As-Built Baseline Monitoring Report – *Riparian Buffer Mitigation*

FINAL

STRAWBERRY HILL MITIGATION PROJECT

NCDMS Project #100094 (Contract #7745)
USACE Action ID: SAW-2019-00124
DWR Project #2019-0159

Johnston County, North Carolina
Neuse River Basin
HUC 03020201

Provided by:

Resource Environmental Solutions, LLC
for Environmental Banc & Exchange – Neuse I, LLC (EBX-Neuse I)

Provided for:
NC Department of Environmental Quality
Division of Mitigation Services

July 2022

M E M O R A N D U M

3600 Glenwood Avenue, Suite 100 Raleigh, North Carolina 27612 919.770.5573 tel. 919.829.9913 fax

TO: **Division of Mitigation Services**

FROM: **Jamey McEachran – RES**

DATE: **July 8, 2022**

RE: **DMS Comments on the Draft As-Built Baseline Monitoring Report**
Strawberry Hill, Project ID #100094, DMS Contract #0007745

Comments:

1. DMS recommends using the most current templates and tables for monitoring reports. It is understood that this project was contracted in December 2018 and therefore templates from that time period are applicable. However, the most current templates provide the IRT and DMS with the needed information in a more streamlined and less verbose format.
   Majority of the Report has been updated using the most current template and tables.

2. Recommend adding dates to photos that do not have them either at the top of the page or with each photo.
   Dates have been added to all photos.

3. Please add Limits of Disturbance to the Record Drawings.
   Limits of Disturbance (LOD) have been added to the Record Drawings.

4. Please consider updating the Sheet List Table on the Record Drawing Title Page in the buffer report only by removing the reference to sheets that are not included, or otherwise indicating that only sheets M1 & M2 are included. Also consider a reference to sheet EC2.
   The Sheet List Table has been updated to only include references to sheets M1 and M2. A Cover Page has also been added for the ESC map with a reference to sheet EC2.

5. During the site visit conducted on June 8, 2022 some small, isolated areas of struggling herbaceous growth were observed, specifically a small bare area on JH5 near the tree line and relatively sparse herbaceous cover along some portions of the old farm roads that paralleled JH5 and JH3. Areas did not appear to currently be causing any major issues, but we recommend over seeding this fall if herbaceous vegetation does not more fully establish this summer.
   This area will be monitored this fall and seeded if needed.

6. At the upstream end of JH1-B near Yelverton Grove Road there is a small area that appears to be less than 30' in width, but greater than 20', which would apply a 25% reduction to buffer credits in this area. Please update the buffer credits and report as necessary.
   The revision has been made. The area has been separated out as a unique polygon in the buffer shapefile and a row has been added in the buffer credit table that accounts for the 75% credit stipulation. The resulting credit yield was reduced by 227.498 credits. The report, credit table, and GIS

shapefile have all been updated accordingly.

Digital File Comments:

1. It is not possible to ensure the easement is accurate when compared to the CCPV in the stream asset baseline report, the CCPV does include the entire easement. The digital easement submitted does represent the DMS recorded easement. A requirement of the CCPV is to include the easement boundary, please revise the CCPV in the Stream Baseline Report to include the entire easement boundary. It is complete in the Buffer Baseline Report.
   Figure 2 has been divided into Figure 2a and 2b so that monitoring devices are legible on 2a and the entire conservation easement is visible on 2b.

2. The tables used are not the most updated templates (2020); this project may not have been contracted with these as requirements. The tables are missing the following information:
   a. Project Background is missing regulatory information and pre-existing stream lengths The Project Background tables were updated and display the new requirements.

   b. The goals table is missing from the digital submission and report. The goals table has been added to the report and digital submission.
3. In future submissions, please choose unique names for 'feature name' in buffer excel asset table and use those unique feature names in the digital submission attribute date for buffer feature class. There are numbers on the buffer asset map that are not defined in the legend. This is noted for future submissions, the unique feature names will be consistent.

4. Data missing from the digital submission: Please submit the missing data.
   a. Longitudinal profile is missing, data and graph
      Long pro data and graphs are shown in the as-built record drawings and redlines.

   b. Particle size distribution is missing, data and graph
      This is not a requirement in the approved mitigation plan nor required as part of the monitoring guidance and therefore was not conducted and will not provided in this report.

   c. Photo point spatial data file is missing Photo points have been added.

   d. Station id not included in the raw cross sectional survey data
      A spreadsheet has been added that includes the raw survey data with station id.

   e. Planted zone
      Planted zone has been added.

5. Please refer to DMS As-bult Survey Requirements, item 15; the .dwg file submitted is not adequately attributed.
   All layers were started with "AB-" to symbolize they are part of the As-Built condition. Layer details can be found behind the AB convention.

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1 Project Summary

1.1 Project Location and Description

The Strawberry Hill Project is within the Neuse River Basin within the 8-digit HUC 03020201, 14-digit HUC 03020201140010 and DWR Sub-basin Number 03-04-02.

The Strawberry Hill Project is located in Johnston County in Smithfield, NC at the crossroads of Yelverton Grove Road and Brogden Road (**Figure 1**). To access the Project from Raleigh, take I-40 East to US-70 East. Then take US-70 BUS West until taking a right onto South 3rd Street in downtown Smithfield. Then take a left onto Brogden Road. Follow Brogden Road for 2.9 miles and the downstream extent of reach JH1-B will be on your left. The coordinates are 35.469579 °N and -78.323896 °W.

Environmental Banc & Exchange – Neuse I, LLC (EBX-Neuse I), a wholly-owned subsidiary of Resource Environmental Solutions (RES), is pleased to provide this Baseline Monitoring Report as a component of the Strawberry Hill Mitigation Project (Project), a full-delivery stream and buffer mitigation project for the Division of Mitigation Services (DMS) (DMS #100094). This buffer component of the Project is designed to provide riparian buffer mitigation credits for unavoidable impacts due to development within the Neuse River Basin, United States Geological Survey (USGS) 8-digit Cataloguing Unit 03020201 (Neuse 01) (**Figure 1**). This Buffer Project provides mitigation in accordance with the Consolidated Buffer Mitigation Rule 15A NCAC 02B .0295 and Nutrient Offset Credit Trading Rule 15A NCAC 02B .0703. The Strawberry Hill Project also entails a stream mitigation component, generating stream mitigation credits through stream restoration. As-built and baseline conditions pertaining to the stream mitigation component of this Project will be provided in a separate baseline monitoring report.

The conservation easement of the Strawberry Hill Project totals 22.12 acres and includes two unnamed tributaries and three ditches that drain into Polecat Branch and eventually the Neuse River. Previous land use within the Project was primarily crop production and disturbed riparian forest. The Project area was used extensively for agricultural and forestry purposes for over 80 years. Land use adjacent to and surrounding the Project is either crop production or forest regeneration. Water quality stressors affecting the Project include pollution from crop production and lack of forested riparian buffer. Previous buffer conditions demonstrated significant degradation with the loss of stabilizing vegetation because of continued crop production and recent clear cut of adjacent riparian forest.

The goal of the buffer component of the Project is to restore and preserve ecological function to the existing streams and their associated riparian buffer areas by establishing appropriate plant communities while minimizing temporal and land disturbing impacts. Buffer and surrounding riparian area improvements will filter runoff from agricultural fields, thereby reducing nutrient and sediment loads to Project channels and provide water quality benefit to the overall watershed. Project attributes are summarized in **Table 1**.

1.2 Monitoring Protocol and Project Success Criteria

Annual vegetation monitoring and visual assessments will be conducted. Riparian vegetation monitoring is based on the "Carolina Vegetation Survey-Ecosystem Enhancement Program Protocol for Recording Vegetation: Level 2 Plot Sampling Only Version 4.2". Monitoring plots were installed a minimum of 100 meters squared in size and cover at least two percent of the planted mitigation area. These plots were randomly placed throughout the planted riparian buffer mitigation area (15.13 acres) and are representative of the riparian restoration conditions. The following data is recorded for all trees in the plots: species, height, planting date (or volunteer), and grid location. All stems in plots are flagged with flagging tape. Data is processed using the CVS data entry tool. In the field, the four corners of each plot were permanently marked with PVC at the origin and metal conduit at the other corners. Photos of each plot are to be taken from the origin each monitoring year. There are 13 fixed vegetation monitoring plots (**Figure 2**).

Photos are to be taken at all vegetation plot origins each monitoring year and be provided in the annual reports. Visual inspections and photos will be taken to ensure that areas are being maintained and compliant. The measures of vegetative success for the Project are the survival of at least four native hardwood tree species, where no one species is greater than 50 percent of stems, at a density of at least 260 stems per acre at the end of Year 5. Native volunteer species may be included to meet the performance standards as determined by NC Division of Water Resources (DWR).

A visual assessment of the conservation easement is also performed each year to confirm:

- Easement boundary markers/signage are in good condition throughout the site;
- No encroachment has occurred;
- No invasive species in areas were invasive species were treated,
- Diffuse flow is being maintained in the conservation easement areas; and
- There has not been any cutting, clearing, filling, grading, or similar activities that would negatively affect the functioning of the buffer.

Component/ Feature	Monitoring	Maintenance through project close-out
Vegetation	Annual vegetation monitoring	Vegetation shall be maintained to ensure the health and vigor of the targeted plant community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be treated by mechanical and/or chemical methods. Any vegetation requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations. Vegetation maintenance activities will be documented and reported in annual monitoring reports. Vegetation maintenance will continue through the monitoring period.
Invasive and Nuisance Vegetation	Visual Assessment	Invasive and noxious species will be monitored and treated so that none become dominant or alter the desired community structure of the Project. Locations of invasive and nuisance vegetation will be mapped.
Project Boundary	Visual Assessment	Project boundaries shall be identified in the field to ensure clear distinction between the mitigation project and adjacent properties. Boundaries are marked with signs identifying the property as a mitigation project and will include the name of the long-term steward and a contact number. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by Project conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as-needed basis. Easement monitoring and staking/ signage maintenance will continue in perpetuity as a stewardship activity.
Road Crossing	Visual Assessment	Road crossings within the Project may be maintained only as allowed by conservation easement or existing easement, deed restrictions, rights of way, or corridor agreements. Crossings in easement breaks are the responsibility of the landowner to maintain.

1.3 Project Components

This Project generates 642,298.475 riparian buffer restoration credits on pre-existing non-forested land, and 8,091.309 buffer preservation credits. The total area of riparian preservation is less than 25 percent of the total area of riparian buffer mitigation in accordance with 15A NCAC 02B .0295 (o)(5). The total riparian buffer mitigation credits that the Strawberry Hill Mitigation Project generate are summarized below, but the detailed Project credit breakdown, including buffer credits that are convertible to nutrient offset credit, utilizing the DWR "Project Credit Table Template (Updated February 2022)," is provided in **Table 1; Appendix A**.

Mitigation Totals	Area Square Feet	Credits
Restoration	652,991	642,070.977
Preservation	81,431	8,091.309
Total Riparian Buffer	**734,422**	**650,162.286**

1.4 Riparian Mitigation Approach

The buffer mitigation is in accordance with the Consolidated Buffer Mitigation Rule 15A NCAC 02B .0295 and Nutrient Offset Credit Trading Rule 15A NCAC 02B .0703. In addition to traditional riparian restoration, the Project also incorporates the alternative buffer mitigation options: Preservation of Buffers on Subject Streams, as outlined in 15A NCAC 02B .0295 (o) (5), and Restoration and Enhancement of Ditches, as outlined in 15A NCAC 02B .0295 (o) (8).

Riparian restoration along the Project streams and ditches is accomplished through the planting, establishment, and protection of a hardwood forest community. Restoration activities included planting a composition of native bare-root tree species along streams and ditches based on reference data. The result will be a riparian area that functions to mitigate nutrient and sediment inputs from the surrounding uplands.

Preservation occurs in some areas along Reach JH1-A and JH1-B. Some of these preservation areas were associated with stream restoration under the stream mitigation component of the Project; therefore, some of the areas were cleared during construction of the new stream corridor. However, these impacted areas were planted under the same criteria as restoration areas.

1.5 Construction and As-Built Conditions

Restoration activities included planting a composition of native bare-root tree species in riparian areas along streams and ditches. The target community type is Coastal Plain Small Stream Swamp (Schafale 2012). There were two planting zones: Zone 1 encompassed the northern easement section where more wet-tolerant tree species were prioritized due to a wetter riparian area, and Zone 2 encompassed the southern easement section where it is drier and wet-tolerant species were not prioritized. Furthermore, bald cypress (*Taxodium distichum*) was only planted in Zone 1 and not in Zone 2. There were no deviations from the originally proposed planting plan. A list of the planted species can be found in **Table 5**. Wherever possible, mature trees were preserved and incorporated into the riparian area. Specifically, some high-quality tree species were found within the cutover areas that were timbered over 8 years ago, so these species were left in place where feasible.

Preparation at the Project involved treating exotic invasive species, clearing undesirable scrub-shrub vegetation, contoured ripping in select areas, seeding, and planting. Other activities included stream restoration, culvert removal, debris removal, irrigation piping removal, demolition of building structures, and local livestaking. Four culverts were removed in the southern easement section: three along reach JH2 and one at the transition of JH3 to JH5. One of the culverts removed along JH2 was not originally planned in the approved mitigation plan, but upon construction preparation, a non-functioning, buried culvert was discovered along the left bank of JH2. There is a lateral drainageway along an adjacent field edge that terminated abruptly before JH2, but then the buried culvert was identified in the field which had likely conveyed water into JH2 historically. Therefore, it was decided to remove the buried culvert from the Project easement and stabilize the resulting drainage feature. Consequently, this feature could convey concentrated flow into the Project riparian buffer area; therefore, a credit deduction was preemptively incurred. Upon removal of all culverts, the banks were graded to match the existing channel dimensions and stabilized. Debris was removed throughout the Project, including brick and concrete piles. Along reaches JH2, JH3, and JH4, exposed, abandoned irrigation piping was removed from buffer restoration areas and disposed of off-site. Along reach JH3, old chicken house structures were demolished, and the debris materials were stockpiled away from the conservation easement for future disposal to be conducted by the landowner. Livestakes were planted on stream and ditch banks where stability was compromised, such as identified areas of erosion and banks where culverts and irrigation pipe were removed.

1.6 Baseline Monitoring Performance

Establishment and monitoring of 13 fixed vegetation plots was completed on March 15th, 2022. Vegetation tables are in **Appendix B** and associated photos are in **Appendix C**. MY0 monitoring data indicates that all plots are exceeding the interim success criteria of 320 planted stems per acre. Planted stem densities ranged from 526 to 971 planted stems per acre with a mean of 753 planted stems per acre across all plots. A total of 12 species were documented within the plots. Volunteer species were not noted at baseline monitoring but are expected to establish in upcoming years. The average tree height observed was 1.5 feet.

Visual assessment of vegetation outside of the monitoring plots indicates that the herbaceous vegetation is becoming well established throughout the project and no invasive species were observed. Easement boundary markers and signs are clearly visible and in good condition. Additionally, there were no signs of encroachment or undocumented concentrated flow in the easement area.

2 Reference

Lee Michael T., Peet Robert K., Roberts Steven D., and Wentworth Thomas R., 2008. *CVS-EEP Protocol for Recording Vegetation Level*. Version 4.2

NC Environmental Management Commission. 2014. Rule 15A NCAC 02B.0295 - Mitigation Program Requirements for the Protection and Maintenance of Riparian Buffers.

NC Environmental Management Commission. 2020. Rule 15A NCAC 02B.0714 – Neuse River Basin: Nutrient Sensitive Waters Management Strategy: Protection and Maintenance of Existing Riparian Buffers.

Resource Environmental Solutions, LLC (2020). Strawberry Hill Mitigation Project – Final Mitigation Plan – Appendix A – Final Buffer Mitigation Plan.

Schafale, M.P. 2012. Classification of the Natural Communities of North Carolina, Fourth Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, NCDENR, Raleigh, NC.

Appendix A

Project Background Tables and Site Maps

Table 1. Strawberry Hill, DMS# 100094, Project Credits

Neuse 03020201 - Outside Falls Lake	**Project Area**
19.16394	**N Credit Conversion Ratio (ft²/pound)**
N/A	**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	0-100	Cropland (JH1, JH5)	370,703	370,703	1	100%	1.00000	Yes	370,703.000	Yes	19,343.778	—
Buffer	Rural	Yes	I / P	Restoration	0-100	Timberland (JH1)	122,409	122,409	1	100%	1.00000	Yes	122,409.000	No	—	—
Buffer	Rural	Yes	I / P	Restoration	101-200	Cropland (JH1, JH5)	9,149	9,149	1	33%	3.03030	Yes	3,019.173	Yes	477.407	—
Buffer	Rural	Yes	I / P	Restoration	101-200	Timberland (JH1)	6,810	6,810	1	33%	3.03030	Yes	2,247.302	No	—	—
Buffer	Rural	No	Ditch	Restoration	0-50	JH2, JH3, JH4	136,211	136,211	1	100%	1.00000	Yes	136,211.000	Yes	7,107.672	—
Buffer	Rural	No	Ditch	Restoration	0-50	Segment Less than 50' (JH2)	6,799	6,799	1	100%	1.00000	Yes	6,799.000	No	—	—
Buffer	Rural	No	Ditch	Restoration	0-100	Non-diffused Flow Deductions (JH1, JH2, JH4)	16,303	0	1	100%		No	—	No	—	—
Buffer	Rural	Yes	I / P	Restoration	20-29	Segment Less than 30' (JH1)	910	910	1	75%	1.33333	Yes	682.502	No	—	—
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							Totals (ft2):	**669,294**	**652,991**					**642,070.977**		**26,928.857**	**0.000**
							Total Buffer (ft2):	**669,294**	**652,991**								
							Total Nutrient Offset (ft2):	**0**	**N/A**								

Total Ephemeral Area (ft²) for Credit:	**0**	**0**	
Total Eligible Ephemeral Area (ft²):	**187,681**	**0.0%**	**Ephemeral Reaches as % TABM**
Total Eligible for Preservation (ft²):	**223,098**	**9.1%**	**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 (ft²)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits
	Rural	Yes	I / P		0-100	JH1, JH5	80,658	80,658	10	100%	10.00000	8,065.800
	Rural	Yes	I / P		101-200	JH1, JH5	773	773	10	33%	30.30303	25.509
												—
												—
												—
						Preservation Area Subtotals (ft²):	**81,431**	**81,431**				

TOTAL AREA OF BUFFER MITIGATION (TABM)			
Mitigation Totals		**Square Feet**	**Credits**
Restoration:		652,991	642,070.977
Enhancement:		0	0.000
Preservation:		81,431	8,091.309
Total Riparian Buffer:		734,422	650,162.286
TOTAL NUTRIENT OFFSET MITIGATION			
Mitigation Totals		**Square Feet**	**Credits**
Nutrient Offset:	**Nitrogen:**	0	0.000
	Phosphorus:		0.000

5ivision [illegible], where viable, in accordance with this table.

Credit conversions must be calculated using the guidance provided in the Clarified Procedures for Calculating Buffer Mitigation Credits and Nutrient Offset Credits letter issued by the DWR in November 2019.

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 2: Summary: Goals, Performance and Results

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Restore and preserve native floodplain and streambank vegetation.	Established and increased forested riparian buffers to 50 feet and greater along both sides of the channel along the project reaches with a hardwood riparian plant community;	Reduction in floodplain sediment inputs from runoff, increased bank stability, increased LWD and organic material in streams, increased	Survival of at least four native hardwood tree species, where no one species is greater than 50 percent of stems, at a density of at least 260 stems per acre at the end of Year 5.	13 fixed vegetation plots	N/A

Table 3. Project Attributes			
Project Name		Strawberry Hill Mitigation Project	
County		Johnston	
Project Area (acres)		22.12	
Project Coordinates (latitude and longitude)		35.469579, -78.323896	
Planted Acreage (Acres of Woody Stems Planted)		19.73	
Project Watershed Summary Information			
Physiographic Province		65m - Rolling Coastal Plain	
River Basin		Neuse	
USGS Hydrologic Unit 8-digit	03020201	USGS Hydrologic Unit 14-digit	03020201140010
DWR Sub-basin		03-04-02	
Project Drainage Area (Acres and Square Miles)		383 ac (0.60 mi^2)	
Project Drainage Area Percentage of Impervious Area		2%	
CGIA Land Use Classification		Bottomland Forest, Cultivated, Evergreen Shrubland, Southern Yellow Pine, Unconsolidated Sediment	

Table 4. Project Timeline and Contacts

Activity or Deliverable	Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted	NA	Dec-20
Mitigation Plan Approved	NA	Nov-20
Construction (Grading) Completed	NA	20-Jan-22
Planting Completed	NA	07-Mar-22
As-built Survey Completed	NA	May-22
MY-0 Baseline Report	Mar-22	May-22
MY1+ Monitoring Reports		
Remediation Items (e.g. beaver removal, supplements, repairs etc.)		
Encroachment		

Strawberry Hill #100094	
Provider	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612
Mitigation Provider POC	Jamey Mceachran (919) 623-9889
Designer	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612
Primary project design POC	Ben Carroll, PE (336) 514-0927
Construction Contractor	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612
Construction contractor POC	Jacy Kirkpatrick

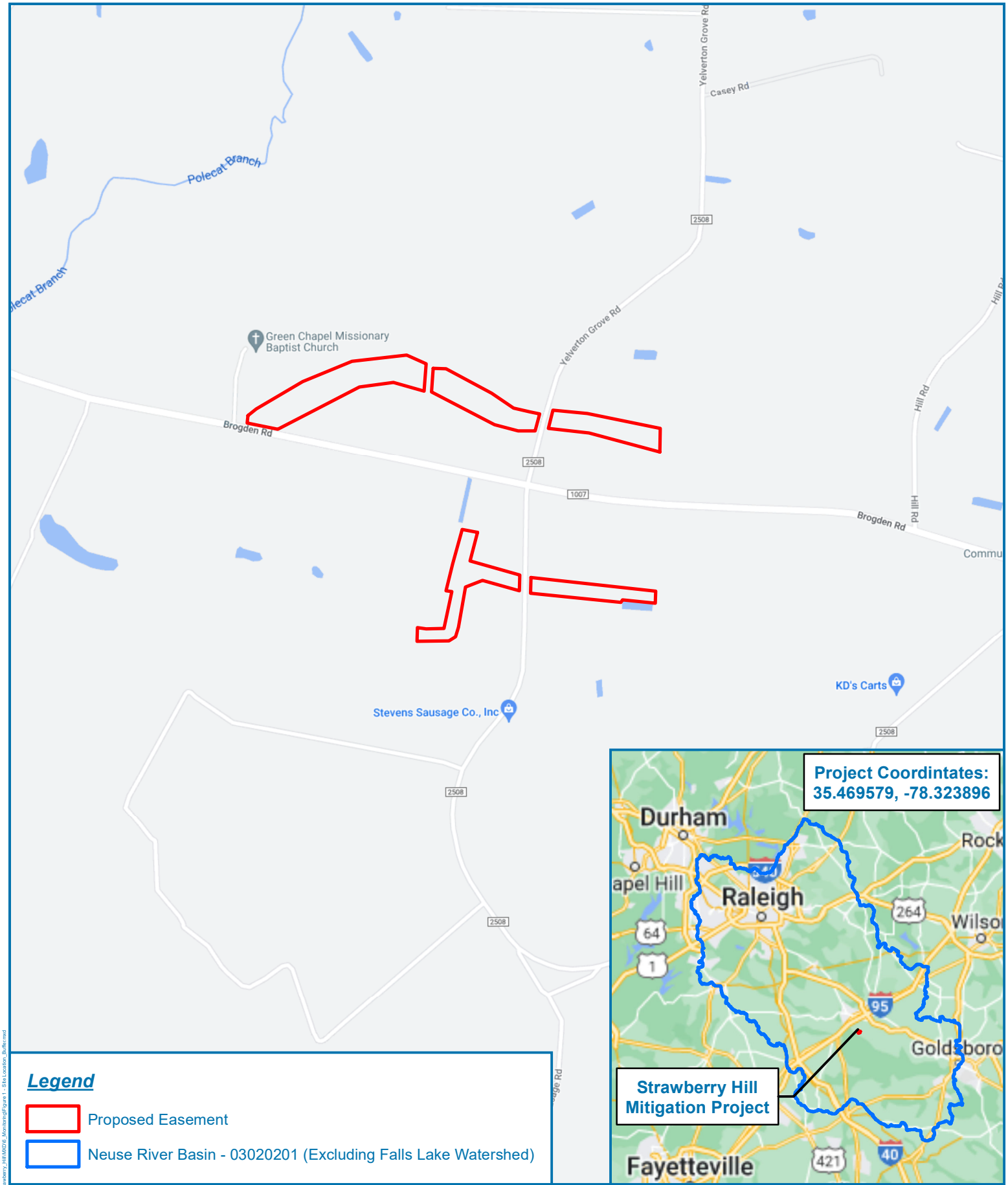


Figure 1 - Site Location

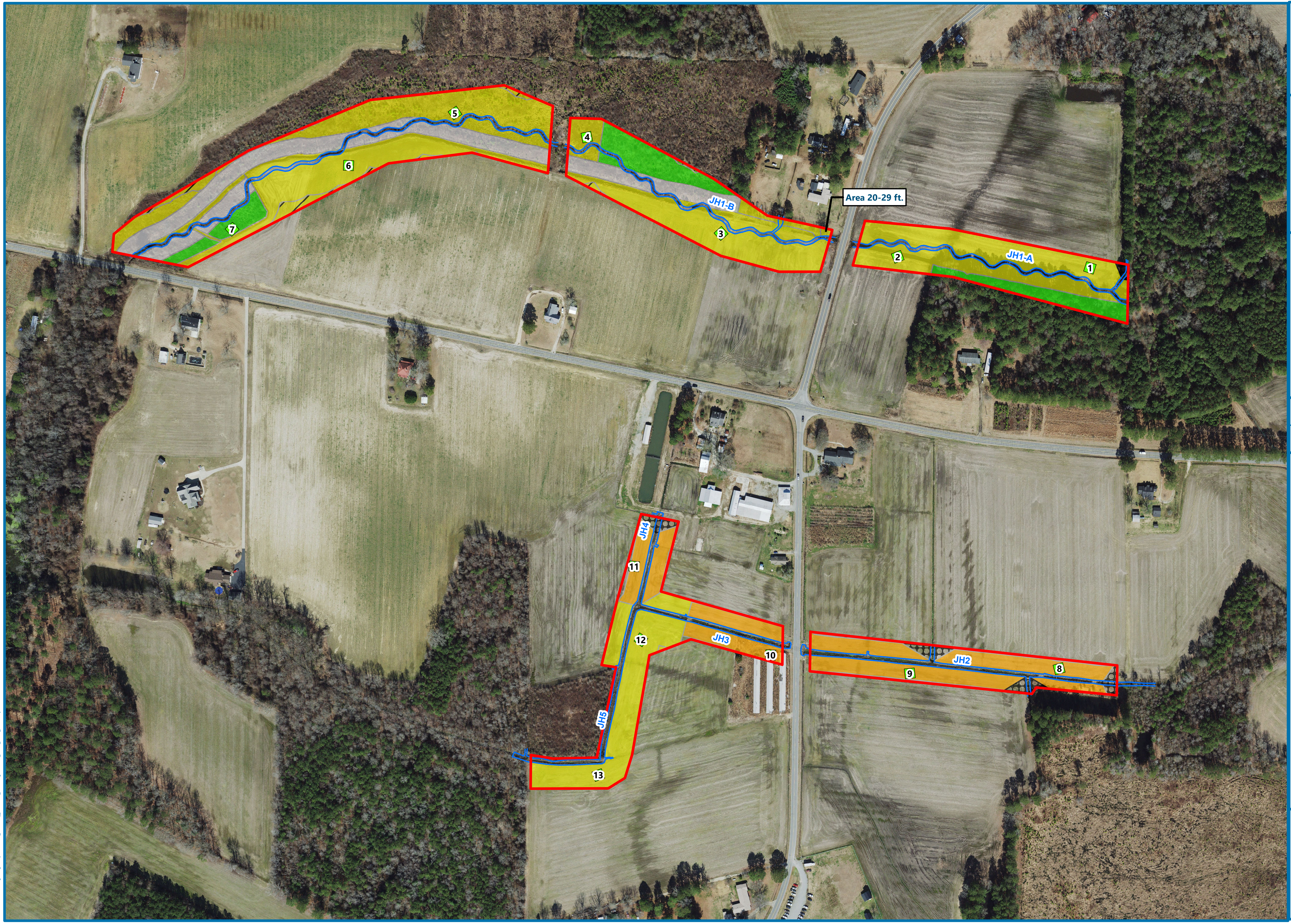
Strawberry Hill Mitigation Project

Johnston County, North Carolina

Date:	3/24/2022
Drawn by:	MDD
Checked by:	JRM
	1 inch = 1,000 feet

res

Document Path: R:\Resilience\projects\101038_Strawberry_Hill\MXD\6_Monitoring\Figure 1 - Site Location_Buffer.mxd



N
W E
S

0 150 300
Feet

Figure 2

Current Conditions Plan View
Riparian Buffer Mitigation

MY0 2022

Strawberry Hill Mitigation Project

Johnston County, North Carolina

Date: 7/8/2022	Drawn by: MDD
Checked by: JRM	1 in = 300 feet

Legend

- Recorded Easement (22.12 ac)

Vegetation Plot

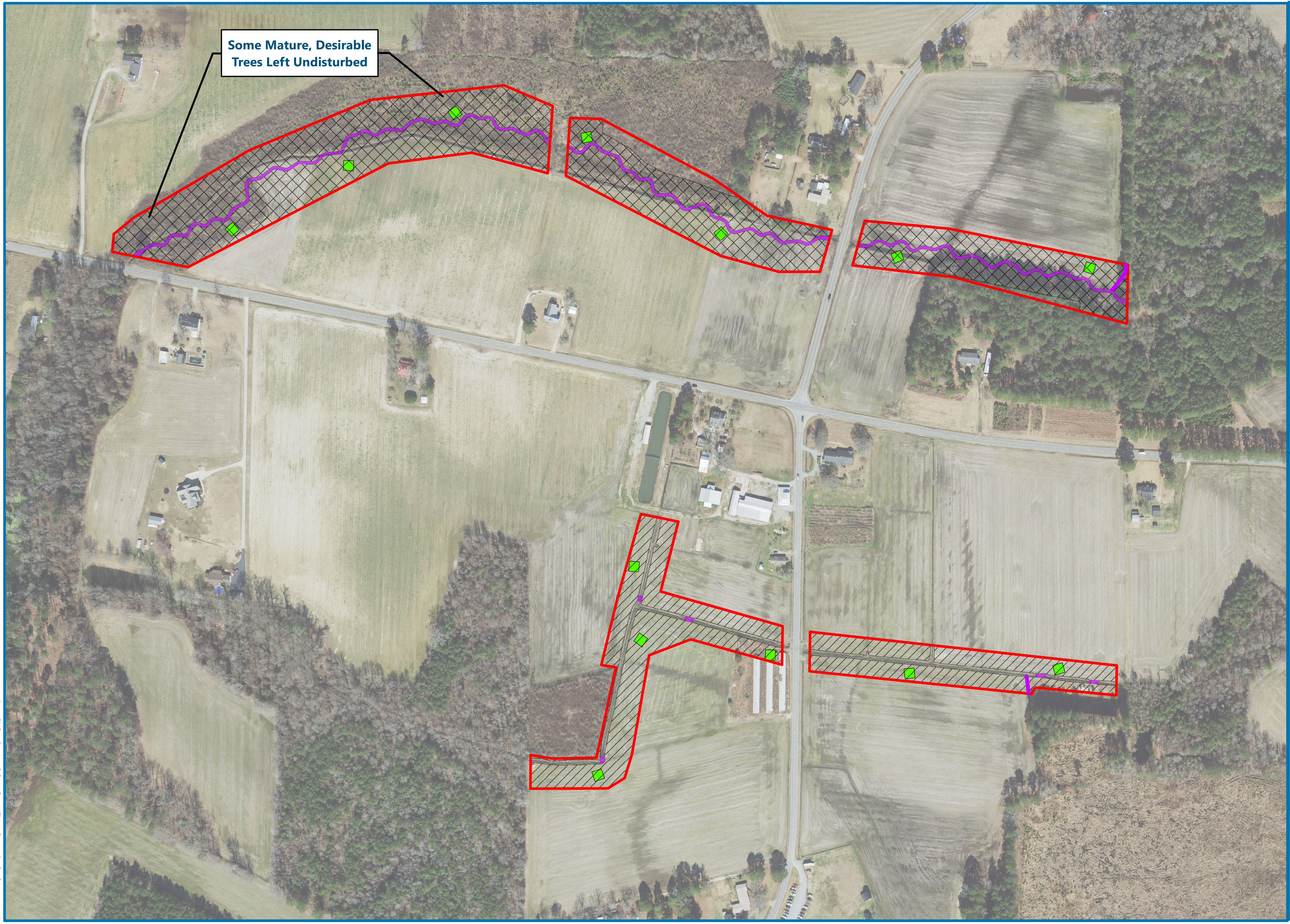
- >320 stems/acre

Riparian Buffer Mitigation Approach

- Riparian Restoration, 0-100'
- Riparian Restoration, 101-200'
- Riparian Restoration (Ditch), 0-50'
- Riparian Preservation, 0-100'
- Riparian Preservation, 101-200'
- Non-diffuse Flow Deduction
- Area Not Viable for Credit
- Surveyed Top of Bank

Vegetation Condition Assessment

Invasive Species	Target Community: Present	Target Community: Marginal	Target Community: Absent
Absent	No Fill		
Present			



N
W E
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0 150 300
Feet

Figure 3

As-Built Planting Map

MY0 2022

Strawberry Hill Mitigation Project

Johnston County, North Carolina

Date: 5/18/2022	Drawn by: MDD
Checked by: JRM	1 in = 300 feet

Legend

Recorded Easement (22.12 ac)

Planted Area

- Zone 1
- Zone 2
- Livestake Zone

Vegetation Plot

- >320 stems/acre

Vegetation Condition Assessment

Invasive Species	Target Community: Present	Target Community: Marginal	Target Community: Absent
Absent	No Fill		
Present			

STRAWBERRY HILL MITIGATION PROJECT

PROJECT LOCATION: 35.469170°, -78.312918°
JOHNSTON COUNTY, NORTH CAROLINA

NEUSE RIVER BASIN: HUC 030202201
MAY 2022

Total Area of Buffer Mitigation		
Mitigation Totals	**Zones**	**Square Feet**
Restoration (Ditch)	0-50	143,010
Restoration	0-100	494,022
Restoration	101-200	15,959
Preservation	0-100	80,658
Preservation	101-200	773

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612

BUFFER AREA LEGEND

- RESTORATION (DITCH ZONE 0-50)
- RESTORATION (ZONE 0-100)
- RESTORATION (ZONE 101-200)
- PRESERVATION (ZONE 0-100)
- PRESERVATION (ZONE 101-200)

SITE MAP
NTS

THE PURPOSE OF THIS SURVEY IS TO SHOW THE BUFFER ZONES ON THE STRAWBERRY HILL MITIGATION SITE. NO PROPERTY BOUNDARY LINES OR CONSERVATION EASEMENT BOUNDARY LINES WERE SURVEYED AT THIS TIME.

PROJECT DIRECTORY

OWNER:
JEREMIAH DOW
NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
217 WEST JONES ST., SUITE 3000A
RALEIGH, NC 27603

DESIGNED & CONSTRUCTED BY:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612

AS-BUILT SURVEY BY:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612

DMS PROJECT #: 100094
CONTRACT #: 7745
USACE ACTION ID #: SAW-2019-00124
RFP #: 16-007576
DWR #: 20190159

AS-BUILT TOPOGRAPHY AND PLANIMETRICS SURVEY WAS PROVIDED BY RESOURCE ENVIRONMENTAL SOLUTIONS, LLC (BRIAN S. HOCKETT, NC PLS L-5165), DATED OCTOBER 27, 2021 - MARCH 29, 2022

FILE NAME:R:\Resad\Projects\101038-Strawberry Hill\ABRL\101038_AB_BPDP Buffer Zones Map_5_17_22.dwg SAVED BY: Bhockett

res
3600 Glenwood Ave, Suite 100
Raleigh, NC 27612
Main: 919.829.9909
www.res.us

Engineering Services Provided By:
RES Environmental Operating Company, LLC
License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN S. HOCKETT

PLOT DATE:

REVISIONS:

RELEASED FOR:
BUFFER AREAS AS-BUILT DRAWING

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

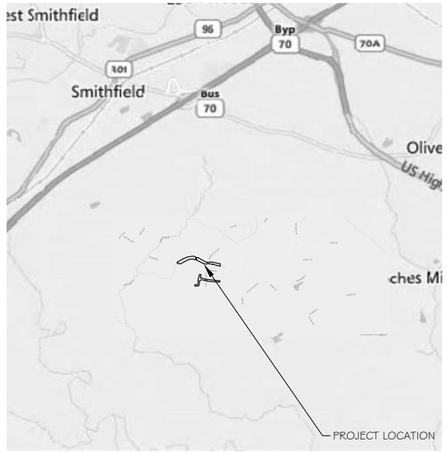
SHEET NUMBER:

STRAWBERRY HILL MITIGATION PROJECT

PROJECT LOCATION: 35.469170°, -78.312918°
JOHNSTON COUNTY, NORTH CAROLINA

NEUSE RIVER BASIN: HUC 030202201
MAY 2022

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612



VICINITY MAP
NTS

PROJECT DIRECTORY

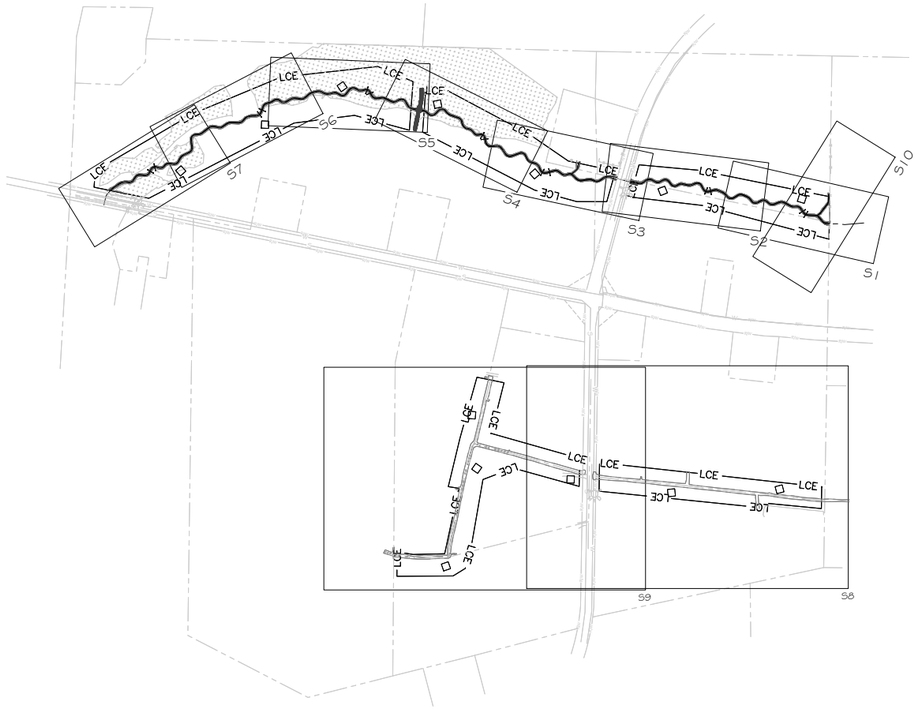
OWNER:
JEREMIAH DOW
NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
217 WEST JONES ST., SUITE 3000A
RALEIGH, NC 27603

DESIGNED & CONSTRUCTED BY:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612

AS-BUILT SURVEY BY:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612

DMS PROJECT #: 100094
CONTRACT #: 7745
USACE ACTION ID #: SAW-2019-00124
RFP #: 16-007576
DWR #: 20190159

STRAWBERRY HILL MITIGATION SITE AS-BUILT SURVEY SEALED BY BRIAN S. HOCKETT, PLS (L-5165) ON MAY 13, 2022.



SITE MAP
NTS

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Sheet Number	Sheet Title
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M1	MAINTENANCE COMPLETED
M2	MAINTENANCE COMPLETED

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License: F-1428

SEAL

PLOT DATE:

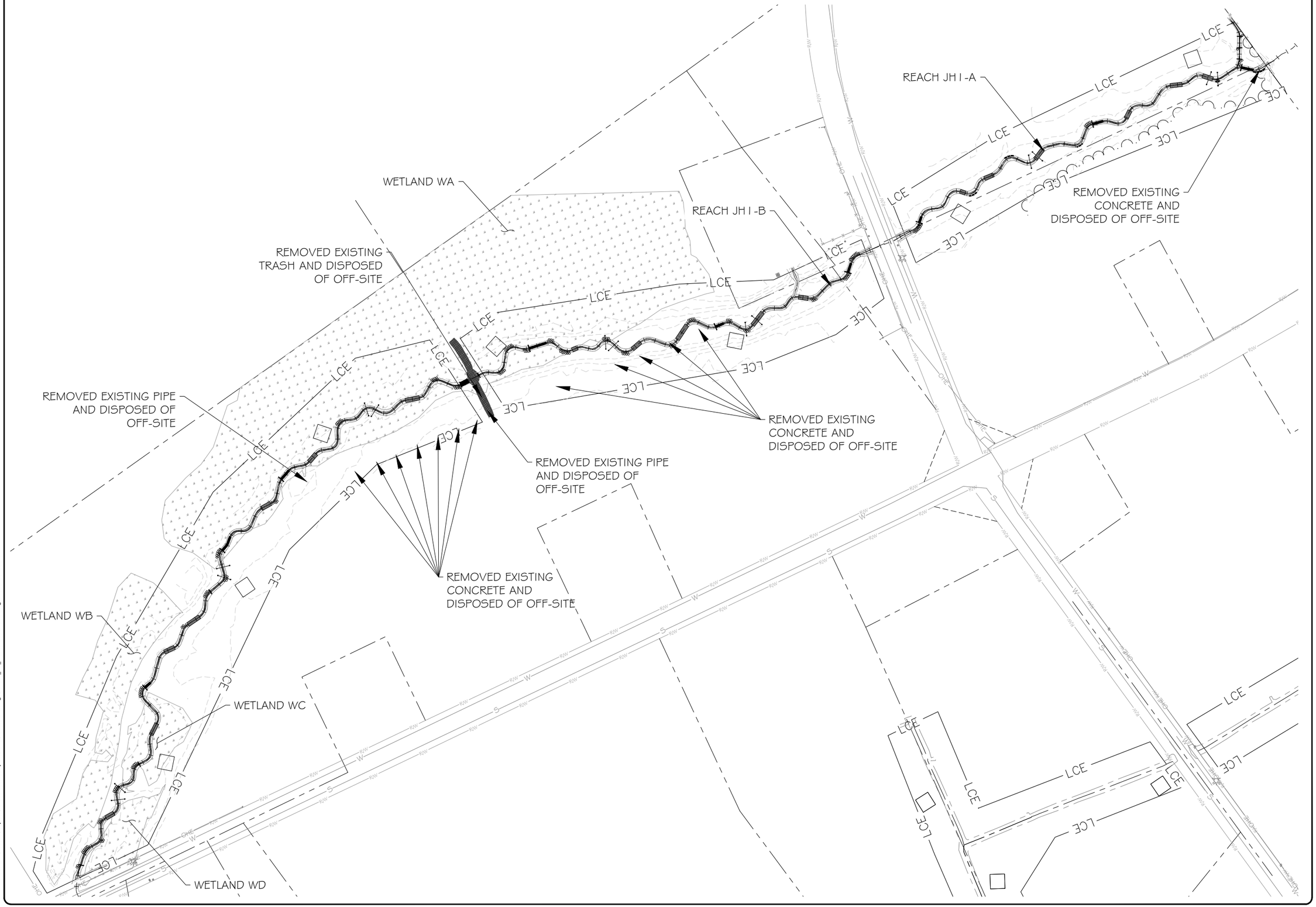
REVISIONS:

RELEASED FOR:
RECORD DRAWINGS

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER:

FILE NAME:R:\Resca\Projects\101038-Strawberry Hill\ABRL\Record Drawings\101038_RD_Cover.dwg SAVED BY: Tswartzfager



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Engineering Services Provided By:
RES Environmental Operating Company, LLC
License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENTON R. CARROLL

FULL SCALE: 1"=100

0 100 200

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
5/23/2022

REVISIONS:

RELEASED FOR:
RECORD DRAWINGS

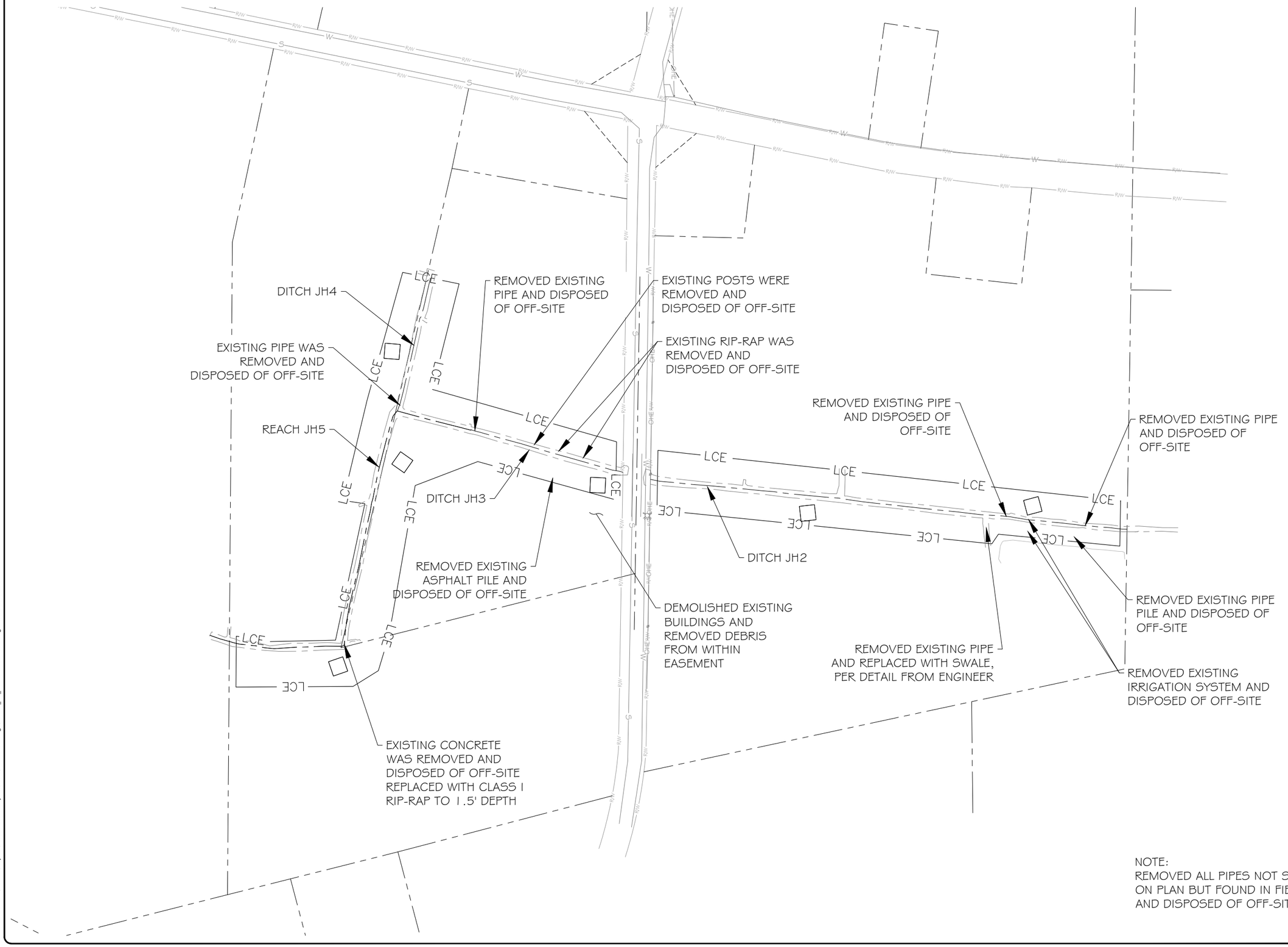
PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
MAINTENANCE COMPLETED

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER:

M1



NOTE:
REMOVED ALL PIPES NOT SHOWN ON PLAN BUT FOUND IN FIELD AND DISPOSED OF OFF-SITE

FILE NAME:R:\Resad\Projects\101038 Strawberry Hill\ABRL\Record Drawings\101038_RD_Maintenace Sheets.dwg SAVED BY: Bcarroll

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Engineering Services Provided By:
RES Environmental Operating Company, LLC
License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENTON R. CARROLL II 5/23/22

FULL SCALE: 1"=100

0 100 200

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
5/23/2022

REVISIONS:

RELEASED FOR:
RECORD DRAWINGS

PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
MAINTENANCE COMPLETED

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER:

M2

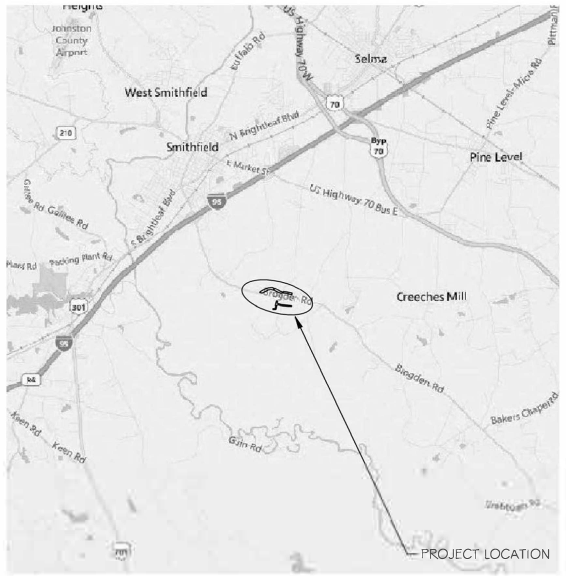
STRAWBERRY HILL MITIGATION PROJECT

PROJECT LOCATION: 35.469170°, -78.312918°
JOHNSTON COUNTY, NORTH CAROLINA

NEUSE RIVER BASIN: HUC 03020201
AUGUST 2021

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612

FOR NCDEQ DIVISION OF MITIGATION SERVICES



VICINITY MAP
NTS

Know what's below.
Call before you dig

NOTICE TO CONTRACTOR

PRIOR TO CONSTRUCTION, DIGGING, OR EXCAVATION THE CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES (PUBLIC OR PRIVATE) THAT MAY EXIST AND CROSS THROUGH THE AREA(S) OF CONSTRUCTION, WHETHER INDICATED ON THE PLANS OR NOT. CALL "811" A MINIMUM OF 72 HOURS PRIOR TO DIGGING OR EXCAVATING. REPAIRS TO ANY UTILITY DAMAGED RESULTING FROM CONSTRUCTION ACTIVITIES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

PROJECT DIRECTORY

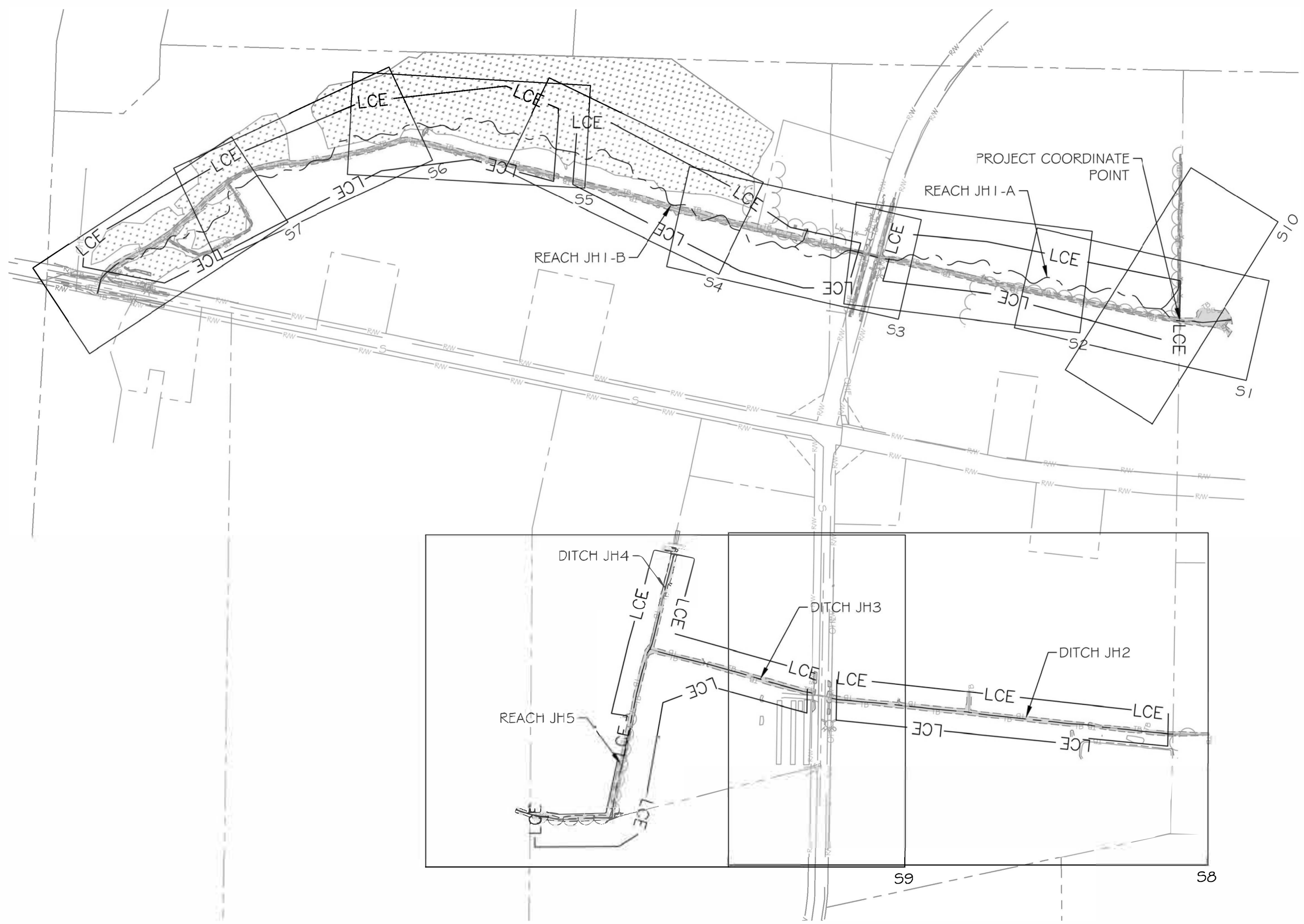
DESIGNED BY:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
3600 GLENWOOD AVE., SUITE 100
RALEIGH, NC 27612

DESIGNED FOR:
JEREMIAH DOW
NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
217 WEST JONES ST., SUITE 3000A
RALEIGH, NC 27603

SURVEYED BY:
WSP USA, INC.
128 TALBERT ROAD
SUITE A
MOORESVILLE, NC 28117

DMS PROJECT #: 100094
CONTRACT #: 7745
USACE ACTION ID #: SAW-2019-00124
RFP #: 16-007576
DWR #: 20190159

PROJECT TOPOGRAPHY AND EXISTING CONDITIONS PLANIMETRICS SURVEY WAS PROVIDED BY WSP USA, INC. (NC FIRM LICENSE NUMBER F-0891, CHRISTOPHER A. MELKE, NC PLS L-5021), DATED MARCH 18, 2020



SITE MAP
NTS

Sheet List Table	
Sheet Number	Sheet Title
--	COVER
EC2	EROSION CONTROL

res
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www.res.us

Engineering Services Provided By:
RES Environmental Operating Company, LLC
License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENTON R. CARROLL

PLOT DATE: 4/20/2021

REVISIONS:

RELEASED FOR: FINAL RELEASED FOR CONSTRUCTION

PROJECT NUMBER:	0674
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	SCF
CHECKED:	AFM

SHEET NUMBER:

FILE NAME:R:\Rescad\Projects\101038-Strawberry Hill\DWG\0674_SHT_COVER.dwg SAVED BY: Bcarroll

WETLAND WA

WETLAND WB

WETLAND WC

WETLAND WD

REACH JH1

REACH JH5

DITCH JH4

DITCH JH3

DITCH JH2

PROPOSED 30 LF OF 18" HDPE

PROPOSED 30 LF OF 18" HDPE

PROPOSED 20 LF OF 18" HDPE

PERMIT BOX & RAIN GAUGE

BROGDEN ROAD - SR 1007

STEVENS SAUSAGE ROAD - SR 2508

LEGEND

- LIMITS OF DISTURBANCE — LOD
- PROPOSED CONSERVATION EASEMENT — LCE
- PROPOSED LIMITS OF GRADING
- EXISTING CONTOUR MAJOR — 50
- EXISTING CONTOUR MINOR
- PROPOSED TOP OF BANK
- SILT FENCE
- SILT FENCE W/ OUTLET
- PROPOSED PUMP AROUND LOCATION
- STAGING/STOCKPILE AREA
- CONSTRUCTION ENTRANCE
- HAUL ROAD
- PROPOSED CULVERT

TOTAL AREA OF DISTURBANCE: 20.97 ACRES
TOTAL AREA OF CONSERVATION EASEMENT: 22.12 ACRES
(AREAS CALCULATE) IN AUTODESK AUTOCAD CIVIL 3D)

FILE NAME:R:\Resca\Projects\101038-Strawberry Hill\DWG\0674_SHT_ESC.dwg SAVED BY: Staaking

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Engineering Services Provided By:
RES Environmental Operating Company, LLC
License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 8/21/21 ENGINEER BENTON R. CARROLL II

FULL SCALE: 1"= 150

0 150 300

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 8/20/2021

REVISIONS:

RELEASED FOR: FINAL RELEASED FOR CONSTRUCTION

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: EROSION CONTROL

PROJECT NUMBER:	0674
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	SCF
CHECKED:	AFM

SHEET NUMBER:

EC2

Appendix B

Vegetation Assessment Data

Table 5. Strawberry Hill Riparian Buffer Planted Species Summary

Common Name	Species	% Zone 1	% Zone 2	Total Planted Amount
River birch	*Betula nigra*	10	10	1,600
Buttonbush	*Cephalanthus occidentalis*	5	5	800
Yellow poplar	*Liriodendron tulipifera*	10	10	1,600
Wax Myrtle	*Morella cerifera*	5	10	1,000
Swamp tupelo	*Nyssa biflora*	5	5	800
American sycamore	*Platanus occidentalis*	10	10	1,600
Laurel oak	*Quercus laurifolia*	5	10	1,000
Overcup oak	*Quercus lyrata*	10	10	1,600
Swamp chestnut oak	*Quercus michauxii*	10	10	1,600
Water oak	*Quercus nigra*	10	10	1,600
Willow oak	*Quercus phellos*	10	10	1,600
Bald cypress	*Taxodium distichum*	10	0	1,000
			TOTAL	15,800

Table 6. Strawberry Hill Riparian Buffer Vegetation Plot Mitigation Success Summary

Plot #	Planted Stems/Acre	Volunteer Stems/Acre	Total Stems/Acre	Success Criteria Met?	Average Planted Stem Height (ft)
1	850	0	850	Yes	1.6
2	809	0	809	Yes	1.6
3	647	0	647	Yes	1.6
4	769	0	769	Yes	1.7
5	971	0	971	Yes	1.6
6	850	0	850	Yes	1.5
7	809	0	809	Yes	1.3
8	809	0	809	Yes	1.5
9	809	0	809	Yes	1.4
10	809	0	809	Yes	1.4
11	567	0	567	Yes	1.3
12	567	0	567	Yes	1.3
13	526	0	526	Yes	1.9
Project Avg.	**753**	**0**	**753**	**Yes**	**1.5**

Table 7. Strawberry Hill Riparian Buffer Stem Count Total and Planted by Plot Species

Strawberry Hill Riparian Buffer			Current Plot Data (MY0 2022)																																	
			101038-01-0001			101038-01-0002			101038-01-0003			101038-01-0004			101038-01-0005			101038-01-0006			101038-01-0007			101038-01-0008			101038-01-0009			101038-01-0010		
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	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	3	3	3	2	2	2	3	3	3	2	2	2				1	1	1	2	2	2			
Cephalanthus occidentalis	common buttonbush	Shrub				1	1	1	1	1	1										1	1	1				3	3	3	1	1	1
Liriodendron tulipifera	tuliptree	Tree	1	1	1	3	3	3	1	1	1	2	2	2	1	1	1	4	4	4	2	2	2	5	5	5	4	4	4	4	4	4
Morella cerifera	wax myrtle	shrub	2	2	2	1	1	1							2	2	2	4	4	4	6	6	6	1	1	1	1	1	1			
Nyssa biflora	swamp tupelo	Tree	2	2	2	1	1	1	1	1	1							1	1	1				1	1	1	1	1	1	2	2	2
Platanus occidentalis	American sycamore	Tree							2	2	2				4	4	4				2	2	2	4	4	4				5	5	5
Quercus laurifolia	laurel oak	Tree	4	4	4				3	3	3	3	3	3	3	3	3				1	1	1	1	1	1	2	2	2	1	1	1
Quercus lyrata	overcup oak	Tree	2	2	2	1	1	1	1	1	1	1	1	1				2	2	2				4	4	4				3	3	3
Quercus michauxii	swamp chestnut oak	Tree	1	1	1				2	2	2	1	1	1				4	4	4	1	1	1				1	1	1	1	1	1
Quercus nigra	water oak	Tree	5	5	5							1	1	1	4	4	4	2	2	2	1	1	1	2	2	2	2	2	2			
Quercus phellos	willow oak	Tree	1	1	1	3	3	3	2	2	2	5	5	5	7	7	7	1	1	1	2	2	2	1	1	1	4	4	4	3	3	3
Taxodium distichum	bald cypress	Tree	3	3	3	8	8	8				4	4	4				1	1	1	4	4	4									
		Stem count	21	21	21	20	20	20	16	16	16	19	19	19	24	24	24	21	21	21	20	20	20	20	20	20	20	20	20	20	20	20
		size (ares)	1			1			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			0.02			0.02		
		Species count	9	9	9	8	8	8	9	9	9	8	8	8	7	7	7	9	9	9	9	9	9	9	9	9	9	9	9	8	8	8
		Stems per ACRE	850	850	850	809	809	809	647	647	647	769	769	769	971	971	971	850	850	850	809	809	809	809	809	809	809	809	809	809	809	809

Strawberry Hill Riparian Buffer			Current Plot Data (MY0 2022)									Annual Means		
			101038-01-0011			101038-01-0012			101038-01-0013			MY0 (2022)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Betula nigra	river birch	Tree				3	3	3				18	18	18
Cephalanthus occidentalis	common buttonbush	Shrub							2	2	2	9	9	9
Liriodendron tulipifera	tuliptree	Tree	4	4	4	1	1	1	1	1	1	33	33	33
Morella cerifera	wax myrtle	shrub	1	1	1	2	2	2	3	3	3	23	23	23
Nyssa biflora	swamp tupelo	Tree				1	1	1	5	5	5	15	15	15
Platanus occidentalis	American sycamore	Tree				1	1	1				18	18	18
Quercus laurifolia	laurel oak	Tree	4	4	4	2	2	2				24	24	24
Quercus lyrata	overcup oak	Tree	1	1	1	1	1	1				16	16	16
Quercus michauxii	swamp chestnut oak	Tree	1	1	1							12	12	12
Quercus nigra	water oak	Tree	1	1	1	2	2	2				20	20	20
Quercus phellos	willow oak	Tree	2	2	2	1	1	1	2	2	2	34	34	34
Taxodium distichum	bald cypress	Tree										20	20	20
		Stem count	14	14	14	14	14	14	13	13	13	242	242	242
		size (ares)	1			1			1			13		
		size (ACRES)	0.02			0.02			0.02			0.32		
		Species count	7	7	7	9	9	9	5	5	5	12	12	12
		Stems per ACRE	567	567	567	567	567	567	526	526	526	753	753	753

Appendix C

Riparian Buffer
Vegetation Monitoring Plot Photos

Strawberry Hill Riparian Buffer Vegetation Monitoring Plot Photos (MY0)

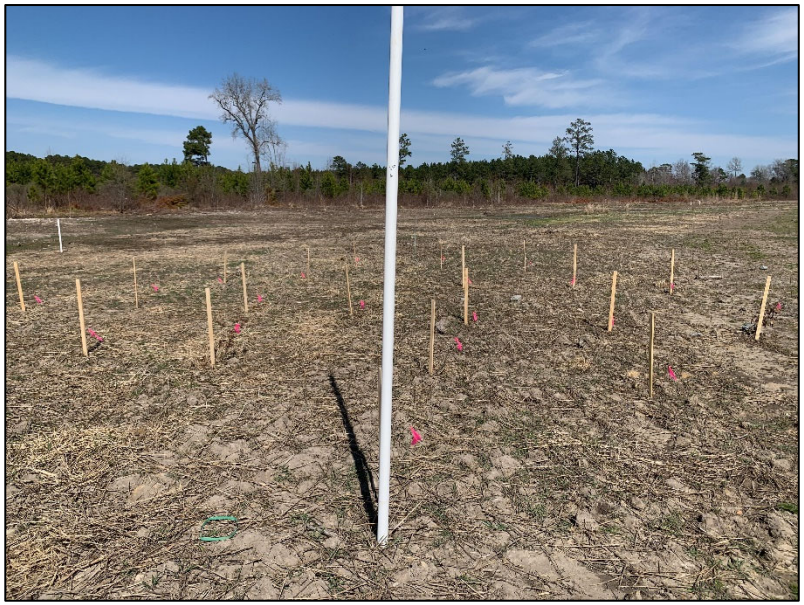
Vegetation Plot 1 (3/15/2022)

Vegetation Plot 2 (3/15/2022)

Vegetation Plot 3 (3/15/2022)

Vegetation Plot 4 (3/15/2022)

Vegetation Plot 5 (3/15/2022)



Vegetation Plot 6 (3/15/2022)

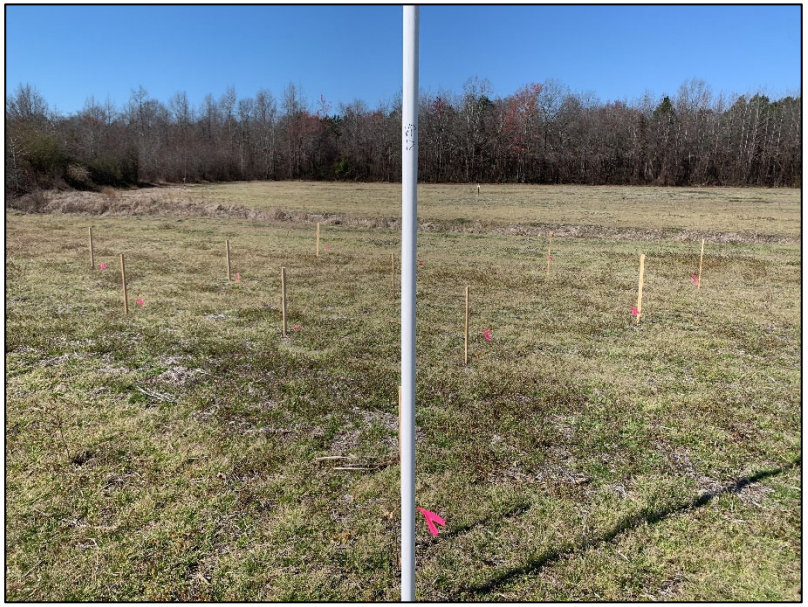
Vegetation Plot 7 (3/15/2022)

Vegetation Plot 8 (3/15/2022)

Vegetation Plot 9 (3/15/2022)

Vegetation Plot 10 (3/15/2022)

Vegetation Plot 11 (3/15/2022)



Vegetation Plot 12 (3/15/2022)

Vegetation Plot 13 (3/15/2022)