiana," dated 1998, and "Montegut, Louisiana," dated 1994, presented in Appendix A, Figure 2-4 (Topographic Site Location Map). Please also refer to the Site Plans presented in Appendix A, Figures 3-9 and 3-10.

3.3.2 Site and Vicinity General Characteristics

At the time of our investigation, Section C consisted of an approximate 21-mile segment consisting of undeveloped land, wetlands, existing levee and roadways, residential and commercial properties, and natural gas and petroleum pipeline right-of-ways. The immediate vicinity surrounding Section C is primarily characterized by undeveloped land, wetlands, pump and residential and commercial properties. Please refer to the Street Site Location Map in Figure 1, the Topographic Site Location Map in Figure 2-4, and the Site Plans in Figures 3-9 and 3-10 for additional details.

3.3.3 Current Use(s) of the Site

Section C consists of undeveloped land, wetlands, existing levee and roadways, natural gas and petroleum pipeline right-of-ways, three pump stations, a marina, and residential and commercial properties. Observations made during the site reconnaissance are further discussed in Section 6 of this report.

3.3.4 Structures, Roads, and Other Improvements on the Site

3.3.4.1 Existing Structures

Existing structures along Section C consist of residential and commercial structures, buried natural gas and petroleum pipelines, pump stations, and the Pointe Aux Chene Marina.

3.3.4.2 Existing Roads

Montegut Road (State Highway 55) and Humble Canal Road are located in Reach J-2. Pointe Aux Chene Road (State Highway 665) is located in Reaches J-2, J-1, J-3, and K. Island Road is located between Reaches J-1 and J-3.

3.3.4.3 Heating/Cooling System

Heat is provided to the strutures in the subject site area by natural gas and electrical heating units, and cooling is provided by electrically powered central and window air conditioning units.

3.3.4.4 Utilities (including Sewage Disposal)

In the vicinity of Section C, electricity is provided by South Louisiana Electric Cooperative Association and Entergy; natural gas is provided by Atmos Energy and South Coast Gas; and sanitary sewer is provided by the Consolidated Waterworks District No. 1 of Terrebonne Parish and Lafourche Parish Water District 1.

3.3.4.5 Potable Water

Potable water is provided to the area of Section C by the Consolidated Waterworks District No. 1 of Terrebonne Parish and Lafourche Parish Water District 1.

3.3.5 Current Uses of the Adjoining Properties

The current uses of the adjoining properties are as follows:

Table 2C-1 Description of Adjoining Parcels – Section C, Reach J-2		
Direction From Site	**Address**	**Description of Current Use**
North	NA	Undeveloped and wetlands
East	State Highway 665	Residential property
South	NA	Undeveloped and wetlands
West	NA	Undeveloped land

Table 2C-2 Description of Adjoining Parcels – Section C, Reach J-1		
Direction From Site	**Address**	**Description of Current Use**
North	NA	Undeveloped land and wetlands
East	State Highway 665	Residential property
South	Island Road	Undeveloped land and wetlands
West	NA	Undeveloped land and wetlands

Table 2C-3 Description of Adjoining Parcels – Section C, Reach J-3		
Direction From Site	**Address**	**Description of Current Use**
North	Island Road	Undeveloped land and wetlands
East	State Highway 665	Residential and commercial property; marina
South	NA	Undeveloped land and wetlands
West	NA	Undeveloped land and wetlands

Table 2C-4 Description of Adjoining Parcels – Section C, Reaches K and L		
Direction From Site	**Address**	**Description of Current Use**
North	NA	Undeveloped land and wetlands
East	NA	Gas platform; Undeveloped land and wetlands
South	NA	Undeveloped land and wetlands
West	NA	Undeveloped land and wetlands

Table 2C-5 Description of Adjoining Parcels – Section C, Reach L-3		
Direction From Site	**Address**	**Description of Current Use**
North	NA	Undeveloped land and wetlands
East	NA	Undeveloped land and wetlands
South	NA	Undeveloped land and wetlands
West	NA	Undeveloped land and wetlands

Based on the information reviewed as part of this assessment, the current uses of adjoining properties are not suspected of having the potential to negatively impact the site.

4.0 USER PROVIDED INFORMATION

4.1 Title Records

A chain-of-title report for the site was not provided to AEROSTAR by the User or Client.

4.2 Environmental Liens or Activity and Use Limitations

Due to the number of parcels associated with the site, the Client did not request an environmental lien search.

4.3 Specialized Knowledge

No information was provided to AEROSTAR by the User with respect to any specialized knowledge or experience that may pertain to recognized environmental conditions in connection with the site.

4.4 Commonly Known or Reasonably Ascertainable Information

The User was not aware of any commonly known or reasonably ascertainable information about the site that would indicate the presence of recognized environmental conditions associated with the property.

4.5 Valuation Reduction for Environmental Issues

The User indicated the purchase or sale price reflected the fair market value of the site.

4.6 Owner, Property Manager, and Occupant Information

The properties associated with the site are owned, managed, and occupied by numerous individual and businesses. Specific information concerning individual site owners and occupants is not provided at the request of the Client.

4.7 Reason for Performing Phase I ESA

The purpose of this ESA was to complete an assessment in a good commercial and customary fashion at the property with respect to the range of hazardous substance, pollutants, or contaminants within the scope of the CERCLA, as well as for petroleum product contaminants. The ESA has been completed to determine the potential for contamination by means of appropriate inquiries into previous ownership and into uses of the property consistent with good commercial or customary practices. It is in compliance with the requirements for conducting "All Appropriate Inquiry" under EPA rule with the exception of conducting an environmental lien search and interviews of applicable parties.

4.8 Other

AEROSTAR reviewed the *Environmental Data for Hazardous, Toxic, and Radioactive Waste (HTRW) Investigations – Morganza, Louisiana, to the Gulf of Mexico Hurricane Protection Levees and Associated Project Features* report dated September 1997 prepared by Gulf Engineers and Consultants as part of this Phase I ESA investigation. The report investigated two alignments that deviate from the currently proposed alignment in some regions of the project corridor, most notably in Section A around the undeveloped portion in the area of the GIWW, in Section B east of the Houma Navigational Canal, and in Section C in the western portion of that segment also known as USACE Reach J-1. The report identified eighteen potential HTRW features that could be sources of significant contamination within the corridor; however, no further investigation was recommended.

AEROSTAR reviewed the *Initial Hazardous, Toxic, and Radioactive Waste (HTRW) Assessment – Morganza to the Gulf of Mexico Hurricane Protection Levees Reach J-1* report dated April 2005 prepared by the USACE as part of this Phase I ESA investigation. The assessment identified a low risk of encountering HTRW at Reach J-1.

A USACE Project Feature Map, provided by the Client, was used as a reference map for the reaches and other project features, provided as Appendix E.

5.0 RECORDS REVIEW

5.1 Standard Environmental Record Sources

As a part of this assessment, AEROSTAR reviewed information sources to obtain existing information pertaining to a release of hazardous substances or petroleum products on or near the site. AEROSTAR obtained an ASTM regulatory database search through FTC. A copy of the database report is included in Appendix C. AEROSTAR also reviewed other available standard environmental record sources at the LDEQ, as needed. Table 3 presents the summary of the regulatory database report.

TABLE 3
Regulatory Database Summary

Source	Applicable Search Distance	Section A			Section B			Section C		
		S[1]	A[2]	ASTM[3]	S[1]	A[2]	ASTM[3]	S[1]	A[2]	ASTM[3]
Federal NPL Site	1.0 mile	0	0	0	0	0	0	0	0	0
Federal Delisted NPL	0.5 mile	0	0	0	0	0	0	0	0	0
Federal CERCLIS List	0.5 mile	0	0	0	0	0	0	0	0	0
Federal CERCLIS NFRAP Site List	0.5 mile	0	0	0	0	0	0	0	0	0
Federal RCRA CORRACTS and TSD Facilities	1.0 mile	0	0	0	0	0	0	0	0	0
Federal RCRA Non-CORRACTS TSD Facilities	0.5 mile	0	0	0	0	0	0	0	0	0
Federal RCRA Generators Lists	S[1] & AP[2]	1	0	0	1	0	0	0	0	0
Federal IC/EC Registries	S[1]	0	0	0	0	0	0	0	0	0
Federal ERNS	S[1]	0	0	0	2	0	0	0	0	0
State- and Tribal-equivalent NPL Sites	1.0 mile	0	0	0	0	0	0	0	0	0
State- and Tribal-equivalent CERCLIS Sites	0.5 mile	0	0	0	0	0	0	0	0	0
State and Tribal Landfill and/or Solid Waste Disposal Site Lists	0.5 mile	0	0	0	0	0	0	0	0	0
State and Tribal LUST Lists	0.5 mile	0	0	0	0	0	0	0	0	0
State and Tribal Registered UST Lists	S[1] & AP[2]	0	0	0	0	0	0	0	0	0
State and Tribal IC/EC	S[1]	0	0	0	0	0	0	0	0	0
State and Tribal voluntary cleanup sites	0.5 mile	0	0	0	0	0	0	0	0	0
State and Tribal Brownfield sites	0.5 mile	0	0	0	0	0	0	0	0	0

[1] Site – number of facilities located at the site
[2] Adjoining Property – number of facilities located on an adjoining property
[3] Within the ASTM-specified search distance – number of facilities located within the applicable search distance

The database report for Section A lists one RCRA-GEN facility that is not located within the segment and is not discussed below. Regulatory information reviewed concerning any facilities located within or adjoining the corridor is detailed below.

The database report for Section B lists two additional ERNS facilities that are not located within the segment and are not discussed below. One facility is listed twice with two different EPA ID#s and is discussed below. One facility listed in the database report, "Winter Shall Energy," was not located based on the limited information provided in the database report and was not listed in the LDEQ database.

Regulatory information reviewed concerning any facilities located within or adjoining the corridor is detailed below.

No facilities were located within the ASTM search distance as listed in the regulatory database report for Section C.

North Terrebonne Gas Plant, 449 Shell E and P Road, Gibson, LA 70356, EPA ID# LAD985197680, AI# 20273, 26875: This RCRA-LQG and AST facility is located within the Barrier Plan alignment of Section A. The facility is used for oil and gas exploration south of the site; several of the wellpoints for this facility are located in the project corridor. Records were obtained for this facility dating back to 1966. According to a RCRA Subtitle C Identification Form for the calendar year 2007, the most recent year reported, the facility did not generate any hazardous waste; however, the facility historically reported generation of the following wastes: D001 – general ignitable waste, D002 – general corrosive waste, D004 - Arsenic, D018 - Benzene, F003 – spent non-halogenated solvents, and F005 – spent non-halogenated solvents. The FTC report lists these wastes including Chromium, Cadmium, and Lead generated at the facility. Information obtained from the LDEQ EDMS lists the following hazardous materials located at the site: storage tanks containing at least 10,000 lbs of cyclohexylamine; 5,000 lbs of ethylene glycol and methanol; 1,000 lbs of diesel, diethanolamine, sodium hydroxide, and sulfuric acid; and several systems containing at least 100 lbs of liquefied petroleum gas, general liquid hydrocarbons, monoethanolamine, petroleum hydrocarbons, sodium hypochlorite, and sodium sulfite. According to documentation obtained from the LDEQ EDMS, the EPA cited the facility for failing to report hazardous waste generation for the facility in April of 2005. Further documentation stated that after Hurricanes Gustav and Ike, a sheen was reportedly observed in floodwaters that inundated the site. During the site investigation, three approximate 100,000 gallon ASTs containing crude oil were observed in the northwest portion of the facility. Thousands of linear feet of aboveground pipeline was observed traversing the site as well as several compressed gas systems. These pipelines are part of the Shell Shoal Oil pipeline system located along the site corridor. Based on information obtained, a leak of approximately 12 barrels of condensate occurred from this pipeline within Section A of the site. The material was removed from the facility; however, no other information regarding this incident was available. Based on the information obtained during this investigation, on-site concerns were noted from this facility.

Plains Pipeline Co. LP – Cocodrie/Plains All American Pipeline, 7394 Highway 56, Chauvin, LA, EPA ID#s LAD985221464/LAR00006676, AI#:158164: This RCRA generator facility is located within Reach H-1 of Section B. Under EPA ID# LAD985221464, the facility is listed as a CE SQG in the database report. Under EPA ID# LAR00006676, the facility is listed as a large quantity generator. The facility operates as pipeline transporter of crude oil, according to the database report. No violations were listed in the database report and none were listed in the LDEQ database. During the site inspection, six ASTs, approximately 300,000 gallons each in size, were observed from the road. No information about the ASTs was available on the LDEQ database. The presence of a crude oil facility within the segment is a concern.

Little Caillou Packing Co., 7241 Shoreline Drive, Chauvin, LA, EPA ID# NA, AI# NA: This ERNS facility is located within Reach H-2 of Section B. According to the database report, 600 gallons of "oil, fuel: No. 2-D" were spilled at the facility from a portable tank because the discharge line developed a leak. The "leak was secured" and sorbents were used to recover materials. The notes indicated that LDEQ would be notified. No information was available from LDEQ about this facility. No ASTs were observed at this facility. Based on the lack of information gathered during this investigation about this incident, on-site concerns were noted from this facility.

No Facility Name, 6809 Highway 56, Chauvin, LA, EPA ID# NA, AI# NA: This ERNS facility is located within Reach H-3 of Section B. According to the database report, an incident report was completed on March 12, 2007. The incident description is as follows: "The caller stated that a transformer started to leak oil onto his property (boat, vehicle, clothes, etc.) and his and his wife's body. The cause of the leak is unknown at this time, but the leak seems to be coming from a seal near the bottom." No other information was listed in the database report. Based on the lack of information gathered during this investigation about this incident, on-site concerns were noted from this facility.

In addition to reviewing the database report, AEROSTAR performed reconnaissance of the site vicinity to identify any sites not mapped by FTC due to inadequate or inaccurate address information and to look for unregistered facilities. Additional petroleum and hazardous material storage facilities were observed within the ASTM search criteria during field reconnaissance performed by AEROSTAR. These facilities were researched on LDEQ's database for information. Facilities queried within Section A included: Waterproof Ridge Farm, Upper Bayou Dularge Pump Station, and Frogco Amphibious Equipment. Facilities queried within Section B included: Cecil Lapeyrouse Grocery, Cecil Lapeyrouse Seafood Bar and Restaurant, Madison Seafood, Castex Energy facility in Montegut, and Shell Pipeline Co. – Lake Barre Crude Oil Pressure Boosting Station. No information relating to petroleum products or hazardous waste was available concerning these facilities. Information gathered regarding the Crosstex LIG Liquids facility, Bob's Bayou Black Marina, Petro Quest Energy, LLC, Transcontinental Gas Pipeline Company, Daneco Alligator Farm, and the Falgout Canal Marina identified within Section A is described below.

Crosstex LIG Liquids – Gibson Gas Plant, 5609 Bayou Black Drive, LA 70356, EPA ID# LAR000068528, AI# 25905, 33190, and 93903: This RCRA-SQG and AST facility is located on an eastern adjoining property to the Barrier Plan alignment of the site. The facility operates as a natural gas routing and production facility. Records were obtained for this facility dating back to 1980. According to a RCRA Subtitle C Identification Form for the calendar year 2010, the facility did not generate any hazardous waste; however, the facility historically reported generation of the following wastes: D001 – general ignitable waste, D035 – Methyl Ethyl Ketone, F004 – spent non-halogenated solvents, and F005 – spent non-halogenated solvents. Information obtained from the LDEQ EDMS lists the following hazardous materials located at the site: an aggregate of approximately 10,000 gallons of oil, fuel oil, and used oil ASTs, a 250-gallon diesel AST, and a 250-gallon methanol AST. In July 1995, disclosure of unauthorized, non-point discharges of liquefied natural gas and condensate was provided to the LDEQ. During a limited site investigation at the facility in April 1996 by Dames & Moore, elevated levels of TPH-G in soil at two near-surface boring locations and elevated levels of benzene in groundwater were observed. A subsequent assessment performed in February 1998 by Fluor Daniels identified levels below the negotiated target levels for the facility; however, re-assessment performed in July 1999 by URS identified levels of TPH-G, TPH-D, and benzene above the RECAP screening standard for soil. A subsequent Corrective Action Plan submitted to the LDEQ by TRC in August 2004 under RECAP MO-1 and MO-2, which identified four TPH-DRO constituents exceeding the SS_{ni} RS for Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, and Indeno(1,2,3-cd)pyrene only, was approved with the recommendation of source removal. In October 2004, TRC removed soil from a 10-foot by 10-foot by 6-foot volume and submitted samples from the sidewalls of the excavation which yielded all chemicals of concern below their respective RS and a NFA-ATT was requested. No further information was available regarding this RECAP event. Further documentation was reviewed regarding operations conducted at the facility by Meridian Resources and Exploration, LLC. Meridian has operated a glycol dehydration unit at the facility since approximately 1997; RECAP analysis of soil and groundwater around this unit in April 2010 showed that TPH-G and Benzene exceeded the RECAP SS_i for soil and TPH-G, Benzene, and Xylenes exceeded the RECAP standard for groundwater. Investigation of this incident is on-going at this facility. Based on the information gathered during this investigation, off-site concerns were noted from this facility.

Bob's Bayou Black Marina, 251 Marina Drive, Gibson, LA, 70356, EPA ID# NA, AI# 164430: This AST facility is located within the Barrier Plan alignment portion of Section A. The facility operates as a boat launch and fueling station. During AEROSTAR's site inspection, one approximate 1,000-gallon AST containing gasoline, one approximate 5000-gallon AST, containing diesel, and one approximate 250-gallon AST containing unknown product was observed in secondary containment along a canal leading to Lake Cocodrie. The facility is listed as permitted by the Department of Health and Hospitals to operate an aerobic sewage treatment system at the facility but has not applied for a permit with the LDEQ. Based on the information gathered during this investigation, on-site concerns were noted from this facility.

Petro Quest Energy LLC, 5299 Bayou Black Drive, Gibson, LA, 70356, EPA ID# NA, AI# 166828: This AST facility is located within the Barrier Plan alignment portion of Section A. The facility operates as a supplier of equipment and products for the oil and gas industry. During AEROSTAR's site inspection, at least 12 metal 55-gallon drums and 14 polycarbonate 55-gallon drums containing unknown product were observed resting on bare earth along a canal leading to Lake Cocodrie. In addition, approximately 200 feet northwest of the facility approximately three drums were observed buried in heavy brush. The facility is listed as permitted by the Department of Health and Hospitals to operate an aerobic sewage treatment system at the facility but has not applied for a permit with the LDEQ. Based on the information gathered during this investigation, on-site concerns were noted from this facility.

Transcontinental Gas Pipeline Company - Williams Facility, 4711 Bayou Black Drive, Gibson, LA 70356, EPA ID# LAD985206366, LAD981903115, AI#s 22982, 32991, 17734, and 17725: This RCRA-CESQG and AST facility is located within the Barrier Plan alignment of Section A. The facility operates as an oil and gas exploration, processing, and routing facility. Based on the information reviewed, this facility has been in operation since at least 1962. According to a RCRA Subtitle C Identification Form for the calendar year 2007, the facility reported generation of the following wastes: D001 – general ignitable waste, D008 – Lead, D018 - Benzene, F003 – spent non-halogenated solvents, and F005 – spent non-halogenated solvents. A Phase II sampling event dated March 2010 was performed by a conglomerate of private legal and environmental firms representing the facility by consent decree during 2006 and 2007. The consent decree pertains to the identification of two historical unregulated waste pits located at the facility. Soil and groundwater sampling was performed in the area of the former waste pits. Arsenic, Benzene, and TPH-D were identified above thresholds established by the consent decree but below RECAP SS_i; an Arsenic groundwater plume was identified but not delineated as part of this investigation. Additionally, dissolved Lead, Benzene, Chloroethane, TPH-D, and NPHC were identified in groundwater above thresholds established by the consent decree. This investigation and remediation activities regarding this incident are on-going at the facility. Based on the information gathered during this investigation, on-site concerns were noted from this facility.

Daneco LLC Alligator Farm, 130 Daneco Court, Houma, LA 70036, EPA ID# NA, AI# 52025: This AST facility is located within the Barrier Plan northern alignment of the site. The facility operates as an alligator skinning and slaughter hatchery. According to the information reviewed, two 5,000-gallon Avgas ASTs, one 2,000-gallon gasoline AST, and one 1,000-gallon diesel AST are located at the facility. During the site inspection, the diesel AST was observed covered in secondary containment. Based on the information gathered during this investigation, on-site concerns were noted from this facility.

Falgout Canal Marina, 1868 Dr. Beatrous Road, Theriot, LA 70397, EPA ID# NA, AI#:169223: This AST facility is located within the southern portion of the segment and operates as a boat launch and fueling facility. According to the information reviewed, as of April 2010, the facility has been permitted to operate an in-ground, 2,000-gallon extended aeration waste water treatment system consisting of activated sludge with chlorination limited to discharges totaling 5,000 gallons per day. During the site inspection, two approximate 1,000-gallon ASTs containing unknown product were observed along the

Falgout Canal. Based on the information gathered during this investigation, on-site concerns were noted from this facility.

5.2 Additional Environmental Record Sources

AEROSTAR performed a review of gas and oil production wells on the LDNR website for the subject site and vicinity. The wells are located in numerous fields and are owned by several different operators. Those wells located on the site and within approximately 500 feet of the subject corridor are discussed In Appendix C.

According to research information reviewed, a common procedure in vertical and directional oil drilling involves combining oil, water, or synthetic oil with other chemicals to form a drilling mixture that is circulated through the bore hole. These mixtures frequently contain materials such as oil and grease, suspended solids, phenol, arsenic, chromium, cadmium, lead, mercury, naturally occurring radioactive materials, and barium. The composition of drilling muds varies widely depending on the location and depth of the well and the type of drilling fluid used. Directional drilling sites frequently require up to two acres of land to stage the drilling rig, well, and support infrastructure, which causes significant soil erosion, soil loss, and sediment contamination of surface waters during the preparation and development of the drilling site. Drilling techniques require extensive use of gas or oil powered drilling equipment which can cause environmental impacts through accidental releases or leaks. Based on the information reviewed as part of this investigation, on-site concerns and off-site concerns were noted from the former drilling operations associated with each well.

5.3 Physical Setting Sources

Section A

The “Gibson, Louisiana,” “Bayou Cocodrie, Lousiana,” “Humphreys, Louisiana,” and “Lake Theriot, Louisiana" USGS topographic quadrangle maps; and regulatory files available regarding properties of environmental concern in the site vicinity were reviewed as sources for obtaining information regarding the physical setting of the site and surrounding vicinity.

Section B

The “Lake Theriot, Louisiana,” “Dulac, Louisiana,” “Lake Quitman, Louisiana,” “Lake Tambour, Louisiana,” and “Montegut, Louisiana” USGS topographic quadrangle maps; and regulatory files available regarding properties of environmental concern in the site vicinity were reviewed as sources for obtaining information regarding the physical setting of the site and surrounding vicinity.

Section C

The “Cut Off, Louisiana,” “Lake Bully Camp, Louisiana,” “Larose, Louisiana,” and “Montegut, Louisiana,” USGS topographic quadrangle maps; and regulatory files available regarding properties of environmental concern in the site vicinity were reviewed as sources for obtaining information regarding the physical setting of the site and surrounding vicinity.

5.3.1 Regional Geology

Terrebonne and Lafourche Parishes are two of Louisiana’s most southern parishes bordering the Gulf of Mexico. The parishes are located on the Coastal Plain Physiographic Province of Louisiana. Based on information obtained from the US Army Corp of Engineers-Engineering Geology and Geophysics Branch website, the soils beneath the site consist of swamp deposited clays from land surface to approximately 5 feet BLS. From 5 to approximately 200 feet BLS, the soils consist of interdistributary undifferentiated soils, followed by Holocene/Pleistocene Substratum sand deposits to approximately 300 feet BLS. Beneath the Substratum Deposits lie the Praire Pleistocene fine grained deposits to a depth of at least 540 feet.

5.3.2 Topography

Section A

The area of the investigation is referenced in the 7.5-minute USGS Topographical Quadrangle Maps of Gibson, Louisiana," dated 1998, "Bayou Cocodrie, Lousiana," dated 1980, "Humpreys, Louisiana," dated 1998 and "Lake Theriot, Louisiana," dated 1994. Based on a review of the topographic map, the segment has little to no topographic relief. According to the topographic map, the site is situated at an elevation of approximately 0 to 5 feet above the NGVD of 1929.

Surface water bodies were identified on the topographic map in the vicinity of Section A. Bayou Black is located approximately 1,000 feet northeast along the northern portion of the segment. The Shell Canal is located approximately 500 feet southwest of the northern portion of the segment. The GIWW intersects the segment in the central portion. The Minor Canal is located within the central portion of the segment. Lake Hatch is located approximately 0.5-mile west of the central portion of the segment. The Marmande Canal intersects the site in the southern portion of the segment. The Thibodaux Canal runs parallel to the segment in the southern portion. The Falgout Canal is located within the segment in the southern portion. Bayou Dularge runs parallel to the southern portion of the segment approximately 0.5-mile to the east.

Based upon a review of the topographic map, regional shallow groundwater and surface water flow in the immediate vicinity of the site appears to be towards the south. Actual groundwater flow in the vicinity of the property may be locally influenced by seasonal rainfall, proximity to surface bodies of water (lakes, rivers, canals), surface topography, underground structures, soil and bedrock geology, production wells and other factors beyond the scope of this study.

Section B

The area of the investigation is referenced in the 7.5-minute USGS Topographical Quadrangle Maps of: "Lake Theriot, Louisiana," dated 1998, "Dulac, Louisiana," dated 1994, "Lake Quitman, Louisiana," dated 1994, "Lake Tambour, Louisiana," dated 1994, and "Montegut, Louisiana," dated 1994. Based on a review of the topographic maps, the segment has little to no topographic relief. According to the topographic map, the site is situated at an elevation of approximately 0 to 5 feet above the NGVD of 1929.

Surface water bodies were identified on the topographic map in the vicinity of Section B. Bayou Dularge intersects Reach E-2. Falgout Canal adjoins Reaches E-1 and E-2. The Houma Navigational Canal adjoins F-1 and F-2. Bayou Grand Caillou intersects the Houma Navigational Canal and is located within Reach F-2. Deep Bayou and Wax Bayou cross Reach G-2. Grassy Bayou and Four Point Bayou cross Alternate Alignment 1. Grassy Bayou is located within Reach G-3. Alternate Alignments 1 and 2 cross Sweetwater Pond. Part of Bayou Sale is located within Reach G-2 and crosses Alternate Alignment 2. Portions of Bayou Terrebonne are located within Reaches H-3, I-1, I-2 and adjoining I-3. Bush Canal intersects Bayou Terrebonne within Reach I-1. Portions of Bayou Petit Calliou are located within Reaches H-1 and H-2. Lapeyrouse Canal intersects Bayou Petit Calliou within Reach H-2. Robinson Canal intersects Reaches H-2 and H-3. Bayou la Cache is located within a portion of Reach H-3. A portion of another canal, also named Lapeyrouse Canal, is located within Reach I-2. Madison Canal intersects Bayou Terrebonne within Reach I-1. Humble Canal, the eastern terminus of the segment, is located within I-3.

Based upon a review of the topographic map, regional shallow groundwater and surface water flow in the immediate vicinity of the site appears to be towards the south. Actual groundwater flow in the vicinity of the property may be locally influenced by seasonal rainfall, proximity to surface bodies of water (lakes, rivers, canals), surface topography, underground structures, soil and bedrock geology, production wells and other factors beyond the scope of this study.

Section C

The area of the investigation is referenced in the 7.5-minute USGS Topographical Quadrangle Maps of : The "Cut Off, Louisiana," dated 1998, "Lake Bully Camp, Louisiana," dated 1994, "Larose, Louisiana," dated 1998, and "Montegut, Louisiana," dated 1994. Based on a review of the topographic maps, the segment has little to no topographic relief. According to the topographic map, the site is situated at an elevation of approximately 0 to 5 feet above the NGVD of 1929.

Surface water bodies were identified on the topographic map in the vicinity of Section C. Humble Canal adjoins Reach J-2 in the western portion of Section C. Wonder Lake adjoins Reach J-2 to the south. Bayou Pointe aux Chenes adjoins Reaches J-2, J-1, J-3, and K. Bayou St. Jean Charles adjoins Reaches J-1 and J-2. Bayou Blue adjoins Reaches L and L-3. Grand Bayou Canal is located within Reaches K, L, and L-3.

Based upon a review of the topographic map, regional shallow groundwater and surface water flow in the immediate vicinity of the site appears to be towards the south. Actual groundwater flow in the vicinity of the property may be locally influenced by seasonal rainfall, proximity to surface bodies of water (lakes, rivers, canals), surface topography, underground structures, soil and bedrock geology, production wells and other factors beyond the scope of this study.

5.3.3 Soils/Geology

Section A

The United States Department of Agriculture Soil Conservation Service, *Web Soil Survey* was utilized to identify native soil characteristics in the vicinity of the site. Copies of the *Web Soil Survey* reports generated as part of this investigation are included in Appendix D. According to the survey, the soils are primarily classified as Allemands muck, Aquents (dredged), Barbary muck, Cancienne silt loam, Cancienne silty clay loam, Clovelly muck, Fausse clay, Kenner muck, Lafitte muck, Larose muck, Rita muck, Schriever clay, and open water. The soils names and depth to water are listed below in Table 4A.

TABLE 4A
Summary of Soils – Section A

Soil Name	Depth to Water
Allemands muck, very frequently flooded	About 0 to 6 inches
Aquents dredged, 1 to 5 percent slopes, occasionally flooded	More than 80 inches
Barbary muck, frequently flooded	About 0 to 6 inches
Cancienne silt loam, 0 to 1 percent slopes	About 18 to 48 inches
Cancienne silty clay loam, 0 to 1 percent slopes	About 18 to 48 inches

TABLE 4A Summary of Soils – Section A	
Soil Name	**Depth to Water**
Cancienne silt loam, 0 to 1 percent slopes, occasionally flooded	About 18 to 48 inches
Clovelly muck, very slightly saline, tidal	About 0 to 6 inches
Fausse clay, frequently flooded	About 0 to 6 inches
Gramercy silty clay loam, 0 to 1 percent slopes	About 0 to 24 inches
Gramercy-Cancienne silty clay loam, 0 to 1 percent slopes	About 0 to 24 inches
Kenner muck, very frequently flooded	About 0 to 6 inches
Lafitte muck, very slightly saline, tidal	About 0 to 6 inches
Larose muck, very frequently flooded	About 0 to 6 inches
Rita muck, occasionally flooded	About 12 to 36 inches
Schriever clay, 0 to 1 percent slopes	About 0 to 24 inches
Schriever clay, frequently flooded	About 0 to 24 inches
Schriever clay, occasionally flooded	About 0 to 24 inches
Urban land	Not Applicable
Open water	Not Applicable

Section B

The United States Department of Agriculture Soil Conservation Service, *Web Soil Survey* was utilized to identify native soil characteristics in the vicinity of the site. Copies of the *Web Soil Survey* reports generated as part of this investigation are included in Appendix D. According to the survey, the soils are primarily classified as Allemands muck, Aquents (dredged), Bancker muck, Barbary muck, Bellpass muck, Cancienne silt loam, Cancienne silty clay loam, Clovelly muck, Fausse clay, Gramercy-Cancienne silty clay loam, Kenner muck, Lafitte muck, Larose muck, Rita muck, Scatlake muck, Schriever clay, timbalier muck and open water. The soils names and depth to water are listed below in Table 4B.

TABLE 4B Summary of Soils – Section B	
Soil Name	**Depth to Water**
Allemands muck, very frequently flooded	About 0 to 6 inches
Aquents dredged, 1 to 5 percent slopes, occasionally flooded	More than 80 inches
Barbary muck, frequently flooded	About 0 to 6 inches
Bancker muck, slightly saline, tidal	About 0 to 6 inches
Bancker muck, very slightly saline, tidal	About 0 to 6 inches
Bellpass muck, tidal	About 0 to 6 inches
Cancienne silt loam, 0 to 1 percent slopes	About 18 to 48 inches
Cancienne silty clay loam, 0 to 1 percent slopes	About 18 to 48 inches
Cancienne silty clay loam, 0 to 1 percent slopes, occasionally flooded	About 18 to 48 inches

TABLE 4B Summary of Soils – Section B	
Soil Name	**Depth to Water**
Cancienne silt loam, 0 to 1 percent slopes, occasionally flooded	About 18 to 48 inches
Clovelly muck, slightly saline, tidal	About 0 to 6 inches
Clovelly muck, very slightly saline, tidal	About 0 to 6 inches
Fausse clay, frequently flooded	About 0 to 6 inches
Gramercy-Cancienne silty clay loam, 0 to 1 percent slopes	About 0 to 24 inches
Kenner muck, very frequently flooded	About 0 to 6 inches
Lafitte muck, slightly saline, tidal	About 0 to 6 inches
Lafitte muck, very slightly saline, tidal	About 0 to 6 inches
Larose muck, very frequently flooded	About 0 to 6 inches
Rita muck, occasionally flooded	About 12 to 36 inches
Scatlake muck, tidal	About 0 to 6 inches
Schriever clay, 0 to 1 percent slopes	About 0 to 24 inches
Schriever clay, frequently flooded	About 0 to 24 inches
Schriever clay, occasionally flooded	About 0 to 24 inches
Timbalier muck, tidal	About 0 to 24 inches
Open water	Not Applicable

Section C

The United States Department of Agriculture Soil Conservation Service, *Web Soil Survey* was utilized to identify native soil characteristics in the vicinity of the site. Copies of the *Web Soil Survey* reports generated as part of this investigation are included in Appendix D. According to the survey, the soils are primarily classified as Allemands muck, Aquents (dredged), Bancker muck, Cancienne silt loam, Cancienne silty clay loam, Clovelly muck, Fausse clay, Fausse-Schriever association, Lafitte-Clovelly association, Lafitte muck, Kenner muck, Rita muck, Schriever clay, Timbalier-Bellpass association. The soils names and depth to water are listed below in Table 4C.

TABLE 4C Summary of Soils – Section C	
Soil Name	**Depth to Water**
Allemands muck	About 0 inches
Aquents, dredged	More than 80 inches
Bancker muck, slightly saline	About 0 to 6 inches
Cancienne silt loam	About 18 to 48 inches
Cancienne silty clay loam	About 18 to 48 inches
Clovelly muck, slightly saline	About 0 to 6 inches
Clovelly muck, very slightly saline	About 0 to 6 inches

TABLE 4C Summary of Soils – Section C	
Soil Name	**Depth to Water**
Fausse clay, frequently flooded	About 0 to 6 inches
Fausse-Schriever association	About 0 inches
Lafitte-Clovelly association	About 0 inches
Lafitte muck, slightly saline, tidal	About 0 to 6 inches
Lafitte muck, very slightly saline	About 0 to 6 inches
Kenner muck	About 0 inches
Rita muck, occasionally flooded	About 12 to 36 inches
Schriever clay, frequently flooded	About 0 to 24 inches
Schriever clay, occasionally flooded	About 0 to 24 inches
Timbalier-Bellpass association	About 0 inches

5.3.4 Hydrogeology

The aquifer system of Southeastern Louisiana is made up of five sand aquifers. Shallow sand, 200 foot sand, 400 foot sand, 700 foot sand, and 1,200 foot sand are the aquifers within the system. The shallow aquifers are not extensive enough to yield sufficient quantities of water. In these shallow aquifers the water is not considered potable. The majority of water yielded has a chloride content greater than 250 parts per million. The principle aquifer in the area is the 700 foot sand aquifer. It supplies the portion of the parish that is west of the Mississippi River. This aquifer has a chloride content less than 250 parts per million.

5.4 Historical Use Information on the Site

Historical use information was obtained from the review of aerial photographs, historical topographic maps and interviews.

Section A

Based on the review of aerial photographs and historical topographic maps, the historical development of Section A appeared as primarily undeveloped land and wetlands in 1892 in the northern portion and 1894 in the southern portion. Section A appeared as undeveloped wetlands with agricultural development along the eastern portion to the north and center of the segment while still undeveloped in the southern portion of the segment in 1940. The North Terrebonne Gas Plant, the Falgout Canal, and Brady Road have been visible since 1944 in the southern portion of the segment. The Transcontinental Pipeline Company, the Northeast Gibson Oil and Gas Field, Waterproof Ridge Farm and the Sunrise Oil and Gas Field have been developed at the site since at least 1964. The Falgout Canal Marina has been developed since at least 1971. Bob’s Bayou Black Marina and the existing levees have been developed since at least 1981.

Section B

Section B appeared as primarily undeveloped land and wetlands with Four Point Road, State Highways 55, 56 and 57, Bayou Dularge, and Bayou Terrebonne crossing or adjoining the segment since at least

1893. Falgout Canal and Brady Road, in the western portion of the segment, and Humble Canal and Point Barre Road, in the eastern portion of the segment, have been visible since at least 1944. Falgout Canal Road was under construction by 1964 and completed by 1971. Houma Navigational Canal, which crosses and adjoins Section B in the western portion of the segment, has been visible since 1964. The present-day Plains All American crude oil pipeline transportation facility, located where Reaches H-1 and H-2 meet, has been visible since 1971. The present-day FAA Air Traffic Control facility has been visible since 1990. The Bayou Terrebonne Floodgate, in the eastern portion of the segment, has been visible since 1998. The present-day Shell Pipeline Co. Lake Barre Booster Station has been visible since 1998.

<u>Section C</u>

Section C appeared as primarily undeveloped land and wetlands from at least 1894 to at least 1941. Levees along State Highway 665, located within Reaches J-1, J-2, and J-3, have been visible since at least 1980. Reaches K, L, and L-3 have been undeveloped and wetlands since at least 1894. Reaches J-1, J-3, and the eastern portion of J-2 have been residentially and commercially developed since at least 1953.

5.5 Historical Use of Adjoining Properties

Historical use information of adjoining properties was obtained from the review of aerial photographs, historical topographic maps and interviews.

<u>Section A</u>

Section A's adjoining properties has appeared as primarily undeveloped wetlands or rural-residential and agricultural land since at least 1940. The northern, western, and southern adjoining properties has been undeveloped wetlands since at least 1894. The eastern adjoining properties have consisted of commercial-industrial with mixed rural-residential property in the northern portion since at least 1940.

<u>Section B</u>

Section B's adjoining properties appeared as primarily undeveloped land and wetlands with Four Point Road, State Highways 55, 56 and 57, Bayou Dularge, and Bayou Terrebonne visible from at least 1893 to at least 1944. Increasingly more residential and commercial-type structures have been visible since 1957. The present-day Castex Energy Inc., Lapeyrouse Commingling facility has been visible on the western adjoining property, adjacent to Reach H-3, since 1980.

<u>Section C</u>

Section C's adjoining properties appeared as primarily undeveloped land and wetlands since at least 1894 to at least 1941. The western adjoining properties have been developed with the Humble Canal since at least 1941. The eastern and central adjoining properties were developed agriculturally from at least 1953 to at least 1980. The Grand Bayou Canal has been present since at least 1894. The eastern adjoining properties have been residentially and commercially developed since at least 1953. The southern adjoining properties have remained primarily undeveloped since at least 1894.

5.6 Standard Historical Sources Reviewed

5.6.1 Aerial Photograph Review

Section A

To evaluate the previous land uses of the property and surrounding area, a series of aerial photographs was reviewed. The aerial photographs provide a progressive overview of parcels pertaining to this assessment.

AEROSTAR personnel reviewed aerial photographs from 1940, 1957, 1971, 1980, and 1990 provided by NRCS; 1998 provided by LDNR; and 2007 provided by the USDA. Copies of the aerial photographs from 1940, 1957, 1971, 1981, 1990, and 1998 are included on a CD in Appendix D. The 2007 aerials are illustrated as Figures 3-1 through 3-5. Descriptions of AEROSTAR's observations are outlined in Table 5A.

TABLE 5A
Summary of Aerial Photograph Observations – Section A

Source	Photograph Date	Photograph Scale	Remarks
COC-2A-38 COC-2A-58 COC-2A-75 COC-2A-108 COC-3A-23 COC-3A-117 COC-3A-115 **Full site coverage not provided**	1940	NA	Site: Undeveloped wetlands, except for agricultural land in the central portion; the GIWW is visible in the central portion. North: Not visible. East: Undeveloped wetlands in the central portion and agricultural land in remainder; Bayou Black is visible along the northern portion of the segment. South: Not visible. West: Undeveloped wetlands.
CQC-6T-40 CQC-6T-80 CQC-6T-88 CQC-6T-154 CQC-6T-184 CQC-7T-40 CQC-7T-61 CQC-7T-141 CQC-7T-155 **Full site coverage not provided**	1957	NA	Site: Primarily undeveloped wetlands; the North Terrebonne Gas Plant is visible in the northern portion; the Northeast Gibson Oil and Gas Field is visible in the northern portion; the Waterproof Ridge Farm is visible in central portion; a man-made canal is visible along the southern portion of the segment with several linear pathways visible extending into the interior of or through Section A from the eastern adjoining properties. North: Undeveloped land. East: Rural-residential and possible agricultural land are visible in the southern portion of the segment. South: Undeveloped wetlands. West: Undeveloped wetlands and open water is visible in the southern portion of the segment.

TABLE 5A Summary of Aerial Photograph Observations – Section A			
Source	**Photograph Date**	**Photograph Scale**	**Remarks**
CQC-1MM-182 CQC-1MM-184 CQC-1MM-186 CQC-1MM-214 CQC-1MM-216 CQC-2MM-39 CQC-2MM-141	1971	NA	Site: Agricultural land is visible at the northern terminus of the segment; numerous man-made canals are visible traversing the undeveloped wetlands in the northern portion of the segment at the Sunrise Oil and Gas Field; the Falgout Canal Marina is visible at the southern terminus of Section A. North: No change. East: The Transcontinental Pipeline Company is visible in the northern portion, otherwise no change. South: No change. West: The Gibson Oil and Gas Field and Orange Grove Oil and Gas Field are visible in the northern portion of the properties; otherwise, no change.
NRCS	1980	NA	Site: Bob's Bayou Black Marina is visible in the northern portion; further development of the North Terrebonne Gas Plant is visible; the existing levee is visible in the southern portion of the segment; the Falgout Canal Marina appears developed to its current state. North: No change. East: No change. South: No change. West: Further development of oil field areas is visible, otherwise, no change.
1423-125 1423-127 1423-166 1423-206 4159-85 4159-87 4159-89	1990	NA	Site: No change. North: No change. East: No change. South: No change. West: No change.
LDNR	1998	NA	Site: No change. North: No change. East: No change. South: No change. West: No change.
USDA	2007	NA	Site: No change. North: No change. East: No change. South: No change. West: No change.

Section B

To evaluate the previous land uses of the property and surrounding area, a series of aerial photographs was reviewed. The aerial photographs provide a progressive overview of parcels pertaining to this assessment.

AEROSTAR personnel reviewed aerial photographs from 1940, 1957, 1971, 1980, and 1990 provided by NRCS; 1998, provided by the LDNR; and 2007, provided by the USDA. Copies of the aerial photographs 1957, 1971, 1980, 1990, and 1998 are included on a CD in Appendix D. The 1940 series did not cover Section B. The 2007 aerials are illustrated as Figures 3-6 through 3-8 in Appendix A. Descriptions of AEROSTAR's observations are outlined in Table 5B.

TABLE 5B
Summary of Aerial Photograph Observations – Section B

Source	Photograph Date	Photograph Scale	Remarks
CQC-5T-208 CQC-6T-88 CQC-6T-90 **Western portion of Section B, Reaches E-1, E-2, F-1, F-2, G-1 and Alternate Alignment 1 are covered**	1957	NA	Site: The site is primarily undeveloped land and wetlands. In the western portion of Section B, Brady Road, Bayou Dularge, and Falgout Canal are visible. Houma Navigational Canal is not visible. Cleared fields are visible where Alternate Alignment 1 crosses Four Point Road. North: Primarily undeveloped land and wetlands. Structures are visible in the westernmost portion, north and south of Bayou Dularge. East: Undeveloped land and wetlands. South: Undeveloped land, wetlands, canals and open water. West: Primarily undeveloped land and wetlands. Some structures are visible west of the segment along State Highway 55 (Montegut Road).

TABLE 5B Summary of Aerial Photograph Observations – Section B			
Source	**Photograph Date**	**Photograph Scale**	**Remarks**
CQC-1MM-124 CQC-1MM-131 CQC-1MM-182 CQC-2MM-21 CQC-2MM-23 CQC-2MM-24 **Portions of Reaches H-2 and H-3 are not covered**	1971	NA	Site: Falgout Canal Road is visible in the western portion of Section B. Two apparent dredge spoil areas are visible along Reaches F-1 and F-2, west of the Houma Navigational Canal. Cleared fields are visible where Alternate Alignment 1 and Reaches G-1 and G-2 cross Four Point Road. Large ASTs are visible where Reaches H-1 and H-2 meet at State Highway 56 at the present-day location of the Plains All American Pipeline facility. Humble Canal and Humble Canal Road are visible at the eastern terminus. Point Barre Road is visible in the eastern portion. More structures are visible along the roadways. North: More structures visible around Bayou Dularge, north of the western terminus of Section B. East: Falgout Canal Road Bridge, crossing the Houma Navigational Canal, is visible. Structures are visible on the adjoining property east of Reaches F-1 and F-2, across Houma Navigational Canal. South: No significant change, except that the present-day levee south of Falgout Canal and east of Bayou Dularge is visible. West: No significant change, except more structures visible along State Highway 55 (Montegut Road).
378-49 378-81 378-47 278-12 178-293 178-295 278-14 378-49	1980	NA	Site: No significant change. North: More structures are visible around Bayou Dularge, north of the western terminus of Section B. East: No significant change. South: No significant change. West: No significant change, except more structures are visible along State Highway 55 (Montegut Road). Present-day Castex Energy Inc, Lapeyrouse Commingling Facility is visible adjoining Reach H-3 on State Highway 56. Cleared roads into the wetlands for oil and gas wells are visible west of Reach H-3.
4159-112 4159-28 4159-23 4159-89 4159-91 1417-20 **Most of Reach I-3 is not covered**	1990	NA	Site: FAA Air Traffic Control facility is visible along Highway 57 within Reach H-1. North: No significant change. East: No significant change. South: No significant change. West: Lapeyrouse Campground and Lapeyrouse Seafood Bar and Grocery is area visible adjoining Reach H-3.

TABLE 5B Summary of Aerial Photograph Observations – Section B			
Source	**Photograph Date**	**Photograph Scale**	**Remarks**
LDNR GIS Database	1998	NA	Site: Bayou Terrebonne Floodgate is visible. Shell Pipeline Co. Lake Barre Booster Station Dock is visible within Reach H-2. North: No significant change. East: No significant change. South: No significant change. West: No significant change.
USDA	2007	NA	Site: No significant change. North: No significant change. East: No significant change. South: No significant change. West: No significant change.

Section C

To evaluate the previous land uses of the property and surrounding area, a series of aerial photographs was reviewed. The aerial photographs provide a progressive overview of parcels pertaining to this assessment.

AEROSTAR personnel reviewed aerial photographs from 1940-1941, 1953, 1971, 1980, and 1990 provided by NRCS; 1998, provided by the LDNR; and 2007, provided by the USDA. Copies of the 1953, 1971, 1980, 1990, and 1998 are included on a CD in Appendix D. The 1941, 1953, and 1990 series did not cover all of Section C. The 2007 aerials are illustrated as Figures 3-9 and 3-10 in Appendix A. Descriptions of AEROSTAR's observations are outlined in Table 5C.

TABLE 5C Summary of Aerial Photograph Observations – Section C			
Source	**Photograph Date**	**Photograph Scale**	**Remarks**
NRCS 00705D 00707D **Full site coverage not provided**	1940-1941	NA	Site: Undeveloped land and wetlands. Humble Canal is visible. North: Undeveloped land and wetlands. East: Undeveloped land and wetlands. Bayou Pointe au Chene is visible. South: Wonder Lake is visible in Reach J-2 followed by undeveloped land and wetlands. West: Cleared agricultural fields are visible west of Humble Canal along State Highway 55.

TABLE 5C Summary of Aerial Photograph Observations – Section C			
Source	**Photograph Date**	**Photograph Scale**	**Remarks**
NRCS Terrebonne Parish Soil Survey	1953	NA	Site: No significant change. North: Gas pipeline is visible and labeled. Bayou St. Jean Charles is visible and labeled. East: Cleared agricultural fields are visible along of Bayou Pointe aux Chenes and State Highway 665. South: Bayou St. Jean Charles is visible and labeled. West: No significant change.
NRCS 00860D 00862D 00863D	1970	NA	Site: Farmland is visible along of Bayou Pointe aux Chenes and State Highway 665. No other significant change. North: Canals are visible. East: Additional residential-type structures are visible along Reach J-1 and Reach J-3 (State Highway 665). South: No significant change. West: No significant change.
NRCS 00994D 01000D 01005D 01006D Lafourche Parish Soil Survey	1980	NA	Site: Additional levees are visible within Reach J-2 and J-1 near State Highway 665. North: No significant change. East: No significant change. South: No significant change. West: No significant change.
NRCS 01300D 01432D 01439D **Full site coverage not provided**	1990	NA	Site: Marina is visible within Reach K. No other significant change. North: No significant change. East: No significant change. South: No significant change. West: No significant change.
LDNR	1998	NA	Site: No significant change. North: No significant change. East: No significant change. South: No significant change. West: No significant change.
LDNR	2008	NA	Site: No significant change. North: No significant change. East: No significant change. South: No significant change. West: No significant change.

5.6.2 Property Ownership Records

Property ownership records were not researched for this investigation at the request of the Client. A chain-of-title was not provided to AEROSTAR by the Client or User.

5.6.3 City Directory Review

Historical city directories were not researched for this investigation at the request of the Client.

5.6.4 Fire Insurance Map Review

Fire Insurance Maps did not provide coverage for the site.

5.6.5 Other Historical Sources

Additional historical sources were reviewed during this investigation.

5.6.5.1 Topographic Maps

Section A

The following historical topographic maps were provided by FTC or acquired from the USGS: "Gibson, Louisiana," dated 1892, 1944, 1964, photorevised 1980, and 1998; "Bayou du Large, Louisiana," dated 1894 and 1944; "Bayou Cocodrie, Louisiana," dated 1964, and photorevised 1980; "Humphreys, Louisiana," dated 1964, photorevised 1980, and 1998; and "Lake Theriot, Louisiana," dated 1964, photorevised 1980, and 1994. Historical topographic maps are included on a CD in Appendix D. Descriptions of AEROSTAR's observations are outlined in Table 6A.

TABLE 6A
Summary of Historical Topographic Map Observations – Section A

Source	Map Date	Map Scale	Remarks
FTC	1892; 1894	1:62,500	Site: Developed land is visible in the central portion; undeveloped wetlands are in the remainder. North: Undeveloped. East: Developed land is visible in the northern portion; wetlands are visible in the remainder. South: Undeveloped wetlands. West: Undeveloped wetlands.

FTC	1944	1:62,500	Site: Developed land is visible in the northern portion; the GIWW is labeled in the central portion of the site; an Indian Mound is identified at a developed parcel in the southern portion; the Thibodaux Canal is labeled further south. North: No change. East: Developed in the southern portion. South: No change. West: Lake Hatch is labeled in the central portion.
FTC	1964	1:24,000	Site: Further development of property is visible in the northern portion; the Northeast Gibson Oil and Gas Field is labeled in the northern portion; the Sunrise Oil and Gas Field is labeled in the central portion; the South Sunrise Oil and Gas Field is labeled in the southern portion of the segment. North: No change. East: No change. South: Unlabeled surface water is visible. West: No change.
FTC	1964 (revised 1980)	1:24,000	Site: No change. North: No change. East: No change. South: No change. West: No change.
USGS **Map covers southern portion of segment**	1994	1:24,000	Site: No change. North: No change. East: No change. South: No change. West: Open water is shown in the wetlands area in the southern portion.
USGS **Map covers northern portion of segment**	1998	1:24,000	Site: The Mandalay National Wildlife Refuge is outlined in the central portion. North: No change. East: No change. South: No change. West: No change.

Section B

The following historical topographic maps were provided by FTC: "Bayou du Large, Louisiana," dated 1893 and 1944, "Lake Theriot, Louisiana," dated 1964 and 1964 (revised 1980), "Dulac, Louisiana," dated 1894, 1944, 1964, and 1964 (revised 1980), "Lake Quitman, Louisiana," dated 1964 and 1964 (revised 1980), "Lake Tambour, Louisiana," dated 1964 and 1964 (revised 1980), and "Montegut, Louisiana," dated 1963 (revised 1963). Historical topographic maps are included on a CD in Appendix D. Descriptions of AEROSTAR's observations are outlined in Table 6B.

TABLE 6B Summary of Historical Topographic Map Observations – Section B			
Source	**Map Date**	**Map Scale**	**Remarks**
FTC	1893; 1894	1:62,500	Site: Primarily undeveloped land and wetlands. Bayou Dularge, Falgout Canal, Houma Navigational Canal and Falgout Canal Road, all presently located in the western portion of Section B, are not depicted. Four Point Road and State Highways 55, 56 and 57 are depicted. Bayou Terrebonne is depicted in the eastern portion of Section B. Some structures are depicted adjoining the roadways. North: Primarily undeveloped land and wetlands. East: Primarily undeveloped land and wetlands. South: Primarily undeveloped land, and wetlands. West: Primarily undeveloped land and wetlands.
FTC	1944	1:62,500	Site: Falgout Canal, in the western portion of Section B, is visible. Brady Road, west of Bayou Dularge, is visible as a trail road. The present-day Indian mound is labeled on State Highway 56. Humble Canal and Point Barre Road, (visible as a trail road), are depicted in the eastern portion of Section B. North: No significant change. East: No significant change. South: No significant change. West: No significant change.
FTC	1963 1964	1:24,000	Site: Falgout Canal Road, in the western portion of Section B, is labeled as “under construction.” A ferry is labeled at the intersection of Falgout Canal and the Houma Navigational Canal. No structures are depicted on roadways. The present-day cemetery adjoining the Indian Mound is depicted on State Highway 56. Humble Canal Road is depicted in the eastern portion of Section B. North: No significant change. East: No significant change. South: No significant change. West: No significant change, except that two oil wells and one gas well are labeled west of Reach H-3.

TABLE 6B Summary of Historical Topographic Map Observations – Section B			
Source	**Map Date**	**Map Scale**	**Remarks**
USGS	1963 (revised 1980); 1964 (revised 1980)	1:24,000	Site: Falgout Canal Road, in the western portion of Section B, is depicted. More structures are depicted along State Highways 56 and 57. The six present-day ASTs are depicted at the crude oil pipeline facility on State Highway 56, where Reaches H-1 and H-2 meet. North: No significant change. East: Structures are depicted on the adjoining property east of Reaches F-1 and F-2, across the Houma Navigational Canal. South: No significant change. West: No significant change.
USGS	1994	1:24,000	Site: Falgout Canal Road, in the western portion of Section B, extends across the Houma Navigational Canal to the east. A structure is depicted in the present-day location of the FAA Air Traffic Control facility in Reach H-1. North: No significant change, except for more structures along roadways. East: No significant change. South: No significant change. West: No significant change.

Section C

The following historical topographic maps were provided by FTC: "Cut Off, Louisiana" dated 1892, 1963, and 1998; "Dulac, Louisiana," dated 1894; "Lake Bully Camp, Louisiana" dated 1994, 1964, and 1964 revision 1979; "Lake Felicity, Louisiana" dated 1894 and 1944; "Larose, Louisiana" dated 1998 and 1963 revision 1979; "Montegut, Louisiana" dated 1994, 1963, and 1963 revision 1980. Historical topographic maps are included on a CD in Appendix D. Descriptions of AEROSTAR's observations are outlined in Table 6C.

TABLE 6C Summary of Historical Topographic Map Observations – Section C			
Source	**Map Date**	**Map Scale**	**Remarks**
FTC	1894 1892	1:62,500	Site: Undeveloped land and wetlands. North: Undeveloped land and wetlands. East: Undeveloped land and wetlands. South: Undeveloped land and wetlands. West: Undeveloped land and wetlands.

FTC	1944	1:62,500	Site: Grand Bayou Canal, Cut Off Canal, and St. Louis Canal are depicted. North: No significant change. East: No significant change. South: No significant change. West: No significant change.
FTC	1963 1964	1:24,000	Site: No significant change. North: No significant change. East: Structures are depicted along State Highway 665 and Bayou Pointe aux Chenes. South: No significant change. West: Structures are depicted along State Highway 55 and Humble Canal Road.
USGS	1963 (revised 1980); 1963 (revised 1979); 1964 (revised 1979)	1:24,000	Site: New levee depicted along Reaches J-2 and J-1. North: No significant change. East: No significant change. South: No significant change. West: Additional structures are depicted along State Highway 55 and Humble Canal Road.
USGS	1994	1:24,000	Site: No significant change. North: No significant change. East: No significant change. South: No significant change. West: No significant change.
USGS	1998	1:24,000	Site: No significant change. North: No significant change. East: No significant change. South: No significant change. West: No significant change.

6.0 SITE RECONNAISSANCE

6.1 Methodology and Limiting Conditions

Visual and physical inspections conducted as part of this investigation included an inspection of properties from the right-of-way. Additionally, observations of access to and egress from the site were noted, as well as the presence and condition of any on-site buildings, utilities, or other improvements. AEROSTAR was not provided access to the interior of the site buildings at the time of the inspection. This visual and physical inspection of the site focused primarily on its surface features. Property use and significant features are indicated on the Site Plans which are included as Figures 3-1 through 3-10 in Appendix A. Site photographs are included in Appendix B.

6.2 General Site Setting

6.2.1 Section A

6.2.1.1 Current Use(s) of the Site

Section A consists of commercial-industrial land and wetlands with an existing levee, two industrial facilities, two oil and gas fields, and the Daneco Alligator Farm in the northern and central portion of the segment; and primarily agricultural land and wetlands, a pump station, and the Falgout Canal Marina located in the southern portion of the segment. The GIWW, used as a navigable waterway for shipping and commerce, intersects the site in the central portion of the segment with the Mandalay National Wildlife Refuge located north of the GIWW.

6.2.1.2 Past Use(s) of the Site

No indication of Section A's previous use was observed during the site reconnaissance.

6.2.1.3 Current Uses of Adjoining Properties

The immediate vicinity surrounding Section A is primarily characterized by undeveloped wetlands to the west and south, commercial-industrial land in the northern portion, agricultural land in the central portion and rural-residential land in the southern portion to the east, and undeveloped land to the north.

6.2.1.4 Past Use(s) of the Adjoining Properties

No indication of the adjoining properties' past uses was observed during the site reconnaissance.

6.2.1.5 Current or Past Use(s) in the Surrounding Area

No indication of the surrounding area's past use was observed during the site reconnaissance.

6.2.1.6 Geologic, Hydrogeologic, Hydrologic, and Topographic Conditions

No significant geologic, hydrogeologic or hydrologic conditions were observed during the site reconnaissance.

6.2.1.7 General Description of Structures

Bob's Bayou Black Marina, the North Terrebonne Gas Plant, the Transcontinental Pipeline Company – Williams Facility, the Daneco Alligator Farm and the Waterproof Ridge Farm were observed in the northern portion of the segment. The Falgout Canal Marina and associated camps and the Upper Bayou Dularge Pump Station are developed in the southern portion of the segment.

6.2.1.8 Roads

US Highway 90 is located at the northern terminus of the Barrier Plan alignment. Old Spanish Trail (Parish Road 11) and Geraldine Road intersect the Barrier Plan alignment in the northern portion of the segment. Bayou Black Road (Parish Road 182) is located approximately 1,000 feet east along the Barrier Plan alignment. Vega Court, Marina Drive, Shell E and P Road, and Daneco Court terminate or are located within the Barrier Plan alignment. Bayou Black Road (Parish Road 182) is located approximately 1,000 feet north of Section A. Gabi Court and Dr. Beatrous Road (Parish Road 59) are located within Section A of the alignment. Brady Drive (Parish Road 111) and Bayou Dularge Road (LA Highway 315) intersect Section A in the southern portion of the alignment.

6.2.1.9 Potable Water Supplies

Potable water is provided to the area by the Consolidated Waterworks District No. 1 of Terrebonne Parish.

6.2.1.10 Sewage Disposal System

Sewage disposal is provided to the area by the Consolidated Waterworks District No. 1 of Terrebonne Parish.

6.2.1.11 Other Conditions of Concern

No other conditions of concern were identified.

6.2.2 Section B

6.2.2.1 Current Use(s) of the Site

Section B consists of undeveloped land, wetlands, existing levee and roadways, residential and commercial properties, crude oil pipeline transportation facilities, a crude oil pipeline booster station, natural and petroleum pipeline right-of-ways, Bayou Terrebonne Floodgate, The Madison Pump Station, Falgout Canal Bridge, FAA Air Traffic Control facility, and a Native American mound and cemetery. Dump trucks and heavy machinery were observed on the levee within Reach I-1, apparently conducting earth-moving activities.

6.2.2.2 Past Use(s) of the Site

No indication of Section B's previous use was observed during the site reconnaissance.

6.2.2.3 Current Uses of Adjoining Properties

The immediate vicinity surrounding Section B is primarily characterized by undeveloped land, wetlands, and residential and commercial properties.

6.2.2.4 Past Use(s) of the Adjoining Properties

No indication of the adjoining properties' past uses was observed during the site reconnaissance.

6.2.2.5 Current or Past Use(s) in the Surrounding Area

No indication of the surrounding area's past use was observed during the site reconnaissance.

6.2.2.6 Geologic, Hydrogeologic, Hydrologic, and Topographic Conditions

No significant geologic, hydrogeologic or hydrologic conditions were observed during the site reconnaissance.

6.2.2.7 General Description of Structures

Existing structures along Section B consist of residential and commercial structures, Falgout Canal Bridge, Bayou Terrebonne Floodgate, Madison Pump Station, buried natural gas and petroleum pipelines, the FAA Air Traffic Control facility, Plains All American Pipeline crude oil transportation facility, Shell Pipeline Co., LP – Lake Barre Booster Station dock facility, and a small Castex Energy booster station facility.

6.2.2.8 Roads

Falgout Canal Road (Parrish Road 10), Brady Road, and Bayou Dularge Road (State Highway 315) are located in Reach E-2. Falgout Canal Road also is located in Reach E-1. Four Point Road is located in Reach G-2 and Alternate Alignment 1. Bayou Sale Road (State Highway 57) is located in Reaches G-2, G-3 and H-1. Little Caillou Road (State Highway 56) is located in Reaches H-1, H-2, and H-3. Montegut Road (State Highway 55) is located in Reaches I-1, I-2 and I-3. Pointe Barre Road is located in Reach I-3. Humble Canal Road is located in Reach I-3. Shoreline Drive and Touloulou Street, located east of Little Caillou Road, and other smaller roads, are located in Reaches H-2 and H-3. Madison Canal Road is located in Reach I-2.

6.2.2.9 Potable Water Supplies

Potable water is provided to the area by the Consolidated Waterworks District No. 1 of Terrebonne Parish.

6.2.2.10 Sewage Disposal System

Sewage disposal is provided to the area by the Consolidated Waterworks District No. 1 of Terrebonne Parish.

6.2.2.11 Other Conditions of Concern

A marked petroleum pipeline was observed crossing Reach I-3, south of Point Barre Road, in an east-west direction across the segment.

6.2.3 Section C

6.2.3.1 Current Use(s) of the Site

Section C consists of undeveloped land, wetlands, existing levee and roadways, natural gas and petroleum pipeline right-of-ways, three pump stations, a marina, and residential and commercial properties. Observations made during the site reconnaissance are further discussed in Section 6 of this report.

6.2.3.2 Past Use(s) of the Site

No indication of Section C's previous use was observed during the site reconnaissance.

6.2.3.3 Current Uses of Adjoining Properties

The immediate vicinity surrounding Section C is primarily characterized by undeveloped land, wetlands, and residential and commercial properties.

6.2.3.4 Past Use(s) of the Adjoining Properties

No indication of the adjoining properties' past uses was observed during the site reconnaissance.

6.2.3.5 Current or Past Use(s) in the Surrounding Area

No indication of the surrounding area's past use was observed during the site reconnaissance.

6.2.3.6 Geologic, Hydrogeologic, Hydrologic, and Topographic Conditions

No significant geologic, hydrogeologic or hydrologic conditions were observed during the site reconnaissance.

6.2.3.7 General Description of Structures

Existing structures along Section C consist of residential and commercial structures, buried natural gas and petroleum pipelines, flood water pump stations and the Pointe Aux Chene Marina.

6.2.3.8 Roads

State Highway 55 (Montegut Road) and Humble Canal Road are located in Reach J-2. State Highway 665 (Point Aux Chene Road) is located in Reaches J-2, J-1, J-3, and K. Island Road is located between Reaches J-1 and J-3.

6.2.3.9 Potable Water Supplies

Potable water is provided to the area by the Consolidated Waterworks District No. 1 of Terrebonne Parish and Lafourche Parish Water District 1.

6.2.3.10 Sewage Disposal System

Sewage disposal is provided to the area by the Consolidated Waterworks District No. 1 and Lafourche Parish District 1.

6.2.3.11 Other Conditions of Concern

A marked petroleum pipeline right-of-way was observed extending along Reach J-2, west of State Highway 665.

6.3 <u>Exterior Observations</u>

6.3.1 Section A

6.3.1.1 Hazardous Substances and Petroleum Products

Nuisance dumping consisting of household appliances, cabinetry, a 55-gallon drum, and paint and household cleaners, totaling in aggregate less than 10 gallons, which appeared to have been burned, was observed in the central portion of the segment.

6.3.1.2 Storage Tanks

An approximate 250-gallon AST associated with an unnamed pumping station was observed in the northern portion of the segment.

An approximate 250-gallon AST was observed at a residence along an outfall canal associated with existing levee; an abandoned drum was observed in the canal adjacent to the AST.

Three fuel storage tanks ranging from approximately 250 gallons to 1,000 gallons were observed at Bob's Bayou Black Marina.

Multiple storage tanks including three bulk storage tanks approximately 100,000 gallons in size, containing crude oil; and several unidentified storage tanks ranging from approximately 500 gallons to 10,000 gallons in size; were observed on the property. Distillation columns, as well as several thousand linear feet of pipeline, were observed at the North Terrebonne Gas Plant.

Two high-pressure tanks approximately 5,000 and 10,000 gallons in size, four vertical storage tanks approximately 2,000 gallons in size, and several thousand linear feet of pipeline were observed at the Transcontinental Pipeline Company – Williams Facility.

Two approximate 1,000-gallon ASTs containing unknown product were observed at the Waterproof Ridge Farm located in the northern portion of the segment.

Two approximate 1,000-gallon ASTs were observed at the Falgout Canal Marina fueling station; at least two approximate 250-gallon ASTs were observed at the camps associated with the Falgout Canal Marina in the southern portion of the segment.

One approximate 1,000-gallon AST was observed at the Upper Bayou Dularge Pump Station located in the southern portion of the segment.

One approximate 5,000-gallon AST was observed at the Frogco Amphibious Equipment facility located at the southern terminus of Section A.

6.3.1.3 Odors

No odors were noted during the site inspection.

6.3.1.4 Pools of Liquids

No pools of liquids were observed during the inspection of the exterior areas of the segment.

6.3.1.5 Drums

An abandoned drum was observed at a residence in an outfall canal associated with the existing levee; an approximate 250-gallon AST was observed along the canal adjacent to the drum.

Approximately 26 steel and polycarbonate drums were observed at the Petro Quest Energy, LLC facility; three drums were observed buried under heavy brush approximately 100 feet northwest of this facility.

Six weathered, empty 55-gallon drums were observed in the vicinity of the proposed culvert in the central portion of the segment. No stained soils were observed in the area of the drums.

6.3.1.6 Unidentified Substance Containers

No unidentified substance containers were observed during the inspection of exterior areas of the segment.

6.3.1.7 PCBs

At least sixteen pole-mounted transformers were observed at the camps associated with the Falgout Canal Marina in the southern portion of the segment. No stains were observed on the ground beneath the pole-mounted transformers that were accessible.

6.3.1.8 Pits, Ponds, or Lagoons

Outfall canals were observed along the levee located in the southern portion of the segment.

6.3.1.9 Stained Soil or Pavement

No stained soils or pavement was observed during the inspection of the exterior areas of Section A.

6.3.1.10 Stressed Vegetation

No stressed vegetation was observed during the inspection of Section A.

6.3.1.11 Solid Waste

Nuisance dumping consisting of household appliances, cabinetry, a 55-gallon drum, and paint and household cleaners, totaling in aggregate less than 10 gallons, which appeared to have been burned, was observed in the central portion of the segment.

6.3.1.12 Waste Water

No waste water discharges to or from the site were observed during the inspection of Section A; however, based on information reviewed as part of this investigation, the Falgout Canal Marina located within Section A is permitted to operate an in-ground, 2,000-gallon extended aeration waste water treatment system consisting of activated sludge with chlorination limited to discharges totaling 5,000 GPD.

6.3.1.13 Wells

No potable, irrigation, or industrial wells were observed during the inspection of the exterior areas of Section A.

6.3.1.14 Septic Systems

No septic systems were observed during the inspection of the exterior areas of Section A.

6.3.1.15 Other Conditions of Concern

No other conditions of concern were observed during the inspection of the exterior areas of Section A.

6.3.2 Section B

6.3.2.1 Hazardous Substances and Petroleum Products

Numerous five-gallon containers, labeled hydraulic oil and engine oil, were observed along State Highway 55 (Montegut Road) and Bayou Terrebonne, within Reach I-2. No stains were observed on the ground around the accessible containers.

6.3.2.2 Storage Tanks

An unlabeled, approximate 7,500-gallon AST, stored in a roofed, concrete secondary containment area, was observed outside a building without signage on Janet Lynn Drive within Reach E-2.

Six approximate 300,000-gallon ASTs were observed from the road at the Plains All American Pipeline-Cocodrie Station facility at 7394 State Highway 56 within Reach H-2.

An unlabeled, approximate 5,000-gallon AST was observed from the road within a fenced area at the Shell Pipeline Company Lake Barre Booster Station Dock within Reach H-1.

Three ASTs were observed stored at Cecil Lapeyrouse Grocery, 7243 Shoreline Drive, within the segment in Reach H-2. One approximate 1,500-gallon AST contained diesel. Two approximate 5,000-gallon ASTs contained unleaded gasoline. The tanks were stored on support structures on the gravel parking lot. This facility was located within Reach H-2.

An unlabeled, rusted, approximate 1,500-gallon AST was observed outside a building without signage on Shoreline Drive within Reach H-2.

An unlabeled, rusted, approximate 2,000-gallon AST was observed outside a building without signage on Driftwood Street within Reach H-2.

An unlabeled, approximate 7,500-gallon AST stored within a concrete vault was observed in the parking lot of the Lapeyrouse Seafood Bar and Grocery on Little Caillou Road (State Highway 56). The AST was stored in a concrete secondary containment structure adjoining a canal within Reach H-2.

An approximate 1,500-gallon AST containing diesel was observed at Sportsman's Paradise, 6830 State Highway 56 (Little Caillou Road) within Reach H-3.

An approximate 1,000-gallon, unlabeled AST and an approximate 5,000-gallon, unlabeled AST were observed outside a building without signage on Little Caillou Road, within Reach H-3.

Three approximate 20,000-gallon ASTs, one with a diesel dispenser in front, and one labeled “regular” and an unlabeled 500-gallon AST were observed outside Madison Seafood at 2166 Highway 55 (Montegut Road) within Reach I-2.
Four approximate 7,500-gallon ASTs were observed from the road at a fenced Castex Energy, Inc. facility on State Highway 55 (Montegut Road), within Reach I-2.

One approximate 2,000-gallon AST for the Madison Pump Station was observed by helicopter on a levee, within Reach I-2.

6.3.2.3 Odors

No unusual odors were observed during the inspection of the exterior areas of Section B.

6.3.2.4 Pools of Liquids

No pools of liquids were observed during the inspection of the exterior areas of Section B.

6.3.2.5 Drums

Two 55-gallon drums were observed outside the Shell Pipeline Company Lake Barre Booster Station Dock within Reach H-1. The drums were labeled “heavy duty engine oil” and “oil.” No stains were observed on the ground in the vicinity of the drums.

6.3.2.6 Unidentified Substance Containers

No unidentified substance containers were observed during the inspection of the exterior areas of Section B.

6.3.2.7 PCBs

Numerous pole-mounted transformers were observed along roadways within Section B. No stains were observed on the ground beneath the pole-mounted transformers that were accessible.

6.3.2.8 Pits, Ponds, or Lagoons

No pits, ponds or lagoons were observed during the inspection of the exterior areas of Section B.

6.3.2.9 Stained Soil or Pavement

No stained soils or pavement was observed during the inspection of the exterior areas of Section B.

6.3.2.10 Stressed Vegetation

No stressed vegetation was observed during the inspection of the exterior areas of Section B.

6.3.2.11 Solid Waste

Dumped debris, *de minimis* in nature, was observed in the marsh along State Highway 55 (Montegut Road) and Bayou Terrebonne, within Reach I-2. No stains were observed around the debris that was accessible.

6.3.2.12 Waste Water

No waste water concerns were noted during the inspection of the exterior areas of Section B.

6.3.2.13 Septic Systems

Private properties were not inspected for septic systems.

6.3.2.14 Other Conditions of Concern

A marked petroleum pipeline was observed crossing Reach I-3, south of Point Barre Road, in an east-west direction across the segment.

6.3.3 Section C

6.3.3.1 Hazardous Substances and Petroleum Products

Discarded debris, consisting of household appliances, cabinetry, and household hazardous waste, totaling in aggregate less than 10 gallons, all of which appeared burned was observed in the Reaches J-1 and J-3. No stains were noted in the vicinity of the debris.

6.3.3.2 Storage Tanks

An approximate 1,500 gallon, abandoned AST was observed along the levee, within Reach K.

An unlabeled 55 gallon poly-drum was observed in the drainage canal near Island Road, within Reach J-3.

An approximate 2,000 gallon, diesel AST was observed outside a drainage canal pump station, within Reach J-1.

An approximate 500 gallon, diesel AST was observed outside a drainage canal pump station, within Reach J-3.
Two ASTs, approximately 10,000 gallons each in size, were observed outside a commercial fishing business, along State Highway 665 and Bayou Pointe aux Chenes, within Reach J-3.

Three diesel ASTs, approximately 500 gallons, 1,000 gallons, and 2,000 gallons in size, were observed outside a drainage canal pump station, within Reach L-3.

Three diesel ASTs, approximately 1,000 gallons and two 2,000 gallons in size, were observed in the Pointe Aux Chene Marina.

6.3.3.3 Odors

No odors were noted during the site inspection.

6.3.3.4 Pools of Liquids

No pools of liquids were observed during the inspection of the exterior areas of Section C.

6.3.3.5 Drums

Section C, Site 2, 29°25'53.76"N, 90°27'39.60"W, one unlabeled 55-gallon poly-drum was observed in the drainage canal near Island Road, within Reach J-3.

6.3.3.6 Unidentified Substance Containers

No unidentified substance containers were observed during the inspection of the exterior areas of Section C.

6.3.3.7 PCBs

Numerous pole-mounted transformers were observed along roadways within Section C. No stains were observed on the ground beneath the pole-mounted transformers that were accessible.

6.3.3.8 Pits, Ponds, or Lagoons

No pits, ponds or lagoons were observed during the inspection of the exterior areas of Section C.

6.3.3.9 Stained Soil or Pavement

No stained soils or pavement was observed during the inspection of the exterior areas of Section C.

6.3.3.10 Stressed Vegetation

No stressed vegetation was observed during the inspection of the exterior areas of Section C.

6.3.3.11 Solid Waste

Dumped debris was observed in the marsh and canal along Reach J-1 and J-3. No stains were observed around the debris that was accessible.

6.3.3.12 Waste Water

No waste water concerns were noted during the inspection of the exterior areas of Section C.

6.3.3.13 Septic Systems

Private properties were not inspected for septic systems.

6.3.3.14 Other Conditions of Concern

A marked petroleum pipeline right-of-way was observed extending along Reach J-2, west of State Highway 665.

7.0 INTERVIEWS

At the request of the client, AEROSTAR did not conduct interviews with site owners, managers, occupants, or other individuals familiar with the site, including local, state, tribal or federal agency representatives; however, an interview with the User following the X3 User Questionnaire found in Appendix X3 of ASTM E 1527-05 was performed as part of this investigation. A Copy of the interview questionnaire is included as Appendix E.

7.1 Interview with Site Owner

Interviews were not conducted with individual site owners as part of the scope of work.

7.2 Interview with Site Manager

Interviews were not conducted with individual site managers as part of the scope of work.

7.3 Interviews with Occupants

Interviews were not conducted with individual site occupants as part of the scope of work.

7.4 Interviews with Local Government Officials

Due to the information collected from the historical sources, AEROSTAR did not interview any local government officials to determine the historical uses of the site.

7.5 Interviews with Others

AEROSTAR interviewed Ms. Elaine Stark, USACE Project Manager and the User, concerning the subject site following User Questionnaire found in Appendix X3 of ASTM E 1527-05. A copy of the User Questionnaire is included in Appendix F. Ms. Stark stated that, to the best of her knowledge, there are no environmental liens or AULs against the properties contained within the site. Ms. Stark indicated that extensive research regarding the fair market value of property within the corridor has been undertaken and that no devaluation from fair market is necessary. She stated that she has no specialized knowledge of the subject site or the adjoining properties that had not already been provided to AEROSTAR. She indicated that, to the best of her knowledge, no spills or environmental cleanups have occurred within the subject corridor. Ms. Stark indicated that the Phase I ESA is being conducted as part of a revised programmatic EIS, whose findings will become a decision document for the Morganza, Louisiana to the Gulf of Mexico project objective.

No other interviews were conducted with other parties as part of the scope of work.

8.0 FINDINGS AND OPINIONS

8.1 Known or Suspect Recognized Environmental Conditions

8.1.1 Section A

The following known or suspect recognized environmental conditions were identified for Section A:

- Section A, Site 1 (29° 38' 33.90" N, 90° 57' 48.82" W): The facility is an off-site RCRA-SQG and AST facility identified in the LDEQ EDMS as containing large volumes of several hazardous materials or petroleum products; soil and groundwater sampling is on-going at the facility.

- Section A, Site 2 (29° 38' 15.9" N, 90° 57' 44.5" W): One approximate 250-gallon AST was observed at an unnamed pumping station.

- Section A, Site 3 (29° 37' 52" N, 90° 57' 1.4" W): An approximate 250-gallon AST was observed at a residence along an outfall canal associated with existing levee; an abandoned drum was observed in the canal adjacent to the AST.

- Section A, Site 4 (29° 37' 43.76" N, 90° 56' 40.39" W): Three fuel storage tanks ranging in size from approximately 250 gallons to 1,000 gallons were observed at Bob's Bayou Black Marina.

- Section A, Site 5 (29° 37' 44.52" N, 90° 56' 43.01" W): Approximately 26 steel and polycarbonate drums were observed at the Petro Quest Energy, LLC facility; three drums were observed buried under heavy brush approximately 100 feet northwest of this facility.

- Section A, Site 6 (29° 37' 46.29" N, 90° 55' 57.27" W): Multiple storage tanks, including three bulk storage tanks approximately 100,000 gallons in size containing crude oil; and several unidentified storage tanks ranging from approximately 500 gallons to 10,000 gallons in size; were observed on the property. Distillation columns, as well as several thousand linear feet of pipeline, were observed at this RCRA-LQG.

- Section A, Site 7 (29° 36' 8.11" N, 90° 52' 33.88" W): Two high-pressure tanks approximately 5,000 and 10,000 gallons in size, four vertical storage tanks approximately 2,000 gallons in size, and several thousand linear feet of pipeline were observed at this RCRA-CESQG and AST facility; groundwater and soil sampling is on-going based on an existing consent decree against the facility.

- Section A, Site 8 (29° 34' 54.31" N, 90° 49' 28.34" W): Two 5,000-gallon and two 1,000-gallon ASTs containing Avgas, gas, and diesel are listed for this facility.

- Section A, Site 9 (29° 32' 46.35" N, 90° 48' 3.81" W): An on-site concern was noted from the Waterproof Ridge Farm, an AST facility, located in the northern portion of the segment.

- Section A, Site 10 (29° 28' 51.60" N, 90° 45' 40.90" W): An on-site concern was noted from nuisance dumping consisting of household appliances, cabinetry, a 55-gallon drum, and paint and household cleaners, totaling in aggregate less than 10 gallons, which appeared to have been burned, in the central portion of the segment.

- Section A, Site 11 (29° 27' 42.48" N, 90° 45' 49.49" W): An on-site concern was noted from six weathered, empty 55-gallon drums observed in the vicinity of a proposed culvert with sluice gates in the central portion of the segment.

- Section A, Site 12 (29° 25' 2.76" N, 90° 47' 3.56" W): An on-site concern was noted from the Upper Bayou Dularge Pump Station, an AST facility, located in the southern portion of the segment.

- Section A, Site 13 (29° 24' 47.95" N, 90° 47' 1.24" W): An on-site concern was noted from the Falgout Canal Marina, an AST facility, located in the southern portion of the segment.

- Section A, Site 14 (29° 24' 37.70" N, 90° 47' 13.21" W): An on-site concern was noted from an unlabeled, approximate 5,000-gallon AST observed outside the Frogco Amphibious Equipment facility. The AST appeared to be stored on the grass.

- Section A: On-site concerns were noted from 17 former and present oil and/or gas well locations identified within Section A.

- Section A: Off-site concerns were noted from eight former and present oil and/or gas well locations identified within 500 feet of Section A (1,000 feet from the centerline of the alignment).

8.1.2 Section B

- Section B, Site 1 (29° 24' 36.41" N, 90° 47' 11.46" W). An on-site concern was noted from the presence of an approximate 5,000-gallon, unlabeled AST observed within a roofed, secondary containment area outside a building without signage on Janet Lynn Drive within Reach E-2.

- Section B, Site 2 (29° 17' 54.89" N, 90° 38' 58.85" W): An on-site concern was noted from six ASTs, approximately 300,000 gallons each, observed from the road at Plains All American Pipeline, Cocodrie Station, 7394 Highway 56, within Reach H-1. The facility is listed as a crude oil pipeline transportation facility.

- Section B, Site 3 (29° 17' 56.76" N, 90° 38' 55.55" W): An on-site concern was noted from an AST and two 55-gallon drums at the Shell Pipeline Company, LP, Lake Barre Booster Station Dock, within Reach H-1. The approximate 5,000-gallon AST was observed from the road and the 55-gallon drums, labeled heavy engine oil and oil, were observed adjoining the facility's entrance.

- Section B, Site 4 (29° 18' 27.36" N, 90° 38' 50.55" W): An on-site concern was noted from three ASTs observed at Cecil Lapeyrouse Grocery, 7243 Shoreline Drive, within Reach H-2. One AST, approximately 1,500-gallons in size, contained diesel. Two ASTs, approximately 5,000 gallons each, contained unleaded gasoline. The tanks were stored on the gravel parking lot.

- Section B, Site 5 (29° 18' 37.93" N, 90° 38' 48.86" W): An on-site concern was noted from an approximate 1,500-gallon, unlabeled, rusted AST observed from the road outside a building without signage on Shoreline Drive, within Reach H-2.

- Section B, Site 6 (29° 19' 30.68" N, 90° 38' 38.38" W): An on-site concern was noted from an approximate 2,000-gallon, unlabeled, AST observed from the road at a building without signage in the southeastern quadrant of Riggio Street and Driftwood Street, within Reach H-2.

- Section B, Site 7 (29° 19' 58.90" N, 90° 38' 35.26" W): An on-site concern was noted from an approximate 7,500-gallon, unlabeled AST, stored inside a concrete vault, at the Lapeyrouse Seafood Bar and Grocery on Little Caillou Road, within Reach H-3.

- Section B, Site 8 (29° 20' 12.86" N, 90° 38' 20.44" W): An on-site concern was noted from an approximate 1,500-gallon, unlabeled AST observed at Sportsman's Paradise, 6830 Highway 56 (Little Caillou Road), within Reach H-3.

- Section B, Site 9 (29° 21' 12.07" N, 90° 37' 33.94" W): An on-site concern was noted from two unlabeled ASTs, approximately 1,000 and 5,000 gallons each in size, observed from the road outside a building without signage on Little Caillou Road, within Reach H-3.

- Section B, Site 10 (29° 23' 25.70" N, 90° 35' 13.59" W): An on-site concern was noted from three ASTs, labeled diesel and unleaded gasoline, approximately 20,000 gallons each in size, and an approximate 500-gallon, unlabeled AST observed outside Madison Seafood, 2166 Highway 55 (Montegut Road), within Reach I-2.

- Section B, Site 11 (29° 23' 46.92" N, 90° 35' 09.72" W): An on-site concern was noted from four, approximate 7,500-gallon, unlabeled ASTs observed from the road at the Castex Energy, Inc. facility on State Highway 55 (Montegut Road), within Reach I-2.

- Section B, Site 12 (29° 23' 59.69" N, 90° 35' 01.39" W): An on-site concern was noted from dumped debris observed in the marsh along State Highway 55 (Montegut Road) and Bayou Terrebonne, within Reach I-2.

- Section B, Site 13 (29° 24' 09.36" N, 90° 34' 55.43" W): An on-site concern was noted from numerous five-gallon containers, labeled hydraulic oil and engine oil, observed along State Highway 55 (Montegut Road) and Bayou Terrebonne, within Reach I-2.

- Section B, Site 14 (29° 24' 19.30" N, 90° 34' 29.38" W): An on-site concern was noted from an approximate 2,000-gallon AST for the Madison Pump Station, observed by helicopter on a levee, within Reach I-2.

- Section B, Site 15 (29° 25' 30.07" N, 90° 34' 01.75" W): An on-site concern was noted from a marked petroleum pipeline observed crossing State Highway 55 (Montegut Road), within Reach I-3.

- Section B, Site 16 (29° 18' 28.29" N, 90° 38' 49.44" W): An on-site concern was noted from Little Caillou Packing Company, identified as an Emergency Response Notification System (ERNS) facility, located at 7241 Shoreline Drive, within Reach H-2. A 600-gallon discharge of a petroleum product from a portable tank discharge line was reported at this facility on December 14, 1995. Database information indicates the leak was "secured;" however, no additional information was available concerning this incident.

- Section B, Site 17 (29° 20' 19.15" N, 90° 38' 13.71" W): An on-site concern was noted from an unnamed facility, identified as an ERNS facility, located at 6809 Highway 56, within Reach H-3. A transformer oil leak was reported at this address. No additional information was available about the incident.

- Section B, Site 18: An on-site concern was noted from a dump site previously identified along Falgout Canal Road in a September 1997 *Final Report for Hazardous, Toxic, and Radioactive*

(HTRW) Investigations that covered portions of the corridor. While the exact location of the dump site was not noted in the report, it was notated on a small scale map and appears to have been located within Reaches E-1 or E-2. At the time of the 1997 assessment, the dump consisted of automobile tires, metal and wood construction debris, six, unlabeled, empty 55-gallon drums, several, empty five-gallon containers, and some areas of distressed vegetation and stained soil. AEROSTAR did not locate this dump during the current site investigation.

- Section B, Site 19 (29° 20' 08.58" N, 90° 38' 29.07" W): An off-site concern was noted from several large ASTs, approximately 50,000 gallons each in size, observed from the road at the Castex Energy, Inc., Lapeyrouse Commingling Facility on 6848 State Highway 56 (Little Caillou Road), adjoining Reach H-3 to the north.

- Section B: On-site concerns were noted from 17 former and present oil and/or gas well locations identified within the Section B segment (500 feet from the centerline of the alignment).

- Section B: Off-site concerns were noted from 19 former and present oil and/or gas well locations identified within 500 feet of the Section B segment (1,000 feet from the centerline of the alignment).

- Section B: On-site concerns were noted from 19 pipeline permits identified within the Section B segment (500 feet from the centerline of the alignment).

8.1.3 Section C

- Section C, Site 1 (29° 25 '20.64" N, 90° 26' 47.76" W): An on-site concern was noted from an approximate 1,500-gallon, abandoned AST observed along the levee, within Reach K.

- Section C, Site 2 (29° 25' 53.76" N, 90° 27' 39.60" W): An on-site concern was noted from an unlabeled 55-gallon poly-drum observed in the drainage canal near Island Road, within Reach J-3.

- Section C, Site 3 (29° 25' 59.17" N, 90° 27' 38.54" W): An on-site concern was noted from an approximate 2,000-gallon, diesel AST observed outside a drainage canal pump station, within Reach J-1.

- Section C, Site 4 (29° 25' 29.27" N, 90° 27' 15.17" W): An on-site concern was noted from an approximate 500-gallon, diesel AST observed outside a drainage canal pump station, within Reach J-3.

- Section C, Site 5 (29° 25' 41.91" N, 90° 27' 21.94" W): An on-site concern was noted from two ASTs, approximately 10,000 gallons each in size, observed outside a commercial fishing business, along State Highway 665 and Bayou Pointe aux Chenes, within Reach J-3.

- Section C, Site 6 (29° 30' 55.10" N, 90° 22' 30.86" W): An on-site concern was noted from three diesel ASTs, approximately 500 gallons, 1,000 gallons, and 2,000 gallons in size, observed outside a drainage canal pump station, within Reach L-3.

- Section C, Site 7 (29° 24' 59.60" N, 90° 26' 51.62" W): An on-site concern was noted from three diesel ASTs, approximately 1,000 gallons and two 2,000 gallons in size, observed in the Pointe Aux Chene Marina.

- Section C, Site 8 (29° 25' 56.46" N, 90° 27' 40.24" W): An on-site concern was noted from a marked petroleum pipeline observed extending northwest to southeast, within Reach J-1 and J-3.

- Section C: On-site concerns were noted from 14 former and present oil and/or gas well locations identified within the Section C segment.

- Section C: Off-site concerns were noted from 19 former and present oil and/or gas well locations identified within 500 feet of the Section C segment (1,000 feet from the centerline of the alignment).

- Section C: On-site concerns were noted from 15 pipeline permits identified within the Section C segment (500 feet from the centerline of the alignment).

8.2 Historical Recognized Environmental Conditions

8.2.1 Section A

No historical recognized environmental conditions were noted in connection with the site.

8.2.2 Section B

No historical recognized environmental conditions were noted in connection with the site.

8.2.3 Section C

No historical recognized environmental conditions were noted in connection with the site.

8.3 *De Minimis* Conditions

8.3.1 Section A

No *de minimis* conditions were noted in connection with the site.

8.3.2 Section B

No *de minimis* conditions were noted in connection with the site.

8.3.3 Section C

No *de minimis* conditions were noted in connection with the site.

9.0 CONCLUSIONS

AEROSTAR has performed a Phase I ESA in conformance with the scope and limitations of ASTM Standard E 1527-05 of Morganza, Louisiana to the Gulf of Mexico, located in Terrebonne and Lafourche Parishes, Louisiana. Any exceptions to, or deletions from, this practice are described in Section 2 of this report. This assessment has revealed no evidence of recognized environmental conditions in connection with the site, except for the following:

- Section A, Site 1 (29° 38' 33.90" N, 90° 57' 48.82” W): The facility is an off-site RCRA-SQG and AST facility identified in the LDEQ EDMS as containing large volumes of several hazardous materials or petroleum products; soil and groundwater sampling is on-going at the facility.

- Section A, Site 2 (29° 38' 15.9" N, 90° 57' 44.5" W): One approximate 250-gallon AST was observed at an unnamed pumping station.

- Section A, Site 3 (29° 37' 52" N, 90° 57' 1.4" W): An approximate 250-gallon AST was observed at a residence along an outfall canal associated with existing levee; an abandoned drum was observed in the canal adjacent to the AST.

- Section A, Site 4 (29° 37' 43.76" N, 90° 56' 40.39" W): Three fuel storage tanks ranging in size from approximately 250 gallons to 1,000 gallons were observed at Bob’s Bayou Black Marina.

- Section A, Site 5 (29° 37' 44.52" N, 90° 56' 43.01” W): Approximately 26 steel and polycarbonate drums were observed at the Petro Quest Energy, LLC facility; three drums were observed buried under heavy brush approximately 100 feet northwest of this facility.

- Section A, Site 6 (29° 37' 46.29" N, 90° 55' 57.27” W): Multiple storage tanks, including three bulk storage tanks approximately 100,000 gallons in size containing crude oil; and several unidentified storage tanks ranging from approximately 500 gallons to 10,000 gallons in size; were observed on the property. Distillation columns, as well as several thousand linear feet of pipeline, were observed at this RCRA-LQG.

- Section A, Site 7 (29° 36' 8.11" N, 90° 52' 33.88” W): Two high-pressure tanks approximately 5,000 and 10,000 gallons in size, four vertical storage tanks approximately 2,000 gallons in size, and several thousand linear feet of pipeline were observed at this RCRA-CESQG and AST facility; groundwater and soil sampling is on-going based on an existing consent decree against the facility.

- Section A, Site 8 (29° 34' 54.31" N, 90° 49' 28.34” W): Two 5,000-gallon and two 1,000-gallon ASTs containing Avgas, gas, and diesel are listed for this facility.

- Section A, Site 9 (29° 32' 46.35" N, 90° 48' 3.81" W): An on-site concern was noted from the Waterproof Ridge Farm, an AST facility, located in the northern portion of the segment.

- Section A, Site 10 (29° 28' 51.60" N, 90° 45' 40.90” W): An on-site concern was noted from nuisance dumping consisting of household appliances, cabinetry, a 55-gallon drum, and paint and household cleaners, totaling in aggregate less than 10 gallons, which appeared to have been burned, in the central portion of the segment.

- Section A, Site 11 (29° 27' 42.48" N, 90° 45' 49.49" W): An on-site concern was noted from six weathered, empty 55-gallon drums observed in the vicinity of a proposed culvert with sluice gates in the central portion of the segment.

- Section A, Site 12 (29° 25' 2.76" N, 90° 47' 3.56" W): An on-site concern was noted from the Upper Bayou Dularge Pump Station, an AST facility, located in the southern portion of the segment.

- Section A, Site 13 (29° 24' 47.95" N, 90° 47' 1.24" W): An on-site concern was noted from the Falgout Canal Marina, an AST facility, located in the southern portion of the segment.

- Section A, Site 14 (29° 24' 37.70" N, 90° 47' 13.21" W): An on-site concern was noted from an unlabeled, approximate 5,000-gallon AST observed outside the Frogco Amphibious Equipment facility. The AST appeared to be stored on the grass.

- Section A: On-site concerns were noted from 17 former and present oil and/or gas well locations identified within Section A.

- Section A: Off-site concerns were noted from eight former and present oil and/or gas well locations identified within 500 feet of Section A (1,000 feet from the centerline of the alignment).

- Section B, Site 1 (29° 24' 36.41" N, 90° 47' 11.46" W): An on-site concern was noted from the presence of an approximate 5,000-gallon, unlabeled AST observed within a roofed, secondary containment area outside a building without signage on Janet Lynn Drive within Reach E-2.

- Section B, Site 2 (29° 17' 54.89" N, 90° 38' 58.85" W): An on-site concern was noted from six ASTs, approximately 300,000 gallons each, observed from the road at Plains All American Pipeline, Cocodrie Station, 7394 Highway 56, within Reach H-1. The facility is listed as a crude oil pipeline transportation facility.

- Section B, Site 3 (29° 17' 56.76" N, 90° 38' 55.55" W): An on-site concern was noted from an AST and two 55-gallon drums at the Shell Pipeline Company, LP, Lake Barre Booster Station Dock, within Reach H-1. The approximate 5,000-gallon AST was observed from the road and the 55-gallon drums, labeled heavy engine oil and oil, were observed adjoining the facility's entrance.

- Section B, Site 4 (29° 18' 27.36" N, 90° 38' 50.55" W): An on-site concern was noted from three ASTs observed at Cecil Lapeyrouse Grocery, 7243 Shoreline Drive, within Reach H-2. One AST, approximately 1,500-gallons in size, contained diesel. Two ASTs, approximately 5,000 gallons each, contained unleaded gasoline. The tanks were stored on the gravel parking lot.

- Section B, Site 5 (29° 18' 37.93" N, 90° 38' 48.86" W): An on-site concern was noted from an approximate 1,500-gallon, unlabeled, rusted AST observed from the road outside a building without signage on Shoreline Drive, within Reach H-2.

- Section B, Site 6 (29° 19' 30.68" N, 90° 38' 38.38" W): An on-site concern was noted from an approximate 2,000-gallon, unlabeled, AST observed from the road at a building without signage in the southeastern quadrant of Riggio Street and Driftwood Street, within Reach H-2.

- Section B, Site 7 (29° 19' 58.90" N, 90° 38' 35.26" W): An on-site concern was noted from an approximate 7,500-gallon, unlabeled AST, stored inside a concrete vault, at the Lapeyrouse Seafood Bar and Grocery on Little Caillou Road, within Reach H-3.

- Section B, Site 8 (29° 20' 12.86" N, 90° 38' 20.44" W): An on-site concern was noted from an approximate 1,500-gallon, unlabeled AST observed at Sportsman's Paradise, 6830 Highway 56 (Little Caillou Road), within Reach H-3.

- Section B, Site 9 (29° 21' 12.07" N, 90° 37' 33.94" W): An on-site concern was noted from two unlabeled ASTs, approximately 1,000 and 5,000 gallons each in size, observed from the road outside a building without signage on Little Caillou Road, within Reach H-3.

- Section B, Site 10 (29° 23' 25.70" N, 90° 35' 13.59" W): An on-site concern was noted from three ASTs, labeled diesel and unleaded gasoline, approximately 20,000 gallons each in size, and an approximate 500-gallon, unlabeled AST observed outside Madison Seafood, 2166 Highway 55 (Montegut Road), within Reach I-2.

- Section B, Site 11 (29° 23' 46.92" N, 90° 35' 09.72" W): An on-site concern was noted from four, approximate 7,500-gallon, unlabeled ASTs observed from the road at the Castex Energy, Inc. facility on State Highway 55 (Montegut Road), within Reach I-2.

- Section B, Site 12 (29° 23' 59.69" N, 90° 35' 01.39" W): An on-site concern was noted from dumped debris observed in the marsh along State Highway 55 (Montegut Road) and Bayou Terrebonne, within Reach I-2.

- Section B, Site 13 (29° 24' 09.36" N, 90° 34' 55.43" W): An on-site concern was noted from numerous five-gallon containers, labeled hydraulic oil and engine oil, observed along State Highway 55 (Montegut Road) and Bayou Terrebonne, within Reach I-2.

- Section B, Site 14 (29° 24' 19.30" N, 90° 34' 29.38" W): An on-site concern was noted from an approximate 2,000-gallon AST for the Madison Pump Station, observed by helicopter on a levee, within Reach I-2.

- Section B, Site 15 (29° 25' 30.07" N, 90° 34' 01.75" W): An on-site concern was noted from a marked petroleum pipeline observed crossing State Highway 55 (Montegut Road), within Reach I-3.

- Section B, Site 16 (29° 18' 28.29" N, 90° 38' 49.44" W): An on-site concern was noted from Little Caillou Packing Company, identified as an Emergency Response Notification System (ERNS) facility, located at 7241 Shoreline Drive, within Reach H-2. A 600-gallon discharge of a petroleum product from a portable tank discharge line was reported at this facility on December 14, 1995. Database information indicates the leak was "secured;" however, no additional information was available concerning this incident.

- Section B, Site 17 (29° 20' 19.15" N, 90° 38' 13.71" W): An on-site concern was noted from an unnamed facility, identified as an ERNS facility, located at 6809 Highway 56, within Reach H-3. A transformer oil leak was reported at this address. No additional information was available about the incident.

- Section B, Site 18: An on-site concern was noted from a dump site previously identified along Falgout Canal Road in a September 1997 *Final Report for Hazardous, Toxic, and Radioactive*

(HTRW) Investigations that covered portions of the corridor. While the exact location of the dump site was not noted in the report, it was notated on a small scale map and appears to have been located within Reaches E-1 or E-2. At the time of the 1997 assessment, the dump consisted of automobile tires, metal and wood construction debris, six, unlabeled, empty 55-gallon drums, several, empty five-gallon containers, and some areas of distressed vegetation and stained soil. AEROSTAR did not locate this dump during the current site investigation.

- Section B, Site 19 (29° 20' 08.58" N, 90° 38' 29.07" W): An off-site concern was noted from several large ASTs, approximately 50,000 gallons each in size, observed from the road at the Castex Energy, Inc., Lapeyrouse Commingling Facility on 6848 State Highway 56 (Little Caillou Road), adjoining Reach H-3 to the north.

- Section B: On-site concerns were noted from 17 former and present oil and/or gas well locations identified within the Section B segment (500 feet from the centerline of the alignment).

- Section B: Off-site concerns were noted from 19 former and present oil and/or gas well locations identified within 500 feet of the Section B segment (1,000 feet from the centerline of the alignment).

- Section B: On-site concerns were noted from 19 pipeline permits identified within the Section B segment (500 feet from the centerline of the alignment).

- Section C, Site 1 (29° 25 '20.64" N, 90° 26' 47.76" W): An on-site concern was noted from an approximate 1,500-gallon, abandoned AST observed along the levee, within Reach K.

- Section C, Site 2 (29° 25' 53.76" N, 90° 27' 39.60" W): An on-site concern was noted from an unlabeled 55-gallon poly-drum observed in the drainage canal near Island Road, within Reach J-3.

- Section C, Site 3 (29° 25' 59.17" N, 90° 27' 38.54" W): An on-site concern was noted from an approximate 2,000-gallon, diesel AST observed outside a drainage canal pump station, within Reach J-1.

- Section C, Site 4 (29° 25' 29.27" N, 90° 27' 15.17" W): An on-site concern was noted from an approximate 500-gallon, diesel AST observed outside a drainage canal pump station, within Reach J-3.

- Section C, Site 5 (29° 25' 41.91" N, 90° 27' 21.94" W): An on-site concern was noted from two ASTs, approximately 10,000 gallons each in size, observed outside a commercial fishing business, along State Highway 665 and Bayou Pointe aux Chenes, within Reach J-3.

- Section C, Site 6 (29° 30' 55.10" N, 90° 22' 30.86" W): An on-site concern was noted from three diesel ASTs, approximately 500 gallons, 1,000 gallons, and 2,000 gallons in size, observed outside a drainage canal pump station, within Reach L-3.

- Section C, Site 7 (29° 24' 59.60" N, 90° 26' 51.62" W): An on-site concern was noted from three diesel ASTs, approximately 1,000 gallons and two 2,000 gallons in size, observed in the Pointe Aux Chene Marina.

- Section C, Site 8 (29° 25' 56.46" N, 90° 27' 40.24" W): An on-site concern was noted from a marked petroleum pipeline observed extending northwest to southeast, within Reach J-1 and J-3.

- Section C: On-site concerns were noted from 14 former and present oil and/or gas well locations identified within the Section C segment.

- Section C: Off-site concerns were noted from 19 former and present oil and/or gas well locations identified within 500 feet of the Section C segment (1,000 feet from the centerline of the alignment).

- Section C: On-site concerns were noted from 15 pipeline permits identified within the Section C segment (500 feet from the centerline of the alignment).

10.0 DEVIATIONS

AEROSTAR prepared this Phase I ESA in accordance with ASTM Standard E 1527-05.

11.0 ADDITIONAL SERVICES

Under the terms of the agreement between Client and AEROSTAR, no additional services were provided in association with the Phase I ESA. There may be environmental issues or conditions at a site that the Client may wish to assess in connection with commercial real estate that are outside the scope of this practice (the non-scope considerations). No implication is intended as to the relative importance of inquiry into such non-scope considerations, and this list of non-scope considerations is not intended to be all inclusive: asbestos-containing materials; radon; lead-based paint; lead in drinking water; wetlands; regulatory compliance; cultural and historical resources; industrial hygiene; health and safety; ecological resources; endangered species; indoor air quality; and high voltage power lines.

12.0 REFERENCES

References reviewed during the Phase I ESA are documented in Appendix E.

13.0 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

This is to certify the Phase I ESA Report of Morganza, Louisiana to the Gulf of Mexico, located in Terrebonne and Lafourche Parishes, Louisiana, has been examined by the undersigned.

DATE: 5/3/11

SIGNATURE: for
Christopher Whitehead
Project Chemist

DATE: 5/3/11

SIGNATURE:
K. Dawn Blackledge, P.G.
Senior Project Manager

14.0 QUALIFICATIONS OF ENVIRONMENTAL PROFESSIONALS

This assessment was completed by Christopher Whitehead, Project Chemist, and reviewed by K. Dawn Blackledge, P.G., Senior Project Manager, all employees of AEROSTAR. We declare that, to the best of our professional knowledge, we meet the definition of environmental professional as defined in § 312.10 of 40 CFR 312. We have the specific qualifications based on education, training, and experience to assess the property of a nature, history, and setting of the site. We have developed and performed the all appropriate inquiries in conformance with the standards set forth on 40 CFR Part 312. Qualifications of personnel participating in this assessment are provided in Appendix G.

Appendix M

DRAFT RECORD OF DECISION

DRAFT RECORD OF DECISION

Mississippi River and Tributaries,
Morganza, Louisiana, to the Gulf of Mexico
Risk Reduction System

The Final Revised Morganza to the Gulf of Mexico, Louisiana, Programmatic Environmental Impact Statement (RPEIS), dated May 2013, was prepared in support of the Morganza to the Gulf of Mexico, Louisiana, Post Authorization Change (PAC) Report dated May 2013. Because of the loss of life and damage caused by Hurricanes Katrina and Rita in 2005, the USACE has made changes and improvements in the planning, design, construction, operation, and maintenance of hurricane risk reduction projects to prevent future disasters to the greatest extent possible. Based on the review of these reports, the reviews of other Federal, state, and local agencies, input from the public, and the review by my staff, I find the plan recommended by the Chief of Engineers to be technically feasible, economically and environmentally justified, cost effective, in accordance with environmental statutes, and in the public interest.

The PAC Report was prepared due to changes in hurricane levee design standards and other changes, since the project authorization, that caused the Morganza to the Gulf project to exceed the 20 Percent cost increase limit specified in WRDA 1986, Section 902. The PAC Report primarily focuses on analysis of two levels of risk reduction (pre- and post-Hurricane Katrina "100-year" designs) along the authorized alignment. The PAC Report includes discussions on post-Katrina design criteria, project designs and costs, and economic analysis necessary for plan selection. The PAC Report describes all changes to the Morganza project since the 2002 Feasibility Report.

The Final RPEIS evaluates various alternatives, as authorized in House Resolution, Docket 2376, April 30, 1992, and WRDA 96 (PL 104-303, Sec 425), to reduce the risk of damages caused by hurricanes and storms for the communities located within the levee system. The risk reduction system consists of a levee system which includes floodgates on navigable waterways, water control structures, road gates and the HNC lock complex. Three alternatives were evaluated in detail for comparison and plan selection.

- The No Action Alternative is a requirement of the NEPA regulations. Under the no action alternative, the TLCD would continue to operate the forced drainage and partial hurricane risk reduction system that currently exists. The existing system contains segments and components, including ring levees, pump stations, and flood gates.
- The 1% Annual Exceedance Probability Storm Surge Risk Reduction System (1% AEP Alternative)—Recommended Plan and environmentally preferred plan consists of 98 miles of levee system which includes 22 floodgates on navigable waterways, 23 water control structures, nine road gates and the HNC lock complex.
- The 3% Annual Exceedance Probability Storm Surge Risk Reduction System (3% AEP Alternative) would consist of a similar alignment and structures as the 1% AEP alternative but with lower elevations.

The 1% AEP has been selected as the Recommended Plan because it has higher net benefits, lower residual risk and is more adaptable. As the Recommended Plan the 1% AEP Alternative provides risk reduction for water levels that have a 1 percent chance of occurring each year.

Although the RPEIS is programmatic in nature, some features of the action alternatives have sufficiently detailed designs to be fully assessed in the RPEIS, and would not require additional NEPA documentation. These features, termed “Constructible Features”, include levee reaches F1, F2, G1; the HNC Lock Complex; and the Bayou Grand Caillou Floodgate. The remaining features are “Programmatic Features” and require additional NEPA documentation.

The Draft RPEIS and PAC were circulated for public review on 04 January 2013. One public meeting was conducted as an opportunity for the public, resource agencies, and elected officials to provide input regarding the proposed risk reduction system and provide comments. The public meeting was held on 31 January 2013 in Houma, LA. All comments and responses to those comments are included in the final RPEIS.

The final RPEIS includes a mitigation plan to fully compensate for direct and indirect wetland impacts associated with the Constructible Features of the Recommended Plan. The wetland mitigation plan includes restoration of 394 acres of intermediate marsh, 358 acres of brackish marsh, and 883 acres of saline marsh, although these acreages may be adjusted somewhat during Preconstruction Engineering Design. Construction of these mitigation features would be implemented concurrent with the initiation of construction of the Constructible Features of the Recommended Plan. To the extent practicable, initial mitigation construction activities would be completed within 18 months of the start of mitigation construction activities.

The environmental Justice analysis identified the communities of Gibson, Bayou Dularge, Dulac, and Isle de Jean Charles as EJ communities based on percent minority and/or low-income. The USACE has assumed the worst-case compensation scenario for the impacted communities outside of the project alignment. Should this scenario prove to be the appropriate mitigation method, at least 2,500 people would need to be relocated to areas behind the Federal protection system through 100% buy-out and uniform relocation assistance. In order to minimize any other potential disproportionate impacts resulting from construction of the levee alignment, additional analysis and outreach to these communities would be conducted and documented in supplemental NEPA reports.

The USACE will continue government-to-government consultation with federally-recognized Tribes on the potential of the proposed project to significantly affect protected tribal resources, tribal rights, and/or Indian lands.

Through consultation with SHPO, federally-recognized Tribes, and other consulting parties, as appropriate, the USACE will negotiate a programmatic agreement. Compliance with the procedures established by the approved programmatic agreement will satisfy the USACE’s section 106 responsibilities.

All practicable means to avoid or minimize adverse environmental effects have been incorporated into the Recommended Plan. Technical and economic criteria used in the formulation of alternative plans were those specified in the Water Resource Council's Principles and Guidelines. All applicable laws, executive orders, regulations and local government plans were considered in the evaluation of alternatives. The public will be best served by implementing the Recommended Plan as described in the Final RPEIS and PAC. The Final RPEIS was filed with the Environmental Protection Agency on Date (ERP No. F- COE-XXXXXX-LA). The purpose of this Record of Decision is to complete the procedural requirements of the National Environmental Policy Act process.

Draft

Date

Jo Ellen Darcy
Assistant Secretary of the Army