

Baseline Monitoring Report

June 2020

Mangum Homestead Mitigation Site

Orange County, NC
NCDEQ Contract No. 7859
DMS ID No. 100107
DWR No. 2019-0645

Jordan Lake-Upper New Hope
Cape Fear River Basin
HUC 03030002

RFP #: 16-007702

PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

BASELINE MONITORING REPORT

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PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

PREPARED BY:

Wildlands Engineering, Inc.
312 W Millbrook Road, Suite 225
Raleigh, NC 27609
Phone: (919) 851-9986

This Mitigation Plan has been written in conformance with the requirements of the following:

- 15A NCAC 02B .0295 Mitigation Program Requirements for Protection and Maintenance of Riparian Buffers.
- 15A NCAC 02B .0262 Jordan Water Supply Nutrient Strategy
- 15A NCAC 02B .0240 Nutrient Offset Payments
- NCDEQ Division of Mitigation Services In-Lieu Fee Instrument signed and dated July 28, 2010.

These documents govern DMS operations and procedures for the delivery of compensatory mitigation.

Contributing Staff:

Andrea Eckardt, *Project Manager*
John Hutton, *Principal in Charge*
Jason Lorch, *Baseline Monitoring Plan*
Daniel Taylor, *Construction Administrator*
Daniel Dixon, *Monitoring Lead*
Christine Blackwelder, *Lead Quality Assurance*

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APPENDICES

1.0 Mitigation Project Summary

The Mangum Homestead Mitigation Site (Site) is located in Orange County approximately three miles northwest of the Town of Carrboro (Figure 1). The Site involves riparian area restoration, enhancement, and preservation on four unnamed tributaries and three ephemeral channels that flow to New Hope Creek upstream of Jordan Lake. The Site has been completed for buffer mitigation credit and nutrient offset credit in the Cape Fear River Basin HUC 03030002, Upper New Hope Watershed of Jordan Lake in accordance with the Consolidated Buffer Mitigation Rules (15A NCAC 02B .0295), the Jordan Water Supply Nutrient Strategy (15A NCAC 02B .0262) and the Nutrient Offset Payments Rule (15A NCAC 02B .0240). See Figure 2 for the Service Area of the Site. The Site is expected to generate 36,933.600 riparian buffer credits, 19,985.729 Nitrogen offset credits, and 1,259.783 Phosphorous Offset credits.

The project is located within the Cape Fear River Basin Hydrologic Unit Code (HUC) 03030002060110, Upper New Hope – Jordan Lake Sub-watershed, and NCDWR Subbasin 03-06-05. Project streams flow approximately one mile to the confluence with New Hope Creek, which is classified as Nutrient Sensitive Waters (NSW) by the North Carolina Division of Water Resources (NCDWR). The project supports specific goals identified in the 2009 Cape Fear River Basin Restoration Priorities Plan (RBRP) by addressing nutrient reductions through buffer restoration and improving habitat for the native mussel species present in the HUC.

1.1 Project Goals

The major goals of the nutrient offset and buffer restoration project are to provide ecological and water quality enhancements to Jordan Lake in the Cape Fear River Basin by creating a functional riparian corridor and restoring the riparian area.

This nutrient offset and riparian buffer restoration project will reduce sediment and nutrient loading, provide and improve terrestrial and in stream habitats, and improve stream and bank stability. The area surrounding the streams and ephemeral channels was agricultural fields, typically used to grow hay. Restoring up to 200 feet of vegetative buffer along the streams and channels has removed the crops and fertilizer inputs within the project area. The restored floodplain areas will assist in filtering sediment during high rainfall events. The establishment of riparian areas will create shading to minimize thermal heating. Finally, invasive vegetation will be treated within the project area and the newly planted native vegetation will provide cover and food for wildlife. Specific enhancements to water quality and ecological processes are outlined below.

- Decrease nutrient levels by filtering runoff from the agricultural fields through restored native 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.
- 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 with the establishment and maintenance of riparian areas creating additional long-term shading of the channel flow to reduce thermal pollution.
- Establishment of a riparian area that will slow flood flows and allow for greater infiltration, reducing peak flows downstream.
- Create appropriate terrestrial habitat by removing invasive vegetation and planting native vegetation.
- Permanently protect the project Site from harmful uses by establishing a conservation easement on the Site that will protect the riparian corridor in perpetuity.

1.2 Pre-construction Site Conditions

The mitigation site is approximately 19.89 acres of primarily agricultural fields located on the Mangum Family Homestead. The project included the restoration, enhancement, and preservation of riparian areas along four unnamed tributaries and three ephemeral channels: UT to New Hope Creek, UT1, UT2, UT2A and E1-E3 (Figure 3). While UT to New Hope Creek, UT1, and E3 have areas of established forested vegetation, UT2, UT2A, E1, and E2 have been mowed regularly with no existing riparian area. Historically, the Site was used for grazing cattle, but its most recent purpose was predominantly agricultural fields for hay production.

The Site is characterized by gently sloped valleys dominated by agricultural fields. UT to New Hope Creek flows east through the Site in an established riparian area. While the right bank maintains a forested buffer, the left bank opens to agricultural fields. E1 enters the Site through a small pipe below a pond, flowing north through the agricultural fields into UT2 just upstream of the existing driveway. E2 enters the project parcels from a mature forest off the project parcels, flowing northwest through the agricultural fields into UT2, also at the confluence with E1. E3 enters the project parcels from a mature forest and flows south into UT1. UT1 then flows for approximately 150 feet into UT to New Hope Creek. E3 is buffered by a strip of mature trees extending out 20-50 feet. UT2A is an intermittent stream that begins in the open agricultural field and flows north between multiple barn structures to join UT2. UT2A flows through a culvert crossing that is currently impairing the stream flow, per the DWR stream determination letter. Overview photos are shown in Appendix 4.

On July 19, 2019 NCDWR conducted on-site determinations to review features and land use within the project boundary. The resulting NCDWR site viability letter and map confirmed the seven project features on the Site are suitable for riparian buffer credit pursuant to 15A NCAC 02B .0295 and for nutrient offset mitigation per 15A NCAC 02B .0240. NCDWR also reviewed the Site for its applicability to the Jordan Riparian Area Protection Rules (15A NCAC 02B .0267). The Site Viability letter from NCDWR is included in Appendix 2.

2.0 Determination of Credits

In addition to buffer restoration on subject streams, per the Consolidated Buffer Mitigation Rules (15A NCAC 02B 0.0295 (o)), alternative mitigation is used on the Site in the form of: buffer restoration on ephemeral channels and preservation of forested buffer on subject streams. The project is in compliance with these rules in the following ways:

Buffer Restoration on Ephemeral Channels (15A NCAC 02B 0.0295(o)(7)):

- NCDWR performed an evaluation of the Site (July 19, 2019) and identified the perennial, intermittent, and ephemeral channels on the property.
- The mitigation area on the Site's ephemeral channels is located completely within their drainage areas.
- The ephemeral channels are directly connected to intermittent or perennial stream channels and will be protected under the same contiguous easement boundary.
- The mitigation area on the ephemeral channels is less than 25% of the total buffer mitigation area on the Site (Table 2, Appendix 1).

Preservation on Subject Streams (15A NCAC 02B .0295 (o)(5):

- The buffer width is at least 30 feet from the stream.
- The area meets the requirements of 15A NCAC 02R 0.0403(c)(7), (8), and (11) with no known structures, infrastructure, hazardous substances, solid waste, or encumbrances within the mitigation boundary.

- Preservation mitigation is being requested on no more than 25% of the total buffer mitigation area (Table 2, Appendix 1).

Mitigation credits are presented in Table 2 and Figure 3 in Appendix 1 and are based upon the as-built survey included in Appendix 3.

3.0 Baseline Summary

The Wildlands Team restored high quality riparian areas along UT to New Hope Creek, four tributaries of UT to New Hope Creek and three ephemeral channels on the Site. The project design ensured that no adverse impacts to existing riparian buffers occurred. Figure 3 illustrates the credit zones for the Site. Detailed descriptions of the restoration activity follow in Sections 3.1 through 3.4. Overview photographs are included in Appendix 4.

3.1 Parcel Preparation

Prior to planting, the buffer restoration area was used as agricultural fields, mainly for hay production. The fields within the project area contained few invasive species; therefore, some selective spot herbicide treatments were required. The Site's ephemeral channels were located fully within the conservation easement area and were completely protected as part of the project; therefore, no land disturbance to maintain diffuse flow was required. Overhead utility lines have been relocated to align with internal crossings so as not to cross over the conservation easement. Culverts were also added to UT to New Hope Creek and UT2 in the internal crossings. The installation of the UT2 culvert also included daylighting a small section of UT2 that was previously underground.

3.2 Riparian Area Restoration Activities

The revegetation plan for the riparian restoration area included permanent seeding where slight disturbance occurred and planting bare root trees. These revegetation efforts were coupled with the select treatment of invasive species to control their population. The specific species composition planted was selected based on the desired community type, observation of occurrence of species in riparian buffers adjacent to the Site, and best professional judgement on species establishment and anticipated site conditions in the early years following project implementation. The total number of tree species planted across the buffer areas are as follows: Schumard Oak (*Quercus shumardii*) 1800 stems, Willow Oak (*Quercus phellos*) 1100 stems, American Sycamore (*Platanus occidentalis*) 2800 stems, River Birch (*Betula nigra*) 2300 stems, American Persimmon (*Diospuros virginiana*) 1000 stems, Boxelder (A*cer negundo*) 660 stems, and Swamp Chestnut Oak (*Quercus michauxii*) 450 stems. Eastern Cottonwood (Populus deltoides) was originally planned for planting however scarcity of the tree led to substituting Swamp Chestnut Oak in its place. In total, 10,110 stems were planted across the restored areas of the site.

Trees were planted at a density sufficient to meet the performance standards outlined in the Rule 15A NCAC 02B .0295 of 260 trees per acre at the end of five years. No one tree species planted was greater than 50% of the established stems. An appropriate seed mix of Red Panic Grass (*Panicum rigidulum*), Blackeyed Susan (*Rudbeckia hirta*), Lanceleaf Coreopsis (*Coreopsis lancelota*), and Virginia Wild Rye (*Elymus virginicus*) was applied as necessary to provide temporary ground cover for soil stabilization and reduction of sediment loss during rain events in disturbed areas. This was followed by an appropriate permanent seed mixture. Planting was completed on April 16, 2020.

Vegetation management and herbicide applications were implemented as needed during tree establishment in the restoration areas to prevent establishment of invasive species that could compete with the planted native species.

3.3 Riparian Area Enhancement Activities

The revegetation plan for the buffer enhancement areas under 15A NCAC 02B .0295(n) included planting supplemental bare root trees and controlling invasive species growth.

3.4 Riparian Area Preservation Activities

No work was done in the buffer preservation areas, as allowed under 15A NCAC 02B .0295(o). The preservation area are protected in perpetuity under a conservation easement.

4.0 Annual Monitoring and Performance Criteria

The performance criteria for the Site follows approved performance criteria presented in the guidance documents outlined in RFP 16-007242 and the Consolidated Buffer Rule (15A NCAC 02B .0295). Annual monitoring and semi-annual site visits will be conducted to assess the condition of the finished project. The buffer restoration project has been assigned specific performance criteria components for vegetation. Performance criteria will be evaluated throughout the five-year post-construction monitoring. An outline of the performance criteria and monitoring components follows and are depicted in Figure 4 and included in Table 3, located in Appendix 1.

The final vegetative success criteria will be the survival of 260 planted stems per acre in the riparian corridor at the end of the required five-year monitoring period. The extent of invasive species coverage will also be monitored and treated as necessary throughout the required monitoring period.

Thirteen vegetation monitoring plots were installed across the Site to measure the survival of the planted stems (Figure 4). Vegetation monitoring will follow the CVS-EEP Level 1 Protocol for Recording Vegetation (2008). Reference photographs of the vegetation plots and Site will be taken during the annual vegetation assessments, planted stems will be flagged annually to discern in the provided photos. Appendix 5 includes the baseline (MY0) vegetation plot photographs and the planted and total stem counts.

4.1 Overview Photographs

Photographs will be taken of the project area once a year to visually document stability for five years following construction. A drone will be used to document the project's overall vegetative growth and ground cover. Overview photographs are shown in Appendix 4.

4.2 Visual Assessments

Visual assessments should support the specific performance standards for each metric as described above. Visual assessments will be performed within the Site on a semi-annual basis during the five-year monitoring period. Problem areas with vegetative health will be noted (e.g. low stem density, vegetation mortality, invasive species or encroachment). Areas of concern will be mapped and photographed accompanied by a written description in the annual report. Problem areas will be re-evaluated during each subsequent visual assessment

4.3 Annual Reporting Performance Criteria

Using the DMS Riparian Buffer and Nutrient Offset Buffer Baseline and Annual Monitoring Report Template version 2.0 (May 2017), monitoring reports will be prepared in the fall of each monitoring year and submitted to DMS. Annual monitoring reports will be based on the above referenced DMS Template (May 2017). The monitoring period will extend five years beyond completion of construction or until performance criteria have been met.

4.4 Maintenance and Contingency Plans

The site boundary was properly marked with NCDMS placards every 200 feet; additional signs were placed in areas where a higher risk of encroachment was thought to potentially occur. Adaptive management will be performed during the monitoring years to address minor issues, as necessary. If, during annual monitoring it is determined the Site's ability to achieve Site performance standards are jeopardized, Wildlands will notify the members of DMS/NCDWR and work with them to develop contingency plans and remedial actions. Any actions implemented will be designed to achieve the success criteria specified previously and will include a work schedule and updated monitoring criteria (if applicable).

5.0 References

Lee, Michael T. Peet, Robert K., Steven D. Wentworth, Thomas R. 2008. CVS-EEP Protocol for Recording Vegetation Version 4.2. http://cvs.bio.unc.edu/protocol/cvs-eep-protocol-v4.2-lev1-2.pdf

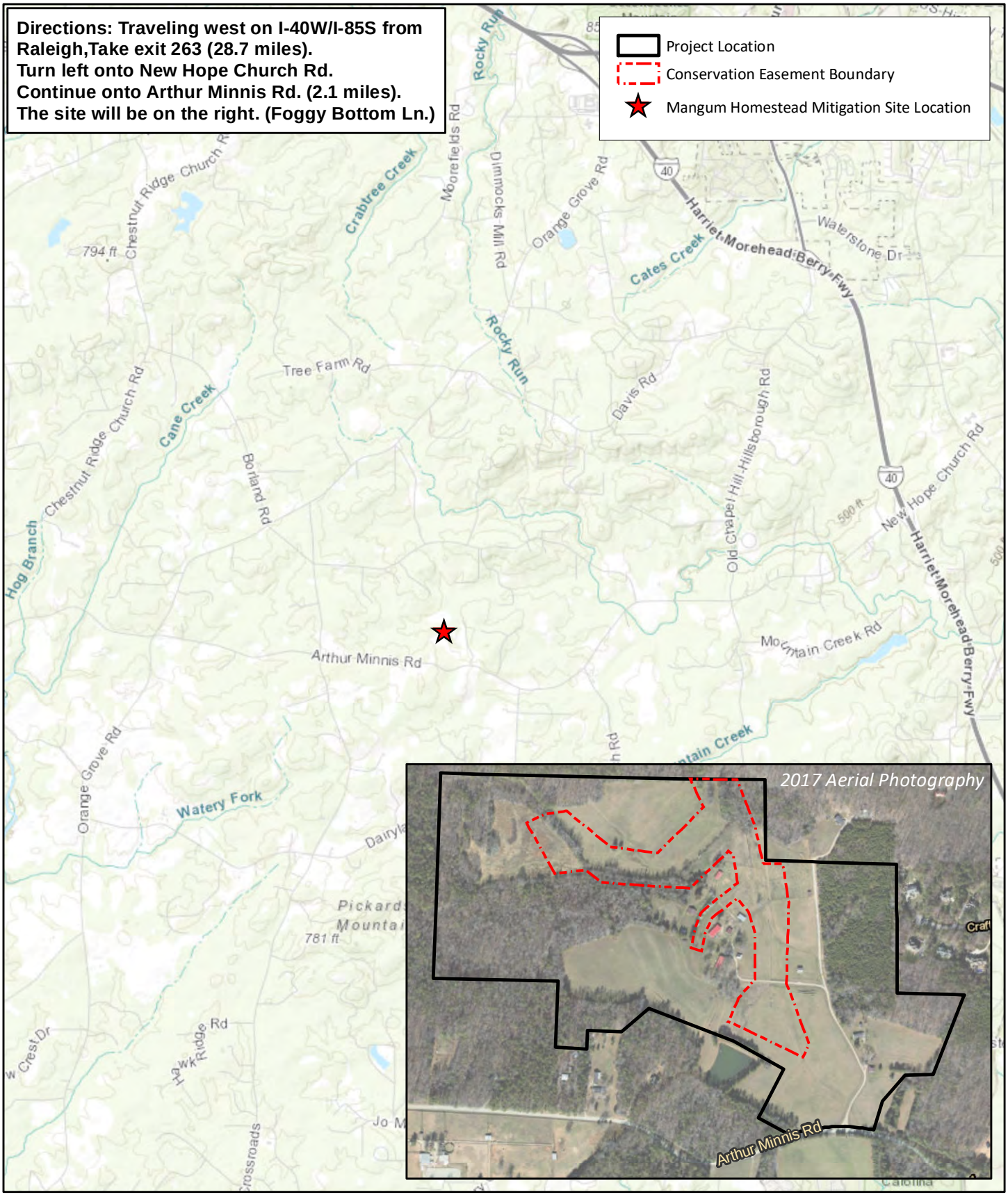
Natural Resources Conservation Service (NRCS). Web Soil Survey of Orange County. http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

North Carolina Department of Environmental Quality, Division of Mitigation Services (NCDMS), 2009. Cape Fear Basin Restoration Priorities. http://portal.ncdenr.org/c/document_library/get_file?uuid=864e82e8-725c-415e-8ed9-c72dfcb55012&groupId=60329

North Carolina Division of Environmental Quality, Division of Water Resources (NCDWR) 2011. Surface Water Classifications. http://deq.nc.gov/about/divisions/water-resources/planning/classification-standards/classifications

North Carolina Department of Environmental Quality, Division of Mitigation Services (NCDMS), 2017. Riparian Buffer and Nutrient Offset Buffer Baseline and Annual Monitoring Report Template version 2.0

APPENDIX 1



WILDLANDS ENGINEERING

0 0.5 1 Miles

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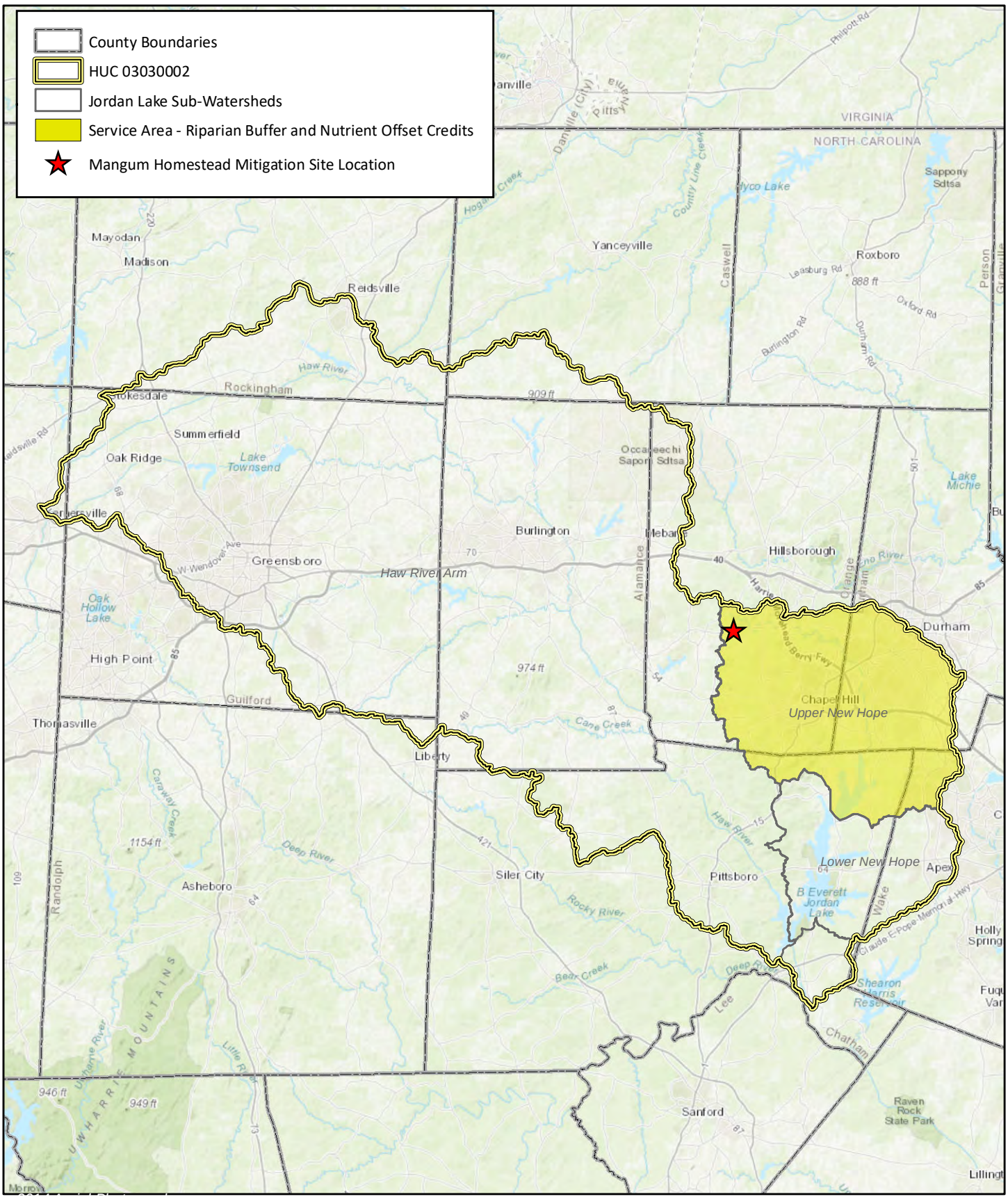
Figure 1 Vicinity Map
Mangum Homestead Mitigation Site
As-Built Report
Cape Fear River Basin (03030002)
Orange County, NC



WILDLANDS ENGINEERING

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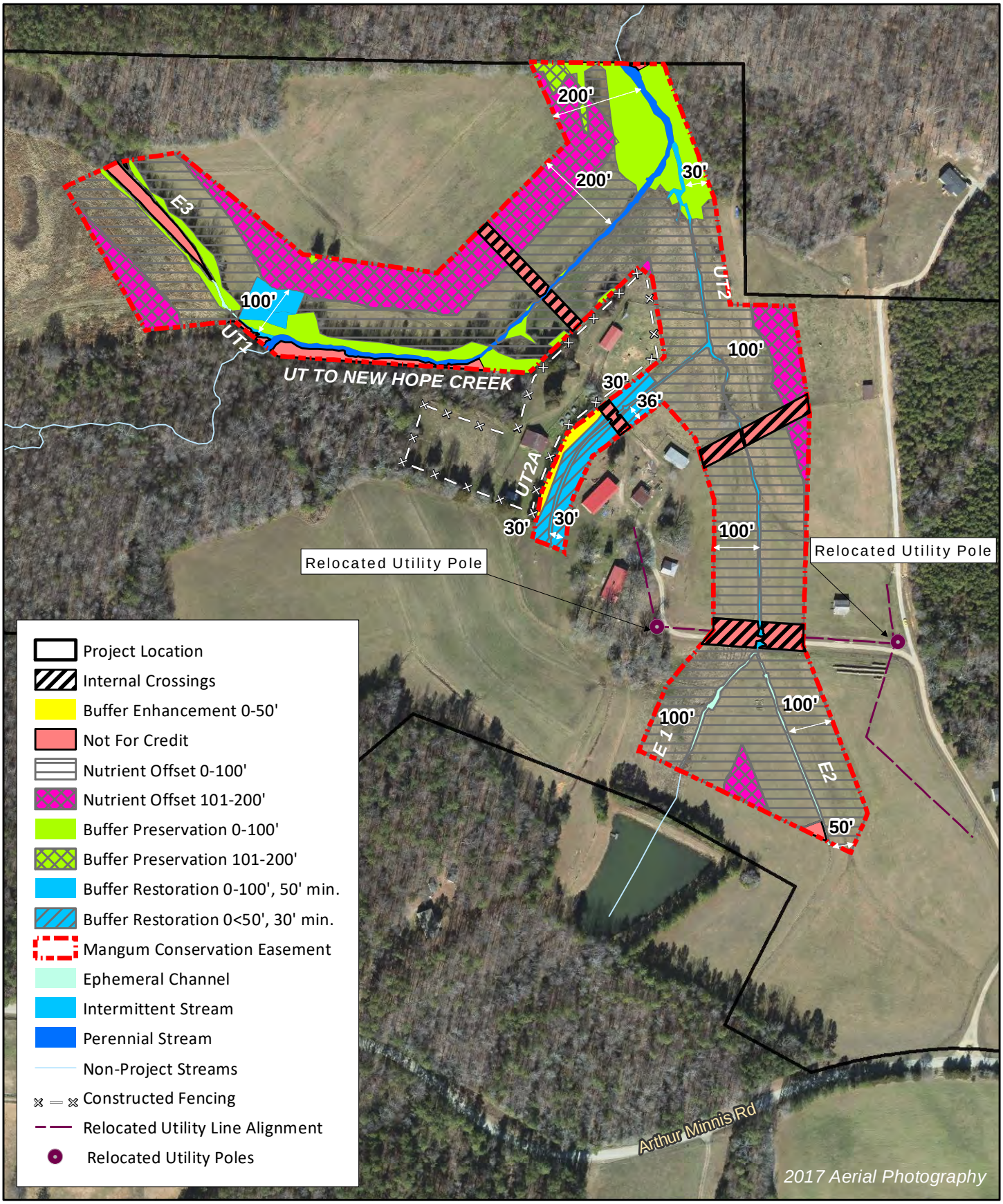
Figure 2 Service Area Map
Mangum Homestead Mitigation Site
As-Built Report
Cape Fear River Basin (03030002)
Orange County, NC



WILDLANDS ENGINEERING

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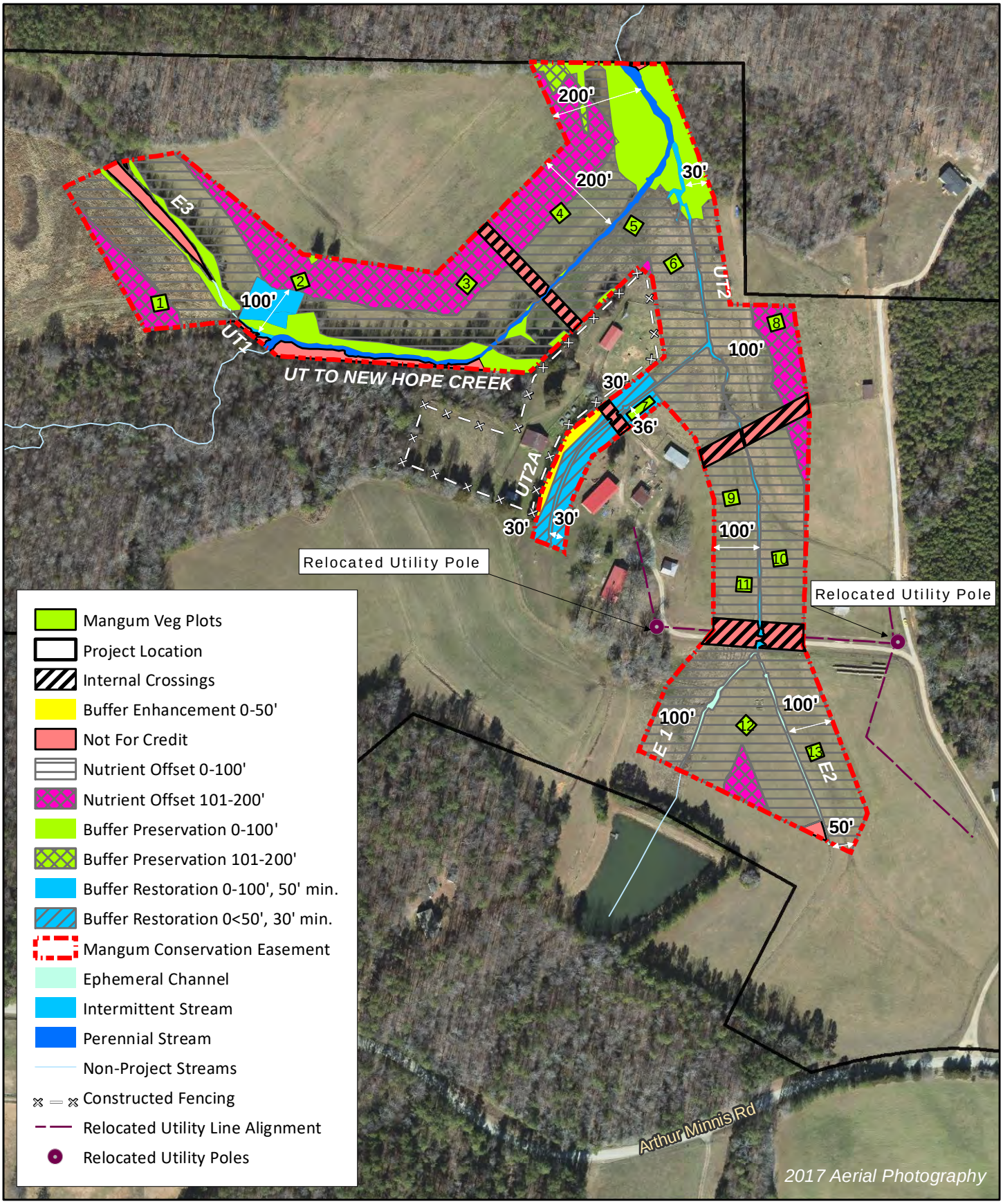
Figure 3 Project Component/Asset Map
Mangum Homestead Mitigation Site
As-Built Report
Cape Fear River Basin (03030002)
Orange County, NC



WILDLANDS ENGINEERING

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Figure 4 Monitoring Plan View
Mangum Homestead Mitigation Site
As-Built Report
Cape Fear River Basin (03030002)
Orange County, NC

Table 1. Project Attributes

Mangum Homestead Mitigation Site

Monitoring Year 0 - 2020

PROJECT INFORMATION	
Project Name	Mangum Homestead Mitigation Site
USGS Hydrologic Unit 14-digit	03030002060110
River Basin	Cape Fear - Jordan Upper New Hope
Project Coordinates (latitude and longitude)	35° 59’ 49.23’’ N, 79° 8’ 44.77’’ W
Total Credits (BMU)	36,933.600
Total Credits (Nitrogen Offset)	19,985.729
Total Credits (Phosphorous Offset)	1,259.783
Types of Credits	Riparian Buffer & Nutrient Offset
Mitigation Plan Date	January 2020
As-Built & Baseline Monitoring Document	June 2020
Year 1 Monitoring Report Date	December 2020
Year 2 Monitoring Report Date	December 2021
Year 3 Monitoring Report Date	December 2022
Year 4 Monitoring Report Date	December 2023
Year 5 Monitoring Report Date	December 2024

Table 2. Project Areas and Assets

Mangum Homestead Mitigation Site

Monitoring Year 0 - 2020

Cape Fear - Jordan Upper New Hope 03030002060110	**Project Area**
32.91899	**N Credit Conversion Ratio (ft²/pound)**
522.2408	**P Credit Conversion Ratio (ft²/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 (ft²)	Total (Creditable) Area of Buffer Mitigation (ft²)	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	Yes	I / P	Restoration	0-50	UT2A	23,810	23,810	1	100%	1.00000	Yes	23,810.000	No	—	—
Buffer	Rural	Yes	I / P	Restoration	0-100	UT1	9,445	9,445	1	100%	1.00000	Yes	9,445.000	Yes	286.916	18.086
Buffer	Rural	Yes	I / P	Enhancement	0-100	UT2A	4,819	4,819	2	100%	2.00000	Yes	2,409.500	No	—	—
Nutrient Offset	Rural	No	Ephemeral	Restoration	0-100	UT to New Hope Creek, UT2, E1, E2, E3	503,726	503,726	1	100%	1.00000	Yes	503,726.000	Yes	15,301.988	964.547
Nutrient Offset	Rural	No	Ephemeral	Restoration	101-200	UT to New Hope Creek, UT2, E1, E2, E3	154,184	154,184	1	33%	3.03030	Yes	50,880.771	Yes	4,683.740	295.235
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						Totals:	695,984	695,984								

Enter Preservation Credits Below

Eligible for Preservation (ft²): 12,691

Credit Type	Location	Subject?	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (sf)	Total (Creditable) Area for Buffer Mitigation (ft²)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits
Buffer	Rural	Yes	I / P	Preservation	0-100	UT to New Hope Creek, UT2	74,537	12,691	10	100%	10.00000	1,269.100
	Rural	Yes	I / P		101-200	UT to New Hope Creek	4,922		10	33%		—
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						Preservation Area Subtotal (ft²):		12,691				
						Preservation as % Total Area of Buffer Mitigation:		25.0%				
						Ephemeral Reaches as % Total Area of Buffer Mitigation:		0.0%				

TOTAL AREA OF BUFFER MITIGATION (TABM)			
Mitigation Totals		**Square Feet**	**Credits**
Restoration:		33,255	33,255.000
Enhancement:		4,819	2,409.500
Preservation:		12,691	1,269.100
Total Riparian Buffer:		50,765	36,933.600
TOTAL NUTRIENT OFFSET MITIGATION			
Mitigation Totals		**Square Feet**	**Credits**
Nutrient Offset:	**Nitrogen:**	657,910	19,985.729
	Phosphorus:		1,259.783

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

last updated 01/17/2020

Table 3. Monitoring Components

Mangum Homestead Mitigation Site

Monitoring Year 0 - 2020

Parameter	Monitoring Feature	Quantity/Length By Reach							Frequency
		UT to New Hope Creek	UT1	UT2	UT3	E1	E2	E3	
Vegetation	**CVS Level 1**	13							Annual
Visual Assessment	Y	Y	Y	Y	Y	Y	Y	Y	Semi- Annual
Exotic and Nuisance Vegetation	Y	Y	Y	Y	Y	Y	Y	Y	Semi- Annual
Project Boundary	Y	Y	Y	Y	Y	Y	Y	Y	Semi- Annual
Reference Photographs	Over View Photographs								Annual

APPENDIX 2

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
LINDA CULPEPPER
Director

NORTH CAROLINA
Environmental Quality

September 4, 2019

Andrea Eckardt
Wildlands Engineering, Inc
1430 S. Mint St, Suite 104
Charlotte, NC 28203
(via electronic mail: aeckardt@wildlandseng.com)

DWR# 2019-0645
Orange County

Re: Site Viability for Buffer Mitigation & Nutrient Offset – Mangum Homestead Site
Located at 1449 Foggy Bottom Ln, Hillsborough, NC
Upper New Hope of Jordan Lake Watershed

Dear Ms. Eckardt,

On May 14, 2019, Katie Merritt, with the Division of Water Resources (DWR), received a request from Wildlands Engineering, Inc. (Wildlands) for an onsite mitigation determination near the above-referenced site (Site). The Site is located within the Upper New Hope sub-watershed of Jordan Lake in the Cape Fear River Basin. The Site is being proposed as part of a full-delivery riparian buffer mitigation and nutrient offset project for the Division of Mitigation Services (RFP #16-007702). On July 19, 2019, Ms. Merritt performed an onsite assessment of riparian land uses adjacent to streams and channels onsite, which are shown on the attached map labeled "Site Map". Staff from the Division of Mitigation Services were also present onsite.

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 .0240.

Feature	Classification onsite	[1]Subject to Buffer Rule	Riparian Land uses adjacent to Feature (0-200')	Buffer Credit Viable	[2]Nutrient Offset Viable	[5]Mitigation Type Determination w/in riparian areas
E1	Ephemeral	No	Non-forested hay field	[4]Yes	Yes	**Restoration Site** per 15A NCAC 02B .0295 (o)(7)
E2	Ephemeral	No	Non-forested hay field	[4]Yes	Yes	**Restoration Site** per 15A NCAC 02B .0295 (o)(7)
UT2	Stream	Yes	Mostly non-forested hay field with some forested areas downstream	[3]Yes	Yes *(non-forested areas only)*	Non-forested areas - **Restoration Site** per 15A NCAC 02B .0295 (n) Forested Areas - **Preservation Site** per 15A NCAC 02B .0295 (o)(5)
UT2A	Stream	No	Mostly non-forested grassed lawn with some trees along fence line	Yes	No	**Restoration Site** per 15A NCAC 02B .0295 (o)(3) Tree line - **Enhancement Site** per 15A NCAC 02B .0295 (o)(3)
E3	Ephemeral	No	Combination of forested areas mostly along the channel and non-forested hay fields	[3,4]Yes	Yes *(non-forested areas only)*	Non-forested areas - **Restoration Site** per 15A NCAC 02B .0295 (o)(7) Forested Areas - **Preservation Site** per 15A NCAC 02B .0295 (o)(7)
UT1 (at DWR flag)	Stream	Yes	Combination of forested areas mostly along the channel and non-forested hay fields	[3]Yes	Yes *(non-forested areas only)*	Non-forested areas - **Restoration Site** per 15A NCAC 02B .0295 (n) Forested Areas - **Preservation Site** per 15A NCAC 02B .0295 (o)(5)
UT to New Hope Creek	Stream	Yes	Combination of forested areas mostly along the channel and non-forested hay fields	[3]Yes	Yes *(non-forested areas only)*	Non-forested areas - **Restoration Site** per 15A NCAC 02B .0295 (n) Forested Areas - **Preservation Site** per 15A NCAC 02B .0295 (o)(5)

[1]Subjectivity calls for the features were determined by DWR in correspondence dated August 27, 2019 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] *NC Division of Water Resources - Methodology and Calculations for determining Nutrient Reductions associated with Riparian Buffer Establishment. Nitrogen and Phosphorus are calculated differently in the Jordan Lake Watershed.*

[3]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.

[4]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).

[5]All features proposed for buffer mitigation or nutrient offset, must have a conservation easement established that includes the tops of channel banks when being measured perpendicular and landward from the channel, even when no credit is viable within the 50' riparian area.

The site map attached to this letter was prepared by Wildlands and edited by DWR to match this correspondence. This letter does not constitute an approval of this site to generate mitigation 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 .0240, 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 .0240.

This viability assessment will expire on September 4, 2021 or upon the submittal of an As-Built Report to the DWR, whichever comes first. **This letter should be provided in all stream and wetland, buffer and/or nutrient offset mitigation plans for this Site.**

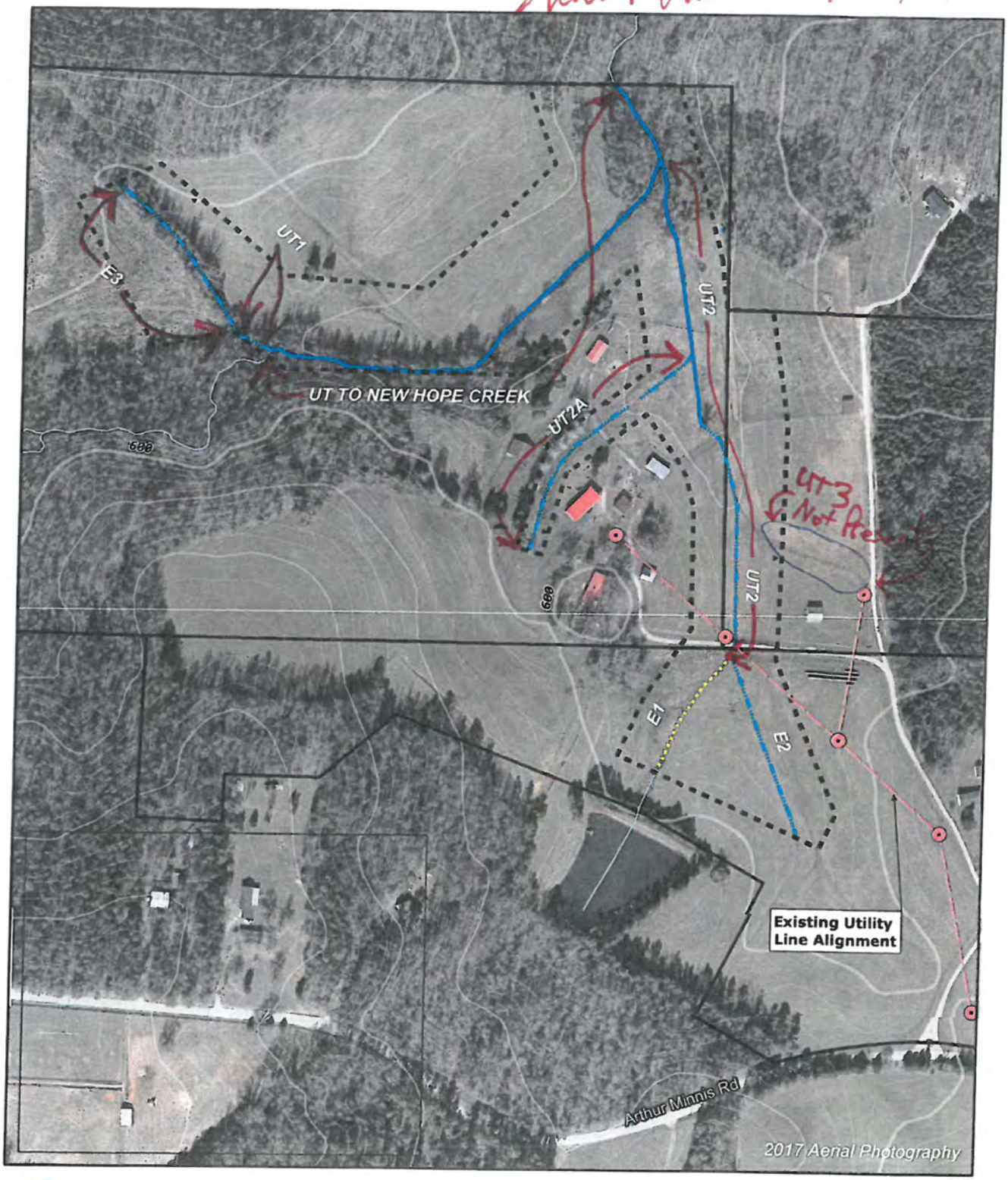
Sincerely,

Mac Haupt, Acting Supervisor
401 and Buffer Permitting Branch

MH/*km*
Attachments: Site Map

cc: File Copy (Katie Merritt)
Lindsay Crocker- DMS (via electronic mail)

8/26/19



WILDLANDS ENGINEERING

0 150 300 Feet

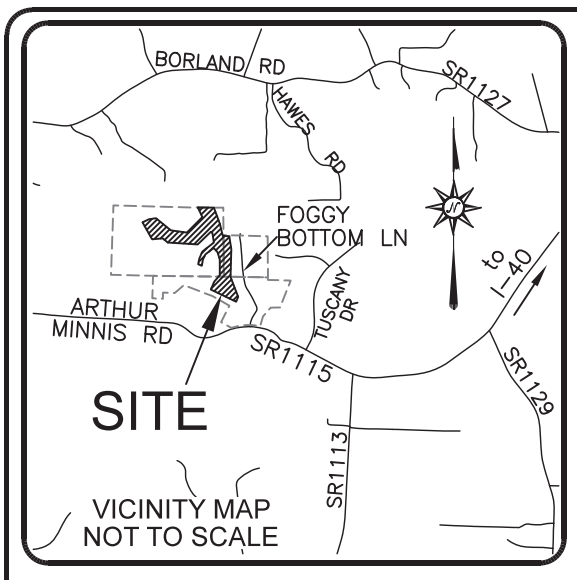
N

Site Map
Mangum Homestead Mitigation Site
Cape Fear River Basin (03030002)

Orange County, NC

9/4/19

APPENDIX 3



MANGUM HOMESTEAD

SHEET 1 of 2

I, ELISABETH G. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, CERTIFY THAT THIS BUFFER MAP WAS DRAWN UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, THAT THE EASEMENT BOUNDARY IS BASED ON PLAT BOOK SEE , PG NOTES RECORDED IN ORANGE COUNTY REGISTER OF DEEDS OFFICE, AND THAT THE BUFFER AREAS SHOWN ARE CALCULATED FROM AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 25th DAY OF MAY, 2020.

ELISABETH G. TURNER, P.L.S. #L-4440

NORTH CAROLINA PROFESSIONAL SEAL L-4440 LAND SURVEYOR ELISABETH G. TURNER

GENERAL NOTES:

1. ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES IN U.S. SURVEY FEET UNLESS OTHERWISE NOTED.
2. THE BASIS OF BEARINGS IS NCGS STATE PLANE NAD83(2011) DATUM.
3. THE AREA SHOWN HEREON WAS COMPUTED USING THE COORDINATE COMPUTATION METHOD.
4. THE PURPOSE OF THIS PLAT IS TO SHOW THE AS-BUILT AREAS FOR RIPARIAN BUFFER CREDITS WITHIN THE CONSERVATION EASEMENT. THIS PLAT IS NOT A BOUNDARY SURVEY. THE LAND PARCELS AND THEIR BOUNDARIES AFFECTED BY THIS CONSERVATION EASEMENT ARE NOT CHANGED BY THIS PLAT.
5. LINES NOT SURVEYED ARE SHOWN AS A DASHED LINETYPE AND WERE TAKEN FROM INFORMATION REFERENCED ON THE FACE OF THIS PLAT.
6. SUBJECT TO ALL EASEMENTS, RIGHT OF WAYS, AND/OR ENCUMBRANCES THAT MAY AFFECT THE PROPERTY(S).
7. SEE CONSERVATION EASEMENT RECORDED IN PLAT BOOK 121, PG. 128 IN THE ORANGE COUNTY REGISTER OF DEEDS OFFICE.
8. STREAM TOP OF BANK LINES SURVEYED BY TURNER LAND SURVEYING, PLLC ON SEPTEMBER 15-22, 2019.

Riparian Buffer Credit:	SQ. FT.	Acres
Buffer Restoration 0'-49' (Min. 30')	23,810	0.547
Buffer Restoration 0'-100' (Min. 50')	9,445	0.217
Buffer Enhancement 0'-100' (Min. 30')	4,819	0.111
Buffer Preservation 0'-100' (Min. 30')	74,537	1.711
Buffer Preservation 101'-200'	4,922	0.113
Nutrient Offset 0'-100' (Min. 50')	503,726	11.564
Nutrient Offset 101'-200'	154,184	3.54
Streams	39,622	0.91
No Credit	51,062	1.172
Total CE Area	**866,127**	**19.885**

THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.

SHEET 1 of 2

SCALE: 1" = 200'
MANGUM HOMESTEAD BUFFER AB_F.dwg
PROJECT: 19-023
REVIEWED BY: EGT
DRAWN BY: EGT
SURVEYED BY: DST
DATE: 05/25/2020

AS-BUILT SURVEY OF BUFFER AREAS FOR
NC DIVISION OF MITIGATION SERVICES
MANGUM HOMESTEAD
DMS PROJECT # 100107 CAPE FEAR RIVER BASIN
BINGHAM TOWNSHIP ORANGE COUNTY NORTH CAROLINA

REVISIONS, DATE AND INITIAL:

TURNER LAND SURVEYING
P.O. BOX 148
SWANNANOA, NC 28778
P-0702 (919) 827-0745
TurnerLandSurveying.com
Certified DBE/WBE

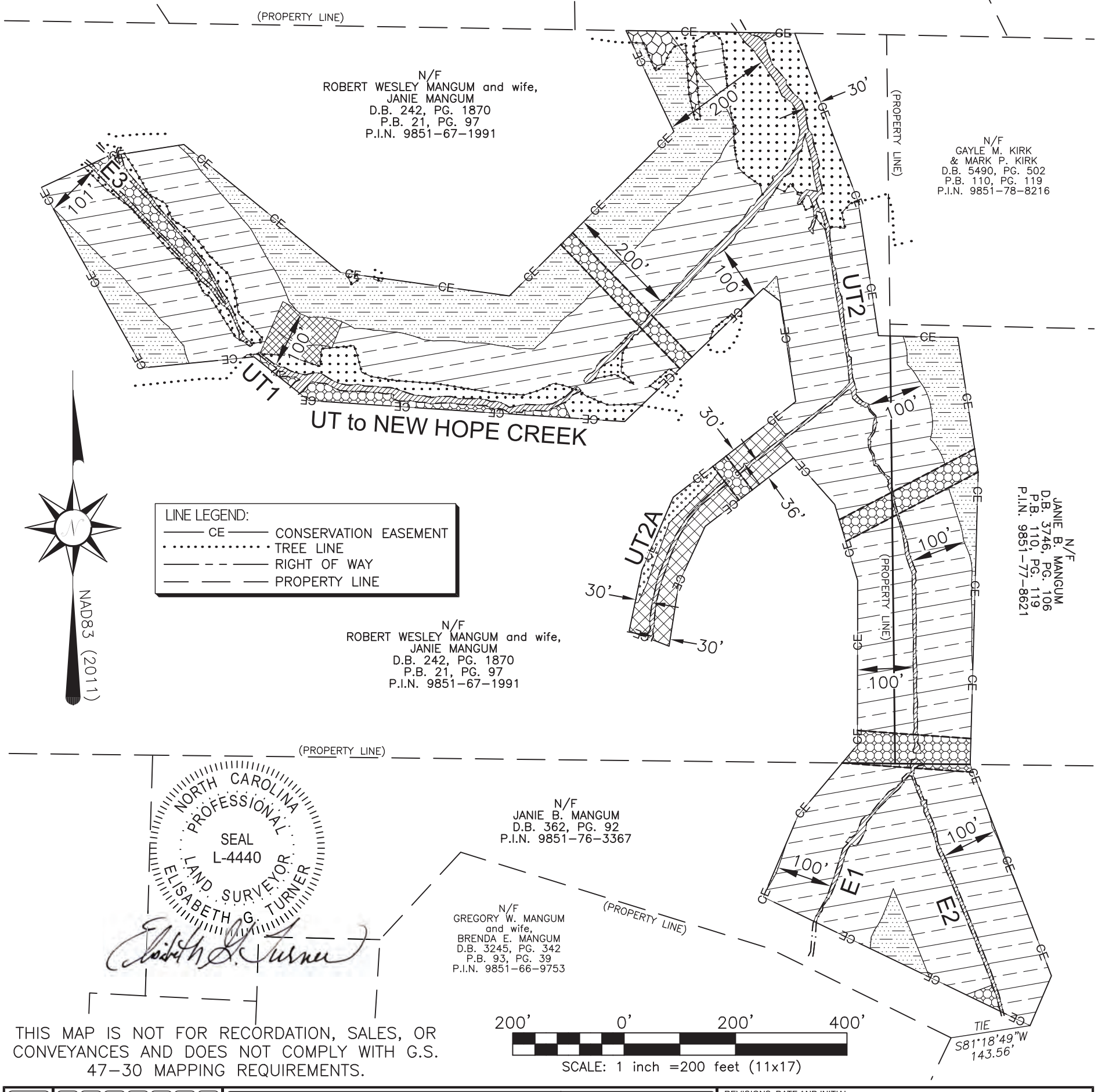
MANGUM HOMESTEAD

SHEET 2 of 2

Buffer Restoration	0'-50' (Min. 30')
Buffer Restoration	0'-100' (Min. 50')
Buffer Enhancement	0'-100' (Min. 30')
Buffer Preservation	0'-100' (Min. 30')
Buffer Preservation	101'-200'

Nutrient Offset	0'-100' (Min. 50')
Nutrient Offset	101'-200'
Streams	
No Credit	

SEE SHEET 1 of 2 FOR NOTES & AREAS.



NORTH CAROLINA PROFESSIONAL SEAL L-4440 LAND SURVEYOR ELISABETH G. TURNER

THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.

SHEET	2 of 2
SCALE:	1" = 200'
MANGUM HOMESTEAD BUFFER AB_F.dwg	
PROJECT:	19-023
REVIEWED BY:	EGT
DRAWN BY:	EGT
SURVEYED BY:	DST
DATE:	06/03/2020

AS-BUILT SURVEY OF BUFFER AREAS FOR

NC DIVISION OF MITIGATION SERVICES

MANGUM HOMESTEAD

DMS PROJECT # 100107 CAPE FEAR RIVER BASIN

BINGHAM TOWNSHIP ORANGE COUNTY NORTH CAROLINA

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APPENDIX 4

APPENDIX 5

Table 4. Planted and Total Stem Counts

Mangum Homestead Mitigation Site
DMS Project No. 100107
Monitoring Year 0 - 2020

			Current Plot Data (MY0 2020)														
			VP 1			VP 2			VP 3			VP 4			VP 5		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree	2	2	2	4	4	4				1	1	1			
Betula nigra	River Birch	Tree	3	3	3	3	3	3	3	3	3	1	1	1	2	2	2
Diospyros virginiana	American Persimmon	Tree	1	1	1	2	2	2	1	1	1	1	1	1			
Platanus occidentalis	Sycamore	Tree	5	5	5	2	2	2	2	2	2	5	5	5	7	7	7
Quercus michauxii	Swamp Chestnut Oak	Tree				2	2	2	3	3	3	5	5	5			
Quercus phellos	Willow Oak	Tree	4	4	4	2	2	2	4	4	4	2	2	2	3	3	3
Quercus shumardii	Shumard Oak	Shrub Tree													1	1	1
		Stem count	15	15	15	15	15	15	13	13	13	15	15	15	13	13	13
		size (ares)	1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02		
		Species count	5	5	5	6	6	6	5	5	5	6	6	6	4	4	4
		Stems per ACRE	607	607	607	607	607	607	526	526	526	607	607	607	526	526	526

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%

PnLS: Number of planted stems excluding live stakes
P-all: Number of planted stems including live stakes
T: Total stems

Table 4. Planted and Total Stem Counts

Mangum Homestead Mitigation Site
DMS Project No. 100107
Monitoring Year 0 - 2020

			Current Plot Data (MY0 2020)														
			VP 6			VP 7			VP 8			VP 9			VP 10		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree	1	1	1				1	1	1	3	3	3	2	2	2
Betula nigra	River Birch	Tree	7	7	7	5	5	5	4	4	4				5	5	5
Diospyros virginiana	American Persimmon	Tree				4	4	4	2	2	2	4	4	4	1	1	1
Platanus occidentalis	Sycamore	Tree	5	5	5	3	3	3	2	2	2	3	3	3	3	3	3
Quercus michauxii	Swamp Chestnut Oak	Tree	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
Quercus phellos	Willow Oak	Tree	1	1	1	3	3	3				3	3	3	3	3	3
Quercus shumardii	Shumard Oak	Shrub Tree				1	1	1	2	2	2						
		Stem count	15	15	15	17	17	17	13	13	13	15	15	15	16	16	16
		size (ares)		1			1			1			1			1	
		size (ACRES)		0.02			0.02			0.02			0.02			0.02	
		Species count	5	5	5	6	6	6	6	6	6	5	5	5	6	6	6
		Stems per ACRE	607	607	607	688	688	688	526	526	526	607	607	607	647	647	647

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%

PnLS: Number of planted stems excluding live stakes
P-all: Number of planted stems including live stakes
T: Total stems

Table 4. Planted and Total Stem Counts

Mangum Homestead Mitigation Site
DMS Project No. 100107
Monitoring Year 0 - 2020

			Current Plot Data (MY0 2020)									Annual Means		
			VP 11			VP 12			VP 13			MY0 (2020)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	Box Elder	Tree										14	14	14
Betula nigra	River Birch	Tree	4	4	4	5	5	5	3	3	3	45	45	45
Diospyros virginiana	American Persimmon	Tree	1	1	1	1	1	1				18	18	18
Platanus occidentalis	Sycamore	Tree				6	6	6	5	5	5	48	48	48
Quercus michauxii	Swamp Chestnut Oak	Tree	2	2	2				3	3	3	23	23	23
Quercus phellos	Willow Oak	Tree	1	1	1							26	26	26
Quercus shumardii	Shumard Oak	Shrub Tree	1	1	1	2	2	2	3	3	3	10	10	10
		Stem count	9	9	9	14	14	14	14	14	14	184	184	184
		size (ares)		1			1			1			13	
		size (ACRES)		0.02			0.02			0.02			0.32	
		Species count	5	5	5	4	4	4	4	4	4	7	7	7
		Stems per ACRE	364	364	364	567	567	567	567	567	567	573	573	573

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%

PnLS: Number of planted stems excluding live stakes
P-all: Number of planted stems including live stakes
T: Total stems

Vegetation Plot Photographs

VEG PLOT 1 *(4/29/2020)*

VEG PLOT 2 *(4/29/2020)*

VEG PLOT 3 *(4/29/2020)*

VEG PLOT 4 *(4/29/2020)*

VEG PLOT 5 *(4/29/2020)*

VEG PLOT 6 *(4/29/2020)*

VEG PLOT 7 *(4/29/2020)*

VEG PLOT 8 *(4/29/2020)*

VEG PLOT 9 *(4/29/2020)*

VEG PLOT 10 *(4/29/2020)*

VEG PLOT 11 *(4/29/2020)*

VEG PLOT 12 *(4/29/2020)*

VEG PLOT 13 *(4/29/2020)*