

**Moccasin Creek Buffer & Wetland
Restoration, Enhancement &
Preservation
Wake and Franklin Counties
North Carolina**

CU: 03020203

SCO# 040611501

Mitigation Report

May 26, 2006



Prepared for:

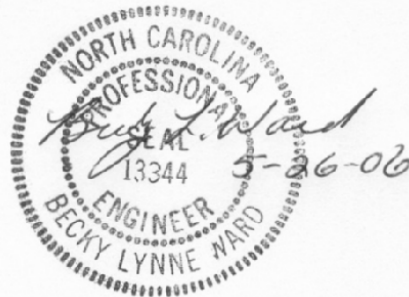
North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
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**Moccasin Creek Buffer & Wetland Restoration,
Enhancement & Preservation
Wake and Franklin Counties
North Carolina**

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Executive Summary

The North Carolina Ecosystem Enhancement Program (EEP) purchased the Moccasin Creek Project Site to preserve, enhance, and restore wetlands and streams. The site is an 84-acre undeveloped tract along Moccasin Creek, located off of North Carolina (NC) Highway 39 between NC Highway 96 and NC Highway 97 and US Highway 64 in Wake and Franklin Counties. Moccasin Creek runs north-south through the property and is the county line. The project site is located in the headwaters of the Neuse River Basin, just upstream of the confluence of Moccasin Creek and Beaverdam creek. The watershed above the confluence is approximately 20.4 square miles, with ninety-five percent of the watershed flowing into Bunn Lake, located approximately 2,500 feet above the project site on Moccasin Creek.

The project site consists of approximately 65 acres of jurisdictional wetlands consisting of bottomland swamp hardwoods in various stages of succession, freshwater marsh, and pine plantation. The wetland area that exists under the fill road will be restored, while the wetland area that exists in the cleared area will be enhanced. The rest of the wetland area will be preserved. There are three named streams, Moccasin Creek, Wolf Creek, and Beaverdam Creek, and three unnamed streams, S1, S2, and S3, located on the property. Moccasin Creek, the main drainage feature, is an E type sand bed perennial stream, with very little incision, that enters the property through the northern property line, travels south to bisect the upper one-third of the property, and then becomes the western property line below Beaverdam Creek. The overall length within the project site is approximately 3,600 linear feet. Moccasin Creek is a riverine system surrounded by a palustrine wetland system.

The project involves 1) wetland restoration, enhancement, and preservation, 2) stream restoration, and 3) riparian buffer restoration and preservation. The objective of the wetland restoration/creation/enhancement portion of the project was to restore the wetlands under the access road, enhance the jurisdictional wetlands in the cleared section, and preserve existing jurisdictional wetlands. The following table displays the approximate areas and lengths of the restoration/enhancement/preservation areas.

Project Restoration/Enhancement/Preservation		
Type	Acres	Linear Feet
Wetland Enhancement	4.93	N/A
Wetland Restoration	0.38	N/A
Wetland Preservation	43.21	N/A
Stream Restoration	N/A	311
Stream Buffer Restoration	2.38	N/A
Stream Buffer Preservation	14.2	N/A

The wetland restoration was accomplished by excavating approximately 860 cubic yards of road fill material, totaling approximately 500 linear feet, to an elevation of 219 feet above mean sea level, the same elevation as the existing wetland area surrounding the road. The wetland enhancement area occurred in the altered fields by restoring natural

forested communities consisting of seedlings of bald cypress, swamp black gum, swamp chestnut oak, and overcup oak in the majority of the cleared area, and river birch, green ash, sycamore, and willow oak in a smaller upland portion in the cleared area. Wetlands preservation occurred in the forested areas.

Stream and buffer restoration were completed in conjunction with vegetation establishment and the removal of the existing culverts and roadway. Stream restoration consisted of restoring the natural channel cross section at five stream locations within the project site. Culverts were removed along with fill material, and the streambed and bank were re-established to match the stable channel conditions directly upstream and downstream of the repair area. Removal of the culverts restored natural channel configurations to sections of Moccasin Creek, Wolf Creek, and unnamed tributaries S1, S2, and S3. Riparian vegetation was established for buffer restoration and preservation on the project site. Buffer restoration occurred on Moccasin Creek, Wolf Creek, in the cleared area surrounding tributary S3 as well as within the existing haul roads on S1 and S2. Areas of Moccasin Creek where a wooded buffer exists were preserved. In addition, buffer preservation occurred along the north side of Beaverdam Creek, and on unnamed tributaries S1 and S2. Vegetation in the wetland areas was restored to reflect historic bottomland swamp hardwood (BSH) species composition and abundance. Plants were established at 6 x 10 foot spacing (726 plants/acre).

Ecological benefits of the restoration include improving the water quality in Moccasin Creek and the Neuse River Basin. This was done by planting riparian and wetland vegetation along the stream banks and in the cleared wetland areas. Riparian vegetation is important for maintaining bank stability and control of bed erosion and can be directly linked to water quality issues. Riparian vegetation also plays a role in increasing biodiversity and serves to provide habitat for native fauna.

The Moccasin Creek Project will be monitored once each year for a period of five (5) years, with the first year monitoring to be completed in April of 2007 by the principal design consultant, Ward Consulting Engineers, P.C. The hydrologic success criteria for the wetland areas will be met if gauge data from the restoration areas indicates that the site is saturated within 12 inches of the soil surface or inundated for a minimum of 8% of the growing season under normal conditions. Hydrologic monitoring data will be collected for a period of five (5) years or until all success criteria are achieved, whichever is longer. The groundwater gauges will be downloaded on a monthly basis to ensure proper functioning and that no prolonged lapses in coverage are experienced. Rainfall data will also be collected monthly to produce a record of the actual rainfall received at the site. The rainfall data will be analyzed to determine if each planting zone, which correspond to different hydrologic zones, is meeting the success criteria as well as compared to the reference wetland ground water data. The success criteria for the preferred species in the restoration areas will be based on annual and cumulative survival and growth over five (5) years. Survival of preferred species must be at a minimum 320 stems/ac at the end of five (5) years of monitoring. Height growth must average six (6) feet. Species composition will be compared with reference stands and will be subject to review and approval. Average annual growth height increment of preferred species will

be 1.25 feet/year over the 5-year monitoring period. Annual reports will be submitted to EEP prior to the end of each calendar year, documenting plant community conditions within the restoration areas and documenting hydrologic data within these areas and reference plots. The annual reports will also include a proposed plan of action for the following year including maintenance activities.

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1.0 Introduction

1.1 Background

The North Carolina Ecosystem Enhancement Program (EEP) purchased the Moccasin Creek Project Site to preserve, enhance, and restore wetlands and streams. The site is an 84-acre undeveloped tract along Moccasin Creek. Moccasin Creek runs north-south through the property and is the county line.

The site was originally forested with thirty to forty year old hardwood forests, which were timbered in the early 1980's by the previous owner. Pine trees were then replanted in a majority of the timbered area. The planted pines were pre-commercially thinned approximately four to five years ago to promote growth of the larger trees. Haul roads were established for accessing timber removal in the early 1980's. There were four culverts located along the main access road within the cleared area: one in Wolf Creek, two in Moccasin Creek, and one in an unnamed tributary west of Moccasin Creek (referred to as S3). One additional pipe was placed at a crossing of another tributary (referred to as S2), found on the east side of the property, during the construction of haul roads. Beavers were a problem to the previous owner after the land was cleared for timber. A professional trapper informed the previous owner that beavers were most likely moving east from a large wetland located on Beaverdam Creek just west of N.C. Highway 39. It was the owners understanding that the upstream property owner did not do any trapping, allowing the beavers to proliferate. The beavers migrated downstream to Moccasin Creek after the timber harvesting conducted in the 1980's. The previous owner routinely removed the dams and beaver trapping was performed every other year.

1.2 Location

The project property is located on NC Highway 39 approximately 0.6 miles north of the intersection of NC 39 and NC Highway 97 in Wake County and Franklin County (Figure 1). A gated, gravel road off NC 39 accesses the property (Latitude 35°50'33" and Longitude 78°16'17"). The site is in the Neuse River Basin in Cataloging Unit 03020203.

1.3 Site Description

The project site consists of approximately 65 acres of jurisdictional wetlands consisting of bottomland swamp hardwoods in various stages of succession, freshwater marsh, and pine plantation. Depending on their location within the project site, these wetlands were preserved, enhanced, or restored. The wetland area that exists under the fill road will be restored, while the wetland area that exists in the cleared area was be enhanced. The rest of the wetland area was preserved. There are three named streams, Moccasin Creel, Wolf Creek, and Beaverdam Creek, and three unnamed streams, S1, S2, and S3, located on the property. Moccasin Creek, the main drainage feature, is an E type sand bed perennial stream, with very little incision, that enters the property through the northern property line, travels south to bisect the upper one-third of the property, and then becomes the western property line below Beaverdam Creek. The overall length within the project site is approximately 3,600 linear feet.

1.4 Watershed Description

The project site is located in the headwaters of the Neuse River Basin, just upstream of the confluence of Moccasin Creek and Beaverdam creek. The watershed above the confluence is approximately 20.4 square miles, with ninety-five percent of the watershed flowing into Bunn Lake, located approximately 2,500 feet above the project site on Moccasin Creek. A weir outflow controls Bunn Lake's water surface elevation. The lake is lowered on average once a year, starting January 1st and lasting for about 45 days, for residents to work on their docks or for new dock construction. During this time the water level in Moccasin Creek is significantly higher with a higher velocity. The Franklin/Wake County Line approximately splits the watershed in half, with the northeastern half in Franklin County and the southwestern half in Wake County. The watershed is primarily rural, zoned for single-family residential use, with farming as the predominant land use. It is anticipated, however, that with the development of Interstate 540, future land use will be converted to suburban land uses, especially on the Wake County side of the watershed.

2.0 Restoration Summary

2.1 Mitigation Goals and Objectives

The mitigation goals and objectives of this project are to ensure that functioning wetlands, natural channel configurations in the five stream sections, and buffers along the streams have been established by the restoration efforts. Success will be determined once the vegetation success criteria have been met within the restoration and enhancement area. The Mitigation Plan, Figure 2, is located in the Figures section of this report.

2.2 Restoration Approach

The project involves: 1) wetland restoration, enhancement, and preservation, 2) stream restoration, and 3) riparian buffer restoration and preservation. The following sections break down the different restoration efforts on the site.

2.2.1 Wetland Restoration/Creation/Enhancement

The objective of the wetland restoration/creation/enhancement portion of the project was to restore the wetlands under the access road, enhance the jurisdictional wetlands in the cleared section, and preserve existing jurisdictional wetlands.

Approximately 0.38 acres of wetland restoration was accomplished by excavating approximately 860 cubic yards of road fill material, totaling approximately 500 linear feet, to 219 feet above mean sea level, the same elevation as the existing wetland area surrounding the road.

Approximately 4.93 acres of wetlands were enhanced in the altered fields by restoring natural forested communities. This was accomplished by planting seedlings of bald cypress, swamp black gum, swamp chestnut oak, and overcup oak in the majority of the cleared area, and river birch, green ash, sycamore, and willow oak in a smaller upland portion in the cleared area.

Approximately 43.21 acres of wetlands on the site were preserved in the forested areas.

2.2.2 Streams

Stream and buffer restoration were completed in conjunction with vegetation establishment and removal of the existing culverts and roadway. Removal of the culverts restored natural channel configurations to sections of Moccasin Creek, Wolf Creek, and unnamed tributaries S1, S2, and S3. Riparian vegetation was established for buffer restoration and preservation on the project site. Buffer restoration occurred on Moccasin Creek, Wolf Creek, in the cleared area surrounding tributary S3 as well as within the existing haul roads on S1 and S2. Areas of Moccasin Creek where a wooded buffer exists were preserved. In addition, buffer preservation occurred along the north side of Beaverdam Creek, and on unnamed tributaries S1 and S2.

Approximately 311 linear feet of stream was restored to the natural channel cross section at five stream locations within the project site. Culverts were removed along with fill material and the streambed and bank were re-established to match the stable channel conditions directly upstream and downstream of the repair area.

Moccasin Creek had two culverts, one 60" Corrugated Metal Pipe (CMP) and one 24" CMP, that were removed and 113 linear feet of stream bed and bank was restored. The width from top of bank to top of bank is approximately 33 feet and the width of the stream channel is approximately 16 feet.

Wolf Creek had one 15" CMP removed and 90 linear feet of stream bed and bank restored. The width from top of bank to top of bank is approximately 15 feet where the pipe was removed, and closer to 20 feet north and south of the where the pipe was removed. In addition, upstream and downstream of the area where the pipe was removed was repaired so the transition between these areas was smooth.

Tributary S1 had 30 linear feet of streambed and bank restored and did not have a culvert to remove. It was previously degraded by hauling equipment that crossed through the stream when it was logged. The width from top of bank to top of bank is seven (7) feet with the width of the channel at 2.5 feet.

Tributary S2 was restored for approximately 36 linear feet and had a 15" CMP removed that was originally placed there for the construction of a haul road for logging. The width from top of bank to top of bank is eight (8) feet and the width of the channel is one (1) foot.

Tributary S3 was restored for approximately 42 linear feet and had a 15' CMP removed. This pipe was originally placed there for the construction of the haul road.

2.2.3 Buffer Restoration

Vegetation in the wetland areas was restored to reflect historic bottomland swamp hardwood (BSH) species composition and abundance. Plants were established at 6 x 10

foot spacing (726 plants/acre). Vegetation in the buffer areas was established for bank stability and for control of bed erosion.

The following planting zones were established for the project:

- Zone 1: 4.3 acres of wetlands located in Soil Unit 1, which is hydric.
- Zone 2: 0.63 acres of wetlands located in Soil Unit 2, which is non-hydric.
- Zone 3, stream buffer: 3.0 acres of stream buffer located along Moccasin Creek, Wolf Creek, the north side of Beaverdam Creek, and tributaries S1, S2, and S3.
- Zone 3, stream bank: 0.06 acres located along the banks of Moccasin Creek, Wolf Creek, and tributaries S1, S2, and S3.

In Zone 1, approximately 3,700 plants were initially installed, and 450 plants were installed in Zone 2. Zone 3 is divided into the 50 foot stream buffer adjacent to all the streams and the stream bank area right along each stream. In the stream buffer area, approximately 2,600 plants were installed. In the stream bank area, the following quantities of plants were installed:

- Zone 3, S1: 15 plants
- Zone 3, S2: 20 plants
- Zone 3, S3: 21 plants
- Zone 3, Moccasin Creek: 330 plants
- Zone 3, Wolf Creek: 27 plants

3.0 Monitoring Plan

The Moccasin Creek Project will be monitored once each year for a period of five (5) years, with the first year monitoring to be completed in April of 2007 by the principal design consultant, Ward Consulting Engineers, P.C. Monitoring will consist of an overall survey of the condition of the wetlands and stream restoration areas, evaluation of monitoring plots, and evaluation of groundwater gauges.

3.1 As-Built Data Collection

The as-built data for the project site were developed using a 610 Geodimeter, Total Station, by MSS Land Consultants (Figure 3). They surveyed the area where the fill road had been taken out and re-graded to the existing wetland elevation, as well as the constructed stream banks and the centerline of tributary S3, then prepared a contour map. They also located all vegetation plots on the site. Ward Consulting Engineers placed additional information on the as-built map including monitoring wells, and the stream restoration lengths and buffer widths for S1 and S2.

3.2 Hydrology

The hydrologic success criteria for wetland areas will be met if gauge data from the restoration areas indicates that the site is saturated within 12 inches of the soil surface or inundated for a minimum of 8% of the growing season under normal conditions.

The rain gauge installed at the site was located on top of a 4 inch by x 4 inch treated timber post. The gauge was located at the southwestern end of the site, near the entrance road. The rain gauge is a Davis instrument Rain Collector II. The self-emptying tipping-bucket design measures rainfall in 0.01” increments. An Onset Computer Corporation, HOBO Event Rainfall logger was connected to the rain gauge. The event data logger records momentary closures/openings generated by the tipping-bucket rain gauge. These “events” are recorded with a time stamp that can be viewed as tabular data or exported into spreadsheets to produce detailed graphs. The event stores up to 8,000 counts in nonvolatile EEPROM memory for up to 20 inches of rainfall.

Three Infinities USA Model #138 Pressure Water Level Data Loggers were installed by The Catena Group. The loggers are programmed to record the water levels once a day. Groundwater gauge #1 is located in the northwestern portion of the property at the edge of the wetland area, groundwater gauge #2 is located in the reference wetland in the southwestern portion of the site, and groundwater gauge #3 is located between Moccasin Creek and Wolf Creek, south of where the access road was located. Verification of wetland hydrology will be determined by these automatic recording ground water and rainfall gauge data collected within the Moccasin Creek project area and the reference plots.

Hydrologic monitoring data will be collected for a period of five (5) years or until all success criteria are achieved, whichever is longer. The groundwater gauges will be downloaded on a monthly basis to ensure proper functioning and that no prolonged lapses in coverage are experienced. Rainfall data will also be collected monthly to produce a record of the actual rainfall received at the site. The rainfall data will be analyzed to determine if each planting zone, which correspond to different hydrologic zones, is meeting the success criteria as well as compared to the reference wetland ground water data. Annual reports will be submitted to EEP prior to the end of each calendar year, documenting plant community conditions within the restoration areas and documenting hydrologic data within these areas and reference plots. The annual reports will also include a proposed plan of action for the following year including maintenance activities.

3.3 Vegetation

The success criteria for the preferred species in the restoration areas will be based on annual and cumulative survival and growth over five (5) years. Survival of preferred species must be at a minimum 320 stems/ac at the end of five (5) years of monitoring. Height growth must average six (6) feet. Species composition will be compared with reference stands and will be subject to review and approval. Average annual height increment of preferred species will be 1.25 ft/yr over the 5-year monitoring period.

Eight vegetation plots were installed by The Catena Group for monitoring, with four plots in Zone 1, one plot in Zone 2, and three plots in buffer Zone 3. The plots were set at 32.8 feet x 32.8 feet (10 x 10 meters) square. Two of the four corners of the plots were marked with 1 ¼ inch PVC piping, with the remaining corners marked with iron rods. Each plot is labeled on one of the PVC corners and the locations of the plots are shown on the as-built plans and described as follows:

- Plot 1-1: Located east of Wolf Creek, north of Planting Zone 2.
- Plot 1-2: Located between Moccasin Creek and Wolf Creek, north of where the access road was located.
- Plot 1-3: Located west of Moccasin Creek and east of S3, north of where the access road was located.
- Plot 1-4: Located west of S3 and south of where the access road was located.
- Plot 2-1: Located east of Wolf Creek in Planting Zone 2
- Plot 3-1: Located north of Wolf Creek, between the two tributaries to Wolf Creek, northeast of plot 1-2.
- Plot 3-2: Located east of Wolf Creek and south of where the access road was located.
- Plot 3-3: Located west of Moccasin Creek, along where the access road was located.

The first vegetation monitoring count was performed on March 7th, 2006 and the results are included in Tables 3 and 4. In addition to the woody vegetation plantings, herbaceous seed mixes were applied throughout the site as detailed in the Restoration Plan. The project will be determined to be successful once vegetation success criteria have been met. The vegetation growth data will be matched with groundwater data and rain data to determine if abnormal conditions were present. During vegetation monitoring, planted and volunteer stem densities will be measured in addition to the relative abundance and diversity of herbaceous vegetation within the monitoring plots. Species will be listed and identified by wetland indicator status. Survival, numbers per acre by species, and tree height will be measured at the end of each growing season just prior to leaf fall. Planting locations and methods will be completed in the first year Annual Report.

4.0 Maintenance & Contingency Plans

The North Carolina Ecosystem Enhancement Program (EEP) will be responsible for the maintenance of this project for a period of five (5) years after project completion. During the first year of monitoring by the design consultant, if a problem that requires an immediate corrective action or a flaw in the site is noted at any point, it will be brought immediately to the attention of the EEP. Beaver activity has been observed in Moccasin Creek, particularly upstream of the repair area. One beaver dam was removed by hand during construction and Moccasin Creek will be monitored and beaver dams removed if they are seen as a threat to the success of the restoration. One other area of concern is the success of the removal of invasive species during construction. Herbicide was applied to all invasive species but the time of year (January) that this was done is not the best time and the herbicide may not have worked as effectively as if it were applied at a different time. The areas of invasive species will be monitored and additional measures taken to remove them if they return. After the first year, repairs will be made as necessary by the EEP.

5.0 References

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6.0 Figures

Figure 1: Location Map

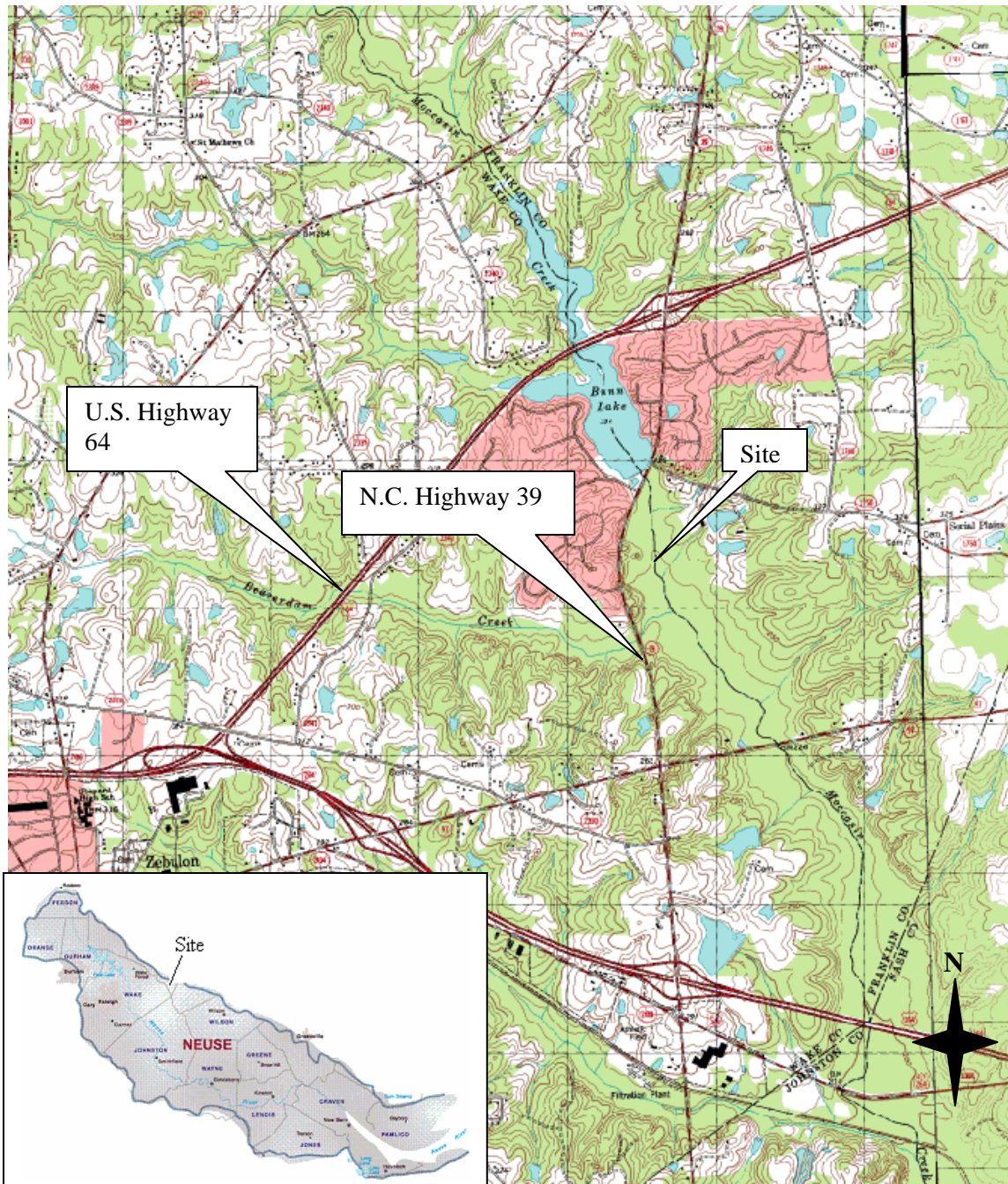
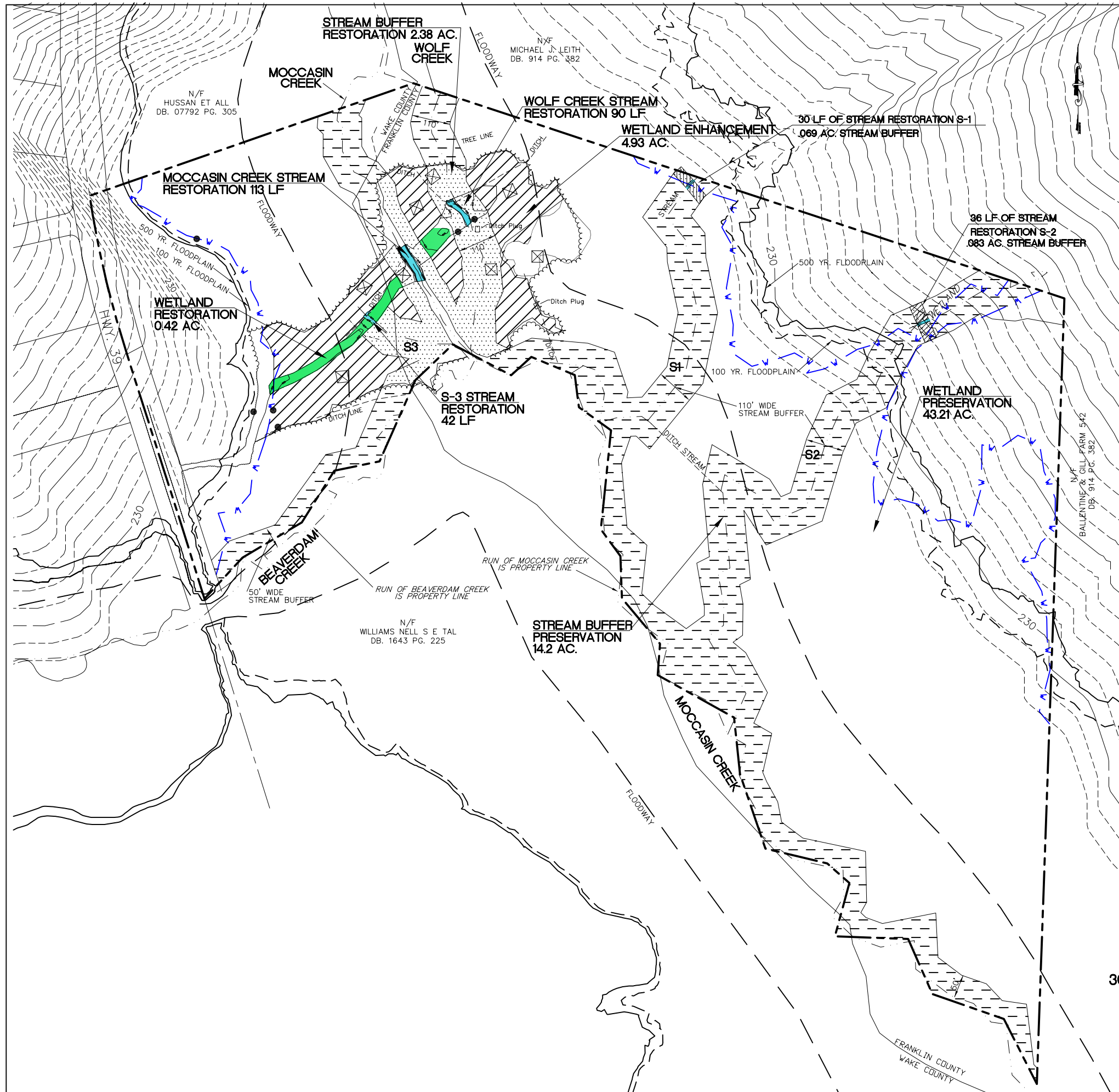


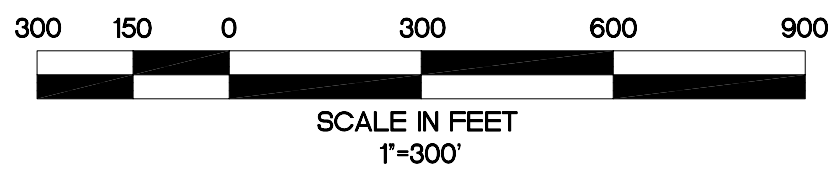
Figure 1: Location Map
 Moccasin Creek Buffer & Wetland Restoration, Enhancement & Preservation Project,
 Wake & Franklin Counties
 CU: 03020203
 Latitude 35°50'33", Longitude 78°16'17"
 Scale: 1" = 100,000 feet

Figure 2: Mitigation Plan

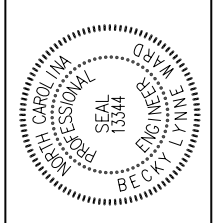


Ecosystem type:
 Successional Bottomland
 Hardwood Forest. Moccasin Creek
 is a Riverine System Surrounded
 by a Palustrine Wetland System.

PROJECT RESTORATION/ENHANCEMENT AND PRESERVATION			
COLOR	TYPE	AREA (ACRES)	DISTANCE (FEET)
	WETLAND ENHANCEMENT	4.93	N/A
	WETLAND RESTORATION	0.38	N/A
	WETLAND PRESERVATION	43.21	N/A
	STREAM RESTORATION	N/A	311
	STREAM BUFFER RESTORATION	2.38	N/A
	STREAM BUFFER PRESERVATION	14.2	N/A
	WETLAND BOUNDARY	N/A	N/A



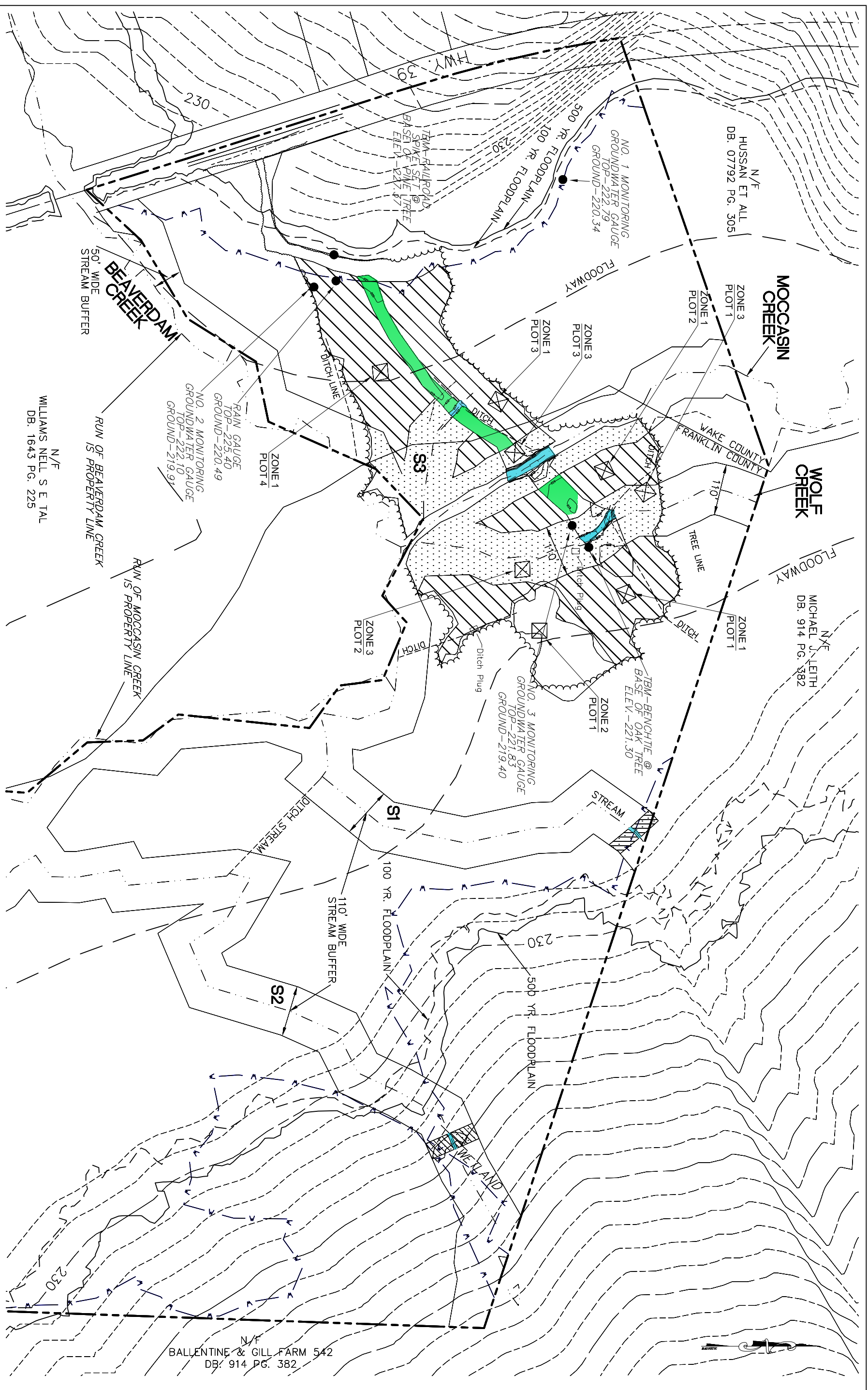
WARD CONSULTING ENGINEERS, PC
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 Raleigh, NC 27613
 (919) 870-0526
 FAX (919) 870-5359



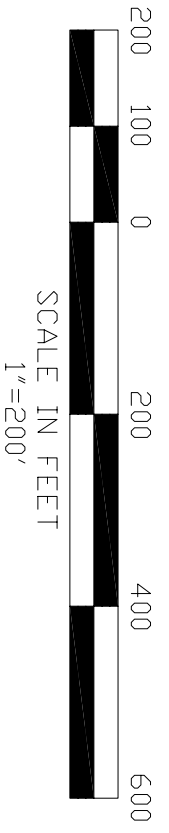
**MOCCASIN CREEK
 MITIGATION PLAN**

DATE: 05-15-06
 PROJ./DWG. NAME:
 MOCCASIN CREEK
 ab-mitigation-11-17
 SCALE:
 1"=300'
 SHEET NO.
1 OF 1

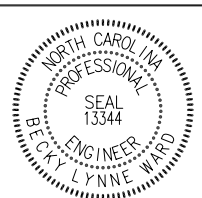
Figure 3: As-Built



LEGEND	
COLOR	TYPE
	WETLAND ENHANCEMENT
	WETLAND RESTORATION
	STREAM RESTORATION
	STREAM BUFFER RESTORATION
	WETLAND BOUNDARY



**MOCCASIN CREEK
AS-BUILT OVERALL SITE**



WARD CONSULTING ENGINEERS, PC



1512 Eglantyne Court
Raleigh, NC 27613

(919) 870-0526
FAX (919) 870-5359

DATE: 05-15-06
PROJ./DWG. NAME:
MOCCASIN CREEK
ob-full-site-11-17
SCALE: 1"=200'
SHEET NO.
1 OF 1

7.0 Tables

**Table 1: Moccasin Creek Restoration/Enhancement/Preservation Project Pre- & Post
Construction Stream & Wetland Areas**

Table 1: Moccasin Creek Restoration/Enhancement/Preservation Project Pre- & Post Construction Stream & Wetland Areas			
Type	Pre-existing wetland & buffer acres/ stream length (linear feet)	Restored wetland & buffer acres	Restored stream length (linear feet)
Wetland area (pre-construction)	65	-	-
Stream length (pre-construction)	3,600	-	-
Wetland Enhancement	-	4.93	-
Wetland Restoration	-	0.38	-
Wetland Preservation	-	43.21	-
Stream Restoration	-	-	-
Moccasin Creek	-	-	113
Wolf Creek	-	-	90
S1	-	-	30
S2	-	-	36
S3	-	-	42
Total	-	-	311
Stream Buffer Restoration	-	-	-
Moccasin Creek	-	1.0	-
Wolf Creek	-	1.14	-
S1	-	.069	-
S2	-	.083	-
S3	-	.52	-
Beaverdam Creek	-	.17	-
Total	-	3.0	-
Stream Buffer Preservation	-	14.2	-

**Table 2: Moccasin Creek Restoration/Enhancement/Preservation Project Post
Construction Credits**

Table 2: Moccasin Creek Restoration/Enhancement/Preservation Project Post Construction Credits			
Type	Level of Restoration	Proposed Credit Ratio	SMU/WMU
Wetlands	Enhancement	3:1	1.6
	Restoration	1:1	.38
	Preservation	5:1	8.6
Wetlands Total			10.58
Streams	Restoration	1:1	311
Stream Buffers	Preservation	10:1	1.42

Table 3: Tree Density Results

Tree Density for 100 square meter plots	
Zone 1	Stems
Plot 1-1	
<i>Taxodium distichum</i>	14
<i>Quercus sp.</i>	16
<i>Nyssa sylvatica</i>	4
	<hr/> <hr/> 34
Plot 1-2	
<i>Taxodium distichum</i>	3
<i>Quercus sp.</i>	5
<i>Nyssa sylvatica</i>	9
<i>Cephalanthus occidentalis</i>	3
	<hr/> <hr/> 20
Plot 1-3	
<i>Quercus sp.</i>	14
<i>Nyssa sylvatica</i>	21
	<hr/> <hr/> 35
Plot 1-4	
<i>Taxodium distichum</i>	5
<i>Quercus sp.</i>	5
<i>Nyssa sylvatica</i>	4
	<hr/> <hr/> 14
Zone 2	Stems
Plot 2-1	
<i>Platanus occidentalis</i>	10
<i>Quercus phellos</i>	15
	<hr/> <hr/> 25
Zone 3	Stems
Plot 3-1	
<i>Taxodium distichum</i>	14
<i>Nyssa sylvatica</i>	5
	<hr/> <hr/> 19
Plot 3-2	
<i>Taxodium distichum</i>	20
<i>Nyssa sylvatica</i>	7
	<hr/> <hr/> 27
Plot 3-3	
<i>Nyssa sylvatica</i>	21
<i>Quercus sp.</i>	15
	<hr/> <hr/> 36

Table 4: Herbaceous Vegetation Results

Percent Cover by Plot #								
Vegetation Type	1-1	1-2	1-3	1-4	2-1	3-1	3-2	3-3
Rushes (Juncus spp.)	60	20	5	95		10	20	
Sedges (Carex and Scirpus spp.)		10	5			30	60	
Tearthumb (Polygonum sp)		58				50		
Cephalanthus occidentalis		2						
BARE GROUND	40	10	85	5	80	10	20	100
Stumps/Root Mass			5					
Grass - Planted					20			
Total Percent Cover	100	100	100	100	100	100	100	100