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.

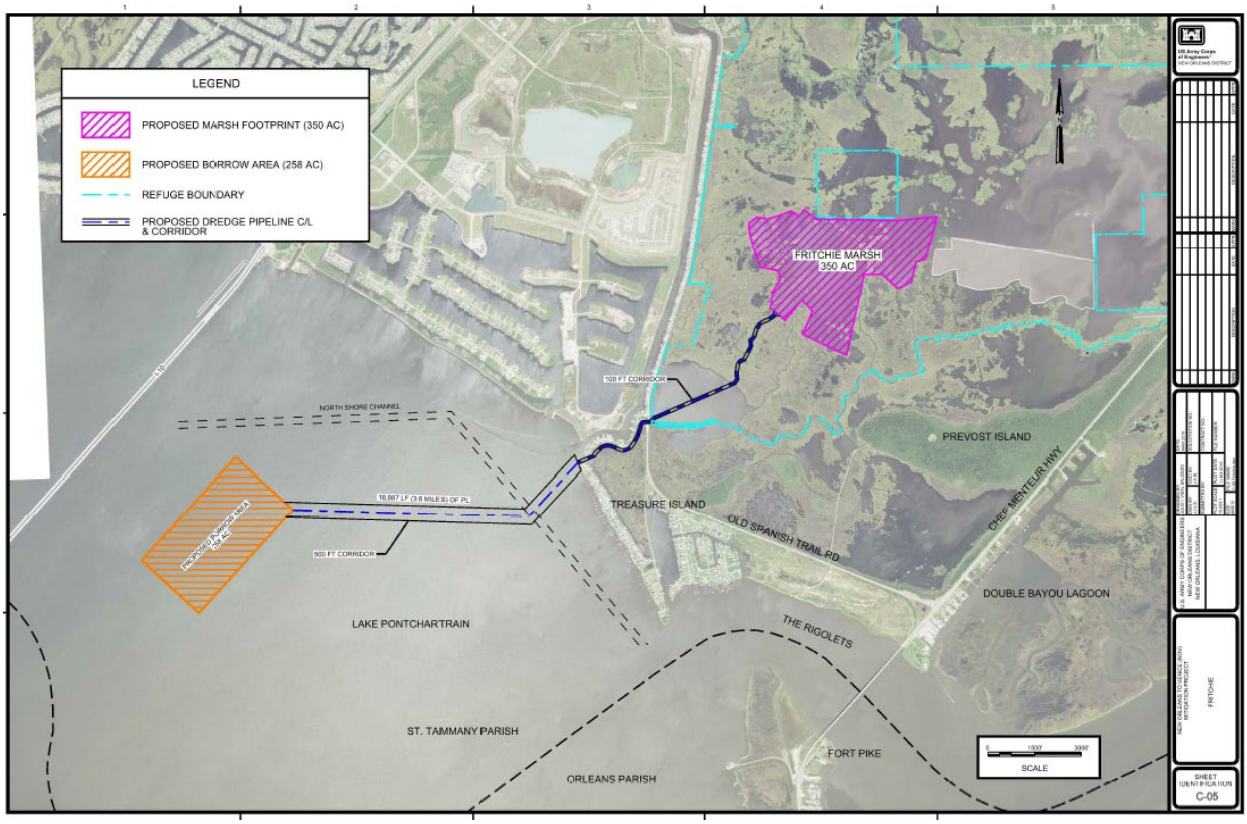

Figure 1. Areas of interest for monitoring plan design at the Fritchie Brackish Marsh site. A minimum of 100 quadrats would be established for this 350 acre site.

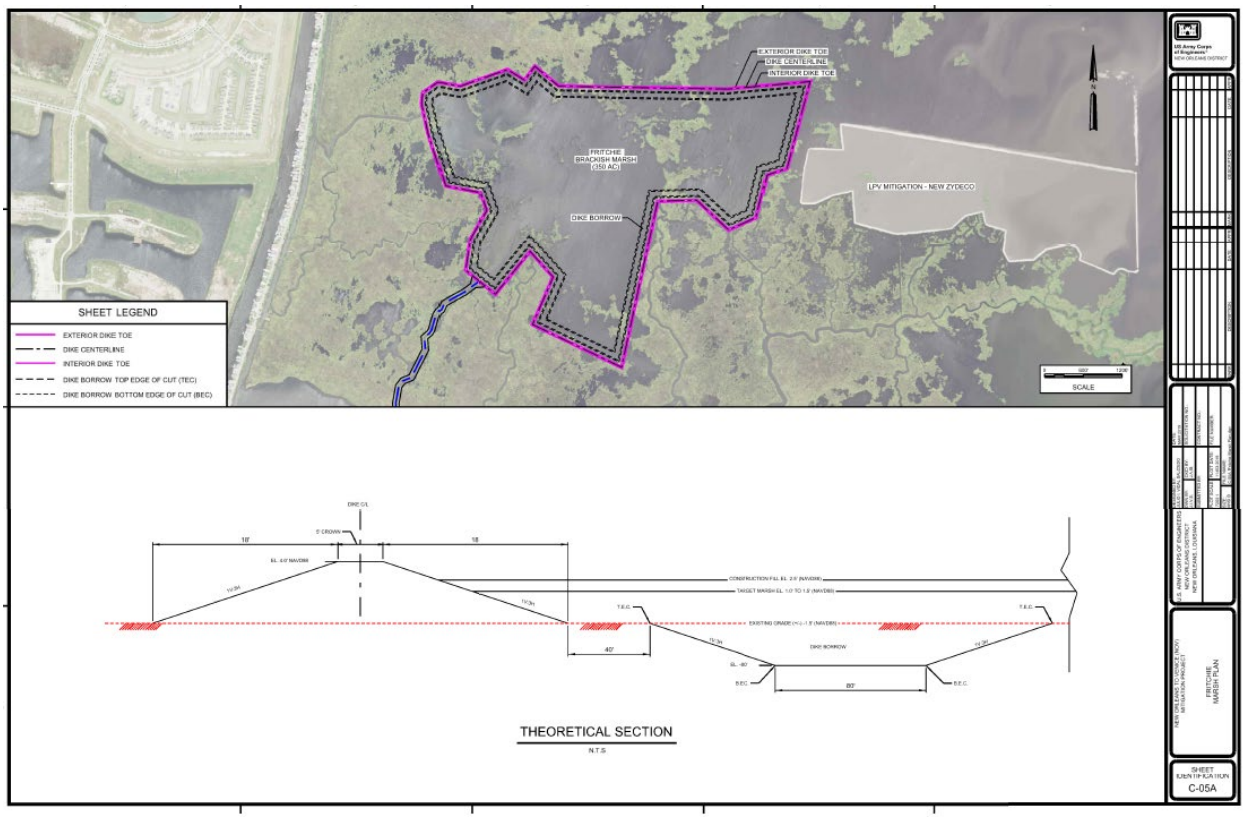

Figure 2. Project Area and Plans for Dike Construction

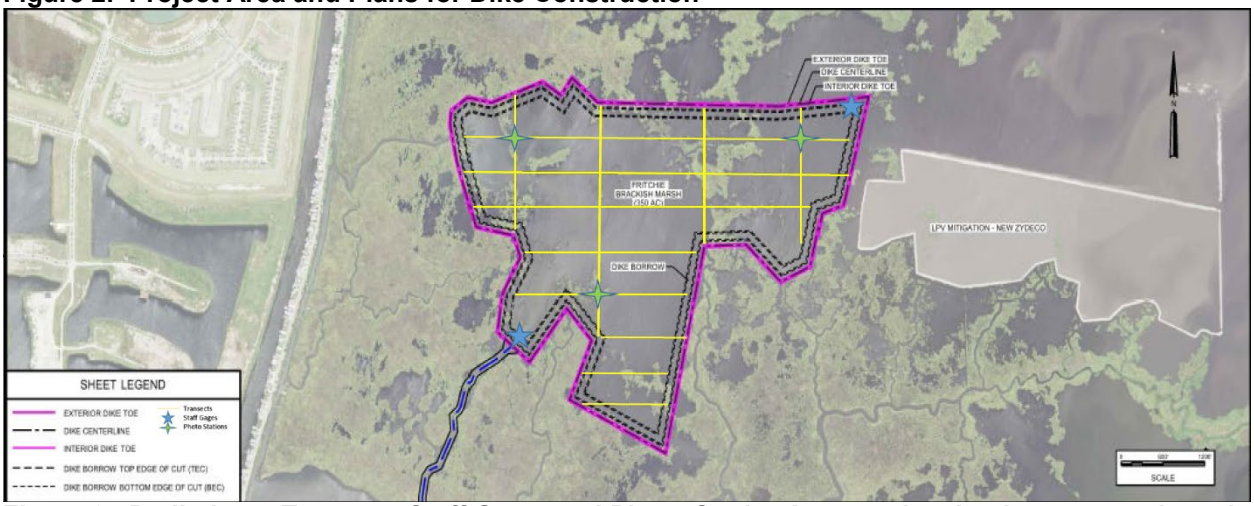

Figure 3. Preliminary Transect, Staff Gage, and Photo Station Layout, drawing is not to scale and will be further refined by Interagency Team

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.