Mississippi Valley Division,
Regional Planning and Environment Division South

Memphis Metropolitan Stormwater – North DeSoto County Feasibility Study, DeSoto County, Mississippi

Appendix D – Conceptual Compensatory Mitigation Plan

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Section 1
Introduction

This conceptual mitigation plan has been developed by the U.S. Army Corps of Engineers (USACE) for the Memphis Metropolitan Stormwater-North DeSoto County Feasibility Study, DeSoto County, Mississippi. This conceptual mitigation plan includes potential compensatory mitigation of impacts that are expected to be incurred from implementation of the tentatively selected plan (TSP) to address flood risk in DeSoto County, Mississippi. The fundamental objective of compensatory mitigation is to offset environmental losses resulting from unavoidable impacts to waters of the United States. This generally refers to the restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization measures have been achieved (USACE 2008). The USACE is required to restore the physical, chemical, or biological processes that are impacted by unavoidable project actions. This document has been developed to meet the requirements stated in ER 1105-2-100, Appendix C, and is organized around the 8 components detailed, therein. The document also addresses the Implementation Guidance for Section 2036(a) of the Water Resources Development Act of 2007 – Mitigation for Fish and Wildlife and Wetlands Losses, as well as the joint U.S. Army Corps of Engineers (USACE)/EPA Compensatory Mitigation for Losses of Aquatic Resources Rule (33 CFR 332.4(c) [40 CFR 230.94(c)])(2008 Mitigation Rule). The specific components of each of these compensatory mitigation documents are enumerated below. The Memphis Metropolitan Stormwater-North DeSoto County Feasibility Study, DeSoto County, Mississippi is composed of a Flood Risk Management component, as well as an Ecosystem Restoration component.

The objective of ecosystem restoration is to restore degraded ecosystem structure, function, and dynamic processes to a less degraded, more natural condition. Restored ecosystems should mimic, as closely as possible, conditions which would occur in the area in the absence of human changes to the landscape and hydrology. Indicators of success would include the presence of a large variety of native plants and animals, the ability of the area to sustain larger numbers of certain indicator species or more biologically desirable species, and the ability of the restored area to continue to function and produce the desired outputs with a minimum of continuing human intervention (ER 1105-2-100). Therefore, compensatory mitigation is not required for the ecosystem restoration component of the project and is not discussed further in this document.

1.1 ER 1105-2-100, APPENDIX C – COMPENSATORY MITIGATION COMPONENTS

It is the policy of the Corps Civil Works program to demonstrate that impacts to all significant ecological resources, both terrestrial and aquatic, have been avoided and minimized to the extent practicable, and that any remaining unavoidable impacts have been compensated to the extent possible. Mitigation planning would be accomplished in a watershed context. The ultimate goal of the watershed approach is to maintain and improve the quality and quantity

of the natural resources in the watershed. Mitigation planning efforts should identify and prioritize natural resource restoration as well as preserve existing natural resources that are important for maintaining or improving the ecological functions of the watershed. As such, ER 1105-2-100, Appendix C requires that the following mitigation components are performed and documented: (1) Inventory and Categorize Ecological Resources; (2) Determine Significant Net Losses; (3) Define Mitigation Panning Objectives; (4) Determine Unit of Measurement; (5) Identify and Assess Potential Mitigation Strategies; (6) Define and Estimate Costs of Mitigation Plan Increments; (7) Display Incremental Costs; (8) Recommended Compensatory Mitigation Plan.

1.2 IMPLEMENTATION GUIDANCE – WRDA 2007 SECTION 2036(A)

The Implementation Guidance Memorandum provides guidance for Civil Works compensatory mitigation as described in Section 2036(a) of WRDA 2007, which amends Section 906(d) of WRDA 1986, to a. ensure that any report, submitted to Congress for authorization, shall not select a project alternative unless such report contains (1) a specific recommendation with a specific plan to mitigate fish and wildlife losses or (2) the Secretary determines that the project would have negligible adverse impacts; b. ensure that other habitat types are mitigated to not less than in-kind condition, to the extent possible; and c. require mitigation plans comply with the mitigation standards and policies of the regulatory programs administered by the Secretary and require specific mitigation plan components including: (1) a description of the physical action to be undertaken to achieve the mitigation objectives within the watershed in which such losses occur and, in any case in which mitigation must take place outside the watershed, a justification detailing the rationale for undertaking the mitigation outside of the watershed; (2) the type, amount, and characteristics of the habitat being restored; (3) ecological success criteria for mitigation based on replacement of lost functions and values of the habitat, including hydrologic and vegetative characteristics. The ecological success criteria should be included in the draft feasibility report; (4) a plan for monitoring to determine the success of the mitigation, including the cost and duration of any monitoring and the entities responsible for any monitoring. If it is not practicable to identify the entities responsible for monitoring in the project decision document, the responsible parties would be identified in the project partnership agreement.; (5) a contingency plan (i.e., adaptive management) for taking corrective actions in cases where monitoring demonstrates that mitigation measures are not achieving ecological success; (6) should land acquisition be proposed as part of the mitigation plan, a description of the lands or interests in lands to be acquired for mitigation and the basis for a determination that such lands are available for acquisition.

1.3 2008 MITIGATION RULE ELEMENTS

In 2008, the USACE and the US Environmental Protection Agency issued regulations, hereafter referred to as the Mitigation Rule, governing compensatory mitigation for activities authorized by permits issued by the Department of the Army. The regulations established performance standards and criteria for the use of permittee-responsible compensatory mitigation, mitigation banks, and in-lieu programs. In addition, the Mitigation Rule improved the planning, implementation and management of compensatory mitigation projects by

emphasizing a watershed approach in selecting compensatory mitigation project locations, requiring measurable, enforceable ecological performance standards and regular monitoring for all types of compensation and specifying the following twelve elements of a complete compensatory mitigation plan: 1) objectives; (2) site selection criteria; (3) site protection instruments (e.g., conservation easements); (4) baseline information (for impact and compensation sites); (5) credit determination methodology; (6) mitigation work plan; (7) maintenance plan; (8) ecological performance standards; (9) monitoring requirements; (10) long-term management plan; (11) adaptive management plan, and (12) financial assurances.

Section 2

Define Mitigation Planning Objectives

The objective of this mitigation plan is to evaluate potential options that would satisfy the compensatory mitigation requirements for the tentatively selected plan (TSP) for the North DeSoto Feasibility Study and integrated EIS, which is the locally preferred plan (LPP). The National Economic Development Plan (NED) includes a Horn Lake Creek (HLC) channel enlargement totaling approximately 0.8 mile and an approximately 22-acre detention basin along Lateral D. The channel enlargement would decrease the flood stages along Horn lake Creek, providing flood risk reduction for residential and commercial properties. In addition to the NED Plan, the LPP includes two detention basins; one along Cow Pen Creek totaling approximately 20 acres (2 pools), and one along Rocky Creek totaling approximately 9 acres. The detention basins would reduce the peak of high-water events and reduce residual flood risk. In addition, the detention basins assimilate polluted waters including nutrient reduction and store sediment from surrounding developed areas, thus improving downstream water quality.

This conceptual mitigation plan is based on preliminary site visits, satellite imagery, GIS mapping, and habitat analysis conducted by the Engineer Research and Development Center (ERDC), to include both the Environmental Laboratory and the Coastal and Hydrology Laboratory, and the project development team. A more detailed mitigation plan would be developed in coordination with the interagency team (IAT) during the pre-construction, engineering and design (PED) phase of the project. Additional NEPA documentation would be prepared, as needed.

Proposed mitigation actions include planting appropriate native bottomland hardwood species along creeks within DeSoto County to provide a riparian buffer and/or within tracts of cleared agricultural land, as appropriate. Grade control structures or low-water weirs, strategic placement of coarse woody debris, construction of in-stream habitat, and bench cuts to promote hydraulic diversity may also be considered for compensatory mitigation; however, no sites have been identified and detailed analyses have not been conducted. The site identification and detailed analyses would be completed during the PED phase of

the project. Members of the IAT (including but not limited to) the Mississippi Department of Environmental Quality, Mississippi Department of Fisheries, Wildlife and Parks, the US Fish and Wildlife Service, and the US Environmental Protection Agency would have the opportunity to aid in the selection and determine the suitability of any site that is chosen to mitigate the impacts. Compensatory mitigation would occur prior to or concurrent with construction of the proposed project.

Section 3

Inventory and Categorize Ecological Resources (Credit Determination Methodology)

The USACE formed a multi-disciplinary team to conduct a study on streams in DeSoto County to help identify problems and opportunities, as well as quantify expected impacts and benefits on the study streams and adjacent habitat based on the proposed alternatives. This effort represents a method of assessing ecosystems using multiple attributes across multiple scales, called the "Multi-Scale Watershed Approach" (MSWA) that was first developed and certified through the National Ecosystem Planning Center of Expertise (ECO-PCX) for the Duck River Watershed Plan, located in middle Tennessee (Pruitt et al. 2020). The concept behind the MSWA, developed by ERDC, established a means of utilizing readily available data and surface investigations to create an overall knowledge base focusing on watershed problems and opportunities. For a more detailed treatise on the formulation and application of SCI, see Formulation of a Multi-Scale Watershed Ecological Model Using a Statistical Approach (ERDC/EL SR-20-6) (https://www.erdc.usace.army.mil/Media/Publication-Notices/Article/2430578/formulation-of-a-multi-scale-watershed-ecological-model-using-a-statistical-app/). The outcome of MSWA can become the principle component of the decision-making process enabling water resource managers to make scientifically defensible decisions. From the watershed perspective, the cause and effect relationships between land use, water quality and quantity, in-channel and riparian conditions, and biotic responses are representative of the ecological condition of the watershed. In addition, assessment at the watershed scale offers advanced planning, including design, construction, and operation, maintenance, repair, replacement and restoration of aquatic ecosystems, and is fully supportive of the objective of Civil Works ecosystem restoration: to restore degraded significant ecosystem structure, function, and dynamic processes to a less degraded, more natural condition (USACE 1999a, 1999b, 2000).

A Stream Condition Index (SCI) is the primary component of a watershed assessment. The SCI is a multi-metric visual tool to score the geomorphic, hydraulic, and habitat condition of a stream reach. The SCI score ranges from 0.1 to 1.0 based on 0.0 for worst conditions and 1.0 for best conditions, and therefore functions as the "Habitat Suitability Index" score in the Habitat Evaluation Procedure to calculate Habitat Units (HU's) annualized over the project

life of 50 years (USFWS 1980). Overall, the results of SCI scores assessment can be used in the planning process to:

1. Prioritize stream segments and sub-watersheds for restoration, enhancement, preservation (conservation), and future risk of aquatic impacts.
2. Assess proposed project alternative analysis and cost/benefit analysis.
3. Develop performance standards and success criteria applicable to restoration actions.
4. Address impacts or improvements beyond the footprint of the project.
5. Establish monitoring plans including adaptive management.
6. Forecast future ecosystem outcomes.
7. Estimate the long-term effects of climate change on ecosystem processes and functions.
8. Assess stream conditions elsewhere and compare against reference conditions established during this watershed assessment.
9. Justify proposed projects at the national significant priority scale.

During a preliminary survey of potential project areas, data was collected from the review of satellite imagery and site surveys to determine the Average Annual Habitat Units of streams and adjacent terrestrial habitat in the area, as well as potential impacts to those resources.

Section 4
Determine Significant Net Losses (Baseline Information)

4.1 HORN LAKE CREEK CHANNEL ENLARGEMENT

A channel enlargement along Horn Lake Creek (HLC) would be constructed downstream of Goodman Road in Horn Lake, Mississippi. The channel bottom would be enlarged from stream mile 18.6 to mile 19.41 (0.8-mile) from the current approximated width of 15-25 feet to 40 feet. The creek banks would be constructed for stability at a slope of approximately 3-foot horizontal to 1-foot vertical (3H:1V). The HLC channel enlargement would require tree clearing of approximately 10 acres along one bank of HLC for access, bank stabilization, and excavation. The enlargement and slope flattening would require approximately 95,000 cubic yards of excavation, all of which would be disposed off-site. Approximately 22,750 tons of riprap would be placed to prevent scour damage. The riprap would be placed in a 3-foot

deep layer on the channel bottom and 5 feet up both streambanks. The riprap would be placed over approximately 6,000 tons of filter material. The upper banks would be protected with 18,780 square yards of turf reinforcing mat. The 0.04 Annual Exceedance Probability (AEP) Nonstructural aggregation feature would reduce stages during the 0.01 AEP event for 158 structures with an average reduction of 0.75 foot. During the 0.04 AEP event this feature would reduce stages for 125 structures with an average reduction of 1 foot.

The current condition of the proposed enlargement area is a low to moderate quality stream with a moderate riparian corridor. The existing riparian SCI score for this section of stream is 0.31, and the in-channel score is 0.4. It is expected that the future without construction of the proposed project would see an increase in habitat value, estimated to increase the SCI to approximately 0.95 over a period of 50 years. A reduction of SCI to approximately 0.1 is expected with construction of the proposed project, resulting in an index reduction of approximately 0.85, or 8.5 Average Annual Habitat Units (AAHU), or a total of approximately 425 habitat units over 50 years is expected due to impacts from riparian tree clearing. The unit termed Average Annual Habitat Units (AAHU) is the product of Stream Condition Index (SCI) scores and area of impact or improvement annualized over a 50-year period. Therefore, approximately 8.5 AAHUs, or a total of approximately 425 habitat units must be replaced to prevent a loss of ecosystem function due to the proposed construction of the Horn Lake Creek channel enlargement.

Due to the improvement of channel planform, bank stability, habitat diversity, and fish cover, there is an SCI increase from 0.4 to approximately 0.7 resulting in a gain of 203 habitat units over a 50-year period. Water quality and aquatic resources would be expected to improve as compared to the existing conditions and future without project.

4.2 LATERAL D DETENTION BASIN

The Lateral D Detention Basin would be constructed in-line with Lateral D, a tributary to HLC. The detention basin would encompass approximately 22 acres of bottomland hardwoods (BLH) that would require clearing. The bottom area of the detention basin would be approximately 16 acres. The area would be excavated to a depth of approximately 10 feet with 3H:1V side slopes. Approximately 350,000 cubic yards would be excavated to create the maximum storage of 177-acre-ft detention basin. A 500-linear foot outlet embankment would be constructed to include a 48-inch reinforced concrete pipe (RCP) outlet with a 100-linear foot overflow spillway armored with approximately 2,000 tons of riprap over approximately 500 tons of filter material on the downstream side. The spillway would operate at elevation 300.0 (the 0.50 annual chance exceedance (ACE) event, or 2-year flood). The current design assumes replanting approximately 10 percent, or 2.2 acres with native vegetation of the area that would be cleared.

The existing condition of the proposed Lateral D detention basin is a moderate to high quality forested area with an SCI score of 0.8, producing approximately 17.7 AAHUs. It is expected that the future without construction of the proposed project would see an increase in habitat value, estimated to increase the SCI to approximately 0.95 over a period of 50 years. A reduction of SCI to approximately 0.1 is expected with construction of the proposed

project, resulting in an index reduction of approximately 0.85, or 18.7 AAHU, or a total of approximately 1,045 habitat units over 50 years is expected due to impacts from tree clearing. Therefore, approximately 18.7 AAHUs, or a total of approximately 1,045 habitat units must be replaced to prevent a loss of ecosystem function due to the proposed construction of the Lateral D detention basin.

4.3 ROCKY CREEK DETENTION BASIN

The Rocky Creek in-line detention basin would total approximately 9 acres and would require approximately 7.5 acres of tree clearing and excavation to a depth of approximately 10 feet. The pool bottom area would encompass approximately 6 acres. The dry detention basin would have a single pool elevation of approximately 302.0. Slopes would be constructed at approximately 3H:1V for stability. A downstream embankment would be constructed and extend approximately 500 linear feet. The embankment would include a 48-inch RCP outlet and 100- linear foot overflow spillway armored with approximately 6,000 tons of riprap placed over approximately 1,500 tons of filter material on the downstream side. The current design assumes replanting with native vegetation of approximately 10%, or 0.9 acre, of the area that would be cleared.

The existing condition of the Rocky Creek detention basin is a moderate-quality forested area with an SCI score of 0.54, producing approximately 4.1 AAHUs. It is expected that the future without construction of the proposed project would see no increase or decrease in habitat value over a period of 50 years, as the adjacent areas are highly developed. A reduction of SCI to approximately 0.1 is expected with construction of the proposed project, resulting in an index reduction of approximately 0.4, or 3.3 AAHU, or a total of approximately 165 habitat units over 50 years is expected due to impacts from tree clearing. Therefore, approximately 3.3 AAHUs, or a total of approximately 165 habitat units must be replaced to prevent a loss of ecosystem function due to the proposed construction of the Rocky Creek detention basin.

4.4 COW PEN CREEK DETENTION BASIN

The Cow Pen Creek detention basin would total approximately 20 acres in two pools (a 12-acre upstream pool and an 8-acre downstream pool) and would require approximately 8.5 acres of tree clearing (upstream pool only) and excavation to a depth of approximately 10 feet. The upper pool would have a bottom elevation of 262.0 with a bottom area of 10 acres, and slopes would be constructed at 3H:1V back to the existing grade. A 500-linear foot embankment would be constructed on the downstream end of the detention basin and would include a 48-inch RCP outlet and 100-linear foot overflow spillway armored with approximately 2,000 tons of riprap over approximately 500 tons of filter material on the downstream side. The spillway would operate at elevation 272.0, approximately at the 0.50 ACE event. The maximum storage of 108 acre-feet requires approximately 175,000 cy of excavation which would be disposed of off-site. The current design assumes replanting with native vegetation of approximately 10%, or 1.2 acres, of the area that would be cleared.

The downstream Cow Pen detention basin would be offline and encompass approximately 8 acres. The basin would have a bottom elevation of 258.0 with a bottom area of approximately 6 acres. Slopes would be constructed up to the existing grade at 3H:1V. A 500-linear foot embankment would be constructed on the downstream end of the detention basin and would include a 48-inch RCP outlet and 100-linear foot overflow spillway armored with approximately 2,000 tons of riprap over approximately 680 tons of filter material. An inlet sill would require an additional 800 tons of riprap. The 100-foot wide spillway would operate at elevation 268.0, approximately at the 0.50 ACE event. The maximum storage of 68 acre-feet requires approximately 115,000 cy of excavation which would be disposed of off-site. The current design assumes replanting with native vegetation of approximately 10%, or 1.2 acres, of the area that would be cleared.

The existing condition of the proposed upstream detention basin is a low-quality forested area with an SCI score of 0.36, producing approximately 3.1 AAHUs. It is expected that the future without construction of the proposed project would see an increase in habitat value, estimated to increase the SCI to approximately 0.5 over a period of 50 years. A reduction of SCI to approximately 0.1 is expected with construction of the proposed project, resulting in an index reduction of approximately 0.4, or 3.4 AAHU, or a total of approximately 170 habitat units over 50 years is expected due to impacts from tree clearing. Therefore, approximately 3.4 AAHUs, or a total of approximately 170 habitat units must be replaced to prevent a loss of habitat due to the proposed construction of the Cow Pen Creek detention basin. The downstream detention basin is currently the site of a baseball or softball field, and currently has little ecological value; therefore, no compensatory mitigation is proposed for that site.

4.5 SUMMARY OF IMPACTS

With implementation of the proposed tentatively selected flood risk management plan, the USACE has determined that approximately 8.5 AAHUs for the Horn Lake Creek channel enlargement would be lost due to tree clearing. In addition, losses of 18.7 AAHUs within the Lateral D detention basin, 3.3 AAHUs within the Rocky Creek detention basin, and 3.4 AAHUs within the Cow Pen detention basin would be incurred. A total of approximately 33.9 AAHUs or approximately 1,695 habitat units over a period of 50 years would be required to be replaced with compensatory mitigation actions to prevent the loss of ecosystem functions. All impacts are associated with BLH clearing and are summarized below in Table A:4-5. Currently, no environmental features have been incorporated into the design of the detention basins with the exception of the approximately 5.1 acres of replanting along the channels post-construction; however, as the project progresses, additional wetland features, microtopography work, and/or tree planting may be incorporated, reducing, or possibly eliminating, the amount of off-site compensatory mitigation required for the detention basins. Gravel-surfaced access roads and security fences would be installed along the perimeter of the basin for the safety and security of local residents. All excavated material is expected to be disposed of off-site and is assumed to be placed in an upland area where no impacts would occur. The channel enlargement and detention basin designs would be optimized during feasibility-level design. A new existing-conditions survey would provide the data necessary to finalize design elevations. Special consideration would be given to transitioning

into and out of the detention basins, managing overflow, and protecting the channel from scour.

Table A:4-5. Summary of Impacts for each feature of the Tentatively Selected Plan.

Impact Analysis												
Impact Sites	**Acreage Impacted**	**Existing SCI**	**Existing AAHU**	**Future without Project SCI[1]**	**Future without Project AAHU**	**Future without Project (50-Year Horizon)**	**With Project SCI**	**With Project AAHU**	**AAHU Loss Per Impact Site**	**Habitat Loss over 50-Year Horizon**	**Net Initial AAHU Loss**	**Net Habitat Unit Loss (50-Year Horizon)**
Horn Lake Creek Enlargement	10	0.31	3.10	0.95	9.50	475.00	0.1	1	8.50	425.00	33.90	1695.0
Lateral D Detention Basin	22	0.80	17.60	0.95	20.90	1045.00	0.1	2.2	18.70	935.00		
Cow Pen Detention Basin	8.5	0.36	3.06	0.50	4.25	212.50	0.1	0.85	3.40	170.00		
Rocky Creek Detention Basin	7.5	0.54	4.05	0.54	4.05	202.50	0.1	0.75	3.30	165.00		
Total	48		27.81	0.74	38.70	1935.00		4.8	33.90	1695.00		

1 - Future without project SCI Total is the average of the FWOP SCIs

Section 5
Identify and Assess Potential Mitigation Strategies

This compensatory mitigation plan presents the types of projects that could be implemented and the associated monitoring and adaptive management plans that would be required by habitat type for these projects if the incremental cost analysis results in the selection of a Corps constructed project(s). Potential mitigation strategies include Plan 1 - Active BLH restoration (replanting native species and implementing a maintenance plan), Plan 2 - Passive BLH restoration (natural succession and implementing a maintenance plan), and Plan 3 - Purchasing BLH credits from an approved compensatory mitigation bank.

5.1 PLAN 1 – ACTIVE RESTORATION

Implementation of Plan 1 would require the acquisition of land and planting of appropriate native tree species (or other native vegetation, as determined appropriate by the PDT and IAT). Species would be selected based on several factors including input from the IAT, surface elevations, hydrologic regime, and geographic location. Approximately 42.5 acres of land acquisition would be required to mitigate 33.9 AAHUs that would be impacted with the implementation of the proposed action. Requirements for each feature of the TSP are delineated below in Table A:5-1. Annual monitoring would occur and would be subject to the ecological performance standards discussed below, and reporting would occur annually for at least 5 years, or until determined successful by the USACE, local sponsor, and concurred with by the interagency team. Ecological performance standards are included below in Section 8.2. The USACE would be responsible for conducting the monitoring events and preparing the associated monitoring reports until such time that the following initial success criteria are achieved as described in Sections 8.1 and 8.2. At the time that the initial success criteria are met, the monitoring responsibilities are transferred to the NFS. Further information regarding monitoring is detailed below in Sections 8.3 and 8.4.

5.2 PLAN 2 – PASSIVE RESTORATION

Implementation of Plan 2 would require the acquisition of appropriate land (as determined appropriate by the pdt and IAT); however, no planting would occur. Reforestation would occur naturally. This option would require the acquisition of additional acreage, and would present a higher risk of failure, as volunteer species may be composed of a high percentage of less desirable native species and/or invasive species significantly lowering the benefits. In addition, time to determine successful compensatory mitigation would likely be extended as the 'fallow' or early successional period would not allow for a success determination.

Annual monitoring would occur and would be subject to the ecological success criteria discussed below, and reporting would occur annually for at least 5 years, or until determined successful by the USACE, local sponsor, and concurred with by the interagency team.

Table A:5-1. Compensatory Mitigation Totals for each TSP feature.

Compensatory Mitigation Acreage		
Impact Sites	Acreage Proposed per Impact Site	Habitat Gain Required (50-Year Horizon)
Horn Lake Creek Enlargement	10.6	425
Lateral D Detention Basin	23.4	935
Cow Pen Detention Basin	4.3	170
Rocky Creek Detention Basin	4.1	165
Total	42.4	1695

5.3 PLAN 3 – PURCHASE OF CREDITS FROM MITIGAITON BANK

Purchase of credits from a compensatory mitigation bank would not be applicable for this study. No compensatory mitigation banks exist within the 8-digit hydrologic code or primary service area of the proposed actions. This option was not investigated further. If additional compensatory mitigation banks are created within the appropriate area, they would be analyzed for use.

Section 6

Define and Estimate Costs of Mitigation Plan Increments

6.1 FINANCIAL ASSURANCES

Sufficient Federal appropriations would be provided to the project to successfully construct and monitor the project mitigation site and to accomplish minor corrective actions, if deemed necessary during the monitoring period. In the event of a total mitigation failure or if major corrective action is required and funds are no longer available, the project would require modification.

6.2 DISPLAY INCREMENTAL COSTS

During the PED phase, an analysis of passive restoration cost as compared to implementing Corps-constructed active restoration mitigation project(s) by impacted habitat type would be conducted to ensure the most cost-effective mitigation project is selected for implementation. This would include identification, screening, comparison, and selection of Corps constructed projects by habitat type using the six-step planning process.

Section 7
Recommended Compensatory Mitigation Plan

Plan 1 – Active Restoration is the recommended compensatory mitigation plan. A total of approximately 42.5 acres of agricultural land would be reforested by planting native trees, other activities as described below may also be included, as determined necessary by the IAT. A planting plan would be created in coordination with the IAT and included in the release of the final Environmental Impact Statement and Conceptual Mitigation Plan. A site-specific mitigation plan would be developed during PED, further detailing a planting plan. Grade control structures or low-water weirs, strategic placement of coarse woody debris, construction of in-stream habitat, and bench cuts may also be considered for compensatory mitigation; however, no sites have been identified and detailed analyses have not been conducted.

Table A:7. Summary of Potential Compensatory Mitigation Gains.

Compensatory Mitigation Proposal (Full Project Summary)						
Projected SCI (50- Year Horizon)	Projected SCI Gain (50- Year Horizon)	10-Year Transition	40-Year (Fully Functional)	Proposed Acreage for Compensatory Mitigation	Net AAHU	Required Habitat Unit Replacement (50-Year Horizon)
0.95	0.22	2.00	38.00	43	33.9	1695

7.1 SITE PROTECTION

The mitigation site(s) would be acquired by the local sponsor and posted for public awareness. The site would be protected in perpetuity through an *in-lieu* fee acquisition, real property acquisition, appropriate easement or other real estate instrument.

7.2 MITIGATION WORK PLAN

Detailed written specifications and work descriptions for the compensatory mitigation project, would be included in this section as plans progress. Important considerations for successful restoration include bed and bank stability, which may require low drop structures and longitudinal stone tows, respectively. These features would ensure the longevity of riparian reforestation. Items to consider include, but are not limited to, the geographic boundaries of the project; construction methods, timing, and sequence; source(s) of water, including connections to existing waters and uplands; methods for establishing the desired plant community; plans to control invasive plant species; the proposed grading plan, including elevations and slopes of the substrate; soil management, and erosion control measures. Other relevant information, such as planform geometry, channel form (e.g., typical channel cross-sections), watershed size, design discharge, and riparian area plantings would be considered prior to finalizing a site-specific mitigation plan.

As noted above, no sites have been proposed at this time. Compensatory mitigation performed would be in-kind. Other relevant factors that would be considered include (but are not limited to) development trends, anticipated land use changes, habitat status and trends, the relative locations of the impact and mitigation sites in the stream network, local or regional goals for the restoration or protection of particular habitat types or functions (e.g., re-establishment of habitat corridors or habitat for species of concern), water quality goals, floodplain management goals, and the relative potential for chemical contamination of the aquatic resources (USACE, 2008).

7.2.1 General Construction for BLH

Complete all necessary earthwork and related construction activities in accordance with the mitigation work plan and the project plans and specifications. The necessary activities would vary with the mitigation site, but may include clearing, grubbing, and grading activities; construction of new water management features (weirs, flap-gates, etc.); modifications or alterations to existing water control structures and surface water management systems, if applicable; plantings; and eradication of invasive and nuisance plant species.

Section 8
Monitoring Requirements

Below are general guidelines for mitigation projects. Site specific success criteria and monitoring plans would be developed after project specific mitigation sites are identified and the associated mitigation plans developed.

8.1 TOPOGRAPHY

Following the completion of any required earthwork features, or grading, to attain desired elevation, but prior to planting, demonstrate that at least 80% of the total graded area within

each feature is within approximately 0.25 foot of the desired target soil surface elevation. Desired elevations would be determined during site-specific mitigation planning. Elevation surveys would be required to achieve success criteria. Once success is determined, no further topography work would be conducted unless it is determined that ecological success criteria are not being met due to unsuitable elevations (see further discussion below in Section 9).

8.2 ECOLOGICAL SUCCESS CRITERIA

A. Initial Success Criteria (at end of first growing season following planting) –

1. Achieve a minimum survival of 75% of planted canopy species (planting density would be determined in coordination with the IAT once a site and specific vegetation suite has been selected).

2. The composition must approximate the species composition and percentages specified in the initial plantings component of the final planting plan.

3. These criteria would apply to the initial plantings, as well as any subsequent re-plantings necessary to achieve this initial success requirement. Greater flexibility for species composition or canopy coverage may be allotted after multiple years of not meeting initial success criteria.

B. Intermediate Success Criteria (3 growing seasons following planting, or 3 growing seasons after initial success criteria are met)

1. Maintain a minimum density of 50% of planted living native canopy species per acre (density may include planted trees and/or naturally recruited native canopy species).

2. Achieve a minimum density of 50% of the living hard-mast producing species in the canopy stratum (planted trees and/or naturally recruited native canopy species). The remaining trees in the canopy stratum may be comprised of soft-mast producing native species.

3. Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria. Plant community must exhibit characteristics and diversity indicative of a viable native forested wetland community, i.e. vegetation community where more than 50% of all dominant species are facultative (FAC) or wetter.

C. Long-Term Success Criteria (Within 6 growing seasons following attainment of Intermediate Success Criteria and maintained for the duration of the remaining 50-year project life).

1. Attain a canopy cover of approximately 50% by planted and/or naturally recruited native canopy species. If the project doesn't meet 50% canopy coverage within approximately 6 years following attainment of Intermediate Success Criteria, the IAT would meet and discuss path forward.

2. Maintain a minimum density of 50% of the living hard-mast producing species in the canopy stratum (planted trees and/or naturally recruited native canopy species). The remaining trees in the canopy stratum may be comprised of soft-mast producing native species.

3. Maintain USACE hydrophytic vegetation criteria. The plant community must exhibit characteristics and diversity indicative of a viable native forested wetland community, i.e. vegetation community where more than 50% of all dominant species are facultative (FAC) or wetter.

It is likely that 30-foot diameter plots located within the site would be used to monitor any riparian plantings, survival percentages and the percentage of species that compose the vegetation in any areas with riparian buffer plantings. The plots would also be used as permanent photo stations to visually document the development of the restoration.

Habitat Suitability: Populations of wildlife would increasingly utilize the tract of land for food, shelter, and/or reproductive purposes as the habitat stabilizes and stream functions return and increase. It must be determined, prior to a success determination, that the mitigation site(s) would produce the AAHUs that were lost, or would be lost, by the proposed action. A comparison of the future with and future without project SCI would be conducted to ensure the physical condition of the stream and/or adjacent area would be improved by the proposed compensatory mitigation objectives.

Periodic surveys of aquatic invertebrates, fish, and wildlife in representative reaches would be documented. Any observations of fauna and non-living remains of fauna would be documented and photographed in each trip report. Any direct observations of wildlife usage would be noted and photographed. General observations of evidence of wildlife usage including scat, used food sources, remnants of hatched eggs, etc. would also be noted in each trip report. Observations of invasive or non-native species, or other detrimental factors would also be documented to aid in the development or execution of adaptive management solutions.

8.3 MONITORING PLAN AND REPORTS

Monitoring Reports would be drafted and coordinated after each annual assessment of the mitigation sites, a final findings report would be provided to the IAT and other concerned parties for the duration of USACE monitoring of the mitigation site(s). See Section 8.4 for further details regarding the mitigation and monitoring schedule.

Below are general guidelines for mitigation projects. Site specific success criteria and monitoring plans would be developed after project specific mitigation sites are identified and the associated mitigation plans developed.

8.3.1 **Baseline Monitoring Report (First Monitoring Report)**

Within 90 days of completion of all final construction activities associated with General Construction for BLH described in Section 7.2.1, a baseline monitoring report would be prepared. Information provided would typically include the following items:

- A detailed discussion of all mitigation activities completed.

- A description of the various features and habitats within the mitigation site. Various qualitative observations would be made to document existing conditions and would include, but not be limited to, potential problem zones, general condition of native vegetation, and wildlife utilization as observed during monitoring.

- A plan view drawing and shapefiles of the mitigation site showing the approximate boundaries of different mitigation features including planted areas, planted rows, areas involving eradication of invasive and nuisance plant species, surface water management features, access rows, proposed monitoring transects locations, sampling plot locations, photo station locations, and if applicable, piezometer and staff gage locations.

- Initial and final construction surveys for areas having had topographic alterations, including elevations of all constructed surface water drainage features, drainage culverts, and/or water control structures. The initial and final construction surveys should also include cross-sectional surveys of topographic alterations involving the removal of existing linear features such as berms/spoil banks, or the filling of existing linear ditches or canals. The number of cross-sections must be sufficient to represent elevations of these features. The initial and final construction surveys must include areas where existing berms, spoil banks, or dikes have been breached, if applicable.

- 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 an itemization of the number of each species planted and correlate this itemization to the various areas depicted on the plan view drawing of the mitigation site.

- Photographs documenting conditions in the project area would be taken at the time of monitoring and at permanent photo stations within the mitigation site. At least two photos would 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 and the locations of these stations would vary depending on the mitigation site. The USACE would make this determination in coordination with the IAT and would specify the requirements in the project-specific Mitigation Monitoring Plan. At a minimum, there would be 4 photo stations established.

- Multiple baseline reports may need to be submitted if additional plantings are required by the contractor to meet planting survival acceptance criteria. Each revision would be updated to incorporate information regarding the re-planting.

8.3.2 **Annual Monitoring Reports**

All monitoring reports generated after the Baseline Monitoring Report would be called Initial, Intermediate or Long-Term Success Criteria Monitoring Reports and shall be numbered sequentially based on the year in which the monitoring occurred (i.e. Initial Success Criteria Monitoring Report 2019). All Monitoring Reports shall provide the following information unless otherwise noted:

- All items listed for the Baseline Monitoring Report are required for each annual monitoring report, with the exception of: (a) the topographic/construction surveys and (b) the inventory and location map for all planted species.

- 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.

- Quantitative plant data collected from circular plots having a radius of approximately 30 feet, or (2) permanent transects sampled using the point-centered quarter method with a minimum of 20 sampling points established along the course of each transect, or; (3) permanent belt transects approximately 50 feet wide and perpendicular to planted rows. The number of permanent monitoring plots and transects, as well as the length of each transect would vary depending on the mitigation site. The USACE would make this determination prior to the first monitoring event in coordination with the IAT and would specify the requirements in the Mitigation Monitoring Plan. Data recorded in each plot or transect would include:

First monitoring report after a planting event

- number of living planted canopy species (excluding recruited) present and the species composition;

- number of living planted midstory species present and the species composition

- average density of living planted canopy species (i.e., the total number of each species present per acre) and the species composition (transect methods)

- 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).

Subsequent monitoring reports

- number of living native canopy trees by species;

- average density of all native species in the canopy stratum, and the wetland indicator status of each species;

- average percent cover by native species in the canopy stratum;

- average diameter at breast height (DBH) for trees (measured 10 years after successful completion of plantings) in the midstory and upper strata;

- number of living native midstory species present and the species composition

- 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).

- Quantitative data concerning plants in the understory (ground cover) stratum and concerning invasive and nuisance plant species would be gathered from sampling quadrats. These sampling quadrats would 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 would be approximately 1 meter X 1 meter in size. The total number of sampling quadrats needed along each sampling transect would be determined by the USACE with the IAT and would be specified in the Mitigation Monitoring Plan. Data recorded from the sampling quadrats would include: average percent cover by native understory species; composition of native understory species and the wetland indicator status of each species; average percent cover by invasive plant species; and average percent cover by nuisance plant species.

- Photographs would be taken to document conditions at each permanent monitoring plot and along each permanent monitoring transect. Two photos at each station would be taken, one facing north and one facing south.

- For BLH-Wet habitats: A summary of rainfall data would be 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, reporting of rainfall data would no longer be required.

- In addition, various qualitative observations would be made in the mitigation site to help assess the status and success of mitigation and maintenance activities. These observations would include: general estimates of the average percent cover by native plant species in the canopy, midstory, and understory strata; general estimate of the average percent cover by invasive and nuisance plant species; general estimates concerning the growth of planted canopy and mid-story species; general observations concerning the colonization by volunteer native plant species; general observations made during the course of monitoring would 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.

- A summary assessment of all data and observations along with recommendations to help meet mitigation and management/maintenance goals and mitigation success criteria.

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

8.4 MITIGATION MONITORING SCHEDULE AND RESPONSIBILITIES

Monitoring would be dependent upon site conditions but may be delayed until later in the growing season due to site conditions or other unforeseen circumstances. Monitoring reports would be submitted as soon as possible but no later than December 31 of that year. Monitoring reports would be provided to the USACE, the NFS, and the agencies comprising the IAT.

The USACE would be responsible for conducting the monitoring events and preparing the associated monitoring reports until such time that the following initial success criteria are achieved as described in Sections 8.1 and 8.2. At the time that the initial success criteria are met, the monitoring responsibilities are transferred to the NFS.

The NFS would be responsible for conducting the required monitoring events and preparing the associated monitoring reports for all other required years after the USACE has demonstrated the initial success criteria listed above have been achieved. The responsibility for management, maintenance, and monitoring of the non-structural components of mitigation project (vegetative) would typically be transferred to the NFS during the first quarter of the year immediately following submittal of the monitoring report that demonstrates attainment of the initial success criteria. Once monitoring responsibilities have been transferred to the NFS, the next monitoring event (intermediate) should take place 2 growing seasons after initial success has been met. After intermediate success has been met, monitoring would be conducted every 5 years throughout the remaining 50-year period of analysis.

In certain cases, it is possible that the mitigation features may be established along with other mitigation features, like other 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 would be prepared by the USACE and the IAT.

If the initial survival criteria specified in Section 8.2 for planted canopy species are not achieved, the IAT would convene to decide by consensus between two remedial actions. 1) Complete replant or supplemental replant or 2) Wait one growing season, monitor for initial success again, and reconvene with the IAT to discuss results and determine path forward. If a replant is selected, a monitoring report would be required for each consecutive year until two annual sequential monitoring reports indicate that all survival criteria have been satisfied (i.e. that corrective actions were successful). If the IAT decides not to replant, then after one

growing season another initial monitoring report would be prepared and the IAT would reconvene to determine path forward. The USACE would be responsible for conducting this additional monitoring and preparing the monitoring reports. The USACE would also be responsible for the purchase and installation of supplemental plants needed to attain the initial success criterion, subject to the provisions mentioned in the Introduction section.

If the intermediate success criteria specified in Section 8.2, are not achieved, a monitoring report would be required for each consecutive year until two annual sequential reports indicate that these criteria have been satisfied. The NFS would be responsible for conducting this additional monitoring and preparing the monitoring reports. The NFS would also be responsible for the purchase and installation of supplemental plants needed to attain these success criteria.

If timber management activities are conducted by the NFS, the NFS would 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). Management activities conducted should be documented in the monitoring report.

Once monitoring responsibilities have 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 initial plantings, the number of monitoring plots and/or monitoring transects that must be sampled during monitoring events may be reduced substantially if 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 IAT.

Section 9
Adaptive Management Plan

This draft Adaptive Management (AM) Plan is designed to mitigate for BLH unavoidable impacts expected to be incurred from the proposed North DeSoto County Feasibility Study actions. The Water Resources Development Act (WRDA) of 2007, Section 2036(a) and U.S 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 2007 (WRDA 2007) – Mitigation for Fish and Wildlife and Wetland Losses”) require adaptive management be included in all mitigation plans for fish and wildlife habitat and wetland losses.

It should be noted that this section only details the Adaptive Management planning for constructible mitigation features for the North DeSoto County Feasibility Study. Although it is not currently anticipated, in the event that mitigation bank credits are purchased, the mitigation

management and maintenance activities for the mitigation bank credits would be set forth in the Mitigation Banking Instrument (MBI) for each particular bank. The bank sponsor (bank permittee) would be responsible for these activities rather than the USACE and/or the local sponsor. USACE Regulatory staff reviews mitigation bank monitoring reports and conducts periodic inspections of mitigation banks to ensure compliance with mitigation success criteria stated in the MBI.

The USACE is the lead agency for implementation of three actions in the National Action Plan (2011) associated with the recommendation to support Integrated Water Resources Management (IWRM):

1. Work with States and interstate bodies (e.g., Levee Boards, The Nature Conservancy, Lower Mississippi River Conservation Committee) to provide assistance needed to incorporate IWRM into their planning and programs, paying particular attention to climate change adaptation issues.

2. Working with States, review flood risk management and drought management planning to identify “best practices” to prepare for hydrologic extremes in a changing climate.

3. Develop benchmarks for incorporating adaptive management into water project designs, operational procedures, and planning strategies.

Adaptive management is a decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood (NRC 2004). Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. The active form of adaptive management employs management actions in an experimental design aimed primarily at learning to reduce uncertainty and improve near-term benefits to the resource. The true measure of adaptive management, and its value to the USACE, is in how well it helps meet environmental, social, and economic goals; increases scientific knowledge; and reduces tensions among stakeholders.

The importance of natural variability to ecological resilience and productivity in the DeSoto County area is being taken into consideration. Adaptive management is not a “trial and error” process, but rather emphasizes “learning while doing.” By developing an AM plan, effective operational decisions and enhancement of socio-economic and ecological benefits can be made. In addition, based on the results and interim conclusions made during the prescribed monitoring process, adjustments can be made in the monitoring plan.

Flexibility would be retained in the management of the mitigation tract(s) that would provide options to maximize benefits to all fish and wildlife resources. Adaptive management decisions would be based upon monitoring results with input from the IAT. Additionally, overall project mitigation may be adjusted in the event that the compensatory mitigation is not functioning as intended. Examples of adaptive management may include, but are not limited to, replanting of riparian buffers and/or BLH forested areas if survival criteria are not met, or planting different types of vegetation or thinning, implementing or modifying methods to enhance and restore hydrology, if necessary.

9.1 ADAPTIVE MANAGEMENT PLANNING

Adaptive management planning would be conducted and the planning elements would include: 1) development of a Conceptual Ecological Model (CEM), 2) identification of key project uncertainties and associated risks, 3) evaluation of the mitigation projects as a candidate for adaptive management and 4) the identification of potential adaptive management actions (contingency plan) to better ensure the mitigation project meets identified success criteria. The adaptive management plan is a living document and would be refined as necessary as new mitigation project information becomes available.

9.2 CONCEPTUAL ECOLOGICAL MODEL (CEM)

A CEM identifies the major stressors and drivers affecting proposed compensatory mitigation project for the DeSoto County project (Table 2). The CEM does not attempt to explain all possible relationships of potential factors influencing the mitigation sites; rather, the CEM presents only those relationships and factors deemed most relevant to obtaining the required acres/average annual habitat units (AAHUs). Furthermore, this CEM represents the current understanding of these factors and would be updated and modified, as necessary, as new information becomes available.

Table A:9 Conceptual Ecological Model

Alternatives / Issues/Drivers	BLH Mitigation Sites	Mitigation Banks
Runoff	-	*
Vegetative Invasive Species	-	*
Herbivory	-	*
Hydrology	+/-	*
Development Intensity	-	*
Topography (elevation)	+/-	*

Key to Cell Codes:

- = Negative Impact/Decrease; + = Positive Impact/Increase; +/- = Duration Dependent/Elevation dependent

*Issues and drivers assumed to be addressed in the Mitigation Bank Instrument

9.3 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 ecosystems within highly developed systems. The project delivery team (PDT) identified the following uncertainties during the planning process.

A. Climate change, such as variability of storm frequency, intensity, and timing
B. Hydrologic trends at mitigation sites

C. Uncertainty Relative to Achieving Ecological Success:
   - Water, sediment, and nutrient requirements
   - Magnitude and duration of wet/dry cycles
   - Nutrients required for desired productivity
   - Growth curves based on hydroperiod and nutrient application
   - Tree litter production based on nutrient and water levels

D. Loss rate of vegetative plantings due to herbivory
E. Long-Term Sustainability of Project Benefits

9.4 ADAPTIVE MANAGEMENT EVALUATION

As part of the North DeSoto Project, the mitigation sites would be further evaluated and planned using the screening criteria to develop a project with minimal risk and uncertainty. The items listed below would be incorporated into the Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) plans to minimize project risks.

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

As part of the adaptive management planning effort, the mitigation project features would be re-evaluated against the CEM and sources of uncertainty and risk would be identified to determine if there is any need for additional actions and costs under the adaptive management plan to ensure that the project meets the required success criteria. Based on the uncertainties and risks associated with the project implementation, contingency actions may be identified for implementation, if needed, to ensure the required AAHUs are met.

1. Potential Action #1. Additional vegetative plantings as needed to meet identified success criteria.
   - Uncertainties addressed A, B, C, D, E

2. Potential Action #2. Additional earthwork at mitigation sites (degrading) to obtain suitable elevations.
   - Uncertainties addressed: A, B, C, E

3. Potential Action #3. Invasive species control to ensure survival of native species and meet required success criteria.
   - Uncertainties addressed: E

4. Potential Action #4. Acquisition of additional compensatory mitigation acreage and/or mitigation credits.
   - Uncertainties addressed: A, B, C, E

Actions 1 and 3 are not recommended as separate adaptive management actions since they are already built into the mitigation plan and success criteria. If monitoring reveals the project does not meet the identified vegetation or hydrologic success criteria, additional plantings or construction activities would be implemented. Specific measures to implement Action 2, if determined necessary to achieve project benefits, would be coordinated with the NFS and other agencies to determine the appropriate course of action. If it is determined that the project benefits are significantly compromised because of unsuitably low elevations, Action 4 may be implemented by increasing the size of the existing mitigation project, mitigating the outstanding balance of the mitigation requirement elsewhere (additional land acquisition), or through the purchase of mitigation bank credits. However, such options may require further analysis in a supplemental NEPA document.

Before implementing any of the potential options, the USACE would coordinate with the NFS and IAT to determine the best path forward. The USACE would be responsible for performing any necessary corrective actions, but the overall cost would be shared with the NFS according to the project cost-share agreement.

The USACE would be responsible for the proposed mitigation construction and would monitor the project until the initial success criteria are met. Initial construction and monitoring would be funded in accordance with all applicable cost-share agreements with the 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 the initial success criteria, the compensatory mitigation project 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 meet the success. The USACE would retain the final decision on the success determination. If structural changes are necessary to meet success criteria, the USACE would implement appropriate adaptive management measures, as described above, in accordance with the contingency plan and subject to cost-sharing requirements, and availability of funding.

9.5 MAINTENANCE PLAN

The maintenance plan would be an integral part of the Adaptive Management Plan. A description and schedule of maintenance requirements to ensure the continued viability of the resource once initial construction is completed would be prepared prior to the completion of the final site-specific mitigation plan. Likely measures may include invasive species control, ensuring that any required channel work is stable and correcting deficiencies, and maintaining control over access to the area where restoration occurs. Maintenance of the project area, such that the total average vegetative cover accounted for by invasive species and the total average vegetative cover accounted for by nuisance species each constitute less than 5% of the total average plant cover throughout the 50-year project life. Inspections to determine the need for invasive/nuisance control would be conducted during monitoring events, as described in Section 8, until the long-term success criteria for vegetation is

achieved. If credits are purchased from an approved mitigation bank, no further maintenance would be required by the USACE or local sponsor for those credits.

Long-Term Management: Mitigation lands would be held and protected in perpetuity by the Government of the United States and/or the local sponsor. The USACE may enter into a long-term management agreement with a state or federal land management agency, as appropriate. Long term management would include an operation/management plan to ensure that the tract continues to function as intended and is protected.

Section 10

Agency Review

This mitigation plan would undergo agency review for comments and suggestions. A copy would be sent to the following agencies.

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

Mississippi Department of Environmental Quality

Mississippi Division of Fisheries, Wildlife and Parks

References and Resources

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List of Acronyms and Abbreviations

AM	Adaptive Management
BLH	Bottom Land Hardwood
CAR	Coordination Act Report
CEMVM	USACE Memphis District
CEQ	Council on Environmental Quality
CWA	Clean Water Act
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
EQ	Environmental Quality
ER	Engineer Regulation
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FMC	Fish Management Counsel
FWCA	Fish and Wildlife Coordination Act
FWCAR	Coordination Act Report
FWOP	Future with Out Project
GCS	Grade Control Structure
H&H	Hydraulics and Hydrology
HTRW	Hazardous, Toxic, and Radioactive Waste
IFR	Integrated Feasibility Report

LERRD	Lands, Easements, Rights-of-Way, Relocations, Disposal
MBTA	Migratory Bird Treaty Act
MDEQ	Mississippi Department of Environmental Quality
MEMA	Mississippi Emergency Management Agency
MVLP	Mississippi Valley Loess Plain
NAAQS	National Ambient Air Quality Standards
NED	National Economic Development
NER	National Ecosystem Restoration
NEPA	National Environmental Policy Act
NFS	Non- Federal Sponsor
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NRHP	National Register of Historic Places
NRCS	Natural Resources Conservation Service
NS	Non-Structural
O&M	Operation and Maintenance
OMRR&R	Operations, Maintenance, Repair, Rehabilitation, Replacement
OSE	Other Social Effects
P&G	Policy and Guidance
PA	Programmatic Agreement
PDT	Project Delivery Team
PED	Pre-construction Engineering and Design
PPA	Project Partnership Agreement
ROD	Record of Decision
ROE	Right of Entry

RPEDS	Regional Planning and Environmental Division South
T&E	Threatened and Endangered
TSP	Tentatively Selected Plan
USACE	United States Army Corps of Engineers
USDA	US Department of Agriculture
USFWS	US Fish and Wildlife Service
USGS	United States Geological Survey
WMA	Wildlife Management Area
WVA	Wetland Value Assessment