

**Whitley Buffer Mitigation Site
Annual Vegetation Monitoring Report
2010 Growing Season
Year 5 Monitoring Report**



Prepared by:

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NCEEP Contract # D05015-4

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1.0 SUMMARY

The Whitley Buffer Mitigation Site is located in central Johnston County, NC, approximately four miles southeast of the town of Smithfield, NC, along NCSR 1007 (Brogden Road). It is located within cataloging unit 03020201 and DENR sub-basin 03-04-02 of the Neuse River Basin.

There are approximately 3,448 linear feet of streams within the 27.5 acres of the Whitley Buffer Mitigation Site Conservation Easement. The easement is held by The State of North Carolina. The site is part of a farm that is used for row crops, hog production and pastureland for cattle and horses. Prior to buffer restoration, the streams on the project site were channelized, and riparian vegetation was cleared in the field areas such that cattle grazing pastures extended up to the top of the stream banks

The restoration area encompasses 26.41 acres of streamside edge and floodplain along Marsh Branch and an unnamed tributary of Polecat Branch. The riparian buffer restoration project has provided numerous ecological benefits within the Neuse River basin. While many of these benefits, such as improved bank stability and restoration of habitat, are limited to the project area, others, such as pollutant removal and improved aquatic and terrestrial habitat, have more far-reaching effects.

Prior land use and clearing had already removed the majority of the native floodplain vegetative communities along Marsh Swamp and within the associated floodplain. However, prior to plant community restoration, remaining invasive vegetation such as privet (*Ligustrum sinense*), which existed in small quantities along the stream banks, was cleared by bush-hogging and mowing. Cleared areas were then disked to further prepare the soil conditions for planting. Bare-root seedlings of tree species were planted at a density of 680 stems per acre on 8-foot centers. Planting was completed in March 2006.

The vegetation monitoring documented a survivability range of 440 stems per acre to 600 stems per acre with an overall average of 540 stems per acre. The site earlier met the interim vegetation survival criteria of 320 stems per acre surviving after the third growing season and has now met the final vegetation survival criteria of 260 stems per acre surviving after the fifth growing season.

The conservation easement is comprised of 27.5 acres. On February 9, 2010 during a DWQ site visit attended by Eric Kulz and Lia Gilleski two areas were delineated to be removed from the buffer credit calculation. These two areas A and B are shown as Appendix C. The sum of Area A 0.12 acres and Area B 0.97 acres resulted in a reduction of 1.09 credits lowering the BMU's onsite to 26.41. Appendix C has been provided to the NCDWQ.

2.0 INTRODUCTION

A total of 26.41 acres of buffer were restored on the Whitley Mitigation Site. The primary objectives of the buffer restoration, as specified in the Restoration Plan are as follows: “the reforestation of cleared floodplain vegetation along Marsh Branch and a tributary to Polecat Branch within the conservation easement with native species to: i) maintain and increase channel bank stability; ii) reduce sedimentation; iii) filter and reduce pollutants; and iv) provide increased habitat for aquatic and terrestrial wildlife.” The project involved the restoration of riparian buffers at least 50 feet in width in areas that historically supported hardwood forest bottomland ecosystems.

The target natural community type for the restored buffer is a “coastal plain bottomland hardwood forest” (Schafale and Weakley, 1990). Restoration of floodplain forest and stream-side habitat allows for development and expansion of characteristic vegetative species across the landscape. The design at the Whitley Buffer Mitigation Site was to restore a small stream swamp community adjacent to the Marsh Branch and the farm ditches that bisects the property. The species composition planted on site was selected based on the vegetation description for the “coastal plain small stream swamp”. In addition to planting the buffer area, permanent fencing was installed to keep the cattle out of the buffer area.

To monitor the vegetation on the mitigation site, approximately 2% or 0.5 acres of the site is being sampled over five growing seasons. Twelve vegetation-monitoring plots that are 10m x 10m in size have been established on the site. The plots are randomly located to represent the range of conditions that exist on the site.

After construction of the mitigation site in March 2006, the following tree species were planted. The species were selected based on the natural communities types discussed above.

Table 1. Tree Species Planted in 2006

ID	Scientific Name	Common Name	FAC Status
1	<i>Quercus michauxii</i>	Swamp Chestnut Oak	FACW-
2	<i>Quercus phellos</i>	Coastal Willow Oak	FACW-
3	<i>Fraxinus pennsylvanica</i>	Green Ash	FACW
4	<i>Betula nigra</i>	River Birch	FACW
5	<i>Platanus occidentalis</i>	Sycamore	FACW-
6	<i>Taxodium distichum</i>	Bald cypress	OBL
7	<i>Quercus lyrata</i>	Overcup Oak	OBL
8	<i>Nyssa biflora</i>	Swamp Tupelo	OBL

3.0 VEGETATION MONITORING

3.1 Success Criteria

The final vegetative success criteria will be the survival of 320 5-year old planted trees per acre at the end of Year 5 of the monitoring period.

Up to 20% of the site species composition may be comprised of invaders. Remedial action may be required should these (i.e. loblolly pine, red maple, sweet gum, etc.) present a problem and exceed 20% composition.

3.2 Monitoring Protocol

The following monitoring protocol was designed to predict vegetative survivability. Twelve plots were established on the Whitley Buffer Mitigation Site, to monitor approximately 2% of the site. The twelve plots are established within the stream restoration buffer to represent the range of conditions that exist on the site. The plots are randomly located and randomly oriented within the stream buffer restoration area.

Plot construction involved using metal fence posts at each of the four corners to clearly and permanently establish the area that was to be sampled. Then ropes were hung connecting all four corners to help in determining if trees close to the plot boundary were inside or outside of the plot. Trees right on the boundary and trees just outside of the boundary that appear to have greater than 50% of their canopy inside the boundary were counted inside the plot. A piece of white PVC pipe ten feet tall was placed over the metal post on one corner to facilitate visual location of site throughout the five-year monitoring period.

All of the planted stems inside the plot were flagged with orange flagging and marked with a three foot tall piece of half inch PVC to mark them as the planted stems (vs. any colonizers) and to help in locating them in the future. Each stem was then tagged with a permanent numbered aluminum tag.

3.3 Results of Vegetation Monitoring

The following tables present stem counts for each of the monitoring plots. Each planted tree species is identified across the top row, and each plot is identified down the left column. The numbers on the top row correlate to the ID column of the previous table. Trees are flagged in the field on an as need basis before the flags degrade. Flags are utilized, because they will not interfere with the growth of the tree. Volunteers are also flagged during this process.

Table 2. 2010 Vegetation Monitoring Plot Species Composition

Plot	1	2	3	4	5	6	7	8	Total	Stem/ac
WH 1	7	0	0	2	4	0	0	0	13	520
WH 2	2	0	0	2	3	7	1	0	15	600
WH 3	5	0	0	2	5	1	0	0	13	520
WH 4	2	1	3	0	3	1	1	0	11	440
WH 5	5	1	0	0	5	1	2	0	14	560
WH 6	0	0	1	4	6	2	0	0	13	520
WH 7	2	0	0	5	7	0	1	0	15	600
WH 8	1	1	0	6	2	0	5	0	15	600
WH 9	3	0	1	2	3	0	2	1	12	480

Plot	1	2	3	4	5	6	7	8	Total	Stem/ac
WH 10	2	0	2	3	2	4	2	0	15	600
WH 11	2	0	3	0	3	1	1	2	12	480
WH 12	0	2	1	2	2	1	6	0	14	560

Average Stems/Acre: 540

Range of Stems/Acre: 440-600

Volunteer species were monitored throughout the five-year monitoring period. Below is a table of the most commonly found woody volunteer species.

Table 3. Volunteers within the Buffer Area

ID	Species	Common Name	FAC Status
A	<i>Liquidambar styraciflua</i>	Sweetgum	FAC+
B	<i>Acer rubrum</i>	Red Maple	FAC
C	<i>Pinus taeda</i>	Loblolly Pine	FAC

Not many volunteer woody species were observed in the vegetation plots. This site was previously an active pasture and the grasses were quick to recover, forming dense ground cover. If volunteer stems do become apparent, they will be flagged and added to the overall stems per acre assessment of the site.

3.4 Vegetation Observations

After construction of the mitigation site, a permanent ground cover seed mixture of Virginia wild rye (*Elymus virginicus*), switch grass (*Panicum virgatum*), and fox sedge (*Carex vulpinoidea*) was broadcast on the site at a rate of 10 pounds per acre. These species are present on the site. Hydrophytic herbaceous vegetation, including rush, (*Juncus effusus*), spike-rush (*Eleocharis obtusa*), Boxseed (*Ludwigia sp.*), and sedge (*Carex sp.*), are observed across the site, particularly in areas of periodic inundation. The presence of these herbaceous wetland plants helps to confirm the presence of wetland hydrology on the site

There are weedy species occurring on the site, though none seem to be posing any problems for the woody or herbaceous hydrophytic vegetation. Weedy species on site includes various pasture grasses, goldenrod (*Solidago spp.*), dogfennel (*Eupatorium capillifolium*), horsenettle (*Solanum spp.*), and broomsedge (*Andropogon spp.*).

3.5 Conclusions

Vegetation monitoring efforts have calculated the average number of stems per acre on site to be 540 which is a survival rate of greater than 82% based on the initial planting count of 653 stems per acre. The lowest stem count recorded on any plot was 440 stems per acre thus the 2010 vegetation monitoring data reflects that the Whitley Buffer Site has achieved the final vegetative success criteria of 260 trees per acre by the end of Year 5.

Appendix A. 2010 Site Photos



Whitley Vegetation Plot 1



Whitley Vegetation Plot 2



Whitley Vegetation Plot 3



Whitley Vegetation Plot 4



Whitley Vegetation Plot 5



Whitley Vegetation Plot 6



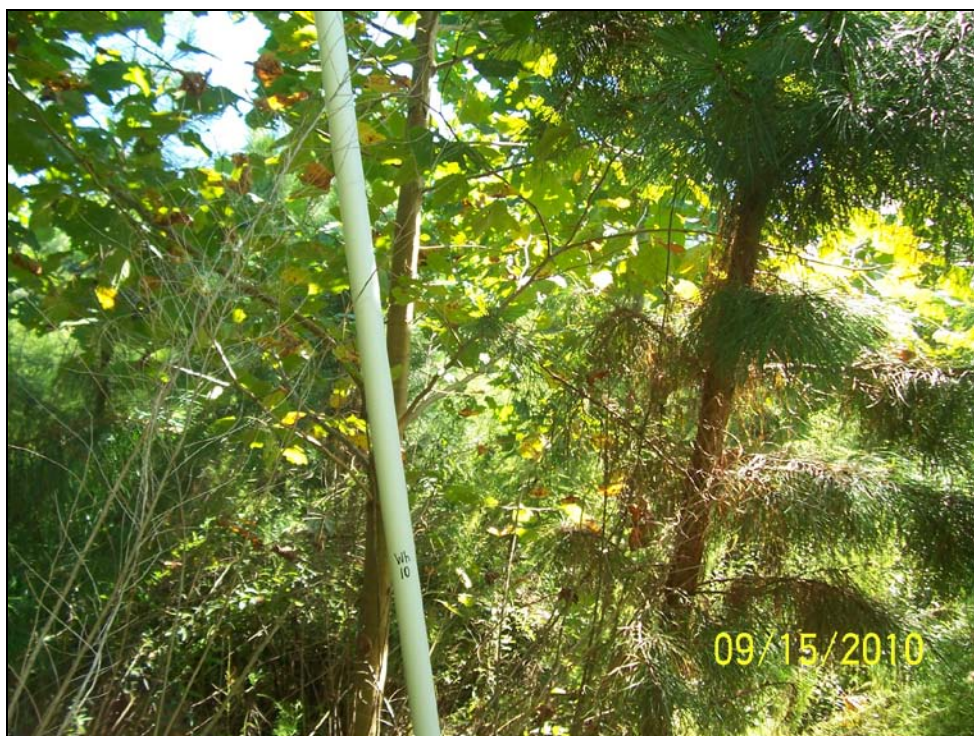
Whitley Vegetation Plot 7



Whitley Vegetation Plot 8



Whitley Vegetation Plot 9



Whitley Vegetation Plot 10



Whitley Vegetation Plot 11



Whitley Vegetation Plot 12

Appendix B. Tree Species And Tag Numbers By Plot

Plot 1

Tag Number	Species Name	Tag Number	Species Name
1	<i>Platanus occidentalis</i>	11	<i>Quercus michauxii</i>
2	<i>Platanus occidentalis</i>	12	<i>Quercus michauxii</i>
3	<i>Platanus occidentalis</i>	13	<i>Quercus michauxii</i>
4	<i>Platanus occidentalis</i>	14	<i>Fraxinus pennsylvanica</i>
5	<i>Betula nigra</i>	15	<i>Quercus michauxii</i>
6	<i>Betula nigra</i>	16	<i>Quercus michauxii</i>
7	<i>Betula nigra</i>		
8	<i>Quercus michauxii</i>		
9	<i>Quercus michauxii</i>		
10	<i>Quercus michauxii</i>		

Plot 2

Tag Number	Species Name	Tag Number	Species Name
1	<i>Quercus lyrata</i>	11	<i>Taxodium distichum</i>
2	<i>Quercus michauxii</i>	12	<i>Taxodium distichum</i>
3	<i>Quercus michauxii</i>	13	<i>Betula nigra</i>
4	<i>Platanus occidentalis</i>	14	<i>Platanus occidentalis</i>
5	<i>Platanus occidentalis</i>	15	<i>Betula nigra</i>
6	<i>Taxodium distichum</i>	16	<i>Betula nigra</i>
7	<i>Taxodium distichum</i>	17	<i>Betula nigra</i>
8	<i>Taxodium distichum</i>	18	<i>Betula nigra</i>
9	<i>Taxodium distichum</i>		
10	<i>Taxodium distichum</i>		

Plot 3

Tag Number	Species Name	Tag Number	Species Name
1	<i>Betula nigra</i>	11	<i>Quercus michauxii</i>
2	<i>Betula nigra</i>	12	<i>Quercus michauxii</i>
3	<i>Platanus occidentalis</i>	13	<i>Quercus michauxii</i>
4	<i>Platanus occidentalis</i>	14	<i>Platanus occidentalis</i>
5	<i>Betula nigra</i>	15	<i>Quercus michauxii</i>
6	<i>Betula nigra</i>	16	<i>Quercus michauxii</i>
7	<i>Platanus occidentalis</i>		
8	<i>Platanus occidentalis</i>		
9	<i>Taxodium distichum</i>		
10	<i>Quercus michauxii</i>		

Plot 4

Tag Number	Species Name	Tag Number	Species Name
1	<i>Betula nigra</i>	11	<i>Fraxinus pennsylvanica</i>
2	<i>Platanus occidentalis</i>	12	<i>Fraxinus pennsylvanica</i>
3	<i>Platanus occidentalis</i>	13	<i>Platanus occidentalis</i>
4	<i>Platanus occidentalis</i>	14	<i>Quercus michauxii</i>
5	<i>Quercus lyrata</i>	15	<i>Fraxinus pennsylvanica</i>
6	<i>Quercus michauxii</i>	16	<i>Taxodium distichum</i>
7	<i>Betula nigra</i>	17	<i>Quercus phellos</i>
8	<i>Betula nigra</i>		
9	<i>Betula nigra</i>		
10	<i>Betula nigra</i>		

Plot 5

Tag Number	Species Name	Tag Number	Species Name
1	<i>Quercus phellos</i>	11	<i>Quercus michauxii</i>
2	<i>Platanus occidentalis</i>	12	<i>Quercus michauxii</i>
3	<i>Betula nigra</i>	13	<i>Platanus occidentalis</i>
4	<i>Betula nigra</i>	14	<i>Platanus occidentalis</i>
5	<i>Quercus michauxii</i>	15	<i>Platanus occidentalis</i>
6	<i>Taxodium distichum</i>	16	<i>Quercus lyrata</i>
7	<i>Quercus michauxii</i>	17	<i>Quercus michauxii</i>
8	<i>Platanus occidentalis</i>		
9	<i>Quercus lyrata</i>		
10	<i>Platanus occidentalis</i>		

Plot 6

Tag Number	Species Name	Tag Number	Species Name
1	<i>Platanus occidentalis</i>	11	<i>Betula nigra</i>
2	<i>Platanus occidentalis</i>	12	<i>Platanus occidentalis</i>
3	<i>Platanus occidentalis</i>	Vole 13	<i>Betula nigra</i>
4	<i>Taxodium distichum</i>	14	<i>Fraxinus pennsylvanica</i>
5	<i>Quercus michauxii</i>	15	<i>Betula nigra</i>
6	<i>Platanus occidentalis</i>	16	<i>Betula nigra</i>
7	<i>Taxodium distichum</i>		
8	<i>Platanus occidentalis</i>		
9	<i>Platanus occidentalis</i>		
10	<i>Platanus occidentalis</i>		

Plot 7

Tag Number	Species Name	Tag Number	Species Name
1	<i>Quercus michauxii</i>	11	<i>Quercus michauxii</i>
2	<i>Platanus occidentalis</i>	12	<i>Betula nigra</i>
3	<i>Betula nigra</i>	13	<i>Platanus occidentalis</i>
4	<i>Platanus occidentalis</i>	14	<i>Quercus lyrata</i>
5	<i>Platanus occidentalis</i>	15	<i>Betula nigra</i>
6	<i>Betula nigra</i>		
7	<i>Platanus occidentalis</i>		
8	<i>Platanus occidentalis</i>		
9	<i>Betula nigra</i>		
10	<i>Platanus occidentalis</i>		

Plot 8

Tag Number	Species Name	Tag Number	Species Name
1	<i>Quercus lyrata</i>	11	<i>Betula nigra</i>
2	<i>Quercus lyrata</i>	12	<i>Betula nigra</i>
3	<i>Quercus lyrata</i>	13	<i>Betula nigra</i>
4	<i>Betula nigra</i>	14	<i>Platanus occidentalis</i>
5	<i>Betula nigra</i>	15	<i>Platanus occidentalis</i>
6	<i>Quercus lyrata</i>	16	<i>Quercus lyrata</i>
7	<i>Quercus phellos</i>		
8	<i>Betula nigra</i>		
9	<i>Betula nigra</i>		
10	<i>Quercus michauxii</i>		

Plot 9

Tag Number	Species Name	Tag Number	Species Name
1	<i>Quercus lyrata</i>	11	<i>Quercus michauxii</i>
2	<i>Quercus lyrata</i>	12	<i>Fraxinus pennsylvanica</i>
3	<i>Platanus occidentalis</i>	13	<i>Quercus michauxii</i>
4	<i>Platanus occidentalis</i>	14	<i>Betula nigra</i>
5	<i>Platanus occidentalis</i>	15	<i>Quercus michauxii</i>
6	<i>Platanus occidentalis</i>		
7	<i>Nyssa biflora</i>		
8	<i>Fraxinus pennsylvanica</i>		
9	<i>Betula nigra</i>		
10	<i>Betula nigra</i>		

Plot 10

Tag Number	Species Name	Tag Number	Species Name
1	<i>Betula nigra</i>	11	<i>Quercus lyrata</i>
2	<i>Platanus occidentalis</i>	12	<i>Fraxinus pennsylvanica</i>
3	<i>Fraxinus pennsylvanica</i>	13	<i>Taxodium distichum</i>
4	<i>Quercus michauxii</i>	14	<i>Platanus occidentalis</i>
5	<i>Taxodium distichum</i>	15	<i>Betula nigra</i>
6	<i>Quercus michauxii</i>	16	<i>Fraxinus pennsylvanica</i>
7	<i>Taxodium distichum</i>	17	<i>Quercus lyrata</i>
8	<i>Betula nigra</i>		
9	<i>Taxodium distichum</i>		
10	<i>Betula nigra</i>		

Plot 11

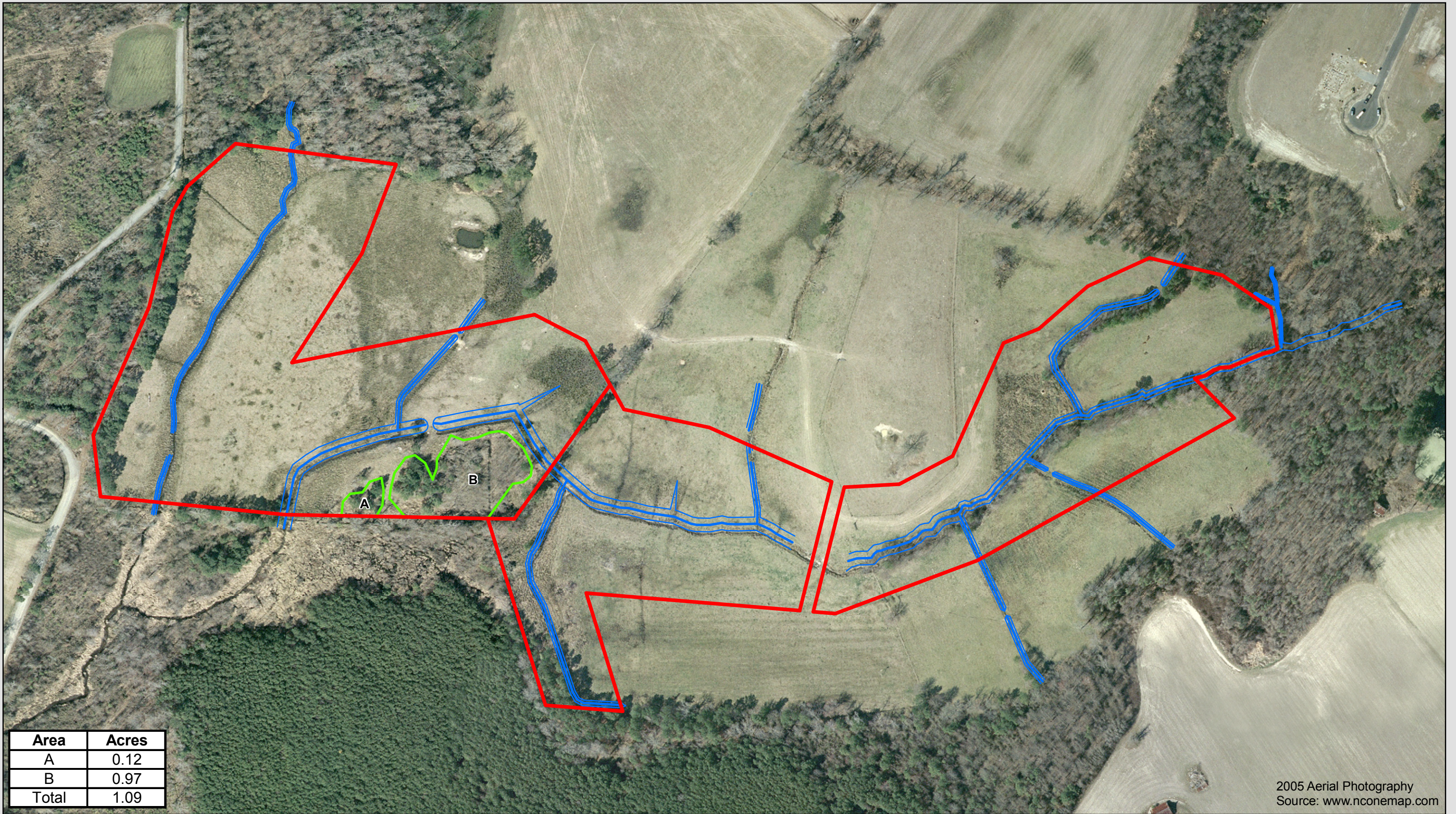
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1	<i>Quercus michauxii</i>	11	<i>Betula nigra</i>
2	<i>Quercus michauxii</i>	12	<i>Platanus occidentalis</i>
3	<i>Fraxinus pennsylvanica</i>	13	<i>Betula nigra</i>
4	<i>Taxodium distichum</i>	14	<i>Platanus occidentalis</i>
5	<i>Nyssa biflora</i>	15	<i>Fraxinus pennsylvanica</i>
6	<i>Nyssa biflora</i>	16	<i>Quercus lyrata</i>
7	<i>Nyssa biflora</i>		
8	<i>Fraxinus pennsylvanica</i>		
9	<i>Quercus lyrata</i>		
10	<i>Platanus occidentalis</i>		

Plot 12

Tag Number	Species Name	Tag Number	Species Name
1	<i>Quercus lyrata</i>	11	<i>Quercus lyrata</i>
2	<i>Quercus lyrata</i>	12	<i>Quercus lyrata</i>
3	<i>Betula nigra</i>	13	<i>Quercus phellos</i>
4	<i>Betula nigra</i>	14	<i>Quercus lyrata</i>
5	<i>Quercus michauxii</i>	15	<i>Fraxinus pennsylvanica</i>
6	<i>Platanus occidentalis</i>	16	<i>Quercus lyrata</i>
7	<i>Platanus occidentalis</i>	17	<i>Taxodium distichum</i>
8	<i>Quercus lyrata</i>		
9	<i>Quercus phellos</i>		
10	<i>Betula nigra</i>		

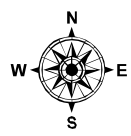
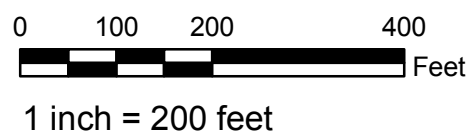
Appendix C: Buffer Mitigation Unit Reduction of Credit Map

Appendix D: Conservation Easement Plat



Area	Acres
A	0.12
B	0.97
Total	1.09

2005 Aerial Photography
 Source: www.nconemap.com



Whitley Site Buffer Mitigation

- Legend**
- Delineated Boundary
 - Easement Boundary
 - Streams



1. REVIEW OFFICER OF JOHNSTON COUNTY CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER _____

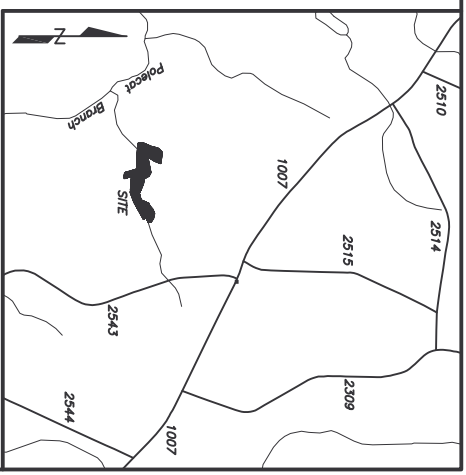
DATE _____

FILED FOR REGISTRATION _____, 2005.
PLAT CABINET _____, PAGE _____.

REGISTER OF DEEDS
JOHNSTON COUNTY

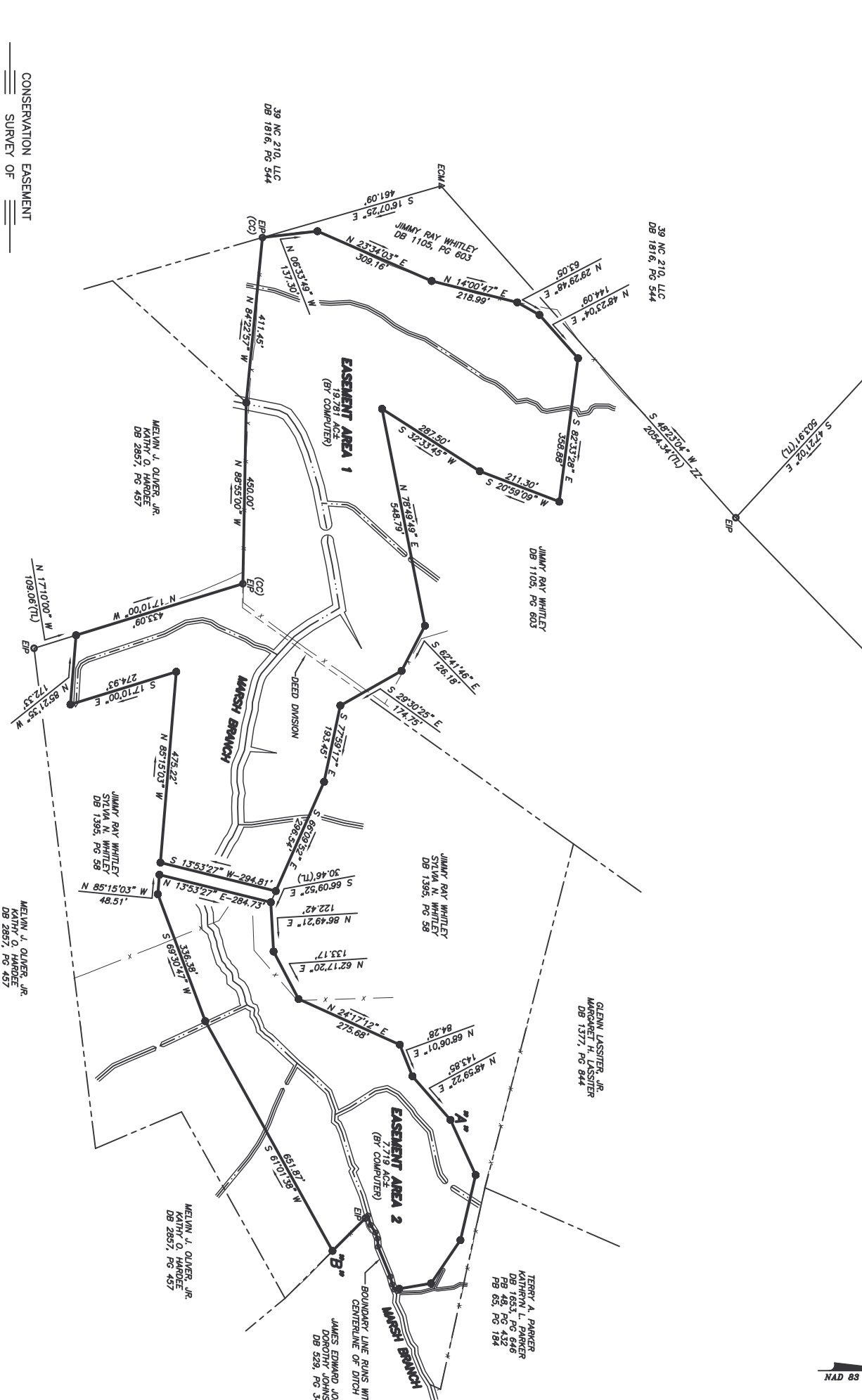
- LEGEND**
- R/W = RIGHT OF WAY
 - C/L = CENTERLINE
 - = NEW IRON STAKE
 - EP = EXISTING IRON PILE MONUMENT
 - = EXISTING RAILROAD SPUR
 - = EXISTING RAILROAD SPUR
 - = NO POINT SET
 - (TL) = THE LINE
 - (CC) = CONTROL CORNER
 - = HOLLOW PROPERTY LINE
 - = WIRE FENCE

FLOOD STATEMENT
THIS PROPERTY IS LOCATED IN ZONE "X & AE" AND IS PARTIALLY WITHIN A SPECIAL FLOOD HAZARD AREA AS DETERMINED BY NFP RATE MAP DATED JULY 2, 2004. COMMUNITY PANEL NUMBER 27013B-2890-L.



FROM EIS 1/4" TO EIS 3/4" ALONG EASEMENT BOUNDARY.

LINE	BEARING	DISTANCE
1	N 65°53'45" E	150.26'
2	S 76°48'07" E	165.93'
3	S 55°49'29" E	128.78'
4	S 09°40'17" E	80.02'
5	S 09°40'17" E	174.02'
6	S 68°53'16" W	133.96'
7	S 68°53'16" W	89.40'
8	S 67°41'09" W	80.12'
9	S 86°06'34" W	20.12'
10	S 70°32'34" W	16.05'
11	S 56°05'51" W	22.14'
12	S 24°16'50" W	24.41'
13	S 44°58'31" E	9.27'
14	S 44°58'31" E	115.12'



CONSERVATION EASEMENT
SURVEY OF
THE WHITLEY SITE
FOR
EBX NEUSE I, LLC

SMITHFIELD TOWNSHIP, JOHNSTON COUNTY, NC
SEPTEMBER 11, 2005
1" = 200'
GRAPHIC SCALE

- NOTES:**
- NO IRON MONUMENTS WERE LOCATED WITHIN 200' OF THE PROPERTY.
 - ALL DISTANCES ARE HORIZONTAL DECIMALS THEREOF, UNLESS OTHERWISE NOTED.

SOURCE OF TITLE

DB 1396, PG 58
DB 1105, PG 803
TOTAL EASEMENT
ADVERSE CLAIM
(BY COMPUTER)
27.50 AC±

L-4189

1. CHRISTOPHER K. PADERICK, PROFESSIONAL LAND SURVEYOR AND REGISTERED PROFESSIONAL SURVEYOR OF ANOTHER CATEGORY, TO WIT: AN EASEMENT SURVEY.

BOUNDARY LINE RUNS WITH CENTERLINE OF DITCH

JAMES EDWARD JOHNSTON
DOROTHY JOHNSTON
DB 529, PG 343

TERRELL PARKER
KATHRYN PARKER
DB 1653, PG 646
PG 48, PG 432
PG 63, PG 184

GLENN LASSITER, JR.
MELISSA LASSITER
DB 1371, PG 844

JIMMY RAY WHITLEY
SYLVIA N. WHITLEY
DB 1385, PG 58

JIMMY RAY WHITLEY
SYLVIA N. WHITLEY
DB 1385, PG 58

JIMMY RAY WHITLEY
DB 1105, PG 603

JIMMY RAY WHITLEY
DB 1105, PG 603

MELVIN J. QUIGER, JR.
KATHY O. HARROSE
DB 2857, PG 457

MELVIN J. QUIGER, JR.
KATHY O. HARROSE
DB 2857, PG 457

REVISED 9/12/2005 - CKP - CHANGED SOURCE OF TITLE

MATRIX EAST, PLLC
PROFESSIONAL LAND SURVEYORS
908 N. QUEEN ST., SUITE A WINSTON, NC 28901
TEL: 252-922-2500 FAX: 252-922-6747

DRAWN BY: CKP	PROJECT NO.: 20050102
SURVEYED BY: CKP-CKK	DATE: 9/11/2005
SCALE: 1" = 200'	DRAWING NAME: 20050102