APPENDIX A: FIGURES

Figure A-1 Construction Status NOV/NF

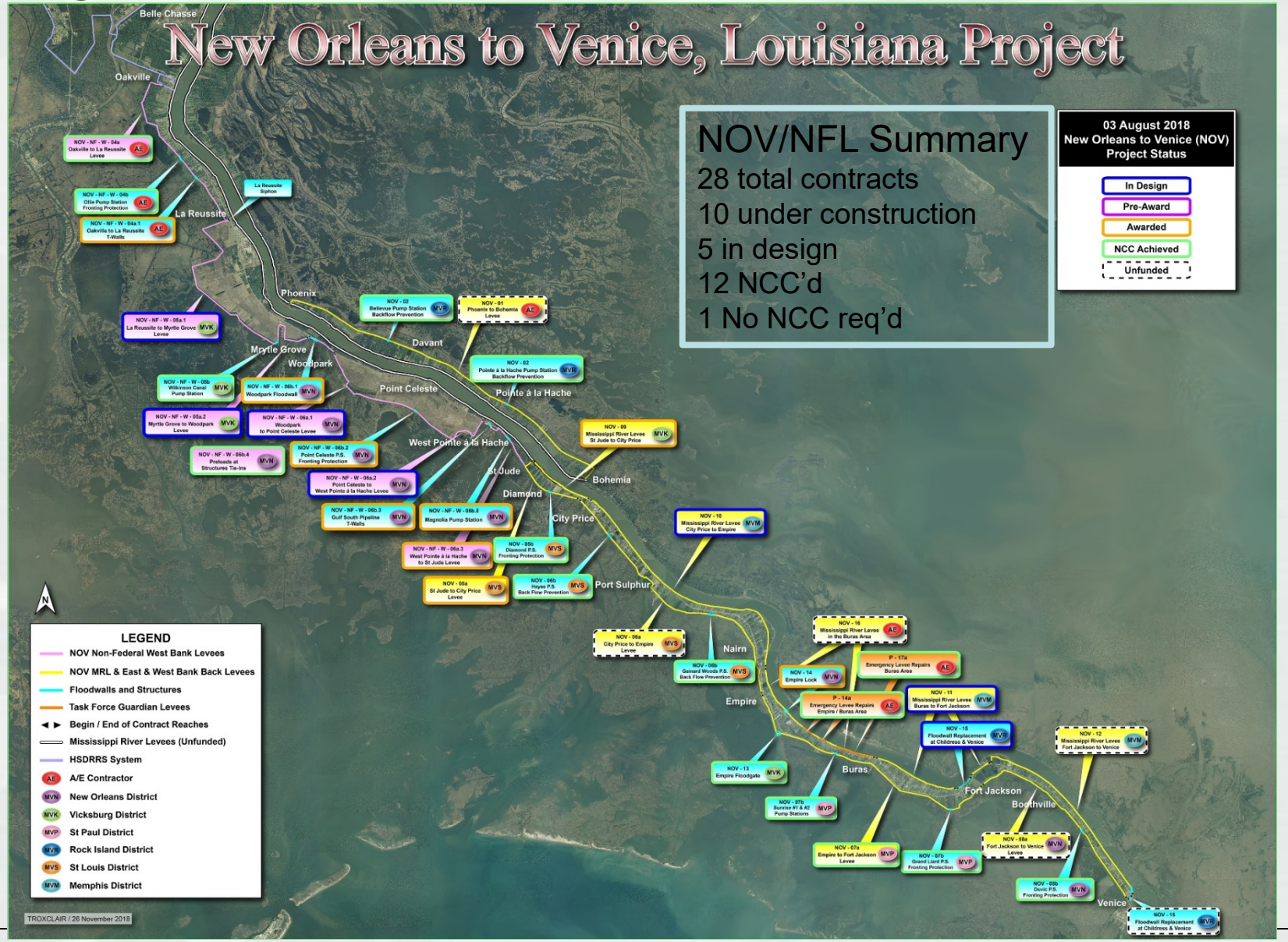

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Figure A-2 HUCs within Deltaic Plain

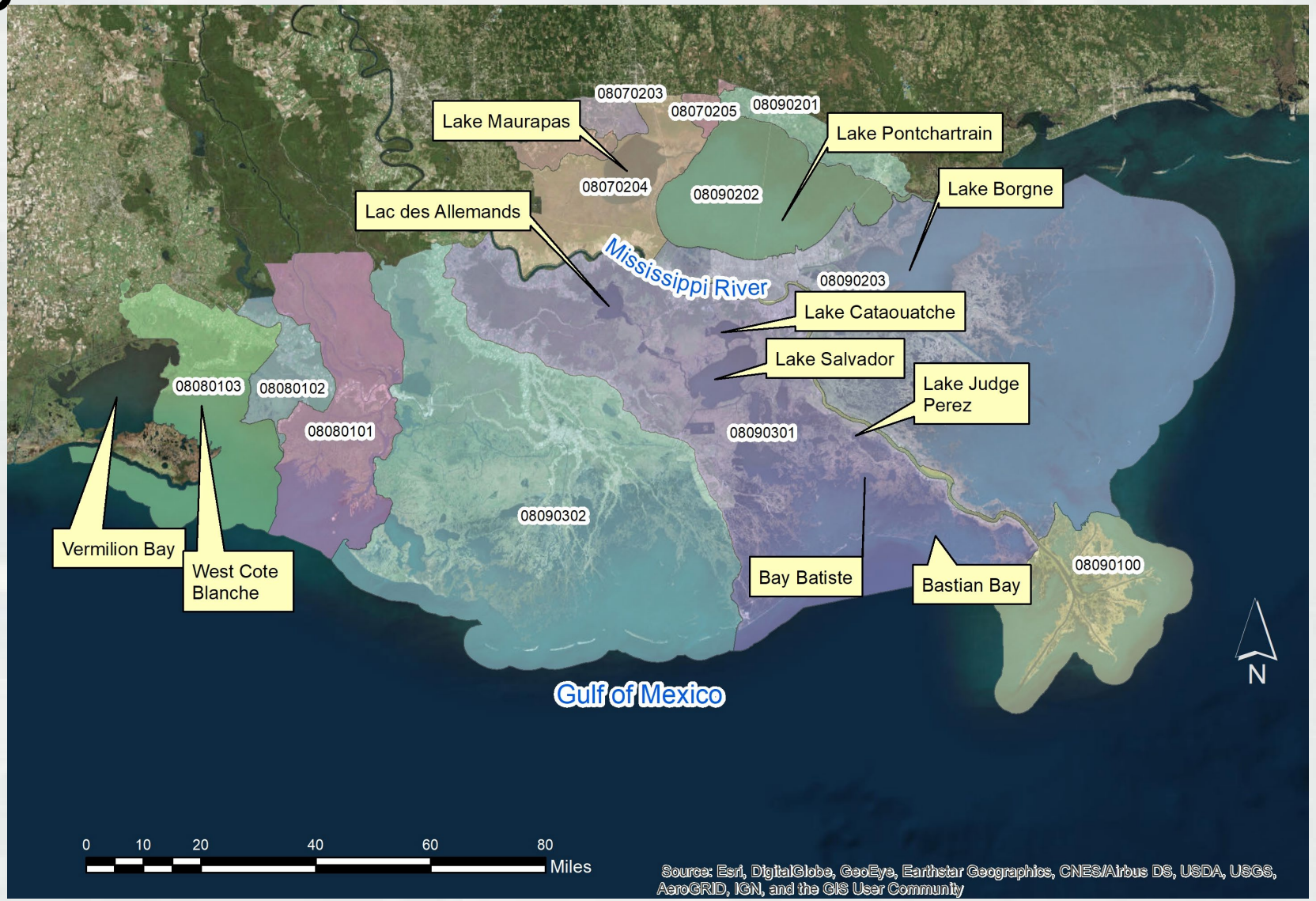

Figure A-3 Overview of Mitigation Sites

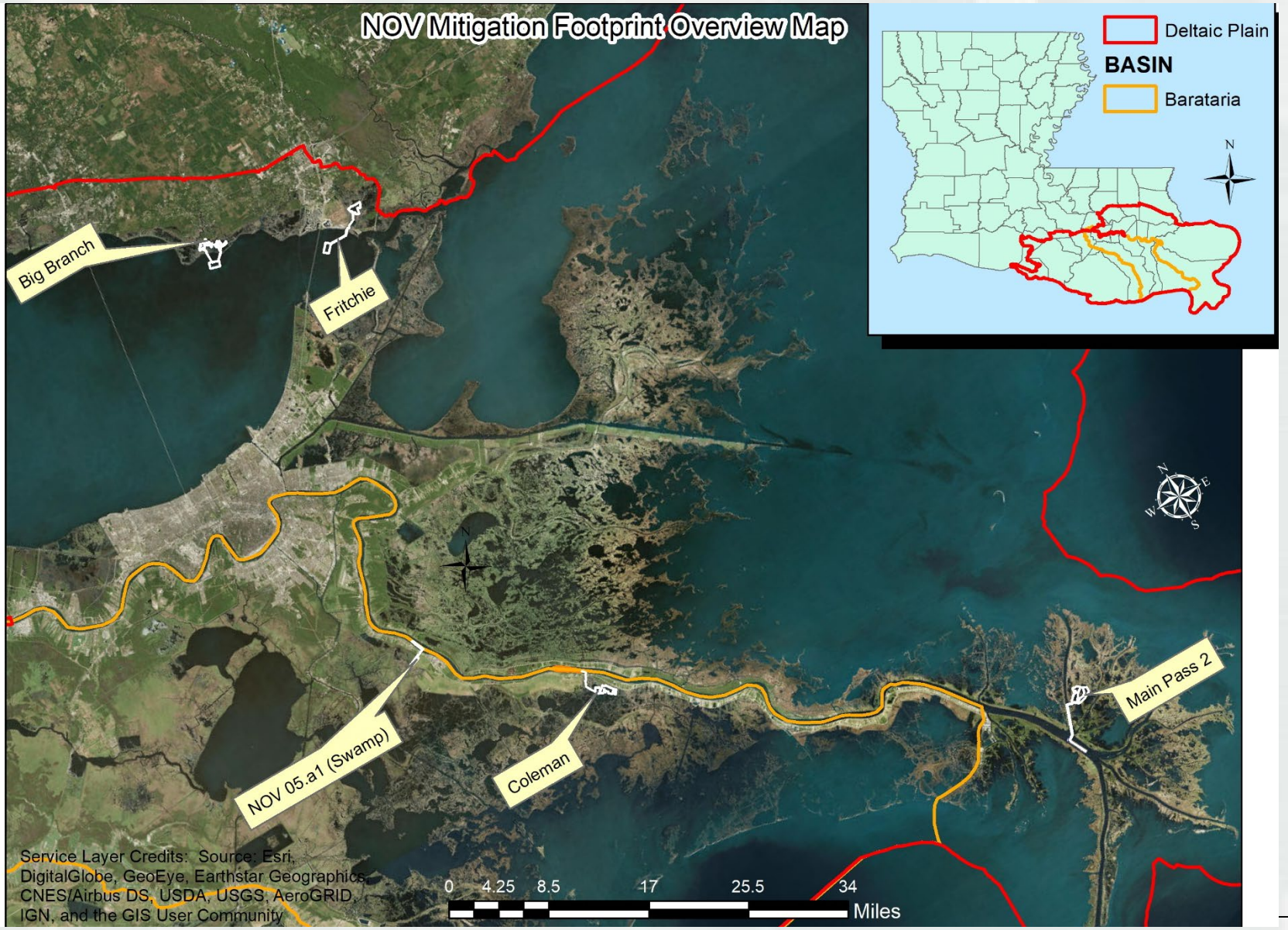

Figure A-4 NF NOV 05a.1 FS Swamp

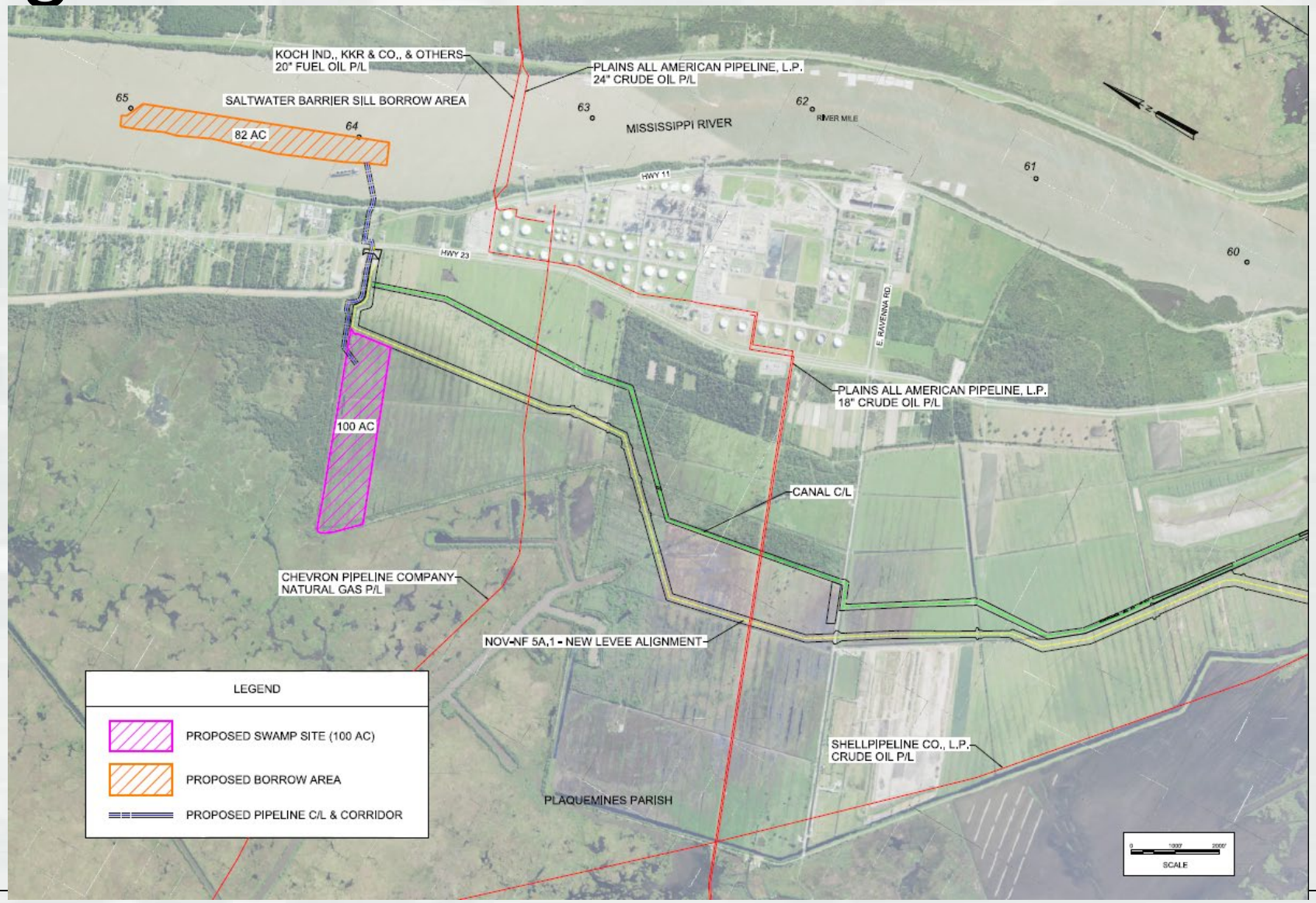

Figure A-5 Big Branch FS Brackish Marsh

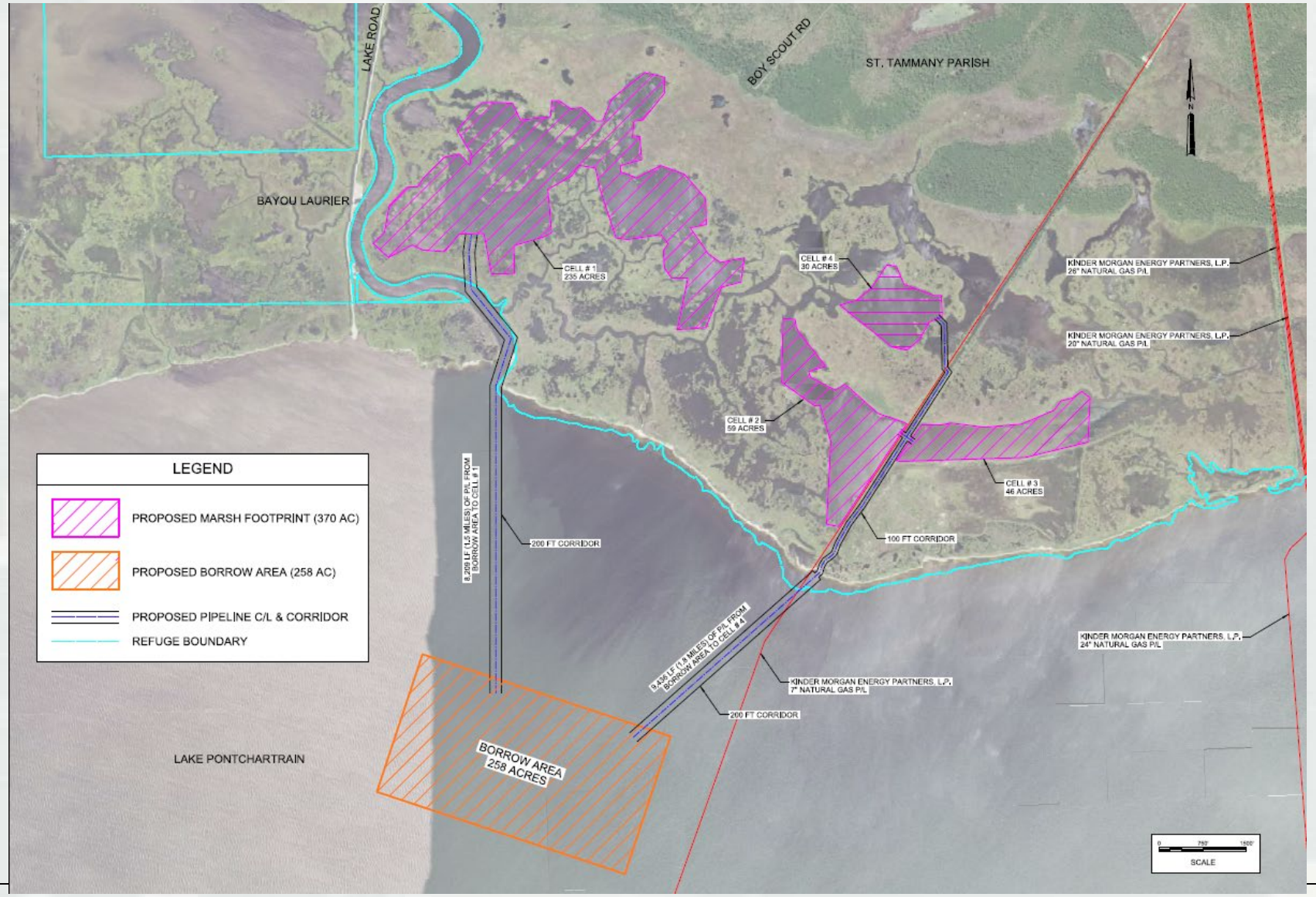

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Figure A-6 Fritchie FS Brackish Marsh

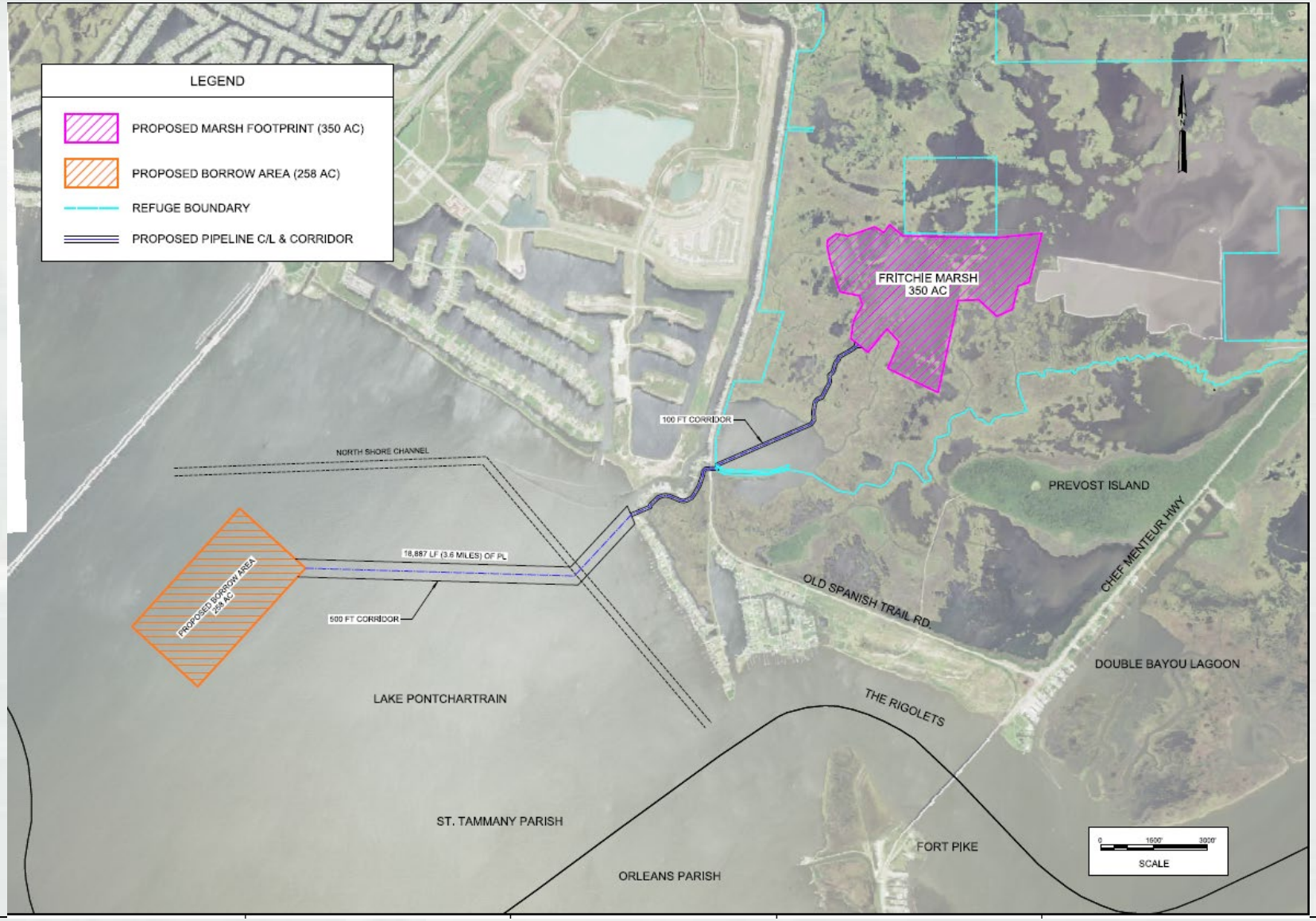

Figure A-6a Fritchie Staging Areas

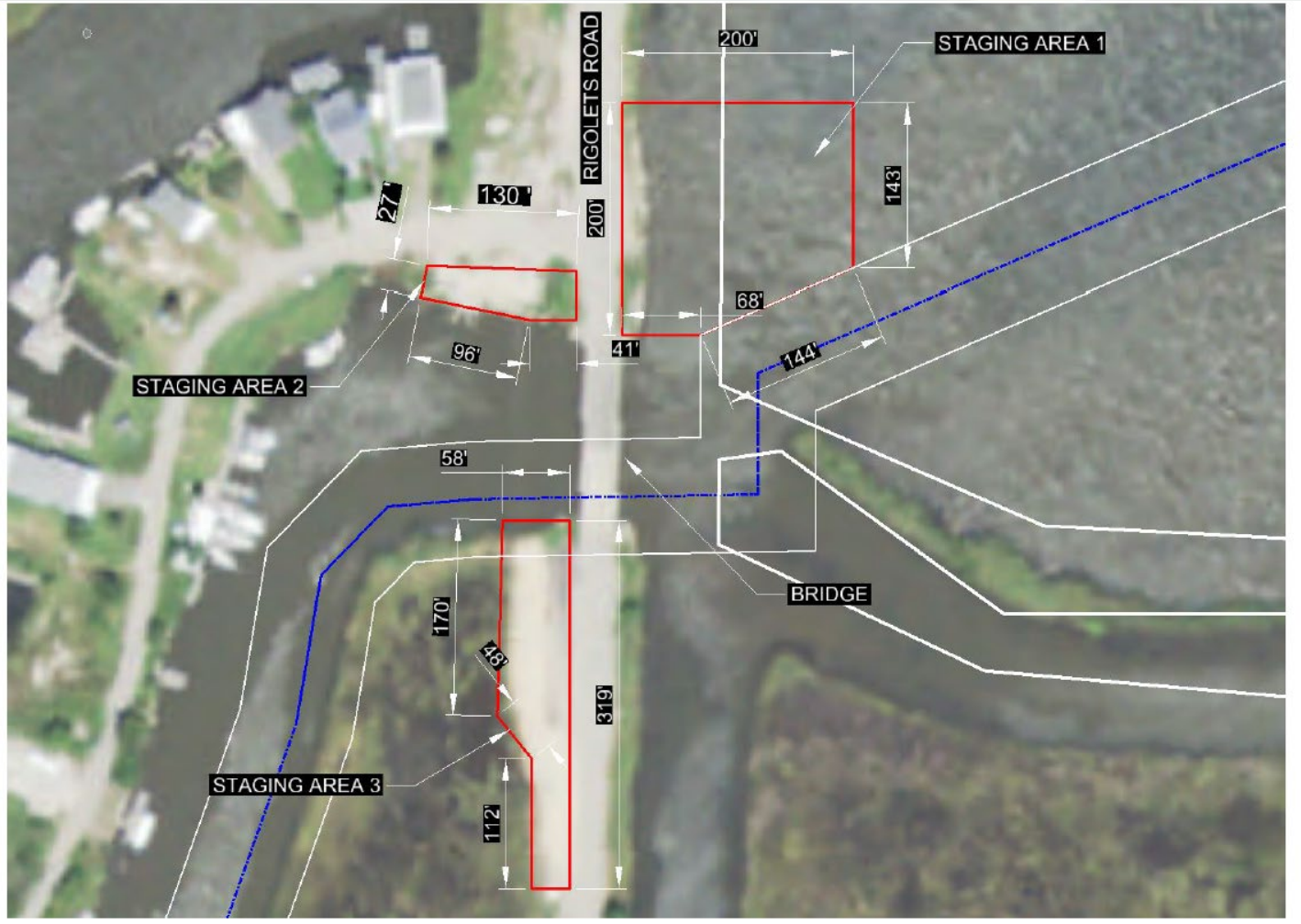

Figure A-6b Fritchie Staging/Access Area

Additional Access Corridor (Southeast Corner of the Refuge) - For access into the marsh creation area.

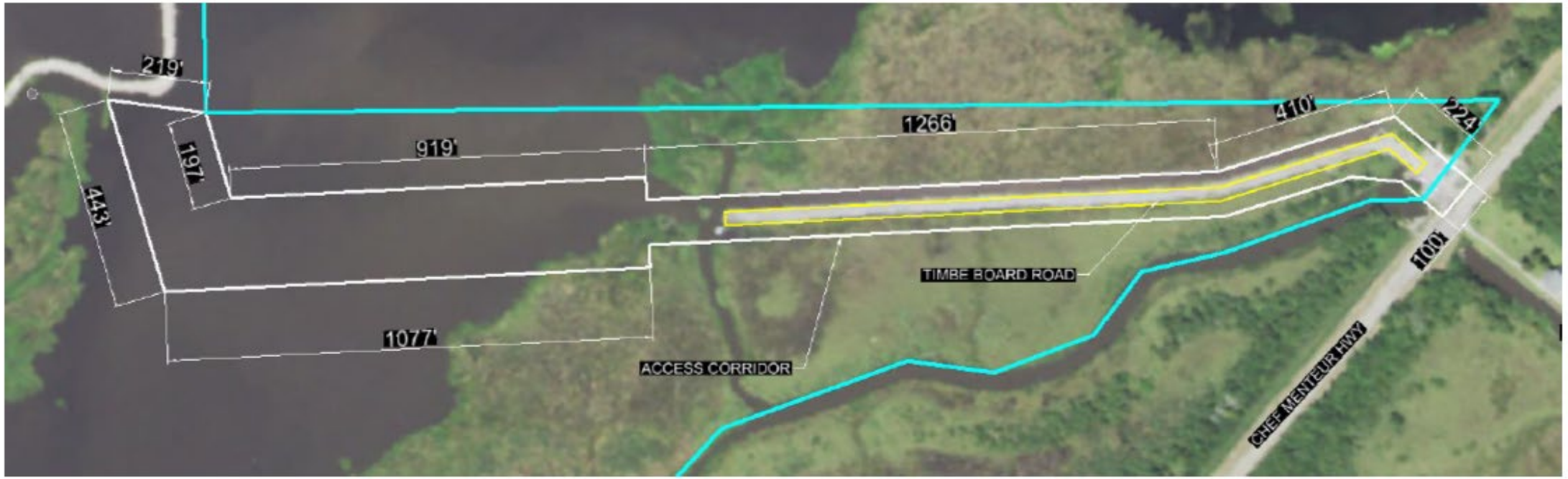

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Figure A-7 Coleman FS Brackish Marsh

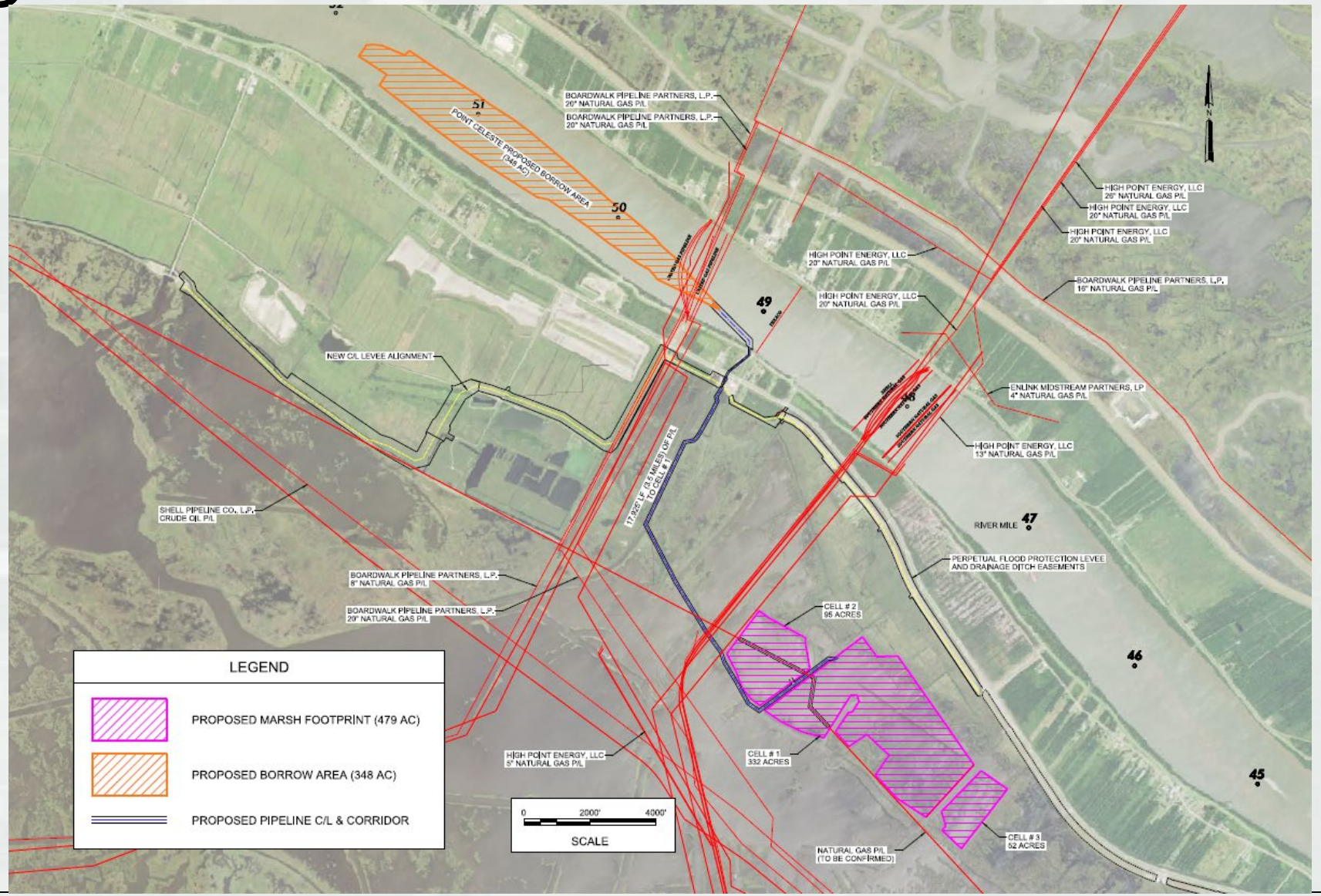

Figure A-8 DNWR Main Pass FS Brackish Marsh

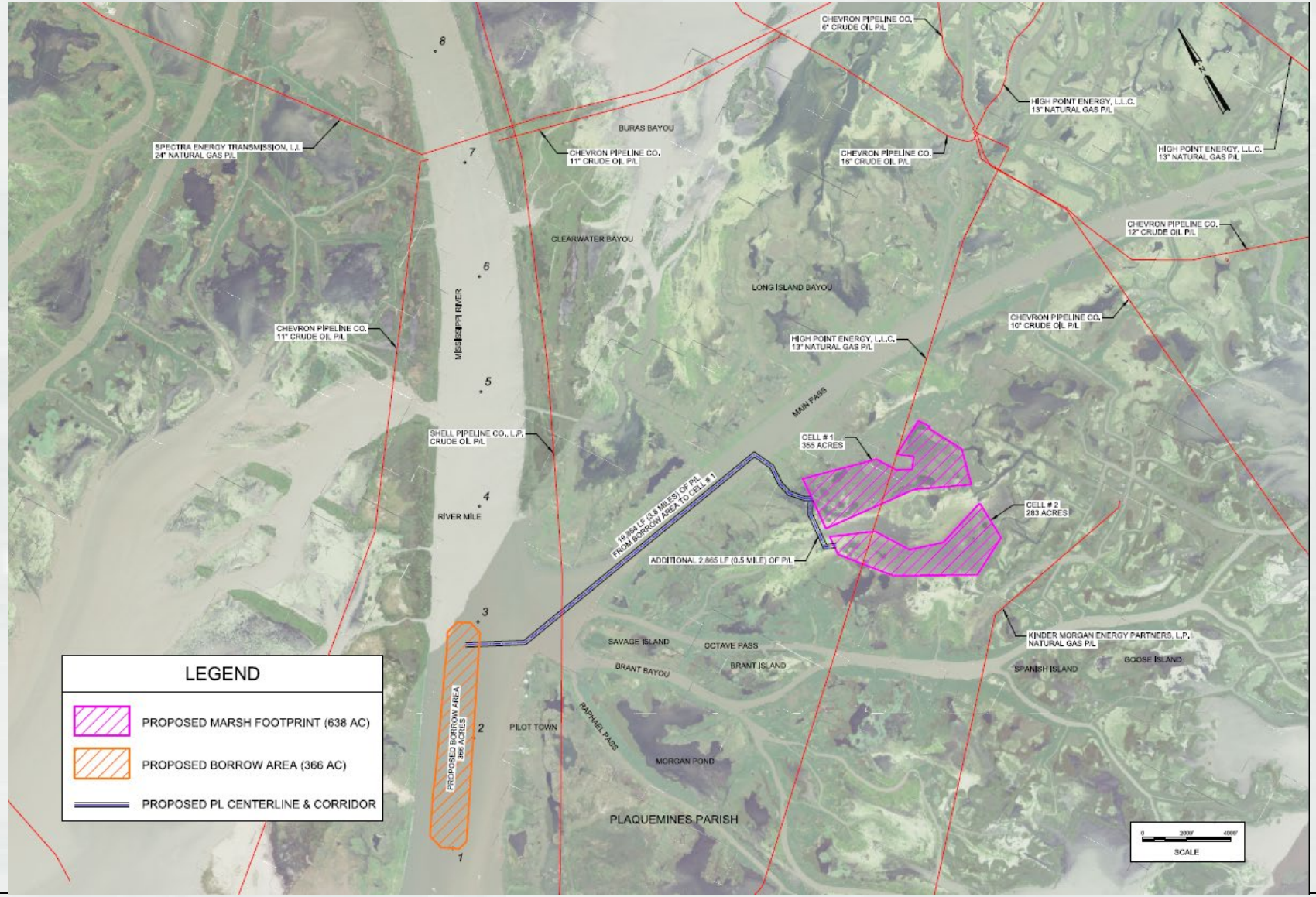

Figure A-9 No Action Existing Conditions Future without Project

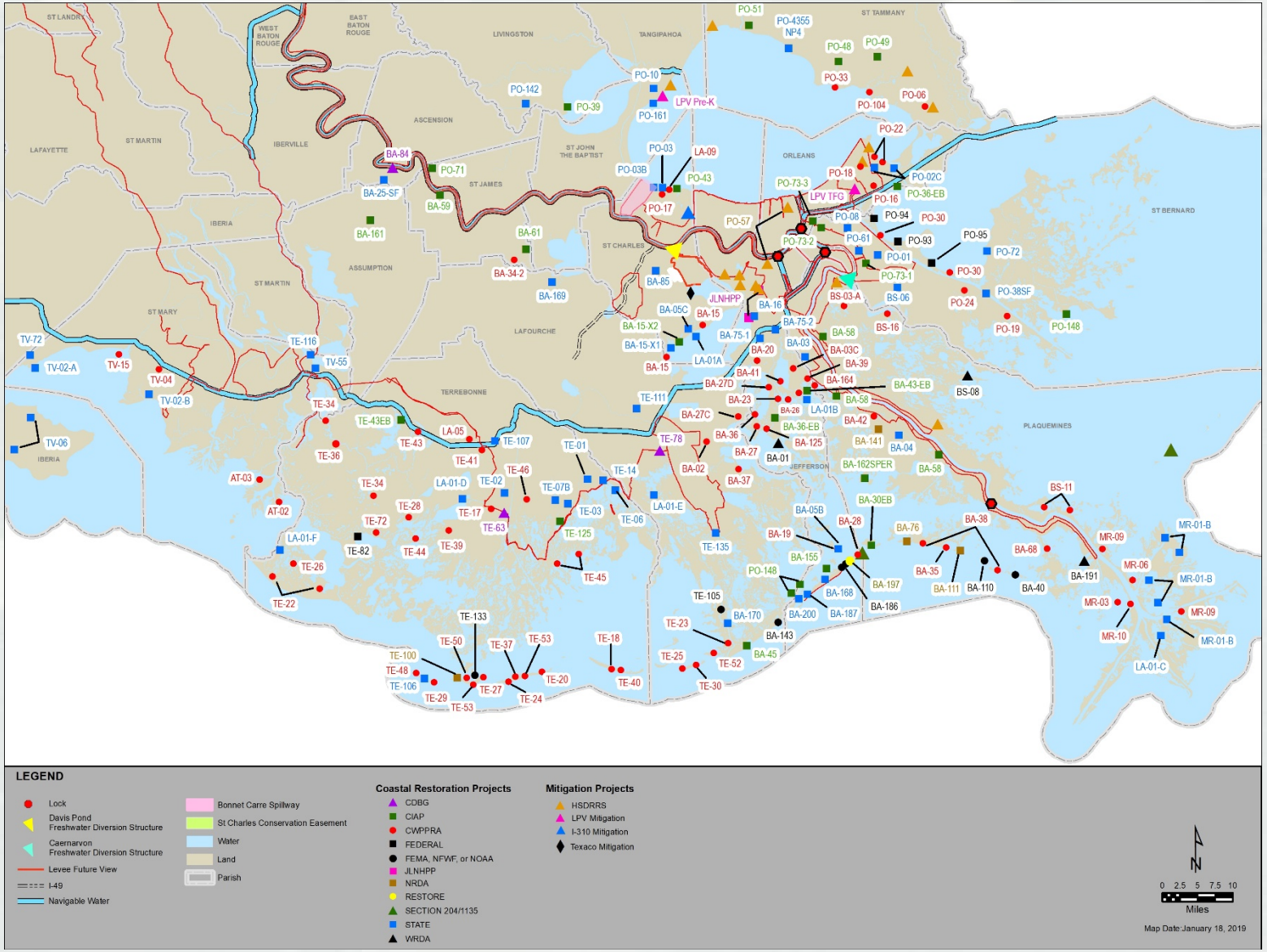

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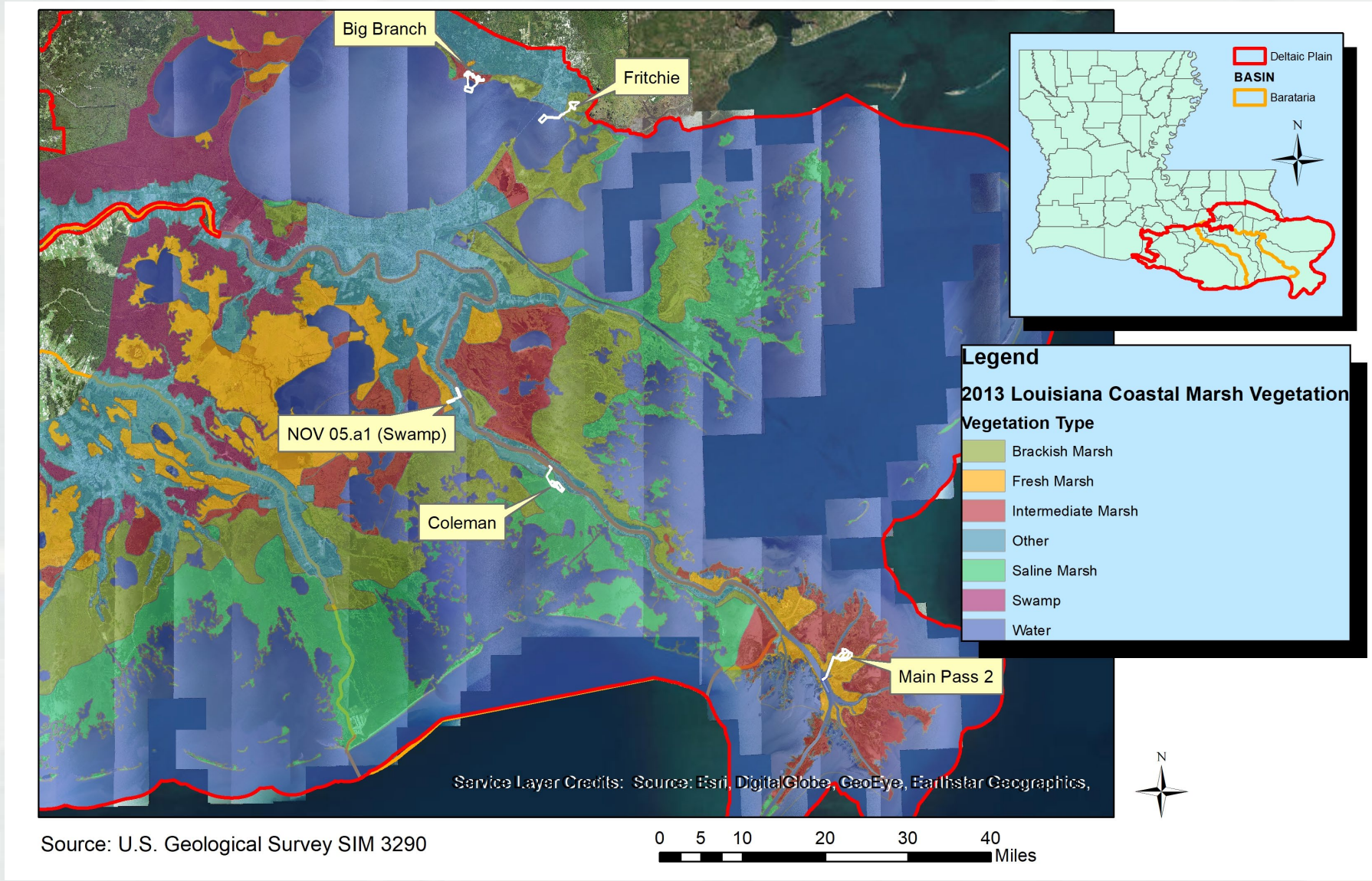
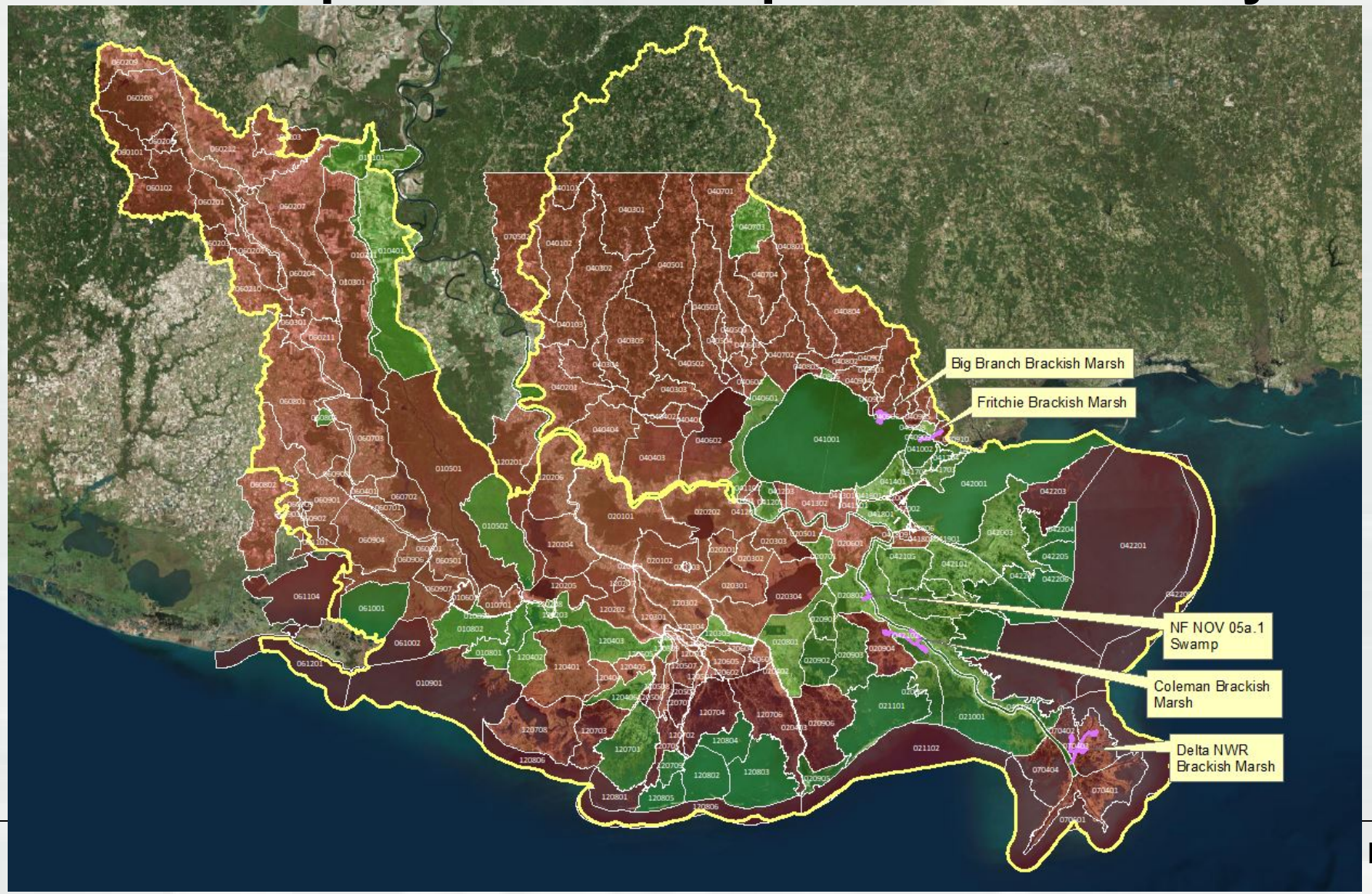
Figure A-10 Vegetative Habitats in Barataria Basin & Deltaic Plain



Source: U.S. Geological Survey SIM 3290

Figure A-11 Hydrologic Units that Encompass both a Project Footprint and an “Impaired” Waterbody



APPENDIX B: TABLES

Table B-1. Remaining Impacts for NFL NOV Projects to be Mitigated

NOV***	**Swamp**		**Intermediate Marsh**		**Brackish Marsh**		**Open Water**		**Saline Marsh**		**Total**	
Levee Reach	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	**Acres**	**AAHUs**
NOV 05	0.0	0.0	0.0	0.0	0.0	0.0	*0.1*	*0.0*	*47.6*	*32.0*	**47.6**	**32.0**
NOV 07	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.1	14.7	**22.1**	**14.7**
NOV 09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
NOV 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
NOV 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
NOV 02, NOV 06b, NOV 08b, NOV 13, NOV 14, P14A, P17A	0.0	0.0	0.8	0.4	0.0	0.0	0.0	0.0	64.0	48.5	**64.8**	**48.9**
Total NOV	**0.0**	**0.0**	**0.8**	**0.4**	**0.0**	**0.0**	**0.1**	**0.0**	**133.7**	**95.1**	**134.6**	**95.5**
NFL***	**Swamp**		**Intermediate Marsh**		**Brackish Marsh**		**Open Water**		**Saline Marsh**		**Total**	
Levee Reach	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	**Acres**	**AAHUs**
NFL Section 1	*39.6*	*33.9*	0.0	0.0	0.0	0.0	*0.3*	*0.0*	0.0	0.0	**39.9**	**33.9**
NFL Section 2	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
NFL Section 3	0.0	0.0	0.0	0.0	7.6	3.2	0.4	0.0	0.0	0.0	**8.0**	**3.2**
NFL Section 4	0.0	0.0	0.6	0.2	5.1	4.6	10.4	0.0	0.0	0.0	**16.1**	**4.8**
Section 2+ 4 Canals	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
Section 2+ 4 Canal Access Road	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
NFL Section 5	0.0	0.0	0.0	0.0	6.0	3.4	4.3	0.0	0.0	0.0	**10.3**	**3.4**
Total NFL	**39.6**	**33.9**	**0.6**	**0.2**	**18.7**	**11.2**	**15.3**	**	**0.0**	**0.0**	**74.2**	**45.4**
Total NOV + NFL	39.6	33.9	1.4	0.6	18.7	11.2	15.3	**	133.7	95.1	208.7	140.9

Text in italics indicates adjusted totals for umitigated impacts from EA 513 that were not purchased in a prior solicitation, and avoided impacts for SEA 543b as result of the realignment of the NF-W-05a.1 levee in NFL Section 2. Specifically, EA 513 impacted in NOV 05, 1.3 acres (1.29 AAHUs) saline marsh and 0.06 acres (0.05AAHUs) saline open water, and in NFL section 1, 0.49 acres (0.36AAHUs) swamp and 0.09 acres (0.04 AAHUs) fresh open water and 0.09 acres of open water (the 0.04 AAHUs were added to swamp impacts not the fresh marsh) were unmitigated due to lack of response and available credits in a previous mitigation bank credit solicitation. SEA 565 avoided impacts to swamp habitat in NFL Section 2 previously predicted to be 0.3 acres (0.2 AAHUs).

**Note: Open Water AAHUs are captured in the total for the Marsh AAHUs.

Table B-2 Risk and Reliability Data Matrix

	Coleman Brackish Marsh	Big Branch Brackish Marsh	Mitigation Bank/ILF
Uncertainty Relative to Achieving Ecological Success	Minimal uncertainty, preferred borrow material. **MP = 0.31** **+**	Minimal uncertainty, preferred borrow material **MP = 0.30** **+**	Minimal uncertainty, no adaptive mgmt need. Exact mitigation potential unknown; assume 0.2 and 0.3 41.9+ 13.4 = 55.3 AAHUs currently available Need 105.6 AAHUs to mitigate for NFL/NOV +
Uncertainty Relative to Implementability Concerns	Real Estate: 1 Private owner, adjacent utility easements. 0	Real Estate: Public land, adjacent utility easements concerns for access. 0	No uncertainty, bank already implemented -
Adaptability	Opportunity to add additional 70% to acreage. +	Minimal opportunity to add acreage. 0	Same assumptions as above -
Long-term Sustainability	59 **0**	43 0	Unknown 0
Active engineering features?	No 0	No 0	N/A (the bank is responsible) 0
Anticipated OMRR&R Activities	Inv species control, general monitoring 0	Inv species control, general monitoring 0	N/A (the bank is responsible) +
Relative Difficulty OMRR&R	Standard 0	Standard 0	N/A (the bank is responsible) +
Relative Probability of Exposure to Stressors	**Hurricanes** **0**	**Hurricanes** **0**	Not a risk, bank will comply with MBI 0
Project Performance Relative to Stressors/Resiliency After Exposure to Stressors	Sea level rise could convert marsh to different habitat (open water) 0	Sea level rise could convert marsh to different habitat (open water) 0	Not a risk, bank will comply with MBI 0
Financial Assurances	YES 0	YES 0	YES 0

Risk/Reliability

	NF NOV 05a.1 Swamp	Combination NF NOV 05a.1 and Mitigation Bank	Mitigation Bank
Uncertainty Relative to Achieving Ecological Success	Uncertainty in hydrology associated with Swamp creation at this location. Preferred borrow material. Adaptive mgmt. needed. **MP = 0.43** **0**	Uncertainty in hydrology and constructability associated with swamp creation. Fine borrow material. Adaptive mgmt. needed. **MP = 0.43/assume 0.45** **0**	Minimal uncertainty, no adaptive mgmt need. Exact mitigation potential unknown; assume 0.45 4.1 AAHUs currently available Need 33.9 AAHUs to mitigate for NFL/NOV +
Uncertainty Relative to Implementability Concerns	Real Estate: 1 Private owner, *landowner will support project 0	Real Estate: 1 Private owner, *landowner will support project 0	No uncertainty, bank already implemented 0
Adaptability	Opportunity to add additional 80% to acreage. Manipulating elevation after planting is not practical. +	Opportunity to add additional 80% to acreage. Manipulating elevation after planting is not practical. +	Same assumptions as above -
Long-term Sustainability	0.76 0	0.76 0	Unknown 0
Active engineering features?	No 0	No 0	N/A (the bank is responsible) 0
Anticipated OMRR&R Activities	Inv species control, additional planting (if needed) and general monitoring. 0	Inv species control, additional planting (if needed) and general monitoring. **0**	N/A (the bank is responsible) +
Relative Difficulty OMRR&R	Standard 0	Standard **0**	N/A (the bank is responsible) +
Relative Probability of Exposure to Stressors	protected from daily wave action; Susceptible to higher salinity impacts 0	protected from daily wave action; Susceptible to higher salinity impacts 0	Not a risk, bank will comply with MBI 0
Project Performance Relative to Stressors/Resiliency After Exposure to Stressors	Salinity could stress/kill trees, sea level rise could convert swamp to different habitat. 0	Salinity could stress/kill trees, sea level rise could convert swamp to different habitat. 0	Not a risk, bank will comply with MBI 0
Financial Assurances	YES 0	YES 0	YES 0

Risk/Reliability

	Fritchie Brackish Marsh	Main Pass DNWR Brackish Marsh	Mitigation Bank/ILF/Corps Constructed
Uncertainty Relative to Achieving Ecological Success	Minimal uncertainty, preferred borrow material. **MP = 0.32** +	Minimal uncertainty, preferred borrow material **MP = 0.23** +	Minimal uncertainty, preferred borrow material. Adaptive mgmt. needed. + Exact mitigation potential unknown; assume 0.2 and 0.3 41.9+ 13.4 = 55.3 AAHUs currently available Need 105.6 AAHUs to mitigate for NFL/NOV
Uncertainty Relative to Implementability Concerns	Real Estate: Public land, adjacent utility easements. +	Real Estate: Public land, adjacent utility easements, will need to designate no work areas for utilities. 0	Public land, adjacent utility easements/Less uncertainty with credit availability because corps constructed project is scalable +
Adaptability	Opportunity to add additional 70% to acreage. +	Opportunity to add additional 70% to acreage. +	Same assumptions as above +
Long-term Sustainability	43 0	83 +	Unknown 0
Active engineering features?	No 0	No 0	N/A (the bank is responsible) 0
Anticipated OMRR&R Activities	Inv species control, general monitoring 0	Inv species control, general monitoring 0	Inv species control, general monitoring/ N/A (the bank is responsible) 0
Relative Difficulty OMRR&R	Standard 0	Standard -	Standard/ N/A (the bank is responsible) 0
Relative Probability of Exposure to Stressors	**Hurricanes** **0**	**Hurricanes** **0**	Not a risk, bank will comply with MBI 0
Project Performance Relative to Stressors/Resiliency After Exposure to Stressors	Sea level rise could convert marsh to different habitat (open water) 0	Sea level rise could convert marsh to different habitat (open water) + USFWS would rank + b/c Delta is more resilient with Riverine Nutrient Fine Sediment Source	Sea level rise could convert marsh to different habitat (open water) Not a risk, bank will comply with MBI 0
Financial Assurances	YES 0	YES 0	YES 0

Table B-3: Watershed & Ecological Site Considerations Data Matrix

Swamp	Watershed Considerations/Significance in Watershed					Ecological Site Considerations (swamp and marsh only)	
	Contiguous With or Within Resource Managed Area	Located in Parish with Impacts	Critical Geomorphic Feature	LaCPR Critical Landscape Feature	Habitat Linkage	Fragmentation Within Site Boundary	Habitat Connectivity To Larger Project Area Given Future Land Use Trends
NF NOV 05a.1	NOT In a refuge NO On the Protected side of the New Orleans to Venice levee system. Adjacent to the BA03 and BA-03C Naomi Outfall Management and Siphon Diversion, Completely within the BA-01 Davis Pond Freshwater Diversion 0	YES (Plaquemines) +	NO 0	Yes Wetlands South of GIWW +	Yes +	NO 0	NO 0
Combination NF NOV 05a.1 and Mitigation Bank	Yes/UNKNOWN On the Protected side of the New Orleans to Venice levee system. Adjacent to the BA03 and BA-03C Naomi Outfall Management and Siphon Diversion, Completely within the BA-01 Davis Pond Freshwater Diversion 0	YES/Unknown (Plaquemines) +	NO/Unknown 0	Yes Wetlands South of GIWW/Unknown +	Yes/Unknown +	NO/Unknown 0	NO/Unknown 0
Mitigation Bank	Unknown 0	Unknown 0	Unknown 0	Unknown 0	Unknown 0	Unknown 0	Unknown 0

Watershed & Ecological Site Considerations

Swamp	With State Master Plan	With Coast 2050 Plan	With LCA	With LACPR
NF NOV 05a.1	Yes Completely within non-structural measure PLA.0.1N Plaquemines - West Bank Nonstructural Risk Reduction: Project includes floodproofing non-residential properties where 100-year flood depths are 1-3 feet, elevating residential properties where 100-year flood depths are 3-14 feet, and acquiring residential properties where 100-year flood depths are greater than 14 feet. Adjacent to 001.DI.101 and 002.DI.102 restoration measures Sediment diversion into Upper Barataria near Ama and Sediment diversion into Mid-Barataria near Myrtle Grove to build and maintain land, +	NO 0	No LCA projects in this area are suspended 0	Yes Completely within Planning Unit 2 coastal measure 2-4 Naomi Diversion sized to sustain receiving area marshes. +
Combination NF NOV 05a.1 and Mitigation Bank	Yes/UNKNOWN Completely within non-structural measure PLA.0.1N. Plaquemines - West Bank Nonstructural Risk Reduction: Project includes floodproofing non-residential properties where 100-year flood depths are 1-3 feet, elevating residential properties where 100-year flood depths are 3-14 feet, and acquiring residential properties where 100-year flood depths are greater than 14 feet. Adjacent to 001.DI.101 and 002.DI.102 restoration measures Sediment diversion into Upper Barataria near Ama and Sediment diversion into Mid-Barataria near Myrtle Grove to build and maintain land,/UNKNOWN +	No/Unknown 0	No/UNKNOWN LCA projects in this area are suspended 0	Yes/UNKNOWN Completely within Planning Unit 2 coastal measure 2-4 Naomi Diversion +
Mitigation Bank	Unknown 0	Unknown 0	Unknown 0	Unknown 0

Watershed & Ecological Site Considerations

Brackish Marsh	Watershed Considerations/Significance in Watershed					Ecological Site Considerations (swamp and marsh only)	
	Contiguous With or Within Resource Managed Area	Located in Parish with Impacts	Critical Geomorphic Feature	LaCPR Critical Landscape Feature	Habitat Linkage	Fragmentation Within Site Boundary	Habitat Connectivity To Larger Project Area Given Future Land Use Trends
Big Branch	Yes Completely within the Big Branch National Willdlife Refuge Partially within PO-33 Goose Point/Point Platte Marsh Creation +	NO (St. Tammany) -	NO 0	NO 0	YES +	NO +	NO 0
Fritche Marsh	Yes Completely within PO-06 Fritche Marsh Restoration +	NO (St. Tammany) -	NO 0	NO 0	YES +	No +	NO 0
Coleman Brackish Marsh	Yes Completely within the BA-01 Davis Pond Freshwater Diversion Area, Completely within BA-04 West Pointe a la Hache Siphon Diversion Area. 0	YES (Plaquemines) +	NO 0	NO 0	Partial +	NO +	NO 0

Watershed & Ecological Site Considerations

Brackish Marsh	Watershed Considerations/Significance in Watershed					Ecological Site Considerations (swamp and marsh only)	
	Contiguous With or Within Resource Managed Area	Located in Parish with Impacts	Critical Geomorphic Feature	LaCPR Critical Landscape Feature	Habitat Linkage	Fragmentation Within Site Boundary	Habitat Connectivity To Larger Project Area Given Future Land Use Trends
Main Pass Delta National Wildlife Refuge Alt 2	Yes Completely within Delta National Wildlife Refuge Completely within MR-09 Delta Wide Crevasses +	YES (Plaquemines) +	NO 0	NO 0	YES +	NO +	NO 0
Mitigation Bank/ILF/Corps Constructed Combination Marsh Restoration	Unknown +	Unknown -	Unknown 0	Unknown 0	Unknown + Changed with all + constructable projects	Unknown +	NO 0
ILF/Mitigation Bank	Unknown 0	Unknown 0	Unknown 0	Unknown 0	Unknown 0	Unknown 0	NO 0

Watershed & Ecological Site Considerations

Brackish Marsh	With 2017 State Master Plan	With Coast 2050 Plan	With LCA	With LACPR
Big Branch	Yes Completely within restoration measure 001.MC.106 St. Tammany Marsh Creation. Creation of approximately 6,700 acres of marsh in St. Tammany Parish along the northern shore of Lake Pontchartrain to create new wetland habitat and restore degraded marsh. +	NO 0	No LCA projects in this area are suspended 0	No 0
Fritchie Marsh	Completely within structural measure STT.0.1N.St. Tammany Nonstructural Risk Reduction: Project includes floodproofing non-residential properties where 100-year flood depths are 1-3 feet, elevating residential properties where 100-year flood depths are 3-14 feet, and acquiring residential properties where 100-year flood depths are greater than 14 feet. +	Yes Regional Ecosystem Strategies (Restore and Sustain Marsh, Adjacent to Objective 10 Maintain Shoreline Integrity); Strategic Goals (Protect Shoreline) 0	No LCA projects in this area are suspended 0	Yes Adjacent to Planning Unit 1 measure 2-5 East New Orleans land bridge marsh creation - 7,996 acres @ 900 acres/yr +
Coleman Brackish Marsh	Yes Partially within non-structural measure PLA.0.1N. Plaquemines - West Bank Nonstructural Risk Reduction: Project includes floodproofing non-residential properties where 100-year flood depths are 1-3 feet, elevating residential properties where 100-year flood depths are 3-14 feet, and acquiring residential properties where 100-year flood depths are greater than 14 feet. Completely within restoration measures 001.DI.101 and 002.DI.102 restoration measures Sediment diversion into Upper Barataria near Ama and Sediment diversion into Mid-Barataria near Myrtle Grove to build and maintain land +	Yes Regional Ecosystem Strategies (Restore and Sustain Marsh, Completely within Objective 8. Construction of effective small diversions); Strategic Goals (Create Wetlands, Dedicated Dredging) 0	No LCA projects in this area are suspended 0	Yes Completely within Planning Unit 2 coastal measure 2-8 West Pointe a la Hache Diversion – sized to sustain receiving area. Project is located adjacent to and on the floodside of the Plaquemines Parish Non-Federal levee from Le Reussite to St. Jude which benefits existing and proposed levees by providing additional marsh acreage to be converted from open water +

Watershed & Ecological Site Considerations

Brackish Marsh	With 2017 State Master Plan	With Coast 2050 Plan	With LCA	With LACPR
Main Pass Delta National Wildlife Refuge Alt 2	No 0	Yes Regional Ecosystem Strategies (Restore and Sustain Marsh, Completely within Objective 7 Build and Maintain Delta Splays); Strategic Goals (Create Wetlands) 0	Yes Mississippi River Delta Management Study 0	No 0
Mitigation Bank/ILF/Corps Constructed Combination Marsh Restoration	Unknown +	Unknown 0	Unknown 0	Unknown +
Mitigation Bank	Unknown 0	Unknown 0	Unknown 0	Unknown 0

Table B-4 Environmental Impact Summary Data

SUBCRITERIA	Hydrology / Hydraulics	Navigable Waters	Scenic Rivers	Water Quality	Wildlife & Habitats	Water Bottoms / Benthic Resources	T & E Species	EFH
	Qualitative	Yes/No; Extent of impacts; Perm/Temp	Coordination or permitting necessary (yes/no); Perm/Temp	Qualitative	Acreage of habitat by type impacted; acreage of habitat by type created	Acreage; Perm/Temp	Species; Critical habitat	Acreage; Species impacted / life stage; Perm/Temp
NF NOV 05a.1 Swamp	100 acres of pasture and wet pasture converted to seasonally flooded soils. +	No; 100 acres of pasture and wet pasture permanently converted to swamp. Temp impact at borrow site. 0	No 0	Temporary increased turbidity at borrow site. 0	100 ac. Pasture land habitat for cattle eliminated. Same ac. habitat created for other birds & terrestrial vertebrates. +	Permanent loss of 100 acres of pasture and wet pasture habitat; 82 ac. borrow site temporarily impacted 0	No impacts by mitigation features. Pallid sturgeon could occur in borrow site. 0	No Perm. impact, at 100 ac. mit site. +
Combination NF NOV 05a.1 and Mitigation Bank	100 acres of pasture and wet pasture converted to seasonally flooded soils. +	No; 100 acres of pasture and wet pasture permanently converted to swamp. Temp impact at borrow site. 0	No 0	Temporary increased turbidity at borrow site. 0	100 ac. Pasture land habitat for cattle eliminated. Same ac. habitat created for other birds & terrestrial vertebrates. +	Permanent loss of 100 acres of pasture and wet pasture habitat; 82 ac. borrow site temporarily impacted 0	No impacts by mitigation features. Pallid sturgeon could occur in borrow site. 0	No Perm. impact, at 100 ac. mit site. +
Mitigation Bank	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts +

Environmental

SUBCRITERIA	Aquatic / Fisheries	Prime Farmland	Cultural Resources	Recreation	Noise	Aesthetics	HTRW	Environmental Justice	Socioeconomics / Land Use
	Acres habitat created or eliminated	Yes/No; Acreage	Qualitative	Acreage & type of resource impacted; Acreage of resource improved	Residential or commercial within 1,000 feet	Qualitative	Probability of encountering HTRW	Low income / minority populations disproportionately impacted	# Impacted – comm./industrial properties; residential units; public properties. Acres ag or forest converted
NF NOV 05a.1 Swamp	100 acres of pasture and wet pasture converted to flooded swamp. Limited fish access to restored swamp. +	Yes, up to 100 acres of prime farmland impacted -	Low probability for impacts. 0	100 acres of private pasture and wet pasture converted to flooded swamp. Same ac. improved re hiking, wildlife viewing, hunting. +	No residences present. 0	No impacts 0	Very low. No oil/gas wells. No pipelines. 0	No impacts 0	No impacts 0
Combination NF NOV 05a.1 and Mitigation Bank	100 acres of pasture and wet pasture converted to flooded swamp. Limited fish access to restored swamp. +	Yes, up to 100 acres of prime farmland impacted -	Low probability for impacts. 0	100 acres of private pasture and wet pasture converted to flooded swamp. Same ac. improved re hiking, wildlife viewing, hunting. +	No residences present. 0	No impacts 0	Very low. No oil/gas wells. No pipelines. 0	No impacts 0	No impacts 0
Mitigation Bank	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts0	No impacts 0	No impacts 0	No impacts 0	No impacts 0

Environmental

SUBCRITERIA	Hydrology / Hydraulics	Navigable Waters	Scenic Rivers	Water Quality	Wildlife & Habitats	Water Bottoms / Benthic Resources	T & E Species	EFH
	Qualitative	Yes/No; Extent of impacts; Perm/Temp	Coordination or permitting necessary (yes/no); Perm/Temp	Qualitative	Acreage of habitat by type impacted; acreage of habitat by type created	Acreage; Perm/Temp	Species; Critical habitat	Acreage; Species impacted / life stage; Perm/Temp
Coleman Brackish Marsh	Reduced wave energy, runoff would substantially increase, water storage capacity would decrease. 479 ac. open water converted to marsh. 0	Yes. 479 ac. open water permanently converted to marsh. Temp impact at borrow site. 0	No 0	Temporary increased turbidity. 0	479 ac. Shallow open water, SAV and eroded marsh eliminated. Same ac. habitat created for other birds & terrestrial vertebrates. +	Permanent loss of 479 ac.; 348 ac. borrow site temporarily impacted 0	No impacts by mitigation features. Pallid sturgeon could occur in borrow site. +	Perm. impact juvenile brown & white shrimp, adult/juvenile red drum and juvenile grey snapper, at 479 ac. mit site. +
Big Branch Brackish Marsh	Reduced wave energy, runoff would substantially increase, water storage capacity would decrease. 370 ac. open water converted to marsh. 0	Yes. 370 ac. open water permanently converted to marsh. Temp impact at borrow sites. -	Yes, temporary impact to designated scenic river and stream Bayou Lacombe 0	Temporary increased turbidity. 0	370 ac. open water eroded marsh habitat eliminated; 370 ac. emergent marsh created increases habitat for birds. +	Permanent loss of 370 ac. water bottom but benthic organisms temp impacted. Borrow site temp impact to 258 ac. 0	Manatee; standard protection measures required. borrow site within Gulf sturgeon critical habitat, requires construction timing restrictions 0	Temp. impact juvenile brown shrimp, adult/juvenile red drum and adult/juvenile white shrimp, at 370 ac. of mit site. Perm impact similar species at borrow site. 0

Environmental

SUBCRITERIA	Hydrology / Hydraulics	Navigable Waters	Scenic Rivers	Water Quality	Wildlife & Habitats	Water Bottoms / Benthic Resources	T & E Species	EFH
	Qualitative	Yes/No; Extent of impacts; Perm/Temp	Coordination or permitting necessary (yes/no); Perm/Temp	Qualitative	Acreage of habitat by type impacted; acreage of habitat by type created	Acreage; Perm/Temp	Species; Critical habitat	Acreage; Species impacted / life stage; Perm/Temp
Fritchie Brackish Marsh	Reduced wave energy, runoff would substantially increase, water storage capacity would decrease. 350 ac. open water converted to marsh. 0	Yes. 350 ac. open water permanently converted to marsh. Temp impact at borrow site. 0	No 0	Temporary increased turbidity. 0	350 ac. open water eroded marsh habitat eliminated; 350 ac. emergent marsh created increases habitat for birds. +	Permanent loss of 350 ac. water bottom but benthic organisms temp impacted. Borrow site temp impact to 258 ac. 0	Manatee; standard protection measures required. borrow site within Gulf sturgeon critical habitat, requires construction timing restrictions 0	Temp. impact adult/juvenile brown & white shrimp, adult/juvenile red drum and juvenile grey snapper, at 350 ac. of mit site. Perm impact similar species at borrow site. 0
Main Pass DNWR Brackish Marsh	638 ac. open water converted to marsh. 0	Yes. 638 ac. open water permanently converted to marsh. Temp impact at borrow site. 0	No 0	Temporary increased turbidity. 0	638 ac. Shallow open water and eroded marsh habitat eliminated; 638 ac. emergent marsh created increases habitat for birds. +	Permanent loss of 638 ac. water bottom but benthic organisms temp impacted. Borrow site temp impact to 750 ac. 0	No impacts by mitigation features. Pallid sturgeon could occur in borrow site. +	Temp. impact adult/juvenile brown & white shrimp, adult/juvenile red drum and juvenile grey snapper, at 638 ac. of mit site. Perm impact similar species at borrow site. +

Environmental

SUBCRITERIA	Hydrology / Hydraulics	Navigable Waters	Scenic Rivers	Water Quality	Wildlife & Habitats	Water Bottoms / Benthic Resources	T & E Species	EFH
	Qualitative	Yes/No; Extent of impacts; Perm/Temp	Coordination or permitting necessary (yes/no); Perm/Temp	Qualitative	Acreage of habitat by type impacted; acreage of habitat by type created	Acreage; Perm/Temp	Species; Critical habitat	Acreage; Species impacted / life stage; Perm/Temp
Combination Corps constructed (Coleman, Big Branch, Fritchie, or Delta NWR) and Mitigation Bank/ILF	Reduced wave energy, runoff would substantially increase, water storage capacity would decrease up to 638 ac. open water converted to marsh. 0	Yes. Up to 638 ac. open water permanently converted to marsh. Temp impact at borrow site. 0	Yes, temporary impact to designated scenic river and stream Bayou Lacombe 0	Temporary increased turbidity. 0	Up to 638 ac. Shallow open water and eroded marsh habitat eliminated; 638 ac. emergent marsh created increases habitat for birds. +	Permanent loss of up to 638 ac. water bottom but benthic organisms temp impacted. Borrow site temp impact to 750 ac. 0	Manatee; standard protection measures required. borrow site within Gulf sturgeon critical habitat, requires construction timing restrictions Pallid sturgeon could occur in borrow site. 0	Temp. impact adult/juvenile brown & white shrimp, adult/juvenile red drum and juvenile grey snapper, up to 638 ac. of mit site. Perm impact similar species at borrow site. 0
Mitigation Bank/ILF	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts 0

Environmental

SUBCRITERIA	Aquatic / Fisheries	Prime Farmland	Cultural Resources	Recreation	Noise	Aesthetics	HTRW	Environmental Justice	Socioeconomics / Land Use
	Acres habitat created or eliminated	Yes/No; Acreage	Qualitative	Acreage & type of resource impacted; Acreage of resource improved	Residential or commercial within 1,000 feet	Qualitative	Probability of encountering HTRW	Low income / minority populations disproportionately impacted	# Impacted – comm./industrial properties; residential units; public properties. Acres ag or forest converted
Coleman Brackish Marsh	479 ac. open water eliminated. 479 ac. Marsh created increases habitat diversity *NMFS says marsh is a more productive habitat for fisheries than open water +	No 0	Low probability for impacts 0	479 ac. open water, broken marsh eliminated, and improved for wildlife viewing and hunting. +	No impacts 0	No impacts 0	Very low. Three plugged and abandoned oil/gas within the proposed mitigation site. No pipelines present. 0	No impacts 0	No impacts 0
Big Branch Brackish Marsh	370 ac. open water eliminated. 370 ac. marsh created increases habitat diversity *NMFS says marsh is a more productive habitat for fisheries than open water +	No 0	High probability for impacts. Cultural resource survey needed. -	370 ac. public boating, fishing, crabbing eliminated. Same ac. possibly improved re birding, hunting. +	No impacts 0	No impacts 0	Very low. No wells and one pipeline within the proposed mitigation site. 0	No impacts 0	No impacts 0

Environmental

SUBCRITERIA	Aquatic / Fisheries	Prime Farmland	Cultural Resources	Recreation	Noise	Aesthetics	HTRW	Environmental Justice	Socioeconomics / Land Use
	Acres habitat created or eliminated	Yes/No; Acreage	Qualitative	Acreage & type of resource impacted; Acreage of resource improved	Residential or commercial within 1,000 feet	Qualitative	Probability of encountering HTRW	Low income / minority populations disproportionately impacted	# Impacted – comm./industrial properties; residential units; public properties. Acres ag or forest converted
Fritchie Brackish Marsh	350 ac. open water eliminated. 350 ac. Marsh created increases habitat diversity *NMFS says marsh is a more productive habitat for fisheries than open water +	No 0	Moderate probability for impacts. Cultural resource survey needed. 0	350 ac. open water, broken marsh eliminated, and improved for wildlife viewing and hunting. +	No impacts 0	No impacts 0	Very low. Two plugged and abandoned oil/gas within the proposed mitigation site. No pipelines present. 0	No impacts 0	No impacts 0
Main Pass DNWR Brackish Marsh	638 ac. open water eliminated. 638 ac. marsh created increases habitat diversity *NMFS says marsh is a more productive habitat for fisheries than open water +	No 0	Low Probability. 0	638 ac. public boating, fishing, crabbing eliminated. Same ac. possibly improved re birding, hunting. +	No impacts 0	No impacts 0	Very low. One plugged and abandoned oil/gas well within the proposed mitigation site. No pipelines present. 0	No impacts 0	No impacts 0

Environmental

SUBCRITERIA	Aquatic / Fisheries	Prime Farmland	Cultural Resources	Recreation	Noise	Aesthetics	HTRW	Environmental Justice	Socioeconomics / Land Use
	Acres habitat created or eliminated	Yes/No; Acreage	Qualitative	Acreage & type of resource impacted; Acreage of resource improved	Residential or commercial within 1,000 feet	Qualitative	Probability of encountering HTRW	Low income / minority populations disproportionately impacted	# Impacted – comm./industrial properties; residential units; public properties. Acres ag or forest converted
Combination Corps constructed (Coleman, Big Branch, Fritchie, or Delta NWR) and Mitigation Bank/ILF	Up to 638 ac. open water eliminated. Up to 638 ac. marsh created increases habitat diversity +	No impacts 0	High probability for impacts. Cultural resource survey needed. 0	Up to 638 ac. boating, fishing, crabbing eliminated. Same ac. possibly improved re birding, hunting. +	No impacts 0	No impacts 0	Very low/No impacts 0	No impacts 0	No impacts 0
Mitigation Bank/ILF	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts 0	No impacts 0

Table B-5: Time to Contract Award Matrix

Project Alternative	Total Duration
NF NOV 05a.1 Swamp	3 years, 2 months
Combination of NF NOV 05a.1 and Mitigation Bank	3 years, 2 months
Swamp Mitigation Bank	2 years
Big Branch	2 years
Fritchie Marsh	2 years
Coleman Marsh	3 years, 2 months
Main Pass Delta National Wildlife Refuge Alt 2	2 years
Brackish Marsh Mitigation Bank/ILF/Corps Constructed Combination	3 years, 2 months

Table B-6: Time to NCC Matrix

Project Alternative	Total Duration
NF NOV 05a.1 Swamp	4 years, 10 months
Combination of NF NOV 05a.1 and Mitigation Bank	4 years, 10 months
Swamp Mitigation Bank	2 years
Big Branch	3 years 7 months
Fritchie Marsh	3 years 7 months
Coleman Marsh	5 years, 1 month
Main Pass Delta National Wildlife Refuge Alt 2	3 years, 11 months
Brackish Marsh Mitigation Bank/ILF/Corps Constructed Combination	3 years 7 months

Table B-7: Other Cost Considerations Matrices

Alternative	Total Project Cost
NF NOV 05a.1 Swamp	~178% > Least Cost
Combination of NF NOV 05a.1 and Mitigation Bank	Between ~178% > Least Cost and Least Cost
Swamp Mitigation Bank	Least Cost
Big Branch	Least Cost
Fritchie Marsh	~3% > Least Cost
Coleman Marsh	~93% > Least Cost
Main Pass Delta National Wildlife Refuge Alt 2	~148% > Least Cost
Mitigation Bank/Corps Constructed (75% Fritchie) Combination	~21% > Least Cost
Mitigation Bank/ILF	~60% > Least Cost

Table B-8: Cost Effectiveness Matrices

Alternative	(AAHUs/$)
NF NOV 05a.1 Swamp	~156% > Least Cost
Combination of NF NOV 05a.1 and Mitigation Bank	Between ~156% > Least Cost and Least Cost
Swamp Mitigation Bank	Least Cost
Big Branch	Least Cost
Fritchie Marsh	~4% > Least Cost
Coleman Marsh	~98% > Least Cost
Main Pass Delta National Wildlife Refuge Alt 2	~154% > Least Cost
Mitigation Bank/Corps Constructed (75% Fritchie) Combination	~29% > Least Cost
Mitigation Bank/ILF	~78% > Least Cost

Table B-9: Three Sea Level Rise (SLR) Scenario Analysis

Mitigation Site	Proposed Habitat	Acres			Variable V1 Value (%) At End of Period of Analysis (marsh habitats; Future With Project (FWP)		
		Low SLR	Intermediate SLR	High SLR	Low SLR	Intermediate SLR	High SLR
Fritchie Marsh	Brackish Marsh	219.74	195.89	120.22	89.3%	79.6%	48.9%
Big Branch	Brackish Marsh	317.17	85.5%	276.11	74.5%	156.47	42.2%
Main Pass 2	Brackish Marsh	631.65	570.83	378.52	98.7%	89.2%	59.1%
Coleman	Brackish Marsh	369.74	308.72	154.67	75.4%	62.9%	31.5%

Table B-10. Reasonably Foreseeable Wetland or Ecosystem Restoration Projects in the Deltaic Plain

Program	Parish	Description	Direct Overlap	Extended Boundary Overlap
CDBG (TE-78): Cut-Off/Pointe aux Chene Levee	Lafourche	This project will fill in the missing gap that is currently in the existing levee system. The 2.5 miles levee will be constructed along Grand Bayou and tie into the existing levee systems on each end. Construction began in August 2017 and is anticipated for completion in January 2020.^@	No	No
CIAP (PO-148): Living Shoreline	St. Bernard, Jefferson, Orleans	The construction of bio-engineered oyster reefs along coastal fringe marsh in St. Bernard Parish. The installation will take place from Eloi Point to the mouth of Bayou La Loutre around Lydia Point and Paulina Point extending around the southern shore of Treasure Bay. Other related Living Shoreline projects are in Plaquemines Parish and Jefferson Parish. Construction began in February 2018 and is anticipated for completion in 2018. ^@	No	No
CWPPRA (BA-125): Northwest Turtle Bay Marsh Creation	Jefferson	This project involves the creation and nourishment of marsh using sediment dredged from Turtle Bay or Little Lake. Construction began in August 2018 and is anticipated for completion in February 2020.^@	No	No
CWPPRA (TE-72): Lost Lake Marsh Creation and Hydrologic Restoration	Terrebonne	The restoration of an important feature of structural framework between Lake Paige and Bayou Decade to prevent the coaslescense of those two water bodies and increase the delivery of fresh water, sediments, and nutrients into the marshes north and west of Lost Lake including the reduction of fetch in open water area via construction of a terrace field. Construction began in September 2016 and is anticipated for completion in January 2019.^	No	No
HSDRRS (BA-156): Plaquemines TFU Mitigation - Braithwaite to Scarsdale - Big Mar	Plaquemines	This envirionmental mitigation project is being led by USACE and is 100% federally funded. It provides for marsh creation in the vicinity of Braithwaite to Scarsdale - Big Mar and is paired with a Plaquemines Parish marsh creation project.^ This project is still in the planning stage, however, a contract award is anticipated for 2021 with an anticipated completion in 2023 (Landry 2019a).	No	No
HSDRRS (BA-158): New Orleans to Venice Mitigation - Plaquemines Non-Federal	Plaquemines	This project will provide BLH wet/dry, swamp, freshwater marsh, and brackish marsh habitat restoration as part of environmental mitigation for impacts incurred as a result of the construction of New Orleans to Vencie Mitigation - Plaquemines Non-Federal levee components. It being led by USACE and is 100% federally funded.^ If the remaining components are selected for construction, construction is anticipated to begin in 2021 with anticipated completion by 2023 (Landry 2019a).	No	No
HSDRRS (BA-159): New Orleans to Venice Mitigation - Federal	Plaquemines	This project will provide BLH wet/dry, intermediate marsh, freshwater marsh, brackish marsh, and saline marsh habitat as part of environmental mitigation for impacts incurred as a result of the construction of New Orleans to Vencie Mitigation - Federal. It being led by USACE and is 100% federally funded.^ If the remaining components are selected for construction, construction is anticipated to begin in 2021 with anticipated completion by 2023 (Landry 2019a).	No	No
HSDRRS: HSDRRS Mitigation LPV Bayou Sauvage Floodside Brackish Marsh	Orleans	This alternative consists of 302 acres of brackish marsh restoration that would be achieved by placing dredged material in open water to elevations conducive for wetland development, followed by planting of marsh vegetation. Features also include the temporary placement of sheet pile along Irish Bayou to contain dredged material and the construction and rehabilitation of rock dikes along the shoreline of Lake Pontchartrain. Construction began in May 2016 and is anticipated for completion in July 2019. (Erwin 2018b, USACE 2012c).	No	No
HSDRRS: HSDRRS Mitigation LPV Turtle Bayou Protected Side Intermediate Marsh	Orleans	This alternative consists of 155 acres of bottomland hardwood (wet) restoration that would be accomplished by placing fill material to elevation conducive to the successful establishment of planted native hardwood species. The 142 acres of intermediate marsh restoration would be achieved by placing dredged material in open water adjacent to the bottomland hardwood site to an elevation conducive for wetland development, followed by planting of wetland vegetation. Construction began in May 2016 and is anticipated for completion in July 2019. (Erwin 2018b;USACE 2012b).	No	No

Program	Parish	Description	Direct Overlap	Extended Boundary Overlap
HSDRRS: HSDRRS Mitigation LPV New Zydeco Ridge Protected Side Bottomland Hardwood Wet and Floodside Brackish Marsh	St. Tammany	The New Zydeco Ridge (NZR) restoration is located on the north shore of Lake Pontchartrain in the north east quadrant of the lake, northwest of U.S. Highway 90, and approximately 5 miles east of Slidell, Louisiana on the Big Branch National Wildlife Refuge. The approved NZR projects in SIER 1 consisted of creating approximately 159 acres of BLH-Wet habitat and 160 acres of intermediate/brackish marsh habitat. Design 1 expands the current design of the NZR Brackish Marsh restoration project by approximately 60 acres, making the total acreage for that project approximately 220 acres; it moves the approved NZR BLH-Wet footprint northward. Design 2 maintains the alignment of the NZR BLH-Wet and Brackish Marsh layouts approved in SIER 1 and adds a 60 acre brackish marsh cell to the north of the BLH-Wet footprint. Construction began in November 2016 and is anticipated for completion in June 2020 (Erwin 2018b, USACE 2016a).	No	No
HSDRRS: HSDRRS Mitigation WBV JLNHPP Park Yankee Pond and Geocrib Floodside Fresh Marsh Restoration	Jefferson	Approximately 115 acres of fresh marsh would be restored by filling Yankee Pond with material dredged from Lake Cataouatche. A rock dike with fish dips would be built on the eastern perimeter to separate the marsh from Bayou Segnette. Additionaly, 50 acres of marsh would be restored by grading an existing dredge material disposal site to achieve target marsh elevations and completing a rock dike with fish dips adjacent to Lake Salvador. This project assumes natural recruitment and no planting would be required at either site to establish marsh vegetation. Supplemental planting would only occur if the initial vegetation success criteria are not achieved (USACE 2012e). Approximately 20 acres of fresh marsh would be restored by filling a canal immediately abutting Yankee Pond in the northern part of Jean Lafitte National Park. The canal would be filled in with dredged material from Lake Cataouatche. This project assumes that natural recruitment would occur and no planting would be required to establish marsh vegetation. Supplemental planting would only occur if the initial vegetation success criteria are not achieved. (USACE 2012f). Construction began in 2017 and is antipicated for completion in 2019 (Behrens 2019b).	No	No
HSDRRS: HSDRRS Mitigation WBV Avondale Protected Side BLH-Dry Restoration		Approximately 920 acres of predominantly invasive and nuisance species would be eradicated and the area planted with native, high quality tree and shrub species. This project would involve enhancing an existing degraded BLH habitat as mitigation for general protected side BLH-Dry impacts incurred through construction of HSDRSS WBV (USACE 2016b). Construction began in 2016 and is anticipated for completion in 2020 (Behrens 2019a).	No	No
HSDRRS: Previously Authorized Mitigation WBV	Jefferson; St. Charles	Mitigation for Pre-Katrina West Bank and Vicinity Hurricane Protection project impacts by land acquisition, preservation, and management of lands along the St. Charles Parish ridge and adjacent to Bayou Segnette State Park. This mitigation is partially completed. The Bayou Segnette mitigation construction was awarded in September 2014 and was completed in 2018. St. Charles land acquisition was completed in December 2017 and is awaiting readjustment of the mitigation plan to move forward into construction (Behrens 2019a).	No	No
LWCRPA (PO-142): Hydrologic Restoration of the Amite River Diversion Canal	Livingston	The purpose of this project was to reestablish hydrologic connectivity between the Maurepas Swamps and natural water bodies, plant vegetation in highly degraded swamp habitat. ^@	No	No
NRDA (BA-76 aka BA-142): Cheniere Ronquille Barrier Island Restoration	Plaquemines	The project goal is to maintain shoreline integrity and create and restore saline marsh on Chenier Ronquille.^@	No	No
RESTORE (BA-197): West Grand Terre Beach Nourishment and Stabilization	Jefferson	The project involvest the construction of beach and dune, restoration of back barrier marsh, and construction of a rock revetment to protect restored marsh. ^@	No	No
SMP 2017: 000.BH.00 Barrier Island Program	Plaquemines; Jefferson; Lafourche; Terrebonne	Barrier islands and headlands will be addressed through CPRA's Barrier Island Program.#	No	No
SMP 2017: 001.DI.02 Lower Breton Diversion (BS-23)	Plaquemines	Sediment diversion of 50,000 cfs into Lower Breton Sound to build and maintain land.#	Yes	Yes
SMP 2017: 001.DI.100 Manchac Landbridge Diversion	St. Charles; St. John the Baptist	A structure in the existing western spillway guide levee to divert 2,000 cfs thereby increasing freshwater exchange with adjacent wetlands.#	No	No

Program	Parish	Description	Direct Overlap	Extended Boundary Overlap
SMP 2017: 001.DI.101 Ama Sediment Diversion	St. Charles	Sediment diversion into Upper Barataria near Ama to provide sediment for emergent marsh creation and freshwater to sustain existing wetlands, 50,000 cfs capacity.#	Yes	Yes
SMP 2017: 001.DI.102 Union Freshwater Diversion	Ascension	Diversion into West Maurepas swamp near Burnside to provide sediment for emergent marsh creation and freshwater and fine sediment to sustain existing wetlands, 25,000 cfs capacity.#	No	No
SMP 2017: 001.DI.104 Mid-Breton Sound Diversion	Plaquemines	Sediment diversion into Mid-Breton Sound in the vicinity of White's Ditch to build and maintain land, 35,000 cfs capacity.#	No	No
SMP 2017: 001.DI.18 Central Wetlands Diversion	St. Bernard	Diversion into Central Wetlands near Violet to provide sediment for emergent marsh creation and freshwater to sustain existing wetlands, 5,000 cfs capacity.#	No	No
SMP 2017: 001.DI.21 East Maurepas Diversion	St. John	Diversion into East Maurepas near Angelina to provide sediment for emergent marsh creation and freshwater to sustain existing wetlands, 2,000 cfs capacity.#	No	No
SMP 2017: 001.HR.100 LaBranche Hydrologic Restoration	St. Charles	Construction of a 750 cfs hybrid pump-siphon structure, intake structure, and an approximately 1 mile long conveyance system to LaBranche wetlands via the Mississippi River to restore the historically fresh to intermediate marshes. Features also include a conveyance channel roadway and railroad crossings.#	No	No
SMP 2017: 001.MC.05 New Orleans East Landbridge Restoration	Orleans; St. Tammany	Marsh creation in the New Orleans East Landbridge to create new wetland habitat and restore degraded marsh.#	No	Yes
SMP 2017: 001.MC.06a Breton Marsh Creation - Component A	St. Bernard	Marsh creation in the Breton Marsh east of Delacroix Island to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 001.MC.07a Lake Borgne Marsh Creation - Component A	St. Bernard	Marsh creation along the south shoreline of Lake Borgne near Proctors Point to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 001.MC.08a Central Wetlands Marsh Creation - Component A	Orleans; St. Bernard	Marsh creation in Central Wetlands near Bayou Bienvenue to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 001.MC.101 Uhlan Bay Marsh Creation	Plaquemines	Marsh creation on the east bank of Plaquemines Parish around Uhlan Bay to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 001.MC.102 Pointe a la Hache Marsh Creation	Plaquemines	Marsh creation on the east bank of Plaquemines Parish near Pointe a la Hache to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 001.MC.104 East Bank Land Bridge Marsh Creation	Plaquemines	Marsh creation in Plaquemines Parish between Grand Lake and Lake Lery to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 001.MC.105 Spanish Lake Marsh Creation	Plaquemines	Marsh creation in Plaquemines Parish along the eastern shore of Spanish Lake to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 001.MC.106 St. Tammany Marsh Creation	St. Tammany	Marsh creation in St. Tammany Parish along the northern shore of Lake Pontchartrain to create new wetland habitat and restore degraded marsh.#	Yes	Yes
SMP 2017: 001.MC.107 Tiger Ridge/Maple Knoll Marsh Creation	Plaquemines	Marsh creation in Plaquemines Parish near Tiger Ridge to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 001.MC.108 Guste Island Marsh Creation	St. Tammany	Marsh creation in St. Tammany Parish along the northwest Lake Pontchartrain shoreline to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 001.MC.13 Golden Triangle Marsh Creation	Orleans; St. Bernard	Marsh creation in Golden Triangle Marsh between the MRGO and GIWW to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 001.RC.01 Bayou LaLoutre Ridge Restoration	St. Bernard	Restoration of historic ridge to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along Bayou LaLoutre.#	No	No
SMP 2017: 001.RC.100 Bayou Terre aux Boeufs Ridge Restoration	St. Bernard	Historic ridge restoration to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along Bayou Terre aux Boeufs.#	No	No
SMP 2017: 001.RC.103 Carlisle Ridge Restoration	Plaquemines	Historic ridge restoration to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation near Carlisle.	No	No

Program	Parish	Description	Direct Overlap	Extended Boundary Overlap
SMP 2017: 001.SP.01 Manchac Landbridge Shoreline Protection	Tangipahoa	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along the west side of Lake Pontchartrain north of Pass Manchac near Stinking Bayou to preserve shoreline integrity and reduce wetland degradation.#	No	No
SMP 2017: 001.SP.101 Unknown Pass to Rigolets Shoreline Protection	Orleans	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along the east side of the New Orleans Landbridge from Unknown Pass to the Rigolets to preserve shoreline integrity and reduce wetland degradation.#	No	No
SMP 2017: 001.SP.104 LaBranche Wetlands Shoreline Protection	St. Charles	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along the southern shore of Lake Pontchartrain near the LaBranche wetlands to preserve shoreline integrity and reduce wetland degradation.#	No	No
SMP 2017: 002.DI.102 Mid-Barataria Diversion	Plaquemines	Sediment diversion into Mid-Barataria near Myrtle Grove to build and maintain land, 75,000 cfs capacity.#	Yes	Yes
SMP 2017: 002.MC.04a Lower Barataria Marsh Creation - Component A	Jefferson	Marsh creation in Jefferson Parish on the east shore of Little Lake and Turtle Bay to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 002.MC.05e Large-Scale Barataria Marsh Creation - Component E	Plaquemines; Jefferson	Marsh creation in the Barataria Basin south of the Pen to the Barataria Landbridge to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 002.RC.02 Spanish Pass Ridge Restoration	Plaquemines	Historic ridge restoration to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation west of Venice along the banks of Spanish Pass.#	No	No
SMP 2017: 002.RC.100 Red Pass Ridge Restoration	Plaquemines	Historic ridge restoration in southwest of Venice to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along the banks of Red Pass.#	No	No
SMP 2017: 002.RC.101 Adams Bay Ridge Restoration	Plaquemines	Historic ridge restoration to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along Adams Bay.#	No	No
SMP 2017:002.RC.102 Bayou Eau Noire Ridge Restoration	Plaquemines	Historic ridge restoration to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along Bayou Eau Noire.#	No	No
SMP 2017: 002.RC.103 Grand Bayou Ridge Restoration	Plaquemines	Historic ridge restoration to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along Grand Bayou. #	Yes	Yes
SMP 2017: 002.SP.100 Lake Hermitage Shoreline Protection	Plaquemines	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 around the southern shore of Lake Hermitage to preserve shoreline integrity and reduce wetland degradation from wave erosion.#	No	No
SMP 2017: 002.SP.102 East Snail Bay Shoreline Protection	Lafourche	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along the northeastern shore of Snail Bay south of Little Lake to preserve shoreline integrity and reduce wetland degradation from wave.#	No	No
SMP 2017: 002.SP.103 West Snail Bay Shoreline Protection	Lafourche	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along the western shoreline of Snail Bay south of Little Lake to preserve shoreline integrity and reduce wetland degradation from wave.#	No	No
SMP 2017: 002.SP.106 Bayou Perot Shoreline Protection	Lafourche	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along the western shore of Bayou Perot to preserve shoreline integrity and reduce wetland degradation from wave erosion.#	No	No
SMP 2017: 03a.DI.01 Bayou Lafourche Diversion	Ascension; Assumption; Lafourche	Diversion of the Mississippi River into Bayou Lafourche to increase freshwater flow down Bayou Lafourche with 1,000 cfs capacity.#	No	No
SMP 2017: 03a.DI.05 Atchafalaya River Diversion	Terrebonne	Sediment diversion off the Atchafalaya River to benefit the Penchant Basin and southwest Terrebonne marshes with 30,000 cfs capacity.#	No	No
SMP 2017: 03a.HR.02 Central Terrebonne Hydrologic Restoration	Terrebonne	Construction of a rock plug in Grand Pass with a 150- foot by 15-foot navigable section to prevent saltwater intrusion from Caillou Lake into Lake Mechant.#	No	No
SMP 2017: 03a.HR.100 Grand Bayou Hydrologic Restoration	Lafourche	Dredging of Margaret's Bayou and Grand Bayou in conjunction with the construction of a fixed crest structure at Grand Bayou and the installation of (5) 48-inch flap-gated culverts on the western bank of Grand Bayou.#	No	No

Program	Parish	Description	Direct Overlap	Extended Boundary Overlap
SMP 2017: 03a.MC.03p Terrebonne Bay Rim Marsh Creation Study	Lafourche; Terrebonne	Planning, engineering, and design of marsh creation features to provide benefits to communities in Terrebonne Parish and the Morganza to the Gulf protection system.#	No	No
SMP 2017: 03a.MC.07 Belle Pass-Golden Meadow Marsh Creation	Lafourche	Marsh creation from Belle Pass to Golden Meadow to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 03a.MC.09b North Terrebonne Bay Marsh Creation - Component B	Terrebonne	Marsh creation south of Montegut between Bayou St. Jean Charles and Bayou Pointe Aux Chenes to create new wetland habitat and restore degraded marsh.	No	No
SMP 2017: 03a.MC.100 South Terrebonne Marsh Creation	Terrebonne	Marsh creation south of Dulac between Bayou Dularge and Houma Navigation Canal to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 03a.MC.101 North Lake Mechant Marsh Creation	Terrebonne	Marsh creation between Lake Decade and Lake Mechant to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 03a.RC.02 Bayou Dularge Ridge Restoration	Terrebonne	Historic ridge restoration to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along Bayou Dularge.#	No	No
SMP 2017: 03a.RC.04 Mauvais Bois Ridge Restoration	Terrebonne	Historic ridge restoration to an elevation of 5 feet NAVD88 at Mauvais Bois to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation.#	No	No
SMP 2017: 03a.RC.05 Bayou Terrebonne Ridge Restoration	Terrebonne	Historic ridge restoration to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along the southern portions of Bayou Terrebonne.#	No	No
SMP 2017: 03a.RC.06 Bayou Pointe Aux Chenes Ridge Restoration	Terrebonne	Historic ridge restoration to an elevation of 5 feet NAVD88 to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation along the southern portions of Bayou Pointe Aux Chenes.#	No	No
SMP 2017: 03a.SP.100 North Lake Boudreaux Shoreline Protection	Terrebonne	Shoreline protection through rock breakwaters designed to an elevation of 3.5 feet NAVD88 along the northern shore of Lake Boudreaux east of Hog Point to preserve shoreline integrity and reduce wetland degradation#	No	No
SMP 2017: 03b.DI.04 Increase Atchafalaya Flow to Terrebonne	Assumption; St. Mary; Terrebonne	Dredging of the Gulf Intracoastal Waterway (GIWW) and construction of a bypass structure at the Bayou Boeuf Lock from the Atchafalaya River to Terrebonne marshes with 20,000 cfs capacity.#	No	No
SMP 2017: 03b.MC.09 Point Au Fer Island Marsh Creation	Terrebonne	Marsh creation on Point Au Fer Island to create new wetland habitat and restore degraded marsh.#	No	No
SMP 2017: 03b.SP.06a Vermilion Bay and West Cote Blanche Bay Shoreline Protection (Critical Areas)	Vermilion; Iberia	Shoreline protection through rock breakwaters of critical areas on the east shoreline of Vermilion Bay to preserve shoreline integrity and reduce wetland degradation from wave erosion.#	No	No

(^Data source is CPRA 2018; @Data source is CPRA 2017a; #Data source is CPRA 2017d)

Table B-11. Additional Authorized Projects in the Deltaic Plain

Program	Parish	Description	Direct Overlap	Extended Boundary Overlap
Louisiana DOTD/FHWA: Future I-49 South, Raceland to the Westbank Expressway (700-92- 0011) and Morgan City to Raceland	St. Charles; Lafourche; Terrbonne	Proposed construction of an elevated extension to US Interstate 49 South along the US 90 corridor from the Louisiana Highway 1 interchange in Raceland, Louisiana to the Westbank Expressway near Ames Boulevard in Marrero, Louisiana. The project also includes the connection of the southern terminus of US Interstate 310 with US Interstate 49. The Record of Decision for the project was signed in January 2008. The Morgan City to Raceland project has been completed, but the Raceland to the Westbank Expressway is not yet complete. (USDOT, 2008; I49 International Coalition, 2018) http://www.interstate49.org/index.php?page=louisiana	No	No
US Department of Justice: St Charles Levee Conservation Easement	St. Charles	St Charles Levee Conservation Easement was authorized and created in 1999 by the U.S. Department of Justice as a conservation area resulting from a federal settlement with Rathborne Land Company to resolve allegations of unpermitted development of wetlands (Scallan, 2010).	No	No

Table B-12. Previously Constructed Wetland or Ecosystem Restoration Projects in the Deltaic Plain

Program	Parish	Year Constructed	Project Description	Direct Overlap	Extended Boundary Overlap
BERM (BA-40): Riverine Sand Mining/Scofield Island Restoration	Plaquemines	2013	The goal of this project was to transport sediments from the Mississippi River to restore dune and marsh habitat on Scofield Island.^	No	No
BERM (BA-110): Shell Island East Berm	Plaquemines	2014	The purpose of this project was to restore the integrity of Shell Island, reduce wave energies within the bay area, and re-establish productive habitat to Bastian Bay and the surrounding area. ^	No	No
DOTD: I-310 Mitigation	St. Charles	1993	Mitigation for environmental impacts associated with the construction of Interstate 310 which was completed in 1993 in St. Charles Parish, Louisiana (USACE 2013).	No	No
CIAP (BA-15-X2): Lake Salvador Shoreline Protection-Phase III	St. Charles	2009	A shoreline protection project, located near Bayou des Allemands along the northwestern Lake Salvador shoreline, tying into the western BA-15 CWPPRA shoreline protection feature and extending approximately 1.5 miles east. *+^	No	No
CIAP (BA-30-EB): East Grand Terre	Plaquemines	2010	The project goal is to restore barrier shoreline and marsh by dredging 3.3 million cubic yards of shore material and rebuilding the island. The project was designed under the CWPPRA program and constructed under the CIAP program. ^	No	No
CIAP (BA-36-EB): Barataria Land Bridge Dedicated Dredging	Jefferson	2010	Located along the southern shoreline of Bayous Perot and Rigolettes, the project created and/or nourished approximately 1,200 acres of marsh in conjunction with CWPPRA project BA-36 (Dedicated Dredging on the Barataria Basin Landbridge). ^	No	No
CIAP (BA-43-EB): Mississippi River Long Distance Sediment Pipeline	Jefferson	2016	The deposition of dredged material from the Mississippi River by long distance pipeline from the Mississippi River to locations within central Barataria Basin for marsh creation and restoration. *+ @^	No	No
CIAP (BA-45-EB): Caminada Headlands	Lafourche	2014	The proposed project will restore and protect beach and dune habitat across the Caminada Headland through the direct placement of sediment from offshore borrow areas. ^	No	No
CIAP (BA-58): Fringe Marsh Repair	Plaquemines	2014	This program involves the reestablishment of critical areas of fragile marsh in lower Plaquemines Parish to help minimize the continued fragmentation of wetland systems throughout the coast. ^@	No	No
CIAP (BA-59): Waterline Booster Pump Station, West Bank	St. James	2010	The project includes the installation of a waterline booster pump station in Welcome, Louisiana along Louisiana Highway 18 on the west bank of the Mississippi River in St. James Parish. *+	No	No
CIAP (BA-61): West Bank Wetland Conservation and Protection	St. James	2010	Acquisition and preservation of approximately 235 acres of existing wetlands along Louisiana Highway 20 in St. James Parish near the communities of South Vacherie and Chackbay to protect the natural habitat from future development. The purchase was completed in 2010. *+	No	No
CIAP (BA-155): Fifi Island Restoration	Jefferson	2015	This shoreline protection projection includes the construction of approximately 10,000 linear feet of rock to protect island habitat.^	No	No
CIAP (BA-161): Mississippi River Water Reintroduction Into Bayou Lafourche - BLWFD	Assumption; Lafourche	2016	The implementation of features and improvements determined to be the most beneficial in order to improve the capacity of Bayou Lafourche to allow for increased flows through the bayou. The project is anticipated to benefit the Terrebonne and Barataria Basins through reductions in the salinities and/or nourishment of wetlands with the introduction and distribution of sediment and nutrients from the river. ^@ #	No	No
CIAP (BA-162-SPER): Shoreline Protection Emergency Restoration	Plaquemines	2013	This project consists of a series of submerged wave breaks surrounding shoreline segments in Lower Plaquemines Parish to protect the oil damaged shores along the existing island remnants from further wave damage while also collecting sediment in order to naturally rebuild the degraded infrastructure of the islands.^	No	No
CIAP (PO-36EB): Orleans Land Bridge Shoreline Protection and Marsh Creation	Orleans	2013	This project provides shoreline protection on the northwest rim of Lake Borgne west of Alligator Point.^	No	No
CIAP (PO-39): Bald Cypress/Tupelo Coastal Forest	Livingston	2011	Acquisition and preservation of approximately 2,600 contiguous acres of coastal wetland forest, specifically bald cypress-tupelo swamp within the Maurepas Swamp in Livingston Parish, Louisiana (USACE 2013).	No	No
CIAP (PO-43): East Labranche Shoreline Protection	St. Charles	2015	A shoreline protection project which includes the construction of a rock dike along the southern shoreline of Lake Pontchartrain tying into the existing PO-03b LaBranche Wetland shoreline protection project, and continuing east along the shoreline. The project is designed to stop wave-induced shoreline erosion and protect the wetland habitat behind the structure (USACE 2013).	No	No

Program	Parish	Year Constructed	Project Description	Direct Overlap	Extended Boundary Overlap
CIAP (PO-48): Green Property Preservation Project	St. Tammany	2011	Property acquisition and preservation of approximately 27 acres of cypress swamp and bottomland hardwood forests within the Bayou Lacombe watershed in St. Tammany Parish, Louisiana. Purchase completed August 2011 (USACE 2013).	No	No
CIAP (PO-49): French Property Preservation Project	St. Tammany	2009	Property acquisition of approximately 40 acres of pine trees and mixed hardwoods to aid in the extension of the wildlife corridor between critical habitats along Bayou Liberty in St. Tammany Parish, Louisiana. The property will also be utilized for educating the public on wetland value (USACE 2013).	No	No
CIAP (PO-51): Mandeville Aquatic Ecosystem Restoration Project	St. Tammany	2010	Upgrade of the existing wastewater treatment plant including the addition of a wetland assimilation system for disbursement of treated sewerage effluent into an adjacent wetland area on to the western border of the City of Mandeville, Louisiana. Added benefits of the assimilation will be the increase of wetland vegetation to an area impacted during Hurricanes Katrina and Rita (USACE 2013).	No	No
CIAP (PO-73-2): Central Wetlands Demonstration	Orleans	2016	This demonstration project investigates the benefical use of Ferrate as an alternative to chlorine to treat effluent at the East Bank Sewer Treatment Plant.^	No	No
CIAP (PO-73-1): Central Wetlands-Riverbend	St. Bernard	2015	This project involves the discharge of effluent from the oxidation plant to be discharged into the Central Wetlands. This would allow vegetation to prosper once again in the area.^	No	No
CIAP (PO-73-3): Central Wetlands Demonstration Expansion	Orleans	2016	The project would restore up to 17.2 acres of critical wetlands within the Central Wetlands area. ^	No	No
CIAP (PO-148): Living Shoreline	St. Bernard, Jefferson, Orleans	2017	The primary project objective involves the construction of bioengineered oyster reefs along coastal fringe marsh in St. Bernard Parish. The installation will take place from Eloi Point to the mouth of Bayou La Loutre around Lydia Point and Paulina Point extending around the southern shore of Treasure Bay. Other related Living Shoreline projects are in Plaquemines Parish and Jefferson Parish.^	No	No
CIAP (TE-43-EB): GIWW Bank Restoration of Critical Areas in Terrebonne	Terrebonne	2011	The project restored critical lengths of deterioated channel banks with shoreline stabilization materials. ^	No	No
CIAP (TE-125): Bush Canal and Bayou Terrebonne Bank Stabilization	Terrebonne	2007	This project reconstructed the south bank of Bush Canal using material dredged from the canal. The restored bank-line was then covered with goetextile fabric and armored with stone rip-rap. The rebuilt bank-line will help to diminish storm surge as well as reduce saltwater intrusion. This project was funded by the CIAP of 2001 (CPRA 2014).	No	No
CWPPRA (AT-02): Atchfalafaya Sediment Delivery	St. Mary	1998	The enhancement of natural delta growth by re-opening Natal Channel and Castille Pass. Material dredged as a result of construction was strategically placed at elevations mimicking natural delta lobes.^	No	No
CWPPRA (AT-03): Big Island Mining	St. Mary	1998	Creation of a western delta lobe behind Big Island to enhance the accretion of land beyond the west bank of the Atchafalaya River.^	No	No
CWPPRA (BA-02): GIWW to Clovelly Hydrologic Restoration	Lafourche	2000	Impede increasing salinity within the project area by the use of hydrologic restoration features such as plugs and weirs to hinder salt water intrusion and decrease marsh loss. Shoreline protection features along the Bay L'Ours were also constructed to lessen wave induced erosion and reduce marsh loss. The project is located east of the communities of Larose and Cutoff in Lafourche Parish, Louisiana and adjacent to Little Lake. *^	No	No
CWPPRA (BA03C): Naomi Outfall Management	Jefferson; Plaquemines	2002	The management of freshwater, sediment, and nutrients diverted from the Mississippi River via the Naomi Siphon (BA-03) into the project area located between the communities of Naomi/La Reusitte and Lafitte in Jefferson Parish, Louisiana including The Pen. The project goal is to decrease salinities and reduce marsh loss.*^	No	No
CWPPRA (BA-15): Lake Salvador Shoreline Protection Demonstration	St. Charles	1998	The maintainence of shoreline integrity along the northern Lake Salvador shoreline east of Baie du Cabanage and help re-establish the natural hydrology of interior marsh. Phase I of the project was constructed to demonstrate the effectiveness of four separate types of segmented breakwaters in a poor soil environment. Phase II of the project included the installation of continuous rock structure along the western section of the lake.*^	No	No
CWPPRA (BA-19): Barataria Bay Waterway Wetland Restoration	Jefferson	1996	The project beneficially used dredge material to enlarge Queen Bess Island.^	No	No
CWPPRA (BA-20): Jonathan Davis Wetland Restoration	Jefferson	2003; 2012	The goal of this project is to restore the natural hydrologic conditions of the area and reduce shoreline erosion. The goal was partly accomplished through constructing a series of water control structures. Additional features were constructed as part of unit 4 consisting of rock rip rap revetment, concrete sheetpile wall, plugs, and marsh creation.*^	No	No

Program	Parish	Year Constructed	Project Description	Direct Overlap	Extended Boundary Overlap
CWPPRA (BA-23): Barataria Bay Waterway (BBWW) West Side Shoreline Protection	Jefferson	2000	Construction of approximately 1.75 miles of rock dike along the west bank of BBWW near Dupre Cut to protect the adjacent marsh from unnatural water exchange and subsequent erosion. ^	No	No
CWPPRA (BA-26): Barataria Bay Waterway (BBWW) East Side Shoreline Protection	Jefferson	2001	Construction of approximately 3.3 miles of levee and rock armor along the eastern bank of BBWW near Dupre Cut to protect the adjacent marsh from excessive tidal action and saltwater intrusion.^	No	No
CWPPRA (BA-27): Barataria Basin Landbridge Shoreline Protection, Phase 1 & 2	Jefferson; Lafourche	2009	Construction of approximately 13.5 miles of shoreline protection along the eastern bank of Bayou Rigolettes to inhibit the erosion on the southwestern shoreline of Bayou Perot and the southeastern shoreline of Bayou Rigolettes. ^	No	No
CWPPRA (BA-27C): Barataria Basin Landbridge Shoreline Protection, Phase 3 CU 7 and 8	Jefferson; Lafourche	1999, 2008, 2017	Construction of shoreline protection along the southern end of Bayous Perot and Rigolettes confluence with Little Lake and Harvey Cutoff Canal. The project tested sections of different shoreline protection types such as concrete panel wall, rock, and light rock. Portions were constructed in 1999, 2008, and 2017. ^@	No	No
CWPPRA (BA-27D): Barataria Basin Landbridge Shoreline Protection, Phase 4	Jefferson	2006	This project consists of a foreshore rock dike with incorporated fish passages and openings at historic natural channels to inhibit shoreline erosion and deterioration of the Barataria landbridge. ^	No	No
CWPPRA (BA-28): Vegetative Plantings of a Dredged Material Disposal Site on Grand Terre Island	Jefferson	2001	This project involved the installation of vegetative plantings on previously constructed marsh and dune platform on Grand Terre Island. ^	No	No
CWPPRA (BA-34-2): Hydrologic Restoration and Vegetative Planting in the Des Allemands Swamp	St. James	2018	The project goal is to increase the health of the swamp ecosystem by increasing water flow via gaps cut in the spoil bank, breaching internal impediments, and reestablishing natural channels. Native vegetation will also be planted at the site.^	No	No
CWPPRA (BA-35): Pass Chaland to Grand Bayou Pass	Plaquemines	2009	This project involves the creation of a dune and marsh platform on the north side of the Gulf of Mexico adjacdent to Bay Joe Wise.^	No	No
CWPPRA (BA-36): Dedicated Dredging on the Barataria Basin Landbridge	Jefferson	2010	The construction of approximately 1,211 acres of intertidal marsh utilizing dredge material in two contained marsh creation areas. In addition, material was placed in adjoining fill areas to nourish approximately 1,578 acres of marsh in conjunction with CIAP BA-36(EB). ^	No	No
CWPPRA (BA-37): Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake	Lafourche	2007	This project protects the Little Lake shoreline, creates intertidal wetlands, and nourishes fragmented, subsiding marsh. This project is designed to protect area wetlands, which currently experience high rates of shoreline erosion. ^	No	No
CWPPRA (BA-38): Pelican Island and Pass La Mer to Chaland Pass Restoration	Plaquemines	2012	The objective of this project is to create barrier island habitat, enhance storm-related surge and wave protection, prevent overtopping during storms, and increase the volume of sand within the active barreir system. ^	No	No
CWPPRA (BA-39): Bayou Dupont Sediment Delivery System	Jefferson; Plaquemines	2010	Dredged material from the Mississippi River near La Reussite, Louisiana was pumped into confined open water areas south of Cheniere Traverse Bayou and adjacent to the West Plaquemines non-federal levee using a pipeline conveyance system to create and restore marsh. Additional grant funded received by the State of Louisiana from The American Recovery and Reinvestment Act of 2009 (ARRA) was added to this project to create approximately 100 additional acres of marsh. *^	No	No
CWPPRA (BA-41): South Shore of the Pen Shoreline Protection and Marsh Creation	Jefferson	2012	This project involves the construction of concrete pile and panel wall and 2 miles of rock revetment along the south shore of The Pen and Bayou Dupont. Dedicated dredging was used to create and nourish marsh, within the triangular area bounded by the south shore of The Pen, the Barataria Bay Waterway (Dupre Cut) and the Creole Gas Pipeline Canal. ^	No	No
CWPPRA (BA-42): Lake Hermitage Marsh Creation	Plaquemines	2015	The creation of wetlands and the reduction of tidal exchange in marshes surrounding Lake Hermitage using material dredged from the Mississippi River. ^	No	No
CWPPRA (BA-48): Bayou Dupont Marsh and Ridge Creation	Jefferson	2016	Long distance pumping of Mississippi River sediment to create marsh, to nourish marshand create a maritime ridge.^@	No	No
CWPPRA (BA-68): Grand Laird Marsh and Ridge Restoration	Plaquemines	2015	This project will create and nourish marsh and build about 20,000 ft of ridge.^	No	No
CWPPRA (BA-164): Bayou Dupont Sediment Delivery - Marsh Creation #3 and Terracing	Plaquemines	2018	This project involves dedicated dredging form the Mississippi River to create and nourish marsh in the vicinity of Bayou Dupont.^	No	No

Program	Parish	Year Constructed	Project Description	Direct Overlap	Extended Boundary Overlap
CWPPRA (BS-03A): Caernarvon Diversion Outfall Management	Plaquemines	2002	The enhancement of marsh to increase the utilization of freshwater, nutrients, and sedimentes provided by the Mississippi Rive through the Caernarvon Freshwater Diversion Structure.^	No	No
CWPPRA (BS-11): Delta Management at Fort St. Phillip	Plaquemines	2006	Enhancement of the delta building process occuring due to the crevasse at Fort St. Phillip.^	No	No
CWPPRA (BS-16): South Lake Lery Shoreline and Marsh Restoration	Plaquemines	2017	The project involves dredging sediment to create approximately 400 acres of marsh and restore 32,000 feet of southern Lake Lery shoreline. ^	No	No
CWPPRA (LA-05): Floating Marsh Creation Demonstration	Terrebonne	2006	A demonstration project developed and tested the creation of floating marsh made of bouyant vegetated mats or artificial islands.^	No	No
CWPPRA (LA-09): Sediment Containment System for Marsh Creation Demonstration	St. Charles	2013	The demonstration project utilizes an unconventional sediment containment system for marsh creation.^	No	No
CWPPRA (MR-03): West Bay Sediment Diversion	Plaquemines	2003	This project consists of a conveyance channel for large-scaled uncontrolled diversion of freshwater and sediments from the Mississippi River.^	No	No
CWPPRA (MR-06): Channel Armor Gap Crevasse	Plaquemines	1997	The project consists of deepening the invert of the existing 150 foot wide gap in the Mississippi River Channel bank armor. The existing invert was lowered to -4.0 feet NGVD. In addition, an existing earthern channel leading from the armored gap to the open water area beyond the bank were enlarged. Excavated material from the outfall channel was cast adjacent to the channel in a manner conducive to marsh nourishment.^	No	No
CWPPRA (MR-09): Delta Wide Crevasses	Plaquemines	1999	The objective of this project is to promote the formation of emergent freshwater and intermediate marsh in shallow, open water areas of the Pass-a-Loutre Wildlife Management Area and the Delta National Wildlife Refuge by either cleaning existing splays of creating new ones.^	No	No
CWPPRA (MR-10): Dustpan Maintenance Dredging Operations for Marsh Creation in the Mississippi River Delta Demonstration	Plaquemines	2002	This project demonstrated the beneficial use of dredged material from routine maintenance of the Mississippi River Navigation Channel by using a dustpan hydraulic dredge to create and restore adjacent marsh. Approximately 40 acres of deteriorated marsh that had converted to shallow open water were restored with approximately 222,000 cubic yards of dredging material. ^	No	No
CWPPRA (PO-06): Fritchie Marsh Restoration	St. Tammany	2001	Remediation of the causes of wetland loss in the area and to improve habitat for wildlife and fisheries by increasing the flow of freshwater into the marsh and managing the outfall.^	No	No
CWPPRA (PO-16): Bayou Sauvage National Wildlife Refuge Hydrologic Restoration, Phase 1	Orleans	1996	Removal of excess water during the spring and summer from the isolated units 3 and 4 of the of the Bayou Sauvage Wildlife Refuge created by the Lake Pontchartrain Hurricane Protection levee. ^	No	No
CWPPRA (PO-17): Bayou Labranche Wetland Creation	Orleans	1994	The project involves dredging sediments from the Lake Pontchartrain to create vegetated wetlands in an area roughly bounded by I-10, Lake Pontchartrain, Bayou Lafourche.^	No	No
CWPPRA (PO-18): Bayou Sauvage National Wildlife Refuge Hydrologic Restoration, Phase 2	St. Charles	1997	Maintenance of water levels at 05. feet above or below marsh elevation to promote vegetation growth in the project area.^	No	No
CWPPRA (PO-19): Mississippi River Gulf Outlet Disposal Area Marsh Protection	St. Bernard	1999	Preservation of vegetated wetlands by repairing the lateral and rear dikes of the Mississippi River Gulf Outlet disposal area.^	No	No
CWPPRA (PO-22): Bayou Chevee Shoreline Protection	Orleans	2001	The project consists of constructing an earthen, erodible dike to contain dredged material from Lake Pontchartrain and create about 150 acres of marsh.^	No	No
CWPPRA (PO-24): Hopedale Hydrologic Restoration	St. Bernard	2005	The replacement of collapsed culverts installed in the 1950s near Yscloskey to abate site-specific wetland loss.^	No	No
CWPPRA (PO-27): Chandeleur Islands Marsh Restoration	St. Bernard	2001	Vegetation plantings to assist and accelerate the recovery of barrier island areas overwashed by Hurricane Georges in 1998.^	No	No
CWPPRA (PO-30): Lake Borgne Shoreline Protection	St. Bernard	2008	Maintenance of the integrity of the narrow strip of marsh that separates Lake Borgne from the Mississippi River Gulf Outlet through the construction of a continuous nearshore rock breakwater.^	No	No
CWPPRA (PO-33): Goose Point/Point Platte Marsh Creation	St. Tammany	2009	The creation of marsh and nourishment of degraded marsh along the northern shoreline of Lake Pontchartrain.^	No	No
CWPPRA (PO-104): Bayou Bonfouca Marsh Creation	St. Tammany	2018	Creation of emergent brackish marsh to stabilize the landform separating Lake Borgne from the MRGO.^	No	No

Program	Parish	Year Constructed	Project Description	Direct Overlap	Extended Boundary Overlap
CWPPRA (TE-17): Falgout Canal Planting Demonstration	Terrebonne	1996	Vegetation planting and wave dampening devices placed along the Falgout Canal.^	No	No
CWPPRA (TE-18): Timbalier Island Planting Demonstration	Terrebonne	1996	The installation of sand fences and vegetation plantings in several areas of Timbalier Island to trap sand and buffer wind and wave energy.^	No	No
CWPPRA (TE-20): Isles Dernieres Restoration East Island	Terrebonne	1999	Restoration of coastal dunes and wetlands of the Eastern Isles Dernieres barrier island chain. Hydraulically filled area on the island to create an elevated marsh platform. Sand fences and vegeation were also installed to stablize the sand and minimize wind-driven transport.^	No	No
CWPPRA (TE-22): Point au Fer Canal Plugs	Terrebonne	1997	The reduction of saltwater intrusion into Point au Fer marshes without reducing freshwater back flooding from the Atchafalaya River. ^	No	No
CWPPRA (TE-23): West Belle Pass Headland Restoration	Lafourche	1998	The project reduces the encroachment of Timbalier Bay into the marshes on the west side of Bayou Lafourche with the use of dedicated dredged materials to create marsh on the west side of Belle Pass. A water control structure was placed in the Evans Canal and plugs on the other canals.^	No	No
CWPPRA (TE-24): Isles Dernieres Restoration Trinity Island	Terrebonne	1999	The restoration of Trinity Island wetlands of the Isles Dernieres chain, enhance the physical integrity of the island, and protect the lower Terrebonne estuary.^	No	No
CWPPRA (TE-25): East Timbalier Island Sediment Restoration, Phase 1	Lafourche	2001	The placement of sediment in three embayments along the landward shoreline of East Timbalier Island. The project also included aerial seeding of the dune platform, installation of sand fencing, and dune vegetation plantings.^	No	No
CWPPRA (TE-26): Lake Chapeau Sediment Input and Hydrologic Restoration, Point Au Fer Island	Terrebonne	1999	The restoration of marshes west of Lake Chapeau, re-establishment of the hydrologic separation of the Locust Bayou and Alligator Bayou watersheds, and re-establishment of the natural drainage patterns within the Lake Chapeau area.^	No	No
CWPPRA (TE-27): Whiskey Island Restoration	Terrebonne	2000	The project created and restored beaches and back island marshes on Whiskey Island.^	No	No
CWPPRA (TE-28): Brady Canal Hydrologic Restoration	Terrebonne	2000	The maintenance of fragile, highly-fragmented transitional marshes between the fresh and estuarine zones by enhancing freshwater, sediment, and nutrient delivery to the area. ^	No	No
CWPPRA (TE-29): Raccoon Island Breakwaters Demonstration	Terrebonne	1997	The project protects the replenished beaches and wetlands of Raccoon Island and protect back barrier and mainland marshes with segmented breakwaters. ^	No	No
CWPPRA (TE-30): East Timbalier Island Sediment Restoration, Phase 2	Lafourche	2000	The project places dredged material along the landward shoreline of East Timbalier Island. Additional rock has been placed on the existing breakwater in front of the island, which will help protect the created area from erosion.^	No	No
CWPPRA (TE-34): Penchant Basin Natural Resources Plan, Increment 1	Terrebonne	2011	The diversion of freshwater flow from northwestern to southeastern sub project area coupled with protection measures to reduce inundation of fragile marsh areas in overall Penchant Basin in Terrebonne Parish.^	No	No
CWPPRA (TE-36): Thin Mat Floating Marsh Enhancement Demonstration	Terrebonne	2000	The objective of this project was to induce the development of thick-mat, continuously floating marsh from a thin-mat flotant using various combinations of treatments including fertilization, herbivory reduction, and transplanting healthy, thick-mat marsh plugs into the thin-mat flotant.^	No	No
CWPPRA (TE-37): New Cut Dune and Marsh Restoration	Terrebonne	2008	The closure of the breach between East and Trinity Islands that was originally created by Hurricane Carmen in 1974 and subsequentlly enlarged by Hurricanes Juan (1985) and Andrew (1992).^	No	No
CWPPRA (TE-39): South Lake Decade Freshwater Introduction	Terrebonne	2011	This project involves the construction of a water control structure in the southern bank of Lake DeCade. The structure increases the amount of Atchafalaya River water and sediment introduced into the marshes south of the lake. In addition, shoreline protection was implemented adjacent to the proposed structure, and a weir in Lapeyrouse Bayou was removed.^	No	No
CWPPRA (TE-40): Timbalier Island Dune and Marsh Creation	Lafourche	2004	The objective of this project was to restore the eastern end of the Timbalier Island by the direct creation of beach, dunes, and marsh. ^	No	No
CWPPRA (TE-41): Mandalay Bank Protection Demonstration	Terrebonne	2003	The development of new techniques for protecting and restoring organic soils, which can be easily eroded. Intact bankds and breakthroughs were treated to determine the cost-effectiveness of demonstrated approaches. The project allows the evaluation of several low-cost solutions for restoring habitat in blowout areas and preventing bank erosion. ^	No	No
CWPPRA (TE-43): GIWW Bank Restoration of Critical Areas in Terrebonne	Terrebonne	2014	The project objective was to restore critical lengths of deteriorated channel banks and stablize/armor selected critical lengths of deteriorated channel banks with shoreline stabilization materials. ^	No	No
CWPPRA (TE-44): North Lake Mechant Landbridge Restoration	Terrebonne	2009	The maintenance and restoration of the landbridge between Lake Mechant north shoreline and the Small Bayou La Pointe Ridge, which provides a hydrologic barrier between brackish and low-salinity habitats.^	No	No

Program	Parish	Year Constructed	Project Description	Direct Overlap	Extended Boundary Overlap
CWPPRA (TE-45): Terrebonne Bay Shoreline Protection Demonstration	Terrebonne	2007	The project was intended to evaluate several different shoreline protection methods, including concrete mats, artificial oyster reefs, and A-Jacks.^	No	No
CWPPRA (TE-46): West Lake Boudreaux Shoreline Protection and Marsh Creation	Terrebonne	2008	The creation and nourishment of marsh along the western shoreline of Lake Boudreaux to protect the shoreline from erosion due to direct exposure to lake wave energy and to restore interior marsh lost to subsidence and saltwater intrusion. ^	No	No
CWPPRA (TE-48): Raccoon Island Shoreline Protection and Marsh Creation	Terrebonne	2007, 2013	The protection of the existing southern shoreline of the Raccoon Island by constructing rock breakwaters and creating marsh on the landward side of the island using dredged material. ^	No	No
CWPPRA (TE-50): Whiskey Island Back Barrier Marsh Creation	Terrebonne	2010	The recreation of a back barrier marsh platform on which the barrier island can migrate to increase the longevity of the previously restored and natural portions of the island.^	No	No
CWPPRA (TE-52): West Belle Pass Barrier Headland Restoration	Lafourche	2012	The re-establishment of the West Belle headland by rebuilding a large portion of the beach, dune, and back barrier marsh that once existed.^	No	No
CWPPRA (TE-53): Enhancement of Barrier Island Vegetation Demonstration	Terrebonne	2011	The project focused specifically on enhancing the establishment and growth of transplants of both dune and marsh vegetation and black mangrove. ^	No	No
CWPPRA (TV-04): Cote Blanche Hydrologic Restoration	St. Mary	1998	The reduction of future shoreline loss from wave erosion, reduction of excess tidal fluctuations and rapid tidal exchange to prevent scouring of interior marsh, develop a hydrologic regime conducive to sediment and nutrient deposition, and to re-establish vegetation in eroded areas. ^	No	No
CWPPRA (TV-15): Sediment Trapping at "The Jaws"	St. Mary	2005	The construction of wetland terraces to reduce wave fetch and promote sedimentation for the creation of emergent vegetated wetlands. Distributary channels were dredged to deliver water and sediment to the project area. ^	No	No
FEDERAL (TE-82): Lost Lake Vegetation	Terrebonne	2011	This coastal vegetative planting project is for erosion control and habitat restoration in the Lost Lake area of southwestern Terrebonne Parish ^	No	No
FEMA (TE-133): Isle Dernieres (Whiskey Island)	Terrebonne	2000	This project involved the installation of sand fencing and the planting of vegetation to repair areas of Whiskey Island damaged by tropical storms and hurricanes during the fall of 1998. ^	No	No
HSDRRS (PO-146): LPV Mitigation, Manchac WMA Marsh Creation	St. John the Baptist	2012	The creation of marsh and reduction of erosion by containment dikes with rock and fill areas with dredge material within the Manchac WMA. ^	No	No
HSDRRS: HSDRRS Mitigation LPV Milton Island Floodside Intermediate Marsh	St. Tammany	2018	This alternative consists of 115 acres of intermediate marsh restoration that would be achieved by placing dredged material in open water adjacent to the bottomland hardwood site to an elevation conducive for wetland development, followed by plating of wetland vegetation. Temporary containment features would be constructed to keep material in place. A shoreline restoration feature is proposed to repair a breach in the lake rim. Construction began in August 2015 and was completed in December 2018 (Erwin 2018b, USACE 2012d).	No	No
HSDRRS (PO-145): LPV Task Force Guardian Mitigation-Bayou Sauvage	St. John the Baptist	2018	This project is mitigating approximately 150 acres due to emergency levee work that utilized 2 borrow pits of about 57 acres. It provides for the elimination of non-native trees with spraying and mechanical clearing, and then the replanting of up to 89,000 trees and shrubs of native species. ^ The construction contract was awarded in 2012 and a Notitication of Contract Completion was received in 2018 (Landry 2019b).	No	No
HSDRRS: HSDRRS Mitigation WBV General Protected Side BLH Wet	Lafourche	2015	Mitigation for West Bank and Vicinity Hurricane Protection Storm Damage Risk Reduction System project impacts to protected side wet bottomland hardwoods (7.27 AAHUs impacted) occurred with the purchase of 11.1 acres from Enterprise Wetlands mitigation bank in February 2015 (USACE 2017b).	No	No
HSDRRS: HSDRRS Mitigation WBV JLNHPP Park/404c Millaudon and Horseshoe Canal Floodside Swamp Enhancement	Jefferson	2017	Mitigation for WBV HSDRRS project impacts to Jean Lafitte National Historical Park and Preserve (JLNHPP)/Bayou aux Carpes 404c area swamp (7.19 AAHUs impacted) to occur within the JLNHPP along the north side of the Millaudon and Horseshoe Canals near the WBV levee. Existing spoil berms will be gapped to improve exchange of surface water between swamp habitats in the area (USACE 2015). The project would involve restoring hydrologic connection and natural sheet flow across existing impounded swamp habitat to compensate for Park/404c swamp impacts. The project would produce approximately 8.4 AAHUs of swamp benefits on JLNHPP. (Behrens 2019a, USACE 2017b).	No	No
HSDRRS: HSDRRS Mitigation WBV JLNHPP Park/404c Hwy 45 Floodside BLH-Wet Restoration	Jefferson	2017	Mitigation for WBV HSDRRS project impacts to JLNHPP/Bayou aux Carpes 404c area to include approximately 6 acres of BLH-Wet restoration by filling a portion of a borrow pit in the northern part of Jean Lafitte National Park. The pit would be filled with clay and sand material trucked in from an offsite source, and native BLH-Wet species would be planted (Behrens 2019a; USACE2012g).	No	No

Program	Parish	Year Constructed	Project Description	Direct Overlap	Extended Boundary Overlap
LWCPRA (BA-187): Grand Isle Bay Side Breakwaters	Jefferson	1995	The purpose of this project was to reduce erosion on the bay side of Grand Isle. Fifteen 300-foot breakwaters were constructed on the back-bay side of Grand Isle. This project included construction of segmented breakwaters on bay side of Grand Isle.^	No	No
LWCPRA (BA-200): North Grand Isle Breakwaters	Jefferson	1995	Approximately 1,500 linear feet of breakwater constructed on the south side of the Northern Grand Isle. ^&	No	No
LWCPRA (PO-01): Violet Siphon Diversion	St. Bernard	1992	Enlargen the size of the diversion so that more sediment and freshwater are available to offset marsh subsudence and saltwater intrusion.^	No	No
LWCRPA (BA-03): Naomi Siphon Diversion	Jefferson; Plaquemines	1992	The Naomi Siphon diversion is located on the west bank of the Mississippi River near the communities of Naomi and LaReussite, Louisiana. The maximum flow capacity of the diversion is 2,100 cfs and is designed to divert freshwater, nutrients, and sediment form the Mississippi River into the adjacent wetlands near Naomi, Louisiana. *^	No	No
LWCRPA (BA-04): West Pointe a la Hache Siphon Diversion	Plaquemines	1992	The construction of siphon to divert water from the Mississippi River into the adjacent wetlands on the west side of the river near Pointe a la Hache, Louisiana at a maximum discharge of 2,100 cfs.^	Yes	Yes
LWCRPA (BA-05B): Queen Bess Island	Jefferson	1993	The purpose of this project is to restore Queen Bess Island as a brown pelican rookery. Dredged material was added to the island to increase its size in 1991, and a rock dike was installed around the perimeter of the original island in 1992 to armor the shoreline. The area has become vegetated and the number of pelican nests on the island increased after the project.^	No	No
LWCRPA (BA-05C): Baie De Chactas	St. Charles	1990	Construction of a rock shoreline protection features between the northwest shoreline of Lake Salvador and Baie du Cabanage in order to reduce erosion, stabilize the shoreline, and inhibit shoreline breaching. *^	No	No
LWCRPA (BA-15-X1): Lake Salvador Shoreline Protection Extension	St. Charles	2005	The shoreline protection project included the construction of a rock dike along the northeastern shoreline of Lake Salvador tying into the BA-15 Phase II CWPPRA project and extending approximately 2 miles northeast. The project is designed to maintain the shoreline integrity and reduce interior marsh loss. *^	No	No
LWCRPA (BA-16): Bayou Segnette	Jefferson	1994; 1998/99	A shoreline protection feature along a narrow strip of spoil bank and marsh which separates the Bayou Segnette Waterway from Lake Salvador and a barrier across an abandoned canal that connects the two water bodies was constructed in 1994 to reduce wave induced erosion of marsh habitats within the JLNHPP. Maintenance of the structure occurred in 1998-1999. *^	No	No
LWCRPA (BA-25): Bayou Lafouche Freshwater Introduction	Lafourche	2011	The Mississippi River diversion into Bayou Lafourche will restore coastal marshes and provide drinking water to over 300,000 residents. This project funded the dredging of the first 6.2 miles of the bayou to accommodate a proposed increased flow of 1,000 cfs. ^	No	No
LWCRPA (BA-168): Grand Isle-Fifi Island Breakwaters	Jefferson	2015	The project will construct breakwaters along the southwestern portion of Fifi Island to reduce erosion on Fifi Island and the bay side of Grand Isle in order to protect commerical and residential infrastructure, wetlands, and fisheries. The project includes renourishment of 1,450 feet of existing breakwaters of an elevation of 8 feet and construction of 1,450 feet of new breakwaters to an elevation of 8 feet. ^	No	No
LWCRPA (BS-06): Lake Lery Hydrologic Restoration	St. Bernard	1997	The construction of a pumping station located along the south-central edge of the St. Bernard Parish Ridge. This will discharge collected rainfall into the marsh north of Lake Lery and help prevent saltwater intrusion. ^	No	No
LWCRPA (LA-01A): Dedicated Dredging Program – Lake Salvador	St. Charles	1999	The deposition of dredge material into two sites in open water areas of Baie du Cabanage within the Salvador Wildlife Management Area where narrow marsh strips exists between Lake Salvador and the bay. The project goal is the restoration of marsh habitat and the reduction of shoreline breaching into the adjacent Lake Salvador as part of the coastwide State Dedicated Dredging Program. *^	No	No
LWCRPA (LA-01B): Dedicated Dredging Program – Bayou Dupont	Jefferson	2000	The deposition of dredge material into three sites adjacent to Bayou Dupont and The Pen to nourish and/or rebuild threatened coastal marshes as part of the coastwide State Dedicated Dredging Program. ^	No	No
LWCRPA (LA-01C): Dedicated Dredging Program – Pass a Loutre	Plaquemines	2000	The project created approximately 26 acres of sustainable freshwater marsh in the vicinity of Pass a Loutre, Louisiana. This project is part of the coastwide state Dedicated Dredging Program. The goal of this program is to use a small, mobile hydraulic dredge along inland waterways in Louisiana's coastal zone to deposit dredged material, and thereby nourish and/or rebuild threatened coastal marshes adjacent to the waterways.^	No	No
LWCRPA (LA-01D): Terrebonne School Board Site - Dedicated Dredging	Terrebonne	2006	The creation of approximately 40 acres of marsh just north of Lake DeCade along the western back of Minors Canal as part of the Dedicated Dreding Program.^	No	No
LWCRPA (LA-01E): Grand Bayou Blue Site - Dedicated Dredging	Lafourche	2007	The creation of approximately 40 acres of marsh near Catfish Lake as part of the Dedicated Dreding Program.^	No	No
LWCRPA (LA-01F): Dedicated Dredging - Point au Fer	Terrebonne	2007	The creation of approximately 67 acres of marsh on Point au Fer Island as part of the Dedicated Dreding Program.^	No	No

Program	Parish	Year Constructed	Project Description	Direct Overlap	Extended Boundary Overlap
LWCRPA (MR-01B): Small Sediment Diversions	Plaquemines	1993	The project involved the excavation of 13 crevasses through the levees of the Mississippi River distributary channels within the Balize Delta in order to create self sustaining emergent marsh.^	Yes	Yes
LWCRPA (PO-01): Violet Siphon	St. Bernard	1992	Repair and enlargement of the existing siphon to allow increased flow of freshwater and nutrients into the surrounding marsh areas to enhance wetland vegetation growth and decrease salinity.^	No	No
LWCRPA (PO-02C): Bayou Chevee	Orleans	1994	This project installed 2,000 feet of brush fences at the mouth of Bayou Chevee.^	No	No
LWCRPA (PO-03): Labranche Shoreline Stabilization and Canal Closure	St. Charles	1987	The restoration of the integrity of the shoreline, which separates Lake Pontchartrain from the western edge of Labranche wetlands.^	No	No
LWCRPA (PO-03B): Labranche Shoreline Protection	St. Charles	1996	A rock breakwater was constructed along the Lake Pontchartrain shoreline, east of Bayou Labranche to inhibit breaching of the hydrologic boundary between the lake and the wetlands.^	No	No
LWCRPA (PO-08): Central Wetlands Pump Outfall	St. Bernard	1992	This project was designed to provide freshwater, nutrients, and sediment associated with storm water runoff to an area of marsh near the Violet Siphon. ^	No	No
LWCRPA (PO-10): Turtle Cove Shore Protection	St. John the Baptist	1994	The project involved the construction of a rock-filled gabion breakwater to maintain and protect the Lake Pontchartrain shoreline that shelters "The Prairie" from high wave energies and to encourage sediment deposition behind the gabion structure. ^	No	No
LWCRPA (PO-72): Biloxi Marsh	St. Bernard	2014	This project involved the construction of approximately four miles of shoreline protection along the southeastern shoreline of Lake Borgne. ^	No	No
LWCRPA (PO-161): Lake Pontchartrain Hurricane Mitigation	St John the Baptist	1996	This project consisted of a near-shore, segmented breakwater system in Lake Pontchartrain parallel to a five-mile reach of the Manchac Wildlife Management Area. The project specifically mitigated for damages resulting from construction of the Lake Pontchartrain Hurricane Protection project. ^	No	No
LWCPRA (PO-4355NP4): Fontainebleau State Park Mitigation	St. Tammany	1999	A mitigation project for impacts associated with the construction of park cabins along the northern Lake Pontchartrain shoreline east of Bayou Castine within the Fontainebleau State Park, St. Tammany Parish. The project involved the deposition of sand in the nearshore zone to supply sediment to close approximately 600 feet of breaches east of the Fontainebleau State Park cabins along the shoreline (USACE 2013).	No	No
LWCRPA (TE-01): Montegut Wetland	Terrebonne	1993	The objective of Montegut Wetland project was to protect and enhance degraded wetland habitat in the Pointe au Chein Wildlife Management Area southeast of Montegut, Louisiana. ^	No	No
LWCRPA (TE-02): Falgout Canal Wetland	Terrebonne	1993, 1995	The primary objectives of this project were to protect marsh and cypress-tupelo swamp, reduce saltwater intrusion, and improve wildlife habitat by moderating water flux and tidal energy in the deteriorating wetland community. ^	No	No
LWCRPA (TE-03): Bayou Lacache Wetland	Terrebonne	1991, 1996	The goal of the project was to minimize the effects of saltwater intrusion by increasing the retention of freshwater derived from local runoff and establish control over saltwater flow into the project area. ^	No	No
LWCRPA (TE-06): Pointe-aux-Chenes Hydrologic Restoration	Lafourche	2006	Restoration of brackish-intermediate marsh within the Pointe Aux Chenes Wildlife Management Area.^	No	No
LWCRPA (TE-07B): Lower Petit Caillou	Terrebonne	1995, 2007	The objective of this project was to decrease saltwater intrusion into the project area by re-routing freshwater discharge from the Lashbrook pumping station through the project area prior to entry into Lake Boudreaux. ^	No	No
LWCRPA (TE-14): Point Farm Refuge Planting	Terrebonne	1995	This project was developed to create bottomland hardwood forest in former Point Farm Refuge Area. ^	No	No
LWCRPA (TE-106): Raccoon Island Repair	Terrebonne	1994	This project was a cooperative effort that utilized dredged material and vegetation to repair storm damage to Raccoon Island.^	No	No
LWCRPA (TE-107): Spoilbank Along the GIWW	Terrebonne	1993	Trees planted along approximately 8,000 feet of the GIWW spoilbank in an effort to reduce further bank erosion. ^	No	No
LWCRPA (TV-02A): Hammock Lake	St. Mary	1990	The construction of 28 wave-dampening fences at Hammock Lake in an effort to reduce turbulence and resuspension of sediments by slowing currents and reducing wave action (Bahlinger 1994).	No	No
LWCRPA (TV-02B): Yellow Bayou	St. Mary	1992	The objectives of the project were to maintain the integrity of the interior marsh between Jackson Bayou and the British-American Canal and to stabilize the East Cote Blanche Bay shoreline. This was achieved by constructing an oyster shell berm adjacent to the water's edge to reduce shoreline erosion. ^	No	No
LWCRPA (TV-06): Marsh Island Control Structures	St. Mary	1993	The project objectives were to reduce the rate of land loss, re-vegetate shallow open-water areas, and increase waterfowl food within the water management units (^; CPRA 2017c).	No	No
LWCRPA (TV-72): Quintana Canal/Cypremort Point	St. Mary	1998	The project features rock breakwaters along the Vermilion Bay shoreline and foreshore rock dike along the Vermilion Bay/ Quintana Canal intersect and the south bank of the Quintana Canal. ^	No	No

Program	Parish	Year Constructed	Project Description	Direct Overlap	Extended Boundary Overlap
National Park Service/USACE: Jean Lafitte National Historical Park & Preserve Beneficial Use Site	Jefferson	2011	The beneficial use of dredged material from Bayou Segnette Waterway and additional material from Algiers Canal associated with the construction of the West Closure Complex/HSDRSS were placed in the site bounded by the 1997 NPS wave break features on the west, existing marsh lands to the north and south, and the 1994 State of Louisiana BA-16 rock dike to the east. The project will provide improved shoreline stability (Minton, 2011).	No	No
National Park Service/USACE: Lake Salvador Shoreline Protection 1997 Shoreline Protection	Jefferson	1997	A shoreline protection barrier was built by the USACE under the authority of the National Parks and Recreation Act of November 10, 1978 (PL 95-625) to protect the Jean Lafitte National Historical Park and Preserve lands from wave induced erosion in an area of the central eastern Lake Salvador shoreline where potential breaching was possible between the Lake Salvador shoreline and the Bayou Segnette Waterway. The wave break is approximately 8,000 feet long (USACE, 1995).	No	No
National Park Service/USACE: Lake Salvador Shoreline Protection 2005	Jefferson	2004-2005	Shoreline protection features were constructed by the USACE within the Jean Lafitte National Historical Park and Preserve along the northeastern Lake Salvador shoreline from the entrance of Bayou Bardeaux southeast along the Lake Salvador shoreline until it meets the National Park Service breakwater constructed in 1997. The goal of this project is to protect the JLNHPP lands and archaeological sites from wave induced erosion (USACE, 2004b).	No	No
National Park Service/USACE: Lake Salvador Shoreline Protection 2011	Jefferson	2011	Construction consisted of placement of rock on the floodside of the geocrib area and repairing existing rock dike on the Jean Lafitte National Historical Park and Preserve along the eastern Lake Salvador shoreline adjacent to the geocrib constructed in 1997. The feature is owned by NPS (O'Cain, 2012).	No	Yes
National Park Service: 2010 Jean Lafitte National Historical Park & Preserve Canal Partial Back Fillings	Jefferson	2010	Jean Lafitte National Historical Park & Preserve canals backfilled in 2010 to restore marsh integrity (Haigler, 2011).	No	No
National Park Service: 2002 Jean Lafitte National Historical Park & Preserve Canal Partial Back Fillings	Jefferson	2002	Jean Lafitte National Historical Park & Preserve canals backfilled in 2002 to restore marsh integrity (Haigler, 2011).	No	No
NFWF (BA-143): Caminada Headland Beach and Dune Restoration Increment 2	Jefferson; Lafourche	2016	This project will retore protect beach and dune habitat across the Caminada Headland through the direct placement of sandy material from Ship Shoal. The project footprint begins near Bayou Mareau and extends approximately 9 miles east towards Caminada Pass.^	No	No
NOAA (BA-186): Fisheries Habitat Restoration on West Grand Terre Island at Fort Livingston	Jefferson	2003	This project consists of a rock dike built to protect the Gulf shoreline of West Grand Terre Island and Fort Livingston. This project was expedited because erosion rates along West Grand Terre rapidly accelerated due to the impacts of tropical storms in 2002. ^	No	No
NOAA (TE-105): Brown Marsh	Lafourche	2002	Project features consisted of a thin layer marsh creation and nourishment covering 44 acres in Lafourche Parish. ^	No	No
NRDA (BA-111): Shell Island West - NRDA	Plaquemines	2017	This project aims to restore the integrity of the Shell Island West barrier island, reduce wave energies within the bay area, and reestablish productive habitat to Bastian Bay and the surrounding area. ^	No	No
NRDA (BA-141): Lake Hermitage Marsh Creation Increment 2	Plaquemines	2014	This project will create 101 acres of marsh in conjunction with the BA-42 Lake Hermitage CWPPRA project. ^	No	No
NRDA (TE-100): NRDA Caillou Lake Headlands	Terrebonne	2018	This project aims to restore the Whiskey Island Barrier Island in order to retain its geomorphologic form and ecologic function. It will create 170 acres of marsh habitat and 917 acres of dune and beach habitat. ^	No	No
SECTION 204/1135: Barataria Waterway/Grand Terre Island Phase 1 & 2	Jefferson	1996 P1; 2002 P2	This Section 204 project provided for the beneficial placement of approximately 500,000 cubic yards of material dredged from the Barataria Bay Waterway to create wetlands on Grand Terre Island.^	No	No
SECTION 204/1135: MRGO, Breton Island Berm Mile -2 to -3	Plaquemines	1999	This Section 204 project utilized material from maintenance dredging activities along the Mississippi River Gulf Outlet to nourish the littoral system that feeds Breton Island.^	No	No
SECTION 204/1135: MRGO, Breton Island Restoration Mile -2.3 to 4.0	Plaquemines	1999	This Section 204 project utilized material from maintenance dredging activities along the Mississippi River Gulf Outlet to repair Breton Island.^	No	No
Texaco Oil Spill Mitigation: Texaco Oil Discharge Mitigation 1991 (Netherlands Area)	St. Charles	1991	Mitigation for the 1991 Texaco oil well discharge into southwestern portion of Lake Salvador. The mitigation feature was constructed in the Netherlands area and consists of a timber pile/tire breakwater approximately 835 feet in length separating the Netherlands area from Lake Cataouatche. The objective of the project is to reduce erosion and enhance submerged aquatic vegetation habitat. The breakwater is anticipated to maintain existing conditions for 50 years (USDOI, 1991).	No	No

Program	Parish	Year Constructed	Project Description	Direct Overlap	Extended Boundary Overlap
US Army Corps of Engineers: LPV Pre-Katrina Mitigation (Manchac Shoreline)	St. John the Baptist	1995	The project is located along the Lake Pontchartrain shoreline south of Pass Manchac near the southern border of the Manchac Wildlife Management Area (WMA) and consists of approximately 5 miles of segmented rock breakwater designed for wetland habitat protection in the WMA (USACE 2013).	No	No
US Army Corps of Engineers: Davis Pond Freshwater Diversion Structure and Guide Levees	St. Charles	2002	The Structure is located on the west bank of the Mississippi River near Luling, Louisiana in St. Charles Parish. Approximately 19 miles of guide levees were also constructed to control the diverted freshwater, nutrients and sediments from the Mississippi River through the diversion structure into the Barataria Basin for the enhancement of the wetland habitat. The maximum flow capacity of the diversion is 10,650 cfs (USACE, 2000).	No	No
USACE (PO-93 and PO-94): MRGO O&M (Bayou Dupre Segment)	St. Bernard	1992	The project is located along the eastern bank of the MRGO in the vicinity of Bayous Bienvenue and Dupre. It consists of approximately 24,000 feet of rock breakwaters to provide wave reduction and protect the marshes behind the structure. Additional maintenance was performed on the structure in 2007/2008 to repair damages from Hurricane Katrina (USACE 2013).	No	No
USACE (PO-95): MRGO O&M 3rd and 4th Supplemental and MRGO O&M (MRGO East Bank Shoreline Protection in the Vicinity of Bayou Yscloskey)	St. Bernard	2008	The project is located along the eastern bank of the MRGO in the vicinity of MRGO river mile 39 to 44 near Bayou Yscloskey. The reach consists of approximately four miles of segmented foreshore rock dikes to reduce wave action and enhance protection to the marshes behind the structure (USACE 2013).	No	No
USACE (PO-152): MRGO O&M 3rd and 4th Supplemental (Doulluts Canal to Jahncke's Ditch)	St. Bernard	2008	This shoreline protection project is located along the southeastern shoreline of Lake Borgne between Doulluts Canal and Jahnckes Ditch. The design for this reach was funded and completed in 2005 by CWPPRA PO-29 project; however, the reach was funded and built with 3rd Supplemental funds (USACE 2013).	No	No
USACE: MRGO O&M (MRGO West Bank Shoreline Protection in the vicinity of Stump Bayou)	St. Bernard	Late 1990s	The project is located along the western bank of the MRGO in the vicinity of Stump Bayou. It consists of approximately 3,000 feet of rock breakwaters to provide wave reduction and enhance protection to the marshes behind the structure (USACE 2013).	No	No
USACE: MRGO O&M 3rd and 4th Supplemental (West of Shell Beach Shoreline Protection)	St. Bernard	2008	A rock shoreline protection feature is to be constructed along the Lake Borgne shoreline south of Proctor Point in the vicinity of Shell Beach to provide protection to the adjacent marshlands. Also, marsh creation will be implemented at specific locations behind the shoreline protection features (USACE 2013).	No	No
WRDA (BA-01): Davis Pond Freshwater Diversion and Forced Drainage Area	Jefferson; Lafourche; Plaquemines; St. Charles	2002	The management of the diverted freshwater, nutrients and sediment from the Mississippi River through the Davis Pond freshwater diversion structure into the surrounding marsh areas to maintain and enhance the ecosystem of the Barataria Basin. *^	Yes	Yes
WRDA (BA-191): Spanish Pass Ridge and Marsh Restoration	Plaquemines	2018	Construction of approximately 1 mile of ridge backed by a marsh platform that would serve as a means to reduce wave energy on the leeward side of the marsh through the use of dredge material. This project is part of the Louisiana Coastal Area, Beneficial Use of Dredged Material Program. ^@	No	No
WRDA (BS-08): Caernarvon Freshwater Diversion	Plaquemines; St. Bernard	1991	This project diverts freshwater and its accompanying nutrients and sediment from the Mississippi River into coastal bays and marshes in Breton Sound for fish and wildlife enhancement. ^	No	No

(^Data source is CPRA 2018; @Data source is CPRA 2017a; # Data source is CPRA 2017b; &Data source is CPRA 2017c; *Data source is CPRA 2012; +Data source is CPRA 2010)

Table B-13: Plant Species Found in Barataria Basin and Deltaic Plain

Common Name	Scientific Name
Alligator weed	*Althernantera philoxeroides*
American elm	*Ulmus americana*
American sycamore	*Platanus occidentalis*
Bald cypress	*Taxodium distichum*
Beggar-tick	*Bidens* sp.
Bermuda grass	*Cynodon dactylon*
Bigleaf marsh-elder	*Iva frutescens*
Black mangrove	*Avicennia germinans*
Black needle rush	*Juncus roemerianus*
Black willow	*Salix nigra*
Boxelder	*Acer negundo*
Bulltongue	*Sagittaria lancifolia*
Buttonbush	*Cephalanthus occidentalis*
California bullwhip	*Scirpus californicus*
Cattail	*Typha latifolia*
Cedar elm	*Ulmus crassifolia*
Chairmaker's bulrush	*Scirpus americanus*
Chinese tallow	*Triadica sebifera*
Coast cockspur	*Echinochloa walteri*
Common persimmon	*Diospyros virginiana*
Common salvinia	*Salvinia minima*
Coontail	*Ceratophyllum demersum*
Cutgrass	*Zizaniopsis miliaceae*
Duckweed	*Lemna sp.*
Dwarf spikerush	*Eleocharis parvula*
Eastern baccharis	*Baccharis halimifolia*
Eastern cottonwood	*Populus deltoides*
Eurasian watermilfoil	*Myriophyllum spicatum*
Green ash	*fraxinus pennsylvanica*
Hackberry	*Celtis occidentalis*
Honey locust	*Gleditsia triacanthos*
Iris	*Iris sp.*
Maidencane	*Panicum hemitomon*
Needlegrass rush	*Juncus roemerianus*
Nuttall oak	*Quercus nuttallii*
Olney’s three square bulrush	*Schoenoplectus americanus*
Pickerelweed	*Pontederia cordata*
Pignut hickory	*Carya glabra*
Planertree	*Planera aquatica*
Rattlebox	*Sesbania drummondii*
Red maple	*Acer rubrum*
Red mulberry	*Morus rubra*
Reeds	*Phragmites* sp.
Rushes	*Juncus sp.*

Saltgrass	*Distichlis spicata*
Saltmarsh bulrush	*Bolboschoenus robustus*
Saltmeadow cordgrass	*Spartina patens*
Sago pondweed	*Stuckenia pectinata*
Sawgrass	*Cladium jamaicense*
Sedges	*Carex sp.*
Smooth cordgrass	*Spartina alterniflora*
Southern live oak	*Quercus virginiana*
Sugarberry	*Celtis laevigata*
Sweetgum	*Liquidambar styraciflua*
Turtleweed	*Batis maritima*
Water hyacinth	*Eichhornia crassipes*
Water lily	*Nymphaea odorata*
Water oak	*Quercus nigra*
Water primrose	*Ludwigia peploides*
Water tupelo/tupelogum	*Nyssa aquatica*
Wild rice	*Zizania aquatica*
Yellow cowpea	*Vigna luteola*

Table B-14: Common Wildlife Species Found in the Barataria Basin and Deltaic Plain

Common Name	Scientific Name
American alligator	*Alligator missippiensis*
American beaver	*Castor canadensis*
American coot	*Fulica americana*
American crow	*Corvus brachyrhynchos*
American eel	*Anguilla rostrata*
American kestrel	*Falco sparverius*
American white pelican	*Pelecanus erythrorhynchos*
American widgeon	*Anas americana*
Bald eagle	*Haliaeetus leucocephalus*
Banded water snake	*Nerodia fasciata*
Barred owl	*Strix varia*
Belted kingfisher	*Ceryle alcyon*
Black skimmer	*Rynchops niger*
Black-necked stilt	*Himantopus mexicanus*
Blue jay	*Cyanocitta cristata*
Blue-winged teal	*Anas discors*
Boat-tailed grackle	*Quiscalus major*
Bobcat	*Lynx rufus*
Brazilian free-tailed bat	*Tadarida brasiliensis*
Bronze frog	*Rana clamitans*
Brown pelican	*Pelecanus occidentalis*
Bufflehead	*Bucephala albeola*
Bullfrog	*Rana catesbeiana*
Carolina wren	*Thryothorus ludovicianus*
Cattle egret	*Bubulcus ibis*
Clapper rail	*Rallus longirostris*
Common grackle	*Quiscalus quiscula*
Common moorhen	*Gallinula chloropus*
Common snapping turtle	*Chelydra serpentine*
Common yellowthroat	*Geothlypis trichas*
Cotton mouse	*Peromyscus gossypinus*
Coyote	*Canis latrans*
Diamondback terrapin	*Malaclemys terrapin*
Double-crested cormorant	*Phalacrocorax auritus*
Eastern pipistrelle	*Pipistrellus subflavus*
Eastern cottontail rabbit	*Sylvilagus floridanus*
Eastern wood-pewee	*Contopus virens*
Evening bat	*Nycticeius humeralis*
Feral hog	*Sus scrofa*
Forster’s tern	*Sterna forsteri*
Fox squirrel	*Sciurus niger*
Fulvous harvest mouse	*Reithrodontomys fulvescens*
Gadwall	*Anas strepera*

Glossy ibis	*Plegadis falcinellus*
Gray fox	*Urocyon cinereoargenteus*
Gray squirrel	*Sciurus carolinensis*
Great blue heron	*Ardea Herodias*
Great egret	*Casmerodius albus*
Greater yellowlegs	*Tringa melanoleuca*
Great horned owl	*Bubo virginianus*
Grebe	*Podilymbus sp.*
Green anole	*Anolis carolinensis*
Green-backed heron	*Butorides striatus*
Green sea turtle	*Chelonia mydas*
Green treefrogs	*Hyla cinerea*
Green-winged teal,	*Anas crecca*
Ground skink	*Scincella lateralis*
Gulf coast toad	*Bufo valliceps*
Gull-billed tern	*Sterna nilotica*
Herring gull	*Larus argentatus*
Hispid cotton rat	*Sigmodon hispidus*
Hooked Mussel	*Ischadium recurvum*
House mouse	*Mus musculus*
Kemp’s ridley sea turtle	*Lepidochelys kempii*
Killdeer	*Chardrius vociferous*
Lane snapper	*Lutjanus synagris*
Laughing gull	*Larus atricilla*
Lesser scaup	*Aythya affinis*
Lesser yellowlegs	*Tringa flavipes*
Loggerhead sea turtle	*Caretta caretta*
Longnose gar	*Lepisosteus osseus*
Lesser Scaup	*Aythya affinis*
Mallard	*Anas platyrhyncos*
Marsh rice rat	*Oryzomys palustris*
Marsh wren	*Cistothorus palustris*
Mink	*Mustela vison*
Mottled duck	*Anas fulvigula*
Mourning Dove	*Zenaida macroura*
Muskrat	*Ondatra zibethicus*
Nine-banded armadillo	*Dasypus novemcinctus*
Northern cardinal	*Cardinalis cardinalis*
Northern harrier	*Circus cyaneus*
Northern mockingbird	*Mimus polyglottos*
Northern pintail	*Anas acuta*
Northern raccoon	*Procyon lotor*
Northern Shoveler	*Anas clypeata*
Northern yellow bat	*Lasiurus intermedius*
Norway rat	*Rattus norvegicus*
Nutria	*Myocastor coypus*

Olivaceous cormorant	*Phalacrocorax brasilianus*
Opposum	*Didelphis virginiana*
Pig frog	*Rana grylio*
Rafinesque's big-eared bat	*Plecotus rafinesquii*
Red bat	*Lasiurus borealis*
Red-breasted merganser	*Mergus serrator*
Red-eared slider	*Trachemys scripta*
River otter	*Lutra canadensis*
Red fox	*Vulpes vulpes*
Redhead	*Aythya americana*
Red-shouldered hawk	*Buteo lineatus*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Ring-billed gull	*Larus delawarensis*
Ring-necked duck	*Aythya collaris*
Roof rat	*Rattus rattus*
Seaside sparrow	*Ammodramus maritimus*
Snowy egret	*Egretta thula*
Southern leopard frog	*Rana sphenocephala*
Squirrel treefrogs	*Hyla squirella*
Stinkpot	*Sternotherus odoratus*
Striped skunk	*Mephitis mephitus*
Swamp rabbit	*Sylvilagus aquaticus*
Tricolored heron	*Egretta tricolor*
West Indian manatee	*Trichechus manatus*
Western cottonmouth	*Agkistrodon piscivorus*
White-eyed vireo	*Vireo griseus*
White-faced ibis	*Plegadis chihi*
White-footed mouse	*Peromyscus leucopus*
White ibis	*Eudocimus albus*
White-tail deer	*Odocoileus virginianus*
Willet	*Tringa semipalmata*
Wood duck	*Aix sponsa*
Yellow-crowned night-heron	*Nycticorax violaceus*

Table B-15: Project Parishes and LA Threatened and Endangered Species

Species	Parish	Critical Habitat	Status	Jurisdiction	
				USFWS	NFMS
Animal					
*West Indian Manatee (*Trichechus manatus*)	Asc, I , J, La, Li, O, Pl, St. B, St. C, St. J, St. M, St. T, Ta, Te		T	X	
Alabama Heelsplitter Mussel (*Potamilus inflatus*)	Asc, Li, St. T		T	X	
Atlantic Sturgeon (*Acipenser oxyrhynchus oxyrhynchus*)	J, I, Li, O, St. B, St. C, St. J, St. M, St. T, Ta, Te	X	T	X	
Gulf sturgeon (*Acipenser oxyrinchus desotoi*)	Asc, J, Pl, St. C, St. T	X	T	X	X
*Pallid sturgeon (*Scaphirhynchus albus*)	Asc, I, J, O, Pl, St. B, St. C, St. J, St. M, St. T		E	X	
Dusky Gopher Frog (*Lithobates sevosus*)	St. T	X	E	X	
Gopher Tortoise (*Gopherus polyphemus*)	St. T, Ta		T	X	
Piping plover (*Charadrius melodus)*	J, La, Pl, St. B, St. M, Te	X	T	X	
Red-cockaded Woodpecker (*Leuconotopicus borealis*)	Li, St. T, Ta		E	X	
Red knot *(Calidris canutus)*	J, La, Pl, I, St. B, St. M, Te		T	X	
Green Sea Turtle (*Chelonia mydas*)	J, La, Pl, I, St. B, St. M, St. T, Te		T	X	X
Hawksbill Sea Turtle (*Eretomchelys imbricata*)	J, La, Pl, I, St. B, St. M, Te		E	X	X
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	J, La, Pl, I, St. B, St. M, St. T, Te		E	X	X
Leatherback Sea Turtle (*Dermochelys coriacea*)	J, La, Pl, I, St. B, St. M, Te		E	X	X
Loggerhead Sea Turtle (*Caretta caretta*)	J, La, Pl, I, St. B, St. M, St. T, Te		T	X	X
Louisiana Quillwort (*Isoetes louisianensis*)	St. T		E	X	
Ringed Map Turtle (*Graptemys oculifera*)	St. T		T	X	

Parish acronym bolded: Ascension, **A**ssumption, **I**beria, **J**efferson, **La**fourche, **Li**vingston, **O**rleans, **Pl**aquemines, **St. B**ernard, **St. C**harles, **St. J**ames, **St. T**ammany, **St. M**ary, **Ta**ngipahoa, and **Te**rrebonne.

Table B-16: Fish and Aquatic Species Found in the Barataria Basin and Deltaic Plain

Common Name	Scientific Name
Atlantic croaker	*Micropogonias undulatus*
American oyster	*Crassostrea virginica*
Asiatic clam	*Corbicula fluminea*
bay anchovy	*Anchoa mitchilli*
bighead carp	*Hypophthalmichthys nobilis*
black drum	*Pogonias cromis*
blue crab	*Callinectes sapidus*
blue catfish	*Ictalurus furcatus*
bluegill	*Lepomis macrochirus*
bowfin	*Amia calva*
brown shrimp	*Farfantepenaeus aztecus*
smallmouth buffalo	*Ictiobus bubalus*
channel catfish	*Ictalurus punctatu* s
common carp	*Cyprinus carpio*
crawfish	*Procambarus sp.*
freshwater drum	*Aplodinotus grunniens*
gizzard shad	*Dorosoma cepedianum*
grass carp	*Ctenopharyngodon idella*
gray snapper	*Lutjanus griseus*
Gulf menhaden	*Brevoortia patronus*
Gulf sturgeon	*Acipenser oxyrinchus desotoi*
hardhead catfish	*Ariopsis felis*
inland silverside	*Menidia beryllina*
Lane snapper	*Lutjanus synagris*
largemouth bass	*Micropterus salmoides*
least killifish	*Heterandria formosa*
longnose gar	*Lepisosteus osseus*
mosquitofish	*Gambusia affinis*
paddlefish	*Polyodon spathula*
pallid sturgeon	*Scaphirhynchus albus*
pink shrimp	*Farfantepenaeus duorarum*
rainwater killifish	*Lucania parva*
redear sunfish	*Lepomis microlophus*
redfish/ red drum	*Sciaenops ocellatus*
ribbed mussel	*Geukensia demissa*
Rio Grande cichlid	*Cichlasoma cyanoguttatum*
sand seatrout	*Cynoscion arenarius*
sailfin molly	*Poecilia latipinna*
sheepshead	*Archosargus probatocephalus*
sheepshead minnow	*Cyprinodon variegatus*
shortnose gar	*Lepisosteus platostomus*
shovelnose sturgeon	*Scaphirhynchus platorynchus*
silver carp	*Hypophthalmichthys molitrix*

southern flounder	*Paralichthys lethostigma*
Spanish mackerel	*Scomberomorus maculatus*
spot	*Leiostomus xanthurus*
spotted gar	*Lepisosteus oculatus*
spotted seatrout	*Cynoscion nebulosus*
striped mullet	*Mugil cephalus*
warmouth	*Lepomis gulosus*
white shrimp	*Litopenaeus setiferus*
Yellow bass	*Morone mississippiensis*
yellow bullhead	*Ameiurus natalis*
zebra mussel	*Dreissena polymorpha*

Table B-17. Construction Equipment Noise Emission Levels

Equipment	Typical Noise Level (dBA) 50 ft., U. S. Dept. of Trans. study 1979	Average Noise Level (dBA) 50 ft., CA/T Project study 1994	Typical Noise Level (dBA) 50 ft., U. S. Dept. of Trans. study 1995	Lmax Noise (dBA) 50 ft., CA/T Project Spec. 721.560
Air Compressor		85	81	80
Backhoe	84	83	80	80
Chain Saw				85
Compactor	82		82	80
Compressor	90	85		80
Concrete Truck		81		85
Concrete Mixer			85	85
Concrete Pump			82	82
Concrete Vibrator			76	80
Crane, Derrick	86	87	88	85
Crane, Mobile		87	83	85
Dozer	88	84	85	85
Drill Rig		88		85
Dump Truck		84		84
Excavator				85
Generator	84	78	81	82
Gradall		86		85
Grader	83		85	85
Hoe Ram		85		90
Impact Wrench			85	85
Jackhammer*		89	88	85

Loader	87	86	85	80
Paver	80		89	85
Pile Driver, Impact		101	101	95
Pile Driver, Sonic			96	95
Pump	80		85	77
Rock Drill			98	85
Roller			74	80
Scraper	89		89	85
Slurry Machine		91		82
Slurry Plant				78
Truck	89	85	88	84
Vacuum Excavator				85

* There are 82 dBA @ 7 meter rated jackhammers (90 lb. class) available. This would be equivalent to 74 dBA @ 50 ft. These are silenced with molded intricate muffler tools.

APPENDIX C: MITIGATION PLAN

APPENDIX C

MITIGATION PLAN AND MONITORING

Fritchie Brackish Marsh Creation Mitigation Project Feature
Supplemental Environmental Assessment 543a

INTRODUCTION

This document follows the general mitigation guidelines, outlined in Appendix J, Supplemental Environmental Assessment (SEA) 543a, developed for New Orleans to Venice (NOV) Hurricane Risk Reduction Project: Incorporation of Non-Federal Levees (NFL) from Oakville to St . Jude and the NOV Federal Hurricane Protection Levee, Plaquemines Parish, Louisiana (hereafter NFL NOV). Mitigation guidelines were developed by the U.S. Army Corps of Engineers, New Orleans District (CEMVN) in coordination with an Interagency Team and the non-Federal project sponsor (NFS), Louisiana Coastal Protection and Restoration Authority Board (LA CPRAB). This appendix describes project-specific mitigation actions and guidelines including plans for planting, monitoring, and reporting only for the Fritchie brackish marsh mitigation project feature, the only constructible feature of the Tentatively Selected Plan (TSP) as documented in SEA 543a. The TSP also includes additional mitigation features including the purchase of swamp mitigation bank credits not the subject of this appendix. Mitigation success criteria are also presented in this appendix. The Fritchie brackish marsh mitigation feature is fully described in SEA 543a and summarized in Table 1.

Table 1. Mitigation Projects included in SEA 543a

Habitat	Project	Action	Acres
Intermediate/ Brackish/Saline Marsh (IM/BM/SM)	Fritchie	Construct marsh platform from open water on Fritchie property and plant IM/BM/SM species. Action includes constructing retention dikes that will be degraded after settlement and dewatering (approximately 1 year).	Up to 350

The mitigation actions include construction of marsh platform suitable for primarily brackish marsh, temporary retention dikes, brackish marsh vegetation plantings, and degrading of retention dikes after settlement and dewatering (approximately 1 year post construction. The NFS will be responsible for operation and maintenance of functional portions of the work as they are completed.

The CEMVN would monitor the completed mitigation site, on a cost-shared basis with the NFS, to determine whether additional construction, invasive species control and/or plantings would be necessary to achieve mitigation success. The CEMVN would

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 the CEMVN determines that the mitigation has achieved initial success criteria, monitoring would be performed by the NFS as part of its OMRR&R obligations. If, after meeting initial success criteria, the mitigation fails to meet its intermediate and/or long-term ecological success criteria, the CEMVN would consult with other agencies and the NFS to determine whether operational changes would be sufficient to achieve ecological success criteria. If additional structural changes are deemed necessary to achieve ecological success, the CEMVN would implement appropriate adaptive management measures in accordance with the contingency plan and subject to cost sharing requirements, availability of funding, and current budgetary and other guidance.

The respective responsibilities for the construction, monitoring, and maintenance of the Fritchie brackish marsh mitigation feature described in SEA 543a are as follows:

1. Construction and planting (the “construction phase”) - performed by the CEMVN per applicable cost-sharing;

2. After construction and planting, the CEMVN issues Notice of Construction Complete (NCC) and provides the Operation, Maintenance, Repair, Replacement, and Rehabilitation manual to the NFS (the “O&M phase”);

3. Notwithstanding NCC, the CEMVN would monitor the project on a cost-shared basis until it reaches its Initial Success Criteria;

4. If, after NCC, but before Initial Success Criteria are achieved, the project needs additional construction, invasive species control or planting, the CEMVN would perform these items subject to applicable cost-sharing and availability of funds;

5. After Initial Success Criteria are achieved, the NFS would monitor project;

6. If, after Initial Success Criteria are achieved, there is a problem that can be corrected through a change in operation, the NFS would be responsible to change its operation of the project; and

7. If, after Initial Success Criteria are achieved, there is a problem that requires structural changes, the CEMVN would implement adaptive management according to applicable cost-sharing and subject to availability of funds.

For the Fritchie brackish marsh creation project, “construction” is defined as:

1. Mobilization and de-mobilization of required construction equipment to the site.

2. Construction of temporary retention/perimeter dikes and associated spill boxes to contain dredged material.

3. Dredging material from the bottom of Mississippi River and pumping the material via hydraulic pipeline along a defined access corridor to the designated fill site to establish marsh platforms at design elevation.

4. Surveying to determine fill height during dredge material disposal, at the end of the dredging operation, and 1 year after conclusion of the dredging operation.

5. Degrading the perimeter dikes and gapping the dikes to allow water exchange once target elevations have been reached.

6. Initial (typically during first year after establishment of marsh platforms) invasive and nuisance plant species control.

7. Testing of the soil 1 year after fill event and before planting to determine the suitability of the soil for the planting of marsh species if required. If soil parameters are not met for marsh, delay planting until achieved.

8. One year after the establishment of the marsh platforms, the planting of native, herbaceous, and wetland vegetation species throughout the fill areas would occur.

FRITCHIE INTERMEDIATE/BRACKISH/SALINE MARSH RESTORATION

Mitigation Work Plan
Section 2.4.1 and 2.4.3.3 of the SEA 543a provides a detailed description of the Fritchie mitigation feature construction/implementation work plan. Figures 1 and 2 depict the proposed mitigation (marsh restoration) features discussed herein. The key elements of the construction/implementation plan are as follows.

- Placement of fill (borrow material) within the mitigation features as necessary to attain the desired final target grade elevation of approximately +1.5 feet NAVD88. The borrow material for the Fritchie site would be dredged from Lake Pontchartrain, south west of the mitigation site and transported to the mitigation site using via pipeline through Salt Bayou and Little Lagoon. To minimize marsh impacts, the pipeline and equipment would follow open water and canals as much as possible.

- As necessary, follow-up eradication of invasive/nuisance plant species within the mitigation features through ground-based application of appropriate herbicides to the target species, prior to the initial planting of native marsh species within these features.

- Initial planting (initial installation) of native marsh species in the mitigation features following the settling/dewatering necessary to meet the final target elevation of the mitigation feature. Refer to the following planting specifications. The successful completion of this initial planting event will mark the end of the mitigation construction phase.

- As necessary, follow-up eradication of invasive/nuisance plant species within the mitigation features through ground-based application of appropriate herbicides to the target species, following the initial planting cited above.

MITIGATION PLANTING GUIDELINES

Because salinities fluctuate between intermediate and brackish conditions, depending on rainfall and tidal conditions, the Fritchie brackish marsh mitigation feature includes plantings of intermediate, brackish, and saline marsh species. The site would either be planted with intermediate or brackish or a combination of intermediate, brackish and saline marsh species depending upon local site conditions the year planting is scheduled to occur. Such determinations would be made in coordination with the Interagency Team.

Herbaceous species would be planted on 7-foot centers (average) to achieve a minimum density of 889 plants per acre. Stock would typically be either 4-inch container size, bare-root, or liner stock, depending on the species availability at the time of plantings. Plants must be obtained from a registered licensed regional nursery/grower and of a regional eco-type species properly stored and handled to ensure viability. Plantings should be conducted during the period from March 15 through June 15. Plantings should not be undertaken later than approximately July 15, unless approval is obtained from the CEMVN, CPRAB, and Interagency Team. Planting during the early fall may be deemed acceptable on a case-by-case basis.

Species planted in proposed intermediate marsh habitats would be selected from the species list provided in Table 2. Plantings would consist of at least two different species. The species used and the proportion of the total plantings represented by each species would be dependent on various factors including local site conditions and plantings represented by planting stock availability.

Table 2: 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	*Schoenoplectus americanus*
Big cordgrass	*Spartina cynosuroides*
Seashore paspalum	*Paspalum vaginatum*

Species planted in proposed brackish and saline marsh habitats would be selected from the species list provided in Table 3. Plantings would consist of at least two different brackish and saline marsh species. The species used and the proportion of the total plantings represented by each species would be dependent on various site factors including local site conditions and planting stock availability at the time of the plantings.

Table 3: Preliminary Planting List for Brackish and Saline Marsh Habitats

Common Name	Scientific Name
Marsh-hay cordgrass	*Spartina patens*
Black needle rush	*Juncus roemerianus*
Smooth cordgrass	*Spartina alterniflora*
Common threesquare	*Schoenoplectus americanus*
Saltmarsh bulrush	*Schoenoplectus robustus*
Salt grass	*Distchilis spicata*

1 . General Construction

A. Within approximately 8 months following the start of mitigation construction, complete all initial mitigation construction activities (e.g. construction of temporary retention/perimeter dikes, placement of fill (borrow material/dredged material) into mitigation site, construction of permanent dikes if applicable, etc.), in accordance with the mitigation work plan and in accordance with final project plans and specifications. Complete an as-built survey. These requirements classify as initial success criteria.

B. Approximately 1 to 3 years following completion of all initial mitigation construction activities (when the restored marsh feature has attained the desired target soil surface elevation), complete all final mitigation construction activities, in accordance with the mitigation work plan and in accordance with final project plans and specifications. Such activities could include, but are not limited to: degrading temporary retention dikes such that the areas occupied by these dikes have a surface elevation equivalent to the desired target marsh elevation; completion of armoring, if required, of any permanent dikes; “gapping” or installation of “fish dips” in permanent dikes; 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 would be considered as the “completion of final mitigation construction activities.” As noted previously, this is anticipated to occur approximately 1 year after placement of fill material in the mitigation feature is completed. The requirements stated herein classify as initial success criteria.

2. Topography

A. Upon completion of final mitigation construction activities (after 1 year dewatering, approximate Target Year 2)

- Demonstrate that at least 80 percent of each mitigation feature has a surface elevation that is within 0.5 feet of the desired target surface elevation. This requirement classifies as an initial success criterion.

B. 1 Year following completion of final mitigation construction activities (approximate Target Year 3)

- Demonstrate that at least 80 percent of the mitigation site has a surface elevation that is within 0.5 feet of the desired target surface elevation. This requirement classifies as an initial success criterion.

C. 3 years following completion of final mitigation construction activities (approximate Target Year 5)

- Demonstrate that at least 90 percent of the mitigation site has a surface elevation that is within the functional marsh elevation range. This requirement classifies as an intermediate success criterion.

3. Native Vegetation

A. For intermediate, brackish and saline marsh restoration features –
- Complete initial marsh planting in accordance with applicable initial marsh planting guidelines. This requirement classifies as an initial success criterion.

B. For intermediate, brackish, and saline marsh restoration features only; 1 year following completion of initial plantings–
- Attain at least 80 percent survival of planted species, or; Achieve a minimum average cover of 25 percent, comprised of native herbaceous species (includes planted species and volunteer species).
- Demonstrate that vegetation satisfies the CEMVN hydrophytic vegetation criteria. This criterion would thereafter remain in effect for the duration of the overall monitoring period.
- The requirements above classify as initial success criteria; with the exception that the requirement to demonstrate vegetation satisfies the CEMVN hydrophytic vegetation criteria throughout the duration of the overall monitoring period classifies as a long-term success criterion.

C. For intermediate, brackish, and saline marsh restoration features; 3 years following completion of initial plantings –
- Achieve a minimum average cover of 75 percent, comprised of native herbaceous species (includes planted species and volunteer species). This requirement classifies as an intermediate success criterion.

D. For all marsh restoration features (intermediate, brackish, and saline) –
- For the period beginning 5 years following completion of final mitigation construction activities and continuing through 20 years following completion of

final mitigation construction activities, maintain a minimum average cover of 80 percent, comprised of native herbaceous species. This requirement classifies minimum average cover of 80 percent, as a long-term success criterion.

4. Invasive and Nuisance Vegetation

A. Complete the initial eradication of invasive and nuisance plant species within 1 year of completion of final mitigation construction activities. This requirement classifies as an initial success criterion.

B. Maintain all areas 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 nuisance species each constitute less than 5 percent of the total average plant cover during periods between maintenance events. These criteria must be satisfied throughout the duration of the overall monitoring period. Until such time that monitoring responsibilities are transferred from the CEMVN to the NFS, this requirement classifies as an initial success criterion. Following the transfer of monitoring responsibilities, this requirement classifies as a long-term success criterion.

MITIGATION MONITORING GUIDELINES

The guidelines for mitigation monitoring provided herein are applicable to all the types of marshes being restored (i.e. intermediate, brackish, and saline), unless otherwise indicated.

Table 4. Mitigation Success Criteria by Habitat Type

Performance Categories	Marsh
Mitigation Construction	Criteria 1A: Complete initial construction activities. Criteria 1B: Complete final construction activities.
Native Vegetation	Criteria 3A. Complete initial plantings for intermediate and brackish marsh. Criteria 3C: For intermediate, brackish, and saline marsh , 1 year after initial plantings, achieve: • ≥80% survival of planted species OR ≥25% cover by native herbaceous species • meets hydrophytic vegetation criteria. Criteria 3E: For intermediate, brackish, & saline marsh 3 years after initial plantings, achieve: ≥75% cover by native herbaceous species.

Performance Categories	Marsh
	Criteria 3F: For all marshes, between year 5 through 20 years following completion of final construction, achieve: ≥80% cover by native herbaceous species.
Invasive and Nuisance Vegetation (INV)	Criteria 4A. Complete initial Eradication of INV. Criteria 4B. Maintain <5% cover by INV.
Topography	Criteria 2A: Upon completion of construction, ≥ 80% of total area must be within 0.5 ft of target elevation. Criteria 2B: 1 to 3 years after completion of construction, ≥ 80% of total area must be within 0.5 ft of target elevation. Criteria 2C: 3 years after completion of construction, ≥ 90% of mitigation site must be within functional marsh elevation range.
Thinning of Native Vegetation	Not applicable.
Hydrology	Not applicable.

Baseline Monitoring Report

The Fritchie brackish marsh mitigation site will be monitored and a baseline monitoring report prepared. Shortly after completion of all initial mitigation activities (e.g. initial eradication of invasive plants, first/initial planting of native species, completion of initial earthwork, grading, surface water management system alterations/construction, etc.), the mitigation site will be monitored and a baseline or monitoring report will be prepared for the Fritchie site. Monitoring and reporting requirements for the baseline report include the following items:

A. A detailed discussion of all mitigation activities completed.

B. A plan view drawing of the mitigation site showing the approximate boundaries of the restored marsh features, monitoring transect locations, sampling quadrat locations, photo station locations, and a staff gage location. The exact locations will be determined and documented using GPS coordinates and coordinated with the CEMVN, CRPA, and Interagency Team during the initial site visit and the baseline monitoring event. If aerial imagery of the mitigation site is available, it will also be included.

C. An as-built survey of surface elevations (topographic survey) within each marsh feature, along with an as-built survey of any permanent dikes constructed as part of the marsh restoration features including any “gaps” or “fish dips” established in such dikes. The layout of the as-built surveys is shown on Figure 3. If a particular

marsh feature is immediately adjacent to existing marsh habitat, the topographic survey will include spot elevations collected within the existing marsh habitat near the restored marsh feature. In addition to the survey data, an analysis of the data will be provided addressing attainment of topographic success criteria.

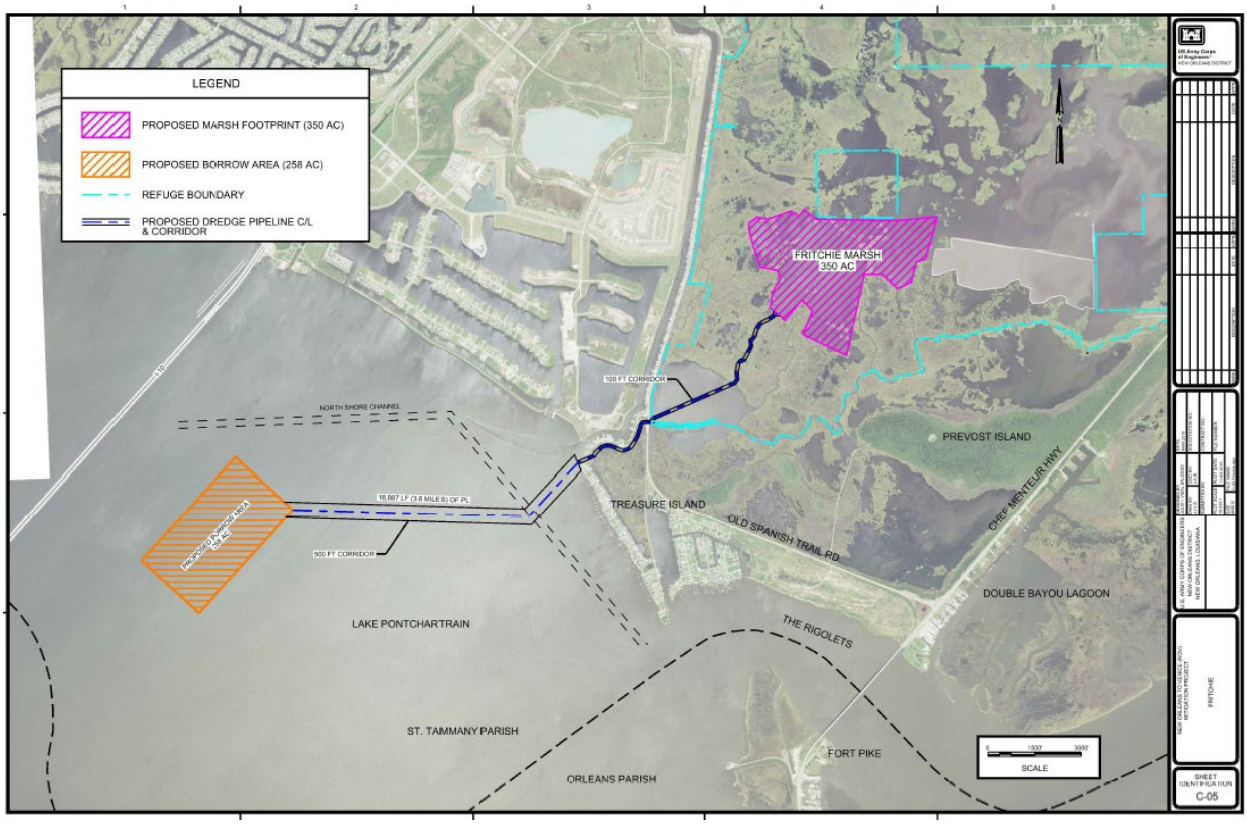


Figure 1. Areas of interest for monitoring plan design at the Fritchie Brackish Marsh site. A minimum of 100 quadrats would be established for this 350 acre site.

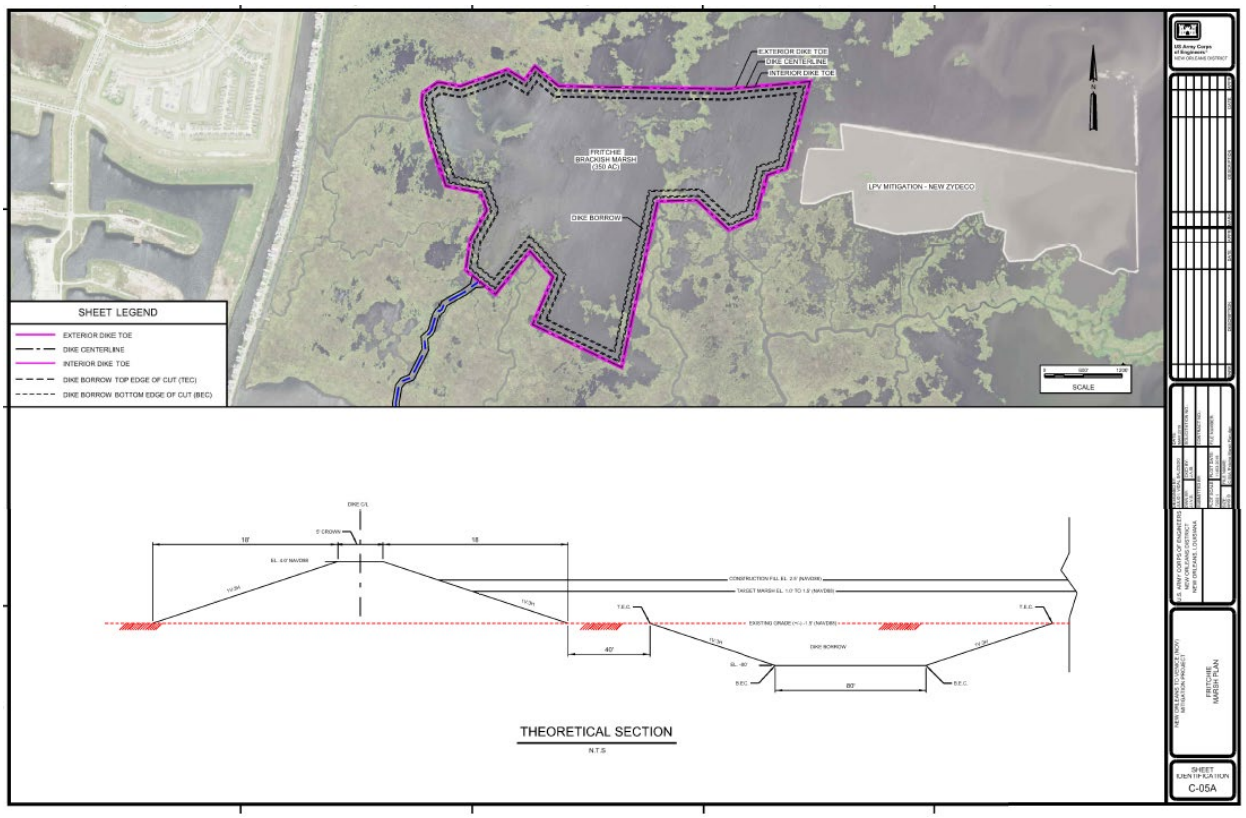


Figure 2. Project Area and Plans for Dike Construction

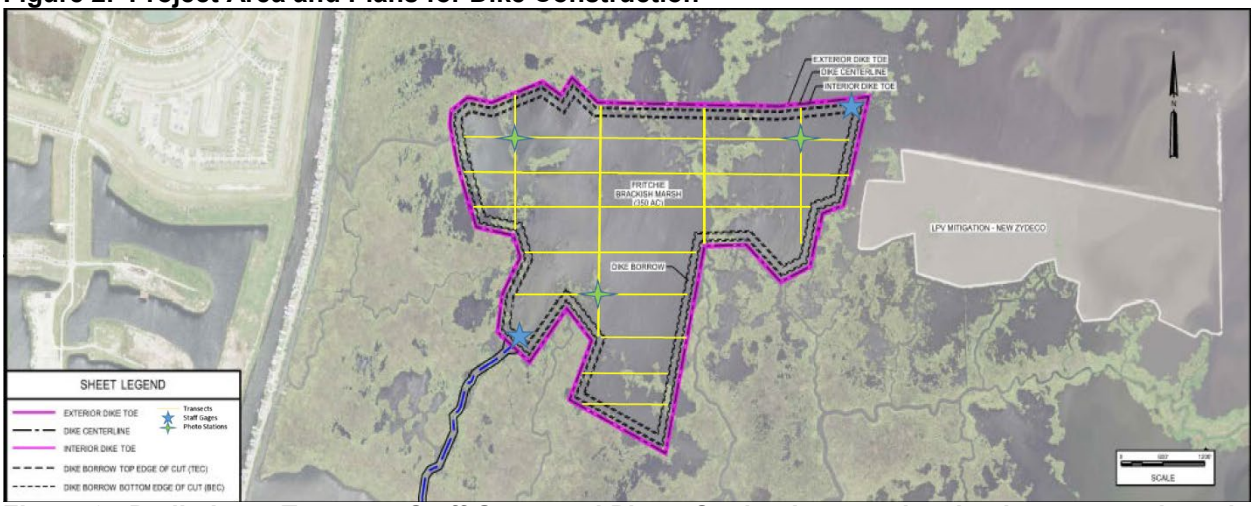


Figure 3. Preliminary Transect, Staff Gage, and Photo Station Layout, drawing is not to scale and will be further refined by Interagency Team

D. 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 site and will be finalized during the baseline monitoring event. Figure 3 illustrates potential locations and areas of

interest for the photo stations and should represent the minimal number of stations.

E. Water level elevation readings collected at the time of monitoring from a single staff gage installed right outside of each of the restored marsh features. The final location of the staff gage will be determined during the initial site visit and installation of the gauges. Potential areas of interests for the gages are indicated in Figure 3. 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 site (the stations will be identified and referenced within the monitoring report). The report will further address estimated mean high and mean low water elevations at the mitigation site based on field indicators such as observations of inundation, soil saturation, water marks, drift lines, sediment deposits or drainage patterns.

F. Various qualitative observations will be made in the mitigation site 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 site 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 permanent 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.

G. 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 if planted marsh features are added after initial construction. The number of monitoring transects and number of sampling quadrats per transect will vary depending on the mitigation site and will be finalized during the initial site visit and coordinated with the CEMVN, but should consist of at least one quadrat per 2 acres. A conceptual design showing areas of interest and minimal number of transects is provided in Figure3. The methodology and

locations chosen for the initial monitoring report must be followed for all subsequent reports.

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

H. 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.

I. A brief description of anticipated maintenance/management work to be conducted during the period from the current monitoring report to the next monitoring report.

Additional Monitoring Reports

All monitoring reports generated after the initial baseline report will provide the following information unless otherwise noted:

A. All items listed for the time zero baseline monitoring report.

B. A brief description of maintenance and/or management work performed since the previous monitoring report along with a discussion of any other significant occurrences.

C. In addition to the above items, the monitoring report prepared for 1 year following completion of mitigation construction activities and the monitoring report prepared for TY 3 and 5 will include a topographic survey of each marsh restoration feature. These surveys will cover the same components as described for the topographic survey conducted for the baseline monitoring report. In addition to the surveys themselves, each of the two monitoring reports involving topographic surveys will include an analysis of the data as regards attainment of applicable topographic success criteria. If the second 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 the CEMVN in coordination with the Interagency Team.

D. Although not proposed in the initial mitigation plan, plantings of herbaceous species within the restored marsh features may also be necessary to attain applicable native vegetation success criteria. Any monitoring report submitted following completion of initial plantings must include an inventory of the number of each species planted and the stock size used. It must also include a depiction

of the areas planted cross-referenced to a listing of the species and number of each species planted in each area.

Monitoring Reports Following Re-Planting Activities in Intermediate, Brackish or Saline Marsh Features

Re-planting of certain areas within restored intermediate and/or brackish and saline marsh habitats may be necessary to ensure attainment of applicable native vegetation success criteria. Any monitoring report submitted following completion of a re-planting event must include an inventory of the number of each species planted and the stock size used. It must also include a depiction of the areas re-planted, cross-referenced to a listing of the species and number of each species planted in each area.

MITIGATION MONITORING SCHEDULE AND RESPONSIBILITIES

Monitoring would typically take place in mid to 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 would be submitted by December 31 of each year of monitoring. Monitoring reports would be provided to the CEMVN, the NFS, and the agencies comprising the Interagency Team. The various monitoring and reporting responsibilities addressed in this section are all subject to the provisions set forth in the Introduction section.

The CEMVN would 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.
2. Topography – A and B.
3. Native Vegetation – For intermediate, brackish and saline marsh features, criteria 3.A and 3.B
4. Invasive & Nuisance Vegetation – A, plus B until monitoring responsibilities are transferred to the NFS.

Monitoring events associated with the above would include the “time zero” (first or baseline) monitoring event (estimated in TY2, 2023) and a second monitoring event 1 year after the time zero monitoring event (estimated in TY3, 2024). The CEMVN would be responsible for conducting these monitoring activities and preparing the associated monitoring reports.

The NFS is responsible for conducting the required monitoring events and preparing the associated monitoring reports after the CEMVN has demonstrated the initial mitigation success criteria listed above have been achieved. Once monitoring responsibilities have been transferred to the NFS, the next monitoring event should take place in 2025 (TY5) in order to demonstrate attainment of success criteria 2.C and 3.C. Thereafter, monitoring would be conducted every 5 years throughout the remaining 50-year period

of analysis (based on 50-year period of analysis beginning in 2020 (TY0) and ending in 2070 (TY50)).

If prescribed 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 CEMVN would be responsible for conducting such additional monitoring and preparing the associated monitoring reports until the mitigation site satisfies all initial success criteria. The following lists instances requiring additional monitoring that would be the responsibility of the CEMVN:

(A) For intermediate, brackish and saline marsh features –

- If the initial survival criterion for planted species or the initial vegetative cover criterion are not achieved (i.e. the criteria specified in success criteria 3.C), a monitoring report would be required for each consecutive year until two sequential annual reports indicate that the applicable survival criterion or vegetative cover criteria have been satisfied (i.e. that corrective actions were successful). The CEMVN would also be responsible for the purchase and installation of supplemental plants needed to attain the success criteria.

(B) For all types of marsh features (intermediate, brackish and saline) –

- If topographic success criteria 2.A or 2.B are not achieved, a monitoring report would 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 CEMVN 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:

(A) For intermediate, brackish and saline marsh features –

- If the vegetative cover criterion specified for 3 years after the initial planting of marsh features is not achieved (i.e. success criterion 3.E), a monitoring report would be required for each consecutive year until two sequential annual reports indicate that the vegetative cover criterion has been satisfied. The Sponsor would also be responsible for the purchase and installation of supplemental plants needed to attain the success criterion.

(C) For all types of marsh features (intermediate, brackish, saline) –

- If the topographic success criterion 2.C is not achieved, a monitoring report would be required for each consecutive year until two sequential annual reports indicate success criteria have been satisfied. Since failure to meet this 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 Sponsor would also be responsible for performing the necessary corrective actions.

- Native vegetation success criterion 3.D is applicable to the period extending from 5 years through 20 years following completion of mitigation construction activities 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 would 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.

Once monitoring responsibilities have been transferred to the NFS, the NFS would 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. Twenty years following completion of mitigation construction activities, the number of monitoring transects and/or quadrats 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 CEMVN in coordination with the Interagency Team.

MITIGATION MONITORING COSTS

Table 4 provides a cost estimate based on the currently available information and may need to be revised in the future as additional information regarding the mitigation feature designs and construction schedule become available.

Table 4. Estimated Monitoring Costs for the Fritchie Brackish Marsh Projects

Target Year	Calendar Year	FY	Work Item	Work Item Description	Cost
0	**2020**	**2020**	Construction Contract	Mob/Demob, Diking, and Dredging. (Feb 2020 - July 2020)	
		2020	Monitoring	Monitoring to ensure initial success criteria is met (Aug - Sept)	$22,800
		2021	Monitoring Report	Submit report (Oct - Dec 2020)	$34,200
1	**2021**				
		2021	Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in mitigation monitoring report. (May 2021)	$30,000
		2021	O&M Contract Dike Degrade	Degrade dike to target marsh elevation, as-built surveys. (June - Aug 2021)	$935,878
		2021	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas. Assume not required. May	$69,000
		2021	Brackish Marsh Planting	If brackish marsh vegetation does not establish, planting of brackish marsh vegetation.	$621,000

Target Year	Calendar Year	FY	Work Item	Work Item Description	Cost
		2021	Monitoring	Perform field mitigation monitoring to determine if planting may be required. Assume planting is not required. (Aug - Sep 2021)	$22,800
		2022	Monitoring Report	Submit report (Oct - Dec 2021)	$34,200
2	**2022**	**2022**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April 2022).	$69,000
		2022	Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in monitoring report.	$50,000
		2022	Monitoring	Perform field mitigation monitoring (Aug 2022 - Sep 2022)	$17,400
		2022	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (late Oct.).	$69,000
		2023	Monitoring Report	Submit report (Oct - Dec 2022)	$26,100
3	**2023**	**2023**	Analysis for Notice of Construction Complete	Review monitoring report from prior year and other data to make determination to issue NCC to Non-Federal Sponsor (Jan 2023)	$10,000
		2023	**Issue NCC to NFS**	Issue Notice of Construction Complete (NCC) to Non-Federal Sponsor (Feb 2023 - Apr 2023)	
		2023	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (May 2023)	$69,000
		2023	Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in mitigation monitoring report.	$50,000
		2023	Monitoring	Perform field mitigation monitoring (Aug 2023 - Sep 2023)	$17,400
		2023	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (Oct 2023)	$69,000
		2024	Monitoring Report	Submit report (Oct 2023 - Dec 2023)	$26,100
4	**2024**	**2024**	Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in mitigation monitoring report.	$50,000
		2024	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2024	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$21,840
		2024	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (late Oct.).	$69,000
		2025	Monitoring Report	Submit report Oct-Dec. Includes aerial photography.	$32,760
5	**2025**	**2025**	Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in mitigation monitoring report.	$50,000
		2025	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2025	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$21,840
		2025	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (late Oct.).	$69,000
		2025	Monitoring Report	Submit report Oct-Dec. Includes aerial photography.	$32,760
		2026	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (late Oct.).	$69,000
6	**2026**	**2026**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April - May?).	$69,000
7	**2027**				
8	**2028**	**2028**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April - May?).	$69,000

Target Year	Calendar Year	FY	Work Item	Work Item Description	Cost
9	**2029**	**2029**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April - May?).	$69,000
10	**2030**	**2030**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2030	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2031	Monitoring Report	Submit report Oct-Dec.	$17,940
11	**2031**	**2031**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
12	**2032**	**2032**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
13	**2033**	**2033**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
14	**2034**	**2034**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
15	**2035**	**2035**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2035	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2036	Monitoring Report	Submit report Oct-Dec.	$17,940
16	**2036**	**2036**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
17	**2037**	**2037**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
18	**2038**	**2038**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
19	**2039**	**2039**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
20	**2040**	**2040**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2040	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2041	Monitoring Report	Submit report Oct-Dec.	$17,940
25	**2045**	**2045**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2045	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2046	Monitoring Report	Submit report Oct-Dec.	$17,940
30	**2050**	**2050**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2050	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2051	Monitoring Report	Submit report Oct-Dec.	$17,940
35	**2055**	**2055**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2055	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2056	Monitoring Report	Submit report Oct-Dec.	$17,940
40	**2060**	**2060**	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2060	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2061	Monitoring Report	Submit report Oct-Dec.	$17,940

Target Year	Calendar Year	FY	Work Item	Work Item Description	Cost
45	2065	2065	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2065	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2066	Monitoring Report	Submit report Oct-Dec.	$17,940
50	2070	2070	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2070	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2071	Monitoring Report	Submit report Oct-Dec.	$17,940

DEFINITION OF TERMS

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.

Interagency Team

The "Interagency Team" consists of representatives from the following resource agencies; US Fish and Wildlife Service, National Marine Fisheries Service, US Environmental Protection Agency, Louisiana Department of Wildlife and Fisheries, State of Louisiana Office of Coastal Protection and Restoration, Louisiana Department of Natural Resources.

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.

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 rescue grass (*Bromus catharticus*).

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.

Non-Federal Sponsor (NFS)
This term refers to the Non-Federal Sponsor for the mitigation projects. In this case, the NFS is the Louisiana Coastal Protection & Restoration Authority Board (CPRAB).

Nuisance Plant Species
Nuisance plant species would 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 wouldow (*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 CEMVN in coordination with the NFS and Interagency Team.

Planting Season
This is generally considered to be the period from approximately December 15 through March 15, although some deviation from this typical range is allowed.

Target Year
This document often refers to a “Target Year.” Target Years are the years in which construction or monitoring activities are expected to occur, based on Target Year 1 as the year in which the initial mitigation construction activities are anticipated to be completed, which is presently estimated to occur in calendar year 2020. Target Year 2 (2022) is the year in which the final construction contract is expected to be completed. Target years increase from this time forward in concert with the corresponding calendar year.

CEMVN Hydrophytic Vegetation Criteria

Reference to satisfaction of the CEMVN 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. If the CEMVN approves and adopts a new list in the future, the new list would 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.

APPENDIX D: ADAPTIVE MANAGEMENT PLAN

ADAPTIVE MANAGEMENT PLAN

Supplemental Environmental Assessment #543a
Fritchie Brackish Marsh Creation Project

1.0. Introduction

This Adaptive Management (AM) Plan addresses only the Fritchie brackish marsh mitigation project feature, the only constructible feature of the Tentatively Selected Plan (TSP) documented in Supplemental Environmental Assessment #543a (SEA #543a). The TSP also includes additional mitigation features including the purchase of swamp mitigation bank credits. The TSP is designed to mitigate for impacts to intermediate, brackish and saline marsh and open water resulting from construction of the New Orleans to Venice (NOV) Hurricane Risk Reduction Project: Incorporation of Non-Federal Levees (NFL) from Oakville to St. Jude and the NOV Federal Hurricane Protection Levee, Plaquemines Parish, Louisiana. Detailed description of the Fritchie brackish marsh mitigation project feature as well as the purchase of mitigation bank credit mitigation features for the NFL NOV are included in the SEA #543a (Figure 1).

2.0. Adaptive Management Planning

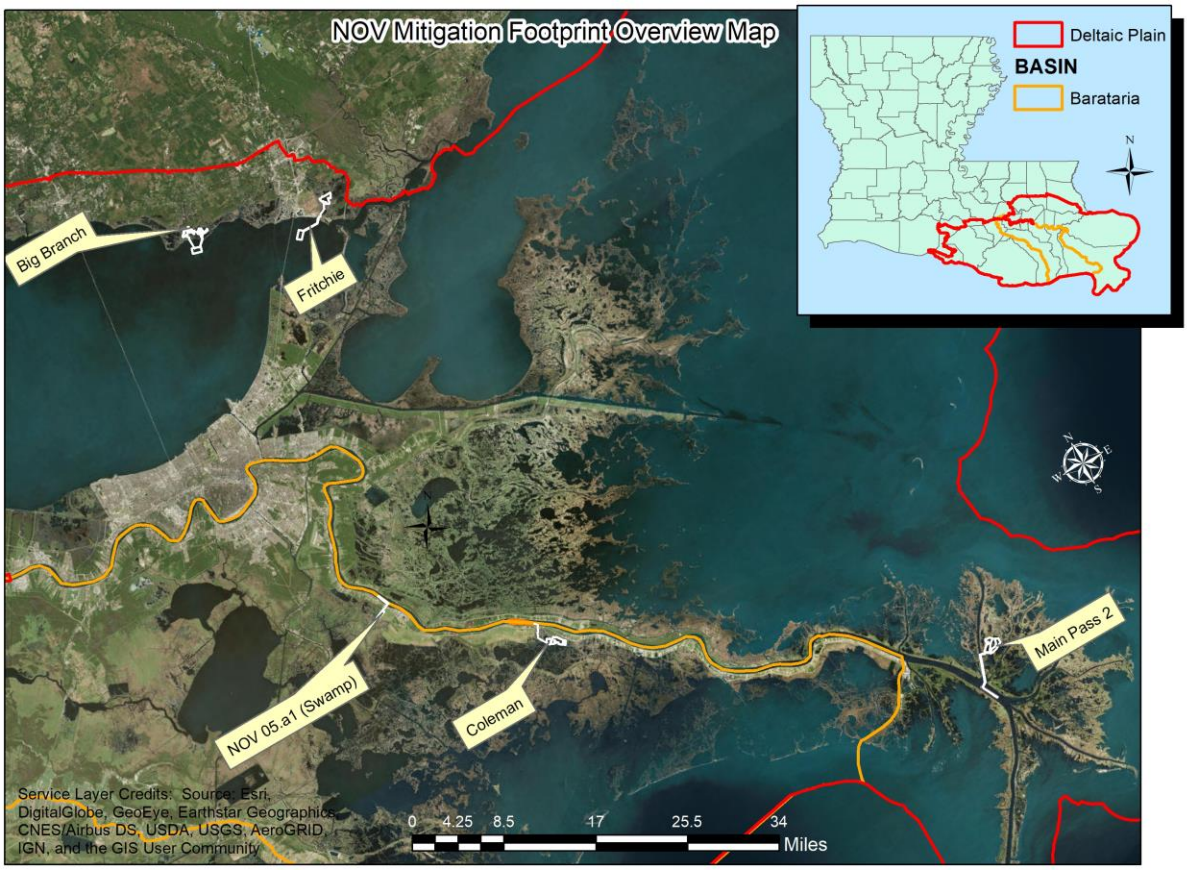
The Water Resources Development Act (WRDA) of 2007, Section 2036(a) and US Army Corps of Engineers (USACE) implementation guidance for Section 2036(a) (CECW-PC Memorandum dated August 31, 2009: “Implementation Guidance for Section 2036(a) of the Water Resources Development Act of of 2007 (WRDA 2007) – Mitigation for Fish and Wildlife and Wetland Losses”) requires AM and monitoring plans to be included in all mitigation plans for fish and wildlife habitat and wetland losses.

Adaptive Management is an iterative and structured process which reduces ecological and other uncertainties that could prevent successful project implementation and performance. AM establishes a framework for decision making which utilizes monitoring results and other information, as it becomes available, as a feedback mechanism used to update project knowledge and adjust management and mitigation actions to better achieve project goals and objectives.

Hence, early implementation of AM and monitoring better enables a project to succeed under a wide range of conditions which can be adjusted as necessary. Furthermore, careful monitoring of project outcomes not only helps to adjust project management operations to changing conditions, but also advances scientific understanding as part of an interative learning process.

AM is warranted when there are consequential decisions to be made, there are high uncertainties, when there is an opportunity to apply learning, when the value of a reducing uncertainty is high, and when a monitoring system can be put in place to reduce uncertainty.

Figure 1. The Tentatively Selected Plan includes the Fritchie brackish marsh project and purchase of Swamp Mitigation Bank Credits.



In cases where AM is not warranted, the project would still develop an AM Plan but the plan would clearly describe the rationale why AM actions would not be warranted. A project where AM is not warranted would still contain a Monitoring Plan to measure project success.

Adaptive management planning was incorporated into the project planning process and development and selection of the TSP as documented in SEA #543a. Adaptive management planning elements include:

1. Development of a Conceptual Ecological Model (CEM),
2. Identification of key project uncertainties and associated risks,
3. Evaluation of mitigation projects as candidate for AM, and
4. Identification of potential AM action (contingency plan) to better ensure the mitigation project meets identified success criteria.

The AM plan is a living document and will be refined as necessary. AM planning was conducted using the AM program framework structure developed by the CEMVN that includes both a Set-up Phase (Figure 2) and an Implementation Phase (Figure 3).

Figure 2. Set-up Phase of Adaptive Management Framework

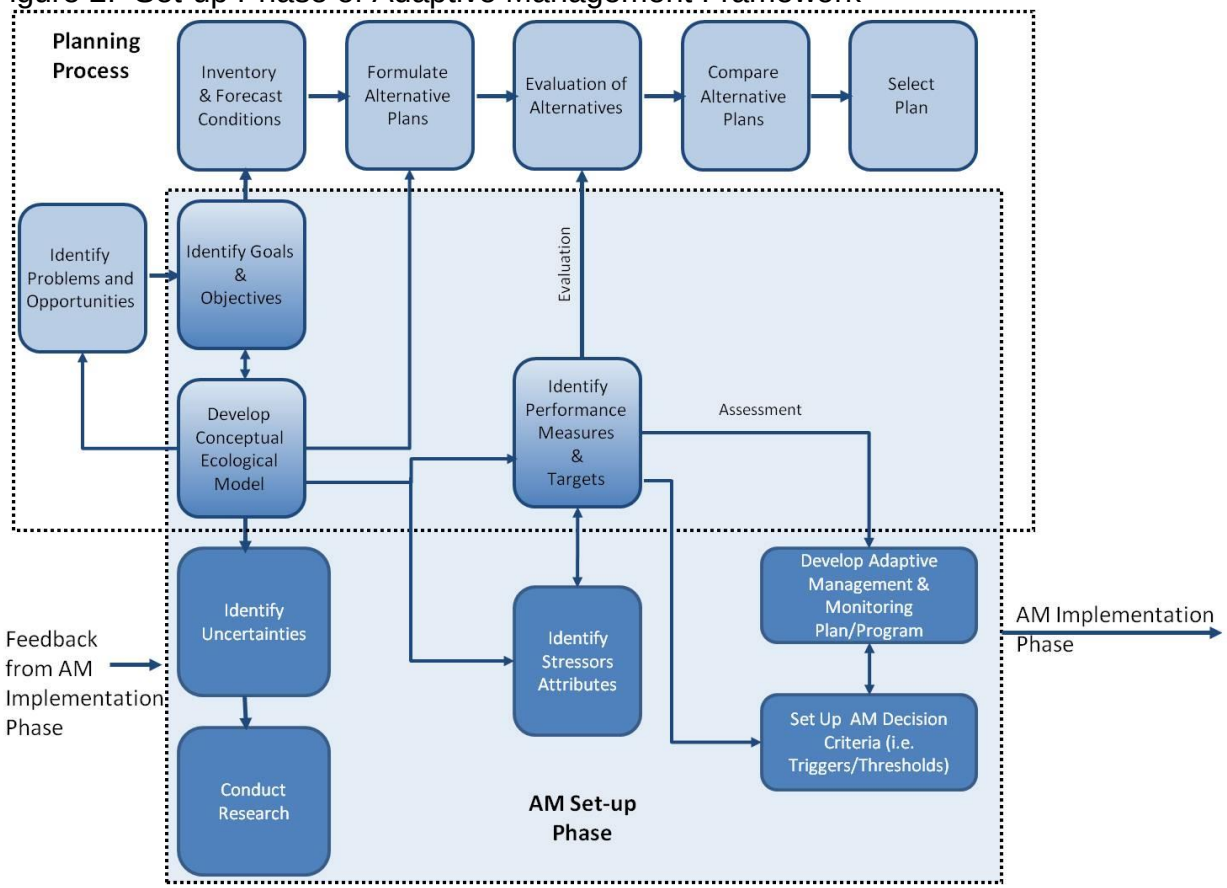
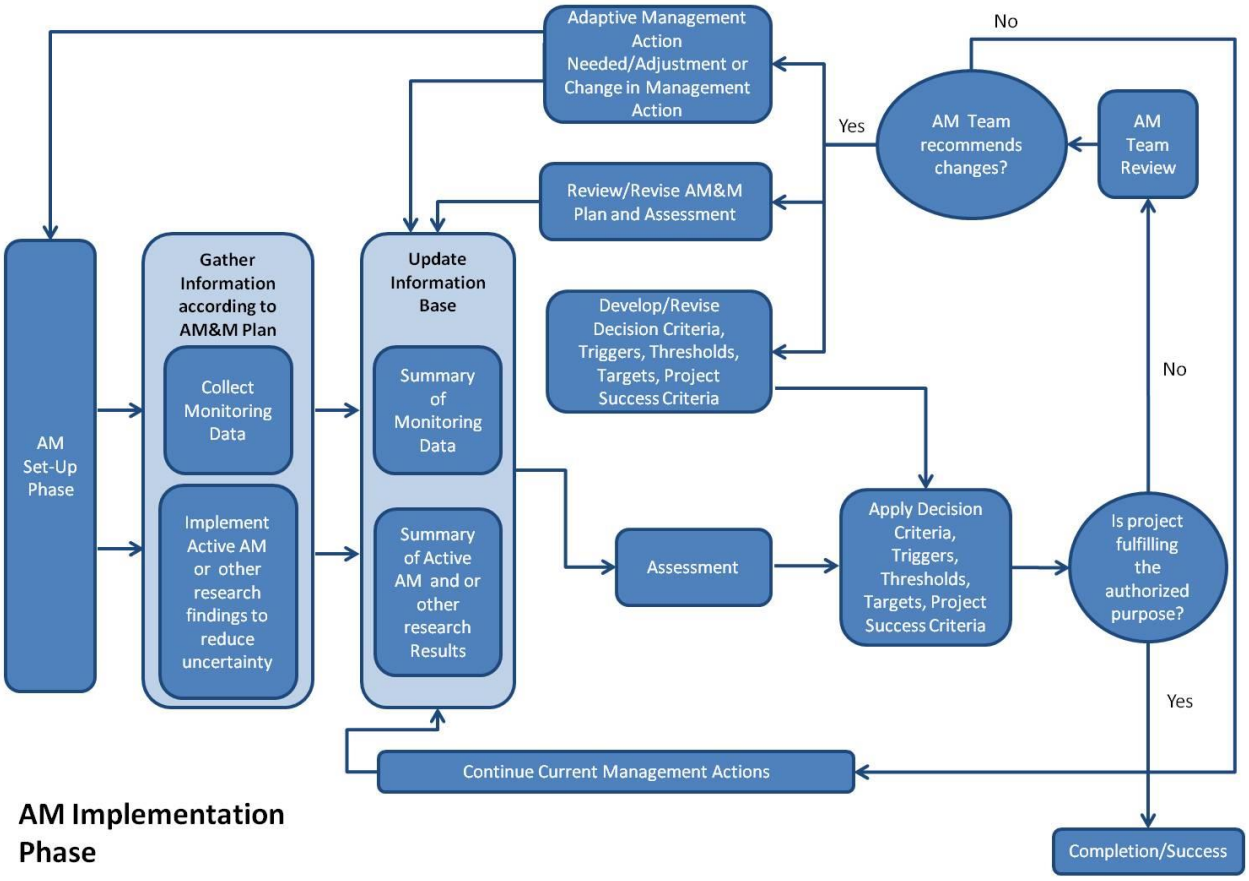


Figure 3. Implementation Phase of the Adaptive Management Framework



Consistent with the AM Set-up Phase, AM and Monitoring Plans were developed concurrently during the alternative plan formulation process. During the Implementation Phase, AM and Monitoring Plans will be put into action. The overall goal of the AM process is to design, construct, monitor, and assess the responses of the ecological system to implementation of the project relative to stated targets, goals, objectives, and project success criteria.

2.1. Conceptual Ecological Model

A CEM was developed to identify the major stressors and drivers affecting the proposed mitigation project in the SEA #543 (see table 1). The CEM does not attempt to explain all possible relationships of potential factors influencing the mitigation site; rather, the CEM presents only those relationships and factors deemed most relevant to obtaining the required acres/average annual habitat units (AAHU). Furthermore, this CEM represents the current understanding of these factors and would be updated and modified, as necessary, as new information becomes available. Stressors and Drivers identified in the CEM were identified during the Alternative Evaluation Process (AEP) process to evaluate relative risks associated with each alternative mitigation alternative.

Table 1. Conceptual Ecological Model

Alternative Project /Issues/Drivers	Flood Side Brackish Marsh	Flood Side Intermediate Marsh	Flood Side Brackish Marsh
Subsidence	-	-	-
Sea Level Rise	-	-	-
Runoff	-	-	-
Storm Induced	+/-	+/-	+/-
Salinity Impacts	+/-	+/-	+/-
Wave Action	-	-	-
Storm Surge	-	-	-
Vegetative Invasive Species	-	-	-
Herbivory	-	-	-
Hydrology	+/-	+/-	+/-
Topography (elevation)	+/-	+/-	+/-

Key to Cell Codes: - = Negative Impact/Decrease
+ = Positive Impact/Increase
+/- = Duration Dependent

2.2. Sources of Uncertainty and Associated Risks

A fundamental tenet underlying adaptive management is decision making and achieving desired project outcomes in the face of uncertainties. There are many uncertainties associated with restoration of the coastal systems. The alternatives considered were

evaluated and ranked to select the TSP with minimal risk and uncertainty. The project delivery team (PDT) identified the following uncertainties during the planning process.

A. Climate change, such as relative sea level rise, drought conditions, and variability of tropical storm frequency, intensity, and timing
B. Subsidence and water level trends at the mitigation sites
C. Uncertainty Relative to Achieving Ecological Success:
    i. Water, sediment, and nutrient requirements for Marsh
    ii. Magnitude and duration of wet/dry cycles for Marsh
    iii. Nutrients required for desired productivity for Marsh
    iv. Growth curves based on hydroperiod and nutrient application for Marsh
    v. Marsh litter production based on nutrient and water levels for Marsh
    vi. Marsh propagation in relation to management/regulation of hydroperiod for Marsh
D. Loss rate of vegetative plantings due to herbivory
E. Long-Term Sustainability of Project Benefits

Issues such as climate change and relative sea level change (i.e., combination of eustatic sea level change and regional subsidence) are significant scientific uncertainties for all coastal Louisiana ecosystem restoration and mitigation projects. These uncertainties were incorporated into the AEP. Specifically, relative sea level rise (RSLR) USACE EC-1165-2-212 provides an 18-step process for developing a “low”, “intermediate”, and “high” future relative sea level rise scenario and provides guidance to incorporate these potential effects into project management, planning, engineering, design, construction, operation and maintenance. The PDT, in accordance with EC-1165-65-2-212, evaluated the final array of alternatives under three potential future RSLR scenarios.

2.3. Adaptive Management Evaluation

The TSP project features were evaluated against the potential need for AM actions. However, prior to AM evaluation, the proposed alternatives were evaluated through the AEP to select a TSP with minimal risk and uncertainty. The AM Team, in coordination with the PDT, determined that uncertainties and risk elements identified for the majority of the TSP project features had been avoided during the AEP evaluation and project implementation process. To further reduce the remaining uncertainties and diminish potential future risks, a monitoring feedback loop was developed to help determine project success. This feedback loop included contingency actions if criterions were not achieved. The items listed below have already been incorporated into the NFL NOV Mitigation project implementation plan and OMRR&R plan to ensure the plan achieves success.

- Detailed planting Guidelines for Intermediate, Brackish and Saline Marsh
- Specified Success Criteria (i.e. mitigation targets)
- Invasive Species Control
- Supplementary plantings as necessary (contingency)
- Corrective actions to meet topographic success as required (contingency)

As part of SEA 543a, the project site was evaluated and planned through the AEP to develop a project with minimal risk and uncertainty. The items listed below were incorporated into the mitigation project implementation plan and Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) plans to minimize project risks.

- Detailed planting guidelines for intermediate, brackish, and saline marsh
- Specified success criteria (i.e., mitigation targets)
- Invasive species control
- Supplementary plantings as necessary (contingency)
- Corrective actions to meet topographic success as required (contingency)

Project features were evaluated against the CEM and sources of uncertainty and risk were identified to determine if there was any need for additional adaptive management actions. Based on the uncertainties and risks associated with the project implementation the following contingency/adaptive management actions have been identified to be implemented if needed to ensure the required AAHU are met:

Potential Action #1. Additional vegetative plantings as needed to meet identified success criteria.

Uncertainties addressed: A, B, C, D, E

Potential Action #2. Potential need to adjust the gapping in the permanent dikes in the future to maintain sufficient marsh hydrology and connectivity.

Uncertainties addressed: A, B, C, E

Actions 1 and 2 are not recommended as separate adaptive management actions since they are already built into the mitigation plan and success criteria identified in Appendix C. In the event that monitoring reveals the project does not meet the identified vegetation or topographic success criteria, additional plantings or construction activities would be conducted under the mitigation project.

The need for a planting event could trigger the need for additional mitigation monitoring. Hence, funding for three monitoring and reporting events was included as potential AM actions (i.e., two additional monitoring/reporting events for the one planting event). Costs were also included for invasive or nuisance plant eradication, if necessary. The total cost for the plantings, invasive species eradication, and monitoring/reporting AM operation and maintenance actions is estimated to be approximately $4,914,300 for the Fritchie brackish marsh mitigation project.

The USACE is responsible for the proposed mitigation construction and monitoring until the initial success criteria are met. Initial construction and monitoring would be funded in accordance with all applicable cost-share agreements with the non-Federal Sponsor (NFS). The USACE would monitor (on a cost-shared basis) the completed mitigation to

determine whether additional construction, invasive/nuisance plant species control, and/or plantings are necessary to achieve initial mitigation success criteria.

Once the USACE determines that the mitigation has met the initial success criteria, monitoring would be performed by the NFS as part of its OMRR&R obligations. If after meeting initial success criteria, the mitigation fails to meet its intermediate and/or long-term ecological success criteria, the USACE would consult with other agencies and the NFS to determine the appropriate management or remedial actions required to achieve ecological success.

The USACE retains the final decision on whether or not the project's required mitigation benefits are being achieved and whether or not remedial actions are required. If structural changes are deemed necessary to achieve ecological success, the USACE would implement appropriate adaptive management measures in accordance with the contingency plan and subject to cost-sharing requirements, availability of funding, and current budgetary and other guidance.

Due to the potential adverse impacts of placing additional fill to the mitigation site once plantings have become established, future sediment lifts are not currently considered as a viable remedial action. Instead, increasing the size of the existing mitigation project or mitigating the outstanding balance of the mitigation requirement elsewhere or through the purchase of mitigation bank credits would be options that could be considered through additional coordination with the NFS and the Interagency Team. However, such options would have to undergo further analysis in a supplemental NEPA document.

3.0. Monitoring for Project Success

Independent of AM, an effective Monitoring Program, consistent with WRDA 2007 Section 2036, is required to determine if Project management and mitigation outcomes are consistent with the identified success criteria. The Monitoring Plan, specific to the Fritchie brackish marsh mitigation project feature is presented in Appendix C. The monitoring plan identifies success criteria and targets, a schedule for the monitoring events, a monitoring report card, and the specific content for the monitoring reports that document progress towards meeting the success criteria.

The cost associated with implementing the Monitoring Program was estimated based on currently available data and information. The current estimate for set-up and implementing the Monitoring Program for the Fritchie brackish marsh mitigation project feature is $639,300. These costs include data collection, data assessment, data management, and development of required reports.

APPENDIX E: 404 PUBLIC NOTICE, 404(B)(1) EVALUATION & 401

US Army Corps of Engineers
New Orleans District

Public Notice

Notice of Availability of the Draft Supplemental Environmental Assessment (SEA) 543a entitled "Brackish Marsh and Swamp Mitigation for the New Orleans to Venice (NOV) Hurricane Risk Reduction Project: Incorporation of Non-Federal Levees (NFL) from Oakville to St. Jude and NOV Federal Hurricane Protection Levee, Plaquemines and St. Tammany Parishes, Louisiana"

Introduction. The U.S. Army Corps of Engineers, New Orleans District (CEMVN), has prepared Draft SEA 543a and it is available for your review. This public notice is being posted per the National Environmental Policy Act (NEPA) and the Council of Environmental Quality's Regulations for Implementing NEPA, Section 1506.6, Public Involvement and the Clean Water Act (CWA) Section 404 in accordance with provisions of Title 33 CFR Parts 336.1(b)(1) and 337.1, which establish policy, practices, and procedures to be followed on Federal actions involving the disposal of dredged or fill material into waters of the United States (application of Section 404(b)(1) of the CWA guidelines). Notice is hereby given that for the SEA 543a, an existing 401 Water Quality Certification (WQC 110520-01) remains valid to place fill material for the NOV mitigation. CEMVN has coordinated this proposed action with the Louisiana Department of Environmental Quality, Office of Environmental Services for a Water Quality Certification in accordance with statutory authority contained in the LAC 33:IX.1507.A-E and provisions of Section 401 of the Clean Water Act and no further action is required.

The purpose of the proposed action discussed in SEA 543a is to evaluate mitigation plan alternatives to mitigate for wetland impacts and compensate for habitat losses incurred during construction of the NOV project. The mitigation plan was formulated to provide compensatory mitigation for unavoidable impacts to intermediate, brackish and saline marsh, open water and swamp habitats assessed in the Final Supplemental Environmental Impact Statement (SEIS), NOV Hurricane Protection Levee, Plaquemines Parish, Louisiana; Final Environmental Impact Statement (EIS), NOV, Louisiana, Hurricane Risk Reduction Project: Incorporation of NFL from Oakville to St. Jude, Plaquemines Parish, Louisiana; SEA 537, NOV Hurricane Risk Reduction Project: Changes to the NFL Project, Oakville to St. Jude, Plaquemines Parish, Louisiana, and EA 543, New Right of Way and Mitigation for the NOV Hurricane Risk Reduction Project: Incorporation of NFL From Oakville to St. Jude and NOV Federal Hurricane Protection Levee, Plaquemines Parish, Louisiana. The Record of Decision (ROD) for both the SEIS and EIS was signed on 31 October 2011, the Finding of No Significant Impact (FONSI) for SEA 537 was signed on 25 March 2016, the FONSI for EA 543 was signed on 12 December 2017. The mitigation plan described in SEA 543a will provide compensatory mitigation for all intermediate, brackish and saline marsh, open water and swamp impacts. Evaluation of the proposed action includes application of the Section 404(b)(1) guidelines promulgated by the Administrator of the U.S. Environmental Protection Agency, through 40 CFR 230.

Location of Work. The proposed action is located in St. Tammany Parish, LA

Description of Work. The proposed action or tentatively selected plan (TSP) assessed in SEA 543a includes the creation of brackish marsh from open water within the Big Branch National Wildlife Refuge (NWR) Fritchie Marsh to mitigate for marsh and open water impacts and the purchase of swamp mitigation bank credits to compensate for habitat losses incurred during construction of the NOV project. The TSP, Fritchie brackish marsh project, would create up to approximately 350 acres of brackish marsh in an eroded open water area within the Big Branch NWR west of Chef Menteur Highway (Hwy), east of Highway 433, and south of Slidell. Approximately 258 acres of Lake Pontchartrain south west of the Fritchie marsh would be dredged to provide borrow material for Fritchie brackish marsh project. This TSP mitigates for the 33.9 Average Annual Habitat Units (AAHUs) of swamp and 106.9 AAHUs of brackish marsh wetland impacts.

Public Involvement. The purpose of this notice is to solicit comments from the public; Federal, State and local agencies and officials; Indian Tribes; and other interested parties. Copies of SEA 543a and supporting documents are available at http://www.mvn.usace.army.mil/About/Projects/NOV/ or upon request.

The 45-day public review and comment period for SEA 543a and CWA Section 404(b)(1) will begin on October 23, 2019 and end on December 6, 2019. Interested parties may express their views on the proposed action. All comments postmarked on or before the expiration of the comment period for this notice will be considered. Comments may be submitted to Laura Lee Wilkinson by email Laura.L.Wilkinson@usace.army.mil or by mail U.S. Army Corps of Engineers; Regional Planning and Environmental Division South; PDS-C; 7400 Leake Avenue, New Orleans, Louisiana 70118-3651.

*The following short form 404(b)(1) evaluation follows the format designed by the Office of the Chief of Engineers, (OCE). As a measure to avoid unnecessary paperwork and to streamline regulation procedures while fulfilling the spirit and intent of environmental statutes, the New Orleans District is using this format for all proposed project elements requiring 404 evaluation, but involving no significant adverse impacts.

PROJECT TITLE. Mitigation for the New Orleans to Venice (NOV) Hurricane Risk Reduction Project: Incorporation of Non-Federal Levees (NFL) from Oakville to St. Jude and the NOV Federal Hurricane Protection Levee, Plaquemines and St. Tammany Parishes, Louisiana

PROJECT DESCRIPTION. This project includes the enhancement of an open water site to mitigate for wetland impacts and compensate for habitat losses incurred during construction of the NFL-NOV project. The tentatively-selected alternative (TSA) is to purchase Swamp mitigation bank credits and to construct the Fritchie Brackish Marsh project. This tentatively-selected plan (TSP) mitigates for the 33.9 AAHUs of swamp and 106.9 AAHUs of brackish marsh (including intermediate marsh, saline marsh, and open water) impacts. The tentatively-selected mitigation plan (TSMP) would purchase swamp mitigation bank credits to mitigate for swamp impacts and construct the Fritchie Flood Side (FS) Brackish Marsh project to mitigate for the intermediate marsh, brackish marsh, saline marsh and open water impacts. No additional evaluation for this 404(b)(1) is necessary for the purchase of swamp credits from a mitigation bank because no new or additional impacts to wetlands or waters of the United States would occur from that TSA of the TSMP. This 404(b) (1) will instead evaluate impacts for the Fritchie brackish marsh creation project.

Fritchie FS Brackish Marsh. The proposed Fritchie FS brackish marsh project would involve the restoration of brackish marsh habitat from shallow open water within what has been identified as public land, more specifically, the Big Branch National Wildlife Refuge to mitigate for open water; intermediate, brackish, and saline marsh FS impacts incurred as result of the NFL NOV project improvements. The proposed project is located in St. Tammany Parish on the northshore of Lake Pontchartrain east and north of Old Spanish Trail Road and west of Chef Menteur Highway. Figures 1 and 2 provide an illustration of the proposed FS brackish marsh restoration mitigation feature. The proposed feature would be up to approximately 350 acres.

The water bottom in the Fritchie marsh creation site is approximate elevation -1.5 feet (ft) North American Vertical Datum 88 (NAVD88). Marsh restoration would require approximately 2,630,000 cubic yards (CY) of material hydraulically dredged from within a 258 acre borrow site in Lake Pontchartrain to construct a brackish marsh platform. Access to the proposed marsh creation area and transport of hydraulically dredged borrow material would be via Salt Bayou and unnamed waterways. Approximately 20,938 LF retention dikes would be constructed to elevation 4 ft NAVD88 with a 5 ft wide crown and 1:3 side slopes using approximately 150,000 CY of borrow obtained from within the marsh creation area. Once the construction of the retention dikes is complete, dredging of material from the Lake Pontchartrain borrow area would commence. The 258 acre borrow site would be dredged to a max elevation depth of -

20 ft NAVD88 with assumed water bottom of 8 ft NAVD88, the material pumped via pipeline, and placed within the marsh creation area to a maximum elevation of 2.5 ft NAVD88 in an effort to achieve an initial fill elevation of 1.5 ft NAVD88. After one year, it is estimated that the initial 2.5 ft NAVD88 fill elevation would settle to an approximate elevation of 1.5 ft NAVD88. The target marsh elevation for brackish marsh habitat would range from 1.0 ft to 1.5 ft NAVD88. The construction duration would be approximately 160 days for dredging and 2 years for settlement and degrading of retention dikes.

During the OMRR&R phase of the project, prior to transfer of monitoring responsibilities to the non-Federal Sponsor (NFS), the site would be monitored and surveyed to ensure the marsh creation area has met the initial success criteria. At a minimum, these actions would include periodic eradication of invasive/nuisance plants in the mitigation feature and mitigation monitoring and reporting. Approximately one year after the construction of the marsh platform is complete, once dewatering and settlement of the marsh platform has occurred, the retention dikes would be degraded to the target marsh elevation. Degraded dike material would be placed within the marsh creation area and adjacent to the retention dikes by marsh buggies to a maximum elevation of 1.0 ft NAVD88. In conjunction with the degradation the retention dikes, trenasses may be constructed by marsh buggy within feature if additional hydraulic conveyance is necessary. Trenasse width would be the width of marsh buggy. If the resulting depression is not adequate for minimal water flow, the marsh equipment could excavate material along the proposed trenasse alignment, not to exceed a 5-foot bottom width by 1-foot deep channel. The marsh feature is not expected to require planting, since it was assumed that native brackish marsh plants would colonize the marsh naturally. If brackish marsh species do not colonize the site on their own, brackish marsh plant species would be planted. The construction duration for degrading the dikes would be approximately 2 months. Additional duration would be necessary if trenasse construction and brackish marsh plantings are required.

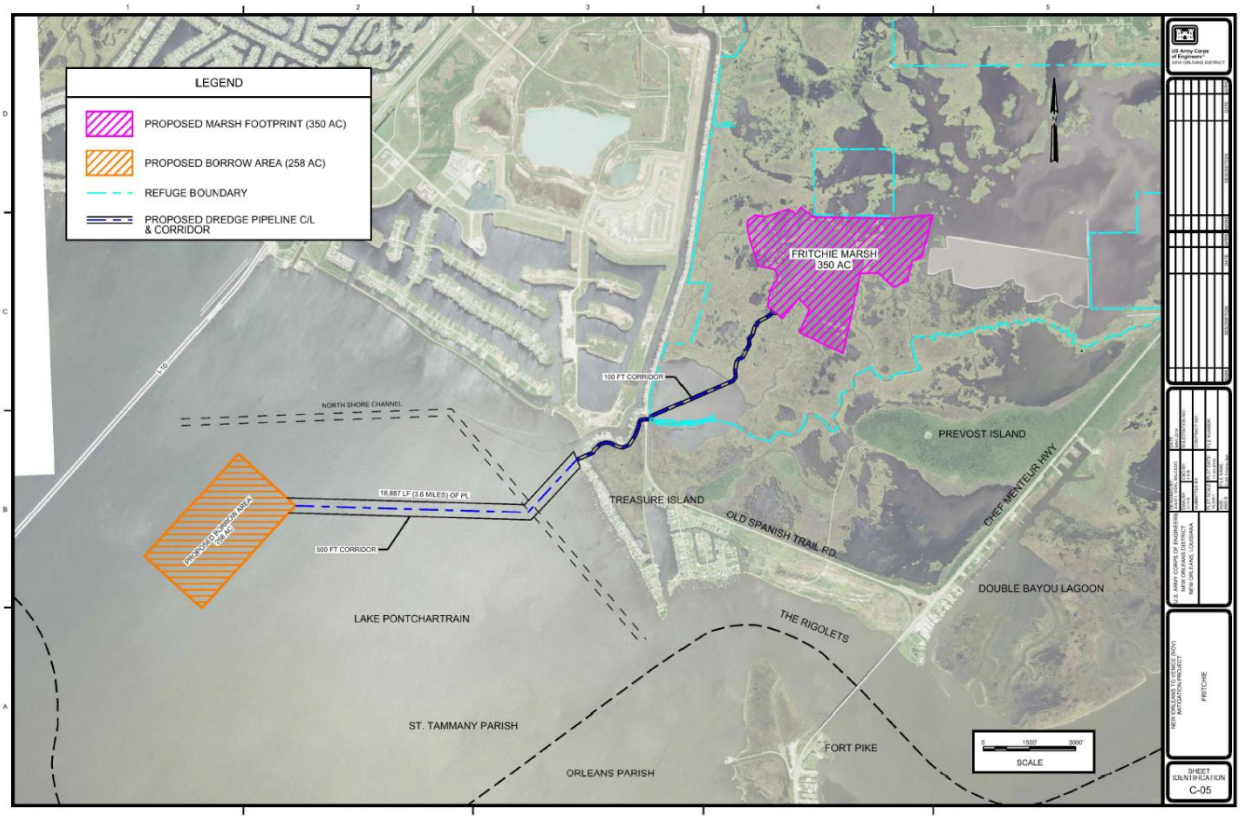


Figure 1: Proposed Marsh Footprint and Borrow Area

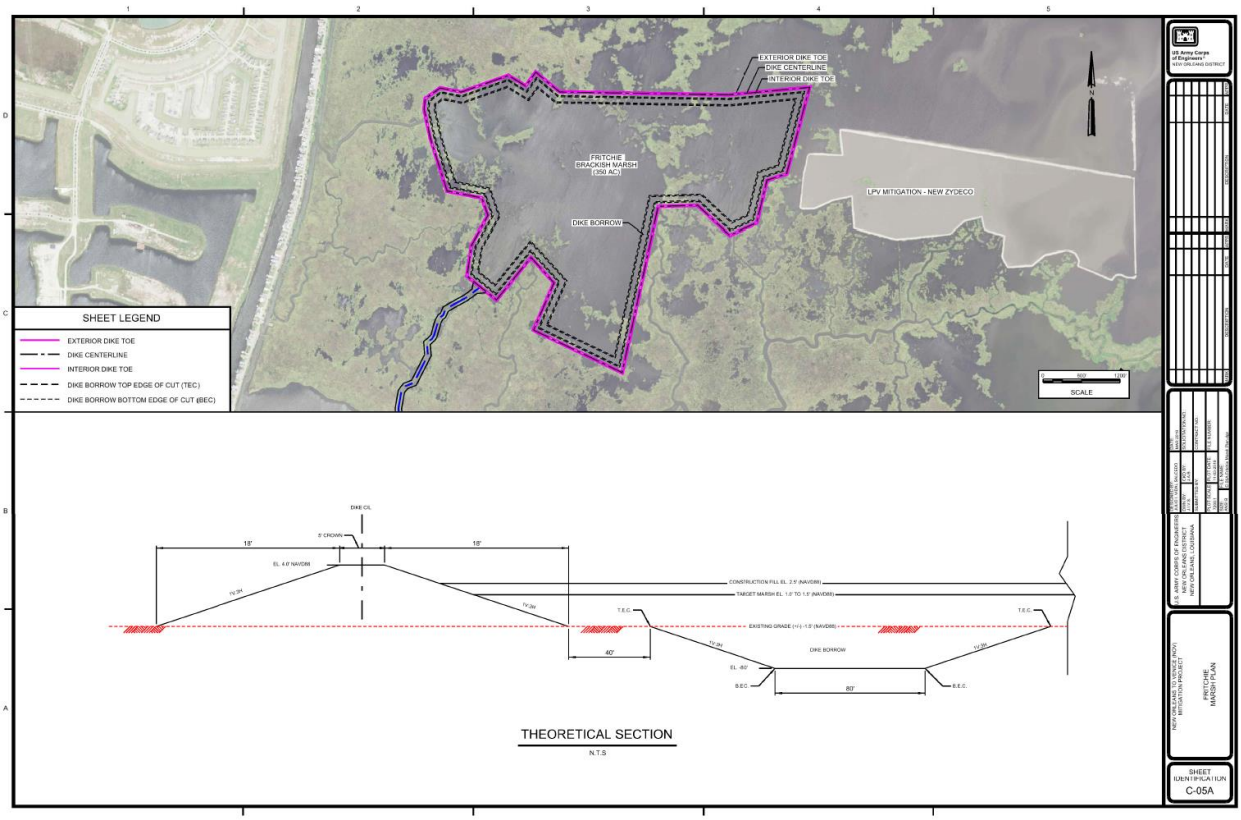


Figure 2: Marsh Plan and Dike Cross-section

1. Review of Compliance (§230.10 (a)-(d)). Preliminary[1] Final[2]

A review of this project indicates that:

a. The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose (if no, see section 2 and information gathered for environmental assessment alternative);

YES	NO*	YES	NO

b. The activity does not appear to: (1) violate applicable state water quality standards or

effluent standards prohibited under Section 307 of the Clean Water Act; (2) jeopardize the existence of Federally listed endangered or threatened species or their habitat; and (3) violate requirements of any Federally designated marine sanctuary (if no, see section 2b and check responses from resource and water quality certifying agencies);	FOR (1) ONLY YES	NO*	YES	NO
c. The activity will not cause or contribute to significant degradation of waters of the United States including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, esthetic, and economic values (if no, see section 2);	YES	NO*	YES	NO
d. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem (if no, see section 5).	YES	NO*	YES	NO

2. Technical Evaluation Factors (Subparts C-F).	N/A	Not Significant	Significant *
a. Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C).			
(1) Substrate impacts.		x	
(2) Suspended particulates/turbidity impacts.		x	
(3) Water column impacts.		x	
(4) Alteration of current patterns and water circulation.		x	
(5) Alteration of normal water fluctuations/ hydroperiod.		x	
(6) Alteration of salinity gradients.		x	
b. Biological Characteristics of the Aquatic Ecosystem (Subpart D).			
(1) Effect on threatened/endangered species and their habitat.		x	
(2) Effect on the aquatic food web.		x	
(3) Effect on other wildlife (mammals, birds, reptiles, and amphibians).		x	
c. Special Aquatic Sites (Subpart E).			
(1) Sanctuaries and refuges.		x	
(2) Wetlands.		x	
(3) Mud flats.		x	
(4) Vegetated shallows.		x	
(5) Coral reefs.		x	
(6) Riffle and pool complexes.		x	
d. Human Use Characteristics (Subpart F).			
(1) Effects on municipal and private water supplies.	x		
(2) Recreational and commercial fisheries impacts.		x	
(3) Effects on water-related recreation.		x	
(4) Esthetic impacts.		x	
(5) Effects on parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves.		x	

Remarks. Where a check is placed under the significant category, the preparer has attached explanation.

3. Evaluation of Dredged or Fill Material (Subpart G).[3]

a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material.

(1) Physical characteristics x

(2) Hydrography in relation to known or anticipated sources of contaminants x

(3) Results from previous testing of the material or similar material in the vicinity of the project x

(4) Known, significant sources of persistent pesticides from land runoff or percolation x

(5) Spill records for petroleum products or designated (Section 311 of CWA) hazardous substances x

(6) Other public records of significant introduction of contaminants from industries, municipalities, or other sources x

(7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities x

(8) Other sources (specify) ..... _____

Appropriate references: See memorandum (Encl 2)

b. An evaluation of the appropriate information in 3a above indicates that there is reason to believe the proposed dredge or fill material is not a carrier of contaminants, or the material meets the testing exclusion criteria.

YES NO*

4. Disposal Site Delineation (§230.11(f)).

a. The following factors, as appropriate, have been considered in evaluating the disposal site.

(1) Depth of water at disposal site x

(2) Current velocity, direction, and variability at disposal site x

(3) Degree of turbulence x

(4) Water column stratification x

(5) Discharge vessel speed and direction ..... _____

(6) Rate of discharge ..... _____

(7) Dredged material characteristics (constituents, amount, and type of material, settling velocities) x

(8) Number of discharges per unit of time ..... _____
(9) Other factors affecting rates and patterns of mixing (specify) ..... _____

Appropriate references: See memorandum (Encl 2)

b. An evaluation of the appropriate factors in 4a above indicates that the disposal site and/or size of mixing zone are acceptable.

YES NO*

5. Actions to Minimize Adverse Effects (Subpart H).

All appropriate and practicable steps have been taken, through application of the recommendations of §230.70-230.77 to ensure minimal adverse effects of the proposed discharge.

YES NO*

6. Factual Determination (§230.11).

A review of appropriate information as identified in items 2-5 above indicates that there is minimal potential for short- or long-term environmental effects of the proposed discharge as related to:

a. Physical substrate at the disposal site (review sections 2a, 3, 4, and 5 above). YES NO*

b. Water circulation, fluctuation and salinity (review sections 2a, 3, 4, and 5). YES NO*

c. Suspended particulates/turbidity (review sections 2a, 3, 4, and 5) YES NO*

d. Contaminant availability (review sections 2a, 3, and 4). YES NO*

e. Aquatic ecosystem structure and function (review sections 2b and c, 3, and 5). YES NO*

f. Disposal site (review sections 2, 4, and 5). YES NO*

g. Cumulative impact on the aquatic ecosystem. YES NO*

h. Secondary impacts on the aquatic ecosystem. YES NO*

*A negative, significant, or unknown response indicates that the project may not be in compliance with the Section 404(b)(1) Guidelines.

[1]Negative responses to three or more of the compliance criteria at this stage indicates that the proposed projects may not be evaluated using this "short form procedure". Care should be used in assessing pertinent portions of the technical information of items 2a-d, before completing the final review of compliance.
[2]Negative responses to one of the compliance criteria at this stage indicates that the proposed project does not comply with the guidelines. If the economics of navigation and anchorage of Section 404(b)(2) are to be evaluated in the decision-making process, the "short form" evaluation process is inappropriate.
[3]If the dredged or fill material cannot be excluded from individual testing, the "short form" evaluation process is inappropriate.

7. Evaluation Responsibility.

a. This evaluation was prepared by:

Name: Whitney Hickerson
Position: Hydraulic Engineer
Organization: U.S. Army Corps of Engineers, New Orleans District
Date: 04/10/2019

Name: Daniel Meden
Position: Biologist
Organization: U.S. Army Corps of Engineers, New Orleans District
Date: 04/10/2019

b. This evaluation was reviewed by:

Name: Eric Glisch
Position: Environmental Engineer
Organization: U.S. Army Corps of Engineers, New Orleans District
Date: 04/12/2019

8. Findings.

a. The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines X

b. The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines with the inclusion of the following conditions .. ___

c. The proposed disposal site for discharge of dredged or fill material does not comply with the Section 404(b)(1) guidelines for the following reason(s):

(1) There is a less damaging practicable alternative ..... ___
(2) The proposed discharge will result in significant degradation of the aquatic ecosystem..... ___
(3) The proposed discharge does not include all practicable and appropriate measures to minimize potential harm to the aquatic ecosystem..... ___

Date: _____

_____
Chief, Environmental Planning

US Army Corps of Engineers,
New Orleans District

To: File

From: Whitney Hickerson, CEMVN-ED-H

CC:

Date: 10 April 2019

Re: New Orleans to Venice (NOV), Louisiana, Hurricane Risk Reduction Project: Incorporation of Non-Federal Levees (NFL) From Oakville to St. Jude and New Orleans to Venice Federal Hurricane Protection Levee, Plaquemines Parish, Louisiana Project

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A short form 404 (b)(1) evaluation of the Federal actions for the subject project was performed by ED-H for water quality impacts. Existing data were used to make factual determinations for the subject actions. The following summarizes the review process and comments noted:

I. Subpart B – Review of Compliance

a. *230.10 (b) (1)*: After consideration of disposal site dilution and dispersion, there are no expected violations of State water quality standards from the proposed Federal actions.

II. Subpart C – Physical and Chemical Characteristics of the Aquatic Ecosystem

a. 230.20 - Substrate Impacts: This project includes the enhancement of an open water site to mitigate for wetland impacts and compensate for habitat losses incurred during construction of the NFL-NOV project. The tentatively-selected alternative (TSA) is to purchase Swamp mitigation bank credits and to construct the Fritchie Brackish Marsh project. This TSP mitigates for the 33.9 AAHUs of swamp and 106.9 AAHUs of brackish marsh (including intermediate marsh, saline marsh, and open water) impacts. The TSMP would purchase swamp mitigation bank credits to mitigate for swamp impacts and construct the Fritchie Flood Side (FS) Brackish Marsh project to mitigate for the intermediate marsh, brackish marsh, saline marsh and open water impacts. No additional evaluation for this 404(b)(1) is necessary for the purchase of swamp credits from a mitigation bank because no new or additional impacts to wetlands or waters of the United States would occur from that TSA of the TSMP. This 404(b) (1) will instead evaluate impacts for the Fritchie brackish marsh creation project.

During the OMRR&R phase of the project, prior to transfer of monitoring responsibilities to the non-Federal Sponsor (NFS), the site would be monitored and surveyed to ensure the marsh creation area has met the initial success criteria. At a minimum, these actions would include periodic eradication of invasive/nuisance plants in the mitigation feature and mitigation monitoring and reporting. Approximately one year after the construction of the marsh platform is complete, once dewatering and settlement of the marsh platform has occurred, the retention dikes would be degraded to the target marsh elevation. Degraded dike material would be placed within the marsh creation area and adjacent to the retention dikes by marsh buggies to a maximum elevation of 1.0 ft NAVD88. In conjunction with the degradation the retention dikes, trenasses may be constructed by marsh buggy within feature if additional hydraulic conveyance is necessary. Trenasse width would be the width of marsh buggy. If the resulting depression is not adequate for minimal water flow, the marsh equipment could excavate material along the proposed trenasse alignment, not to exceed a 5-foot bottom width by 1-foot deep channel. The marsh feature is not expected to require planting, since it was assumed that native brackish marsh plants would colonize the marsh naturally. If brackish marsh species do not colonize the site on their own, brackish marsh plant species would be planted. The construction duration for degrading the dikes would be approximately 2 months. Additional duration would be necessary if trenasse construction and brackish marsh plantings are required.

The placement of dredged material associated with the proposed action for Fritchie Marsh would result in short-term alterations in water circulation, depth, and current pattern in the vicinity of the four access channels and stockpile areas. In addition to alterations to some of the hydraulic properties, the dredged material discharges would adversely affect immobile organisms, as they would be smothered by material removed for access channels when it is being stockpiled adjacent to access channels. Following the backfill of stockpiled material into the access channel, organisms and submerged aquatic vegetation are expected to gradually reestablish from adjacent areas not affected by the dredging and disposal activities. Therefore, no long-term alterations in water circulation, depth, and current pattern are expected due to the placement of dredged material in conjunction with the proposed project.

b. 230.21 – Suspended Particulates/Turbidity Impacts: The proposed actions are not expected to directly result in significant, long-term impacts to water column suspended particulate and turbidity levels. Material dredged from Lake Pontchartrain would be hydraulically pumped into the marsh restoration area for mitigation area dike construction/degradation and mitigation area dredged material placement. Along with placement of material excavated for trenasse construction and access channel material stockpiling and backfilling, where suspended particulates would largely be allowed to deposit within the restoration area prior to discharge of effluent from these areas (restoration area will be designed to maximize retention of solids in dredged material slurry pumped into this area). Effluent turbidity is expected to be elevated compared to ambient surface waters outside of marsh restoration area; following restoration activities, turbidity levels of these waters are expected to return to background

conditions. Construction and rehabilitation of retention dikes would cause a temporary increase in suspended particulates and turbidity near the project location, but no significant long-term impacts are anticipated.

c. *230.22 – Water Column Impacts*: Impacts to the water around the project would be significant due to the project. With the placement of dredged material, the chemical and physical characteristics of the water would not change significantly. Dredging would temporarily affect the water column but would not produce any significant permanent impacts. The proposed disposal activity is therefore not expected to introduce levels of contaminants associated with adverse impacts to aquatic organisms into the water column. Material placement is expected to result in short-term and localized impacts to water column suspended particulates and turbidity levels.

d. *230.23 – Alteration of Current Patterns and Water Circulation*: Construction of the proposed project is expected to directly alter the substrate elevation within its footprint, which would subsequently alter water circulation, current pattern, and water level fluctuations within and adjacent to the project. These are considered to be beneficial effects associated with construction of marsh from dredged material.

Approximately one year after the construction of the marsh platform is complete, once dewatering and settlement of the marsh platform has occurred, the retention dikes would be degraded to the target marsh elevation. In conjunction with the degradation of the retention dikes, trenasses may be constructed by marsh buggy within feature if additional hydraulic conveyance is necessary.

e. *230.24 – Alteration of Normal Water Fluctuations/Hydroperiod*: Retention features are expected to result in localized alterations to water level fluctuations and hydroperiod by hindering water exchange between restoration areas and adjacent waters during construction activities. Following degradation of the retentions dikes, the project area hydrology would generally resemble that of adjacent existing marsh areas.

f. *230.25 – Alteration of Salinity Gradients:* No significant alteration of salinity gradients are expected due to the placement of dredged material in association with the proposed project. Following the backfill of access channels with stockpile material, the bathymetry in the vicinity of the Fritchie Marsh site would predominantly be restored to pre-project conditions.

III. Subpart F – Human Use Characteristics

a. *230.50 – Effects on Municipal and Private Water Supplies*: N/A.

IV. Subpart G – Evaluation of Dredged or Fill Material

a. *230.61 (a) – Considerations in Evaluating the Biological Availability of Possible Contaminants in Dredged or Fill Material:* See II(a) above

Appropriate references: See VIII below

b. An evaluation of the appropriate information in VI(a) above indicates that there is reason to believe the proposed dredge or fill material is not a carrier of contaminants, or the material meets the testing exclusion criteria: Yes

V. Disposal Site Delineation

a. 230.11 (f) – Considerations in Evaluating the Disposal Site:

b. An evaluation of the appropriate factors in V(a) above indicates that the disposal site and/or size of mixing zone are acceptable: Yes.

VI. Subpart H - Actions to Minimize Adverse Effects

All appropriate and practicable steps have been taken, through application of the recommendations of *230.70 – 230.77* to ensure minimal adverse effects of the proposed discharge: Yes.

VII. Factual Determinations

A review of appropriate information as identified in items I - VI above indicates that there is minimal potential for short- or long-term environmental effects of the proposed discharge:

a. Physical substrate at the disposal site (review sections II, IV, V, and VI above): Yes

b. Water circulation, fluctuation and salinity (review sections II, IV, V, and VI): Yes

c. Suspended particulates (review sections II, IV, V, and VI): Yes

d. Contaminant availability (review sections II, IV, and V): Yes

VIII. References

a. National Oceanic and Atmospheric Administration (NOAA). *SQuiRT Cards*. http://response.restoration.noaa.gov/environmental-restoration/environmental-assessment-tools/squirt-cards.html. Last accessed April 10, 2019.

b. Louisiana DEQ, Chapter 11 Surface Water Quality Standards, May 2017: *https://deq.louisiana.gov/assets/docs/Legal_Affairs/Water052017.pdf*

c. U.S. Coast Guard (USCG), April 2018. National Response Center. http://nrc.uscg.mil/. Last accessed April 10, 2019.

d. U.S. Environmental Protection Agency (USEPA). *National Recommended Water Quality Criteria – Aquatic Life Criteria Table*. https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table. Last accessed April 10, 2019.

e. U.S. Environmental Protection Agency (USEPA). 2016. *National Recommended Water Quality Criteria – Aquatic Life Criteria Table*. https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table. Last accessed April 10, 2019.

From: Elizabeth Hill
To: Meden, Daniel C CIV USARMY CEMVN (USA)
Subject: [Non-DoD Source] RE: Water Quality Certificate for NOV NFL (UNCLASSIFIED)
Date: Monday, May 13, 2019 4:47:53 PM

Daniel:

As a supplemental environmental assessment for EA 543, this application is valid under water quality certification, WQC 110520-01. The administrative record is amended to reflect the Mitigation for the New Orleans to Venice (NOV) Hurricane Risk Reduction Project: Incorporation of Non-Federal Levees from Oaksville to St. Jude and the NOV Federal Hurricane Protection Levee, Plaquemine Parish, Louisiana, Construction of the Fritchie Flood Side Brackish Marsh Creation Mitigation Project in St. Tammany Parish, Louisiana. No further action is required.

-----Original Message-----
From: Meden, Daniel C CIV USARMY CEMVN (USA) <Daniel.C.Meden@usace.army.mil>
Sent: Monday, May 13, 2019 2:56 PM
To: Elizabeth Hill <Elizabeth.Hill@la.gov>
Cc: Behrens, Elizabeth H CIV USARMY CEMVN (USA) <Elizabeth.H.Behrens@usace.army.mil>; Wilkinson Wolfson, Laura L CIV USARMY CEMVN (USA) <Laura.L.Wilkinson@usace.army.mil>
Subject: Water Quality Certificate for NOV NFL (UNCLASSIFIED)
Importance: High

CLASSIFICATION: UNCLASSIFIED

Good afternoon, Elizabeth.

I thought I had previously sent out this Application for Water Quality Certification for the title project: Mitigation for the New Orleans to Venice (NOV) Hurricane Risk Reduction Project: Incorporation of Non-Federal Levees from Oaksville to St. Jude and the NOV Federal Hurricane Protection Levee, Plaquemine Parish, Louisiana, Construction of Fritchie Flood Side Brackish Marsh Creation Mitigation Project in St. Tammany Parish, Louisiana. Please see the signed application for consideration as this is for a supplemental environmental assessment for EA 543.

Thank you!

Daniel Meden
Biologist, Coastal Environmental Planning RPEDS, New Orleans District
Office: 504-862-1014

CLASSIFICATION: UNCLASSIFIED

APPENDIX F: COMMANDER'S INTENT AND ALTERNATIVES EVALUATION PROCESS PLAN SELECTION CRITERIA

APPENDIX F

COMMANDER'S INTENT FOR NOV PROJECT, ENVIRONMENTAL MITIGATION

Purpose: Provide compensatory mitigation for unavoidable losses to fish and wildlife, wetlands and bottomland hardwood habitat consistent with relevant laws and policies.

Desired End State: Successfully mitigate for all unavoidable impacts associated with construction of the NFL NOV Project in a manner that is environmentally responsible, within the available budget, and timely. Implement the NFL NOV Project and associated compensatory mitigation plan(s) within the available and allocated appropriations.

Key Tasks:

1. Develop and implement compensatory mitigation plan(s) for unavoidable habitat losses associated with construction of the NFL NOV alignment.
2. Collaboratively engage Federal and State resource agencies and other stakeholders in the planning process, and draw from lessons learned during implementation of the project(s) described in EA #543.
3. Evaluate Corps-constructed projects, areas identified in the 2017 Louisiana State Master Plan, and mitigation bank and In Lieu Fee (ILF) credits consistent with relevant laws, guidance, and policies.
4. Compensatory mitigation project(s) will be:
    1) undertaken concurrent with the construction of authorized project levee reaches and features, or as quickly as possible thereafter;
    2) located within the same watershed that the impacts occur and where the mitigation is most likely to successfully replace lost functions and services or within the service area of a mitigation bank or ILF program that has been authorized to mitigate for impacts occurring in the Project's watershed; and
    3) self-sustaining once ecological success criteria are met to the maximum extent practicable.
5. Develop a fully integrated Project Management Plan (PMP) with a STRATCOM that effectively communicates the mitigation requirement for the NFL NOV Project, develop visualization means to effectively communicate the plan to the public, and keep internal USACE and external stakeholders engaged and updated.

AEP PLAN SELECTION CRITERIA

In brief, plan selection criteria reflect project goals. For instance, if the mission is to buy a car, goals may be to have a low start-up and operating cost. This scenario would have the criteria of retail cost and gas mileage. Note that constraints are not considered criteria (i.e. the retail cost of the car must be under $20K) because alternatives cannot be compared based on this information. Selection criteria vary widely depending on the problem, and can even vary within the umbrella of Civil Works. But for the purposes of the Plaquemines New Orleans to Venice (NOV) non-Federal Levee (NFL) Environmental Mitigation, the Project Delivery Team (PDT) has identified the following plan selection criteria:

- Risk & Reliability
- Environmental
- Time
- Cost Effectiveness
- Other Cost Considerations
- Watershed & Ecological Site Considerations

1.0 **Risk & Reliability:** One of the Chief's 4 priorities is to "employ risk-based concepts in planning, design, construction, operations, and major maintenance." Analysis of alternatives with regard to their risk and reliability is a paradigm shift from deterministic methodologies (e.g. National Economic Development, Benefit/Cost ratios, etc.) to more statistical, probabilistic terms. Though the policy and even the science is still in its nascent stages, enough is usually known to begin making risk-informed decisions, at least qualitatively. An Alternative Evaluation Process (AEP) was conducted to determine the type of hurricane and storm damage risk reduction features that would be built in a given polder defined risk and reliability primarily in terms of flood risk. The environmental mitigation AEP process has adapted this definition to better capture the risk-based decisions to be made for mitigation projects, such as project sustainability.

Risk is defined as probability multiplied by consequences. An example of risk would be a calculation of the relative chance of saltwater intrusion during the 50-year period of analysis multiplied by magnitude of anticipated plant mortality. Actions can be implemented to reduce risk, but because risk can never be completely eliminated, *residual risk* will remain.

Reliability refers to the chance that a component of the system will fail to perform its intended purpose as a function of the forces placed upon it. Reliability is often displayed using a fragility curve which describes the probability of failure as a function of an applied force. Many separate system components can be combined in an event tree to represent the reliability of a system.

Since these two factors are similar, it is best to consider them as one criterion: Risk & Reliability. Moreover, PDTs are only expected to perform Risk & Reliability analysis qualitatively. It is unlikely that PDTs will have fragility curves or event trees when analyzing alternatives. Instead, PDTs should analyze alternatives comparatively. For example, "Alternative 1 is *much more* reliable than Alternative 2, but only *slightly more* reliable than Alternative 3."

The below risk and reliability subcriteria (see Table B-1.0) were applied to each mitigation alternative, and qualitative and quantitative data for each alternative under each of the subcriteria are provided in Appendix B.

Table B-1.0: Risk and Reliability Subcriteria

Issue	Explanation
Uncertainty Relative to Achieving Ecological Success/Potential Need for Adaptive Management (Contingency) Actions	Sources of *uncertainty relative to achieving ecological success* include: (1) incomplete understanding of the system (environmental or engineering) to be managed or restored (e.g. hydroperiod, water depth, water supply, substrate, nutrient levels, toxic compounds) (2) imprecise estimates of the outcomes of alternative management actions (e.g. proven methodology, project complexity). *Evaluation of Potential Need for Adaptive Management (Contingency) Actions:* (1) Is there sufficient flexibility within project design and operation to permit adjustments to management actions? (2) Is the system (or components) to be restored or managed well understood (e.g. hydrology and ecology) and are management outcomes accurately predictable? (3) Do participants generally agree on the most effective design and operation to achieve project goals and objectives? (4) Are the goals and objectives for restoration understood and agreed upon by all parties?
Uncertainty Relative to Implementability	Includes implementability issues that are not captured under other selection criteria. Implementability means that the alternative is feasible from technical, environmental, economic, financial, political, legal, institutional, and social perspectives. If it is not feasible due to any of these factors, then it cannot be implemented, and therefore is not acceptable. An infeasible plan should not be carried forward for further consideration. However, just because a plan is not the preferred plan of a non-Federal sponsor does not make it infeasible or unacceptable *ipso facto.*
Adaptability	Ability to expand (or otherwise adapt) the measure to achieve/maintain ecological success
Long-Term Sustainability of Project Benefits	For marsh: Measured by % emergent marsh remaining in TY50, as calculated for Variable 1 in the Marsh WVA model. For Forested Habitat: Measured by the Habitat Suitability Index Value at TY50, which incorporates the suitability index of all WVA variables in the WVA model.
Self-Sustainability of Project Once Ecological Success Criteria Linked to NCC are Achieved	(1) Does the project utilize active engineering features (e.g., pumps)? (2) Anticipated OMRR&R Activities (3) Relative difficulty of OMRR&R
Risk of Exposure to Stressors/ Reliability & Resiliency of Design	(1) To what stressors will a given alternative be exposed (e.g. sea level rise, subsidence, saltwater intrusion during storm or drought, long-term salinity shift, herbivory, invasive species,

	inundation from storm surge, damage from storm-induced wave action, runoff from adjacent property which could alter chemical or nutrient balance of soils, altered hydrologic regime which could change habitat type or stress vegetation, non-storm wave energy)? (2) How is the project, as designed, likely to perform relative to stressors and/or how well is the project expected to return to functionality after exposure to stressors?

2.0 **Environmental:** The National Environmental Policy Act (NEPA) and other environmental laws require federal agencies to consider environmental impacts in their decision-making, identify unavoidable environmental impacts, and make this information available to the public. All evaluated alternatives should be investigated with respect to environmental consequences. The NEPA document records this investigation. However, since a recommended alternative needs to be identified prior to the Environmental Assessment (EA) being released for public review and comment, the PDT must attempt to analyze impacts using preliminary information, for those resources which could be impacted to differing degrees by each of the alternatives, focusing only on noteworthy differences between the alternatives. Environmental metrics are displayed in a data matrix in the Environmental Appendix G of this EAR.

3.0 **Time:** The PDT must analyze the likely implementation schedules for mitigation alternatives. Time metrics account for engineering and design, real estate acquisition, construction, and period to project turn-over (i.e. notice of construction completion). Time metrics include:

- Estimated time to construction contract award (measured from TSP milestone) presented below in Table F-1.1.

Table F-1.1. Time to Contract Award

Project Alternative	Total Duration
NF NOV 05a.1 Swamp	3 years, 2 months
Combination of NF NOV 05a.1 and Mitigation Bank	3 years, 2 months
General Mitigation Bank	8 months
Big Branch Brackish Marsh	2 years
Fritchie Marsh Brackish Marsh	2 years
Coleman Brackish Marsh	3 years, 2 months
DNWR Main Pass 2 Brackish Marsh	3 years, 2 months
Combination #1 Corps Constructed Project, Mitigation Bank and/or ILF	Range would be indicated

- Estimated time to notice of construction completion (NCC) milestone (measured from TSP milestone) presented below in Table F-1.2.

Table F-1.2. Time to NCC	
Project Alternative	**Total Duration**
NF NOV 05a.1 Swamp	4 years, 10 months
Combination of NF NOV 05a.1 and Mitigation Bank	4 years, 10 months
Big Branch Brackish Marsh	3 years 7 months
Fritchie Marsh Brackish Marsh	3 years 7 months
Coleman Brackish Marsh	5 years, 1 month
DNWR Main Pass 2 Brackish Marsh	3 years, 11 months
Combination #1 Corps Constructed Project, Mitigation Bank and/or ILF	Range would be indicated

4.0 **Cost Effectiveness**: Cost effectiveness analysis seeks to answer the question: given an adequately described objective, what is the least-costly way of attaining the objective? An analysis of cost effectiveness (annualized life cycle cost per average annual habitat unit) is presented in the Economics Appendix I of this EAR.

5.0 **Other Cost Considerations:** In most cases, a contract's Current Working Estimate (CWE) is based on the Programmatic Cost Estimate (PCE), which includes the additional request for funds received in the President's Budget. PDTs should not expect additional appropriations. Therefore, alternatives' costs, excluding escalation and contingency, should not exceed the NOV NFL CWE. Life cycle costs are a consideration when evaluating alternatives, but should not drive plan selection. Cost calculations for NOV NFL projects should include construction, engineering and design, construction supervision and administration, Lands, Easements, Rights-of-Way, Relocations, and Disposal Areas (LERRDs), and Operation Maintenance Repair Replacement & Rehabilitation (OMRR&R). Monitoring and adaptive management costs should be added for mitigation projects. Cost containment is an important consideration and PDTs should not only analyze an alternative's ability to stay within CWE, but also determine the least-cost alternative. Cost metrics include Total Project Cost and Average Annual Cost (and components thereof) which are quantified in the Economics Appendix I of this EAR.

For alternative comparison purposes, minimal OMRR&R activities are assumed for both the WVA modeling and for cost development. These are limited to: monitoring, invasive/nuisance plant eradication, maintenance/replacement of weirs/dikes and culverts, and access road maintenance. Once the TSMP is identified, assumptions may be changed for the TSMP elements to include adaptive management, additional OMRR&R activities, major rehabilitation, etc. in order to sustain ecological success or to address uncertainty. These new assumptions would be reflected in the advanced project design, revised WVA modeling for the TSMP, and revised TSMP cost estimates.

6.0 **Watershed & Ecological Site Considerations:** The PDT has added this selection criterion to address unique factors that apply to environmental mitigation projects that were not addressed in the previously listed selection criteria. Guidance from 40 CFR Part 230 discusses consideration of a mitigation site's role in the larger landscape and other ecological conditions. The subcriteria described in 6.1 and 6.2 below aim to capture this guidance. These subcriteria are considered for each alternative, and

the outcome of this consideration is shown in the Watershed & Ecological Site Considerations data matrix in Attachment 3 of this Appendix.

6.1 Watershed Considerations/Significance within the Watershed:

- Consistency with watershed plans (e.g. Coast 2050, LCA, LaCPR, State Master Plan 2017). 40 CFR Part 230 Compensatory Mitigation for Losses of Aquatic Resources includes guidance regarding the siting of mitigation projects. This guidance directs that mitigation should consider existing watershed plans within the project area. Therefore, the selection criteria considers how a given alternative relates to existing watershed plans within the project area. The four watershed plans considered are Coast 2050, LCA, LaCPR, and the 2012 State Master Plan. Coast 2050 is a strategic plan for coastal Louisiana, sponsored by the Louisiana State Wetlands Conservation and Restoration Authority and the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Task Force. It was adopted in 1999. The Coast 2050 report evolved into the Louisiana Coastal Area (LCA) Ecosystem Restoration Plan of 2004. In 2007, the Corps of Engineers, in partnership with the State of Louisiana, developed a preliminary report entitled The Louisiana Coastal Protection and Restoration (LaCPR) Preliminary Technical Report, which identified a range of coastal restoration and flood control measures for South Louisiana. Also in 2007, the state officially adopted Louisiana's Comprehensive Master Plan for a Sustainable Coast, which complements the LaCPR report. The 2007 Master Plan was updated and adopted in 2012 and at the time of this report the 2017 Master Plan is under development. Mitigation measures have been coordinated with the Louisiana Coastal Protection and Restoration Authority to ensure consistency with the State Master Plan.
- Contiguous with or within resource managed area (i.e. Federal, state, private mitigation bank or other restoration projects considered under Future Without Project condition)
- Located in parish of impact by habitat-type
- Critical features
    - critical geomorphic structures for ecosystem stability (critical geomorphic structures in the coastal ecosystem are those above sea level that protect lower elevation features and in many instances represent the first line of defense against marine influences and tropical storm events (i.e. restoration or preservation of natural ridges, lake rims, land bridges, gulf shoreline barrier islands, barrier headlands, and Chenier ridges)
    - LaCPR critical landscape features for storm damage risk reduction identified in Figure 7-17, Louisiana Coastal Protection and Restoration Final Technical Report and Comment Addendum, August 2009
- Habitat Linkages (e.g. wildlife corridors)

6.2 Ecological Site Considerations not captured in WVA (see Attachment 1 for WVA variables and definitions):

- Fragmentation within site boundary (swamp and marsh alternatives only)
- Site habitat connectivity to larger surrounding project area considering future land use trends (swamp and marsh alternatives only)

APPENDIX G: PUBLIC AND AGENCY COMMENTS

APPENDIX H: WVA MODEL ASSUMPTIONS

Wetland Value Assessment Methodology

The Wetland Value Assessment (WVA) methodology operates under the assumption that optimal conditions for general 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 yield an index of habitat quality. Habitat quality is estimated or expressed through the use of a mathematical model developed specifically for each wetland 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 Index) and different variable values, and; (3) a mathematical formula that combines the Suitability Index for each variable into a single value for wetland habitat quality. That single value is referred to as the Habitat Suitability Index, or HSI.

The following WVA models were used for the Plaquemines New Orleans to Venice and Non Federal Levee mitigation effort:

- Coastal Wetlands Planning, Protection and Restoration Act, Wetland Value Assessment Methodology, Bottomland Hardwood Community Model (4/4/11 model version).
- Coastal Wetlands Planning, Protection and Restoration Act, Wetland Value Assessment Methodology, Coastal Marsh Community Model for Fresh/Intermediate Marsh, Brackish Marsh, and Saline Marsh (1/19/12 model version 1.1).).
- Coastal Wetlands Planning, Protection and Restoration Act, Wetland Value Assessment Methodology, Swamp Community Model (4/4/11 model version).

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 coastal marsh WVA models consists of six variables: (1) percent of wetland area covered by emergent vegetation; (2) percent of open water area covered by aquatic vegetation; (3) marsh edge and interspersion; (4) percent of open water area $\leq$ 1.5 feet deep in relation to marsh surface; (5) salinity, and; (6) aquatic organism access. The swamp WVA model consists of four variables: (1) stand structure; (2) stand maturity; (3) water regime, and; (4) salinity. The bottomland hardwood model, which was used for both bottomland hardwood-wet and bottomland hardwood-dry features, consists of seven variables: (1) stand structure; (2) stand maturity; (3) understory/midstory; (4) hydrology; (5) size of contiguous forests areas; (6) suitability and traversability of surrounding land uses, and; (7) disturbance.

Values for the model variables are derived for existing conditions and are estimated for conditions projected into the future if no restoration efforts are applied (i.e., future-without-project), and for conditions projected into the future if the proposed restoration project is implemented (i.e., future-with-project), providing an index of quality or habitat suitability of the habitat for the given time period. The habitat suitability index (HSI) is combined with the acres of habitat to get a number that is referred to as “habitat units”. Expected project benefits are estimated as the difference in habitat units between the future-with-project (FWP) scenario and the future-without-project (FWOP) scenario. To allow comparison of WVA benefits to project

costs for overall project evaluation, total benefits are averaged over a 57-year period (the project life), with the result reported as Average Annual Habitat Units (AAHUs).

Site visits are being planned or have occurred to obtain existing conditions data for proposed mitigation features at the NF O5a.1 swamp site, the Flemming property swamp site, the Big Branch brackish marsh site, the Fritchie brackish marsh site, the Coleman brackish marsh site, the Defelice brackish marsh, and the Delta National Wildlife Refuge intermediate/brackish marsh mitigation sites. If direct access was not available for an area, then data was gathered from nearby areas where access was available and inferences were made concerning existing conditions present in areas. Existing conditions data for these sites were collected via observations of the site, and through estimations based on the aerial observations and working knowledge of similar habitats in the immediate area.

CEMVN and members of the Interagency Team developed general assumptions applicable to some of the variables contained in each of the three WVA models employed. These assumptions were primarily applicable to the assignment of values to and/or treatment of variables under the FWP scenario for the different types of mitigation proposed (ex. swamp restoration, BLH-wet restoration, etc.). The assumptions were used in running the WVA models in order to help ensure a uniform approach to model inputs.

For use in the WVA models, projected Relative Sea Level Rise (RSLR) estimates were developed according to EC 1165-2-211 (USACE, 2009), using reference gages situated within the deltaic plain project area. Data from Gage 8761724 near Grand Isle and Gage 85700 near Rigolets Lake Pontchartrain, were used to develop a low, intermediate, and high rate of Sea Level Rise (SLR). The resulting SLR data are provided in Appendix D. Based on MVD planning guidance, the Intermediate rate was used for the purpose of WVA modeling and alternative comparison.

The following is an explanation of the application of the RSLR projections, originally developed by evaluation of the Bayou Barataria at Barataria Gage (gage #82750), in the Wetland Value Assessment habitat modeling. Projected land loss rates were developed by USGS for the subunits within the NOV study area. A hyper-temporal approach used land/water data from 2006 to 2063 to develop a linear regression relationship to estimate recent historic land loss rates. These land loss rates were assumed to have occurred under a constant low SLR rate, and were assumed to be the future loss rates under the low RLSR Scenario. For the accelerated RSLR scenarios (i.e. Intermediate and High scenarios), the subunit land loss rates were gradually increased by multiplying the 2006-2063 annual wetland loss rates by adjustment factors developed by USFWS. The annual wetland loss rate adjustment factors were based on a positive relationship observed between wetland loss rates and RSLR rates from coastwide Louisiana non-fresh marshes. In this relationship, RSLR was calculated as the sum of subsidence per statewide subsidence zones 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. A linear regression was used to predict land loss rates from subsidence rates. According to this relationship, the land loss rate is zero when RSLR = 1.09 mm/yr.

Therefore, a constant was subtracted from all project-specific predicted RSLR rates such that the WVA model Target Year (TY) 1 rate = 1.09 mm/yr. The correlation formula describing the relationship was then used to predict a land loss rate increase for post-TY1 RSLR increases, and a value of 1.0 was added to the result to produce the wetland loss rate adjustment factor. Using these procedures, the base year TY1 would have an adjustment factor of 1.0 (i.e., no increase in land loss rate) and the factor would increase with time. This factor was multiplied by the historic (Low) land loss rate, thus increasing the land loss rates over time in proportion to increasing RSLR rates.

The complete WVA models and accompanying Project Information Sheets are available upon request by contacting the Environmental Manager, Laura Lee Wilkinson, via email (Laura.L.Wilkinson@usace.army.mil) or by phone (504-862-1212).

It is important to understand the basis of the WVA models and the associated approach used in developing 35% design plans for the mitigation features proposed at the various mitigation sites. The first step in the process involved generating preliminary design plans. The size of the mitigation features (mitigation polygons) used in the preliminary plans was based on assumed mitigation potentials (e.g. the net gain in AAHUs that would be generated by each acre of the mitigation feature, or AAHUs/acre) for the various proposed habitats and types of mitigation (restoration or enhancement). These assumed mitigation potentials were based on the results of WVA models run for similar mitigation projects in the general region, using an average of the mitigation potentials derived from these models. Table H-1 provides a listing of the assumed mitigation potentials. The size of mitigation features thus was determined by multiplying the assumed mitigation potential times the number of AAHUs necessary to compensate for habitat impacts to yield the estimated acreage required.

Table H-1. Mitigation potentials used in generating preliminary 35% design plans.

Proposed Habitat	Mitigation Type	Mitigation Potential (AAHUs/acre)
Fresh Marsh	Restore	0.5
BLH-Dry	Restore	0.21 to 0.4
BLH-Wet	Restore	0.43 to 0.6
Swamp	Restore	0.43 to 0.54
Brackish Marsh	Restore	0.27 to 0.45

Once the preliminary design plans were completed, the WVA models were run based on the mitigation features as depicted in these plans. The outputs from the WVA models were examined to determine the actual mitigation potential associated with these mitigation features, as opposed to the assumed mitigation potentials used to develop the preliminary plans. These actual mitigation potentials were then used to "reshape" or "resize" the proposed mitigation features at each mitigation site such that the features would provide the number of AAHUs required. In some cases, this exercise required increasing the size of one or more mitigation features or even adding mitigation features. In other cases, this process required reducing the size of mitigation features or even eliminating some mitigation features entirely.

As a hypothetical example, assume the number of AAHUs necessary to mitigate for brackish marsh impacts was 27 AAHUs. In preparing the preliminary design plans, the total acres of fresh marsh restoration features required was determined using the assumed mitigation potential of 0.27 AAHUs/acre. Hence, the total acres of marsh features proposed at a particular mitigation site was at least 100 acres (27 AAHUs needed / (0.27 AAHUs/ac.) = 100 ac.). Now assume the WVA model run for these marsh features at a particular mitigation site indicated the actual mitigation potential was 0.50 AAHUs/acre. Based on this, the total acres of marsh features actually needed at the mitigation site was 54 acres (27 AAHUs needed / (0.50 AAHUs/ac.) = 54 ac.), rather than the 100 acres used in the preliminary design plan. The preliminary design plan for the mitigation site would be revised in this example such that the proposed marsh features totaled at least 54 acres.

The final 35% design plans presented in the EAR represent the modified designs based on the "reshaping/resizing" process discussed above. These modifications resulted in significant changes to the proposed mitigation features depicted in the final 35% design plans as compared to the features depicted in the preliminary 35% design plans. In some cases, such changes not only involved revisions to the size of mitigation features but also involved spatial reconfigurations of mitigation features in an effort to optimize the design.

This scenario occurs in cases where one or more mitigation features shown in the preliminary 35% design plan were eliminated in the final 35% design plan due to the eliminated features not being necessary to meet the AAHU requirement.

The resizing process discussed above was based on the assumption that the mitigation potentials produced by the WVA models run using the preliminary design plans would not change substantially if these models were re-run using the final design plans. It was recognized that a WVA model run for a particular mitigation feature as shown in the final plan would indeed likely produce a mitigation potential value for the feature that is different than the mitigation potential value for the same feature as generated by the WVA model run based on the preliminary plan. However, it was assumed that the magnitude of this difference would be essentially the same for all mitigation alternatives as grouped based on the mitigation feature type. Thus, the ranking order of mitigation alternatives would not have changed had new WVA models been run based on the final 35% design plans. Also for the EAR because the levee construction project is undergoing minor design changes, a 10% buffer was added to increase project size to account for additional wetland impacts not yet quantified.

Table H-2 provides a summary of the results of the WVA models, indicating the mitigation potential for features within each mitigation site (expressed in net AAHUs generated per acre of mitigation feature) as well as the minimum acreage necessary to satisfy mitigation requirements. In certain cases this table indicates a range of mitigation potentials for a particular mitigation site. This is a result of there being multiple proposed mitigation features at the mitigation site, with the various mitigation features having differing mitigation potentials.

Table H-2. Mitigation potentials predicted by WVA models and minimum acreage needed to fulfill mitigation requirements.

Project Group (Mitigation Site)	Proposed Habitat & Type of Mitigation	Acres to be created w/10% buffer	Mitigation Potential (AAHUs/ac.)	Total Net AAHUs Generated
Swamp Impacts (mitigation required: 33.9 AAHUs)				
NF NOV 05a.1 Swamp	Swamp (restore)	86.72	0.43	33.9
Mitigation Bank	Swamp Credit Purchase	0 to 322	0.2 to 0.63	33.9
Brackish Marsh (includes Saline Marsh) Impacts (mitigation required: 106.9 AAHUs)				
Big Branch Brackish Marsh	Brackish Marsh (restore)	391.97	0.30	106.9
Fritchie Marsh Brackish Marsh	Brackish Marsh (restore)	261.31 to 350	0.45	106.9
Coleman Brackish Marsh	Brackish Marsh (restore)	379.32	0.31	106.9
Defelice Brackish Marsh	Brackish Marsh (restore)	345.85	0.34	106.9
Delta National Wildlife Refuge (DNWR) Main Pass 1 Brackish Marsh	Brackish Marsh (restore)	435.52	0.27	106.9
DNWR Main Pass 2 Brackish Marsh	Brackish Marsh (restore)	511.26	0.23	106.9
DNWR Delta Bend Brackish Marsh	Brackish Marsh (restore)	367.47	0.32	106.9
Mitigation Bank/ILF	Brackish Marsh Credit Purchase	0 to 228.97	0.2 to 0.63	106.9

WVA models have been applied in accordance with the guidance provided in "Memorandum for CEMVN-PD, Subject: Wetlands Value Assessment (WVA) Models, Guidance for Application, dated 21 March 2011" (Staebell, 2011). Spring 2012 versions of the WVA models were used, as addressed in the preceding section. All WVA models are approved for use and considered certified as planning models for USACE studies in accordance with EC 1105-2-412 (https://cw-environment.erdc.dren.mil/model-library.cfm?CoP=Restore&Option=View&Id=1 and Kitch, 2012). Attachment H-1 "Plaquemines New Orleans to Venice (NOV) and Non Federal Levee (NFL) Mitigation: Wetland Value Assessment Model Assumptions and Related Guidance (Revised/Updated: 31 January 2017)" gives a detailed description of the assumptions utilized for the WVA assessments for the Plaquemines mitigation project and was updated using lessons learned from reviews and sensitivity analysis made on the Lake Pontchartrain and Vicinity (LPV) and Westbank and Vicinity (WBV) Hurricane Storm Damage Risk Reduction System WVAs.

References

Kitch, Harry. 2012. Memorandum for Director, ECO-PCX, Subject: Wetland Value Assessment Models – Coastal Marsh Module Version 1.0 – Approval for Use. USACE, Planning and Policy Division, Directorate of Civil Works, Washington DC.

Staebell, Jodi. 2011. Memorandum for CEMVN-PD, Subject: Wetland Value Assessment (WVA) models, guidance for application. USACE, Mississippi Valley Division, Ecosystem Restoration Planning Center of Expertise, Vicksburg, MS.

US Army Corps of Engineers (USACE). 2009. EC 1165-2-211; Water policies and authorities incorporating sea-level change considerations in civil works programs. USACE, Washington, DC.

US Army Corps of Engineers (USACE). 2011. EC 1105-2-412; Assuring quality of planning models. USACE, Washington, DC.

ATTACHMENT H-1
Plaquemines New Orleans to Venice (NOV) and Non Federal Levee (NFL) Mitigation:
WETLAND VALUE ASSESSMENT (WVA) MODEL ASSUMPTIONS AND RELATED GUIDANCE
(Revised/Updated: 25 September 2018)

PREFACE

Several of the assumptions set forth in this document are based on mitigation implementation schedules. Many sections include specified WVA model target years (TYs) and calendar years applicable to assumptions, and a few sections outline anticipated mitigation construction (i.e. mitigation implementation) schedules. It is critical for the WVA analyst to understand that this document has not been revised to account for changes to the mitigation implementation/construction schedules. It is therefore imperative for the analyst to obtain the most recent mitigation implementation/construction schedule for a particular mitigation project from CEMVN prior to running WVA models. The analyst may then need to modify some of the WVA model assumptions and guidelines presented herein to account for differences between the present mitigation implementation/construction schedule and the schedule(s) that were assumed in generating this document.

This document should be applied when conducting WVA analyses for the Engineering Alternatives Report and the Tentatively Selected Plans (TSPs) selected for meeting Plaquemines NOV and NFL mitigation needs.

1.1 SWAMP MODEL – GENERAL ASSUMPTIONS

V1 – Stand Structure (percent closure or Cover: overstory, midstory, herbaceous)

Swamp restore, FWP scenario --
Assumptions applicable to restoration features built in existing open water areas and for any restoration features that require deposition of fill to achieve target grades. If construction involves substantial excavation and grading rather than filling, use the next assumptions table rather than this one.

TY	Year	Assumption
0	2021	Baseline conditions (site-specific)
1	2022	Class 1
2	2023	Class 1
3	2024	Class 2
15	2036	Class 6
35	2056	Class 6
50	2071	Refer to Note 1

Notes:
1. Over time, sea-level rise and possibly subsidence could adversely affect the hydrologic regime (increased flooding duration, increased depth of inundation). Salinity could increase in some areas concurrent with sea-level rise. These factors are anticipated to adversely affect plant growth and survival. Thus, cover in the midstory and herbaceous (ground cover) strata are anticipated to decrease over time, as could percent cover in the canopy stratum to a lesser degree. This potential reduction must be evaluated on a site-specific basis, factoring in considerations such as the proposed grade of the mitigation polygon relative to the projected sea-level rise elevation, changes in salinity, etc. As a general "rule of thumb", one may anticipate the stand structure to decrease from Class 6 in TY35 to Class 4 by TY50. However, it is emphasized that the decrease in class score over time must be evaluated on a case-by-case basis.

Swamp restore, FWP scenario --
Assumptions applicable to restoration features involving substantial excavation and grading as part of the initial construction efforts. If fill is required via pumping of sediments into the feature, use the preceding assumptions table.

TY	Year	Assumption
0	2021	Baseline conditions (site-specific)
1	2022	Class 1
2	2023	Class 1
15	2036	Class 6
35	2056	Class 6
52	2073	Refer to Note 1 in preceding assumptions table

General Notes:

- Include the cover accounted for by Chinese tallow and other invasive plant species when working with this variable (for FWOP scenario in all model target years and for FWP scenario at TY0).
- For swamp enhancement features, FWP scenario --- The evaluation of existing canopy, midstory, and understory will be done via field data collection for this variable. The growth of planted species will be estimated from a growth calculator that is based on pertinent research. Assumptions will have to be made about the correlation between plant growth and observed coverage. The values will be averaged to get a single HSI for this variable. Planted canopy species should not be factored into the overstory coverage estimate until TY15. They will be considered either as part of understory cover (earlier) or midstory cover (later) prior to TY15.

V2 – Stand Maturity (average DBH of canopy trees; plus total basal area all trees)

Swamp restore, FWP scenario --
Assumptions applicable to restoration features built in existing open water areas and for any restoration features that require deposition of fill to achieve target grades. If construction involves substantial excavation and grading rather than filling, use the next assumptions table rather than this one.

TY	Year	Assumptions – Density of Trees	Assumptions – DBH of Planted Trees
0	2021	Baseline conditions.	N/A
1	2022	0 trees/ac.	N/A
2	2023	538 trees/ac. (trees installed, initial density)	Cypress = 0.2” // Tupelo = 0.3”
3	2024	269 trees/ac. (50% survival of planted trees)	Cypress = 0.2” // Tupelo = 0.5”
4	2036	258 trees/ac. (48% survival of planted trees)	
15	2056	215 trees/ac. (40% survival of planted trees)	Cypress = 3.5” // Tupelo = 4.1”
35	2071	161 trees/ac. (30% survival of planted trees)	Cypress = 8.2” // Tupelo = 9.6”
50	2021	161 trees/ac. (30% survival of planted trees)	Cypress = 11.9” // Tupelo = 14.0”

Swamp restore, FWP scenario --
Assumptions applicable to restoration features, or the portions thereof, involving substantial excavation and grading as part of the initial construction efforts. If fill is required via pumping of sediments into the feature, use the preceding assumptions table concerning tree densities.

TY	Year	Assumptions – Density of Trees	Assumptions – DBH of Planted Trees
0	2021	Baseline conditions.	N/A
1	2022	538 trees/ac. (trees installed; initial density)	Cypress = 0.2” // Tupelo = 0.3”
2	2023	269 trees/ac. (50% survival of planted trees)	Cypress = 0.2” // Tupelo = 0.5”
3	2036	258 trees/ac. (48% survival of planted trees)	
15	2056	215 trees/ac. (40% survival of planted trees)	Cypress = 3.5” // Tupelo = 4.1”
35	2073	161 trees/ac. (30% survival of planted trees)	Cypress = 8.2” // Tupelo = 9.6”
52	2021	161 trees/ac. (30% survival of planted trees)	Cypress = 11.9” // Tupelo = 14.0”

Swamp restore, FWP scenario ---

- Assume 70% of the trees planted will be cypress and that 30% of the trees planted will be tupelo or other non-cypress species. Assume that this ratio will remain constant over time once the trees are planted.

Swamp enhance, FWP scenario ---

- Do not factor planted trees into the site DBH calculations until TY15. Prior to TY15, the planted trees will be considered as being in the understory or midstory strata.

General Notes:

- Factors such as sea-level rise and increased salinity over time may adversely affect the growth and/or survival of planted trees and existing trees. These factors must be considered when assessing this variable and may require adjustments to the assumed density of planted trees (as regards survival of trees) and the assumed dbh of planted trees indicated in the preceding tables. The FWS spreadsheet used to predict tree growth (reference the "BLH Site Ingrowth" spreadsheet) includes correction factors used to adjust typical growth rates to account for trees subject to stressors like excessive inundation or salinity. These correction factors should be used for target years in which one anticipates the stress factors may significant enough to affect tree growth. The stage in the project life that the effects become significant must be determined on a case-by-case basis.

V3 – Water Regime (flooding duration and water flow/exchange)

Swamp restore, FWP scenario --

Assumptions applicable to restoration features built in existing open water areas and for any restoration features that require deposition of fill to achieve target grades. If construction involves substantial excavation and grading rather than filling, use the next assumptions table rather than this one.

TY	Year	Assumption
0	2021	Baseline conditions (score based on existing hydrology)
1	2022	Duration = permanent // Exchange = none
2	2023	Duration = seasonal Refer to Note 1
15	2036	Duration = seasonal Refer to Note 1
35	2056	Duration = seasonal or semi-permanent Refer to Notes 1 and 2
50	2071	Duration = semi-permanent or permanent Refer to Notes 1 and 2

Notes:

1. Scoring of water flow/exchange component of hydrology must be based on site-specific conditions anticipated.
2. During the latter portions of the project life, flooding duration may be affected by sea-level rise. Swamp mitigation features are designed to have seasonal flooding once the features are constructed and have reached the desired target grade elevation. Sea-level rise will likely increase the duration of flooding. This effect will be site-specific and must be evaluated on a case-by-case basis. Sea-level rise will also likely affect the water flow/exchange. For a site that has limited exchange during early years, this may actually improve exchange for a period of years (ex. increase from low exchange in TY2 to moderate exchange in TY15). As the sea-level rise continues over time, however, the effect may be to reduce exchange (ex. decrease from moderate exchange in TY35 to low exchange in TY50). The degree to which sea-level rise affects flow/exchange over time must also be evaluated on a case-by-case basis.

Swamp restore, FWP scenario --

Assumptions applicable to restoration features, or the portions thereof, involving substantial excavation and grading as part of the initial construction efforts. If fill is required via pumping of sediments into the feature, use the preceding assumptions table.

TY	Year	Assumption
0	2021	Baseline conditions (score based on existing hydrology)
1	2022	Duration = seasonal Refer to Note 1
2	2023	Duration = seasonal Refer to Note 1
15	2036	Duration = seasonal Refer to Note 1
35	2056	Duration = seasonal or semi-permanent

		Refer to Notes 1 and 2
50	2071	Duration = semi-permanent or permanent Refer to Notes 1 and 2

Notes:
Notes 1 and 2 are the same as in the preceding table.

V4 – Mean High Salinity During the Growing Season (salinity re baldcypress & other trees)

General Notes:

- For current and near-term salinities, use the Coastwide Reference Monitoring System (CRMS) data (website http://www.lacoast.gov/crms%5Fviewer/) and USGS gage data (website http://waterdata.usgs.gov/la/nwis/rt) where available. Future salinities should be forecast using reasonable estimates and best professional judgment (in the absence of hydrologic and hydrodynamic modeling).

Other WVA Swamp Model Guidance

The WVA procedural manual and Swamp Community Model text advises that habitat classification data and aerial photos should be used to determine a conversion rate of swamp to marsh. Based on this evaluation, the guidance states that areas of swamp converting to fresh marsh should be evaluated as open water habitat using the fresh marsh model. The determination of appropriate conversion rates would be quite complicated in the project area. Hence, this issue will not be addressed as part of the WVA analyses.

1.2 NOTES REGARDING CONSTRUCTION & PLANTING OF SWAMP MITIGATION AREAS

Typical Estimated Project Construction Timelines -----

All projects – Begin construction around June 2021.

For swamp restoration areas built in existing open water features and for any other swamp restoration areas that require deposition of fill material as part of the construction process:

- June 2021 – Begin construction.
- Feb. 2022 – Complete construction.
- Feb. 2023 – Initial grade settles to desired target grade (1 year after end of construction). If applicable, perimeter dikes constructed are degraded or gapped at this time.
- Sept. 2023 – Install plants.

For swamp restoration areas involving extensive excavation and earthwork but that do not require deposition of fill as part of the construction process:

- June. 2021 – Begin construction.
- Dec. 2021 – End construction (subsequent grading may be required in some areas after an as-built survey completed in order to correct any deficiencies).
- Sept. 2021 – Install plants.

For swamp enhancement areas:

- June 2021 – Begin construction (includes start of invasive plant eradication).
- Oct. 2021 – End construction.
- Dec. 2021 – Install plants.

Note: All of the above timelines are preliminary and are subject to refinement as plans are refined for a particular mitigation site.

Planting of Swamp Restoration Areas -----

Initial plantings will be:

- Canopy species: plant on 9-foot centers (538 trees/acre); of total trees planted, approximately 70% will be cypress while the remaining trees will consist of tupelo and other non-cypress species.
- Midstory species (shrubs and small trees): plant on 20-foot centers (109 seedlings per acre).
- Stock size (minimums): Canopy species = 1 year old, 3 feet tall, 0.5" root collar; Midstory species = 1 year old, 3 feet tall.

Planting of Swamp Enhancement Areas -----

Initial plantings will follow the same guidelines as for swamp restoration areas regarding the general density of installed plants and the stock used. Where initial enhancement activities include the eradication of invasive and nuisance plant species, significant numbers of native canopy and/or midstory species may remain, but in a spatial distribution that leaves relatively large "gaps" in the canopy stratum and/or the midstory stratum. In such cases, areas measuring approximately 25 feet by 25 feet that are devoid of native canopy species should be planted and areas measuring approximately 45 feet by 45 feet that are devoid of native midstory species should be planted.

The typical guideline of having roughly 70% of the canopy species planted be cypress and 30% of the canopy species planted be tupelo and other non-cypress species may be altered in situations where several native trees remain after eradicating invasive/nuisance species. For example, if the remaining native trees are almost all cypress, then a greater proportion of the planted trees may consist of non-cypress species. Similarly, the composition of the species planted might also be altered to be more representative of the species composition present in nearby healthy swamp habitats.

1.3 SWAMP WVA MODEL – TARGET YEARS FOR MODELS

Typically use the target years specified below when analyzing swamp restoration polygons built in existing open water features and for any other swamp restoration polygons that require deposition of fill material as part of the construction process:

TY	Year	
0	2021	Baseline conditions (assume construction starts in 2021 even though anticipated start is late 2021)
1	2022	Initial construction activities begin and are completed. No plants installed. V1 = Class 1; V3 = permanent duration.
2	2023	Restoration feature settles to desired target grade. Any associated perimeter containment dikes are degraded or gapped. Plants installed. V1 = Class 1; V2 = 538 trees/ac.; V3 = seasonal duration.
3	2024	V1 = Class 2; V2 = 269 trees/ac.; V3 = seasonal duration.
4	2025	V1 = Class 2; V2 = 258 trees/ac.; V3 = seasonal duration.
15	2036	V1 = Class 6; V2 = 215 trees/ac.; V3 = seasonal duration.
35	2056	V1 = Class 6; V2 = 161 trees/ac.; V3 = seasonal or semi-permanent duration.
50	2071	End of project life for a HSDRRS mitigation feature. V2 = 161 trees/ac.; V3 = semi-permanent or permanent duration.

Typically use the target years specified below when analyzing swamp restoration polygons that do not require deposition of fill material as part of the construction process, and when analyzing BLH enhancement polygons:

TY	Year	
0	2021	Baseline conditions (assume construction starts in 2021 even though anticipated start is late 2021)
1	2022	Initial construction activities begin and are completed. Initial eradication of invasive & nuisance plant species is started and completed.

		Plants are installed (either in March or in December depending on construction activities. Appropriate planting season extends from November through February). V1 = Class 1; V2 = 538 trees/ac.; V3 = seasonal duration.
2	2023	V1 = Class 2; V2 = 269 trees/ac.; V3 = seasonal duration.
3	2024	V1 = Class 2; V2 = 258 trees/ac.; V3 = seasonal duration.
15	2036	V1 = Class 6; V2 = 215 trees/ac.; V3 = seasonal duration.
35	2056	V1 = Class 6; V2 = 161 trees/ac.; V3 = seasonal or semi-permanent duration.
50	2071	End of project life for a HSDRRS mitigation feature (adjusted end to be consistent with final TY used in impact WVAs). V2 = 161 trees/ac.; V3 = semi-permanent or permanent duration.

The user of these guidelines is cautioned that the construction schedule for proposed mitigation features may not follow the construction schedule assumed in the preceding sections. If this is the case, the model target years and their associated model assumptions may have to be adjusted accordingly.

1.4 BRACKISH MARSH MODEL – GENERAL ASSUMPTIONS

V1 – Percent of Wetland Area Covered by Emergent Vegetation

Marsh restore, FWP scenario:

Calendar Year	TY	Planted Marsh Platform (credit)	50% planting rate (credit)	Unplanted Marsh Platform (credit)
2021	0 (baseline)			
2022	1 (supratidal)	10%	5%	0%
2024	3 (supratidal)	25%	17.5%	15%
2026	5 (intertidal)	100%	50%	50%
2027	6 (intertidal)	100%	100%	100%

Note: Assume 7-ft center planting densities.

FWOP scenario:
2021 land rolled forward by applying 3 years of loss.

General Notes:
1. Typically, no existing project benefits are considered under FWOP. Project sites were typically selected to avoid overlap with existing non-diversion projects. In the case of existing diversions, either the effect of the diversion is assumed to be captured in the historic loss rate or the diversion would have to substantially fill in the project site FWOP to affect the net changes under V1 and V4, plus marsh creation gets optimal credit on its own if or until accretion does not keep pace with RSLR. Doing marsh creation in diversion areas may be more sustainable. However, not capturing that potential higher sustainability effect within the WVA would be more conservative for compensatory purposes (i.e., would generate less AAHUs and require more acres), but would not allow differentiation between sites with or without existing diversion influence where that influence is not captured in the historic loss rate.

   In limited cases, some existing project benefits are indeed considered under FWOP. Coordinate directly with CEMVN to determine whether any benefits from existing projects should be considered under the FWOP scenario.
2. Under the FWP scenario, begin applying land loss once the marsh fill has settled to the desired target grade (i.e. in TY2, one year after completion of initial fill placement). The USGS loss rates derived from a linear regression will be applied using a linear loss rate.
3. For the FWP scenario, one must subtract the acreage of interior borrow areas (borrow used to build dikes) from the total acreage of marsh land to derive the percentage of the total feature acreage that will count as marsh land. These borrow areas will have a greater settlement rate than will other portions of the mitigation feature. Seek engineering input as to what percentage of the borrow area footprint will settle to an elevation whereby the area would be considered as shallow open water rather than marsh land.

4. For the FWP scenario, one must also subtract the acreage of any trenasses initially constructed from the total acreage of marsh land to derive the acreage that will count as marsh land. These trenasses will count as shallow open water areas (assuming they are not excavated over 1.5 feet deep in relation to the marsh surface elevation).
5. For the FWP scenario, only those portions of earthen retention dikes that fall within the intertidal range can be included in the marsh restoration feature acreage. Portions of such dikes that are not degraded such that their crest elevation is equal to the final marsh target elevation cannot be counted in the acreage of the marsh feature, nor can portions of the dikes that will remain underwater. Similarly, the footprints occupied by proposed foreshore dikes (rock dikes) cannot be counted in the acreage of the marsh feature.
6. It is assumed that proposed marsh restoration features will not be planted. Instead, it is assumed that suitable vegetative cover will develop rapidly via natural recruitment and colonization of the feature.
7. For the FWP scenario, land loss will be assumed to begin once the restored marsh feature has settled to the desired target grade. This will occur 1 year after the initial construction (dike construction, placement of fill as slurry) has occurred.

V2 – Percent Open Water Area Covered by Submerged Aquatic Vegetation

Marsh restore, FWP scenario:

TY	Year	Assumption
0	2021	Baseline conditions (existing conditions).
1	2022	0%
3	2024	0%
5	2026	Same as baseline conditions.
6	2027	Increase baseline by 10%, then maintain this through TY25 (i.e. SI value plateaus).
25	2046	See guidance for TY6.
50	2071	25% of baseline conditions.

Marsh restore, FWOP scenario:
TY50 (2071) = 15% of baseline

Note:
Base the SAV cover estimates on the average cover during the peak of the growing season. SAVs do not include floating aquatics (but do include floating-leaf aquatics).

General Notes:
Brackish marshes also have the potential to support aquatic plants that serve as important sources of food and cover for several species of fish and wildlife. Although brackish marshes generally do not support the amounts and kinds of aquatic plants that occur in fresh/intermediate marshes, certain species, such as widgeon-grass, and coontail and milfoil in lower salinity brackish marshes, can occur abundantly under certain conditions. Those species, particularly widgeon-grass, provide important food and cover for many species of fish and wildlife. Therefore, the V_2 Suitability Index graph in the brackish marsh model is identical to that in the fresh/intermediate model.

V3 – Marsh Edge and Interspersion

Marsh restore, FWP scenario:

TY	Year	Assumption
0	2021	Baseline conditions (existing conditions).
1	2022	100% Class 5
3	2024	100% Class 3
5	2026	50% Class 3 and 50% Class 1
6	2027	100% Class 1

Notes:

When assigning SI values to variable V3, the percent marsh values (variable V1) should also be considered and interspersion classes developed accordingly. This could result in assumptions that differ from those indicated above.
Between TY6 and TY50, one must use best professional judgment coupled with land loss projections to determine appropriate SI values for variable V3.

V4 – Percent of the Open Water Area ≤ 1.5 Feet Deep (in relation to marsh surface)

Marsh restore, FWP scenario:

TY	Year	Assumption
0	2021	Baseline conditions (existing conditions).
1	2022	Any marsh lost becomes shallow open water.
3	2024	Any marsh lost becomes shallow open water.
5	2026	Any marsh lost becomes shallow open water.
6	2027	Any marsh lost becomes shallow open water.
50	2071	1/6th of the shallow open water becomes deep based on 0.5 feet of subsidence.

Marsh restore, FWOP scenario:

- Marsh lost between TY1 & TY50 becomes shallow open water.
- At TY50, 1/3 of existing shallow water becomes deep (based on subsidence rate used in determining SLR adjustment).

V5 – Salinity

Assume salinity scores will be the same for FWP and FWOP scenarios.

Assume salinity values will not change enough over time to force a shift from the fresh marsh model to the brackish marsh model.

Data Source --
CRMS site http://www.lacoast.gov/crms2/Home.aspx - Click on Basic Viewer under the Mapping link. Click on the nearest data station and then select the Water tab to get the salinities. The data are approximately average annual and most appropriate for the Brackish Marsh and Saline Marsh models if the period of record doesn't have an anomalous event (e.g., drought, unusual FW diversion operation). Average annual salinity may be accepted on a case-specific basis for the Fresh Marsh/Intermediate Marsh model as well.

V6 – Aquatic Organism Access (% wetland accessible & type of access)

Marsh restore, FWP scenario:

TY	Year	Assumption
0	2021	Baseline conditions (existing conditions).
1	2021	0.0001 (supratidal; retention dikes not gapped or degraded)
3	2024	0.0001 (supratidal; retention dikes have been gapped or degraded)
5	2026	1.0 (intertidal)
6	2027	1.0 (intertidal)
50	2071	1.0 (intertidal)

Note:
Suggested minimum standard for “gapping” containment dikes or similar dikes is no less than one 25-foot wide gap (bottom width) every 1,000 feet, with the “gap” excavated to the desired average marsh elevation. The preferred standard is one 25-foot wide gap (bottom width) every 500 feet, with the “gap” excavated to the pre-project elevation (i.e. the water bottom). If the project design does not provide the minimum gapping, then the

organism access values indicated above will need to be adjusted accordingly (re the maximum score attained as of TY5).

Marsh restore, FWOP scenario:
The structure rating is based on site specific, existing conditions and how those may change over time with land loss.

1.5 ADDITIONAL GUIDANCE FOR MARSH RESTORATION FEATURES PROPOSED IN AREAS WHERE THERE IS NO SIGNIFICANT LAND LOSS OVER TIME

The guidance provided herein is only applicable to proposed marsh restoration (marsh creation) features located in areas where data indicate no land loss will occur over the life of the mitigation project. For proposed marsh restoration features located in areas where there will be land loss, the general assumptions previously provided for use in running WVA marsh models will remain applicable.

V1 - % of Wetland Area Covered by Emergent Vegetation

Guidance for determining how much of the restored marsh feature will be land and how much will be shallow open water:

- Assume 1% of the total feature acreage will be open water in TY1 and 99% of the total acreage will be land.
- After TY1, increase the open water area by 0.075% each year using the total feature acreage to determine the acreage increase. Decrease the total acreage of land accordingly.

Example Calculation:
Assume the proposed marsh restoration feature encompasses 100 acres that can all be counted as marsh land. At TY1, the land area will be 99% of the 100 acres while the open water area will be 1% of the 100 acres. The increase in the open water area per year after TY1 and the decrease in the land area per year after TY1 will be: 0.075% X 100 acres = 0.075 acre per year.

Determination of land area and open water area:

TY	Land Acres	Open Water Acres	Open Water Calculation	Land Calculation
1	99.00	1.00	100 ac.*0.01	100 ac.*0.99
3	98.85	1.15	(1.0 ac. at TY1) + (2 yrs * 0.075 ac./yr.) = A	(99.0 ac. at TY1) - A
5	98.70	1.30	(1.0 ac. at TY1) + (4 yrs * 0.075 ac./yr.) = B	(99.0 ac. at TY1) - B
6	98.625	1.375	(1.0 ac. at TY1) + (5 yrs * 0.075 ac./yr.) = C	(99.0 ac. at TY1) - C
21	97.50	2.50	(1.0 ac. at TY1) + (20 yrs * 0.075 ac./yr.) = D	(99.0 ac. at TY1) - D
25	97.20	2.80	(1.0 ac. at TY1) + (24 yrs * 0.075 ac./yr.) = E	(99.0 ac. at TY1) - E
50	95.325	4.675	(1.0 ac. at TY1) + (49 yrs * 0.075 ac./yr.) = F	(99.0 ac. at TY1) - F

Determination of land area covered by emergent vegetation (marsh area):

TY	Land Acres	Marsh Acres	Marsh Area Calculation
1	99.00	9.9	99.0 ac. land * 0.10 (i.e. 10% of land covered by emergent vegetation)
3	98.85	49.425	98.85 ac. land * 0.50 (i.e. 50% of land covered by emergent vegetation)
5	98.70	98.70	98.70 ac. land * 1.00 (i.e. 100% of land covered by emergent vegetation)
6	98.625	98.625	98.70 ac. land * 1.00 (i.e. 100% of land covered by emergent vegetation)
21	97.50	97.50	97.50 ac. land * 1.00 (i.e. 100% of land covered by emergent vegetation)
25	97.20	97.20	97.20 ac. land * 1.00 (i.e. 100% of land covered by emergent vegetation)
50	95.325	95.325	95.325 ac. land * 1.00 (i.e. 100% of land covered by emergent vegetation)

Notes:

1. Values for TY0 will be based on existing conditions within the marsh restoration features.
2. The general assumptions applicable to determining the percentage of the marsh feature acreage (e.g. land acreage) that is covered by emergent vegetation remain the same as those set forth in the original fresh marsh WVA model guidance. These assumptions are: TY1 = 10%; TY3 = 50%; TY5 = 100%; TY6 = 100%.
3. Refer to the notes under the variable V1 assumptions for fresh marsh models concerning how features such as dikes, interior borrow areas, and constructed trenasses must be handled as regards the acreage of marsh land.

V4 – Percent of the Open Water Area ≤1.5 Feet Deep (relative to marsh surface)

Assume all of the open water areas that develop within the marsh feature (see variable V1 guidance) will be less than or equal to 1.5 feet deep. This assumption is applicable to target years 1 through 50.

3.5 PROJECT CONSTRUCTION NOTES FOR RESTORED MARSHES

The typical anticipated schedule for initial construction associated with the proposed marsh restoration features is as follows:

- June 2021 – Begin construction
- Feb. 2021 – Complete construction
- Feb. 2022 – Initial marsh grade settles to target grade (1 year after end of construction). Degrade containment dikes, and/or install “fish gaps”, and or establish gaps in other dikes.
- 2022 – Install plants (intermediate marsh and brackish marsh features only).

Note that none of the proposed fresh marsh restoration features will be planted. It was assumed that these areas

would be sufficiently vegetated via natural recruitment and colonization. Planting would only occur if sufficient vegetative cover (herbaceous) does not develop through natural processes.

Remember that it is very important to review the most detailed design plans available (e.g. initial 35% design plans (drawings), or 65%+ design plans), and the project description narrative associated with these plans. These descriptions and drawings contain important information for specific mitigation features/sites that will affect assumptions used in the WVA models.

3.6 MARSH MODELS – MODEL TARGET YEARS

Typically use the target years specified below when analyzing marsh restoration polygons built in existing open water features:

TY	Year	
0	2021	Baseline conditions (assume construction starts in 2021 even though anticipated start is late 2021)
1	2023	Initial construction activities begin and are completed. No plants installed. V1 = 10% credit (but see calcs for areas where there is no land loss). V2 = 0%. V3 = 100% Class 5. V4 = lost land becomes shallow water. V6 = 0.0001.
3	2024	Restoration feature settles to desired target grade. Any associated perimeter containment dikes are degraded or gapped. Plants installed in intermediate and brackish marsh features (no planting in fresh marsh features since none required). V1 = 50% credit (but see calcs for areas where there is no land loss). V2 = 0%. V3 = 100% Class 3. V4 = lost land becomes shallow water. V6 = 0.0001.
5	2026	V1 = 100% credit (but see calcs for areas where there is no land loss). V2 = baseline SAV cover. V3 = 50% Class 3 and 50% Class 5. V4 = lost land becomes shallow water. V6 = 1.0
6	2027	V1 = 50% credit (but see calcs for areas where there is no land loss). V2 = increase baseline SAV cover by 15%. V4 = lost land becomes shallow water. V6 = 1.0
25	2046	V2 = increase baseline SAV cover by 15%.
50	2071	End project life. V2 = 50% of baseline SAV (FWP). V3 = 100% Class 3. V4 = 1/6th of shallow open water becomes deep (FWP); but if no land loss, all open water remains shallow. V6 = 1.0

The user of these guidelines is cautioned that the construction schedule for proposed mitigation features may not follow the construction schedule assumed in the preceding sections. If this is the case, the model target years and their associated model assumptions may have to be adjusted accordingly.

4.1 RELATED TOPICS – LAND LOSS AND ACCRETION

LAND LOSS RATES

To remain consistent with the WVAs run for the levees (including those for the 57-year period of analysis), the linear loss rates must be calculated in the linear loss spreadsheet. This requires 1984 to 2010 mitigation analysis/land change data from USGS within which a particular time period is chosen depending on water levels taken at that time with efforts to pick years that allow for the greatest time during this range. Data selection is subject to interagency approval. The rate should be calculated in acres/year for integration with below methods on SLR and accretion.

The land loss rate applied to restored marshes will be 50% of the background (FWOP) loss rate. However, land loss rates will revert back to baseline rates after 10 inches of soil have formed/accreted above the initially created marsh platform. Based on input from Dr. Andy Nyman and other academics, plant roots extend downward a maximum of approximately 10 inches below the marsh surface. Consequently, when the plant roots are no longer in contact with the created platform, loss rates revert back to those of the adjoining marshes (i.e., background loss rate).

Derivation and Application of Land Loss Rates

A linear regression is applied to USGS' hyper-year (hyper temporal) data of the extended boundary. The slope of the regression line provides the acres of marsh lost for the extended boundary during the years of USGS analysis. By dividing the slope (marsh lost in acres) by the acreage at the beginning of the USGS evaluation period (e.g. 1984), the percent loss rate is determined for the extended boundary. (Note: USGS provides a percent loss rate by dividing the marsh lost in acres by the total acres of the extended polygon, which is why the percent loss rates are different.)

The project area FWOP loss rate (in acres/year) is determined by applying the extended boundary percent loss rate to the marsh acres in the project area at the beginning of the USGS period of analysis (e.g. 1984 in this case) under FWOP. The project area FWP loss rate is determined by multiplying the acres of the marsh creation area by the percent loss rate and dividing by 2 to apply the 50% reduction in loss for marsh creation.

ACCRETION

Utilize the following accretion rates when running WVA models:

- Fresh Marsh and Intermediate Marsh = 7.2 mm/year.
- Brackish Marsh = 7.7 mm/year.

Accretion is incorporated into determining when the background loss rate resumes within a created marsh area. Normally, the loss of mechanically created or nourished marsh is considered to be half of background loss rate. In the year when post-construction accretion exceeds 10 inches, the loss rate returns to the background loss rate. However, when created marshes are higher than natural marshes, there could be a delay in the loss rate change. Depending on the mechanically created marsh elevation post-construction, cumulative accretion assumes a 3-year settling period (marsh creation sites are assumed to achieve full functionality and vegetation coverage 3 years after construction).

Marsh collapse is a 10-year period that begins when the calculated cumulative accretion deficit reaches limits determined by staff working on the modeling for the 2012 Coastal Master Plan (see below). Typically, the collapse criteria are reached only during the High SLR scenario, however this generalization may not hold true in all cases.

Collapse Threshold Ranges Used in Master Plan Work

- Intermediate Marsh (cm): Low = 30.7; High = 38.0; Median = 34.4
- Brackish Marsh (cm): Low = 20.0; High = 25.8; Median = 22.9.
- Saline Marsh (cm): Low = 16.0; High = 25.0; Median = 20.5.

Collapse threshold selected as the median range for type of marsh indicated. First year of collapse is the

year when the Cumulative Accretion Deficit (inundation) is equal to or greater than the median range.

Accelerated Sea Level Rise

The land loss rates determined as described above, are for the constant historic or low SLR scenario (1.7 mm/yr). Based on water level gages and known historic SLR rates, the Corps has identified RSLR rates under the historic SLR scenario, and under the intermediate and high SLR scenarios. The intermediate and high SLR scenarios would result in gradually accelerating SLR rates and it is assumed that those scenarios would result in accelerating land loss rates. Using Corps-predicted water level rise, RSLR rates can be determined. RSLR rates are then converted into an annual adjustment factor that increases wetland loss rates in proportion to the magnitude of the RSLR rate. The annual wetland loss rate adjustment factors are based on a positive relationship observed between wetland loss rates and RSLR rates from coastwide non-fresh marshes. In this relationship, RSLR was calculated as the sum of subsidence per statewide subsidence zones (see Figure 1) 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.

Although this is approaching the limits of rigor for WVA, each of the above methods carry substantial averaging and compounding uncertainty. Users should be aware of the general limits of accuracy and avoid adding more complexity unless deemed necessary and reasonable.

4.2 RELATED TOPICS - GENERAL SHORELINE PROTECTION ISSUES

Hard structures (foreshore dikes, rock dikes, breakwaters) get credit for preventing 100% of loss from shoreline erosion as long as the structure is maintained. If it is not maintained, then a linear decrease in effectiveness must be assumed beginning after the end of the maintenance period. For example, if a rock dike is assumed to need a lift every 14 years but the last lift was at year 14 (TY14), then beginning TY28 (for the rock) it would have a linear decrease in effectiveness to the point of not reducing shoreline erosion at all by TY42.

Vegetative plantings get credit for reducing shoreline erosion by 50% until TY20. After TY20, the area would revert to 100% of the shoreline erosion rate.

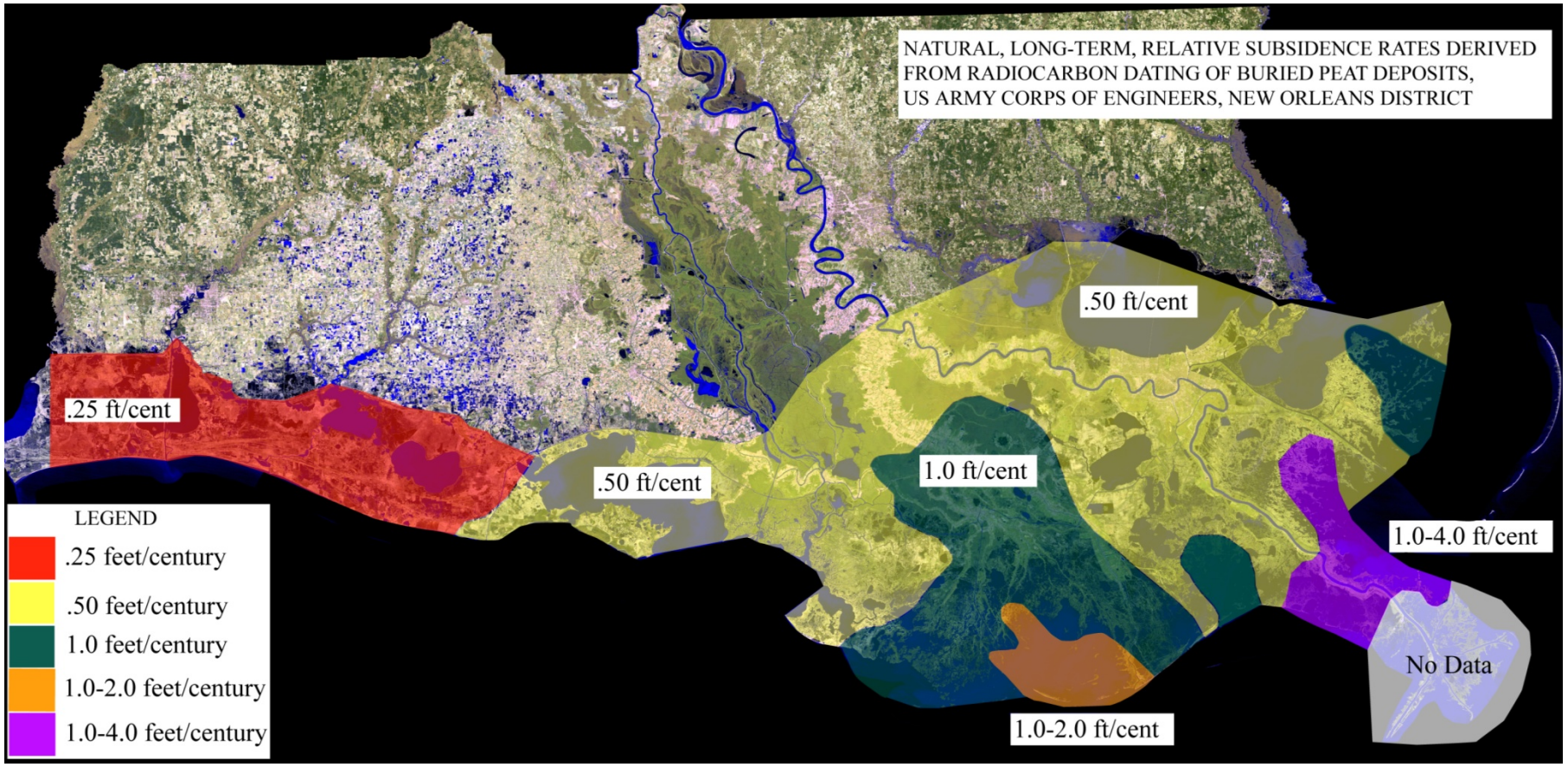

Figure 1. Long-term relative subsidence rates.

APPENDIX 1
Predicting Abrupt Marsh Collapse

(from MRGO Ecosystem Restoration Study methods doc, 3 Feb 2012)
Ronny Paille - USFWS

Research by Nyman et al. (1993) and Nyman et al. (2006) suggests that coastal marshes may undergo rapid degradation and conversion to open water beyond a critical rate of submergence/inundation. Louisiana Coastal Protection and Restoration Authority (CPRA) personnel working to model marsh loss for the 2012 Louisiana Coastal Master Plan have used statewide Coastal Reference Monitoring System data to develop plant productivity vs inundation (i.e., accretion deficit) relationships. From those relationships, they identified inundation ranges at the primary production low-end points (Table 1) to predicting onset of abrupt marsh collapse (Coastal Protection and Restoration Authority of Louisiana 2012). In this study, the median values by habitat type were used to predict onset of abrupt marsh collapse.

Table 1. Cumulative accretion deficits assumed to initiate marsh collapse.

Marsh Type	Range Low Limit (cm)	Range High Limit (cm)	Range Median (cm)
Intermediate	30.7	38.0	34.4
Brackish	20.0	25.6	22.8
Saline	16.0	25.0	20.5

It is assumed that it will take 10 years for the collapsing wetland landscape to completely convert to open water (the 10-year period was assumed to account for wetlands of varying elevations). These values incorporated the average area accretion rate of 7.4 mm per year (Table 2).

Table 2. Study area accretion measurements.

Site	Date	Wetland Type	Method	Accretion rate (cm yr-1)	Source
Breton Sound	1963-1999	Freshwater	^{137}Cs	0.65 ± 0.18	DeLaune and Pezeshki, 2003
Caernarvon diversion	1999	Freshwater	feldspar	1.57 ± 0.05*	Lane et al., 2006
Violet diversion	1999	Saline	feldspar	0.44 ± 0.01*	Lane et al., 2006
Central Wetlands				0.47	U.S. Army Corps *
St. Bernard Parish (Shell Beach)	1963-1992	Saline	^{137}Cs	0.54 ± 0.13	DeLaune et al., 1992
Rigolets	1963-1992	Saline	^{137}Cs	0.77 ± 0.09	DeLaune et al., 1992
Caernarvon	1963-1992	Freshwater	^{137}Cs	0.75 ± 0.12	DeLaune et al., 1992
				Avg. = 0.74	

** personal communication, Mr. Del Britsch, New Orleans District, U.S. Army Corps of Engineers*

Using this average accretion rate and the water level increases associated with sea level rise (post the SLR baseline year of 2011, see Figure 1), the cumulative accretion and cumulative water level rise were calculated for each year within the project life. The accretion deficit may then be calculated as the difference between the cumulative water level rise and the cumulative accretion. Based on those calculations, the collapse criteria were determined (Table 3).

Figure 1. Shell Beach predicted relative sea level rise estimates.

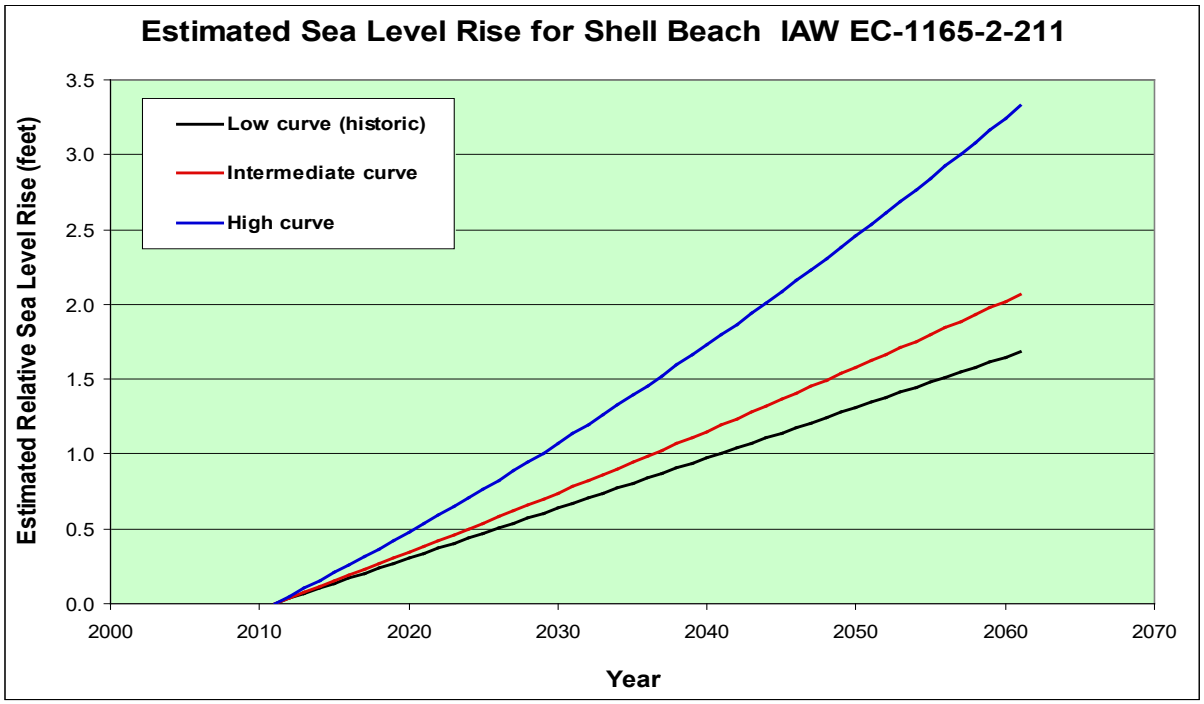

Table 3 Years when marsh collapse is predicted to begin.

SLR Scenario	Year Marsh Collapse Begins		
	INT marsh	BR marsh	SAL marsh
Med SLR	**	2058	2054
High SLR	2044	2035	2033

*** collapse occurs beyond the 50-year project life*

According to this analysis, marsh collapse would begin in 2033 and 2035 for saline and brackish marshes, respectively, under the High RSLR scenario. Under the medium SLR scenario, collapse would begin in 2054 and 2058 for saline and brackish marshes, respectively.

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APPENDIX I: ABBREVIATIONS AND ACRONYMS

LIST OF ABBREVIATIONS AND ACRONYMS

AAHUs	Average Annual Habitat Units
ACS	American Community Survey
AEP	Alternatives Evaluation Process
AM	Adaptive Management
APE	Area of Potential Effect
ATV	All-terrain vehicle
BA	Biological Assessment
BG	Block Group
BLH-Dry	Dry Bottomland Hardwoods
BLH-Wet	Wetland Bottomland Hardwoods
BMP	Best management practice
CAA	Clean Air Act of 1970
CAR	Coordination Act Report
CDBG	Community Development Block grant
CEI	Coastal Environments, Inc.
CEMVK	US Army Corps of Engineers, Mississippi Valley Division Vicksburg District
CEMVM	US Army Corps of Engineers, Mississippi Valley Division Memphis District
CEMVN	US Army Corps of Engineers, Mississippi Valley Division New Orleans District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIAP	Coastal Impact Assistance Program
CPRA	Coastal Protection and Restoration Authority
CT	Census Tract
CY	cubic yards
CWA	Clean Water Act
CWPPRA	Coastal Wetlands Planning, Protection, and Restoration Act
CZD	Coastal Zone Determination
CZMA	Coastal Zone Management Act
dB	Decibel
dBA	A-weighted decibel
DCAR	Draft Fish and Wildlife Consolidation Act Report
DNL	Day-night average sound level
EA	Environmental Assessment
EC	Engineering Circular
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
ER	Engineering Regulation
ESA	Endangered Species Act of 1973

ESRI	Environmental Systems Research Institute
FEIS	Final EIS
FMC	Fishery Management Council
FONSI	Finding of No Significant Impact
FS	Flood Side
FWCAR	Fish and Wildlife Coordination Act Report
FWOP	Future without Project
FWP	Future with Project
GIWW	Gulf Intracoastal Waterway
GMFMC	Gulf of Mexico Fisheries Management Council
HAPC	Habitat Areas of Particular Concern
HPL	Hurricane Protection Levee
HSDRRS	Greater New Orleans Hurricane and Storm Damage Risk Reduction System
HSI	Habitat Suitability Index
HTRW	Hazardous, toxic and radioactive waste
HUC	Hydrologic Unit Code
ILF	In Lieu Fee
JLNHPP	Jean Lafitte National Historical Park and Preserve
LCRP	Louisiana Coastal Resources Program
LDEQ	Louisiana Department of Environmental Quality
LDNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries
LF	Linear Feet
LORR	Level of Risk Reduction
LWCRPA	Louisiana Wetland Conservation and Restoration Program Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MRL	Mississippi River Levee
MR&T	Mississippi River and Tributaries
NAAQS	National Ambient Air Quality Standards
NAS	Naval Air Station
NAVD88	North American Vertical Datum 88
NEPA	National Environmental Policy Act of 1969
NFL	Non-Federal Levee
NFS	Non-Federal Sponsor
NHPA	National Historic Preservation Act of 1966
NMFS	NOAA National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NOI	Notice of Intent
NOV	New Orleans to Venice
NPL	National Priority List
NRCS	Natural Resources Conservation Service
NRDA	Natural Resource Damage Assessment
NRHP	National Register of Historic Places
NTU	Nephelometric turbidity units
NWR	National Wildlife Refuge

OMRR&R	Operational, Maintenance, Repair, Replacement and Rehabilitation
PDT	Project delivery team
PM-2.5	Particulate matter less than 2.5 microns in size
PM-10	Particulate matter less than 10 microns in size
PPG	Plaquemines Parish Government
ppt	Parts per thousand
PS	Protected Side
REC	Recognized Environmental Condition
RIBITS	Regulatory In lieu fee and Bank Information Tracking System
RPEDS	Regional Planning and Environment Division South
ROD	Record of Decision
ROE	Right of Entry
ROW	Right of Way
RSLS	Relative Sea Level Rise
RV	Recreational Vehicle
SAV	Submerged aquatic vegetation
SCORP	(Louisiana) Statewide Comprehensive Outdoor Recreation Plan
SEA	Supplemental EA
SEIS	Supplemental EIS
SHPO	State Historic Preservation Officer
SLR	Sea Level Rise
SWPPP	Storm Water Pollution Prevention Plan
TSA	tentatively selected alternative
TSMP	tentatively selected mitigation plan
TSP	tentatively selected plan
U.S.	United States
US	U.S. Highway
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WBV	West Bank and Vicinity
WMA	Wildlife Management Area
WQC	Water Quality Certification
WRDA	Water Resources Development Act
WVA	Wetland Value Assessment
ZIP	Zone Improvement Plan

APPENDIX J: MITIGATION PLANTING, MONITORING & RELATED GUIDELINES

MITIGATION PLANTING GUIDELINES, OTHER GENERAL MITIGATION GUIDELINES, MITIGATION SUCCESS CRITERIA, MITIGATION MONITORING GUIDELINES, AND MITIGATION MONITORING SCHEDULES AND RESPONSIBILITIES

MITIGATION PLANTING GUIDELINES

PLANTING GUIDELINES FOR SWAMP HABITATS

Canopy species will be planted on 9-foot centers (average) to achieve a minimum initial stand density of 538 seedlings (trees) per acre. Midstory species will be planted on 20-foot centers (average) to achieve a minimum initial stand density of 109 seedlings per acre. Stock used for canopy species will be at least 1 year old, at least 3 feet tall, and have a root collar diameter that exceeds 0.5 inch. Stock used for midstory species will be at least 1 year old and will be at least 3 feet tall. All stock must 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 December through March 15 (planting season/dormant season); however, unanticipated events may delay plantings until late spring or early summer. The seedlings will be installed in a manner that that avoids monotypic rows of canopy and midstory species (i.e. goal is to have spatial diversity and mixture of planted species). If herbivory may threaten seedling survival, then seedling protection devices such as wire-mesh fencing or plastic seedling protectors will be installed around each planted seedling.

The canopy species installed will be in general accordance with the species lists provided in Table 3A. The species composition of the plantings should mimic the percent composition guidelines indicated in this table. However, site conditions (factors such as hydrologic regime, soils, composition of existing native canopy species, etc.) and planting stock availability may necessitate deviations from the species lists and/or the percent composition guidelines indicated. In general, a minimum of 3 canopy species should be utilized, the plantings must include baldcypress and tupelogum (water tupelo), and baldcypress should typically comprise at least 50% of the total number of seedlings installed.

The midstory species installed will be selected from the species list provided in Table 3B. Plantings will consist of at least 2 different species. The species used and the proportion of the total midstory plantings represented by each species (percent composition) will be dependent on various factors including site conditions (composition and frequency of existing native midstory species, hydrologic regime, soils, etc.) and planting stock availability.

Table 3A: Preliminary Planting List for Swamp Habitat, Canopy Species

Common Name	Scientific name	Percent Composition
Bald cypress	*Taxodium distichum*	60% - 75%
Tupelogum	*Nyssa aquatic*	20% - 25%
Green ash	*Fraxinus pennsylvanica*	10% - 15%
Drummond red maple	*Acer rubrum* var. *drummondii*	5%
Bitter pecan	*Carya x lecontei*	5% - 10%

Table 3B: Preliminary Planting List for Swamp Habitat, Midstory Species

Common Name	Scientific name	Percent Composition
Buttonbush	*Cephalanthus occidentalis*	TBD
Roughleaf dogwood	*Cornus drummondii*	TBD
Swamp privet	*Forestiera acuminata*	TBD
Possumhaw	*Ilex decidua*	TBD
Virginia willow	*Itea virginica*	TBD
Wax myrtle	*Myrica cerifera*	TBD
Swamp rose	*Rosa palustris*	TBD

American snowbell	*Styrax americanus*	TBD

TBD = To Be Determined

Deviations from Typical Planting Guidelines

Proposed mitigation features that involve restoration will commonly require planting the entire feature using the prescribed planting guidance addressed in the preceding sections. In contrast, mitigation features that involve enhancement will often require adjustments to the typical plant spacing/density guidelines and may further require adjustments to the guidelines pertaining to species composition.

For swamp enhancement projects that include the eradication of invasive and nuisance plant species, significant numbers of native canopy and/or midstory species may remain, but in a spatial distribution that leaves relatively large "gaps" in the canopy stratum and/or the midstory stratum. In such cases, areas measuring approximately 25 feet by 25 feet that are devoid of native canopy species should be planted and areas measuring approximately 45 feet by 45 feet that are devoid of native midstory species should be planted.

The initial enhancement actions involved within a particular swamp enhancement mitigation site could include a variety of measures such as the eradication of invasive and nuisance plant species, topographic alterations (excavation, filling, grading, etc.), and hydrologic enhancement actions (alterations to drainage patterns/features, installation of water control structures, etc.). These actions may result in areas of variable size that require planting of both canopy and midstory species using the typical densities/spacing described above. There may also be areas where several native canopy and/or midstory species remain, thus potentially altering the general guidelines described as regards the spacing of plantings, and/or the species to be planted, and/or the percent composition of planted species. Similarly, areas that must be re-planted due to failure in achieving applicable mitigation success criteria may involve cases where the general guidelines discussed above will not necessarily be applicable.

Given these uncertainties, initial planting plans specific to a mitigation site will be required and must be specified in the Mitigation Work Plan for the site. The initial planting plans will be developed by the USACE in cooperation with the Interagency Team. Initial plantings will be the responsibility of the USACE. If re-planting of an area is necessary following initial plantings, a specific re-planting plan must also be prepared and must be approved by the USACE in cooperation with the Interagency Team prior to re-planting. With the exception of any re-planting actions necessary to attain the initial survivorship success criteria (i.e. survival required 1 year following completion of initial plantings), the Sponsor will be responsible for preparing re-planting plans and conducting re-planting activities. Re-planting necessary to achieve the initial survivorship criteria will be the responsibility of the USACE.

PLANTING GUIDELINES FOR MARSH HABITATS

Planting Guidelines for Intermediate and Brackish Marsh Habitats

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. The required stock size for each plant species proposed for installation must be specified in the Mitigation Work Plan. Plants must be obtained from a registered licensed regional nursery/grower and of a regional eco-type species properly stored and handled to ensure viability. Plant installation should be conducted 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.

Species installed in proposed intermediate marsh habitats will be selected from the species list provided in Table 4. 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 dependent on various factors including site conditions and planting stock availability.

Table 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*

Species installed in proposed brackish marsh habitats will be selected from the species list provided in Table 5. 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 dependent on various factors including site conditions and planting stock availability.

Table 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*
Saltmarsh bulrush	*Schoenoplectus robustus*
Salt grass	*Distchilis spicata*

Deviations from Typical Planting Guidelines

Initial planting plans specific to an intermediate marsh or to a brackish marsh mitigation site will be required and must be specified in the Mitigation Work Plan for the site. The initial planting plans will be developed by the USACE in cooperation with the Interagency Team. Initial plantings will be the responsibility of the USACE. If re-planting of an area is necessary following initial plantings, a specific re-planting plan must also be prepared and must be approved by the USACE in cooperation with the Interagency Team prior to re-planting.

It may be determined that the initial planting of brackish 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 final design phase of the mitigation project. The proposed planting scheme would be subject to review and approval by the Interagency Team.

Re-planting of intermediate marsh features and/or brackish marsh features could also be required if the initial plant survivorship goal is not attained or if initial vegetative cover goals are not achieved. In such cases, re-planting or supplemental planting of such mitigation features would be the responsibility of the USACE. Once the initial success criteria are achieved, the Sponsor will be responsible for conducting any re-planting activities necessary to achieve success. All re-planting plans will be subject to review and approval by the USACE and Interagency Team prior to plant installation. These plans may deviate from the general planting guidelines as regards the density of plantings, the species utilized, or the plant stock size in an effort to rapidly establish appropriate vegetative cover.

ADDITIONAL MITIGATION GUIDELINES

GUIDELINES FOR THE ERADICATION AND CONTROL OF INVASIVE AND NUISANCE PLANT SPECIES

The eradication of invasive and nuisance plant species may incorporate a variety of eradication methods including mechanized removal (ex. hydroaxes, gyro-tracs, heavy machinery used in areas slated for topographic alterations), non-mechanized removal (use of hand implements such as chain saws and machetes, direct uprooting by hand), aerial herbicide applications (applications using aircraft), and ground herbicide applications (on-the-ground applications using backpack sprayers, wick applicators, etc.). Only ground herbicide applications would be used in marsh habitats. Regardless of the methods involved, care will be exercised to avoid damage to desirable native species to the greatest extent practicable.

During the initial eradication process in forested habitats, larger quantities of felled materials may be removed from the mitigation site and disposed in a duly-licensed facility. Some felled woody plants may be chipped on-site with the chips spread in a layer not exceeding approximately 3 to 4 inches thick. Felled woody plants may also be gathered and stacked “teepee” style in scattered locations. In certain cases, larger invasive trees may be killed and allowed to remain standing if it is determined this would not interfere with mitigation goals. The Mitigation Work Plan must address the specific measures proposed to conduct initial eradication efforts, including handling of vegetative debris, and the recommended measures for the subsequent control of invasive and nuisance plant species.

The USACE will be responsible for the initial eradication of invasive and nuisance plants as well as for any subsequent eradication efforts until such time that the mitigation project is transferred to the Sponsor. Thereafter, the Sponsor will be responsible for the successful control and eradication of invasive and nuisance plant species. The management objectives will be to maintain the mitigation site such that it is essentially free from invasive and nuisance plant species immediately following a given maintenance event and such that the total vegetative cover accounted for by invasive and nuisance species each constitute less than 5% of the total plant cover during periods between maintenance events.

GUIDELINES FOR CLEARING, GRADING, AND OTHER EARTHWORK ACTIVITIES

Enhancement or restoration activities in certain mitigation areas where the proposed habitat is swamp may include alterations to existing topography. This includes an array of potential actions such as lowering grades over relatively large areas, breaching or removal of existing berms and spoil banks, filling of drainage canals and ditches, construction of containment berms, etc. The construction process could involve mechanized clearing and grubbing of the areas to be graded followed by the actual grading work.

Prior to the clearing, grubbing, grading, and related earthwork activities, the exact limits of zones requiring clearing and grading/earthwork will be determined in the field and will be marked with protective barriers such as flagging, ropes, stakes, silt fence, enviro-fence, or a combination of such items. These marker barriers will remain in place until grading activities are completed. Prior to initiation of the clearing and grading/earthwork activities, silt fences will also be installed at appropriate locations adjacent to existing wetlands to control erosion and sediment transport. These erosion/sediment control devices will remain in place until earthwork activities are completed and the disturbed areas are stabilized. Machinery/vehicle ingress and egress routes to the areas requiring earthwork will be restricted to avoid unnecessary damage to nearby upland and wetland areas.

Cleared vegetation will be removed from the mitigation site for disposal either within a duly licensed off-site disposal facility, or will be burned on-site if practicable. Soil removed during the grading/earthwork process will either be disposed off-site in a licensed facility or used within the mitigation site as fill if the material is suitable and fill is needed. All other debris generated during the clearing and grading process will be disposed in a duly-licensed off-site facility.

If grading or other earthwork activities are necessary, the Mitigation Work Plan must include detailed plans depicting the required activities (ex. grading contours, cross-sections, stormwater pollution prevention plans, etc.). These plans will be developed by the USACE in coordination with the Interagency Team. The USACE

will be responsible for the successful completion of all initial earthwork activities. The Sponsor will be responsible for any subsequent earthwork activities necessary for the proper maintenance of the mitigation site. However if the primary purpose of the initial grading/earthwork activities is to enhance site hydrology, then the USACE will be responsible for conducting any additional grading/earthwork activities necessary to ensure the hydrologic enhancement objectives (success criteria) are achieved. Once it is demonstrated that these objectives have been satisfied, the Sponsor will then be responsible for any further earthwork activities needed to ensure proper maintenance.

The construction of all proposed marsh habitats (intermediate, and brackish marshes) and the construction of some swamp restoration features will be achieved by adding fill to existing open water areas. The Mitigation Work Plan for such construction must include a detailed Stormwater Pollution Prevention Plan that minimizes potential impacts to adjacent natural habitats and minimizes degradation of water quality in off-site areas. The USACE will be responsible for preparation of this plan and for the successful completion of all initial construction activities. Once the applicable topographic success criteria have been achieved, the Sponsor will thereafter be responsible for any topographic alterations necessary to achieve mitigation success.

GUIDELINES FOR SURFACE WATER MANAGEMENT FEATURES AND STRUCTURES

Enhancement or restoration efforts in some mitigation areas may include construction of surface water management systems and/or installation of water conveyance or water control structures (ex. drainage culverts, flap gates, weirs). If such actions are necessary, the Mitigation Work Plan must include detailed plans for these activities as well as operational specifications if applicable. These plans and specifications will be developed by the USACE in coordination with the Interagency Team. The USACE will be responsible for the successful construction of any surface water management features, drainage structures, and water control structures. The Sponsor will be responsible for the subsequent maintenance and operation activities required.

It is noted that there is a strong preference for mitigation sites that are self-sustaining from a hydrologic perspective. While active water management might be needed in the short-term for establishment of plantings or other reasons, sites that require active hydrologic management to achieve long-term success should generally be avoided.

SWAMP HYDROLOGY GUIDELINES

The optimal hydrologic regime for baldcypress/tupelogum swamps involves both seasonal flooding and good surface water exchange between a particular swamp and adjacent systems. The typical hydroperiod should include several periods of flooding (inundation) and drawdown, or a “pulsing” hydrology. Surface water should be present for extended periods, especially during portions of the growing season, but should be absent (water table at or below the soil surface) by the end of the growing season in most years. At a minimum, standing surface water should be absent for approximately 2 months during the growing season once every 5 years. Abundant and consistent freshwater input from riverine systems is most desirable, as is relatively consistent surface water flow through the swamp during flooded periods. However, other sources of sheetflow into the swamp can be similarly beneficial. The main objective is to have sufficient surface water exchange between the swamp and adjacent habitats. Situations involving permanent flooding and/or no surface water exchange should be avoided when possible.

The following provides some general hydrologic guidelines for mitigation projects involving swamp restoration and for those mitigation projects involving swamp enhancement where enhancement of the existing hydrologic regime is a component of the mitigation work program. It is emphasized that these are merely guidelines and the attainment of one or more of these guidelines may not be possible in some situations.

- Strive for a minimum of about 200 consecutive days but no more than roughly 300 consecutive days of inundation (flooding). This period of inundation should overlap a portion of the growing season (preferably the early portion or late portion).
- Strive for a minimum of roughly 40 to 60 consecutive days during the growing season where the water table is at or below the soil surface (i.e. non-inundated period). This non-inundated period should

preferably occur during the middle portion of the growing season. The non-inundated period should not exceed approximately 90 to 120 days.

- Strive to achieve an average maximum (peak) water table elevation that ranges between approximately 1.0 to 2.0 feet above the soil surface (i.e. depth of average peak inundation is 1.0 to 2.0 feet). Water table elevations greater than 2 feet above the soil surface may occur, however such occurrences should be of relatively short duration (i.e. brief "spikes" in the depth of inundation).
- Locate the mitigation area such that it naturally receives freshwater inputs via surface flow from adjacent lands and such that, during periods of inundation, there is good sheet flow through the mitigation area including a means for surface water discharge from the mitigation area. If the mitigation area cannot be located to attain these goals naturally, then mitigation activities should include actions to achieve these goals to the greatest degree practicable (e.g. include measures to provide for good surface water exchange between the swamp and adjacent systems), while at the same time not jeopardizing hydrology objectives pertaining to the swamp's hydroperiod.

MITIGATION SUCCESS CRITERIA AND MITIGATION MONITORING: SWAMP MITIGATION FEATURES

MITIGATION SUCCESS CRITERIA

The success criteria specified herein apply to both swamp restoration projects and swamp enhancement projects unless otherwise indicated.

1. General Construction

A. As applicable, complete all necessary initial earthwork and related construction activities in Mitigation TY1 (2020). The necessary activities will vary with the mitigation site. Examples include, but are not limited to: clearing, grubbing, and grading activities; construction of new water management features (weirs, flap-gates, diversion ditches, etc.); modifications/alterations to existing water control structures and surface water management systems; construction of perimeter containment dikes and installation of fill (dredged sediments or other soil).

B. For mitigation features established in existing open water areas, complete all final construction activities in Mitigation TY2 (2021). The necessary activities will vary with the mitigation site. Examples include, but are not limited to: degrading or "gapping" of perimeter retention dikes; construction of water management structures (weirs, etc.).

2. Native Vegetation

A. Complete initial planting of canopy and midstory species.

B. 1 Year Following Completion of Initial Plantings (at end of first growing season following plantings) –

- Achieve a minimum average survival of 50% of planted canopy species (i.e. achieve a minimum average canopy species density of 269 seedlings/ac.). 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.
- Achieve a minimum average survival of 85% of planted midstory species (i.e. achieve a minimum average midstory species density of 93 seedlings/ac.). The surviving plants must approximate the species composition 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.

C. 4 Years Following Completion of Initial Plantings –

- Achieve a minimum average density of 250 living native canopy species per acre (planted trees and/or naturally recruited native canopy species).
- Achieve a minimum average density of 125 living baldcypress trees (planted trees and/or naturally recruited native canopy species). The species composition of the additional native canopy species present must be generally consistent with the planted ratios for such species.
- Achieve a minimum average density of 85 living native midstory species per acre (planted midstory and/or naturally recruited native midstory species).
- Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

D. Within 15 Years Following Completion of Initial Plantings –
- Achieve one of the two following vegetative cover requirements:
  1. The average percent cover by native species in the canopy stratum is at least 50%, and; the average percent cover by native species in the midstory stratum exceeds 33%, and; the average percent cover by native species in the ground cover stratum (herbaceous cover) exceeds 33%.
  2. The average percent cover by native species in the canopy stratum is at least 75%, and: (a) the average percent cover by native species in the midstory stratum exceeds 33%, or; (b) the average percent cover by native species in the ground cover stratum (herbaceous cover) exceeds 33%.

E. Within 45 Years Following Completion of Initial Plantings –
- Demonstrate that the average diameter at breast height (DBH) of living baldcypress trees exceeds 10 inches. This criterion will thereafter remain in effect for the duration of the overall monitoring period.
- Demonstrate that the average DBH of the other living native trees in the canopy stratum (trees other than baldcypress) exceeds 12 inches. This criterion will thereafter remain in effect for the duration of the overall monitoring period.
- Demonstrate that the average total basal area accounted for by all living native trees in the canopy stratum combined exceeds approximately 161 square feet per acre. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

F. 45 Years Following Completion of Initial Plantings –
- Demonstrate that a minimum of 160 living native trees remain in the canopy stratum.
- Demonstrate that either success criteria D.1 or D.2 above have been maintained.

Note: The above requirements may need to be modified later due to factors such as the effects of sea level rise or salinity on vegetative cover. Proposed modifications must first be approved by the USACE in coordination with the Interagency Team.

3. Invasive and Nuisance Vegetation

A. Complete the initial eradication of invasive and nuisance plant species.

B. Maintain all areas such that they are essentially free from invasive and nuisance plant species immediately following a given maintenance event and such that the total vegetative cover accounted for by invasive and nuisance species each constitute less than 5% of the total plant cover during periods between maintenance events. These criteria must be satisfied throughout the duration of the overall monitoring period.

4. Topography

A. For mitigation features requiring earthwork to attain desired grades (excluding areas restored from existing open water features – Following completion of initial construction activities (anticipated in TY1, 2020), demonstrate that at least 80% of the total graded area within each feature is within approximately 0.5 feet of the proposed target soil surface elevation (e.g. the desired soil surface elevation).

B. For mitigation features restored from existing open water areas – (a) In the year that final construction activities are completed (anticipated in TY2, 2021), demonstrate that at least 80% of the total graded area within each feature is within approximately 0.5 feet of the proposed target soil surface elevation (e.g. the

desired soil surface elevation), and; (b) In the year after final construction activities are completed, demonstrate that at least 85% of the total graded area within each feature is within approximately 0.5 feet of the proposed target soil surface elevation.

5. Thinning of Native Vegetation (Timber Management)

The USACE, in cooperation with the Interagency Team, may determine that thinning of the canopy and/or midstory strata is warranted to maintain or enhance the ecological value of the site. This determination will likely be made after it is demonstrated that the average total basal area accounted for by living native canopy species exceeds 170 square feet per acre. If it is decided that timber management efforts are necessary, the Sponsor will develop a Timber Stand Improvement/Timber Management Plan in coordination with the USACE and Interagency Team. Following approval of the plan, the Sponsor will perform the necessary thinning operations and will demonstrate the successful completion of these operations. Timber management activities will only be allowed for the purposes of ecological enhancement of the mitigation site.

6. Hydrology

The following applies to mitigation features involving swamp restoration and to those involving swamp enhancement where hydrologic enhancement is a component of the mitigation program.

A. In a year having essentially normal rainfall, demonstrate compliance with each of the following criteria:

- Achieve inundation of the majority of the mitigation area for a minimum of 200 consecutive days but for no more than approximately 300 consecutive days, preferably with periods of inundation overlapping a portion of the growing season.
- Achieve non-inundation of the majority of the mitigation (water table at or below the soil surface) for a minimum of approximately 60 consecutive days but for no more than approximately 90 consecutive days, preferably during the period from June through August.
- The average maximum (peak) water table elevation must range between approximately 1.0 feet to 2.0 feet above the soil surface.

Note: The specific mitigation work program generated for the mitigation area may include deviations from one or more of the above criteria to better reflect the desired wetland hydroperiod. Such deviations must be approved by the USACE in coordination with the Interagency Team, and would supersede the above criteria once approved.

The following applies to swamp enhancement mitigation areas where hydrologic enhancement is not a component of the mitigation program.

B. In a year having essentially normal rainfall, demonstrate that the water table is less than or equal to 12 inches below the soil surface for a period of at least 14 consecutive days.

MITIGATION MONITORING GUIDELINES

"Time Zero" Monitoring Report

Shortly after completion of all initial mitigation activities (e.g. initial eradication of invasive and nuisance plants, first/initial planting of native species, completion of initial earthwork, grading, surface water management system alterations/construction, etc.), the mitigation site will be monitored and a "time zero" or "baseline" monitoring report prepared. Information provided will include the following items:

- A detailed discussion of all mitigation activities completed.

- A description of the various features and habitats within the mitigation site.

- A plan view drawing of the mitigation site showing the approximate boundaries of different mitigation features (ex. planted areas, areas only involving eradication of invasive and nuisance plant species; surface water management features, etc.), monitoring transect locations, sampling plot locations, photo station locations, and piezometer and staff gage locations.

- An as-built survey of finished grades for any relatively large areas subject to topographic alterations and an as-built survey of any surface water drainage features, drainage culverts, and/or water control structures constructed. Detailed surveys of topographic alterations simply involving the removal of existing linear features such as berms/spoil banks, or involving the filling of existing linear ditches or canals, will not be required. However, the as-built survey will include spot cross-sections of such features sufficient to represent typical conditions. The as-built survey must include a survey of areas where existing berms, spoil banks, or levees have been breached in sporadic locations. For mitigation features involving habitat restoration in existing open water areas, the as-built survey must include a topographic survey of the entire restoration feature.

- A detailed inventory of all canopy and midstory species planted, including the number of each species planted and the stock size planted. In addition, provide a breakdown itemization indicating the number of each species planted in a particular portion of the mitigation site and correlate this itemization to the various areas depicted on the plan view drawing of the mitigation site.

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 site showing the approximate boundaries of different mitigation features (ex. planted areas, areas only involving eradication of invasive and nuisance plant species; surface water management features, etc.), monitoring transect locations, sampling plot locations, photo station locations, and piezometer 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. The number of photo stations required as well as the locations of these stations will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. Permanent photo stations will primarily be established in areas slated for planting of canopy and midstory species. For mitigation involving swamp enhancement, some photo stations may also be located in areas where plantings are not needed.

- Quantitative plant data collected from permanent monitoring plots measuring approximately 80 feet X 80 feet in size. Data recorded in each plot will include: number of living planted canopy species present and the species composition; number of living planted midstory species present and the species composition; average density of all native species in the canopy stratum, the total number of each species present, and the wetland indicator status of each species; average percent cover by native species in the canopy stratum; average density of all native species in the midstory stratum, the total number of each species present, and the wetland indicator status of each species; average percent cover by native species in the midstory stratum; average percent cover accounted for by invasive plant species (all vegetative strata combined); average percent cover accounted for by nuisance plant species (all vegetative strata combined). In addition to these data, the following information will be recorded for native tree species in the canopy stratum: the average diameter at breast height (DBH; expressed in inches) of baldcypress trees; average DBH of all other native tree

species excluding baldcypress; the average total basal area of living native trees (expressed in square feet per acre). The DBH of planted canopy species will not need to be documented until the average DBH of these trees reaches approximately 2 inches. Total basal area data will also not need to be documented until such time that the average total basal area is estimated to exceed approximately 100 square feet per acre. The permanent monitoring plots will typically be located within mitigation areas where initial planting of canopy and midstory species is necessary. The number of plots required as well as the locations of these plots will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan.

- Quantitative data concerning plants in the understory (ground cover) stratum and concerning invasive and nuisance plant species will be gathered from permanent sampling quadrats nested within the permanent monitoring plots described above. There will be a total of 4 quadrats with each quadrat measuring approximately 2 meters X 2 meters in size. Data recorded from the sampling quadrats will include: average percent cover by native ground cover species; composition of native ground cover species and the wetland indicator status of each species; average percent cover by invasive plant species; average percent cover by nuisance plant species.

- Quantitative plant data collected from either: (1) permanent transects sampled using the point-centered quarter method with a minimum of 20 sampling points established along the course of each transect, or; (2) permanent belt transects approximately 50 feet wide. The number of transects necessary as well as the location and length of each transect will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. Data recorded from the sampling transects will include: average density of living planted canopy species present and the species composition; average density of living planted midstory species present and the species composition; average density of all native species in the canopy stratum along with the species composition and the wetland indicator status of each species; average percent cover by all native species in the canopy stratum; average density of native species in the midstory stratum, the total number of each species present, and the wetland indicator status of each species; average percent cover by native species in the midstory stratum; if present, average percent cover accounted for by invasive and nuisance species present in the canopy and midstory strata (combined). In addition to these data, the following information will be recorded for native tree species in the canopy stratum: the average diameter at breast height (DBH; expressed in inches) of baldcypress trees; average DBH of all other native tree species excluding baldcypress; the average total basal area of living native trees (expressed in square feet per acre). The DBH of planted canopy species will not need to be documented until the average DBH of these trees reaches approximately 2 inches. Total basal area data will also not need to be documented until such time that the average total basal area is estimated to exceed approximately 100 square feet per acre.

- Quantitative data concerning plants in the understory (ground cover) stratum and concerning invasive and nuisance plant species will be gathered from sampling quadrats. These sampling quadrats will be established either along the axis of the belt transects discussed above, or at sampling points established along point-centered quarter transects discussed above, depending on which sampling method is used. Each sampling quadrat will be approximately 2 meters X 2 meters in size. The total number of sampling quadrats needed along each sampling transect will be determined by the USACE with the Interagency Team and will specify be specified in the Mitigation Monitoring Plan. Data recorded from the sampling quadrats will include: average percent cover by native ground cover species; composition of native ground cover species and the wetland indicator status of each species; average percent cover by invasive plant species; average percent cover by nuisance plant species.

- A summary of rainfall data collected during the year preceding the monitoring report based on rainfall data recorded at a station located on or in close proximity to the mitigation site. Once all hydrology success criteria have been achieved, collection and reporting of rainfall data will no longer be required.

- A summary of water table elevation data collected from piezometers coupled with staff gages installed within the mitigation site. The number of piezometers and staff gages required as well as the locations of

these devices will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. Data (water table elevations) will be collected at least bi-weekly throughout the year. For mitigation areas involving swamp enhancement where hydrologic enhancement is not a component of the mitigation program, it may also be necessary to collect water table elevations on a daily basis over the course of 3 to 4 weeks in order to demonstrate that the water table is less than or equal to 12 inches below the soil surface for a period of at least 14 consecutive days during the growing season. Once it is demonstrated that all applicable hydrology success criteria have been satisfied, water table monitoring will no longer be required. However, monitoring reports generated subsequent to the attainment of success criteria will include a general discussion of water levels and hydroperiod based on qualitative observations.

- Various qualitative observations will be made in the mitigation site to help assess the status and success of mitigation and maintenance activities. These observations will include: general estimates of the average percent cover by native plant species in the canopy, midstory, and ground cover strata; general estimate of the average percent cover by invasive and nuisance plant species; general estimates concerning the growth of planted canopy and midstory species; general observations concerning the colonization by volunteer native plant species; general observations regarding the growth of non-planted native species in the canopy and midstory strata. General observations made during the course of monitoring will also address potential problem zones, general condition of native vegetation, trends in the composition of the plant communities, wildlife utilization as observed during monitoring, and other pertinent factors.

- For mitigation features restored from existing open water areas, provide an as-built topographic survey of all such mitigation features in the year immediately following the “time zero” monitoring event. No additional topographic surveys will typically be required following this second survey. However if the second 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 Interagency Team.

- Rectified aerial photographs of all mitigation features. This aerial photography will only be provided in the following monitoring reports: (a) The monitoring report prepared for monitoring conducted in the year immediately preceding the year the mitigation project is transferred to the Sponsor; (b) The monitoring report prepared for monitoring conducted approximately 15 years following completion of initial plantings.

- 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.

Monitoring Reports Involving Timber Management Activities

In cases where timber management activities (thinning of trees and/or shrubs in the canopy and/or midstory strata) have been approved by the USACE in coordination with the Interagency Team, monitoring will be required in the year immediately preceding and in the year following completion of the timber management activities (i.e. pre-timber management and post-timber management reports). These reports must include data and information that are in addition to the typical monitoring requirements. The Sponsor’s proposed Timber Stand Improvement/Timber Management Plan must include the proposed monitoring data and information that will be included in the pre-timber management and post-timber management monitoring reports. The proposed monitoring plan must be approved by the USACE in coordination with the Interagency Team prior to the monitoring events and implementation of the timber management activities.

Monitoring Reports Following Re-Planting Activities

Re-planting of certain areas within the mitigation site may be necessary to ensure attainment of applicable native vegetation success criteria. Any monitoring report submitted following completion of a re-planting event must include an inventory of the number of each species planted and the stock size used. It must also include a depiction of the areas re-planted, cross-referenced to a listing of the species and number of each species planted in each area.

MITIGATION MONITORING SCHEDULE AND RESPONSIBILITIES

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 December 31 of each year of monitoring. Monitoring reports will be provided to the USACE, the Sponsor, and the agencies comprising the Interagency Team.

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 – 1.A or 1.B, as applicable.
2. Native Vegetation – A and B.
3. Invasive & Nuisance Vegetation – A, plus B until such time as project is transferred to the Sponsor.
4. Topography – A, as applicable, or B, as applicable.

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 Sponsor. The years applicable to these monitoring events will vary depending on the type of mitigation involved (restoration or enhancement) and site conditions present at the time mitigation activities are initiated. For example, the first monitoring event may occur in 2021 (TY2) for certain mitigation sites while this event may not occur until 2022 (TY3) for other mitigation sites.

The Sponsor 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. The overall responsibility for management, maintenance, and monitoring of the mitigation will be transferred to the Sponsor during the first quarter of the year immediately following submittal of the monitoring report that demonstrates attainment of said criteria.

Once monitoring responsibilities have been transferred to the Sponsor, the next monitoring event will take place during the year that attainment of success criterion 2.C (native vegetation criterion applicable 4 years after completion of initial plantings) must be demonstrated. Thereafter, monitoring will be conducted every 5 years throughout the life or the mitigation project (based on 50-year project life beginning in 2019 (TY0) and ending in 2069 (TY50).

If the initial survival criteria for planted canopy and midstory species are not achieved (i.e. the 1-year survival criteria specified in success criteria 2.B), a monitoring report will be required for each consecutive year until two annual sequential reports indicate that all survival criteria have been satisfied (i.e. that corrective actions were successful). The USACE will be responsible for conducting this additional monitoring and preparing the monitoring reports. The USACE will also be responsible for the purchase and installation of supplemental plants needed to attain these success criteria.

If the native vegetation success criteria specified for 4 years following completion of initial plantings are not achieved (i.e. success criteria 2.C) , a monitoring report will be required for each consecutive year until two annual sequential reports indicate that these criteria have been satisfied. The Sponsor will be responsible for conducting this additional monitoring and preparing the monitoring reports. The Sponsor will also be responsible for the purchase and installation of supplemental plants needed to attain these success criteria.

If timber management activities conducted in the mitigation features by the Sponsor, the Sponsor will be responsible for conducting the additional monitoring and preparing the associated monitoring reports necessary for such activities (e.g. one monitoring event and report in the year immediately preceding timber management activities and one monitoring event and report in the year that timber management activities are completed).

The year in which mitigation features are first planted, a key milestone triggering the start of mitigation monitoring, may vary depending on the type of mitigation involved and the mitigation construction activities involved. In certain cases, it is also possible that the BLH mitigation features may be established along with other mitigation features like swamp or marsh habitats at the same mitigation site. Such factors make it necessary to develop a reasonable and efficient monitoring schedule at the time final mitigation plans are generated. This schedule must be in general accordance with the guidance provided above and will be prepared by the USACE in coordination with the Interagency Team and the Sponsor.

Once monitoring responsibilities have transferred to the Sponsor, the Sponsor 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. Twenty 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 substantially 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 Interagency Team.

MITIGATION SUCCESS CRITERIA AND MITIGATION MONITORING: MARSH MITIGATION FEATURES (Intermediate, Brackish, and Saline Marsh Habitats)

MITIGATION SUCCESS CRITERIA

The success (performance) criteria described herein are applicable to all proposed marsh habitats (intermediate marsh, brackish marsh, and saline marsh restoration features), unless otherwise indicated.

1. General Construction

A. Within approximately 8 months following the start of mitigation construction, complete all initial mitigation construction activities (e.g. construction of temporary retention/perimeter dikes, placement of fill (borrow material/dredged material) into mitigation site, construction of permanent 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 target soil surface elevation) complete all final mitigation construction activities. Such activities could include, but are not limited to: degrading temporary retention dikes such that the areas occupied by these dikes have a surface elevation equivalent to the desired target marsh elevation; completion of armoring, if required, of any permanent dikes; “gapping” or installation of “fish dips” in permanent dikes; 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 (approximate Target Year 2) –
- Demonstrate that at least 80% of each mitigation feature has a surface elevation that is within 0.5 feet of the desired target surface elevation.

B. 1 Year following completion of final mitigation construction activities (approximate Target Year 3) –

- Demonstrate that at least 80% of the mitigation site has a surface elevation that is within 0.5 feet of the desired target surface elevation.

C. 3 years following completion of final mitigation construction activities (approximate Target 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 target elevation for each marsh feature will be determined during the final design phase. The "functional marsh elevation range", i.e. the range of the marsh surface elevation that is considered adequate to achieve proper marsh functions and values, will also be determined during the final design phase. The target elevation and functional marsh elevation range will be determined by the USACE in conjunction with the Interagency Team. These determinations will apply to the topographic success criteria above and could potentially alter the marsh area percentages set forth in these criteria.

3. Native Vegetation

A. For intermediate marsh, brackish marsh, and saline marsh restoration features only –
- Complete initial marsh planting in accordance with applicable marsh planting guidelines.

B. For intermediate marsh, brackish marsh, and saline marsh restoration features only; 1 year following completion of initial plantings–
- Attain at least 80% survival of planted species, or; Achieve a minimum average cover of 25%, comprised of native herbaceous species (includes planted species and volunteer species).
- Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

C. For intermediate marsh, brackish marsh, and saline marsh restoration features only; 3 years following completion of initial plantings –
- Achieve a minimum average cover of 75%, comprised of native herbaceous species (includes planted species and volunteer species).

D. For all marsh restoration features (fresh, intermediate, brackish and saline) –
- For the period beginning 5 years following completion of final mitigation construction activities and continuing through 20 years following completion of final mitigation construction activities, maintain a minimum average cover of 80%, comprised of native herbaceous species.

4. Invasive and Nuisance Vegetation

A. Complete the initial eradication of invasive and nuisance plant species within 1 year of completion of final mitigation construction activities

B. Maintain all areas such that they are essentially free from invasive and nuisance plant species immediately following a given maintenance event and such that the total vegetative cover accounted for by invasive and nuisance species each constitute less than 5% of the total plant cover during periods between maintenance events. These criteria must be satisfied throughout the duration of the overall monitoring period.

MITIGATION MONITORING GUIDELINES

The guidelines for mitigation monitoring provided herein are applicable to all the types of marshes being restored (i.e. intermediate, brackish and saline) unless otherwise indicated.

"Time Zero" Monitoring Report

The mitigation site will be monitored and a "time zero" or "baseline" monitoring report prepared. Information provided will include the following items:

- A detailed discussion of all mitigation activities completed.

- A plan view drawing of the mitigation site showing the approximate boundaries of the restored marsh features, significant interspersion features established within the marsh features (as applicable), monitoring transect locations, sampling plot locations, photo station locations, and staff gage locations.

- An as-built survey of surface elevations (topographic survey) within each marsh feature, along with an as-built survey of any permanent dikes constructed as part of the marsh restoration features including any "gaps" or "fish dips" established in such dikes. If a particular marsh feature is immediately adjacent to existing marsh habitat, the topographic survey will include spot elevations collected within the existing marsh habitat near the restored marsh feature. In addition to the survey data, an analysis of the data will be provided addressing attainment of topographic success criteria.

- 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 site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. At a minimum, there will be at least 4 photo stations established within each marsh feature.

- For restored intermediate marsh, brackish marsh, and saline marsh features only -- A detailed inventory of all species planted, including the number of each species planted and the stock size planted. For mitigation sites that include more than one restored marsh feature, provide a breakdown itemization indicating the number of each species planted in each marsh and correlate this itemization to the marsh features depicted on the plan view drawing of the mitigation site.

- Water level elevation readings collected at the time of monitoring from a single staff gage installed within one of the restored marsh features. The location of the staff gage will be determined by the USACE in coordination with the Interagency Team during the final design phase of the mitigation project and will be specified in the Mitigation Monitoring Plan. 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 site. The report will further address estimated mean high and mean low water elevations at the mitigation site based on field indicators.

- Various qualitative observations will be made in the mitigation site 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 site 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 permanent 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.

Additional Monitoring Reports

All monitoring reports generated after the initial “time zero” report will provide the following information unless otherwise noted:

- All items listed for the “time zero” (baseline) monitoring report with the exception of: (a) the topographic/as-built survey, although additional topographic/as-built surveys are required for specific monitoring reports (see below); (b) the inventory of planted species; although such an inventory must be provided in any monitoring report generated for a year in which a restored intermediate, brackish, or saline marsh feature is re-planted to meet applicable success criteria, and such an inventory must be provided in any monitoring report generated for a year in which a restored marsh feature is planted to meet applicable success criteria.

- 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 in planted marsh features. The number of monitoring transects and number of sampling quadrats per transect will vary depending on the mitigation site. This will be determined the USACE in coordination with the Interagency Team during the final design phase of the mitigation project and the resulting requirements, including quadrat dimensions, will be specified in the final Mitigation Monitoring Plan for the project. 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 in intermediate, brackish, and saline marsh features. However, data for percent survival of planted species will only be recorded until such time as it is demonstrated that success criteria for plant survivorship has been achieved.

- A brief description of maintenance and/or management work performed since the previous monitoring report along with a discussion of any other significant occurrences.

- Rectified aerial photographs of all mitigation features. This aerial photography will only be provided in the monitoring report prepared for monitoring conducted 3 years following completion of mitigation construction activities (estimated TY5).

- In addition to the above items, the monitoring report prepared for 1 year following completion of mitigation construction activities (estimated TY3) and the monitoring report prepared for 3 years following completion of mitigation construction activities (estimated TY5) will include a topographic survey of each marsh restoration feature. These surveys will cover the same components as described for the topographic survey conducted for the “time zero” monitoring report. In addition to the surveys themselves, each of the two monitoring reports involving topographic surveys will include an analysis of the data as regards attainment of applicable topographic success criteria. If the second 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 Interagency Team.

Monitoring Reports Following Re-Planting Activities in Intermediate, Brackish or Saline Marsh Features

Re-planting of certain areas within restored intermediate, brackish, and/or saline marsh habitats may be necessary to ensure attainment of applicable native vegetation success criteria. Any monitoring report submitted following completion of a re-planting event (for intermediate, brackish, and saline marshes) and any monitoring report submitted following completion of initial plantings must include an inventory of the number of each species planted and the stock size used. It must also include a depiction of the areas re-planted or those planted, as applicable, cross-referenced to a listing of the species and number of each species planted in each area.

MITIGATION MONITORING SCHEDULE AND RESPONSIBILITIES

Monitoring will typically take place in mid to 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 December 31 of each year of monitoring. Monitoring reports will be provided to the USACE, the Sponsor, and the agencies comprising the Interagency Team.

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.
2. Topography – A and B.
3. Native Vegetation – For intermediate marsh, brackish marsh, and saline marsh features, criteria 3.A and 3.B.
4. Invasive & Nuisance Vegetation – A, plus B until such time as project is transferred to the Sponsor.

Monitoring events associated with the above will include the “time zero” (first or baseline) monitoring event (estimated in TY2, 2021) and a second monitoring event 1 year after the time zero monitoring event (estimated in TY3, 2022). The USACE will be responsible for conducting these monitoring activities and preparing the associated monitoring reports.

The Sponsor 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. The overall responsibility for management, maintenance, and monitoring of the mitigation will be transferred to the Sponsor during the first quarter of the year immediately following submittal of the monitoring report that demonstrates attainment of said criteria. Once monitoring responsibilities have been transferred to the Sponsor, the next monitoring event should take place in 2025 (TY5) in order to demonstrate attainment of success criteria 2.C and 3.D (for intermediate, brackish and saline marsh). Thereafter, monitoring will be conducted every 5 years throughout the remaining life or the mitigation project (based on 50-year project life beginning in 2020 (TY0) and ending in 2070 (TY50).

In certain cases it is possible that the marsh mitigation features may be established along with other mitigation features, like swamp habitats, at the same mitigation site. This scenario could require some adjustments to the typical monitoring schedule described above in order to develop a reasonable and efficient monitoring schedule that covers all the mitigation features. Such adjustments, if necessary, would be made at the time final mitigation plans are generated. This schedule must be in general accordance with the guidance provided above and will be prepared by the USACE in coordination with the Interagency Team and the Sponsor.

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. The following lists instances requiring additional monitoring that would be the responsibility of the USACE:

(A) For intermediate, brackish, and saline marsh features –

- If the initial survival criterion for planted species or the initial vegetative cover criterion are not achieved (i.e. the criteria specified in success criteria 3.C), 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 (i.e. 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) For all types of marsh features (fresh, intermediate, brackish, and saline) –

- 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 Sponsor would be responsible:

(A) For intermediate, brackish, and saline marsh features –

- If the vegetative cover criterion specified for 3 years after the initial planting of marsh features is not achieved (i.e. success criterion 3.D), 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 Sponsor would also be responsible for the purchase and installation of supplemental plants needed to attain the success criterion.

(B) For all types of marsh features (fresh, intermediate, brackish, and saline) –

- 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 criteria have been satisfied. Since failure to meet this 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 Sponsor would also be responsible for performing the necessary corrective actions.

- Native vegetation success criterion 3.D is applicable to the period extending from 5 years through 20 years following completion of mitigation construction activities and is applicable to all marsh features. If this criterion is not satisfied at the time of monitoring, the Sponsor 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 Sponsor would be responsible for conducting these additional monitoring events and preparing the associated monitoring reports.

Once monitoring responsibilities have transferred to the Sponsor, the Sponsor 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. Twenty years following completion of mitigation construction activities, the number of monitoring transects and/or quadrats that must be sampled during monitoring events may be reduced substantially 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 Interagency Team.

DEFINITION OF TERMS

Certain terms used herein shall have the meaning discussed in the following section.

Interagency Team
The "Interagency Team" consists of representatives from the following resource agencies; US Fish and Wildlife Service, National Marine Fisheries Service, US Environmental Protection Agency, Louisiana Department of Wildlife and Fisheries, State of Louisiana Office of Coastal Protection and Restoration, Louisiana Department of Natural Resources. In cases where proposed mitigation features will be established within Jean Lafitte National Historical Park and Preserve, representatives from the National Park Service would also comprise the Interagency Team.

Sponsor
This term refers to the Non-Federal Sponsor for the mitigation projects.

Target Year
This document often refers to mitigation "target years" or a particular mitigation "target year" (abbreviated "TY"). Target Year 0 (TY0) is the year in which mitigation construction activities are anticipated to commence, which is presently estimated to occur in calendar year 2019. Target years increase from this time forward. Hence, based on construction beginning in 2019, target year 1 (TY1) would be calendar year 2020, target year 2 (TY2) would be calendar year 2021, etc.

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)
>
> U.S. Geological Survey. 2011. NAS – Nonindigenous Aquatic Species, Louisiana.
> Website - http://nas.er.usgs.gov/queries/SpeciesList.aspx?group=Plants&state=LA&Sortby=2

In addition, invasive plant species include; Japanese climbing fern (*Lygodium japonicum*), tall fescue (*Festuca arundinacea*), chinaberry (*Miscanthus sinensis*), Brazil vervain (*Verbena litoralis* var. *brevibrateata*), 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. Examples of potential nuisance plant species 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.), black willow (*Salix nigra*), and boxelder (*Acer negundo*). The determination of whether a particular plant species should be considered as a nuisance species and therefore eradicated or controlled will be determined by the USACE in coordination with the Interagency Team, based on conditions present within a particular mitigation area.

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, 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.

Reed, P. B., Jr. 1988. National List of Plant Species that Occur in Wetlands: 1988 National Summary. Biological Report 88(24). Washington, DC: U.S. Fish and Wildlife Service.
(website - http://www.usace.army.mil/CECW/Documents/cecwo/reg/plants/list88.pdf)

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.

Planting Season
This is generally considered to be the period from approximately December 15 through March 15, although some deviation from this typical range is allowed.

Point-Centered Quarter Method
A plot-less method of forest sampling. Use of this method will be in general compliance with the applicable methodology described in the following reference:

Cottam, Grant and J. T. Curtis. 1956. The use of distance measures in phytosociological sampling. Ecology, 37(3):451-460.

Piezometer
Typically a small-diameter observation well employed as a means of measuring water elevations in the surficial aquifer (water table elevations). Piezometers used for monitoring purposes should be constructed in general accordance with the following reference, unless otherwise approved by the USACE:

U. S. Army Corps of Engineers. 2005. Technical standard for water-table monitoring of potential wetland sites. ERDC TN-WRAP-05-02. Vicksburg, MS: U.S. Army Engineer Research and Development Center.
(website - http://el.erdc.usace.army.mil/wrap/pdf/tnwrap05-2.pdf)

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.

APPENDIX K: INTERAGENCY ENVIRONMENTAL PROJECT DELIVERY TEAM

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Judy Almerico	U.S. Army Corps of Engineers
Kyle Balkum	Louisiana Department Wildlife & Fisheries
Elizabeth Behrens	U.S. Army Corps of Engineers
Jason Binet	U.S. Army Corps of Engineers
Catherine Breaux	U.S. Fish and Wildlife Service
Aven Bruser	U.S. Army Corps of Engineers
Frank Cole	Louisiana Dept. of Natural Resources
Gloria Croft	U.S. Army Corps of Engineers
Jared Everitt	U.S. Army Corps of Engineers
Sydney Dobson	Louisiana Coastal Protection and Restoration Authority
Barret Fortier	U.S. Fish and Wildlife Service
Brian Fortsen	ELOS
Caitlin Glymph	Louisiana Coastal Protection and Restoration Authority
Craig Gothreaux	NOAA National Marine Fisheries Service
Judi Gutierrez	U.S. Army Corps of Engineers
Raul Gutierrez	U.S. Environmental Protection Agency
Kevin Harper	U.S. Army Corps of Engineers
Jeff Harris	Louisiana Dept. of Natural Resources
Elizabeth Hill	Louisiana Dept. of Environmental Quality
Guy Hughes	National Park Service
Neil Lalonde	U.S. Fish and Wildlife Service
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Keith O'Cain	U.S. Army Corps of Engineers
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Erin Rowan	U.S. Army Corps of Engineers
Sandra Sears	U.S. Army Corps of Engineers
Loribeth Tanner	U.S. Environmental Protection Agency
Ann Tran	U.S. Army Corps of Engineers
Kevin Wagner	U.S. Army Corps of Engineers
David Walther	U.S. Fish and Wildlife Service
Patrick Williams	NOAA National Marine Fisheries Service
Laura Lee Wilkinson	U.S. Army Corps of Engineers
Karen Vance	U.S. Army Corps of Engineers

APPENDIX L: CUMULATIVE IMPACTS

Project Name	Project Type	Wetlands and Other Surface Waters	Wildlife	Threatened and Endangered Species	Fisheries, Aquatic Resources, and Water Quality	Essential Fish Habitat	Cultural Resources	RecreationalResources	Aesthetic Resources	Air Quality	Noise	Socioeconomics	Environmental Justice
CIAP (BA-161): Mississippi River Water Reintroduction Into Bayou Lafourche - BLWFD	Diversion	+	+/-	o	+/-	+/-	o	+/-	-	o	o	+	+/-
CIAP (BA-43-EB): Mississippi River Long Distance Sediment Pipeline	Diversion	+/-	+/-	o	+/-	+/-	o	+/-	+/-	o	o	o	o
CWPPRA (BA-39): Bayou Dupont Sediment Delivery System	Diversion	+/-	+/-	o	+/-	+/-	o	+/-	-	o	o	o	+/-
CWPPRA (MR-03): West Bay Sediment Diversion	Diversion	+	+/-	+/-	+/-	+/-	-	+/-	-	o	+/-	o	o
CWPPRA (TE-34): Penchant Basin Natural Resources Plan, Increment 1	Diversion	+	+/-	o	+/-	+/-	o	+/-	-	o	+/-	o	o
LWCRPA (BA-03): Naomi Siphon Diversion	Diversion	+	+/-	o	+/-	+/-	o	+/-	-	o	o	o	+/-
LWCRPA (BA-04): West Pointe a la Hache Siphon Diversion	Diversion	+	+/-	o	+/-	+/-	o	+/-	-	o	o	o	+/-
LWCRPA (BA-25): Bayou Lafouche Freshwater Introduction	Diversion	+	+/-	o	+/-	+/-	+/-	+/-	-	o	o	+	+/-
LWCRPA (MR-01B): Small Sediment Diversions	Diversion	+/-	+/-	+/-	+/-	+/-	+/-	+/-	-	o	o	o	o
LWCRPA (PO-01): Violet Siphon	Diversion	+	+/-	+/-	+/-	+/-	o	+/-	-	o	o	o	+/-
WRDA (BA-01): Davis Pond Freshwater Diversion and Forced Drainage Area	Diversion	+	+/-	o	+/-	+/-	o	+/-	o	o	o	o	o
WRDA (BS-08): Caernarvon Freshwater	Diversion	+	+/-	+/-	+/-	+/-	o	+/-	-	o	o	o	+/-
CWPPRA (AT-02): Atchfalafaya Sediment Delivery	Diversion/ Marsh Creation	+/-	+/-	+/-	+/-	+/-	+	+/-	o	o	o	o	o
CIAP (PO-51): Mandeville Aquatic Ecosystem Restoration Project	Habitat Enhancement	+/-	+/-	o	+/-	+/-	o	+/-	o	o	o	o	o
CWPPRA (BS-11): Delta Management at Fort St. Phillip	Habitat Enhancement	+	+	+/-	+/-	+/-	+	+/-	o	o	o	o	o
CWPPRA (MR-06): Channel Armor Gap Crevasse	Habitat Enhancement	+	+	+/-	+/-	+/-	+	+/-	o	o	o	o	o
CWPPRA (MR-09): Delta Wide Crevasses	Habitat Enhancement	+/-	+	+/-	+/-	+/-	+/-	+/-	o	o	o	o	o

Project Name	Project Type	Wetlands and Other Surface Waters	Wildlife	Threatened and Endangered Species	Fisheries, Aquatic Resources, and Water Quality	Essential Fish Habitat	Cultural Resources	RecreationalResources	Aesthetic Resources	Air Quality	Noise	Socioeconomics	Environmental Justice
CWPPRA (TE-53): Enhancement of Barrier Island Vegetation Demonstration	Habitat Enhancement	+	+	+	+/-	+/-	o	+/-	o	o	o	o	o
LWCRPA (TE-01): Montegut Wetland	Habitat Enhancement	+	+	+	+/-	o	o	+/-	o	o	o	o	o
SECTION 204/1135: MRGO, Breton Island Berm Mile -2 to -3	Habitat Enhancement	+	+	+/-	+/-	+/-	o	+/-	o	o	o	o	o
CIAP (BA-61): West Bank Wetland Conservation and Protection	Habitat Preservation	+	+	+	o	o	o	o	+	o	o	o	o
CIAP (PO-39): Bald Cypress/Tupelo Coastal Forest	Habitat Preservation	+	+	+	+/-	o	o	+	o	o	o	o	o
CIAP (PO-48): Green Property Preservation Project	Habitat Preservation	+	+	+	o	o	o	o	+	o	o	o	o
CIAP (PO-49): French Property Preservation Project	Habitat Preservation	+	+	+	o	o	o	o	+	o	o	o	o
CWPPRA (PO-19): Mississippi River Gulf Outlet Disposal Area Marsh Protection	Habitat Preservation	+	+	o	+/-	+/-	o	o	+	o	o	o	o
CWPPRA (PO-30): Lake Borgne Shoreline Protection	Habitat Preservation	+	+	+/-	+/-	+/-	o	o	+	o	o	o	o
HSDRRS: HSDRRS Mitigation WBV General Protected Side BLH Wet	Habitat Preservation	+	+	+	o	o	o	o	+	o	o	o	o
HSDRRS: Previously Authorized Mitigation WBV	Habitat Preservation	+	+	+	o	o	o	o	+	o	o	o	o
LWCRPA (BA-16): Bayou Segnette	Habitat Preservation	+	+	o	+/-	+/-	o	o	o	o	o	o	o
National Park Service/USACE: Jean Lafitte National Historical Park & Preserve Beneficial Use Site	Habitat Preservation	+	+	o	-	-	o	o	o	o	o	o	o
Texaco Oil Spill Mitigation: Texaco Oil Discharge Mitigation 1991 (Netherlands Area)	Habitat Preservation	+	+	o	+/-	+/-	o	o	o	o	o	o	o
US Department of Justice: St Charles Levee Conservation Easement	Habitat Preservation	+	+	o	o	o	o	o	+	o	o	o	o
USACE (PO-152): MRGO O&M 3rd and 4th Supplemental (Doulluts Canal to Jahncke's Ditch)	Habitat Preservation	+	+	o	+/-	+/-	o	o	+	o	o	o	o

Project Name	Project Type	Wetlands and Other Surface Waters	Wildlife	Threatened and Endangered Species	Fisheries, Aquatic Resources, and Water Quality	Essential Fish Habitat	Cultural Resources	RecreationalResources	Aesthetic Resources	Air Quality	Noise	Socioeconomics	Environmental Justice
USACE (PO-93 and PO-94): MRGO O&M (Bayou Dupre Segment)	Habitat Preservation	+	+	o	+/-	+/-	o	o	+	o	o	o	o
USACE (PO-95): MRGO O&M 3rd and 4th Supplemental and MRGO O&M (MRGO East Bank Shoreline Protection in the Vicinity of Bayou Yscloskey)	Habitat Preservation	+	+	o	+	+/-	o	o	+	o	o	o	o
USACE: MRGO O&M (MRGO West Bank Shoreline Protection in the vicinity of Stump Bayou)	Habitat Preservation	+	+	o	o	+/-	o	o	+	o	o	o	o
CIAP (BA-45-EB): Caminada Headlands	Habitat Restoration	+/-	+	+/-	o	+/-	o	o	o	o	o	o	o
CIAP (PO-73-3): Central Wetlands Demonstration Expansion	Habitat Restoration	+/-	+/-	+/-	+/-	+/-	o	+/-	o	o	o	+	+/-
CWPPRA (BA-02): GIWW to Clovelly Hydrologic Restoration	Habitat Restoration	+	+	o	+/-	+/-	o	o	o	o	o	o	o
CWPPRA (BA03C): Naomi Outfall Management	Habitat Restoration	+	+	o	+/-	+/-	o	o	o	o	o	o	+/-
CWPPRA (BA-19): Barataria Bay Waterway Wetland Restoration	Habitat Restoration	+/-	+/-	+/-	+/-	+/-	o	+	o	o	o	o	o
CWPPRA (BA-20): Jonathan Davis Wetland Restoration	Habitat Restoration	+	+	o	+/-	+/-	o	o	+/-	o	o	o	o
CWPPRA (BA-34-2): Hydrologic Restoration and Vegetative Planting in the Des Allemands Swamp	Habitat Restoration	+	+	o	+/-	o	o	+	+	o	o	o	o
CWPPRA (BS-03A): Caernarvon Diversion Outfall Management	Habitat Restoration	+	+	o	+/-	+/-	o	+	o	o	o	o	+/-
CWPPRA (PO-06): Fritchie Marsh Restoration	Habitat Restoration	+	+	o	+/-	+	o	o	o	o	o	o	o
CWPPRA (PO-16): Bayou Sauvage National Wildlife Refuge Hydrologic Restoration, Phase 1	Habitat Restoration	+	+	o	+/-	+/-	o	o	o	o	o	o	+/-
CWPPRA (PO-18): Bayou Sauvage National Wildlife Refuge Hydrologic Restoration, Phase 2	Habitat Restoration	+	+	o	+/-	+/-	o	o	o	o	o	o	o

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CWPPRA (PO-22): Bayou Chevee Shoreline Protection	Habitat Restoration	+/-	+/-	o	+	+/-	o	+	o	o	o	o	o
CWPPRA (PO-24): Hopedale Hydrologic Restoration	Habitat Restoration	+	+	o	+	+	o	o	o	o	o	o	o
CWPPRA (PO-27): Chandeleur Islands Marsh Restoration	Habitat Restoration	+	+	+/-	o	o	o	o	o	o	o	o	o
CWPPRA (TE-20): Isles Dernieres Restoration East Island	Habitat Restoration	+/-	+/-	+/-	+/-	+/-	o	o	-	o	o	o	o
CWPPRA (TE-23): West Belle Pass Headland Restoration	Habitat Restoration	+/-	+/-	+/-	+/-	-	+	o	+/-	o	o	o	o
CWPPRA (TE-24): Isles Dernieres Restoration Trinity Island	Habitat Restoration	+/-	+/-	+/-	+/-	+/-	o	+	+	o	o	o	o
CWPPRA (TE-25): East Timbalier Island Sediment Restoration, Phase 1	Habitat Restoration	+/-	+/-	+/-	+/-	-	+/-	o	o	o	o	o	o
CWPPRA (TE-26): Lake Chapeau Sediment Input and Hydrologic Restoration, Point Au Fer Island	Habitat Restoration	+	+	o	+	+	o	+	o	o	o	o	o
CWPPRA (TE-27): Whiskey Island Restoration	Habitat Restoration	+/-	+/-	+/-	+/-	+/-	o	+	+	o	o	o	o
CWPPRA (TE-28): Brady Canal Hydrologic Restoration	Habitat Restoration	+	+	o	+	+	o	o	o	o	o	o	o
CWPPRA (TE-36): Thin Mat Floating Marsh Enhancement Demonstration	Habitat Restoration	+/-	+/-	o	+/-	+/-	o	o	o	o	o	o	o
CWPPRA (TE-37): New Cut Dune and Marsh Restoration	Habitat Restoration	+/-	+/-	+/-	+/-	-	o	o	o	o	o	o	o
CWPPRA (TE-39): South Lake Decade Freshwater Introduction	Habitat Restoration	+	+	o	+/-	+/-	o	o	+/-	o	o	o	o
CWPPRA (TE-41): Mandalay Bank Protection Demonstration	Habitat Restoration	+/-	+/-	o	+/-	+/-	o	o	o	o	o	o	o
CWPPRA (TE-52): West Belle Pass Barrier Headland Restoration	Habitat Restoration	+/-	+/-	+/-	+/-	-	o	+	+	o	o	o	o
CWPPRA (TV-04): Cote Blanche Hydrologic Restoration	Habitat Restoration	+	+	o	+/-	+/-	+	o	-	o	o	o	o

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CWPPRA (TV-15): Sediment Trapping at "The Jaws"	Habitat Restoration	+/-	+/-	+/-	+/-	+/-	+/-	+	-	o	o	o	o
FEDERAL (TE-82): Lost Lake Vegetation	Habitat Restoration	+/-	+/-	o	+/-	+/-	o	+	+	o	o	o	o
FEMA (TE-133): Isle Dernieres (Whiskey Island)	Habitat Restoration	+/-	+/-	+/-	+/-	o	o	o	o	o	o	o	o
HSDRRS (BA-158): New Orleans to Venice Mitigation - Plaquemines Non-Federal	Habitat Restoration	+/-	+/-	+/-	+/-	+/-	+/-	o	o	o	o	o	o
HSDRRS (BA-159): New Orleans to Venice Mitigation - Federal	Habitat Restoration	+/-	+/-	+/-	+/-	+/-	+/-	o	o	o	o	o	o
HSDRRS (PO-145): LPV Task Force Guardian Mitigation-Bayou Sauvage	Habitat Restoration	+/-	+/-	+/-	+/-	o	o	+	o	o	o	o	o
HSDRRS: HSDRRS Mitigation LPV Bayou Sauvage Floodside Brackish Marsh	Habitat Restoration	+/-	+/-	+/-	+/-	+/-	o	+	o	o	o	o	o
HSDRRS: HSDRRS Mitigation LPV New Zydeco Ridge Protected Side Bottomland Hardwood Wet and Floodside Brackish Marsh	Habitat Restoration	+/-	+/-	+/-	+/-	o	+/-	+	o	o	o	o	o
HSDRRS: HSDRRS Mitigation LPV Turtle Bayou Protected Side Intermediate Marsh	Habitat Restoration	+/-	+/-	+/-	+/-	-	+/-	+/-	+/-	o	o	o	o
HSDRRS: HSDRRS Mitigation WBV Avondale Protected Side BLH-Dry Restoration	Habitat Restoration	+/-	+/-	+/-	o	o	o	o	+	o	o	o	o
HSDRRS: HSDRRS Mitigation WBV JLNHPP Park Yankee Pond and Geocrib Floodside Fresh Marsh Restoration	Habitat Restoration	+/-	+/-	o	+/-	+/-	+/-	+/-	+/-	o	o	o	o
HSDRRS: HSDRRS Mitigation WBV JLNHPP Park/404c Hwy 45 Floodside BLH-Wet Restoration	Habitat Restoration	+/-	+/-	o	+/-	o	o	+/-	+	o	o	o	o

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HSDRRS: HSDRRS Mitigation WBV JLNHPP Park/404c Millaudon and Horseshoe Canal Floodside Swamp Enhancement	Habitat Restoration	+/-	+/-	o	+/-	o	o	+/-	o	o	o	o	o
LWCPRA (PO-4355NP4): Fontainebleau State Park Mitigation	Habitat Restoration	+	+	o	+/-	+/-	o	+	o	o	o	o	o
LWCRPA (BA-05B): Queen Bess Island	Habitat Restoration	+/-	+	+	+/-	-	o	o	-	o	o	o	o
LWCRPA (BS-06): Lake Lery Hydrologic Restoration	Habitat Restoration	+	+	o	+/-	+/-	o	o	o	o	o	o	o
LWCRPA (PO-02C): Bayou Chevee	Habitat Restoration	+	+	o	+/-	+/-	o	+	-	o	o	o	o
LWCRPA (PO-08): Central Wetlands Pump Outfall	Habitat Restoration	+	+	o	+/-	+/-	o	o	o	o	o	o	+/-
LWCRPA (PO-142): Hydrologic Restoration of the Amite River Diversion Canal	Habitat Restoration	+	+	o	+/-	+	o	+	o	o	o	o	o
LWCRPA (TE-02): Falgout Canal Wetland	Habitat Restoration	+	+	o	+/-	+/-	o	+	+	o	o	o	o
LWCRPA (TE-03): Bayou Lacache Wetland	Habitat Restoration	+	+	o	+/-	+/-	o	o	-	o	o	o	o
LWCRPA (TE-06): Pointe-aux-Chenes Hydrologic Restoration	Habitat Restoration	+/-	+	o	+/-	o	+/-	+	o	o	o	o	o
LWCRPA (TE-07B): Lower Petit Caillou	Habitat Restoration	+	+	o	+/-	o	o	o	o	o	o	o	o
LWCRPA (TE-106): Raccoon Island Repair	Habitat Restoration	+/-	+	+/-	+/-	-	o	+	+	o	o	o	o
LWCRPA (TE-14): Point Farm Refuge Planting	Habitat Restoration	+/-	+/-	+	+/-	o	+/-	+	+	o	o	o	o
LWCRPA (TV-06): Marsh Island Control Structures	Habitat Restoration	+	+	o	+/-	+	o	+	+	o	o	o	o
NRDA (BA-111): Shell Island West - NRDA	Habitat Restoration	+/-	+/-	+/-	+/-	+/-	o	+	o	o	o	o	o
NRDA (BA-76 aka BA-142): Cheniere Ronquille Barrier Island Restoration	Habitat Restoration	+/-	+/-	+/-	+/-	+/-	+/-	+	+/-	o	o	o	o
NRDA (TE-100): NRDA Caillou Lake Headlands	Habitat Restoration	+/-	+/-	+/-	+/-	+/-	+/-	+	+	o	o	o	o

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RESTORE (BA-197): West Grand Terre Beach Nourishment and Stabilization	Habitat Restoration	+/-	+/-	+/-	+/-	+/-	o	+	+/-	o	o	o	o
SECTION 204/1135: MRGO, Breton Island Restoration Mile -2.3 to 4.0	Habitat Restoration	+/-	+/-	+/-	+/-	-	o	+	+/-	o	o	o	o
CWPPRA (MR-10): Dustpan Maintenance Dredging Operations for Marsh Creation in the Mississippi River Delta Demonstration	Habitat Restoration/ Marsh Creation	+/-	+/-	+/-	+/-	+/-	o	+	+	o	o	o	o
BERM (BA-110): Shell Island East Berm	Marsh Creation	+/-	+/-	+/-	+/-	+/-	o	+	-	o	o	o	o
BERM (BA-40): Riverine Sand Mining/Scofield Island Restoration	Marsh Creation	+/-	+/-	+/-	+/-	+/-	+/-	+	o	o	o	o	o
CIAP (BA-36-EB): Barataria Land Bridge Dedicated Dredging	Marsh Creation	+/-	+/-	o	+/-	+/-	o	+	+	o	o	o	o
CIAP (BA-58): Fringe Marsh Repair	Marsh Creation	+/-	+/-	+/-	+/-	+/-	o	+/-	o	o	o	+	o
CWPPRA (AT-03): Big Island Mining	Marsh Creation	+/-	+/-	+/-	+/-	+/-	o	+/-	o	o	o	o	o
CWPPRA (BA-125): Northwest Turtle Bay Marsh Creation	Marsh Creation	+/-	+/-	+/-	+/-	+/-	+/-	o	o	o	o	o	o
CWPPRA (BA-164): Bayou Dupont Sediment Delivery - Marsh Creation #3 and Terracing	Marsh Creation	+/-	+/-	+/-	+/-	+/-	o	+/-	o	o	o	+	+/-
CWPPRA (BA-28): Vegetative Plantings of a Dredged Material Disposal Site on Grand Terre Island	Marsh Creation	+	+	o	+/-	+/-	o	+/-	+	o	o	o	o
CWPPRA (BA-35): Pass Chaland to Grand Bayou Pass	Marsh Creation	+/-	+/-	+/-	+/-	+/-	o	+/-	+	o	o	o	o
CWPPRA (BA-36): Dedicated Dredging on the Barataria Basin Landbridge	Marsh Creation	+/-	+/-	+/-	+/-	+/-	o	+/-	o	o	o	o	o
CWPPRA (BA-37): Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake	Marsh Creation	+/-	+/-	o	+/-	+/-	+	+/-	o	o	o	o	o
CWPPRA (BA-42): Lake Hermitage Marsh Creation	Marsh Creation	+/-	+/-	+/-	+/-	+/-	o	+/-	o	o	o	o	o

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CWPPRA (BA-48): Bayou Dupont Marsh and Ridge Creation	Marsh Creation	+/-	+/-	o	+/-	+/-	o	+/-	o	o	o	o	o
CWPPRA (LA-05): Floating Marsh Creation Demonstration	Marsh Creation	+/-	+/-	o	+/-	+/-	o	o	o	o	o	o	o
CWPPRA (LA-09): Sediment Containment System for Marsh Creation Demonstration	Marsh Creation	+/-	+/-	o	+/-	+/-	o	o	-	o	o	o	o
CWPPRA (PO-104): Bayou Bonfouca Marsh Creation	Marsh Creation	+/-	+/-	o	+/-	+/-	o	+/-	o	o	o	o	o
CWPPRA (PO-17): Bayou Labranche Wetland Creation	Marsh Creation	+/-	+/-	o	+/-	+/-	o	+	o	o	o	o	o
CWPPRA (PO-33): Goose Point/Point Platte Marsh Creation	Marsh Creation	+/-	+/-	o	+/-	+/-	o	+	o	o	o	o	o
CWPPRA (TE-40): Timbalier Island Dune and Marsh Creation	Marsh Creation	+/-	+/-	+/-	+/-	+/-	o	+	+	o	o	o	o
CWPPRA (TE-50): Whiskey Island Back Barrier Marsh Creation	Marsh Creation	+/-	+/-	+/-	+/-	+/-	o	+	+	o	o	o	o
DOTD: I-310 Mitigation	Marsh Creation	+/-	+	o	+/-	+/-	o	+	o	o	o	o	+/-
HSDRRS (BA-156): Plaquemines TFU Mitigation - Braithwaite to Scarsdale - Big Mar	Marsh Creation	+/-	+/-	o	+/-	+/-	o	+	+	o	o	o	o
HSDRRS (PO-146): LPV Mitigation, Manchac WMA Marsh Creation	Marsh Creation	+/-	+/-	o	+/-	+/-	o	+/-	-	o	o	o	o
HSDRRS: HSDRRS Mitigation LPV Milton Island Floodside Intermediate Marsh	Marsh Creation	+/-	+/-	o	+/-	+/-	+/-	+/-	+	o	o	o	o
LWCRPA (LA-01A): Dedicated Dredging Program – Lake Salvador	Marsh Creation	+/-	+	o	+/-	-	o	+	o	o	o	o	o
LWCRPA (LA-01B): Dedicated Dredging Program – Bayou Dupont	Marsh Creation	+/-	+	+/-	-	-	o	+/-	o	o	o	o	o
LWCRPA (LA-01C): Dedicated Dredging Program – Pass a Loutre	Marsh Creation	+/-	+/-	+/-	-	-	+	+/-	o	o	o	o	o
LWCRPA (LA-01D): Terrebonne School Board Site - Dedicated Dredging	Marsh Creation	+/-	+/-	o	-	-	+/-	+/-	o	o	o	o	o

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LWCRPA (LA-01E): Grand Bayou Blue Site - Dedicated Dredging	Marsh Creation	+/-	+/-	o	-	-	o	+/-	o	o	o	o	o
LWCRPA (LA-01F): Dedicated Dredging - Point au Fer	Marsh Creation	+/-	+/-	+/-	-	-	o	+/-	o	o	o	o	o
National Park Service: 2010 Jean Lafitte National Historical Park & Preserve Canal Partial Back Fillings	Marsh Creation	+	+	o	-	-	o	+	o	o	o	o	o
National Park Service: 2002 Jean Lafitte National Historical Park & Preserve Canal Partial Back Fillings	Marsh Creation	+	+	o	-	-	o	+	o	o	o	o	o
NOAA (TE-105): Brown Marsh	Marsh Creation	+	+	o	+/-	+/-	o	o	o	o	o	o	o
NRDA (BA-141): Lake Hermitage Marsh Creation Increment 2	Marsh Creation	+/-	+/-	o	-	-	o	o	o	o	o	o	o
SECTION 204/1135: Barataria Waterway/Grand Terre Island Phase 1 & 2	Marsh Creation	+/-	+/-	o	-	-	o	o	o	o	o	o	o
WRDA (BA-191): Spanish Pass Ridge and Marsh Restoration	Marsh Creation	+/-	+/-	+/-	+/-	+/-	o	+	+	o	o	o	o
CWPPRA (BA-68): Grand Laird Marsh and Ridge Restoration	Marsh Creation/ Hydrologic Restoration	+/-	+/-	+/-	+/-	+/-	o	+/-	o	o	o	o	o
CWPPRA (TE-72): Lost Lake Marsh Creation and Hydrologic Restoration	Marsh Creation/ Hydrologic Restoration	+/-	+/-	o	+/-	+/-	o	+/-	o	o	o	o	o
CIAP (BA-155): Fifi Island Restoration	Shoreline Protection	+/-	+	+/-	+/-	-	o	o	-	o	o	o	o
CIAP (BA-15-X2): Lake Salvador Shoreline Protection-Phase III	Shoreline Protection	+/-	+	o	+/-	+/-	+	+	o	o	o	o	o
CIAP (BA-162-SPER): Shoreline Protection Emergency Restoration	Shoreline Protection	+/-	+	+/-	+/-	+/-	+/-	o	-	o	o	+	o
CIAP (PO-148): Living Shoreline	Shoreline Protection	+/-	+	+/-	+/-	+/-	o	o	-	o	o	o	o
CIAP (PO-36EB): Orleans Land Bridge Shoreline Protection and Marsh Creation	Shoreline Protection	+/-	+	o	+	+/-	o	+/-	o	o	o	o	o

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CIAP (PO-43): East Labranche Shoreline Protection	Shoreline Protection	+	+	o	+	+/-	o	+	o	o	o	o	o
CIAP (TE-125): Bush Canal and Bayou Terrebonne Bank Stabilization	Shoreline Protection	+/-	+	o	+/-	+/-	+	o	-	o	o	o	o
CIAP (TE-43-EB): GIWW Bank Restoration of Critical Areas in Terrebonne	Shoreline Protection	+/-	+/-	o	+/-	-	+	o	-	o	o	+	o
CWPPRA (BA-15): Lake Salvador Shoreline Protection Demonstration	Shoreline Protection	+/-	+	o	+/-	+/-	o	+	o	o	o	o	o
CWPPRA (BA-23): Barataria Bay Waterway (BBWW) West Side Shoreline Protection	Shoreline Protection	+/-	+	o	+/-	-	o	o	-	o	o	o	o
CWPPRA (BA-26): Barataria Bay Waterway (BBWW) East Side Shoreline Protection	Shoreline Protection	+/-	+	o	+/-	-	o	o	-	o	o	o	o
CWPPRA (BA-27): Barataria Basin Landbridge Shoreline Protection, Phase 1 & 2	Shoreline Protection	+/-	+	o	+/-	+/-	+	o	-	o	o	o	o
CWPPRA (BA-27C): Barataria Basin Landbridge Shoreline Protection, Phase 3 CU 7 and 8	Shoreline Protection	+/-	+	o	+/-	+/-	+	o	-	o	o	o	o
CWPPRA (BA-27D): Barataria Basin Landbridge Shoreline Protection, Phase 4	Shoreline Protection	+/-	+	o	+/-	+/-	+	o	-	o	o	o	o
CWPPRA (TE-17): Falgout Canal Planting Demonstration	Shoreline Protection	+/-	+/-	o	+/-	+/-	+	+/-	-	o	o	+	o
CWPPRA (TE-18): Timbalier Island Planting Demonstration	Shoreline Protection	+/-	+	+/-	+/-	O	+	+/-	-	o	o	o	o
CWPPRA (TE-29): Raccoon Island Breakwaters Demonstration	Shoreline Protection	+/-	+	+/-	+/-	+/-	+	+/-	-	o	o	o	o
CWPPRA (TE-30): East Timbalier Island Sediment Restoration, Phase 2	Shoreline Protection	+/-	+	+/-	+/-	+/-	+/-	+/-	-	o	o	o	o
CWPPRA (TE-43): GIWW Bank Restoration of Critical Areas in Terrebonne	Shoreline Protection	+/-	+	o	+/-	+/-	+	+/-	-	o	o	+	o

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CWPPRA (TE-44): North Lake Mechant Landbridge Restoration	Shoreline Protection	+/-	+/-	o	+/-	+/-	+	+/-	-	o	o	o	o
CWPPRA (TE-45): Terrebonne Bay Shoreline Protection Demonstration	Shoreline Protection	+/-	+/-	o	+/-	+/-	+/-	+/-	-	o	o	o	o
LWCPRA (BA-187): Grand Isle Bay Side Breakwaters	Shoreline Protection	+/-	+	+/-	+/-	+/-	o	+/-	-	o	o	+	o
LWCPRA (BA-200): North Grand Isle Breakwaters	Shoreline Protection	+/-	+	+/-	+/-	+/-	+	+/-	-	o	o	+	o
LWCRPA (BA-05C): Baie De Chactas	Shoreline Protection	+/-	+	o	+/-	+/-	o	o	o	o	o	o	o
LWCRPA (BA-15-X1): Lake Salvador Shoreline Protection Extension	Shoreline Protection	+/-	+/-	o	+/-	+/-	o	o	o	o	o	o	o
LWCRPA (BA-168): Grand Isle-Fifi Island Breakwaters	Shoreline Protection	+/-	+	+/-	+/-	+/-	+	o	-	o	o	+	o
LWCRPA (PO-03): Labranche Shoreline Stabilization and Canal Closure	Shoreline Protection	+/-	+	o	+	+/-	o	+	o	o	o	o	o
LWCRPA (PO-03B): Labranche Shoreline Protection	Shoreline Protection	+/-	+	o	+	+/-	o	+	o	o	o	o	o
LWCRPA (PO-10): Turtle Cove Shore Protection	Shoreline Protection	+/-	+	o	+	+/-	o	+	-	o	o	o	o
LWCRPA (PO-161): Lake Pontchartrain Hurricane Mitigation	Shoreline Protection	+/-	+	o	+/-	+/-	+	+/-	-	o	o	o	o
LWCRPA (PO-72): Biloxi Marsh	Shoreline Protection	+/-	+	o	+/-	+/-	o	+	o	o	o	o	o
LWCRPA (TE-107): Spoilbank Along the GIWW	Shoreline Protection	+/-	+	o	+/-	+/-	+	o	o	o	o	+	o
LWCRPA (TV-02A): Hammock Lake	Shoreline Protection	+/-	+	o	+/-	+/-	+	+/-	-	o	o	o	o
LWCRPA (TV-02B): Yellow Bayou	Shoreline Protection	+/-	+	o	+/-	+/-	+	+/-	-	o	o	o	o
LWCRPA (TV-72): Quintana Canal/Cypremort Point	Shoreline Protection	+/-	+	+/-	+/-	+/-	+/-	+/-	-	o	o	o	o
National Park Service/USACE: Lake Salvador Shoreline Protection 1997 Shoreline Protection	Shoreline Protection	+	+	o	+/-	+/-	o	o	o	o	o	o	o
National Park Service/USACE: Lake Salvador Shoreline Protection 2005	Shoreline Protection	+/-	+	o	+/-	+/-	+	+	o	o	o	o	o

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National Park Service/USACE: Lake Salvador Shoreline Protection 2011	Shoreline Protection	+/-	+	o	+/-	+/-	o	o	o	o	o	o	o
NFWF (BA-143): Caminada Headland Beach and Dune Restoration Increment 2	Shoreline Protection	+/-	+	+/-	+/-	+/-	+	+/-	o	o	o	o	o
NOAA (BA-186): Fisheries Habitat Restoration on West Grand Terre Island at Fort Livingston	Shoreline Protection	+/-	+	+/-	+/-	+/-	+	+/-	-	o	o	o	o
US Army Corps of Engineers: LPV Pre-Katrina Mitigation (Manchac Shoreline)	Shoreline Protection	+/-	+	o	+/-	+/-	o	+	o	o	o	o	o
USACE: MRGO O&M 3rd and 4th Supplemental (West of Shell Beach Shoreline Protection)	Shoreline Protection	+/-	+	o	+/-	+/-	o	+	o	o	o	o	o
CWPPRA (BA-38): Pelican Island and Pass La Mer to Chaland Pass Restoration	Shoreline Protection/ Habitat Restoration	+/-	+/-	+/-	+/-	+/-	+	o	o	o	o	o	o
CIAP (BA-30-EB): East Grand Terre	Shoreline Protection/ Marsh Creation	+/-	+/-	+/-	+/-	+/-	+	o	o	o	o	o	o
CWPPRA (BA-41): South Shore of the Pen Shoreline Protection and Marsh Creation	Shoreline Protection/ Marsh Creation	+/-	+/-	o	+/-	+/-	+/-	o	o	o	o	o	o
CWPPRA (BS-16): South Lake Lery Shoreline and Marsh Restoration	Shoreline Protection/ Marsh Creation	+/-	+/-	o	+/-	-	+/-	+/-	-	o	o	o	o
CWPPRA (TE-46): West Lake Boudreaux Shoreline Protection and Marsh Creation	Shoreline Protection/ Marsh Creation	+/-	+/-	o	+/-	o	+/-	+/-	-	o	o	o	o
CWPPRA (TE-48): Raccoon Island Shoreline Protection and Marsh Creation	Shoreline Protection/ Marsh Creation	+/-	+/-	+/-	+/-	+/-	+/-	+/-	-	o	o	o	o
Algiers Lock	Structure	+/-	+/-	o	-	-	o	+/-	-	o	o	-	o
Algiers Non-federal Levee (Donner Canal Levee)	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
Bayou Gauche Ring Levee (Sunset Levee)	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
Bonnet Carre Spillway	Structure	+/-	+/-	+/-	+/-	+/-	+/-	-	-	o	o	+	o

Project Name	Project Type	Wetlands and Other Surface Waters	Wildlife	Threatened and Endangered Species	Fisheries, Aquatic Resources, and Water Quality	Essential Fish Habitat	Cultural Resources	RecreationalResources	Aesthetic Resources	Air Quality	Noise	Socioeconomics	Environmental Justice
CDBG (TE-78): Cut-Off/Pointe aux Chene Levee	Structure	+/-	+/-	o	+/-	o	o	+/-	-	o	o	+	o
CDBG Funded Project - Bayou Larfourche Fresh Water District - Walter S. Lemann Memorial Pump Station Renovation (BA-84)	Structure	+/-	+/-	o	+/-	+/-	+/-	-	-	o	+/-	+	+/-
CDBG Funded Project - Cut-Off/Pointe aux Chene (TE-78)	Structure	+/-	+/-	o	+/-	+/-	+/-	-	-	o	o	+	o
CDBG Funded Project - Falgout Canal Road Levee (TE-63)	Structure	+/-	+/-	o	+/-	+/-	+/-	-	-	o	o	+	o
CDBG Funded Project - Lafitte Area Levee Repair (BA-82)	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
CIAP (BA-59): Waterline Booster Pump Station, West Bank	Structure	+/-	+/-	o	+/-	o	+/-	-	-	o	o	+	+/-
CIAP (PO-71): Waterline Booster Pump Station, East Bank	Structure	+/-	+/-	o	+/-	o	o	-	-	o	o	+	+/-
CIAP (PO-73-1): Central Wetlands-Riverbend	Structure	+/-	+/-	o	+/-	o	+	-	-	o	o	+	+/-
CIAP (PO-73-2): Central Wetlands Demonstration	Structure	+/-	+/-	o	+/-	o	o	-	-	o	o	+	+/-
CPRA and North Lafourche Conservation, Levee and Drainage District, Valentine to Larose Levee (TE-111)	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
East Plaquemines Non-federal Levee	Structure	+/-	+/-	o	o	o	+/-	-	-	o	o	+	o
Empire Lock	Structure	+/-	+/-	o	-	-	o	+/-	-	o	o	-	o
English Turn Non-federal Levee (Donner Canal Levee)	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
Forty Arpent Levee	Structure	+/-	+/-	o	o	o	+/-	-	-	o	o	+	o
GIWW Navigation System	Structure	+/-	+/-	o	+/-	+/-	+/-	+/-	o	o	o	+	o
Harvey Canal Lock	Structure	+/-	+/-	o	-	-	o	+/-	-	o	o	-	o
Hurricane and Storm Damage Risk Reduction System (HSDRRS), West Bank and Vicinity	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o

Project Name	Project Type	Wetlands and Other Surface Waters	Wildlife	Threatened and Endangered Species	Fisheries, Aquatic Resources, and Water Quality	Essential Fish Habitat	Cultural Resources	RecreationalResources	Aesthetic Resources	Air Quality	Noise	Socioeconomics	Environmental Justice
Hurricane and Storm Damage Risk Reduction System (HSDRRS),Lake Pontchartrain and Vicinity	Structure	+/-	+/-	o	-	-	+/-	-	-	o	o	+	o
I-10 Mile 246 to 248 Non-Federal Levee	Structure	+/-	+/-	o	o	o	+/-	-	-	o	o	+	o
IHNC Lock Replacement	Structure	+/-	+/-	o	-	-	+/-	+/-	-	o	o	+	o
Larose to Golden Meadow, Louisiana, Hurricane Protection Project (LGM)	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
Little Woods/Maxent Non-federal Levee	Structure	+/-	+/-	o	o	o	+/-	-	-	o	o	+	o
Louisiana DOTD/FHWA: Future I-49 South, Raceland to the Westbank Expressway (700-92- 0011)	Structure	+/-	+/-	o	o	-	o	-	-	o	+	+	o
Louisiana DOTD/FHWA: Future I-49 South, Raceland to the Westbank Expressway (700-92- 0011) and Morgan City to Raceland	Structure	+/-	+/-	o	o	-	o	-	-	o	+	+	o
Lower Ninth Ward Non-Federal Levee	Structure	+/-	+/-	o	o	o	+/-	-	-	o	o	+	o
LWCRPA project: Kraemer Bayou Boeuf Levee Lift (BA-169)	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
LWCRPA project: Morgan City/St. Mary Flood Protection (TV-55)	Structure	+/-	+/-	o	-	-	+/-	-	-	o	o	+	+/-
LWCRPA project: Raising of LA-1 at Golden Meadow Floodgate and Completion of Golden Meadow Lock Structure	Structure	+/-	+/-	o	o	-	+/-	+/-	-	o	o	+	o
LWCRPA project: St. Mary Backwater Flooding (TE-116)	Structure	+/-	+/-	o	-	-	+/-	-	-	o	o	+	+/-
LWCRPA project: Violet Canal North Levee Alignment (BA-170)	Structure	+/-	+/-	o	-	-	+/-	-	-	o	o	+	o
Maxent Lagoon Non-Federal Levee	Structure	+/-	+/-	o	o	o	+/-	-	-	o	o	+	o
Mississippi River Gulf Outlet (MRGO)	Structure	+/-	+/-	o	+/-	+/-	+/-	-	o	o	o	+	o

Project Name	Project Type	Wetlands and Other Surface Waters	Wildlife	Threatened and Endangered Species	Fisheries, Aquatic Resources, and Water Quality	Essential Fish Habitat	Cultural Resources	RecreationalResources	Aesthetic Resources	Air Quality	Noise	Socioeconomics	Environmental Justice
Mississippi River Levees : MR&T Project	Structure	+/-	+/-	o	-	-	+/-	-	-	o	o	+	o
Mississippi River Navigation Operations and Maintenance	Structure	+/-	+/-	o	+/-	+/-	o	-	o	o	o	+	o
Monticello Non-Federal Levee	Structure	+/-	+/-	o	o	o	+/-	-	-	o	o	+	o
Morganza to the Gulf	Structure	+/-	+/-	o	-	-	+/-	-	-	o	o	+	+/-
New Orleans to Venice (NOV) levee project, St. Jude to Venice	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
New Orleans to Venice (NOV) levee project, Incorporation of Nonfederal Levees (NFL) into NOV	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
Oakville to La Reussite Non-federal Levee	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
Ormond Non-Federal Levees	Structure	+/-	+/-	o	o	o	+/-	-	-	o	o	+	o
Southeast Louisiana Urban Flood Control Project (SELA) PO-57	Structure	+/-	+/-	o	o	o	+/-	-	-	o	o	+	+/-
St. Charles Parish Levee - Phase 1, West Bank Magnolia Ridge (BA-85-1)	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
St. Charles Parish Levee - Phase 2, West Bank Willow Ridge (BA-85-2)	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
St. Charles Parish Levee - Phase 3, West Bank Ellington (BA-85-3)	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
State of Louisiana Surplus Fund 2007 Project: Lafitte Tidal Protection (BA-75-3)	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
State of Louisiana Surplus Fund 2007 Project: East of Harvey Canal Interim Hurricane Protection - Phase 1	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
State of Louisiana Surplus Fund 2007 Project: Jean Lafitte Tidal Protection, Fisher School Basin	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
State of Louisiana Surplus Fund 2007 Project: Jean Lafitte Tidal Protection, Rosethorne Basin, (BA-75-2)	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o

Project Name	Project Type	Wetlands and Other Surface Waters	Wildlife	Threatened and Endangered Species	Fisheries, Aquatic Resources, and Water Quality	Essential Fish Habitat	Cultural Resources	RecreationalResources	Aesthetic Resources	Air Quality	Noise	Socioeconomics	Environmental Justice
State of Louisiana Surplus Fund MRGO Closure at Bayou La Loutre (PO-38-SF)	Structure	+/-	+/-	o	+/-	+/-	+/-	-	-	o	o	o	o
US Army Corps of Engineers: Davis Pond Freshwater Diversion Structure and Guide Levees	Structure	+/-	+/-	o	o	o	o	-	-	o	o	o	o
US Army Corps of Engineers: Davis Pond Freshwater Diversion Structure and Guide Levees	Structure	+/-	+/-	o	o	o	+/-	-	-	o	o	o	o
West Plaquemines Non-federal Levee	Structure	+/-	+/-	o	o	o	o	-	-	o	o	+	o
CWPPRA (TE-22): Point au Fer Canal Plugs	Structure/ Hydrologic Restoration	+/-	+/-	o	o	+/-	o	-	-	o	o	o	o

+ positive effect, - negative effect, o no effect, +/- both positive and negative effects

APPENDIX M: AGENCY COORDINATION

From: Elizabeth Hill
To: Wilkinson Wolfson, Laura L CIV USARMY CEMVN (USA); Meden, Daniel C CIV USARMY CEMVN (USA)
Subject: [Non-DoD Source] RE: SEA 543a brackish mitigation site in St. Tammany Parish (UNCLASSIFIED)
Date: Monday, August 26, 2019 4:11:47 PM

Yes, this is fine

-----Original Message-----
From: Wilkinson Wolfson, Laura L CIV USARMY CEMVN (USA) <Laura.L.Wilkinson@usace.army.mil>
Sent: Friday, August 23, 2019 3:37 PM
To: Meden, Daniel C CIV USARMY CEMVN (USA) <Daniel.C.Meden@usace.army.mil>; Elizabeth Hill <Elizabeth.Hill@la.gov>
Subject: RE: SEA 543a brackish mitigation site in St. Tammany Parish (UNCLASSIFIED)

Greetings Elizabeth,
I just wanted to make sure that I capture our Water Quality Certification coordination correctly. Below is the paragraph that I plan to include in SEA #543a:

" The Clean Water Act (CWA) sets and maintains goals and standards for water quality and purity. Section 401 requires a Water Quality Certification from the Louisiana Department of Environmental Quality (LDEQ). Coordination with the Louisiana Department of Environmental Quality is ongoing and SEA 543a will be incorporated into LDEQ's administrative record for WQC 110520-01. WQC 110520-01 remains valid for this project, see coordination email in Appendix M."

Email below will be in appendix M. Please let me know if you are okay with this language.
Thanks,
Laura Lee Wilkinson
Biologist
CEMVN PDS-C
504-862-1212

-----Original Message-----
From: Elizabeth Hill [mailto:Elizabeth.Hill@la.gov]
Sent: Wednesday, May 15, 2019 9:17 AM
To: Meden, Daniel C CIV USARMY CEMVN (USA) <Daniel.C.Meden@usace.army.mil>
Subject: [Non-DoD Source] RE: SEA 543a brackish mitigation site in St. Tammany Parish (UNCLASSIFIED)

Yes. The project location in St. Tammany Parish was considered as well as the source of the material from Lake Pontchartrain.

Prior to issuing approval, the project was evaluated for impacts to water quality. The mitigation project as proposed is not expected to violate water quality standards. As soon as supplement EA 543a is received, it will be incorporated into the administrative record for WQC 110520-01.

Upon review of the entire scope of the NO to Venice & NFL project including Oakville to St Jude, NFL Oakville to St Jude & FL NO to Venice, La Reussite to Myrtle Grove, and mitigation projects and all the documentation including the SEAs and FONSIs on file, in order to ensure that all the information is trackable and retrievable, we thought it was easier to file it under one water quality certification number.

With a project of this size and so many parts this was the best way we thought to manage the voluminous documentation. If there is something LDEQ can do to diminish any confusion, please let us know. Any assistance is welcome!!!

-----Original Message-----
From: Meden, Daniel C CIV USARMY CEMVN (USA) <Daniel.C.Meden@usace.army.mil>
Sent: Wednesday, May 15, 2019 6:44 AM
To: Elizabeth Hill <Elizabeth.Hill@la.gov>
Cc: Wilkinson Wolfson, Laura L CIV USARMY CEMVN (USA) <Laura.L.Wilkinson@usace.army.mil>; Behrens, Elizabeth H CIV USARMY CEMVN (USA) <Elizabeth.H.Behrens@usace.army.mil>
Subject: SEA 543a brackish mitigation site in St. Tammany Parish (UNCLASSIFIED)

CLASSIFICATION: UNCLASSIFIED

Good morning, Elizabeth!

When I contacted you yesterday about the Water Quality Certificate for NOV NFL mitigation, I wanted to make sure you were aware that our new supplemental EA 543a has a mitigation site located in St. Tammany Parish (Fritchie Brackish Marsh). Would this still be valid under WQC 110520-01 since we are looking for completing mitigation outside of Plaquemines Parish?

Thanks!

Daniel Meden
Biologist, Coastal Environmental Planning RPEDS, New Orleans District
Office: 504-862-1014

CLASSIFICATION: UNCLASSIFIED
CLASSIFICATION: UNCLASSIFIED

From: Elizabeth Hill
To: Meden, Daniel C CIV USARMY CEMVN (USA)
Subject: [Non-DoD Source] RE: Water Quality Certificate for NOV NFL (UNCLASSIFIED)
Date: Monday, May 13, 2019 4:47:53 PM

Daniel:

As a supplemental environmental assessment for EA 543, this application is valid under water quality certification, WQC 110520-01. The administrative record is amended to reflect the Mitigation for the New Orleans to Venice (NOV) Hurricane Risk Reduction Project: Incorporation of Non-Federal Levees from Oaksville to St. Jude and the NOV Federal Hurricane Protection Levee, Plaquemine Parish, Louisiana, Construction of the Fritchie Flood Side Brackish Marsh Creation Mitigation Project in St. Tammany Parish, Louisiana. No further action is required.

-----Original Message-----
From: Meden, Daniel C CIV USARMY CEMVN (USA) <Daniel.C.Meden@usace.army.mil>
Sent: Monday, May 13, 2019 2:56 PM
To: Elizabeth Hill <Elizabeth.Hill@la.gov>
Cc: Behrens, Elizabeth H CIV USARMY CEMVN (USA) <Elizabeth.H.Behrens@usace.army.mil>; Wilkinson Wolfson, Laura L CIV USARMY CEMVN (USA) <Laura.L.Wilkinson@usace.army.mil>
Subject: Water Quality Certificate for NOV NFL (UNCLASSIFIED)
Importance: High

CLASSIFICATION: UNCLASSIFIED

Good afternoon, Elizabeth.

I thought I had previously sent out this Application for Water Quality Certification for the title project: Mitigation for the New Orleans to Venice (NOV) Hurricane Risk Reduction Project: Incorporation of Non-Federal Levees from Oaksville to St. Jude and the NOV Federal Hurricane Protection Levee, Plaquemine Parish, Louisiana, Construction of Fritchie Flood Side Brackish Marsh Creation Mitigation Project in St. Tammany Parish, Louisiana. Please see the signed application for consideration as this is for a supplemental environmental assessment for EA 543.

Thank you!

Daniel Meden
Biologist, Coastal Environmental Planning RPEDS, New Orleans District
Office: 504-862-1014

CLASSIFICATION: UNCLASSIFIED

JOHN BEL EDWARDS
GOVERNOR

THOMAS F. HARRIS
SECRETARY

State of Louisiana

DEPARTMENT OF NATURAL RESOURCES

OFFICE OF COASTAL MANAGEMENT

July 10, 2019

Marshall K. Harper
Environmental Branch
Corps of Engineers- New Orleans District
7400 Leake Avenue
New Orleans, LA 70118
Via email: Marshall.K.Harper@usace.army.mil

RE: **C20100384 Mod 13,** Coastal Zone Consistency
New Orleans District, Corps of Engineers
Direct Federal Action
SEA #543a, New Orleans to Venice levee upgrade: Fritchie Marsh brackish marsh mitigation project, **Plaquemines Parish, Louisiana**

Dear Mr. Harper:

The above referenced project has been reviewed for consistency with the Louisiana Coastal Resources Program in accordance with Section 307 (c) of the Coastal Zone Management Act of 1972, as amended. The project, as proposed in this application, is consistent with the LCRP.

If you have any questions concerning this determination please contact Jeff Harris of the Consistency Section at (225) 342-7949 or jeff.harris@la.gov.

Sincerely yours,

/S/ Charles Reulet
Administrator
Interagency Affairs/Field Services Division

CR/MH/jdh

cc: Daniel Meden, COE
Elizabeth Beherens, COE
Dave Butler, LDWF
Frank Cole, OCM/FI
Robert Spears, Plaquemines Parish

United States Department of the Interior

FISH AND WILDLIFE SERVICE
200 Dulles Drive
Lafayette, Louisiana 70506
September 13, 2019

Colonel Stephen Murphy
District Commander
U.S. Army Corps of Engineers
7400 Leake Avenue
New Orleans, Louisiana 70118

Dear Colonel Murphy:

Please find enclosed the Draft Supplemental Fish and Wildlife Coordination Act Report for the proposed New Orleans to Venice, Louisiana, Hurricane Protection Project (NOV) – Incorporation of Nonfederal Levees from Oakville to St. Jude, Plaquemines Parish, Louisiana (NFL), project. This report addresses the selected alternatives to mitigate marsh and swamp habitat impacts and supplements our August 2019 with an updated mitigation acreage. This report is transmitted under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 United States Code (U.S.C.) 661 et seq.). The National Marine Fisheries Service and Louisiana Department of Wildlife and Fisheries have been provided a copy for comments; their comments will be incorporated into our final report.

Should your staff have any questions regarding the enclosed report, please have them contact David Walther of this office at 337/291-3122.

Sincerely,

[redacted]

Joseph A. Ranson
Field Supervisor
Louisiana Ecological Services Office

Attachment
cc: EPA, Dallas, TX
NMFS, Baton Rouge, LA
LDWF, Baton Rouge, LA
LDNR, CMD, Baton Rouge, LA
CPRA, Baton Rouge, LA

Supplemental II
Fish and Wildlife Coordination Act Report

For Environmental Assessment 538a
New Orleans to Venice, LA, Hurricane Protection Project:
Incorporation of Nonfederal Levees from Oakville to St. Jude
Plaquemines Parish, Louisiana

Provided to:
U.S. Army Corps of Engineers
New Orleans, Louisiana

Prepared by:
David Walther
Ecological Services
Lafayette, Louisiana

U.S. Fish and Wildlife Service
Southeast Region
Atlanta, Georgia

September 2019

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EXECUTIVE SUMMARY

The U.S. Fish and Wildlife Service (Service) has prepared this supplemental Fish and Wildlife Coordination Act Report for the proposed New Orleans to Venice, Louisiana, Hurricane Protection Project (NOV) – Incorporation of Nonfederal Levees from Oakville to St. Jude, Plaquemines Parish, Louisiana (NFL), under the authority of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 United States Code (U.S.C.) 661 et seq.). The U.S. Army Corps of Engineers, New Orleans District (USACE) is preparing an Environmental Assessment (EA) 543a to fulfill the USACE compliance with the National Environmental Policy Act (NEPA) of 1969 (83 Stat. 852; 42 U.S.C. 4321 et seq.). Work proposed in that EA would be conducted under the authority of Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4). That law authorized the USACE to upgrade and incorporate certain nonfederal levees into the existing NOV project in Plaquemines Parish, Louisiana.

This supplemental l report contains a summary of the fish and wildlife resources of the project area, discusses future with- and without-project habitat conditions and provides recommendations for the proposed mitigation project. This report incorporates and supplements the November 26, 2007, Draft Programmatic FWCA Report that addresses the hurricane protection improvements authorized in Supplemental 4; our draft and final reports on this project dated December 20, 2010, April 27, 2011, and our March 10, 2016, and October 3, 2017, reports. This report also supplements our August 2019 report via an update of mitigation acreage need. This report does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the FWCA. This report will be provided to the Louisiana Department of Wildlife and Fisheries (LDWF) and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) for comment; their comments will be incorporated into the final report.

The NFL-NOV project area is located within the Barataria Basin of the Mississippi River Deltaic Plain of the Lower Mississippi River Ecosystem. It is defined by the Mississippi River to the east; forested and emergent wetlands to the west; a forested and emergent marsh complex and the town of Oakville, Louisiana, to the north; and the NOV hurricane protection system, emergent marsh, and the town of Magnolia, Louisiana, to the south. Some of the mitigation alternatives are located within the Lake Pontchartrain Basin which is also located within the Mississippi River Deltaic Plain of the Lower Mississippi River Ecosystem. Portions of Jefferson, Orleans, St. Charles, St. Bernard and Plaquemines Parishes are included in the Project area. Within those areas there are hurricane protection systems, natural levees and lower lying wetlands that have been leveed and drained to accommodate residential, commercial, and agricultural development; however, a majority of the land remains undeveloped. Undeveloped lands generally consist of forested wetlands and tidal marshes.

Project area wetlands support nationally important fish and wildlife resources. Factors that will strongly influence future fish and wildlife resource conditions outside of the hurricane protection levees include the degree of freshwater and sediment input and loss of coastal wetlands. Regardless of which of the above factors ultimately has the greatest influence, emergent wetlands within and adjacent to the project area will likely experience losses due to subsidence, erosion, and relative sea-level rise.

The USACE final alternative in the previous Final Environmental Impact Statement's (FEIS) included raising the existing hurricane protection levee system and expanding some level of flood protection in areas that had limited or no flood protection. Construction of the NFL-NOV hurricane protection system resulted in direct impacts to non-wet and wet bottomland hardwood habitat, swamp habitat, fresh marsh and wet pasture, and brackish, saline and intermediate marsh. Currently, USACE is exploring mitigation alternatives for swamp and marsh habitat. For swamp mitigation, purchase of credits from a bank will be the first option and construction of marsh within the Big Branch National Wildlife Refuge (NWR) has been selected as the mitigation for marsh impacts. Marsh impacts are proposed to be mitigated by purchase of credits from a mitigation bank.

SERVICE POSITION AND RECOMMENDATIONS

Construction of the NFL hurricane protection system resulted in direct impacts to swamp habitat (-33.8 AAHUs), fresh marsh and wet pasture (-53 AAHUs), and brackish, saline and intermediate marsh (-105.6 AAHUs).

The Service does not object to providing improved hurricane protection to Plaquemines Parish, provided the following fish and wildlife conservation recommendations are incorporated into future project planning and implementation of the TSMP.

1. The USACE shall fully compensate for any unavoidable losses to swamp habitat (-33.8 AAHUs), fresh marsh and wet pasture (-53 AAHUs), and brackish, saline and intermediate marsh (-105.6 AAHUs) caused by project construction. All aspects of mitigation planning should be coordinated with the Service, NMFS, the Environmental Protection Agency (EPA), the Louisiana Department of Natural Resources (LDNR), Coastal Protection and Restoration Authority (CPRA) and LDWF.

2. The Corps should continue to coordinate with NWR personnel during the planning processes. A Special-Use Permit should be obtained prior to any entrance onto the refuge. Coordination should continue until construction of the mitigation project is complete and prior to any subsequent maintenance. Points of contacts for the refuge are Neil Lalonde, Project Leader for the Service's Southeast National Wildlife Refuges Complex and Daniel Breaux (985) 822-2000, Refuge Manager for the Big Branch Marsh NWR.

3. Based upon the amount of sand within the filled areas adjacent to the Fritche Marsh site and the lack of significant settlement that has occurred the Service recommends that an initial target elevation of 2 feet be used.

4. We recommend that USACE reinitiate Endangered Species Act (ESA) consultation with the Service to ensure that the proposed project would not adversely affect any federally listed threatened or endangered species or their critical habitat if one of the following conditions occurs; 1) the scope or location of the proposed project is changed significantly, 2) new information reveals that the action may affect listed species or designated critical habitat; 3) the action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat is designated.

5. Avoid adverse impacts to wading bird nesting colonies and bald eagle nesting locations through careful design of project features and timing of construction. A qualified biologist should inspect the proposed work site for the presence of undocumented wading bird nesting colonies and bald eagle nests within 1,000 feet and 660 feet, respectively, of the work during the nesting seasons (i.e., February 16 through October 31 for wading bird colonies, and October through mid-May for bald eagles). In addition, we recommend that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests, and should avoid affecting them during the breeding season.

6. During marsh creation, colonies containing nesting gulls, terns, and/or black skimmers may nest on newly deposited marsh creation material or retaining dikes; all activity occurring within 650 feet of a nesting site should be restricted to the non-nesting period (i.e., September 16 through April 1, exact dates may vary within this window depending on species present). If time of year restrictions cannot be implemented and the project area is within areas known to be occupied by nesting shorebirds, we recommend that a bird abatement plan be developed in coordination with the Service and the LDWF. The abatement plan should include a monitoring plan including pre-construction and construction monitoring, anticipated abatement procedures, a report outline of daily monitoring and abatement activities, and include a post-construction report.

7. If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary and those results should be forwarded to this office.

8. Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds to the maximum extent practicable

9. Impacts to Essential Fish Habitat (EFH) should be avoided and minimized to the greatest extent possible. For proposed project areas that impact designated EFH habitat, coordination with the NMFS should be conducted.

10. Construction of mitigation or purchasing credit from an approved mitigation bank for all compensatory mitigation should be conducted concurrent with construction of the NOV - NFL projects, to ensure that mitigation obligations are met on behalf of the public interest.

11. We recommend that the USACE consider the availability of credits at a bank and within a hydrologic unit when evaluating the mitigation bank alternative to avoid exhausting credits available for individual landowners/permittee within a particular hydrologic unit.

12. Only USACE approved mitigation banks with perpetual conservation servitudes, within the Basin, currently in compliance with their mitigation banking instrument (MBI) should be considered for purchase of mitigation credits.

13. Further detailed planning of mitigation features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be

coordinated with the Service, NMFS, EPA, LDNR, and LDWF, and shall provide them with an opportunity to review and submit recommendations on all work addressed in those reports.

14. Refinement of the mitigation potential as determined by the Wetland Value Assessment (WVA) for USACE constructed projects should be undertaken at the 30, 60 and 90 percent design stages. These refinements should be an interagency task and should utilize the most recent detailed design, geotechnical information, and relative sea level rise rates (RSLR).

15. Any proposed change in mitigation features or plans should be coordinated in advance with the Service, NMFS, LDWF, EPA and LDNR.

16. Mitigation success criteria, monitoring and reporting requirements, and adaptive management should adhere to those developed for the Hurricane Storm Damage and Risk Reduction Study (HSDRRS).

17. The Service encourages the USACE to finalize mitigation plans and proceed to mitigation construction so that it will be concurrent with project construction. If construction is not concurrent with mitigation implementation then revising the impact and mitigation period-of-analysis to reflect additional temporal losses will be required.

18. The USACE should implement non-point source erosion control measures to protect wetlands and water bodies prior to initiation of construction and maintain during construction.

INTRODUCTION

The New Orleans to Venice Hurricane Protection (NOV) Project provides hurricane protection to developed and agricultural areas of Plaquemines Parish, Louisiana, along the Mississippi River below New Orleans. In coordination with the U.S. Army Corps of Engineers' (USACE) New Orleans District and the Louisiana Coastal Protection and Restoration Authority (CPRA), the nonfederal sponsor), prepared a Final Environmental Impact Statement (FEIS) for the incorporation of the nonfederal levees from Oakville to St. Jude (NFL), in Plaquemines Parish, Louisiana, into the existing NOV federal levee system. Based on a risk analysis the nonfederal levees revised plan of protection provides a 25-year level of storm protection. Detailed planning and engineering studies revealed the need to further modify the project to provide access and staging areas, avoid existing oil and gas infrastructure and required rights-of-way (ROW) modifications. Therefore subsequent National Environmental Policy Act (NEPA) documents (e.g. Environmental Assessment 537 and its supplement) were prepared. In addition, the selected tentative mitigation plan has undergone revision; thus necessitating this report. The proposed project would be built under the authority of Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery 2006 (Supplemental 4).

This report incorporates and supplements the November 26, 2007, Draft Programmatic Fish and Wildlife Coordination Act (FWCA) Report that addressed the hurricane protection improvements authorized in Supplemental 4 and our final reports on this project dated December 20, 2010, April 27, 2011, March 10, 2016, and October 3, 2017. This report also supplements our August 2019 report via an update of mitigation acreage need. 237This report only addresses the most recent modifications to the tentatively selected mitigation plan. This report does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the FWCA. This report was provided to the Louisiana Department of Wildlife and Fisheries (LDWF) and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) for comment; their comments will be incorporated into this final report.

Our previous reports on this project contain a description of the existing fish and wildlife resources (including habitats) that occur within the project area. For brevity, that discussion is incorporated by reference herein but the following information is presented to provide fundamental fish and wildlife information, discusses future with- and without-project habitat conditions, and provides recommendations for the proposed mitigation.

Project Description

The goal of the proposed action is to mitigate impacts to swamp and brackish marshes impacted by the NFL-NOV system in Plaquemines Parish, Louisiana. Therefore our discussion will focus on those habitat types. Approximately 39.9 acres (33.9 AAHUs) of swamp, 153.5 acres (107 AAHUs) of intermediate, brackish, and saline marsh and 15.3 acres open water impacts remain to be mitigated for the NFL-NOV construction. USACE has been implementing mitigation primarily via purchase of credits from mitigation banks.

DESCRIPTION OF THE PROJECT AREA

The NFL-NOV project area is located within the Barataria Basin of the Mississippi River Deltaic Plain of the Lower Mississippi River Ecosystem. It is defined by the Mississippi River to the east; forested and emergent wetlands to the west; a forested and emergent marsh complex and the town of Oakville, Louisiana, to the north; and the NOV hurricane protection system, emergent marsh, and the town of Magnolia, Louisiana, to the south. Within the NFL hurricane protection system, natural levees and lower lying wetlands have been leveed and drained to accommodate residential, commercial, and agricultural development; however, a majority of the land remains undeveloped. Undeveloped lands generally consist of bottomland hardwood and scrub-shrub habitats.

Some of the mitigation alternatives are located within the Lake Pontchartrain Basin which is also located within the Mississippi River Deltaic Plain of the Lower Mississippi River Ecosystem. Portions of Jefferson, Orleans, St. Charles, St. Bernard and Plaquemines Parishes are included in the Project area. Higher elevations occur on the natural levees of the Mississippi River and its distributaries. Developed lands are primarily associated with natural levees, but extensive wetlands have been leveed and drained to accommodate residential, commercial, and agricultural development. Federal, State, and local levees have been installed for flood protection purposes, often with negative effects on adjacent wetlands. Extensive wetlands and associated shallow open waters dominate the landscape outside the flood control levees. Major water bodies include Lake Pontchartrain located north of the project area, the Mississippi River which bisects that basin.

Description of Habitats

The major habitat types in the Project area can be classified as estuarine emergent marsh, estuarine scrub-shrub wetlands, palustrine forested wetlands, wetland pasture, open water, and developed upland. Due to development and a forced-drainage system, the hydrology of the forested habitat within those basin has been altered. Forced-drainage systems have been in operation for many years, and subsidence is evident throughout the areas enclosed by levees.

The coastal wetlands within the Project area provide plant detritus to adjacent coastal waters and thereby contribute to the production of commercially and recreationally important fishes and shellfishes. Wetlands in the project area also provide valuable water quality functions such as reduction of excessive dissolved nutrient levels, filtering of waterborne contaminants, and removal of suspended sediment. In addition, coastal wetlands buffer storm surges reducing their damaging effect to man-made infrastructure within the coastal area.

Factors that will strongly influence future fish and wildlife resource conditions outside of the protection levees include freshwater input and loss of coastal wetlands. Depending

upon the deterioration rate of marshes, the frequency of occasional short-term saltwater events may increase. Under that scenario, tidal action in the project area may increase gradually as the buffering effect of marshes is lost, and use of that area by estuarine-dependent fishes and shellfish tolerant of saltwater conditions would likely increase. Regardless of which of the above factors ultimately has the greatest influence, freshwater wetlands within and adjacent to the project area will probably experience losses due to development, subsidence, and erosion.

The ongoing loss of coastal Louisiana wetlands (approximately 1,149 square miles between 1956 and 2004; average loss rate of 24 square miles per year) was recently exacerbated by Hurricanes Katrina and Rita in 2005. Those hurricanes caused an initial loss of wetlands equivalent to 9 years (approximately 217 square miles) of mean annual losses. Louisiana wetlands provide 26 percent of the seafood landed in the conterminous United States and over 5 million migratory waterfowl utilize those wetlands every year. In addition, those wetlands provide protection to coastal towns, cities and their infrastructure, as well as important infrastructure for the nation's oil and gas industry.

Non-wet bottomland hardwoods within the project area also provide habitat for wildlife resources. Between 1932 and 1984, the acreage of bottomland hardwoods in Louisiana declined by 45 percent (Rudis and Birdsey 1986). A large percentage of the original bottomland hardwoods within the Mississippi River floodplain in the Deltaic Plain are located within levees. However, losses of that habitat type are not regulated or mitigated with the exception of impacts resulting from USACE of Engineers projects as required by Section 906(b) of the Water Resources Development Act of 1986.

Terrestrial Habitats/Wildlife Resources

Forested habitats in the Project area are divided into two major types; bottomland hardwood forests and cypress-tupelo swamps. Cypress-tupelo swamps are located along the flanks of larger distributary ridges as a transition zone between bottomland hardwoods and lower-elevation marsh or scrub-shrub habitats. Cypress-tupelo swamps exist where there is little or no salinity, usually minimal daily tidal action and are usually flooded throughout most of the growing season. Cypress swamps that are within the levee system and under forced drainage are often dominated by bald cypress, but vegetative species more typical of bottomland hardwoods dominate the under- and mid-story vegetation. These sites often have ecological functions closer to those of a bottomland hardwood. Because of their altered hydrology, these areas may potentially convert to sites dominated by bottomland hardwood species.

Marsh types within the Project area include fresh, intermediate, brackish, and saline. Fresh marshes occur at the upper ends of inter-distributary basins and are often characterized by floating or semi-floating organic soils and minimal daily tidal action. Associated open water habitats may often support extensive beds of floating-leafed and submerged aquatic vegetation. Intermediate marshes are a transitional zone between fresh and brackish marshes and are often characterized by organic, semi-floating soils. Typically,

intermediate marshes experience low levels of daily tidal action. Salinities are negligible or low throughout much of the year, with salinity peaks occurring during late summer and fall. Ponds and lakes within the intermediate marsh zone often support extensive submerged aquatic vegetation. Brackish marshes are characterized by low to moderate daily tidal energy and by soils ranging from firm mineral soils to organic semi-floating soils. Freshwater conditions may prevail for several months during early spring; however, low to moderate salinities occur during much of the year, with highest salinities in the late summer or fall. Shallow brackish marsh ponds occasionally support abundant beds of wigeongrass. Saline marshes occur along the fringe of the coastal wetlands. Those marshes usually exhibit fairly firm mineral soils and experience moderate to high daily tidal energy. Submerged aquatic vegetation is rare. Within the Project area, intertidal mud flats are most common in saline marshes.

Mammals known to occur in the Project-area swamps and marshes include white-tailed deer, mink, raccoon, swamp rabbit, nutria, river otter, and muskrat. Those habitats also support a variety of birds including herons, egrets, ibises, least bittern, rails, gallinules, olivaceous cormorant, anhinga, white pelicans, pied-billed grebe, black-necked stilt, sandpipers, gulls, and terns. Forested and marsh habitats within the Project area also provide habitat for many resident passerine birds and essential resting areas for many migratory songbirds; many of these and other passerine birds have undergone a decline in population primarily due to habitat loss.

Given the extent of development and drainage, waterfowl use within the hurricane protection system is likely minimal, except in the adjacent wetlands outside the levees. Swamps and fresh and intermediate marshes usually receive greater waterfowl utilization than brackish and saline marshes because they generally provide more waterfowl food.

Aquatic Habitat/Fishery Resources

Open-water habitat within the project area consists of ponds, lakes, canals, bays, and bayous. Natural marsh ponds and lakes are typically shallow, ranging in depth from 6 inches to over 2 feet. Typically, the smaller ponds are shallow and the larger lakes and bays are deeper. In fresh and low-salinity areas, ponds and lakes may support varying amounts of submerged and/or floating-leaved aquatic vegetation. Brackish and, much less frequently, saline marsh ponds and lakes may support wigeon grass beds.

Canals and larger bayous typically range in depth from 4 or 5 feet, to over 15 feet. Strong tidal flows may occur at times through those waterways, especially where they provide hydrologic connections to other large waterbodies. Such canals and bayous may have mud or clay bottoms that range from soft to firm. Dead-end canals and small bayous are typically shallow and their bottoms may be filled in to varying degrees with semi-fluid organic material. Erosion due to wave action and boat wakes, together with shading from overhanging woody vegetation, tends to retard the amount of intertidal marsh vegetation growing along the edges of those waterways.

Some of the waterbodies in the project area meet criteria for primary and secondary contact recreation and partially meet criteria for fish and wildlife propagation, while others do not meet the criteria for fish and wildlife propagation. Causes for not fully meeting fish and wildlife propagation criteria include excessive nutrients, organic enrichment, low dissolved oxygen levels, flow and habitat alteration, pathogens and noxious aquatic plants. Indicated sources of those problems include hydrologic modification, habitat modification, recreational activities, and unspecified upstream sources. Municipal point sources, urban runoff, storm sewers, and onsite wastewater treatment systems are also known contributors to poor water quality in the area.

Deteriorating water quality in the Barataria Basin, at least partially correlated to wetlands loss and a commensurate reduction in the area's waste assimilation capacity, is a major problem affecting fish and wildlife in that portion of the Project area. According to Bahr et al. (1983), factors that currently adversely affect water quality in the Barataria Basin are those generally related to urban development and associated urban pollution (including non-point source discharge), altered land-use patterns, and hydrologic modifications (drainage, etc.) within the watershed. Two major human-related causes of water quality degradation include eutrophication and increased levels of toxic substances.

Essential Fish Habitat

Estuarine wetlands and associated intertidal and sub-tidal areas within the Project area have been identified as Essential Fish Habitat (EFH) for post-larval, juvenile and sub-adult stages of brown shrimp, white shrimp, red drum, and Gulf stone crab, as well as the adult stages of those species in near-shore and offshore waters. EFH requirements vary depending upon species and life stage. Categories of EFH in the project area include estuarine emergent wetlands, estuarine water column, submerged aquatic vegetation, and estuarine water bottoms. Detailed information on federally managed fisheries and their EFH is provided in the 2005 generic amendment of the Fishery Management Plans for the Gulf of Mexico prepared by the Gulf of Mexico Fishery Management Council. The generic amendment was prepared as required by the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; P.L. 104-297).

In addition to being designated as EFH for various federally managed species, wetlands and water bottoms in the project area provide nursery and foraging habitats for a variety of economically important marine fishery species such as blue crab, gulf menhaden, spotted seatrout, sand seatrout, southern flounder, and striped mullet. Some of these species serve as prey for other fish species managed under the Magnuson-Stevens Act by the Gulf of Mexico Fishery Management Council (e.g., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks). Wetlands in the project area also produce nutrients and detritus, important components of the aquatic food web, which contribute to the overall productivity of the Barataria Bay estuary.

Endangered and Threatened Species

We recommend that the USACE re-initiation ESA consultation with this office to ensure that the proposed project (or any future changes or modifications) would not adversely affect any federally listed threatened or endangered species or their habitat if: 1) the scope or location of the proposed project is changed significantly, 2) new information reveals that the action may affect listed species or designated critical habitat; 3) the action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat is designated. Additional consultation as a result of any of the above conditions or for changes not covered in this consultation should occur before changes are made and or finalized.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.) and the Bald and Golden Eagle Protection Act (BGEPA) (54 Stat. 250, as amended, 16 U.S.C. 668a-d) offer additional protection to many bird species within the project area including colonial nesting birds and the bald eagle (*Haliaeetus leucocephalus*).

The project area is located where colonial nesting waterbirds may be present. LDWF currently maintains a database of these colonies locations. That database is updated primarily by monitoring the colony sites that were previously surveyed during the 1980s. Until a new, comprehensive coast-wide survey is conducted to determine the location of newly-established nesting colonies, we recommend that a qualified biologist inspect the proposed work sites for the presence of undocumented nesting colonies during the nesting season (e.g. February through September depending on the species). If colonies exist work should not be conducted within 1,000 feet of the colony during the nesting season.

The Project-area forested wetlands provide nesting habitat for the bald eagle, which was officially removed from the List of Endangered and Threatened Species on August 8, 2007. Bald eagles nest in Louisiana from October through mid-May. Bald eagles generally nest in large trees located near coastlines, rivers, or lakes that support adequate food supplies. In the southeastern Parishes, eagles typically nest in mature trees (e.g., bald cypress, sycamore, willow, etc.) near fresh to intermediate marshes or open water. Eagles may also nest in mature pine trees near large lakes. Major threats to this species include habitat alteration, human disturbance, and environmental contaminants (i.e., organochlorine pesticides and lead).

Bald eagles are vulnerable to disturbance during courtship, nest building, egg laying, incubation, and brooding. Disturbance during these periods may lead to nest abandonment, cracked and chilled eggs, and exposure of small young to the elements. Human activity near a nest late in the nesting cycle may also cause flightless birds to jump from the nest tree, thus reducing their chance of survival.

Although the bald eagle has been removed from the List of Endangered and Threatened Species, bald eagles and their nests continue to be protected under the MBTA and the BGEPA. The Service developed the National Bald Eagle Management (NBEM) Guidelines to provide landowners, land managers, and others with information and recommendations to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the BGEPA. A copy of the NBEM Guidelines is available at: http://www.fws.gov/southeast/es/baldeagle/NationalBaldEagleManagementGuidelines.pdf. Those guidelines recommend: (1) maintaining a specified distance between the activity and the nest (buffer area); (2) maintaining natural areas (preferably forested) between the activity and nest trees (landscape buffers); and (3) avoiding certain activities during the breeding season. On-site personnel should be informed of the possible presence of nesting bald eagles within the project boundary, and should identify, avoid, and immediately report any such nests to this office. If a bald eagle nest occurs or is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary. Results of that determination should be provided to this office. The Division of Migratory Birds for the Southeast Region of the Service (phone: 404/679-7051, e-mail: SEmigratorybirds@fws.gov) has the lead role in conducting such consultations. If after consulting those guidelines you need further assistance in determining the appropriate size and configuration of buffers or the timing of activities in the vicinity of a bald eagle nest, please contact this office.

Public Lands

Marsh mitigation alternatives were purposed on the Delta National Wildlife Refuge (NWR) and Big Branch Marsh NWR. Both refuges are part of the Southeast Louisiana National Wildlife Refuges Complex and are managed for the conservation of fish and wildlife resources. Delta NWR is located on the eastern side of the Mississippi River Delta while Big Branch Marsh NWR is located on the northeastern shore of Lake Pontchartrain. Those refuges have a diversity of marsh and open water habitats with Big Branch Marsh NWR also supporting upland habitat.

Future Fish and Wildlife Resources

The combination of subsidence and sea level rise is called submergence or land sinking. As the land sinks the wetlands become inundated with higher water levels, stressing most non-fresh marsh plants, bottomland hardwood plants and even cypress-tupelo swamps leading to plant death and conversion to open water. Other major causes of wetland losses within the Project area include altered hydrology, storms, saltwater intrusion (caused by marine processes invading fresher wetlands), shoreline erosion, herbivory, and development activities including the direct and indirect impacts of dredge and fill (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands

Conservation and Restoration Authority 1998). The continued conversion of wetlands and forested habitat to open water or developed land represent the most serious fish and wildlife-related problems in the Project area. Those losses could be expected to cause significant declines in coastal fish and shellfish production and in the project area's carrying capacity for numerous migratory waterfowl, wading birds, other migratory birds, alligators, furbearers, and game mammals. Wetland losses will also reduce storm surge protection of developed lands, and will likely contribute to water quality degradation associated with excessive nutrient inputs.

MITIGATION PROJECTS

Construction of the NFL-NOV levee and implementation and mitigation analysis of project changes have been addressed through several National Environmental Policy Act (NEPA) documents. Currently, approximately 39.9 acres (33.9 Average Annual Habitat Units [AAHUs]) of swamp, 153.5 acres (107 AAHUs) of intermediate, brackish, and saline marsh and 15.3 acres open water impacts remain to be mitigated for the NFL-NOV construction. Open water impacts are assessed using the marsh model for similar salinities. When open water is impacted at the same time marsh impacts are incurred, the marsh impact/mitigation model incorporated the open water impacts and produces a total number of AAHUs impacted. As such, Marsh AAHU totals include Open Water AAHUs.

Though USACE continues to minimize impacts to wetlands during design and construction, and remain within the environmentally cleared ROW, design changes could occur to account for additional factors of safety, needs for staging, access, etc. that incur additional environmental impacts. If these occur, additional NEPA compliance documents addressing these changes would be produced and made available for public review. However, in an attempt to avoid redesigning and completing additional NEPA on the mitigation projects if future minor increases in impacts occur, USACE constructed mitigation project acreages have been increased by 10%

To address possible changes in sea level rise (SLR) three SLR scenarios, low, medium and high, were analyzed to verify selection of the TSMPs. Potential increases in SLR could affect the performance and therefore ability of a mitigation project to adequately mitigate lost functions and values. Because all of the mitigation projects were designed based on the intermediate SLR scenario to account for potential uncertainties in future SLR impacts, the risk of the proposed projects not successfully meeting the mitigation requirement due to SLR has been minimized.

Only USACE approved mitigation banks with perpetual conservation servitudes, within the Basin, currently in compliance with their mitigation banking instrument (MBI), and able to mitigate the habitat types and Coastal Zone impacts incurred by the Plaquemines NFL-NOV's work would be considered to mitigate the swamp requirements. If, at the time of solicitation, there are not sufficient mitigation banking credits available to meet 100 percent of the mitigation requirement by habitat type or if USACE does not receive satisfactory bids (based on cost and/or other factors), then USACE may reevaluate the

mitigation plan and decide to implement another project within the Final Array (Table 1). In addition, if the actual costs for purchasing the mitigation bank credits turn out to be more than what was estimated for the general mitigation bank project during project selection, a re-analysis would be conducted to verify the ranking of the projects and selection of the mitigation plan.

Table 1. Summary Final Array of Mitigation Projects

Mitigation Project	Habitat & Type of Mitigation	Acres Required / +10% buffer	Mitigation Potential (AAHUs/ac.)	Minimum AAHUs Generated
Swamp Impacts (mitigation required: 33.9 AAHUs)				
05a1 Swamp Restoration	Swamp (restore flood side)	78.84 / 86.72	0.43	33.9
Corps Constructed Project/Mitigation Bank Combination	Swamp (restore flood side) and Credit Purchase	TBD*	0.43	33.9
Mitigation Bank Tentatively Selected Plan (TSP)	**Swamp Credit Purchase**	**TBD***	**TBD***	**33.9**
Brackish Marsh (includes Intermediate Marsh and Saline Marsh) Impacts (mitigation required: 105.6 AAHUs)				
Big Branch Brackish Marsh	Brackish Marsh (restore flood side)	352/387.20	0.30	105.6
Fritchie Marsh Brackish Marsh Restoration (TSP)	**Brackish Marsh (restore flood side)**	**237/260**	**0.45**	**117**
Coleman Brackish Marsh	Brackish Marsh (restore flood side)	377.14 / 414.86	0.28	105.6
Delta National Wildlife Refuge Brackish Marsh Restoration	Brackish Marsh (restore flood side)	480/528	0.22	105.6
Corps Constructed Project/Mitigation Bank\ILF Combination	Brackish Marsh (restore flood side) and Credit Purchase	TBD*	TBD*	105.6

Note: Bold print identifies the **TSPs** combined to form the TSMP.
***Since the mitigation bank that will ultimately be selected for use is unknown at this time, the mitigation potential at that bank and the number of acres necessary to satisfy the mitigation requirement is similarly unknown.

Tentatively Selected Mitigation Plan (TSMP)

The measure selected as the tentatively selected Plan (TSP) for each habitat type to mitigate the remaining NFL-NOV mitigation need were combined to form the tentatively

selected mitigation plan (TSMP). The alternative consists of the purchase of mitigation bank credits and the construction of a USACE-constructed project (Table 2).

Table 2. NFL NOV TSMP

Habitat Type	TSPs	AAHUs Impacted	Mitigation Project Acres
FS Swamp	Mitigation Bank	33.9 AAHUs	TBD
FS Brackish Marsh	Fritchie	105.6 AAHUs	260 (includes 10% buffer)*

*Final acreage may vary as a result of more detailed engineering studies.

WVAs

The WVA methodology operates under the assumption that optimal conditions for general 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 level to provide an index of habitat quality. Habitat quality is estimated or expressed through the use of a mathematical model developed specifically for each wetland 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 Index) and different variable values; and 3) a mathematical formula that combines the Suitability Index for each variable into a single value for wetland habitat quality. That single value is referred to as the Habitat Suitability Index, or HSI.

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 impacts on fish and wildlife resources

Values for variables used in the models are derived from existing conditions and are estimated for conditions projected into the future if no mitigation efforts are applied (i.e., future without project conditions, or "FWOP"), and for conditions projected into the future if the proposed mitigation project is implemented (i.e., future with project, or "FWP"), providing an index of habitat quality, or habitat suitability, for the period of analysis. The HSI is combined with the acres of habitat to generate a number that is referred to as "habitat units." Expected project impacts/benefits are estimated as the difference in habitat units between the FWP scenario and the FWOP scenario. To allow comparison of WVA benefits to costs for overall project evaluation, total benefits are averaged over a 57-year period, with the result reported as AAHUs. Table 2 summarizes the mitigation alternatives and components including habitat, type of mitigation, acres required to be created as well as a 10% buffer and total net AAHUs generated.

Fritchie Tidal Brackish Marsh

The proposed Fritchie FS brackish marsh project would involve the restoration of brackish marsh habitat from shallow open water within the Big Branch Marsh NWR to mitigate for open water; intermediate, brackish, and saline marsh tidal impacts. The proposed site is located in St. Tammany Parish on the northeastern shore of Lake Pontchartrain, east and north of Old Spanish Trail Road and west of Chef Menteur Highway. The proposed feature would be approximately 350 acres; to meet the acreage required several open water sites may be needed for marsh creation.

The water bottom in the Fritchie marsh creation site is approximate elevation -1.5 feet (ft) North American Vertical Datum (NAVD)88. Marsh restoration would require approximately 2,630,000 cubic yards (CY) of material hydraulically dredged from within a 258 acre borrow site in Lake Pontchartrain to construct a brackish marsh platform. Access to the proposed marsh creation area and transport of hydraulically dredged borrow material would be via Salt Bayou and unnamed waterways. Approximately 20,938 linear feet (LF) retention dikes would be constructed to elevation 4 ft NAVD88 with a 5 ft wide crown and 1:3 side slopes using approximately 150,000 CY of borrow obtained from within the marsh creation area. Depending on the final site selection the linear feet and quantity of material may change. Once the construction of the retention dikes is complete, dredging from the Lake Pontchartrain borrow area would begin. The 258 acre borrow site would be dredged to a max elevation depth of -20 ft NAVD88 with assumed water bottom of 8 ft NAVD88, the material pumped via pipeline, and placed within the marsh creation area to a maximum elevation of 2 ft NAVD88 in an effort to achieve an initial fill elevation of 1.5 ft NAVD88. After one year, it is estimated that the initial fill would settle to an approximate elevation of 1.5 ft NAVD88. The target marsh elevation for brackish marsh habitat would range from 1.0 ft to 1.5 ft NAVD88. The construction duration would be approximately 160 days for dredging and 2 years for settlement and degrading of retention dikes.

During the operation and maintenance phase of the project, prior to transfer of monitoring responsibilities to the non-Federal sponsor, the site would be monitored and surveyed to ensure the marsh creation area has met the initial success criteria. At a minimum, these actions would include periodic eradication of invasive/nuisance plants in the mitigation site and mitigation monitoring and reporting. Approximately one year after the construction of the marsh platform is complete (once dewatering and settlement of the marsh platform has occurred) the retention dikes would be degraded to the target marsh elevation. Degraded dike material would be placed within the marsh creation area and adjacent to the retention dikes by marsh buggies to a maximum elevation of 1.0 ft NAVD88. In conjunction with the degradation the retention dikes, trenasses may be constructed by marsh buggy within feature if additional hydraulic conveyance is necessary. Trenasse width would be the width of the marsh buggy's tracks. If the resulting depression is not adequate for minimal water flow, the marsh equipment could excavate material along the proposed trenasse alignment, not to exceed a 5-foot bottom width by 1-foot deep channel. The marsh feature is not expected to require planting, since it was assumed that native brackish marsh plants

would colonize the marsh naturally. If brackish marsh species do not colonize the site on their own within one year, brackish marsh plant species would be planted. The construction duration for degrading the dikes would be approximately 2 months. Additional time would be necessary if trenasse construction and brackish marsh plantings are required.

FISH AND WILDLIFE CONSERVATION AND MITIGATION MEASURES

The President's Council on Environmental Quality (CEQ) defined the term "mitigation" in the NEPA regulations to include:

1. avoiding the impact altogether by not taking a certain action or parts of an action;
2. minimizing impacts by limiting the degree or magnitude of the action and its implementation;
3. rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
4. reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
5. compensating for the impact by replacing or providing substitute resources or environments.

The Service supports and adopts this definition of mitigation and considers its specific elements to represent the desirable sequence of steps in the mitigation planning process. Based on current and expected future without-project conditions, the planning goal of the Service is to develop a balanced project (i.e., one that is responsive to demonstrated hurricane protection needs while addressing the co-equal need for fish and wildlife resource conservation).

The Service's Mitigation Policy (Federal Register, Volume 46, No. 15, January 23, 1981) identifies four resource categories that are used to ensure that the level of mitigation recommended by Service biologists will be consistent with the fish and wildlife resource values involved. Considering the high value of forested and emergent wetlands and the relative scarcity of those habitat types, those wetlands are usually designated as Resource Category 2 habitats, the mitigation for which is no net loss of in-kind habitat value. Remaining direct and indirect project impacts to forested wetlands should be mitigated via in-kind compensatory replacement of the habitat values lost.

Impacts to open water bottoms are anticipated as a result of construction activities. Regardless of depth, open water bottoms with no submerged aquatic vegetation (SAVs) will remain a Category 4 Resource; impacts to those areas are discouraged, if feasible. SAV beds located in open water are currently considered a Category 2, and lost functions and values should be replaced. However, because of the relatively low success rate of SAV replanting, mitigating in-kind may not be practicable. Potential impacts to any SAVs should first go through the mitigation sequencing of avoidance, minimization, and rectification, prior to compensation of impacts.

Because open water bottoms without SAVs are considered a Category 4 Resource for our trust resources the Service does not recommend mitigation. However, some tidally-influenced un-vegetated water bottoms are designated as EFH, and the loss of that habitat would result in a loss of EFH. Should EFH be impacted, coordination with the NMFS is recommended as mitigation for impacts to these areas is necessary.

The National Wildlife Refuge System Improvement Act of 1997 authorized that no new or expanded use of a refuge may be allowed unless it is first determined to be compatible. In the 2007 Big Branch Marsh NWR Comprehensive Conservation Plan and accompanying Environmental Assessment one of the described goals for the refuge including the restoration and enhancement of habitats though such activities as dedicated dredged material placement in open ponds greater than 5 acres in size, therefore no compatibility determination is necessary.

All construction or maintenance activities (e.g., surveys, land clearing, etc.) on Big Branch Marsh NWR will require the Corps of Engineers (Corps) to obtain a Special Use Permit from the Refuge Manager; furthermore, all activities on that NWR must be coordinated with the Refuge Manager. Therefore, we recommend that the Corps request issuance of a Special Use Permit well in advance of conducting any work on the refuge. Please contact Refuge Manager Daniel Breaux (985) 822-2000 for further information on compatibility of flood control features, and for assistance in obtaining a Special Use Permit. Close coordination by both the Corps and its contractor must be maintained with the Refuge Manager to ensure that construction and maintenance activities are carried out in accordance with provisions of any Special Use Permit issued by the NWR.

SERVICE POSITION AND RECOMMENDATIONS

Construction of the NFL hurricane protection system resulted in direct impacts to swamp habitat (-33.8 AAHUs), fresh marsh and wet pasture (-53 AAHUs), and brackish, saline and intermediate marsh (-105.6 AAHUs).

The Service does not object to providing improved hurricane protection to Plaquemines Parish, nor implementation of the selected mitigation alternatives provided the following fish and wildlife conservation recommendations are incorporated into future project planning and implementation of the TSMP.

1. The USACE shall fully compensate for any unavoidable losses to swamp habitat (-33.8 AAHUs), fresh marsh and wet pasture (-53 AAHUs), and brackish, saline and intermediate marsh (-105.6 AAHUs) caused by project construction. All aspects of mitigation planning should be coordinated with the Service, NMFS, the Environmental Protection Agency (EPA), the Louisiana Department of Natural

Resources (LDNR), Coastal Protection and Restoration Authority (CPRA) and LDWF.

2. The Corps should continue to coordinate with NWR personnel during the planning processes. A Special-Use Permit should be obtained prior to any entrance onto the refuge. Coordination should continue until construction of the mitigation project is complete and prior to any subsequent maintenance. Points of contacts for the refuge are Neil Lalonde, Project Leader for the Service's Southeast National Wildlife Refuges Complex and Daniel Breaux (985) 822-2000, Refuge Manager for the Big Branch Marsh NWR.

3. Based upon the amount of sand within the filled areas adjacent to the Fritche Marsh site and the lack of significant settlement that has occurred the Service recommends that an initial target elevation of 2 feet be used.

4. We recommend that USACE reinitiate ESA consultation with the Service to ensure that the proposed project would not adversely affect any federally listed threatened or endangered species or their critical habitat if one of the following conditions occurs; 1) the scope or location of the proposed project is changed significantly, 2) new information reveals that the action may affect listed species or designated critical habitat; 3) the action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat is designated.

5. Avoid adverse impacts to wading bird nesting colonies and bald eagle nesting locations through careful design of project features and timing of construction. A qualified biologist should inspect the proposed work site for the presence of undocumented wading bird nesting colonies and bald eagle nests within 1,000 feet and 660 feet, respectively, of the work during the nesting seasons (i.e., February 16 through October 31 for wading bird colonies, and October through mid-May for bald eagles). In addition, we recommend that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests, and should avoid affecting them during the breeding season.

6. During marsh creation, colonies containing nesting gulls, terns, and/or black skimmers may nest on newly deposited marsh creation material or retaining dikes; all activity occurring within 650 feet of a nesting site should be restricted to the non-nesting period (i.e., September 16 through April 1, exact dates may vary within this window depending on species present). If time of year restrictions cannot be implemented and the project area is within areas known to be occupied by nesting shorebirds, we recommend that a bird abatement plan be developed in coordination with the Service and the LDWF. The abatement plan should include a monitoring plan including pre-construction and construction monitoring, anticipated abatement procedures, a report outline of daily monitoring and abatement activities, and include a post-construction report.

7. If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary and those results should be forwarded to this office.

8. Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds to the maximum extent practicable

9. Impacts to EFH should be avoided and minimized to the greatest extent possible. For proposed project areas that impact designated EFH habitat, coordination with the NMFS should be conducted.

10. Construction of mitigation or purchasing credit from an approved mitigation bank for all compensatory mitigation should be conducted concurrent with construction of the NOV - NFL projects, to ensure that mitigation obligations are met on behalf of the public interest.

11. We recommend that the USACE consider the availability of credits at a bank and within a hydrologic unit when evaluating the mitigation bank alternative to avoid exhausting credits available for individual landowners/permittee within a particular hydrologic unit.

12. Only USACE approved mitigation banks with perpetual conservation servitudes, within the Basin, currently in compliance with their mitigation banking instrument (MBI) should be considered for purchase of mitigation credits.

13. Further detailed planning of mitigation features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service, NMFS, EPA, LDNR, and LDWF, and shall provide them with an opportunity to review and submit recommendations on all work addressed in those reports.

14. Refinement of the mitigation potential as determined by the Wetland Value Assessment (WVA) for USACE constructed projects should be undertaken at the 30, 60 and 90 percent design stages. These refinements should be an interagency task and should utilize the most recent detailed design, geotechnical information, and relative sea level rise rates (RSLR).

15. Any proposed change in mitigation features or plans should be coordinated in advance with the Service, NMFS, LDWF, EPA and LDNR.

16. Mitigation success criteria, monitoring and reporting requirements, and adaptive management should adhere to those developed for the Hurricane Storm Damage and Risk Reduction Study (HSDRRS).

17. The Service encourages the USACE to finalize mitigation plans and proceed to mitigation construction so that it will be concurrent with project construction. If construction is not concurrent with mitigation implementation then revising the impact and mitigation period-of-analysis to reflect additional temporal losses will be required.

18. The USACE should implement non-point source erosion control measures to protect wetlands and water bodies prior to initiation of construction and maintain during construction.

LITERATURE CITED

Bahr, L.M., Jr., R. Costanza, J.W. Day, S.E. Bayley, C. Neill, S.G. Leibowitz, and J. Fruci. 1983. Ecological characterization of the Mississippi Deltaic Plain Region: a narrative with management recommendations. U.S. Fish and Wildlife Service, Division of Biological Services, Washington, D.C. FWS/OBS-82/69. 189 pp.

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Rudis, V. A., and R. A. Birdsey. 1986. Forest resource trends and current conditions in the Lower Mississippi Valley. Resource Bulletin SO-116. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 7 pp.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVENUE
NEW ORLEANS, LOUISIANA 70118

REPLY TO
ATTENTION OF

MAY 1 3 2019

Regional Planning and
Environment Division, South

Joseph Ranson
Field Office Supervisor
U.S. Fish and Wildlife Service
200 Dulles Drive
Lafayette, LA 70506

[redacted]

Dear Mr. Ranson:

The U.S. Army Corps of Engineers, New Orleans District (CEMVN) is submitting a request for consultation on the Fritchie Flood Side (FS) Brackish Marsh Creation project to mitigate for wetland impacts as result of the New Orleans to Venice project. CEMVN has prepared a Biological Assessment (BA) with a determination of "*may affect, but not likely to adversely affect*" for the federally listed species of West Indian manatee. This species could potentially be found in the project area. This BA has been prepared by the CEMVN and is enclosed for your review and opinion.

Questions and/or concerns should be directed to Ms. Laura Lee Wilkinson and Ms. Tammy Gilmore; U.S. Army Corps of Engineers; Regional Planning and Environment Division, South; CEMVN PDS-C; Room 139; 7400 Leake Avenue, New Orleans, Louisiana 70118. Ms. Wilkinson may also be contacted by email laura.l.wilkinson@usace.army.mil or phone (504) 862-1212 and Ms. Gilmore may also be contacted by email tammy.h.gilmore@usace.army.mil or phone (504) 862-1002.

Sincerely,

[redacted]

Marshall K. Harper
Chief, New Orleans District
Environmental Branch

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
https://www.fisheries.noaa.gov/region/southeast

10/18/2019

F/SER31:LW
SERO-2019-00546

Chief, Environmental Planning Branch
New Orleans District Corps of Engineers
Department of the Army
7400 Leake Avenue
New Orleans, Louisiana 70118

Ref.: Fritchie Flood Side Brackish Marsh Creation, St. Tammany Parish, Louisiana. – EXPEDITED

Dear Mr. Marshall:

This letter responds to your October 15, 2019, request pursuant to Section 7 of the Endangered Species Act (ESA) for consultation with the National Marine Fisheries Service (NMFS) on the subject action.

We reviewed the action agency's consultation request document and related materials. Based on our knowledge, expertise, and the action agency's materials, we concur with the action agency's conclusions that the proposed action is not likely to adversely affect the NMFS ESA-listed species and/or designated critical habitat. This concludes your consultation responsibilities under the ESA for species and/or designated critical habitat under NMFS's purview. Reinitiation of consultation is required and shall be requested by the action agency or by NMFS where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) take occurs; (b) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this consultation; (c) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not previously considered in this consultation; or (d) if a new species is listed or critical habitat designated that may be affected by the action.

Updates to the regulations governing interagency consultation (50 CFR part 402) will become effective on October 28, 2019 [84 FR 44976]. Because this consultation was pending and will be completed prior to that time, we are applying the previous regulations to the consultation. However, as the preamble to the final rule adopting the new regulations noted, "[t]his final rule does not lower or raise the bar on section 7 consultations, and it does not alter what is required or analyzed during a consultation. Instead, it improves clarity and consistency, streamlines consultations, and codifies existing practice." Thus, the updated regulations would not be expected to alter our analyses.

We look forward to further cooperation with you on other projects to ensure the conservation of our threatened and endangered marine species and designated critical habitat. If you have any questions on this consultation, please contact Laura Wright, Consultation Biologist, at (727) 209-5977 or by email at laura.wright@noaa.gov.

Sincerely,

[redacted]

for David Bernhart
Assistant Regional Administrator
for Protected Resources

File: 1514-22.f.7