THUNDER MITIGATION SITE

As-built & Baseline Monitoring Report
Wayne County, North Carolina
Neuse River Basin - 03020201

DMS Project ID No. 100185
Full Delivery Contract No. 0402-02
DWR Project No. 2021 0018 v3
USACE Action ID No. SAW-2021-01102
RFP No. 16-20200402

Prepared for:

Mitigation Services
ENVIRONMENTAL QUALITY

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NORTH CAROLINA 27699-1652

Baseline Data Collected: February 2023
Date Submitted: April 2023

Restoration Systems, LLC
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Raleigh, North Carolina
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Response to DMS Comments

Thunder Mitigation Site, Project ID #100185, DMS Contract #0402-02
DWR Project No. 2021-0018 v3
Neuse River Basin 03020201, Wayne County
DMS Reviewers: Emily Dunnigan and Kelly Phillips

Comments Received (Black Text) & Responses (Blue Text):

1. Please update the List of Tables to correct the error for Table 1 and Table 2.
   Completed.

2. The Mitigation Plan stated soil ripping would be completed, and soil testing may be completed prior to planting. Please include a discussion of these activities in the narrative.
   Discussion has been added to Section 3.1 Riparian Area Restoration Activities regarding these activities.

3. Vegetation plots do not adequately represent the 101-200 ft riparian restoration area. Suggest adding a plot within this area or moving Plot 13 to better represent this area.
   Vegetation Plot 13 has been moved to be completely within the 101-200 ft riparian restoration area.

4. It would be helpful to include the phase 2 conservation easement to the CCPV.
   The adjacent second-phase conservation easement has been added to the CCPV.

5. The mitigation plan and the MY0 CCPV have an easement acreage of 41.78 and the MY0 report says it's 41.79 acres. Based on the shapefiles delivered 41.78 is more accurate. Please be consistent throughout the report.
   The conservation easement acreage in the MY0 report has been updated to 41.78 to be consistent with the CCPV and shapefile.

6. Suggest changing the title of the table on the first page of the credit determination plan to "Total Riparian Buffer and Nutrient Offset Mitigation".
   The title of the table has been updated.

7. The table on the first page of the credit determination plan has total square feet for all the assets which do not match the assets in the credit table (Table 4). Shouldn't they match? Also, in the table, the Preservation (20-29) and Preservation (101-200) should say no credit.
   After comparing the GIS files and CAD files there were revisions made to the easement boundary along the road right-of-way, surveyed top of bank, and areas where asset lines overlapped or a gap was present. The table on the first page of the credit determination plan now matches the credit table (Table 4). No credit has been added to the descriptions for Preservation (20-29) and Preservation (101-200). Below are tables showing the adjustments made to the asset areas and corresponding credits.

Credit Type	Mitigation Activity	Feature Type	Min-Max Buffer Width (ft)	Feature	Draft As-Built Area (sqft)	Final As-Built Area (sqft)
Buffer	Restoration	Ephemeral	0-100	3	74,436	74,436
Buffer	Restoration	Ephemeral	101-200	3	3,531	3,531
Buffer	Restoration	I/P	0-100	1A, 2, 4, 5	590,538	590,597
Buffer	Restoration	I/P	101-200	1A, 2, 4, 5, Thunder Swamp	32,157	32,146
Buffer	Restoration	I/P	0-100	1B	95,208	95,212
Buffer	Restoration	I/P	101-200	1B	128	150
Nutrient Offset	Restoration	Ditch	0-100	1C	10,403	10,402
Nutrient Offset	Restoration	Ditch	101-200	1C	3,482	3,490
Buffer	Preservation	I/P	20-29	4	2,170	2,170
Buffer	Preservation	I/P	0-100	1A, 2, 4, 5, Thunder Swamp	429,463	429,307
Buffer	Preservation	I/P	101-200	1A, 4, Thunder Swamp	198,930	198,930

TOTAL AREA OF BUFFER MITIGATION (TABM)					
Mitigation Totals		Draft As-Built Square Feet	Draft As-Built Credits	Final As-Built Square Feet	Final As-Built Credits
Restoration:		795,998	772,001.292	796,072	772,067.922
Enhancement:		0	0.000	0	0.000
Preservation:		265,333	26,533.300	265,357	26,535.700
Total Riparian Buffer:		1,061,331	798,534.592	1,061,429	798,603.622
TOTAL NUTRIENT OFFSET MITIGATION					
Mitigation Totals		Draft As-Built Square Feet	Draft As-Built Credits	Final As-Built Square Feet	Final As-Built Credits
Nutrient Offset:	Nitrogen:	13,885	724.538	13,892	724.903
	Phosphorus:				

8. Multiple easement encroachments were noted across the project during the site visit. Additional easement markers and farmer coordination are necessary to eliminate encroachments. Please update the CCPV and narrative with all observed encroachments (scalloping & ditching etc.) and provide an action plan for these areas.
Correspondence with the farmer about the encroachment was conducted on Thursday, May 18, 2023, via phone call. On June 12, 2023, a site visit was performed by an RS staff member to ensure planting of row crops was performed outside the easement. The CCPV and narrative (section 3.1) have been updated to identify the encroachment areas and measures to restore the encroached areas to the design specifications.

9. At as-built, RS is below contract by 40,601.31 buffer credits. The Task 4 payment should be $113,283.35 (15% of the total contract value). However, the 40,601.31 buffer shortfall below the contracted amount reduces the contract value by $36,541.18 (at $0.90/buffer credit). The amended nutrient offset amount of $9,636.36 for Tasks 1-4 should be added to the Task 4 payment. In order to reconcile the difference resulting from the 40.601.31 buffer credit shortfall, please adjust the Task 4 payment downward to a revised amount of $86,378.52.
After reconciling the credit differences noted in comment 7, the total final Initial Contract as-built credits have increased by 69.03 square feet to 798,603.622 RBMUs. As a result, the as-built credits are short by 40,532.28. Restoration Systems was overpaid on Tasks 1-3 of the Initial Contract by $20,063.47. The Task 4 payment for the Initial Contract will be reduced by $20,063.47 (at $0.90/buffer credit) to account for the overpayment of tasks 1-3; the Task 4 payment for the Initial Contract will be $87,748.01, which is the as-built credit calculated revised Initial Contract amount ($107,811.49) minus the over payment to-date ($20,063.47). For Tasks 5-9, invoice amounts will be based on the as-built credits.

<u>Boundary Inspection Action Items:</u>

10. Install a witness post with sign at each corner monument where signs are missing or not positioned immediately adjacent to the monument.
Noted, a witness post with sign will be installed at the referenced locations and documented in the MY1 report.

11. Upgrade sign fasteners to a material that is likely to meet the longevity specifications in the marking requirements. Partially driven 16d aluminum nails are frequently used to allow room for the tree to grow without compromising the easement signs.
Noted, sign fasteners will be upgraded and documented in the MY1 report.

12. A high failure rate was observed onsite where plastic insulators were used to attach the easement signs to the T-posts. These fasteners should also be upgraded.
Noted, sign fasteners will be upgraded and documented in the MY1 report.

13. Install missing in-line markings and consider decreasing the spacing to promote visibility in densely vegetated areas.
Noted, missing in-line markings along with additional markings will be installed and documented in the MY1 report.

14. Install supplemental boundary markings along the overhead utility corridor to reduce the encroachment risk during utility maintenance.
Noted, supplemental boundary markings will be installed along the overhead utility corridor and documented in the MY1 report.

15. Eliminate all easement encroachments and restore the topography and vegetation to the design specifications. Coordination with the IRT should be initiated prior to replanting efforts.
Noted, these action items will be completed and documented in the MY1 report.

16. Landowner and farm operator coordination needs to be initiated to identify the easement boundary locations and allowed easement usage. In addition to mowing/planting, herbicide overspray/drift into the easement is also an encroachment and should be discussed during the coordination.
Noted, coordination began immediately after the site visit via a phone call on May 18, 2023, and then a site meeting occurred on June 12, 2023 with the farmer to review the easement and detail the restrictions regarding the easement.

17. Supplemental boundary markings should be installed as necessary to prevent encroachment.
Noted, supplemental boundary markings will be installed and documented in the MY1 report.

18. Blazing the trees in wooded areas is recommended for easier identification of the site boundary.
Noted, trees in wooded areas will be blazed and documented in the MY1 report.

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Prepared by:

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Appendices

1.0 Mitigation Project Summary

Restoration Systems (RS) is pleased to provide the North Carolina Division of Mitigation Services (NC DMS) this **As-built & Baseline Monitoring Report** for the **Thunder Mitigation Site (hereafter referred to as the "Project" or "Site")**. The Project has been implemented in accordance with State Rules 15A NCAC 02B .0295 (Consolidated Buffer Mitigation Rule – CMB Rule) to provide Neuse River Riparian Buffer Credits (RBC) and 15A NCAC 02B .0703 (Nutrient Offset Credit Trading Rule) to provide Neuse River Nutrient Offset Credits (NOC) for impacts within the Neuse River Basin USGS 8-digit HUC 03020201, excluding the Falls Lake Watershed. The Site is located within the warm waters of the United States Geological Society (USGS) Hydrologic Unit 03020201-170030 and NC DWR subbasin 03-04-12. The permanent conservation easement encompasses 41.78 acres within a single 78-acre track and provides 798,603.622 RBCs (Available RBC) and 724.903 lbs nitrogen NOCs (Available NOC). Additionally, 772,067.922 RBCs can potentially be converted to 41,540.101 lbs nitrogen NOCs at the request of NCDMS. The Project provides the State with the Available RBC while permanently protecting the restored riparian area and preserving the forested Thunder Swamp floodplain, a mapped FEMA Floodway (Map 3720256300K, Panel 2563, effective June 20, 2018).

Located in Wayne County, North Carolina, the Project encompasses 41.78 acres, of which 18.592 acres were in crop production, remaining area includes existing hardwood forest and water features. The Project restored the riparian buffer areas along five (5) unnamed tributaries and preserved the established riparian buffer along Thunder Swamp. Additionally, a mitigation bank parcel has been established adjacent to the project conservation easement, restoring 13.49 additional acres of riparian buffer area in the 101-200 feet from TOB zone. Detailed project mapping is provided in Appendix A, along with site-specific data in Appendix B.

The parcels were acquired by RS through a fee-simple purchase agreement with the former landowners (Betty Carraway and Myrtle Mangum) effective July 1, 2021. Following the purchase, RS assigned a conservation easement to the State Property Office recorded September 2, 2021.

A DWR representative conducted an on-site stream determination on January 21, 2021. A Stream Determination letter was provided on February 26, 2021. Further, A DWR representative conducted a Site Viability visit on March 24, 2021, and provided an approval letter on April 13, 2021. Both the Stream Determination and Site Viability letters are attached in Appendix C.

RS began preparation for restoration of the riparian buffer by filling in two existing ditches and stabilizing eroding banks in November 2022 and then planting the Site in February 2023. Riparian buffer restoration activities included bank stabilization at 9 locations, treatment of herbaceous vegetation, live-stake planting, bare-root planting, and broadcast application of a permanent seed mix. On February 15, 2023, Axiom Environmental installed fifteen (15) Carolina Vegetation Survey (CVS) monitoring plots and collected as-built data (Appendix B).

1.1 Project Goals and Objectives

The primary goals of the proposed nutrient offset project are to provide ecological and water quality enhancements to the Neuse River Basin by restoring the riparian area to create a functional riparian corridor. The Site is not located within a watershed planning unit but addresses watershed goals outlined by the Neuse River Basin Restoration Priorities (RBRP) report (NCEEP 2010 amended 2018). Table 1 summarizes the RBRP goals and provides site-specific objectives to address the RBRP goals. Specific enhancements to water quality and ecological processes are outlined in Table 1.

Table 1. Ecological and Water Quality Goals

Goal	Objective
Decrease nutrient levels	Nutrient input will be decreased by filtering runoff from the agricultural fields through restored riparian buffer zones. The off-site nutrient input will also be absorbed on-site by filtering flood flows through restored floodplain areas, where flood flows can disperse through native vegetation.
Decrease sediment input	Sediment from off-site sources will be captured by deposition on restored floodplain areas where native vegetation will slow overland flow velocities.
Decrease water temperature and increase dissolved oxygen concentrations	Planted riparian trees will shade the streams as they mature, reducing thermal pollution.
Create appropriate terrestrial habitat	Buffer areas will be restored by planting native vegetation.
Permanently protect the project Parcel from harmful uses	A permanent conservation easement will be recorded, protecting the Parcel's assets in perpetuity.

Ecological and water quality goals will be achieved by restoring 18.592 acres of forested riparian buffer and preserving 23.103 acres of existing riparian forest, including 13.9 acres of the FEMA Regulated Floodway along Thunder Creek.

1.2 Pre-construction Site Conditions

The Project encompasses 41.78 acres, of which 18.592 acres were in crop production, remaining area includes existing hardwood forest and water features. The Project will restore the riparian buffer areas along five (5) unnamed tributaries and preserve the established riparian buffer along Thunder Swamp. Detailed project mapping is provided in Appendix A, along with site-specific data in Appendix B.

Intensive agriculture practices existed across all proposed restoration areas. Agricultural fields within and adjacent to the Site were subject to routine fertilizer and herbicide applications. Site streams and ditches exhibited bank erosion due to long-term plowing and removal of native vegetation throughout the proposed restoration areas. Thunder Swamp is a braided stream system within an old-growth forest. Historic imagery dating back to 1959 indicates that land management practices are consistent with the Site's conditions prior to restoration (Restoration Systems, 2022).

Site tributaries ("features") two, four, and five originate less than one (1) mile south of NC HWY 55. Tributaries one and three originate on-site. All tributaries drain to Thunder Swamp.

2.0 Determination of Credits

Within the 41.78-acre Site, 18.592 acres of agricultural fields historically used for row crops have been planted for riparian buffer restoration. The primary goals associated with restoring riparian areas within the Site will improve water quality, enhance flood attenuation, and restore wildlife habitat. These goals are being achieved by restoration of the 18.592 acres of forested riparian buffer and preserving a total of 23.103 acres of existing forest (6.091 acres eligible for riparian buffer preservation credit) and water features, including 13.9 acres of the FEMA Regulated Floodway along Thunder Creek. Mitigation credits are presented in Table 8 and Figure 2 in Appendix A and are based upon the as-built survey in Appendix A.

3.0 Baseline Restoration Activities Summary

Riparian area restoration involved planting appropriate native tree species along the 200-foot-wide riparian corridor of streams and hydrologically connected ditches at a density of 680 stems per acre on 8ft x 8ft spacing. Vegetation management and herbicide applications may be needed over the first few years of tree establishment in the riparian restoration areas to prevent encroachment of undesirable species that may out-compete the planted native vegetation. Tree species planted across the riparian areas of the Parcel included those listed in Table 3. Stems were mixed prior to planting to ensure diversity of bare roots across the planted area. A seed mix including the species listed in Table 4 were applied to provide temporary and permanent ground cover for soil stabilization and reduction of sediment loss during rain events in areas without existing herbaceous cover. Planting took place on February 6, 2023.

Table 2 – Restoration Plan Activities

Restoration Plan Activity	Phase Specific Actions
Ditch Fill & Bank Stabilization	1. Two existing ditches were backfilled to create diffuse flow through the restored riparian buffer 2. Stream banks were stabilized at nine locations along Features 4 and 5 by sloping the eroding banks back to a 3:1 slope, areas were further stabilized with erosion control matting, temporary and permanent seeding establishment, and planted live-stakes along with bare-root stems Total disturbed area = 0.453 acres
Riparian Restoration	1. Parcel-wide soil preparation herbaceous vegetation treatment ahead of planting 2. Establishment of a native herbaceous community via site-specific seed mix (Table 4) 3. Establishment of 18.592 acres of native hardwood forest via the planting of bare-root saplings from the top of the bank to the conservation easement boundary (Table 3)

3.1 Riparian Area Restoration Activities

Restoration of the riparian area allows for recolonization and expansion of characteristic species across the landscape. The riparian areas were restored according to the Consolidated Buffer Mitigation Rule 15A NCAC 02B.0295. Prior to planting a cover crop was planted to improve soil health, and by doing so it was determined that soil ripping and testing was not needed to facilitate restoration of the native hardwood forest. The planting plan for the riparian restoration area included planting 13,050 native bare-root

hardwood saplings across 18.592 acres at a density of +/- 701 stems per acre. In addition, 600 live stakes were planted for stream bank stabilization where necessary. The planted species composition is intentionally diverse and while based on these communities, also accounted for local observations and nursery availability.

All species were selected based on their ability for: sediment stabilization, rapid growth rate, withstanding hydraulic forces associated with flood events, suitability to specific soil types, and Project conditions. Tree species were mixed thoroughly before planting to provide a diverse and random plant across the Site. Planting density was set to ensure sufficient diversity and density of planted stems outlined in Rule 15A NCAC 02B.0295 of 260 trees per acre at the end of five years. No one tree species was greater than 50% of the established stems.

The bare root planting list is provided in Table 3 followed by the permanent seed mix in Table 4. As-built baseline vegetation data is provided in Appendix B. Baseline data was collected in February 2023 by Axiom Environmental and derived an average planted stem density of 548 stems per acre.

Table 3 – Planting List

Vegetation Association		Coastal Plain Bottomland Hardwood		Dry Mesic Oak-Hickory Mixed Forest		Bank Stabilization (Live Stakes)		Ordered Total # Planted
Species	**Indicator Status**	**# planted**	**% of total**	**# planted**	**% of total**	**# planted**	**% of total**	
River birch (*Betula nigra*)	FACW	700	15%					700
Black gum (*Nyssa Sylvatica*)	FAC	~~435~~ 420	~~10~~ 9%	830	10%			1,250
Bitternut hickory (*Carya cordiformis*)	FAC	450	10%					450
American elm (*Ulmus americana*)	FAC	~~220~~ 300	~~5~~ 7%					300
Red bud (*Cercis canadensis*)	UPL			850	10%			850
Persimmon (*Diospyros virginiana*)	FAC			450	5%			450
Hackberry (*Celtis occidentalis*)	FACU			850	10%			850
Green ash (*Fraxinus pennsylvanica*)	FACW	250	5%					250
Sycamore (*Platanus occidentalis*)	FAC	450	10%	1,250	15%			1,700
Tulip poplar (*Liriodendron tulipifera*)	FACU	450	10%	850	10%			1,300
Red mulberry (*Morus rubra*)	FACU			450	5%			450
Water oak (*Quercus nigra*)	FACW	~~435~~ 420	~~10~~ 9%	830	10%			1,250
Swamp Chestnut oak (*Quercus michauxii*)	FACW	~~435~~ 500	~~10~~ 11%					500

Vegetation Association		Coastal Plain Bottomland Hardwood		Dry Mesic Oak-Hickory Mixed Forest		Bank Stabilization (Live Stakes)		Ordered Total # Planted
Species	**Indicator Status**	**# planted**	**% of total**	**# planted**	**% of total**	**# planted**	**% of total**	
Red oak (*Quercus rubra*)	FACU			1,250	15%			1,250
Willow oak (*Quercus phellos*)	FACW	650	~~15~~ 14%	850	10%			1,500
Black willow (*Salix nigra*)	OBL					300	50%	300
Silky dogwood (*Cornus amomum)*	OBL					300	50%	300
TOTAL		4,590	100%	8,460	100%	600	100%	**13,650**

Note: Table text in RED indicates a change from the mitigation plan based on plant availability.

Table 4 – Permanent Seed

Permanent Seed					
Species*	**%**	**Species***	**%**	**Species***	**%**
Achillea millefolium	2	*Desmodium canadense*	2	*Liatris spicata*	1
Baptisia australis	3	*Dicanthelium clandestinum*	5	*Monarda fistulosa*	1
Carex vulpinoidea	1	*Echinacea purpurea*	6	*Panicum rigidulum*	0.5
Chamaecrista fasciculata	2	*Elymus virginicus*	5	*Penstemon digitalis*	2
Chamaecrista nicititans	2	*Eupatorium coelestinum*	1	*Rudbeckia amplexicaulis*	2
Chysanthemum leucanthemum	5.5	*Eupatorium perfoliatum*	1	*Rudbeckia hirta*	4
Chrysanthemum maximum	4	*Gaillardia perennial*	3	*Schizachyrium scoparium*	5
Coreopsis lanceolata	5	*Helianthus angustifolius*	2	*Senna hebcarpa*	1
Coreopsis tintoria	5	*Heliopsis helianthoides*	2	*Triden flavus*	18
Cosmos bupinnatus	2	*Hibiscus mocheutos*	1	*Verbena hastata*	2
Delphinium ajacis	3	*Lespedeza capitata*	1		
				Total	**100**

Post planting the farmer encroached along the edges of the easement in nine separate areas (totaling 0.7 acres) while preparing the fields adjacent to the easement for planting. RS discussed the encroachment with the farmer by phone on May 18, 2023, and scheduled a site visit with the farmer to review the encroachment areas. On June 12, 2023, RS met with the farmer to ensure planting of row crops was performed outside the easement. Also, the easement boundary was walked with the farmer and no further evidence of encroachments within the easement. RS will install additional T-post, easement placards, and horse tape along areas of extreme encroachment to ensure diffuse flow into the buffer is provided. RS will replant 450 bare roots within the 0.7 acres of encroachment. Species from the approved Mitigation Plan will be used including a minimum of five of the following species: black gum (*Nyssa sylvatica*), redbud (*Cercis canadensis*), persimmon (*Diospyros virginiana*), sycamore (*Platanus occidentalis*), tulip poplar (*Liriodendron tulipifera*), water oak (*Quercus nigra*), red oak (*quercus rubra*), and willow oak (*Quercus phellos*). Photo documentation of the planting and additional easement marking will be provided in the MY1 report.

4.0 Monitoring Protocol & Success Criteria

4.1 Monitoring Protocol

Restoration monitoring procedures for vegetation will monitor plant survival and species diversity. Fifteen permanent 10 x 10-meter vegetation plots were installed for quantitative sampling as outlined in the *CVS Level 1-2 Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008) (Figures 2A-B, Appendix A). Vegetation monitoring will occur no earlier than Fall of each year. A reference photo will be taken from the origin point of each plot. All planted stems in the plots will be marked with flagging tape and recorded. Data collected will include species, height, planting type (planted stem and/or volunteer) and vigor. Monitoring of the restoration efforts will be performed for five years or until success criteria are fulfilled. Monitoring will be conducted by Axiom Environmental, Inc based on the schedule in Table 5. A summary of monitoring is outlined in Table 6. Annual monitoring reports will be submitted to the NCDMS by Restoration Systems no later than December 1 of each monitoring year data. Appendix B includes the baseline (MY0) vegetation plot photographs along with the planted and total stem counts.

Table 5. Monitoring Schedule

Resource	Year 1	Year 2	Year 3	Year 4	Year 5
Vegetation (2% of planted area)	x	x	x	x	x
Visual Assessment (100% of Site)	x	x	x	x	x
Report Submittal	x	x	x	x	x

Table 6. Monitoring Summary

Vegetation Parameters				
Parameter	**Method**	**Schedule/ Frequency**	**Number/ Extent**	**Data Collected/Reported**
Vegetation	15 Permanent vegetation plots 0.0247 acre (100 square meters) in size; *CVS-EEP Protocol for Recording Vegetation*, *Version 4.2* (Lee et al. 2008).	As-built (MY 0), MY 1, 2, 3, 4, and 5	15 plots across the restoration portion of the Site	Species, height, vigor, planted vs. volunteer, stems/acre. Reference photo at each monitoring plot.

4.2 Success Criteria

Success criteria will be based on the survival of planted species at a density of 260 stems per acre after five years of monitoring. The first annual monitoring activities will commence at the end of the first growing season, at least five months after planting has been completed.

Table 7. Success Criteria

Vegetation
• Within planted portions of the Site, in accordance with Rule 15A NCAC 02B .0295: a) a minimum of 260 stems per acre must be present at year 5, and b) a minimum of four native hardwood and native shrub species in each vegetation monitoring plot, where no one species is greater than 50 % of stems. • Planted and volunteer stems are counted, provided they are included in the approved planting list for the Site; natural recruits not on the planting list may be considered by the DWR on a case-by-case basis.

4.3 Maintenance and Contingency Plans

An adaptive management plan will be developed and implemented with the approval of DMS and DWR in the event the Site or a specific component of the Site fails to achieve success criteria as outlined above. Other vegetation maintenance and repair activities may include pruning, mulching, and fertilizing. If exotic invasive plant species require treatment, such species will be controlled by mechanical (physical removal with the use of a chainsaw) and/or herbicide application in accordance with North Carolina Department of Agriculture (NCDA) rules and regulations.

5.0 References

Consolidated Buffer Mitigation Rule - 15A NCAC 02B .0295 (Published November 17, 2014)

Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, North Carolina.

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North Carolina Division of Mitigation Services (NCDMS). 2010 amended 2018. Neuse River Basin Restoration Priorities (online). Available: https://files.nc.gov/ncdeq/Mitigation%20Services/Watershed_Planning/Neuse_River_Basin/RBRP-Neuse-201807-.pdf (September 11, 2020).

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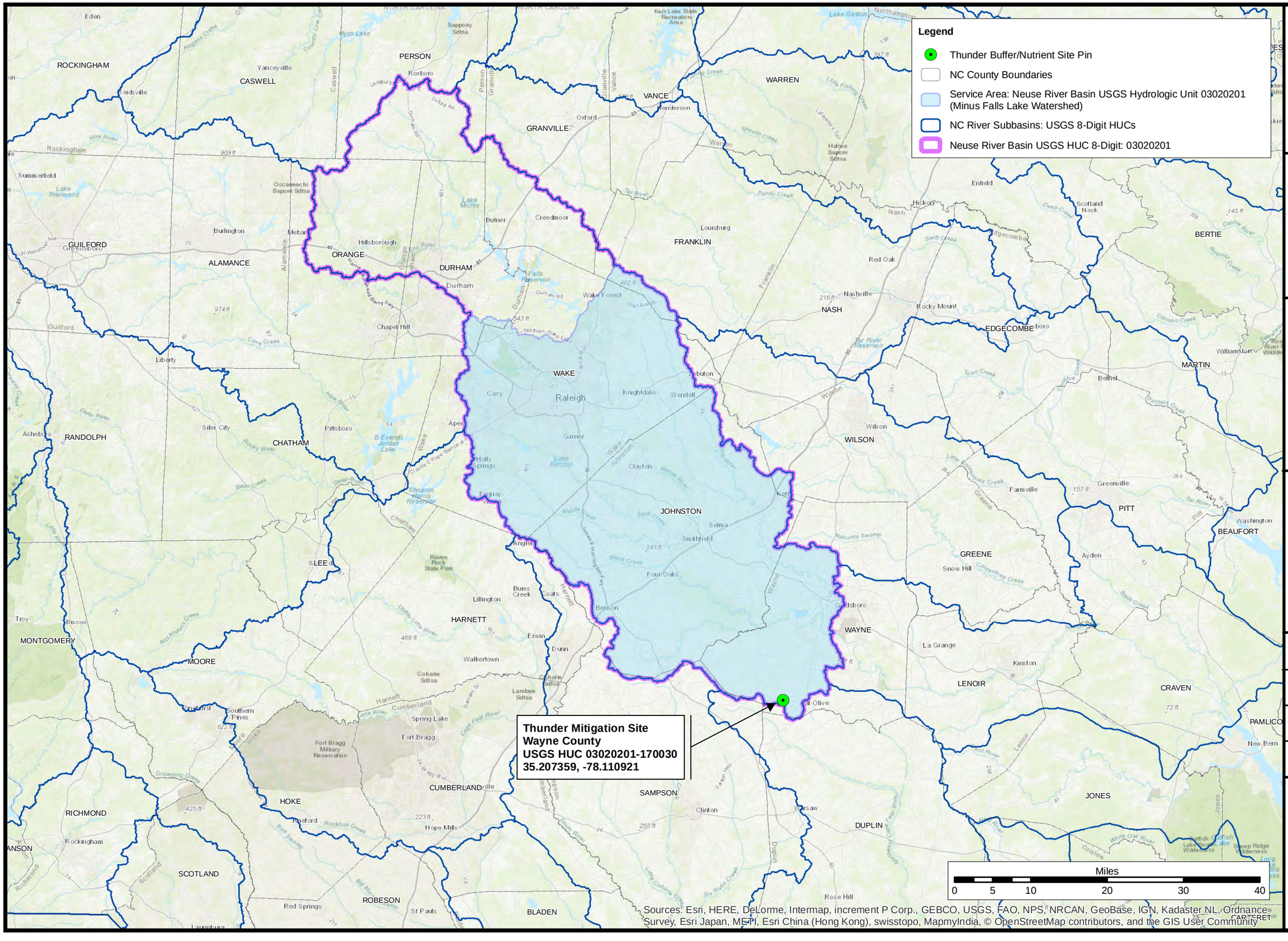
Schafale, M. P. and Weakley, 2012. A Classification of the Natural Communities of North Carolina, Fourth Approximation. North Carolina Natural Heritage Program, North Carolina Department of Environment and Natural Resources. Raleigh, North Carolina.

United States Department of Agriculture (USDA). 2019. Web Soil Survey (online). Available: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx [September 2, 2020].

US Fish and Wildlife Service, 2020. Endangered Species, Threatened Species, Federal Species of Concern, and Candidate Species, Wayne County, North Carolina (online, updated July 17, 2020). Available: https://www.fws.gov/raleigh/species/cntylist/wayne.html [September 2, 2020].

Appendix A: General Figures and Tables

Figure 1 - Parcel Location / Service Area
Figure 2 - Current Conditions Plan View
As-built Survey – Sheet 1-2
Table 8 - Project Components and Mitigation Credits
Table 9 - Project Activity and Reporting History
Table 10 - Project Contact
Table 11 - Project Baseline Information and Attributes



RESTORATION SYSTEMS | LLC

Prepared for:

NC DEQ
Division of Mitigation Services

Project:

THUNDER MITIGATION SITE

WAYNE COUNTY

Title:

VICINITY MAP & SERVICE AREA MAP

ESRI Open StreetMap 2023

Drawn by: RJH

Date: MARCH 2023

Scale: 1:1,000,000

Project No.: 100185

FIGURE

1

Legend

- Subject Site Parcel (NC Pin 2563511701)
- Conservation Easement: 41.78 acres
- Thunder Phase B - Conservation Easement
- Vegetation Monitoring Plots:15 Total
- Surveyed TOB

TOB Offsets Polylines

- TOB 30 Foot Offset Line
- TOB 50 Foot Offset Line
- TOB 100 Foot Offset Line
- TOB 200 Foot Offset Line

Riparian Buffer Mitigation

- Riparian Preservation, No Credit (<20-Feet)
- Riparian Restoration (TOB - 100 Feet)
- Riparian Restoration (101-200 Feet)
- Preservation (20-29 Feet)
- Preservation (0-100 Feet)
- Preservation (101-200 Feet)
- NOC, Restoration (TOB - 200 Feet)

Encroachment Areas

- MY0 (0.7 Acres)

NOTE ABOUT WIDTHS & CREDITING:

Diffuse flow at ditchs to be provided by adjacent DMS Site (Thunder Phase B DMS Project No. 100651)

Riparian Buffer Credits (RBC)
Restoration Areas TOB to 20-29' qualifies for 75% RBM credit.

TOB-100 ft. = Buffer width is contiguous from TOB, is a minimum of 30 ft. from the TOB and maximum of 100 ft. from the TOB, and qualifies for 100% RBM credit.

101-200 ft. = Buffer width is contiguous from TOB, is a maximum of 200 ft. from the TOB, and qualifies for 33% RBM credit.

Nutrient Offset Credit (NOC)
Nutrient Offset Credit is contiguous from TOB, is a minimum of 50 ft. from the TOB and a maximum of 200 ft. from the TOB.

MONITORING NOTES:

Quantitative sampling will include fifteen (15) permanent 10 x10-meter vegetation plots, 2% of the Total Restoration Area (TRA). TRA includes all planted areas within 200-feet from the TOB, including non-credit restoration areas.

1, 10 x10-meter vegetation plots = 1,076.39 sq. ft.
TRA = 809,885.000 sq. ft.
2% of TRA = 16197.70 sq. ft. / 1,076.39 sq. ft. = 15

15 vegetation plots accounting for 2% of the TRA.

Thunder Swamp
Top of Bank
(Outside Braided Channel)

Thunder Swamp (Subject)

Carolina Power & Light Co.
(Now Duke Progress)
100-Foot Right-of-Way

Feature 4 (Subject)

Feature 3 (Subject)

Feature 1A (Subject)

Feature 1B (Subject)

Feature 5 (Subject)

Feature 2 (Subject)

Feature 4 (Subject)

Feature 1C (Not Subject)

Thunder Swamp Rd.

NC Highway 55

Feet
0 100 200 400 600 800

RESTORATION SYSTEMS | LLC

Prepared for:

NC DEQ
Division of
Mitigation Services

Project:

THUNDER
MITIGATION SITE

WAYNE COUNTY

Title:

PROJECT COMPONENT / ASSET MAP & MONITORING PLAN

2021 NC OneMap

Drawn by: RJH

Date: MARCH 2023

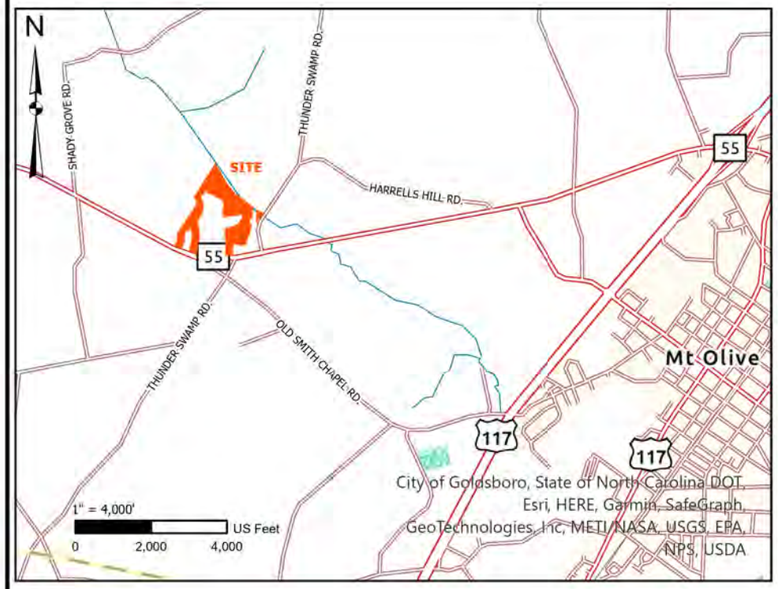
Scale: 1:2,500

Project No.: 100185

FIGURE

2

N



AS BUILT LEGEND:

- **TOB:** TOP OF BANK
- **R/W:** RIGHT-OF-WAY
- INSTALLED CVS PLOTS (15 TOTAL)
- RIPARIAN PRESERVATION, NO CREDIT (LESS THAN 20FT)
- RIPARIAN RESTORATION (TOB - 100FT)
- RIPARIAN RESTORATION (101 - 200FT)
- PRESERVATION, NO CREDIT (20 - 29FT)
- PRESERVATION (TOB - 100FT)
- PRESERVATION, NO CREDIT (101 - 200FT)
- NOC, RESTORATION (TOB - 200FT)
- SURVEYED TOP OF BANK
- 100FT UTILITY EASEMENT
- ROAD
- CONSERVATION EASEMENT
- DISTANCES FROM TOB (30FT, 50FT, 100FT, 200FT)
- PROPERTY LINES

TOTAL RIPARIAN BUFFER AND NUTRIENT OFFSET MITIGATION

MITIGATION TOTALS	SQ. FT	ACRES
RIPARIAN PRESERVATION (LESS THAN 20FT) NO CREDIT	966.00	0.02
RIPARIAN RESTORATION (TOB - 100FT)	760245.00	17.45
RIPARIAN RESTORATION (101 - 200FT)	35,827.00	0.82
PRESERVATION NO CREDIT (20 - 29FT)	2170.00	0.05
PRESERVATION (TOB - 100FT)	429,307.00	9.86
PRESERVATION NO CREDIT (101 - 200FT)	198,930.00	4.57
NOC, RESTORATION (TOB - 200FT)	13,892.00	0.32
SURVEYED TOP OF BANK (NO CREDIT)	205,835.00	5.76

NORTH CAROLINA PROFESSIONAL SEAL L-4194 LAND SURVEYOR JOHN ASHLEY RUDOLPH

SURVEYORS CERTIFICATION(S)

Surveyors disclaimer: No attempt was made to locate any cemeteries, wetlands, hazardous material sites, underground or above ground utilities or any other features above, or below ground other than those shown.

I certify that the survey is of another category (credit determination plan), such as the recombination of existing parcels, a court-ordered survey, or other exception to the definition of subdivision.

I certify that this plat does not meet G.S. 47-30 as amended.

I, John A. Rudolph, certify that this project was completed under my direct and responsible charge from an actual survey made under my supervision; that this survey was performed to meet the requirements for an LIS/GIS survey to the accuracy of Class C and no vertical accuracy; method of measurement GNSS; date(s) of survey July of 2022; datum used for survey NAD83 (2011); and all coordinates are based on NAD83 (2011).

L-4194

Professional Land Surveyor — License Number

774 S. Beston Road
La Grange, NC 28551
252.582.3097
www.k2designgroup.com
Firm License no. C-2111

k2 design group

Client: RESTORATION SYSTEMS, LLC
1101 HAYNES STREET
SUITE 211
RALEIGH, NC 27604

Project: THUNDER DMS MITIGATION SITE
FORK TOWNSHIP, WAYNE COUNTY
NORTH CAROLINA

Title: CREDIT DETERMINATION PLAN
FOR THE PURPOSE OF MONITORING

DRAWN BY:	JTR
DATE:	06/15/23
SURVEYED BY:	JAR
DWG. NO.	RSS501AB23
SHEET:	1 OF 2

AS BUILT LEGEND:

TOB: TOP OF BANK
R/W: RIGHT-OF-WAY
INSTALLED CVS PLOTS (15 TOTAL)
RIPARIAN RESTORATION, NO CREDIT (LESS THAN 20FT)
RIPARIAN RESTORATION (TOB - 100FT)
RIPARIAN RESTORATION (101 - 200FT)
PRESERVATION, NO CREDIT (20 - 29FT)
PRESERVATION (TOB - 100FT)
PRESERVATION, NO CREDIT (101 - 200FT)
NOC, RESTORATION (TOB - 200FT)
SURVEYED TOP OF BANK
100FT UTILITY EASEMENT
ROAD RIGHT-OF-WAY
CONSERVATION EASEMENT
DISTANCES FROM TOB (30FT, 50FT, 100FT, 200FT)
PROPERTY LINES

N
NC GRID NAD'83(2011)

JONES
D.B. 1102, PG. 531

ACCESS EASEMENT 1
20' WIDE

OUTLAW
W.B. 11E, PG. 678

CONSERVATION
EASEMENT AREA 1
40.96 ACRES +/-

FEATURE 4 (SUBJECT)

GRUMPLER
D.B. 1632, PG. 287

CAROLINA POWER & LIGHT CO.
(NOW DUKE PROGRESS)
100-FOOT RIGHT-OF-WAY

CONSERVATION
EASEMENT AREA 2
0.83 ACRES +/-

P.C. N, SL. 71-J
GARNER THESIA
THESIA ISEDORA TRUST
D.B. 3078, PG. 473

FEATURE 1 (SUBJECT)
UT TO HALF MILE BRANCH
BUFFER CREDITABLE
NUTRIENT CREDITABLE

200FT-FROM-TOB
100FT FROM TOB
50FT FROM TOB
30FT-FROM-TOB

RESTORATION
SYSTEMS, LLC
D.B. 3642, PG. 355

FEATURE 1A (SUBJECT)

FEATURE 1B (SUBJECT)

R/W

RESTORATION
SYSTEMS, LLC
D.B. 3642, PG. 355

RESTORATION
SYSTEMS, LLC
D.B. 3642, PG. 355

FEATURE B (NOT SUBJECT)
NON-CREDIT GENERATING

NC GEODETIC
SURVEY MARKER
"KENNEDY" (PID EZ4538)

N.C. HIGHWAY 55
(150' R/W-PUBLIC-PAVED)

NORTH CAROLINA
PROFESSIONAL
SEAL
L-4194
LAND SURVEYOR
JOHN ASHLEY RUDOLPH

1" = 300'
US Feet
0 150 300 600

SHEET 2

Table 8. Project Components and Mitigation Credits
Thunder Mitigation Site, Project Credits (Asbuilt)

Neuse 03020201 - Outside Falls Lake	Project Area
19.16394	N Credit Conversion Ratio (ft^2/pound)
N/A	P Credit Conversion Ratio (ft^2/pound)

Credit Type	Location	Subject? (enter NO if ephemeral or ditch [1])	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (ft^2)	Total (Creditable) Area of Buffer Mitigation (ft^2)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Convertible to Riparian Buffer?	Riparian Buffer Credits	Convertible to Nutrient Offset?	Delivered Nutrient Offset: N (lbs)	Delivered Nutrient Offset: P (lbs)
Buffer	Rural	No	Ephemeral	Restoration	0-100	3	74,436	74,436	1	100%	1.00000	Yes	74,436.000	Yes	3,884.170	—
Buffer	Rural	No	Ephemeral	Restoration	101-200	3	3,531	3,531	1	33%	3.03030	Yes	1,165.231	Yes	184.252	—
													—		—	—
Buffer	Rural	Yes	I / P	Restoration	0-100	1A, 2, 4, 5	590,597	590,597	1	100%	1.00000	Yes	590,597.000	Yes	30,818.141	—
Buffer	Rural	Yes	I / P	Restoration	101-200	1A, 2, 4, 5, Thunder Swamp	32,146	32,146	1	33%	3.03030	Yes	10,608.191	Yes	1,677.421	—
													—		—	—
Buffer	Rural	No	I / P	Restoration	0-100	1B	95,212	95,212	1	100%	1.00000	Yes	95,212.000	Yes	4,968.289	—
Buffer	Rural	No	I / P	Restoration	101-200	1B	150	150	1	33%	3.03030	Yes	49.500	Yes	7.827	—
													—		—	—
Nutrient Offset	Rural	No	Ditch	Restoration	0-100	1C	10,402	10,402	1	100%	1.00000	No	—	Yes	542.790	—
Nutrient Offset	Rural	No	Ditch	Restoration	101-200	1C	3,490	3,490	1	33%	3.03030	No	—	Yes	182.113	—
													—		—	—
													—		—	—
													—		—	—
													—		—	—
													—		—	—
													—		—	—
													—		—	—
													—		—	—
						Totals (ft2):	809,964	809,964					772,067.922		42,265.004	0.000
						Total Buffer (ft2):	796,072	796,072								
						Total Nutrient Offset (ft2):	13,892	N/A								

Total Ephemeral Area (ft^2) for Credit:	77,967	77,967	
Total Eligible Ephemeral Area (ft^2):	265,357	7.3%	Ephemeral Reaches as % TABM
Total Eligible for Preservation (ft^2):	265,357	25.0%	Preservation as % TABM

Enter Preservation Credits Below

Credit Type	Location	Subject?	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (sf)	Total (Creditable) Area for Buffer Mitigation (ft^2)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits
	Rural	Yes	I / P		20-29	4	2,170	0	10	75%		—
	Rural	Yes	I / P		0-100	1A, 2, 4, 5, Thunder Swamp	429,307	265,357	10	100%	10.00000	26,535.700
	Rural	Yes	I / P		101-200	1A, 4, Thunder Swamp	198,930	0	10	33%		—
												—
												—
						Preservation Area Subtotals (ft^2):	630,407	265,357				

TOTAL AREA OF BUFFER MITIGATION (TABM)			
Mitigation Totals		Square Feet	Credits
Restoration:		796,072	772,067.922
Enhancement:		0	0.000
Preservation:		265,357	26,535.700
Total Riparian Buffer:		1,061,429	798,603.622
TOTAL NUTRIENT OFFSET MITIGATION			
Mitigation Totals		Square Feet	Credits
Nutrient Offset:	Nitrogen:	13,892	724.903
	Phosphorus:		0.000

1. The Randleman Lake buffer rules allow some ditches to be classified as subject according to 15A NCAC 02B .0250 (5)(a).

last updated 08/03/2020

Table 9. Project Activity and Reporting History

Activity / Milestone	Mitigation Plan Proposed Date	Actual Date
Mitigation Plan Approved	NA	December 9, 2022
Parcel Protection	NA	Recorded September 2, 2021
Planting	Q1 2023	February 6, 2023
As-built Data Collection	Q1 2023	February 15, 2023
Construction Completion Walkthrough	NA	February 6, 2023
As-built Report Submittal	NA	April 2023
Year 1-5 Monitoring	Q4 2023 - 2027	On schedule

Table 10: Project Contact

	Firm	POC & Address
Full Delivery Provider	Restoration Systems, LLC	1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604 John Preyer 919.755.9490
Designer/Permitting:	Restoration Systems, LLC	Raymond Holz: 919.755.9490 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604
Planting Contractor:	Restoration Systems, LLC	Josh Merritt: 919.755.9490 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604
Seeding Contractor:	Restoration Systems, LLC	Matthew Harrell: 919.755.9490 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604
Nursery Stock Suppliers:	Superior Trees, Inc. & Native Forest Nursery	1.888.888.7158
Baseline Data Collection	Axiom Environmental, Inc.	Grant Lewis; 919.215.1693 218 Snow Ave. Raleigh, NC 27603
Vegetation Monitoring:	Axiom Environmental, Inc.	Grant Lewis; 919.215.1693 218 Snow Ave. Raleigh, NC 27603

Table 11: Project Baseline Information & Attributes

Project Information			
Project Name		Thunder	
County		Wayne	
Project Area (acres)		41.78	
Project Coordinates (latitude and longitude)		35.207359ºN, -78.110921ºW (NAD83/WGS84)	
Project Watershed Summary Information			
Physiographic Province		Southeastern Plain	
River Basin		Neuse	
USGS Hydrologic Unit 8-digit	03020201	USGS Hydrologic Unit 14-digit	03020201170030
DWR Sub-basin		03-04-12	
Project Drainage Area, Total Outfall (acres)		Thunder Swamp: 6.5 square miles Features 1 – 3 = 160 acres, Feature 4 & 5 = 23 acres	
Project Drainage Area Percentage of Impervious Area		<5%	

Appendix B: Project Photos and Baseline Vegetation Data

Construction and Planting Photos
Table 12 - Baseline Vegetation
Vegetation Plot Photos 1-15

Photo 1: Upper portion of Feature 1C (ditch) filled in, facing west. November 9, 2022

Photo 2: Ditch adjacent to Feature 2 filled in, facing north. November 9, 2022

Photo 3: Bank Stabilization on Feature 4, facing north. November 9, 2022

Photo 4: Bank Stabilization on Feature 4, facing south. November 9, 2022

Photo 5: Bank Stabilization on Feature 4, facing north. November 9, 2022

Photo 6: Ditch adjacent to Feature 2 filled in, facing west. November 9, 2022

Photo 7: Ditch adjacent to Feature 2 filled in, facing north. November 9, 2022

Photo 8: Bank Stabilization on Feature 5, facing south. November 9, 2022

Photo 9: Bank Stabilization on Feature 5, facing south. November 9, 2022

Photo 10: Bank Stabilization on Feature 5, facing northwest. November 9, 2022

Photo 11: Planting Bareroots. February 6, 2023

Photo 12: Planting Bareroots. February 6, 2023

Photo 13: Planting Bareroots. February 6, 2023

Photo 14: Planting Bareroots. February 6, 2023

Photo 15: Planting Livestakes. February 6, 2023

Photo 16: Planting Livestakes. February 6, 2023

Table 12. Stem Count by Plot and Species

Scientific Name	Common Name	Species Type	Current Plot Data (MY0 2023)																								
			23009-01-0001			23009-01-0002			23009-01-0003			23009-01-0004			23009-01-0005			23009-01-0006			23009-01-0007			23009-01-0008		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Betula nigra	river birch	Tree										4	4	4				1	1	1	1	1	1	4	4	4
Carya cordiformis	bitternut hickory	Tree	2	2	2																					
Celtis occidentalis	common hackberry	Tree																								
Cercis canadensis	eastern redbud	Tree							5	5	5															
Diospyros virginiana	common persimmon	Tree				1	1	1	1	1	1							2	2	2				1	1	1
Fraxinus pennsylvanica	green ash	Tree				1	1	1										2	2	2						
Liriodendron tulipifera	tuliptree	Tree	2	2	2	5	5	5	1	1	1				1	1	1									
Morus rubra	red mulberry	Tree																								
Nyssa sylvatica	blackgum	Tree				1	1	1				2	2	2							1	1	1	3	3	3
Platanus occidentalis	American sycamore	Tree	7	7	7										1	1	1									
Quercus	oak	Tree	2	2	2				1	1	1															
Quercus michauxii	swamp chestnut oak	Tree	3	3	3	3	3	3										1	1	1	1	1	1			
Quercus nigra	water oak	Tree				2	2	2				2	2	2	4	4	4	4	4	4	6	6	6	3	3	3
Quercus phellos	willow oak	Tree																1	1	1	1	1	1	1	1	1
Quercus rubra	northern red oak	Tree				3	3	3	4	4	4	2	2	2	7	7	7	3	3	3	4	4	4	2	2	2
Ulmus americana	American elm	Tree										1	1	1	1	1	1	2	2	2	1	1	1			
		Stem count	16	16	16	16	16	16	12	12	12	11	11	11	14	14	14	16	16	16	15	15	15	14	14	14
		size (ares)	1			1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	5	5	5	7	7	7	5	5	5	5	5	5	5	5	5	8	8	8	7	7	7	6	6	6
		Stems per ACRE	647.5	647.5	647.5	647.5	647.5	647.5	485.6	485.6	485.6	445.2	445.2	445.2	566.6	566.6	566.6	647.5	647.5	647.5	607	607	607	566.6	566.6	566.6

Scientific Name	Common Name	Species Type	Current Plot Data (MY0 2023)																					Annual Means		
			23009-01-0009			23009-01-0010			23009-01-0011			23009-01-0012			23009-01-0013			23009-01-0014			23009-01-0015			MY0 (2023)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Betula nigra	river birch	Tree										2	2	2				1	1	1	1	1	1	14	14	14
Carya cordiformis	bitternut hickory	Tree																2	2	2				4	4	4
Celtis occidentalis	common hackberry	Tree																			1	1	1	1	1	1
Cercis canadensis	eastern redbud	Tree													1	1	1				1	1	1	7	7	7
Diospyros virginiana	common persimmon	Tree							1	1	1							1	1	1	1	1	1	8	8	8
Fraxinus pennsylvanica	green ash	Tree																			1	1	1	4	4	4
Liriodendron tulipifera	tuliptree	Tree				1	1	1							2	2	2							12	12	12
Morus rubra	red mulberry	Tree										1	1	1										1	1	1
Nyssa sylvatica	blackgum	Tree							4	4	4				4	4	4	2	2	2	1	1	1	18	18	18
Platanus occidentalis	American sycamore	Tree	9	9	9				2	2	2							5	5	5	5	5	5	29	29	29
Quercus	oak	Tree				8	8	8	4	4	4	5	5	5	2	2	2	2	2	2	2	2	2	26	26	26
Quercus michauxii	swamp chestnut oak	Tree													1	1	1							9	9	9
Quercus nigra	water oak	Tree																						21	21	21
Quercus phellos	willow oak	Tree	1	1	1	4	4	4	3	3	3	2	2	2	1	1	1	2	2	2				16	16	16
Quercus rubra	northern red oak	Tree	1	1	1																			26	26	26
Ulmus americana	American elm	Tree													1	1	1				1	1	1	7	7	7
		Stem count	11	11	11	13	13	13	14	14	14	10	10	10	12	12	12	15	15	15	14	14	14	203	203	203
		size (ares)	1			1			1			1			1			1			1			15		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.37		
		Species count	3	3	3	3	3	3	5	5	5	4	4	4	7	7	7	7	7	7	9	9	9	16	16	16
		Stems per ACRE	445.2	445.2	445.2	526.1	526.1	526.1	566.6	566.6	566.6	404.7	404.7	404.7	485.6	485.6	485.6	607	607	607	566.6	566.6	566.6	547.7	547.7	547.7

Color for Density

Exceeds requirements by 10%

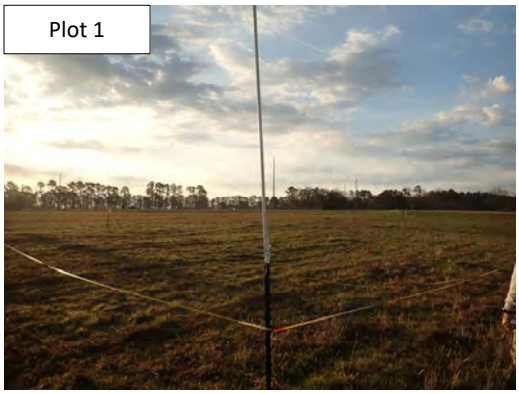
Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

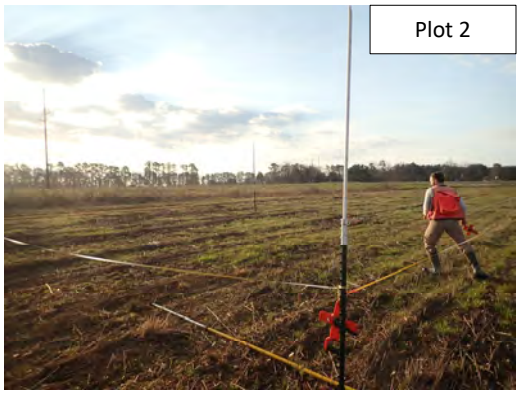
Fails to meet requirements by more than 10%

Thunder Swamp
MY0 (2023) Vegetation Monitoring Photographs (taken February 2023)

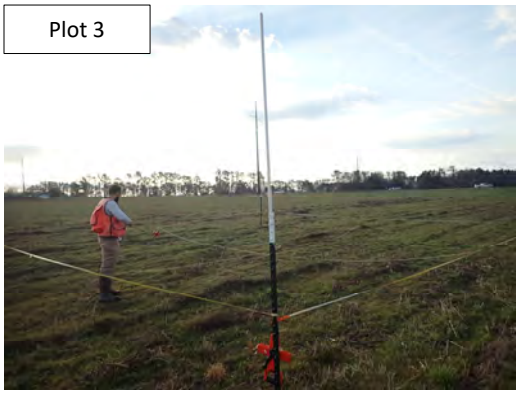
Plot 1



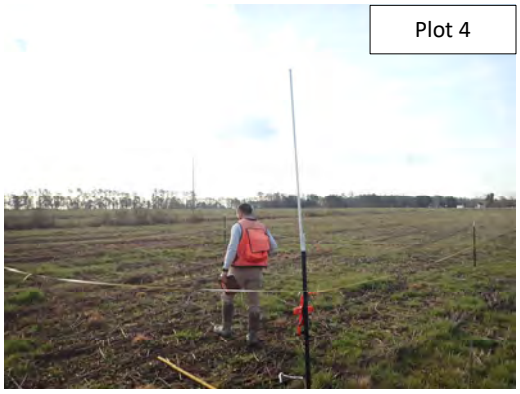
Plot 2



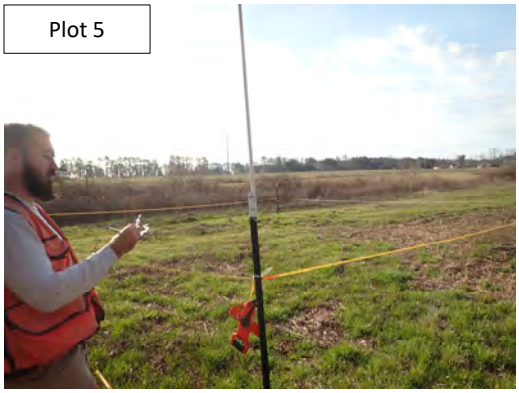
Plot 3



Plot 4

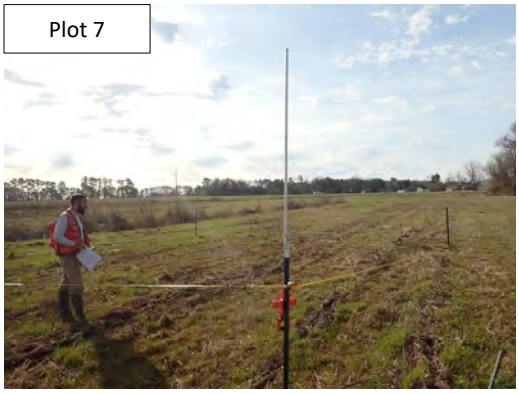


Plot 5

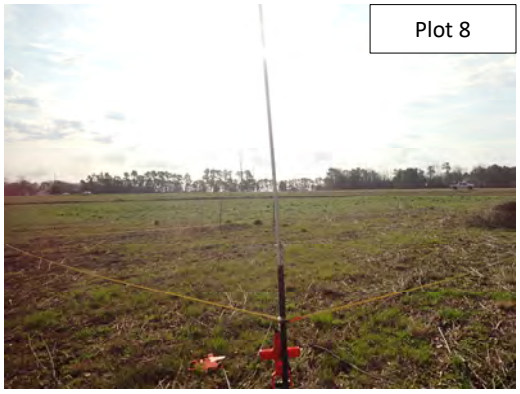


Plot 6

Plot 7

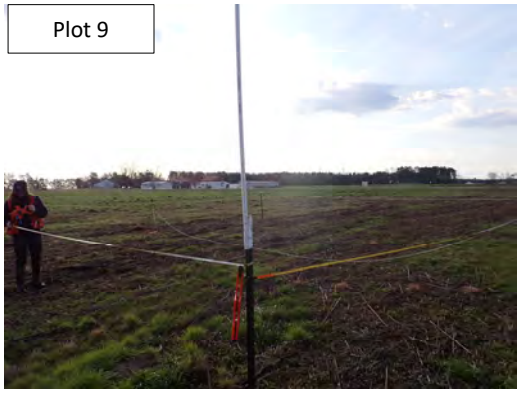


Plot 8

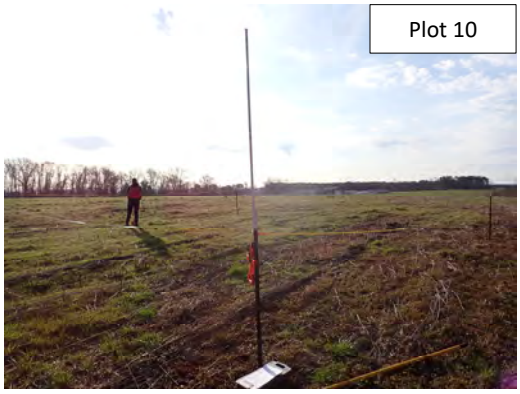


Thunder Swamp
MY (2023) Vegetation Monitoring Photographs (taken February 2023)

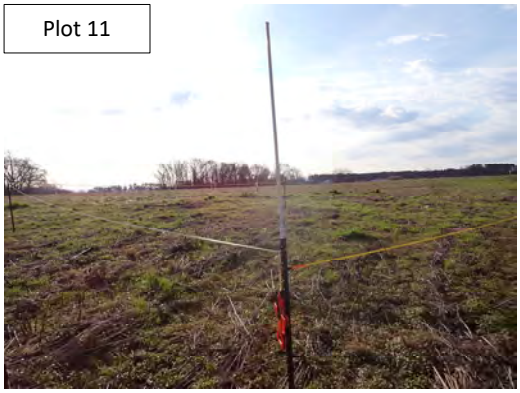
Plot 9



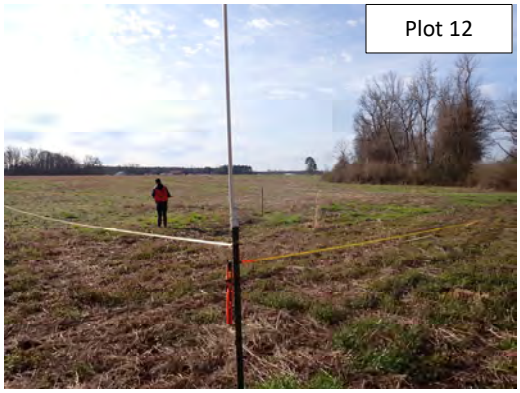
Plot 10



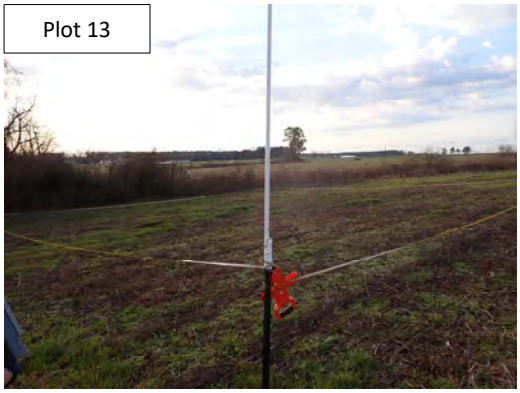
Plot 11



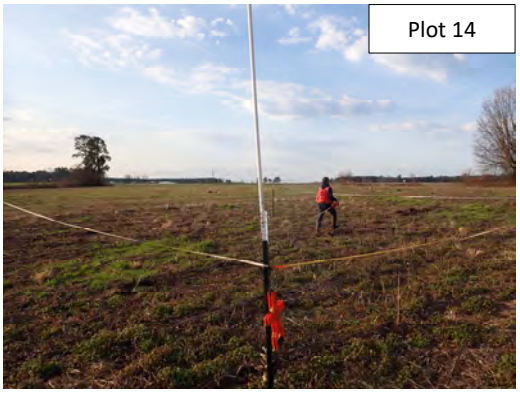
Plot 12



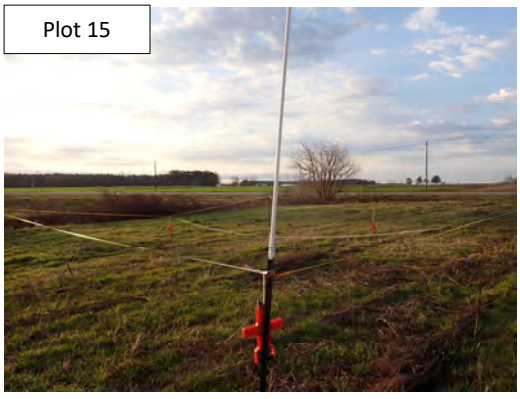
Plot 13



Plot 14



Plot 15



Appendix C: Agency Letters/Correspondence

DWR Stream Determination Letter, February 26, 2021
DWR Site Viability Letter, April 13, 2021
Approved Jurisdictional Determination
FEMA Floodplain Checklist

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
S. DANIEL SMITH
Director

NORTH CAROLINA
Environmental Quality

February 26, 2021

Betty Carraway
c/o Raymond Holz
Restoration Systems, LLC
1101 Haynes Street Suite 211
Raleigh, North Carolina 27604

2021 0018 v1
Wayne County

Subject: **On-Site Determination** for Applicability to Neuse Riparian Buffer Rules (15A NCAC 02B .0714)

Subject Property/ Project Name: Thunder Mitigation Site

Address/Location: 1107 NC Hwy 55, Mt. Olive, NC 28635 Wayne County

Stream(s) Evaluated: (8) – UT 1 to UT 5 to Thunder swamp, Neuse River Basin

Determination Date: January 21, 2021 Staff: Allen Stewart

Determination Type:	
Buffer:	Stream:
X - Neuse (15A NCAC 02B .0714) - Tar-Pamlico (15A NCAC 02B .0734 - Catawba (15A NCAC 02B .0614) - Jordan (15A NCAC 02B .0267) (governmental and/or interjurisdictional projects) - Randleman (15A NCAC 02B .0724) - Goose Creek (15A NCAC 02B .0605-.0608)	X - Intermittent/Perennial Determination

Stream	E/I/P*	Not Subject	Subject	Start@	Stop@	Soil Survey	USGS Topo
Feature 1a / UT 1	P		X	35.207401, -78.110844	35.208634, -78.109632	X	
Feature 1b / UT 1b	I	X		35.206422, -78.110623	35.207909, -78.110380		
Feature 1c / UT 1c	E / Ditch	X		35.205500, -78.111119	35.206422, -78.110623		
Feature 2 / UT 2	I		X	35.205415, -78.111880	35.207401, -78.110844	X	
Feature 3 / UT 3	E	X		35.206422, -78.111144	35.207401, -78.110844	X	
Feature 4 / UT 4	I		X	35.205656, -78.115020	35.207863, -78.115017	X	
Feature 5 / UT 5	I		X	35.206073, -78.116301	35.212163, -78.112973	X	
Thunder Swamp	P		X	35.208370, -78.108611	35.212163, -78.112973	X	X

*Ephemeral / Intermittent / Perennial

Dear Ms. Carraway,

The Division of Water Resources has determined that the streams listed above and included on the attached map have been located on the most recent published (1974) NRCS Soil Survey of Wayne County, North Carolina and/or the most recent copy of the Mt. Olive USGS Topographic map at a 1:24,000 scale and evaluated for applicability to the Neuse Riparian Buffer Rule. Features 1b and 1c were determined to be the relocation of Feature 3 (the soils map shows it historically continuing to the road) this is backed up by the soil type (Rains) and Lidar imaging. They are not mapped and therefore not subject to buffer rules. What remains of Feature 3 today has a score of 17.25 on the SWIT form and is not subject. Feature 1b scored at 22.75 on the SWIT form and is acting as an intermittent natural stream. Feature 1c scored 17.5 on the SWIT form, remains a ditch and not subject. For Each stream that is checked "Not Subject" it has been determined to not be at least intermittent or not present on the property. Streams that are checked "Subject" have been mapped on (1974) NRCS Soil Survey and/or USGS Topographic map 1:24,000, located on the property and possess characteristics that qualify them to be at least intermittent streams. There may be other streams or features located on the property that do not appear on the maps referenced above but may be considered jurisdictional according to the US Army Corps of Engineers and subject to the Clean Water Act.

This on-site determination shall expire five (5) years from the date of this letter. Landowners or affected parties that dispute a determination made by the DWR may request a determination by the Director. An appeal request must be made within sixty (60) calendar days of date of this letter to the Director in writing.

If sending via US Postal Service:
c/o *Paul Wojoski*
DWR – 401 & Buffer Permitting Unit
1617 Mail Service Center
Raleigh, NC 27699-1617

If sending via delivery service (UPS, FedEx, etc.):
c/o Paul Wojoski
DWR – 401 & Buffer Permitting Unit
512 N. Salisbury Street
Raleigh, NC 27604

This determination is final and binding as detailed above unless an appeal is requested within sixty (60) days.

This determination only addresses the applicability to the buffer rules and does not approve any activity within the buffers or waters. The project may require a Section 404/401 Permit for the proposed activity. Any inquiries regarding applicability to the Clean Water Act should be directed to the US Army Corps of Engineers Raleigh Regulatory Field Office at (919)-554-4884 Ext. 22.

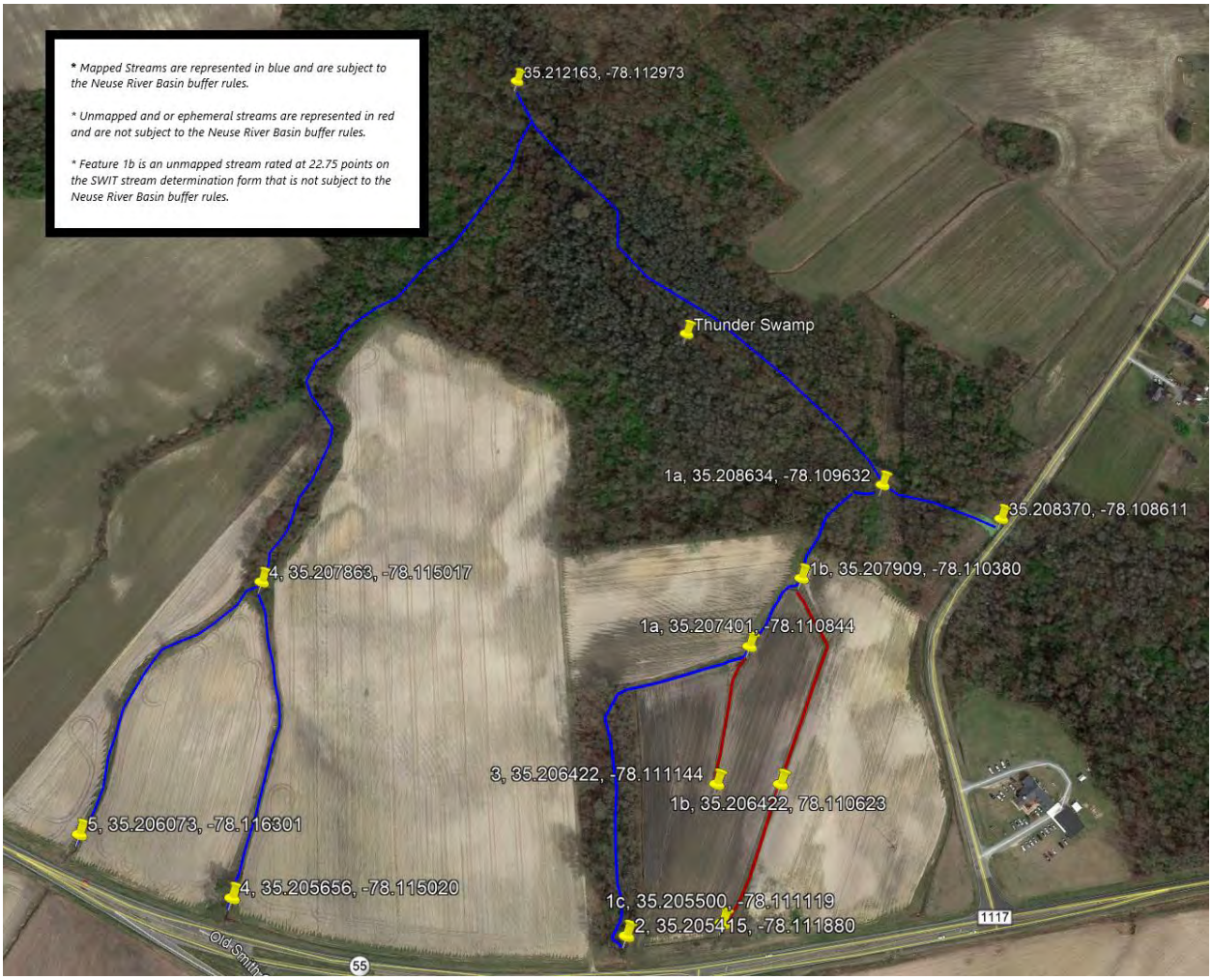
If you have questions regarding this determination, please feel free to contact Allen Stewart at (252) 946-6481.

Sincerely,

Robert Tankard

Robert Tankard, Assistant Regional Supervisor
Water Quality Regional Operations Section
Division of Water Resources, NCDEQ

cc: WaRO DWR File Copy/LASERFICHE
Raymond Holz, Restoration Systems LLC, rholz@restorationsystems.com
Katie Merritt, NCDWR 401 & Buffer Permitting Branch, Katie.Merritt@ncdenr.gov
Samantha Dailey, US Army Corps of Engineers Raleigh Regulatory Field Office,


* Mapped Streams are represented in blue and are subject to the Neuse River Basin buffer rules.
* Unmapped and or ephemeral streams are represented in red and are not subject to the Neuse River Basin buffer rules.
* Feature 1b is an unmapped stream rated at 22.75 points on the SWIT stream determination form that is not subject to the Neuse River Basin buffer rules.
35.212163, -78.112973
Thunder Swamp
1a, 35.208634, -78.109632
35.208370, -78.108611
4, 35.207863, -78.115017
1b, 35.207909, -78.110380
1a, 35.207401, -78.110844
3, 35.206422, -78.111144
1b, 35.206422, 78.110623
5, 35.206073, -78.116301
4, 35.205656, -78.115020
1c, 35.205500, -78.111119
2, 35.205415, -78.111880
1117
55

ROY COOPER
Governor
DIONNE DELLI-GATTI
Secretary
S. DANIEL SMITH
Director

NORTH CAROLINA
Environmental Quality

April 13, 2021

Raymond Holz
Restoration Systems, LLC
(via electronic mail: rholz@restorationsystems.com)

Re: Site Viability for Buffer Mitigation & Nutrient Offset – Thunder Site
1105 NC-55, Mt. Olive (near 35.205514, -78.110868)
Neuse 03020201
Wayne County

Dear Mr. Holz,

On December 11, 2020, Katie Merritt, with the Division of Water Resources (DWR), received a request from you on behalf of Restoration Systems, LLC (RS) for a site visit near the above-referenced site in the Neuse River Basin within the 8-digit Hydrologic Unit Code 03020201. The site visit was to determine the potential for riparian buffer mitigation and nutrient offset within a proposed conservation easement boundary, which is more accurately depicted in the attached map labeled "Figure 1-Existing Conditions" (Figure 1) prepared by RS. The proposed easement boundary in Figure 1, includes all riparian areas intended to be proposed as part of a full-delivery project for the Division of Mitigation Services (RFP #16-20200402) as well as a private mitigation bank by RS. On March 24, 2021, Ms. Merritt performed a site assessment of the subject site. Staff with RS were also present.

Ms. Merritt's evaluation of the features onsite and their associated mitigation determination for the riparian areas are provided in the table below. This evaluation was made from Top of Bank (TOB) and landward 200' from each feature for buffer mitigation pursuant to 15A NCAC 02B .0295 (effective November 1, 2015) and for nutrient offset credits pursuant to 15A NCAC 02B .0703.

Feature	Classification onsite	[1]Subject to Buffer Rule	Riparian Land uses adjacent to Feature (0-200')	Buffer Credit Viable	[3]Nutrient Offset Viable	[4,5]Mitigation Type Determination w/in riparian areas
3	Ephemeral	No	Non-forested agricultural fields	[6]Yes	Yes	**Restoration Site** per 15A NCAC 02B .0295 (o)(7)
1a	Stream	Yes	Combination of non-forested agricultural fields with mature forest downstream to thunder swamp	[2]Yes	Yes (fields only)	Non-forested fields - **Restoration Site** per 15A NCAC 02B .0295 (n) Forested Areas – **Preservation Site** per 15A NCAC 02B .0295 (o)(5)
1b	Stream	No	Non-forested agricultural fields	Yes	Yes	**Restoration Site** per 15A NCAC 02B .0295 (n)

Feature	Classification onsite	[1]Subject to Buffer Rule	Riparian Land uses adjacent to Feature (0-200')	Buffer Credit Viable	[3]Nutrient Offset Viable	[4,5]Mitigation Type Determination w/in riparian areas
1c	Ditch >3' depth	No	Non-forested agricultural fields and partially located within a DOT Right Of Way (ROW)	No	Yes	**Restoration Site** per 15A NCAC 02B .0295 (n) Note: No credits are allowed within the DOT R.O.W
2	Stream	Yes	Combination of non-forested agricultural fields with mature forest a linear ditch within the riparian area along the right bank	Yes	Yes (fields only)	Non-forested fields - **Restoration Site** per 15A NCAC 02B .0295 (n) Forested Areas – **Preservation Site** per 15A NCAC 02B .0295 (o)(5) Note: Ditch needs to be filled
4	Stream	Yes	Combination of non-forested agricultural fields with mature forest downstream below confluence with feature 5. Upstream is partially located within a DOT ROW & Banks are unstable and eroding in many areas, some sink holes are present.	[2]Yes	Yes (fields only)	Non-forested areas - **Restoration Site** per 15A NCAC 02B .0295 (n) Forested Areas – **Preservation Site** per 15A NCAC 02B .0295 (o)(5) *Minor bank stabilization and grading needed where bank stability is compromised and where erosional rills, sink holes and gullies are observed* Note: No credits are allowed within the DOT R.O.W
5	Stream	Yes	Non-forested agricultural fields Upstream is partially located within a DOT ROW	Yes	Yes	**Restoration Site** per 15A NCAC 02B .0295 (n) *Minor bank stabilization and grading needed where bank stability is compromised and where erosional rills and gullies are observed* Note: No credits are allowed within the DOT R.O.W
Thunder Swamp	Stream	Yes	Mature forest	[2]Yes	No	**Preservation Site** per 15A NCAC 02B .0295 (o)(5)

[1]Subjectivity calls for the features were determined by DWR in correspondence dated February 26, 2021 (ID# 2021-0018) using the 1:24,000 scale quadrangle topographic map prepared by USGS and the most recent printed version of the soil survey map prepared by the NRCS .

[2]The area of preservation credit within a buffer mitigation site shall comprise of no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 0295 (o)(5) and 15A NCAC 0295 (o)(4). Site cannot be a Preservation Only site to comply with this rule.

[3]*NC Division of Water Resources - Methodology and Calculations for determining Nutrient Reductions associated with Riparian Buffer Establishment*

[4]Determinations made for this Site are determined based on the proposal provided in maps and figures submitted with the request.

[5] All features proposed for buffer mitigation or nutrient offset, must have a planted conservation easement established that includes the tops of channel banks when being measured perpendicular and landward from the banks, even if no credit is viable within that riparian area.

[6]The area of the mitigation site on ephemeral channels shall comprise no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 02B .0295 (o)(7).

Determinations provided in the table above were based on the proposed conservation easement boundaries depicted in Figure 1 for the full-delivery mitigation site and the private mitigation bank site. The two easement boundaries are contiguous, and thus, the approval of the private mitigation bank site will be dependent on the approval and implementation of the full-delivery mitigation site. The map representing the proposal for the site is attached to this letter and is initialed by Ms. Merritt on April 13, 2021. Substantial changes to the proposed easement boundaries could affect the site's potential to generate buffer mitigation and nutrient offset credits.

This letter does not constitute an approval of this Site to generate buffer and nutrient offset credits. Pursuant to 15A NCAC 02B .0295, a mitigation proposal and a mitigation plan shall be submitted to DWR for written approval **prior** to conducting any mitigation activities in riparian areas and/or surface waters for buffer mitigation credit. Pursuant to 15A NCAC 02B .0703, a proposal regarding a proposed nutrient load-reducing measure for nutrient offset credit shall be submitted to DWR for approval prior to any mitigation activities in riparian areas and/or surface waters.

All vegetative plantings, performance criteria and other mitigation requirements for riparian restoration, enhancement and preservation must follow the requirements in 15A NCAC 02B .0295 to be eligible for buffer and/or nutrient offset mitigation credits. For any areas depicted as not being viable for nutrient offset credit above, one could propose a different measure, along with supporting calculations and sufficient detail to support estimates of load reduction, for review by the DWR to determine viability for nutrient offset in accordance with 15A NCAC 02B .0703.

This viability assessment will expire on April 13, 2023 or upon approval of a mitigation plan by the DWR, whichever comes first. This letter should be provided in any nutrient offset, buffer, stream or wetland mitigation plan for this Site.

Please contact Katie Merritt at (919) 707-3637 if you have any questions regarding this correspondence.

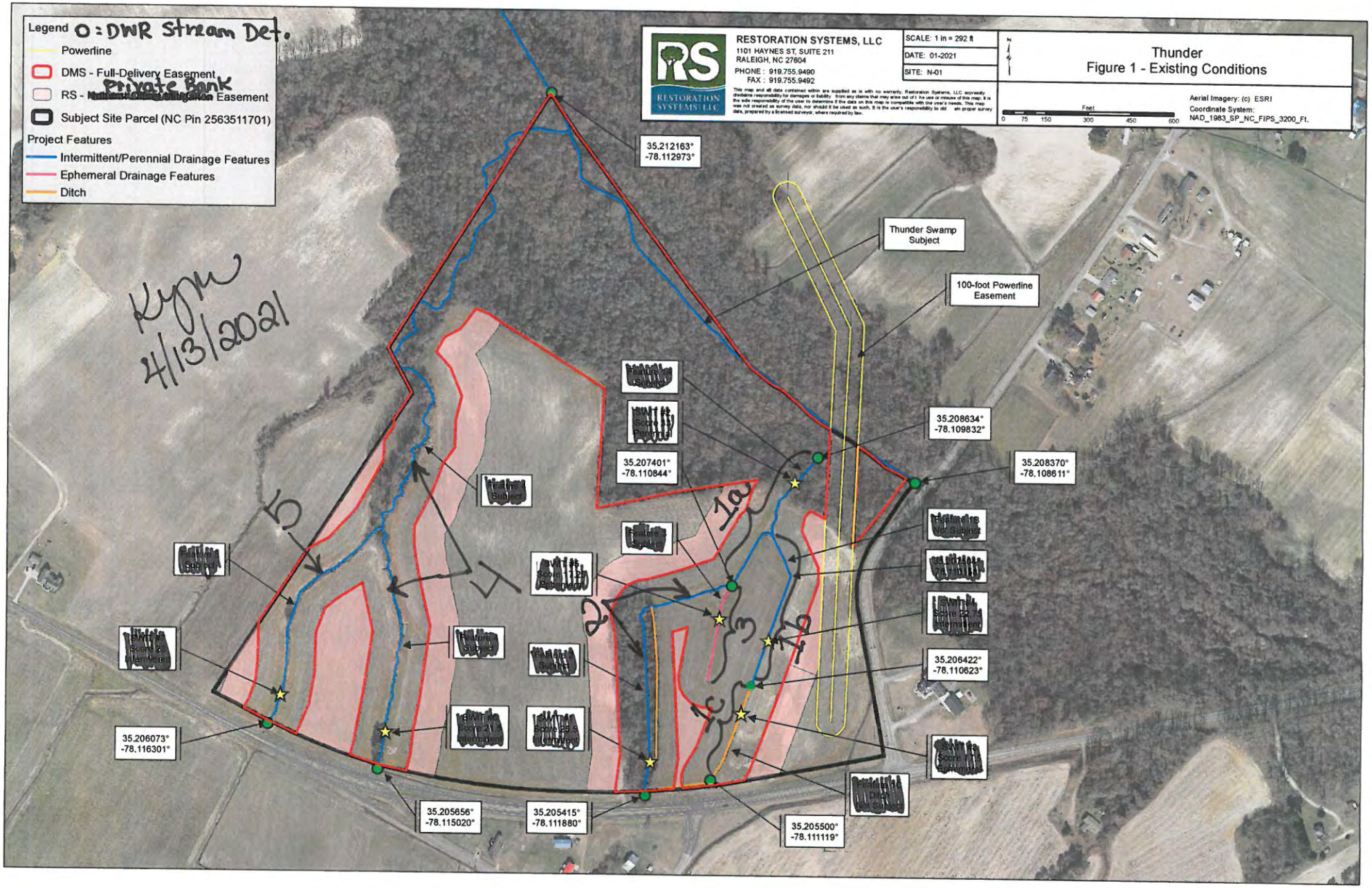
Sincerely,

DocuSigned by:
Paul Wojoski
949D91BA53EF4E0...

Paul Wojoski, Supervisor
401 and Buffer Permitting Branch

PW/kym
Attachments: "Figure 1 – Existing Conditions"

cc: File Copy (Katie Merritt)



From:	Thompson, Emily B CIV USARMY CESAW (US)
To:	Alex Baldwin
Subject:	SAW-2021-01102 (Thunder Buffer Mitigation Site/Wayne)
Date:	Friday, May 21, 2021 12:54:31 PM
Attachments:	SAW-2021-01102 Thunder Buffer Mitigation Site Map.pdf

Hi Alex,

On May 13, 2021, we received information from you requesting the Wilmington District, Regulatory Division review and concur with the boundaries of an aquatic resource delineation.

We have reviewed the information provided by you concerning the aquatic resources, and by copy of this e-mail, are confirming that the aquatic resources delineation has been verified by the Corps to be a sufficiently accurate and reliable representation of the location and extent of aquatic resources within the identified review area. The location and extent of these aquatic resources are shown on the delineation map, labeled *Figure 5 – Potential Waters of the U.S. Jurisdictional Delineation Concurrence* and provided on May 13, 2021 without revisions.

Regulatory Guidance Letter (RGL) 16-01

https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll9/id/1256 provides guidance for Jurisdictional Determinations (JD) and states “The Corps generally does not issue a JD of any type where no JD has been requested”. At this time we are only verifying the delineation. This delineation may be relied upon for use in the permit evaluation process, including determining compensatory mitigation. “This verification does not address nor include any consideration for geographic jurisdiction on aquatic resources and shall not be interpreted as such. This delineation verification is not an Approved Jurisdictional Determination (AJD) and is not an appealable action under the Regulatory Program Administrative Appeal Process (33 CFR Part 331). However, you may request an AJD, which is an appealable action.

If you wish to receive a Preliminary Jurisdictional Determination (PJD), or an Approved Jurisdictional Determination (AJD) please respond accordingly, otherwise nothing further is required and we will not provide any additional documentation.
The delineation included herein has been conducted to identify the location and extent of the aquatic resource boundaries and/or the jurisdictional status of aquatic resources for purposes of the Clean Water Act for the particular site identified in this request. This delineation may not be valid for the Wetland Conservation Provisions of the Food Security Act of 1985, as amended. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should discuss the applicability of a certified wetland determination with the local USDA service center, prior to starting work.

Let me know if you have any questions – thank you for providing detailed information to facilitate our review.

Sincerely,
Emily

Emily B. Thompson
Regulatory Specialist
U.S. Army Corps of Engineers
Washington Regulatory Field Office
2407 W. 5th Street
Washington, NC 27889
(910) 251-4629
Emily.B.Thompson@usace.army.mil

From: Alex Baldwin <abaldwin@restorationsystems.com>

Legend

- Subject Site Parcel (NC Pin 2563511701)
- DMS - Full-Delivery Easement

Potential Waters of the U.S.

- Intermittent/Perennial Tributaries
- Wetlands
- Wetland Boundary Flags

Datapoints

- DWR SWIT Form
- USACE Paired Wetland Form

RESTORATION SYSTEMS, LLC
1101 HAYNES ST, SUITE 211
RALEIGH, NC 27604
PHONE : 919.755.9490
FAX : 919.755.9492

SCALE: 1 in = 250 ft
DATE: 04-2021
SITE: THUNDER

Figure 5 - Potential Waters of the U.S. Jurisdictional Delineation Concurrence (2017 Orthoimagery)

Feet
0 62.5 125 250 375 500

Imagery Source: NC One Map
Coordinate System: NAD_1983_SP_NC_FIPS_3200_Ft.

UT-4
Thunder Swamp
Wetland A
UT-1A
Thunder Swamp Rd
SWIT #2
Score: 33
Perennial
UT-5
UT-1B
Wetland B
SWIT #5
Score: 17.25
Ephemeral
SWIT #7
Score: 23
Intermittent
UT-1C
SWIT #4
Score: 22.75
Intermittent
Wetland C
UT-4
SWIT #3
Score: 17.5
Ephemeral
SWIT #6
Score: 21.5
Intermittent
SWIT #1
Score: 25.5
Intermittent
55
55

Ray Holz

From: Berry Gray <berry.gray@waynegov.com>
Sent: Thursday, July 01, 2021 9:57 AM
To: Ray Holz
Subject: RE: [External] - FEMA Floodplain Coordination - Riparian Buffer Restoration Project
Attachments: DOC070121-07012021093433.pdf

See attached. Let me know if you need anything else.

Berry Gray
Planning Director
Wayne County, North Carolina
134 N John Street
PO Box 227
Goldsboro, NC 27533-0227

Phone: 919-731-1650
Email: berry.gray@waynegov.com

From: Ray Holz [mailto:rholz@restorationsystems.com]
Sent: Thursday, July 1, 2021 9:24 AM
To: Berry Gray <berry.gray@waynegov.com>
Subject: [External] - FEMA Floodplain Coordination - Riparian Buffer Restoration Project

Mr. Gray,

I work with Restoration Systems, and we are implementing a riparian buffer restoration project on behalf of the North Carolina Division of Mitigation Services (DMS) west of Mount Olive, off Highway 55, and adjacent to Thunder Swamp. The project totals 41.78 acres and consists of minimal grading and the planting of hardwood trees. All work is located outside the FEMA-regulated floodplain/floodway. The project is to be permanently protected by a conservation easement that extends into and covers approximately 12.54 acres of the Thunder Swamp FEMA regulated floodplain/floodway (Panel 3720256300K – eff. 06/20/2018). By including the floodplain/floodway within the conservation easement, I am required by DMS to coordinate with the local Floodplain Administrator and to receive concurrence of the attached DMS Floodplain Checklist.

For my coordination, can you please review the attached information, fill out the last portion of the NCDMS floodplain checklist (bottom of page three), and return it to me via e-mail?

Thank you for your time. If you have any questions or would like to discuss, please do not hesitate to give me a call at 919-604-9314 – I am available all day.

Sincerely,
Raymond H.

Attachments
- NCDMS Floodplain Checklist
- Figure 1 – Location Map
- Figure 2 – Existing Conditions
- Figure 3 – Restoration Plan

- Figure 4 – Planting Plan

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Raymond J. Holz | Restoration Systems, LLC
1101 Haynes St. Suite 211 | Raleigh, NC 27604
tel: 919.334.9122 | cell: 919.604.9314 | fax: 919.755.9492
email: rholz@restorationsystems.com

DMS Floodplain Requirements Checklist

This form was developed by the National Flood Insurance program, NC Floodplain Mapping program and the Division of Mitigation Services (DMS) to be filled for all DMS projects. The form is intended to summarize the floodplain requirements during the design phase of the projects. The form should be submitted to the Local Floodplain Administrator with three copies submitted to NFIP (attn. State NFIP Engineer), NC Floodplain Mapping Unit (attn. State NFIP Coordinator) and NC Ecosystem Enhancement Program.

Project Location

Name of project:	Thunder Site
Name if stream or feature:	Thunder Swamp
County:	Wayne
Name of river basin:	Neuse
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Wayne County
DFIRM panel number for entire site:	Panel 3720256300K (eff. 06/20/2018)
Consultant name:	Raymond Holz Restoration Systems, LLC
Phone number:	919-604-9314
Address:	1101 Haynes St. Suite 211 Raleigh, NC 27607

Design Information

Provide a general description of project (one paragraph). Include project limits on a reference orthophotograph at a scale of 1" = 500". – Project Figures Attached

No work is proposed within the FEMA regulated floodplain. A project description is included in the cover letter.

Floodplain Information

Is project located in a Special Flood Hazard Area (SFHA)?

(•) Yes ( ) No The lower reaches

If project is located in a SFHA, check how it was determined:

- [ ] Redelineation
- [ ] Detailed Study
- [ ] Limited Detail Study
- [ ] Approximate Study
- [ ] Don't know

List flood zone designation:

Check if applies:

- [x] AE Zone
  - (•) Floodway
  - ( ) Non-Encroachment
  - ( ) None
- [ ] A Zone
  - ( ) Local Setbacks Required
  - ( ) No Local Setbacks Required

If local setbacks are required, list how many feet:

Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks?

( ) Yes (•) No

Land Acquisition (Check)

- [ ] State owned (fee simple)

☐ Conservation easment (Design Bid Build)

☑ Conservation Easement (Full Delivery Project)

Note: if the project property is state-owned, then all requirements should be addressed to the Department of Administration, State Construction Office (attn: Herbert Neily, (919) 807-4101)

Is community/county participating in the NFIP program?

◉ Yes ○ No

Note: if community is not participating, then all requirements should be addressed to NFIP (attn: State NFIP Engineer, (919) 715-8000

Name of Local Floodplain Administrator: Berry Gray
Phone Number: 919-731-1650

Floodplain Requirements

This section to be filled by designer/applicant following verification with the LFPA

☑ No Action

☐ No Rise

☐ Letter of Map Revision

☐ Conditional Letter of Map Revision

☐ Other Requirements

List other requirements:

Comments:

Name: Raymond Holz Signature: Raymond H.

Title: Operations Manager Date: 07-01-2021