

Mitigation Banking Instrument

***BROSNAN FOREST MITIGATION BANK
DORCHESTER COUNTY, SC***

NORFOLK SOUTHERN RAILWAY COMPANY

SUBMITTED TO:

Charleston District Interagency Review Team

Representing:

U.S. Army Corps of Engineers, Charleston District

U.S. Environmental Protection Agency, Region 4

U.S. Fish and Wildlife Service, Charleston Ecological Services

National Oceanic and Atmospheric Administration, National Marine Fisheries Service

US Department of Agriculture, Natural Resource Conservation Service

S.C. Department of Natural Resources

S.C. Department of Health and Environmental Control

S.C. Department of Archives and History

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USACE approval of this Instrument constitutes the regulatory approval required for the *Brosnan Forest Mitigation Bank* to be used to provide compensatory mitigation for Department of the Army permits pursuant to 33 C.P.R. 332.8(a)(1). This Instrument is not a contract between the Sponsor or Property Owner and USACE or any other agency of the federal government. Any dispute arising under this Instrument will not give rise to any claim by the Sponsor or Property Owner for monetary damages. This provision is controlling notwithstanding any other provision or statement in the Instrument to the contrary.

I. PROJECT DESCRIPTION

A. Type and Purpose: Whereas, the purpose of this Banking Instrument is to establish guidelines and responsibilities for the establishment, use, operation, and maintenance of the *Brosnan Forest Mitigation Bank*. The Bank will provide compensatory mitigation for unavoidable adverse impacts to Waters of the United States including wetlands that result from activities authorized under Sections 401 and 404 of the Clean Water Act, provided such activities have met all applicable requirements and are authorized by the appropriate authority.

B. Size and Location of Proposed Bank Site and Associated Watershed: The 289.8-acre Bank is part of, and entirely bounded by, Norfolk Southern Railway Company's Brosnan Forest, a 14,500-acre corporate conference facility and outdoor retreat center. Brosnan Forest is located in central Dorchester County, SC and is bisected by Highway 78, approximately 11 miles east of the town of St. George and 2 miles west of the town of Dorchester. The Bank is situated in the south-central interior portion of Brosnan Forest, approximately two miles south of Highway 78, one mile east of Smoak Road, and one mile west of Sandridge Road (**Appendix 1:Map 1**). Coordinates for the center of the Bank are: N 33°07'06", W 80°27'20". The Bank is located in the Mid-Atlantic Flatwoods physiographic province, in the Middle Atlantic Coastal Plain ecoregion, in the Edisto River Basin on a divide between 03050205 and 03050206 8-digit HUC watersheds. Detailed maps of the project can be found in **Appendix 1**.

C. Bank Size and Classes of Wetlands or Other Aquatic Resources: The proposed mitigation bank site is 289.8 acres of pine plantation, natural hardwoods and ditches/roads located along the drainage divide between the Edisto River and Four Hole Swamp. The area was historically a pocosin, a wetland located on top of a hill. There are no natural inflows or outflows from the site, beyond surface and groundwater discharges. Historic wetland area includes 228.3 acres of the proposed bank. In addition, approximately 19.2 acres of intact uplands will be preserved and 41.9 acres of pine plantation will be restored to natural uplands, as buffers surrounding the restored wetland. A roadbed of about 2 acres that runs through the middle of the site (within the historic wetland) is excluded from proposed mitigation, but other roads and ditches will be restored.

The current land classification of the site is:

Wetlands	15.1 acres
Uplands	263.2 acres
Other (roadway and ditch)	11.5 acres

D. Ownership:

1. Identity of Owner: The Owner, Norfolk Southern Railway Company (NSRC) is one of the nation's largest rail transportation companies, and NSRC or its rail subsidiaries operates approximately 21,000 route miles in 22 states and the District of Columbia serving every major container port in the eastern United States. Josh Raglin, General Manager Facilities, is the primary contact for NSRC, with management responsibility for Brosnan Forest. Detailed contact information is provided in **Appendix 2**.

2. Identity of Sponsor: The Sponsor is Norfolk Southern Railway Company. NSRC relies upon Milliken Forestry Company (MFC) for natural resource management consulting services on its Brosnan Forest property and the proposed BFMB. MFC was founded in 1956 and offers forestry, GIS, wildlife, appraisal, real estate and environmental services including wetland delineation and permitting, threatened/endangered species assessments and forest soil mapping. Through a consulting agreement with NSRC, MFC is responsible for project development and management. Contact information for team members is provided in **Appendix 2**.

3. Identity of Long-Term Steward: Josh Raglin, General Manager of Facilities with management responsibility for Brosnan Forest, is the primary contact for NSRC, the long-term steward of the bank.

4. Identity of Conservation Easement Holder: Lowcountry Open Land Trust, Inc. will hold the Brosnan Forest Mitigation Bank conservation easement. Contact information is provided in **Appendix 2**.

II. ESTABLISHMENT OF THE BANK

Mitigation Plan:

1. Goals and Objectives: The overall goal of the restoration is to reverse the impact of the past 40 years of land alteration and drainage on this 228-acre pocosin wetland and surrounding upland buffers. We intend to restore natural hydrology and vegetation as it existed prior to installation of the drainage ditches. This will re-establish wetland functions and values in a pocosin that stores water for the area and provides clean overflow surface and groundwater discharge to two nearby stream systems (Coldwater Branch on the Four Hole Swamp drainage and an unnamed tributary of Indian Field Swamp on the Edisto River drainage). This will result in a self-sustaining wetland ecosystem protected in perpetuity, thus providing opportunities for compensatory mitigation alternatives for impairment of wetlands and streams associated with authorized (permitted) impacts within the approved bank service area (**Appendix 1:Maps 2&3**). Ditch plugs and ditch/roadbed removal will restore wetland hydrology, and clearing of pine plantations and replanting will re-establish native vegetation to accomplish restoration and enhancement of wetland function and values to the proposed bank area.

The 289.8-acre bank area is divided into nine unit types (**Appendix 1:Map 4**):

A. Existing wetland with wetland vegetation – 8.6 acres. Hydrology will be enhanced, allowing existing remnant hydrophytic vegetation to increase and thrive.

B. Existing wetland dominated by planted loblolly pine – There are 6.5 acres of technically classified wetlands, based on soil characteristics and well data analysis, with a dominant vegetative component of mature loblolly pine plantation. Hydrology will be enhanced while pine removal followed by reforestation will re-establish wetland vegetation.

C. Impaired historic wetland dominated by mature loblolly pine plantation – 170.1 acres. These large areas, the majority of the historic wetland, will require restoration of wetland hydrology and pine removal followed by replanting to re-establish wetland functions.

D. Impaired historic wetland with wetland vegetation present – 21.3 acres. These areas of persisting wetland hardwoods will require restoration of the hydrology and resulting enhancement of the vegetation.

E. Impaired historic wetland that is presently open land (fields, food plots, logging decks) – 10.7 acres. These areas will receive restoration of the wetland hydrology and re-establishment of hydrophytic vegetation through replanting.

F. Internal roadways and ditches – 8.8 acres. The smaller internal roadways and ditches will be eliminated by grading the areas to historic elevation (adjacent unaltered level). The large east-west road and ditch will be degraded and plugged at the ends. The regraded areas will be planted with wetland vegetation.

G. Primary internal roadway – 2.7 acres. The primary internal north-south roadway will be retained to provide access through the site to other portions of the property.

H. Longleaf pine upland buffer – 19.2 acres. The natural longleaf pine upland buffer will be preserved and likely enhanced by application of prescribed fire, which will be possible once wetland hydrology is restored to the rest of the site.

I. Loblolly pine upland buffer – 41.9 acres. The loblolly pine upland buffer will be converted to longleaf pine upland buffer and maintained using prescribed fire.

2. Site Selection: The proposed wetland restoration site is approximately 289.8 acres of pine plantation and natural hardwoods located along the drainage divide between the Edisto River and Four Hole Swamp watersheds. The area is an example of a pocosin, a wetland located on top of a hill. It is situated between the headwaters of Coldwater Branch on the Four Hole Swamp drainage and an unnamed tributary of Indian Field Swamp on the Edisto River drainage (**Appendix 1:Map 1**). It rests on a small remnant barrier of the Wicomico terrace (Colquhoun 1974) at an elevation of 102ft. just west of the prominent beach feature (105-108ft.) locally known as Sand Ridge. The wetland type may be classified as a mineral soil flat (Brinson 1995), with limited lateral surface or subsurface drainage and rainfall as the primary source of water. However, the site is slightly lower than the surrounding upland and may have some characteristics of a depression. The area is higher than the nearby Coldwater Creek to the northeast and tributary of Indian Field Swamp to the southwest; it probably historically produced flow to the headwaters of both these creeks, primarily as groundwater seepage to the west and as surface flow to the east. **Appendix 3** describes in detail factors important to the site selection of this project and the reference site, including geologic setting and hydrologic considerations.

The goal of restoration will be to reverse the impact of land alteration, restoring the site to the hydrology and vegetation patterns of the wetland prior to installation of the drainage ditches, so that it will again function as a self-sustaining wetland that provides ecosystem services to the region. A reference site in the Francis Marion National Forest has been chosen that most closely approximates the geologic and hydrologic setting of the restoration site. It appears to have vegetation cover similar to that of the restoration site in historical aerial photographs. Success of the restoration will be evaluated primarily by evidence of restoration of hydrology (*i.e.*, change from pre-restoration drained hydrology to post-restoration stable hydrology) within the site itself, and also by similarity of the water table depth, depth range, flooding frequency and flooding duration of the restored site and the reference site.

The proposed bank site is surrounded by property under the same ownership, which is presently under a conservation easement agreement with the Lowcountry Open Land Trust. The entire ownership is managed to maintain the natural ecosystem functions and is used for sustainable timber production and outdoor recreation. Restoration activities planned for the bank site are

compatible with surrounding land uses and will benefit the water supply to the adjacent creek systems. The adjacent land uses are not likely to impede restoration or threaten long-term stability of the restored wetland in any way; actually, prescribed burning and other practiced management activities should improve the condition of the bank upland buffers.

The Service Area proposed for the bank (**Appendix 1:Maps 2 & 3**) indicates both the regional contribution we expect the bank functions to make and the likely demand for replacement of wetland functions in the region. Charleston development is rapidly expanding into the numerous waterways and tributaries that feed into that important coastal ecosystem. Watershed impairment, reduction of clean water supply for stream systems, increased erosion, altered hydrologic regimes and reduced habitat for native plants and animals are inevitable consequences. Protection of a large important wetland resource at the top of two watersheds, where it can contribute water storage and delivery to downstream systems, as well as provide sustainable wetland habitat in a larger managed site in perpetuity, is exceptional compensation for impacts to less-sustainable downstream wetland resources.

3. Site Protection: A conservation easement (**Appendix 4**) for the 289.8-acre mitigation bank site (inclusive of associated wetland restoration areas, upland buffers and internal roadways) will be granted to Lowcountry Open Land Trust as part of the bank establishment. The surrounding 12,488 acres, also owned by Norfolk Southern Railway Company, were placed in a conservation easement with Lowcountry Open Land Trust in August 2008.

4. Baseline Conditions

Project Site

The earliest aerial photograph of the site (1938) shows what appears to be a shrub-dominated wetland with scattered trees and an intact upland pine forest surrounding (**Appendix 1:Map 5**). There is no indication of roads or ditches within the wetland. Ditching was begun in the 1960s in an effort to create a pine plantation on the site (Miller and Maki 1957). Early efforts were hampered by a thick surface of organic materials and roots of understory shrubs that did not allow root development of planted pines. Excavation of deep ditches in the late 1960s (**Appendix 1:Map 6**) and mechanical treatment of this root mat finally allowed successful pine establishment by the early 1980s (**Appendix 1:Map 7**). A portion of the area considered too hard to plant remained in hardwoods (sweet gum, red maple, scattered loblolly pine, cypress and black gum).

The wetland site has two very poorly drained soils (Pantego, Rutlege) and one poorly drained soil (Leon). It is surrounded by somewhat poorly drained (Eshaw, Ocilla) and moderately well drained (Goldsboro) types (**Appendix 1:Map 8**). Modern soil examination and the extent of hardwood vegetation on the historic aerials suggest the historic wetland boundary closely approximated the border between the very poorly drained and somewhat poorly drained soils on the west and south, while it is contained within the poorly drained Leon soil on the east.

Foresters began draining pocosins and wetland flats in the Southeast to establish pine plantations in the 1930s and 40s (Miller and Maki 1957, Olson et al. 1954). Drainage ditches were placed on the mitigation site in the late 1950s and early 60s, though drainage was not completed until 1970. A main canal was dug from Coldwater Branch to the northeast, through the site and to the Indian Field Swamp tributary to the southwest (**Appendix 1:Map 6**). The bottom of the canal intersects each drainage at an elevation of about 95ft. (**Appendix 1:Map 9**), with a control structure that allows water levels to be determined by placement of riser boards to raise outlet water levels as high as 102ft. (**Appendix 3:Figure 4**). Drainage ditches were distributed across the site until it was drained sufficiently to allow both fire and mechanical site preparation to be used to clear the site to allow successful establishment of loblolly pine.

Plantation establishment was completed in 1984, with loblolly established on 171 acres of the wetland (**Appendix 1:Map 7**). The plantations have been thinned within the past decade. About 36 acres consists of hardwoods, mostly in the wettest areas. Several cleared areas and a food plot make up the 10 acres of open non-forested habitat. Roads and ditches encompass about 11 acres. There are actively managed waterfowl ponds downstream of the wetland in both the Coldwater Branch and Indian Field Swamp drainages (**Appendix 3:Figure 4**). The design of the main canal not only facilitated drainage of the wetland for plantation establishment, but also provided a reservoir to flood these waterfowl ponds in the adjacent stream basins. Because the outlet structures on each end of the canal are lower than any point in the canal and the tops are higher than most of the wetland basin, a gradient can be created that will supply water in either direction. With these structures, outflow from the basin can be diverted to either Coldwater Branch or Indian Field Swamp depending on the need for water in the waterfowl ponds. Photographs of control structures, wells and typical site conditions are provided in **Appendix 5**.

Draining of the wetland was done in a manner typical of forest operations, with empirical results used for design of the operation. A shallow series of ditches were spread across the site, with deeper ditches added to increase the rate of drainage until the objectives were met (**Appendix 1:Map 9**). Although mathematical estimation of water table decline was used to engineer drainage patterns for agriculture (Skaggs 1976), drainage in forestry was primarily empirical, based on measures of tree response at varying distances from a ditch. Model analysis of forest drainage in the Southeast was not begun until the modification of DRAINMOD (Skaggs 1982) for forested stands in 1992 (McCarthy et al. 1992). A very useful application of such analysis is the Skaggs Method (Skaggs et al. 2005) to predict the distance from a single ditch where the definition of wetland hydrology will not be met (www.bae.ncsu.edu/lateral_effect.html). Using that method with parameters measured on Leon soil (Williams 1978, Williams 1981) yields an estimate of 673ft. for a 5-foot deep ditch and 492ft. for a 3-foot deep ditch. Comparable numbers for Rutlege and Pantago soils would be 246 and 173ft. These values suggest that the ditches placed on the site have resulted in complete removal of wetland hydrology from most of the site. Only three small areas totaling 8.6 acres (**Appendix 1:Map 10, Unit A**) retain wetland hydrology and vegetation. A delineation verification request was submitted to the Corps in October 2013.

Reference Site

A location in the Francis Marion National Forest, about 50 miles east of the proposed wetland bank on Brosnan Forest, was selected as a reference site (**Appendix 3:Figure 2**). Two shallow ground-water wells were installed in early 2009 to monitor water levels for comparison with those of the bank. It is challenging in this part of South Carolina to identify and secure access to an un-impacted pocosin wetland, with intact hydrology, native vegetation and ongoing appropriate land management (*i.e.*, prescribed fire, invasives control). The reference site is several HUCs removed from the bank and more coastal, but a closer intact comparable pocosin wetland with access and management was not located. Francis Marion is a large managed federal conservation area protected from development, which will not be affected by the proposed restoration activities on the project site or future development of nearby properties. It should continue to receive appropriate management during the lifetime of monitoring and hydrologic conditions appear to be intact and stable.

Appendix 3 describes in detail factors important to the site selection of the reference site, including geomorphology and topology, hydrologic considerations and comparison with onsite water level patterns, and vegetative conditions around the chosen well sites. The vegetative composition of the reference site was used to determine the species to be planted in the restored wetland. The wells on the reference sites will continue to be monitored concurrently with the wells on the restoration site to document hydrology within a fully functional wetland during both normal rainfall and drought conditions. These data may be used to support a request for a credit

release if hydrology within the restored wetland system does not appear to meet performance standards, but is comparable to hydrology within the fully functional wetland system during drought conditions.

5. Determination of Credits

Service Area

The service area for the bank (**Appendix 1:Maps 2 & 3**) was determined by the IRT using the 8-Digit HUC divisions and Ecoregions of South Carolina. This service area reflects both the regional contribution we expect the bank functions to make and the likely demand for replacement of wetland functions in the region. Charleston development is rapidly expanding into the numerous waterways and tributaries that feed into that important coastal ecosystem.

Watershed impairment, reduction of clean water supply for stream systems, increased erosion, altered hydrologic regimes and reduced habitat for native plants and animals are inevitable consequences. Protection of a large important wetland resource at the top of two watersheds, where it can contribute water storage and delivery to downstream systems, as well as provide sustainable wetland habitat in a larger managed site in perpetuity, is favorable compensation for impacts to less-sustainable downstream wetland resources.

Functional Assessment Method

The aquatic resource type of the proposed bank site may be classified as a mineral soil flat in the HGM system, with limited lateral surface or subsurface drainage. However, the site is slightly lower than the surrounding uplands and has some characteristics of a depression, receiving all of its input from rainfall or seepage. In the NWI system (Cowardin et al. 1979), the bank site is a freshwater palustrine system, with emergent, scrub-shrub and forested wetland classes. This bank will provide compensatory mitigation for authorized impacts to freshwater flats or depressional wetlands within the service area.

Credit Determination

Appendix 6 contains a proposed wetland mitigation credit worksheet for the bank, including calculated upland buffer values applied as appropriate. Units (**Appendix 1:Map 4**) were divided as needed to apply the upland buffers only to the portions affected, as well as to delineate forested or shrub wetland type expected, as indicated on the historical aerial (**Appendix 1:Map 5**). This delineation of shrub versus forested wetland type also affects the proposed planting design. A summary table of credits to be generated by each restoration/enhancement activity appears below. Brosnan Forest Mitigation Bank will generate approximately **792.8** freshwater palustrine credits for the service area proposed.

Restoration Activities	Units	Hydro	Veg	End Type	Clear pines?	Plant trees	Area (acres)	Credits
Forested Wet Enh/Veg Pres	As	E	P	For wet	No	No	8.6	25.4
Forested Wet Enh/Veg Rest	Bs	E	R	For wet	Yes	Yes	6.5	19.2
Forested Wet Rest/Veg Enh	Ds	R	E	For wet	No	No	21.3	70.6
Forested Wet Rest/Veg Rest - Filled or Open	Es & Fs	R	R	For wet	No	Yes	5.5	19.4
Forested Wet Rest/Veg Rest - Pine Plantation	Cs	R	R	For wet	Yes	Yes	65.7	235.4
Shrub Wet Rest/Veg Rest	Cs, Es, Fs	R	E	Shrb wet	Yes	Yes	118.4	422.8
Sums							226.0	792.8

R=Restoration, E=Enhancement, P=Preservation

6. Mitigation Work Plan

In late 2013, a site visit of the project was conducted by the IRT, and the Prospectus was accepted. Comments in letters of concurrence (**Appendix 7**) from relevant agencies were addressed. Primary restoration activities for the bank include: 1) removing all loblolly pines from the site, 2) degrading roads and filling/plugging ditches to restore hydrology, and 3) planting trees and shrubs to restore wetland plant communities.

Hydrologic Restoration

Construction activities to accomplish hydrologic restoration include (**Appendix 1:Map 11**):

- a) filling tertiary, secondary and primary ditches by degrading existing road levies into ditches,
- b) creating reinforced plugs at north, south, east and west exit points of primary ditches,
- c) providing augmented fill material where needed, including compacted fill for plugs,
- d) providing 9 equalizer pipes under elevated north-south road to be retained,
- e) installing an emergency overflow swale and temporary managed outflow pipe to facilitate planting establishment at east exit point of primary canal into Coldwater Branch,
- f) reinforcing the retained ditch bank outside the wetland in the southwest corner.

Existing wetlands (**Appendix 1:Map 12**) will be enhanced by increased inundation and hydroperiod. Hydrology in the remainder of the wetland will be restored to wetland conditions. Topography (**Appendix 1:Map 13**) within the site indicates that target water elevation at peak wet season levels will be above 103 feet. This will inundate most of the wetland for several months in typical rainfall years. Water elevation of 102 feet in drier years or as levels drop in normal years will inundate about 50% of the wetland. About 15% of the wetland area will be inundated at water elevation of 101 feet. **Appendix 8** provides engineered construction plans for earthwork activities and supplemental fill specifications.

Earthwork will be accomplished onsite by experienced heavy equipment operators. Tertiary and secondary ditches will be filled to grade using adjacent and nearby fill. Three north-south roadbeds and the major east-west road (**Appendix 1:Map 11**) will be pushed into the adjacent ditches and smoothed to grade. Some fill from the east-west road berm will be used to elevate the north-south retained road to 105 feet elevation, with 18-inch equalizer pipes placed every 400 feet (**Appendix 8:Sheet C101**) with an invert elevation of about 102 feet (**Appendix 8:Sheet C104**). Any pockets of fill shortage within the footprint of the filled east-west primary ditch will be smoothed to small shallow circular “pocket ponds”, which will support longer hydroperiod species within the wetland.

We propose to use clay from a local borrow pit for the core fill of the engineered plugs, which has been tested and meets our required permeability of 1×10^{-7} when compacted to 95% standard proctor (**Appendix 8:Summerville Clay Permeability Test**). Designs for the north and south (**Appendix 8:Sheet C102**) and east and west (**Appendix 8:Sheet C103**) ditch plugs meet standard slope and elevation requirements, blocking primary ditch ends to an elevation of about 105 feet.

In the east ditch plug, we propose to install two outlet structures (**Appendix 8:Sheet C103**) to manage water levels in the event of unexpected weather conditions. A 24-inch diameter reinforced pipe with a sealed Waterman slide ditch gate (**Appendix 8:C8E Gate flyer**) is proposed to temporarily maintain water levels during establishment of the wetland plantings (first year post-construction). The invert elevation within the wetland will be 102.5ft. Following vegetation establishment, the gate will be permanently closed and locked. The second structure is a stone treated swale (elevation 104ft.) in the roadbed north of the plug (**Appendix 8:Sheet C103**) that will function as a permanent emergency overflow outlet allowing discharge during extreme rain events that would otherwise endanger the integrity of the ditch plugs. External ditch banks in vulnerable to seepage areas, such as the southwest corner of the wetland, will be reinforced with core fill (**Appendix 8:Sheet C104**) as needed.

Vegetative Restoration

Loblolly plantation pines will be removed from the entire site prior to construction. After earthwork is completed, we will allow wet-season water levels to establish, to reduce pine regeneration, during which time we will also map inundation zones. Planting of wetland trees and shrubs will be implemented (**Appendix 1:Map 14**) as water levels recede, concentrating longer hydroperiod species in deeper areas. Residual loblolly pine regeneration will be removed at this time. Upland buffer areas will be treated and planted. **Appendix 9** presents the full planting plan, including target species by area and planting densities. All augmented plants will be hand-planted and flagged for survivorship monitoring. If plants respond poorly to rising water levels the following spring, we propose to temporarily draw down for a season to allow plants to establish. When trees and shrubs show good survivorship during high water levels, the waterman canal gate on the temporary drawdown pipe will be permanently locked.

Restoration Timeline

Mitigation bank development activities are proposed for the following timeframes:

Mitigation Activity	Timeframe
Record conservation easement, install and take pre-restoration photopoints, veg data	Summer 2015
Loblolly pine removal and stumping	Summer 2015
Mark wells, raise recorders, take pre-construction photopoints	Summer 2015
Earthwork on minor ditches	Summer 2015
Earthwork on major ditches, plugs, road	Fall 2015
Inundation mapping/pine regen control/ take post-construction photopoints	Fall 2015
Planting of wetland trees/shrubs, upland pine	Winter 2015
Take post-planting photopoints	Early 2016
Water level adjustment using canal gate based on stress level of plantings	Summer 2016
1st veg monitoring collection	Summer 2016
2nd veg monitoring collection	Summer 2017
3rd veg monitoring collection	Summer 2018
4th veg monitoring collection	Summer 2019
Final veg monitoring collection	Summer 2020

7. Maintenance Plan

To ensure continued viability of the wetland after construction is completed, we propose that:

- Trees and shrubs will be re-planted following the first and second monitoring sessions if densities fall below targets.
- We will conduct quarterly inspection and repair of plugs, ditch fills, equalizer pipes and outlet structures.
- The wetland will be inspected quarterly for invasive species occurrence, which will be treated and removed.

8. Performance Standards

The following performance standards indicate how each mitigation unit type will be evaluated for success based on mitigation activities, response of the wetland and monitoring parameters established. These performance standards will be assessed in each annual monitoring report to verify that the mitigation site is meeting interim success criteria and objectives are being attained. The monitoring parameters and target values for each area are provided in the [Monitoring Requirements](#) section (below). Conditions in the reference site will be assessed and presented in each monitoring report as a comparison to verify that typical rainfall patterns occurred and to indicate response of an unimpacted wetland system.

Unit Type	Units	Area (acres)	Mitigation Activities	Performance Standards
Forested Wet Enh/ Veg Pres	As	8.6	Increase inundation	Measured hydrology shows increased inundation/saturation depth and duration ($\pm 25\%$ of targets)
Forested Wet Enh/ Veg Rest	Bs	6.5	Clear pines, increase inundation, re-plant	Loblolly pines are absent; measured hydrology shows increased inundation/saturation depth and duration ($\pm 25\%$ of targets); planted trees demonstrate $\geq 50\%$ survival, with a target density of 150TPA
Forested Wet Rest/ Veg Enh	Ds	21.3	Restore hydrology	Measured hydrology shows saturation or above-ground inundation for at least 1 month ($\pm 25\%$) in typical rainfall year
Forested Wet Rest/ Veg Rest - Filled or Open	Es & Fs	5.5	Restore hydrology, re-plant	Ditches are filled to grade; measured hydrology shows saturation or above-ground inundation for 3 months in a typical rainfall year ($\pm 25\%$ of targets); planted trees and shrubs demonstrate $\geq 50\%$ survival
Forested Wet Rest/ Veg Rest - Pine Plantation	Cs	65.7	Clear pines, restore hydrology, re-plant trees	Loblolly pines are absent; measured hydrology shows saturation or above-ground inundation for ≥ 3 months in a typical rainfall year ($\pm 25\%$ of targets); planted trees demonstrate $\geq 50\%$ survival, with a target density of 150TPA
Shrub Wet Rest/ Veg Rest	Cs, Es, Fs	118.4	Clear pines, restore hydrology, re-plant trees and shrubs	Loblolly pines are absent; measured hydrology shows saturation or above-ground inundation for ≥ 3 months in a typical rainfall year ($\pm 25\%$ of targets); planted trees/shrubs demonstrate $\geq 50\%$ overall survival, with a target density of 100 trees or shrubs/acre

Credit Release Schedule

We propose the following credit release schedule, based on mitigation activity completion benchmarks and achievement of success criteria and performance standards within specific mitigation units, as documented in the annual monitoring reports.

Release	Action	Est. Timeframe	Proportion	Credits
Release 1	Approved MBI, execution of conservation easement, installation of signage, execution of financial assurances	Fall 2015	15%	120
Release 2	Completion of construction, provision of as-builts	Late 2015	15%	120
Release 3	Interim success 1-year after completion of construction	Late 2016	10%	80
Release 4	Interim success 2-years after completion of construction	Late 2017	10%	80
Release 5	Interim success 3-years after completion of construction	Late 2018	15%	120
Release 6	Interim success 4-years after completion of construction	Late 2019	15%	120
Final release	Determination that all performance standards have been met 5-years after completion of construction	End 2020	20%	153

9. Monitoring Requirements

To evaluate the response of the wetland system to mitigation activities and assess if the project is meeting [Performance Standards](#), a monitoring network will be established that evaluates hydrologic, vegetative and general site conditions prior to construction (baseline) and for at least 5 years post-construction. In April 2009, 2 wells in the Francis Marion reference site (FMNF) and a series of wells within the project site were established, 15 of which were outfitted with continuous water level recorders (**Appendix 10**). Well 1 is within the primary drainage ditch discharging the wetland to the east, so it is not actually a well and will be removed during construction. Reference Well #1 is the West Reference Well; Reference Well #2 is the East Reference Well. Pre-restoration water level data from the 17 recorders and rainfall data from gauges in both FMNF and BFMB are presented as a baseline monitoring report (**Appendix 11**).

Appendix 12 presents the monitoring plan for BFMB, including the proposed locations for rainfall, hydrologic, vegetation and photopoint monitoring stations (**Appendix 1:Map 15**). Data at each station will be collected at appropriate intervals; *e.g.*, continuous data from wells and rain gauges will be downloaded monthly, vegetation plots and photopoints will be sampled annually. An annual monitoring report will be provided by December 31 of each year, presenting the results from the previous water year (Oct 1 to Sept 30). The following table summarizes the number of stations of each type of monitoring data for each mitigation unit type.

Unit Type	Units	Hydro Monitoring (Well Numbers)	Veg Monitoring (Mit Unit w/ plot)	Number of Camera Points
FMNF Reference	N/A	FMNF rain gauge; East & West wells	N/A	2
BFMB	All	BFMB rain gauge	N/A	8 (outer edge)
Forested Wet Enh/ Veg Pres	As	5, 7	N/A	1
Forested Wet Enh/ Veg Rest	Bs	9, 15	B4, B7	2
Forested Wet Rest/ Veg Enh	Ds	13	N/A	2
Forested Wet Rest/ Veg Rest - Filled or Open	Es & Fs	10, 12	E5	1
Forested Wet Rest/ Veg Rest - Pine Plantation	Cs	3, 6, 11	C5F, C6F, C7F, C8F	4
Shrub Wet Rest/ Veg Rest	Cs, Es & Fs	2, 4, 8, 14	C3S, C4S, C5S, C7S, C8S, F2	7

10. Long-term Management

After all mitigation activities are completed and the bank is determined to be successful, the site will be managed as part of the overall Brosnan Forest property, owned by Norfolk Southern Railway Company and its affiliate Southern Region Industrial Realty, Inc. The remainder of the property is already under a conservation easement held by the Lowcountry Open Land Trust. The property is managed to maintain natural ecosystem functions and is used for sustainable timber production and outdoor recreation. Surrounding land uses are compatible with the long-term protection of the wetland, which will benefit wildlife and enhance water supply to the adjacent creek systems. Prescribed burning and other management activities on the property will improve the condition of the bank upland buffers and the wetland itself. **Appendix 13** describes the long-

term management program planned for the site, which includes prescribed burning, maintenance of permanent signage to protect the site, inspection of ditch plugs and construction features, and treatment of invasive species.

Appendix 14 itemizes the predicted cost of long-term management activities on the site. The annualized cost is estimated to be about \$8,000 in today's (2015) dollars, which assumes the site will be burned every 3 years. Norfolk Southern Railway Company will establish a non-wasting endowment fund to support these activities. The amount of the fund will be \$200,000 and it will be fully funded at least one year prior to final credit release.

11. Adaptive Management

In the event the mitigation bank or a specific management unit within the bank fails to achieve the necessary performance standards as specified, we will notify the members of the IRT and work with the IRT to develop contingency plans and remedial actions for approval by the IRT.

12. Financial Assurances

Appendix 14 provides itemized cost estimates for both long-term management expenses and construction and monitoring costs during the operational phase of the bank. For long-term management expenses, we propose to create an endowment account. As financial assurance of construction expenses, we propose to self-fund construction and monitoring (**Appendix 15**), which we estimate will be about \$163,000.

III. OPERATION OF THE BANK

A. Reporting Requirements

NSRC is responsible for coordination with the IRT regarding the implementation of the approved mitigation plan. We will contact the IRT immediately if unable to implement all or a portion of the approved mitigation plan in accordance with the approved MBI, should adverse weather or site conditions result in delays to the overall project schedule.

B. Provisions for the Release of Mitigation Credits

Once the MBI has been approved and the necessary site protection instruments are executed, NSRC will request authorization to release credits from the mitigation bank to provide compensatory mitigation for projects authorized under Section 404 and 401 of the Clean Water Act. NSRC intends to request additional releases of credits as the mitigation site achieves the necessary interim performance standards.

C. Provisions for the Sale and Transfer of Credits

Once the Corps receives documentation from NSRC stating that we agree to accept responsibility for a permittee's compensatory mitigation requirements, we understand that NSRC becomes responsible for assuring that the appropriate number and resource type of credits are protected in perpetuity. NSRC expressly reserves the right to assign all or a portion of the credits to be received under this Instrument to a "qualified intermediary," as defined by Treasury Regulation Section 1.1031(k)-1(g)(4), in order to effectuate a like-kind exchange under federal tax regulations.

D. Accounting Procedures

NSRC will be responsible for submitting quarterly and annual ledger reports describing each action, date of sale, Corps permit number or other agency action or permit number, number of acres and credits used from each unit of the mitigation bank, total acres and credits released, total acres and credits used, and total acres and credits remaining. We plan to use the template format provided.

Transaction	Sale Date	Permit No.	Acres Used	Credits Used	Total Ac/Credits Used	Total Ac/Credits Remaining
1						
2						
3						
4						
5						
6						
7						

E. Provisions Covering the Use of the Land

Use of the land will be restricted as detailed in the conservation easement (**Appendix 4**). In accordance with the terms and conditions of this easement, other uses compatible with the purpose of the bank should be authorized by the Corps, such as hunting, pine straw or pine cone collection, or upland pine thinning. NSRC accepts responsibility to correct any damage to the mitigation site caused by these uses.

F. Eminent Domain

In the event all or part of this property is taken by exercise of the power of Eminent Domain or acquired by purchase in lieu of condemnation, whether by public, corporate, or other authority, so as to terminate the conservation easement in whole or in part, NSRC will be responsible for replacing wetland mitigation credits lost with in-kind mitigation credits.

G. Provisions for Deficit

If the IRT determines that the bank is operating at a deficit, debiting by NSRC shall immediately cease, and the authorizing agencies, in consultation with the IRT and NSRC, will determine what remedial actions are necessary to correct the situation. As determined by the IRT and NSRC, if conditions at the bank site do not improve or continue to deteriorate within one growing season from the date that the need for remediation was first identified in writing to NSRC by the U.S. Army Corps of Engineers through the IRT, the agent responsible for the financial assurances shall be directed by the Corps to transfer the amount necessary to correct the deficiency to a party acceptable to the IRT, to undertake corrective measures.

H. Provisions For Bank Termination

If the IRT determines that NSRC is in material default of any provision of this Agreement, the Corps may notify NSRC that the sale or transfer of any Credits will be suspended on all banks owned by NSRC until the appropriate deficiencies have been remedied. Upon notice of such suspension, NSRC agrees to cease all sales or transfers of Mitigation Credits until the IRT informs NSRC that sales or transfers may be resumed. Failure of NSRC to remedy deficiencies in a timely manner may result in termination of the MBI and any subsequent Bank operations.

I. Force Majeure Clause

Nothing herein shall be construed to authorize proceedings against NSRC for any damages to the bank property caused by acts of God such as earthquake, fire, flood, storm, war, civil disturbance, strike, or similar causes. In the event of a force majeure event, NSRC will notify the members of the IRT and work with the IRT to resolve the damages, if any, caused by the event. However, if the acts of God do not preclude NSRC from resuming bank operations without unreasonable expense, then it shall not be relieved of its obligations under this document. Any impact to future credit releases or numbers of credits available for sale shall be discussed and determined by the IRT at that time.

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