ELLERBE CREEK STREAM RESTORATION – Project #127
Third Annual Monitoring Report - February 2008 - FINAL

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Submitted to:

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Table of Contents

I. Executive Summary 4
II. Project Background 4
A. Project Objectives 4
B. Project Structure, Restoration Type, and Approach 4
C. Location and Setting 5
D. History and Background 7
III. Project Conditions and Monitoring Results 9
A. Vegetation Assessment 9
B. Stream Assessment 10
1. Morphometric Criteria 10
2. Hydrologic Criteria 11
C. Wetland Assessment 20
IV. Methodology 20

LIST OF FIGURES

Figure 1 Vicinity Map 6
Figure 2 USGS Stream gauge data for Ellerbe Creek 12

Tables

Exhibit Table I. Project Restoration Components 7
Exhibit Table II. Project Activity and Reporting History 7
Exhibit Table III. Project Contact Table 8
Exhibit Table IV. Project Background Table 8
Exhibit Table V. Verification of Bankfull Events 15
Exhibit Table VII. Categorical Stream Feature Visual Stability Assessment 20
Exhibit Table VIII. Baseline Morphology and Hydraulic Summary 19
Exhibit Table IX. Morphology and Hydraulic Monitoring Summary 21

APPENDICES

Appendix A Vegetation Raw Data

Table A1. Vegetation Data Tables
- Table 5. Stem Count by Plot and Species
- Table 6. Vegetation Problem Areas

Figure A1. Vegetation Current Condition Plan View
Table A2. Vegetation Problem Area Photos
Table A3. Vegetation Monitoring Plot Photos

Appendix B Geomorphologic Raw Data

1. Figure B1. Stream Current Condition Plan View
2. Table B1. Stream Problem Areas
3. Stream Problem Area Photos
4. Stream Photostation Photos
5. Qualtitative Visual Stability Assessment
6. Cross section Plots
7. Longitudinal Plots
8. Pebble Count Frequency Distribution Plots

I. Executive Summary

The Ellerbe Creek stream restoration a project is located on the Hillandale Golf Course in Durham, North Carolina just east of the intersection of U.S. 15/501 and Interstate 85 (I-85). The project has restored 6,279 linear feet of the perennial stream in the Neuse River Basin (USGS HUC 03020201050010). The drainage area for the site covers approximately 5,635 acres. Several unnamed tributaries enter Ellerbe Creek upstream of the restoration site. Project construction began in January 2004 and was completed in December of the same year. First year monitoring was done in the fall of 2005. Second year monitoring was completed in November 2006. The third year monitoring was completed in early July 2007.

RJG&A's initial 2007 qualitative evaluation was conducted on 10 April. Quantitative vegetation and geomorphologic data were collected between 25 June and 10 July. Another qualitative evaluation was conducted on 02 October 2007. Vegetation monitoring was performed, recorded, entered, and analyzed pursuant to the methodology outlined in the Mitigation Plan and the First Annual Monitoring Report.

The restoration project has met its design goals. No significant geomorphologic changes have occurred during the third monitoring year. Aquatic and semi-aquatic organisms have colonized most of the restoration area and the average woody stem density (843 per acre) has exceeded the vegetation restoration goal.

II. Project Background

A. Project Objectives

The objectives of the Ellerbe Creek Stream restoration project are to:

1. Establish a new floodplain at a lower elevation and connecting the stream to the new floodplain;
2. Reduce erosion and sedimentation;
3. Provide wildlife habitat through the creation of a more natural riparian buffer;
4. Improve aquatic habitat with the use of natural material stabilization structures and a riparian buffer; and
5. Improve water quality within Ellerbe Creek.

B. Project Structure, Restoration Type, and Approach

A Priority 2 stream restoration was used for the most of project's length to establish a new floodplain, improve sediment transport capability, restore wildlife habitat, and improve water quality. Some stream enhancement was done in the Croasdaile, Hillandale, and Albany reaches, where utility rights-of-way were present. The Albany reach also included preservation. The project involved channel dimension adjustments, pattern alterations, in-stream structure (root wads, rock vanes, and woody debris)

installation to provide grade control and channel stability, and riparian buffer restoration (woody vegetation planting and stock exclusion).

The areas where site constraints related to the golf course and utility rights-of-way are detailed in the As-Built Report.

Exhibit Table I. Project Objectives Table (from Ellerbe Creek Year One Monitoring Report) Ellerbe Creek Stream Restoration - Project #127			
Reach ID	Mitigation Type	Linear Feet or Acreage	Comment
Hillsborough	Restoration	1663 LF	Changed dimension, pattern, and profile
Croasdaile	Restoration	199 LF	Changed dimension, pattern, and profile
Croasdaile	Enhancement	504 LF	Changed dimension and profile
Hillandale	Restoration	1321 LF	Changed dimension, pattern, and profile
Hillandale	Enhancement	618 LF	Changed dimension and profile
Albany	Restoration	1207 LF	Changed dimension, pattern, and profile
Albany	Enhancement	391 LF	Changed dimension and profile
Albany	Preservation	376 LF	Protected existing stream
Buffer	Restoration	17.41 AC	Restored buffer area
Stormwater Wetland	Creation	0.15 AC	Created wetlands
Pocket Wetlands	Creation	0.23 AC	Created wetlands

C. Location and Setting

The Ellerbe Creek restoration is located in the City of Durham on the Hillandale Golf Course. The golf course and restoration area are located approximately 1,500 feet east of the I-85/U.S. 15/501 intersection, on the east and west sides of Hillandale Road. To access the site from I-85, travel south on exit 17a (Hillandale Road). Ellerbe Creek is at the bottom of the first hill. The restoration site begins where Ellerbe Creek emerges from a double box culvert under I-85, continues east under Belleview Avenue and Hillandale Road, and terminates approximately 300 feet west of Albany Street. Sprunt Avenue parallels most of the site to the south. Indian Trail parallels the Albany reach to the north (Figure 1). The Croasdaile reach is along an unnamed tributary to Ellerbe Creek that emerges from a double box culvert under I-85. It is paralleled by Belleview Avenue to the east.

Maintenance of the immediately surrounding golf course, channel straightening, and the large amount of impervious surface in the surrounding urban watershed were primarily responsible for the stream's instability. The golf course had intensively managed the vegetation adjacent to the stream and only a grass buffer existed along the banks. The result was an entrenched stream with low sinuosity. The channel was incised four to six feet and erosion and slumping affected large portions of the banks.

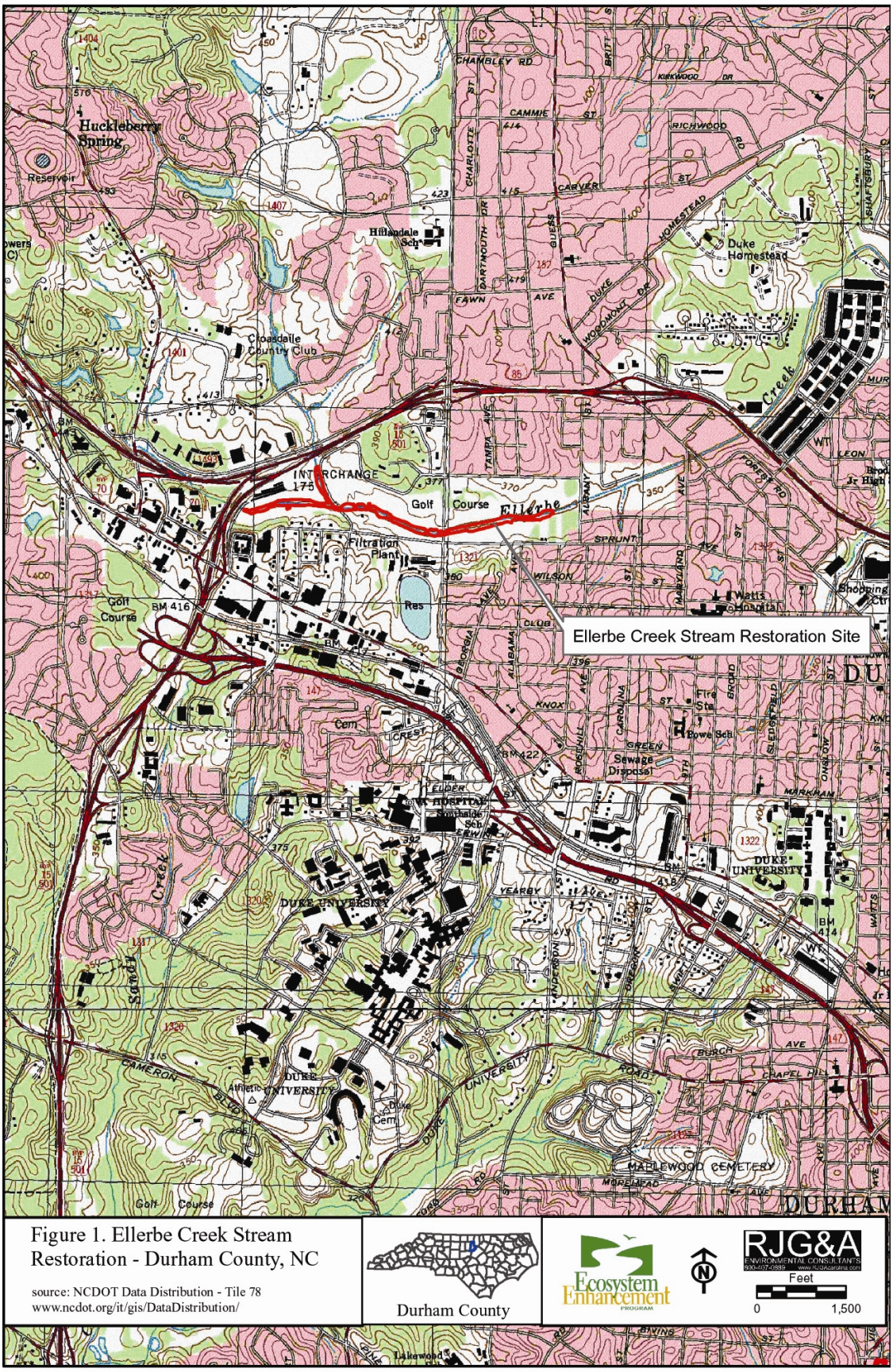

Figure 1. Ellerbe Creek Stream Restoration - Durham County, NC

source: NCDOT Data Distribution - Tile 78
www.ncdot.org/it/gis/DataDistribution/

D. History and Background

Exhibit Table II. Activity and Reporting History Ellerbe Creek Stream Restoration – Project #127		
Activity or Report	**Calendar Year of Completion or Planned Completion**	**Actual Completion Date**
Restoration Plan	2003	March 2003
Construction	2005	March 2005
Temporary S&E mix applied	2004	December 2004
Permanent seed mix applied	2004	December 2004
Bare Root Planting	2004	January 2004
Mitigation Plan	2005	May 2005
As-built	2004	May 2005
Year 1 Monitoring	2005	October 2005
Year 2 Monitoring	2006	December 2006
Year 3 Monitoring		
Vegetation	2007	June 2007
Geomorphological	2007	July 2007
Report	2007	October 2007

Exhibit Table III. Project Contacts Ellerbe Creek Stream Restoration – Project #127
Design: Stantec Consulting, Inc. 801 Jones Franklin Road, Suite 300 Raleigh, North Carolina 27606 Mr. Brad Fairley (919) 851-6866
Construction Contractor: SEI Environmental, Inc. 130 Penmarc Drive Raleigh, NC 27603-2470 Ms. Jackie Utley (919) 832-2535
Monitoring Performers: RJG&A 1221 Corporation Parkway, Suite 100 Raleigh, NC 27610 Ms. Jessi O'Neal (919) 872-1174

Exhibit Table IV. Project Background - Ellerbe Creek Stream Restoration – Project #127	
County	Durham
Drainage Area	Hillsborough Reach – 1,140 Acres (1.78 sq. miles)
	Hillandale Reach – 1,810 Acres (2.83 sq. miles)
	Albany Reach – 2,150 Acres (3.36 sq. miles)
	Croasdaile Reach – 535 Acres (0.84 sq. miles)
Drainage Impervious Cover Estimate (%)	80% impervious; 20% forest and residential
Stream Order	Third Order
Physiographic Region	Piedmont
Ecoregion	Triassic Basins
Rosgen Classification of As-built	C4
Dominant Soil Types	Cartecay, Chewacla, and Congaree
Reference Site ID	SCO#010551001A
USGS HUC for Project and Reference	Ellerbe: 03020201; Cabin Branch: 03020201; Tributary to Marks Creek: 03020201
NCDWQ Sub-basin for Project and Reference	Ellerbe: 03-04-01; Cabin Branch: 03-04-01; Tributary to Marks Creek: 03-04-02
NCDWQ Classification for Project and Reference	Ellerbe: Impaired; Cabin Branch: Not Rated; Tributary to Marks Creek: Excellent
Any portion of the project segment 303d listed?	Yes
Any portion of the project segment upstream of a 303d listed segment?	Yes
Reasons for 303d Listing or Stressor	Urban runoff/storm sewers
% of Project Easement Fenced 0%	None

Vegetation Plot Coordinates: Hillandale Reach			
Plot Side	HD-V1	HD-V2	HD-V3
Pin Coordinate	E 20117272.5870 N 827357.3090	E 2017822.8120 N 827293.6640	E 2018339.7600 N 827077.4290
A	19.9'	30.8'	20'
B	48.4'	31.1'	44.6'
C	22.2'	34.2'	14.2'
D	44.7'	32'	46.1'

	Easting	Northing
Cross-sections		
HD1L	2017297.3510	827444.6380
HD1R	2017305.8250	827358.5730
HD2L	2017374.0400	827421.2960
HD2R	2017358.2570	827357.0970
HD3L	2017882.0380	827326.3380
HD3R	2017835.7280	827218.0475
HD4L	2017870.4020	827311.3050
HD4R	2017919.3160	827220.8030
Photopoints		
HD-P1	2017158.5527	827368.2372
HD-P2	2017423.2777	827370.9011
HD-P3	2017633.3927	827372.5660
HD-P4	2017780.9060	827327.6127
HD-P5	2018032.6444	827207.0713
HD-P6	2018319.0135	827067.8826
HD-P7	2018632.0216	826962.3256

Match Line

2850 2900 2950 3000 3050 3100 3150 3200 3250 3300 3350 3400 3450 3500 3550 3600 3650 3700 3750 3800 3850 3900 3950 4000 4050 4100 4150 4200 4250 4300 4350 4400 4450 4500 4550 4600 4650 4700 4750 4800 4850 4900 4950

Figure 2.1

Figure 2.2

Hillandale Road

Figure 2.2

Figure 2.3

Match Line

Figure 2.2 - 2007 Plan View - Monitoring.Year 3

Ellerbe Creek Stream Restoration - Durham, NC - NCEEP Project #127

LEGEND

- Thalweg-2007 Survey
- NCDOT Stormwater Structures

As-built Drawings
(Supplied by Stantec)

- Ellerbe Easement Boundary
- Thalweg - As-built
- Top of Bank
- Vegetation Monitoring Plots
- Monitoring Cross Sections
- Photo Points
- As-built Features
- Pre-existing Features

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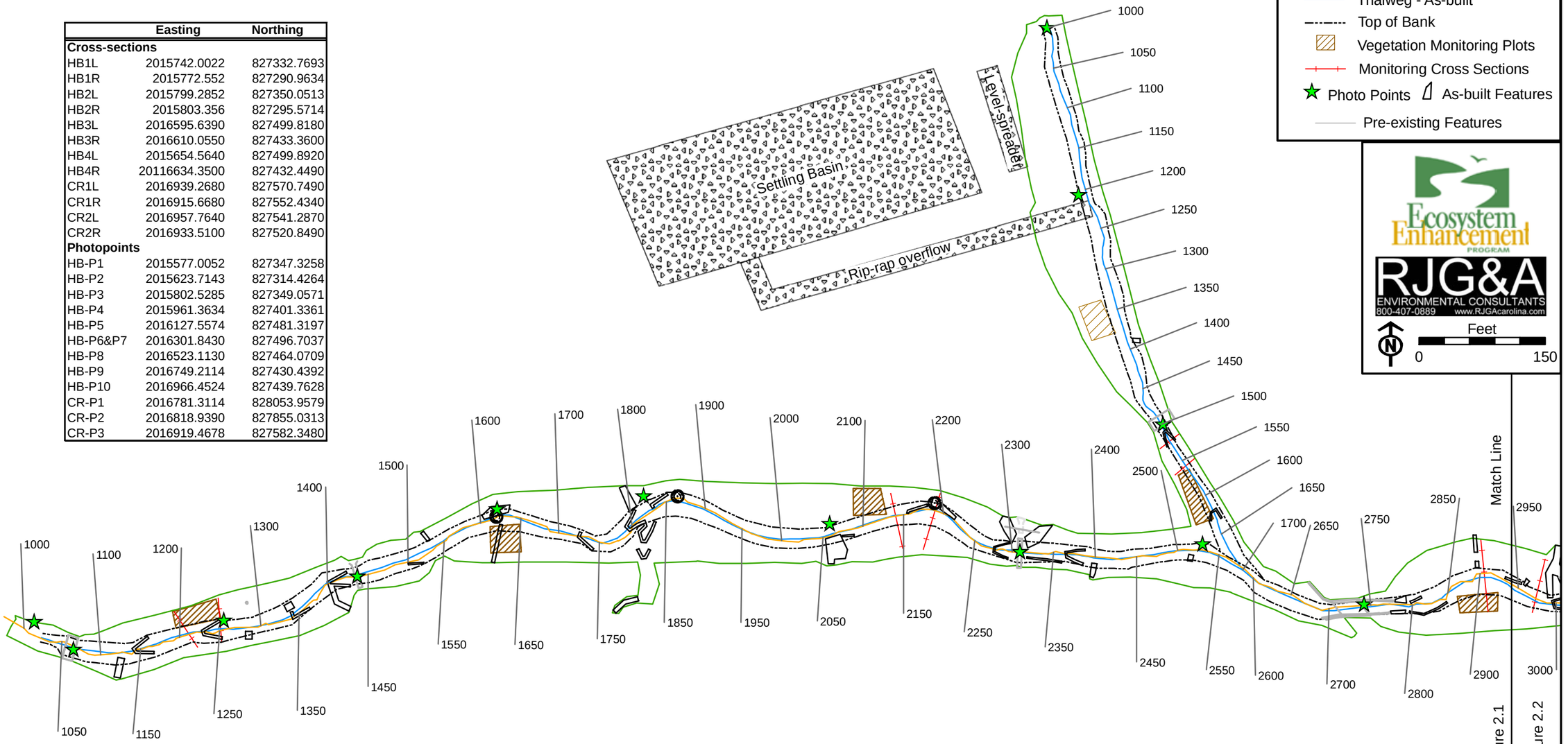
Feet
0 150

Figure 2.1 - 2007 Plan View - Monitoring Year 3
Ellerbe Creek Stream Restoration - Durham, NC - NCEEP Project #127

Vegetation Plot Coordinates: Hillsborough Reach			
Plot Side	HB-V1	HB-V2	HB-V3
Pin Coordinate	E 20115741.5610 N 827358.3480	E 20116120.1110 N 827428.6750	E 2016551.0870 N 827505.1970
A	19.5'	31.1'	31.9'
B	52.1'	35.4'	32.6'
C	23.2'	33.1'	31.3'
D	53'	36.2'	39.4'

Vegetation Plot Coordinates: Croasdaile Reach		
Plot Side	CR-V1	CR-V2
Pin Coordinate	E 2016811.8250 N 827741.1850	E 2016933.510 N 827520.8490
A	32.4'	18.3'
B	33.2'	65.5'
C	29.9'	21.7'
D	31.9'	64.1'

	Easting	Northing
Cross-sections		
HB1L	2015742.0022	827332.7693
HB1R	2015772.552	827290.9634
HB2L	2015799.2852	827350.0513
HB2R	2015803.356	827295.5714
HB3L	2016595.6390	827499.8180
HB3R	2016610.0550	827433.3600
HB4L	2015654.5640	827499.8920
HB4R	20116634.3500	827432.4490
CR1L	2016939.2680	827570.7490
CR1R	2016915.6680	827552.4340
CR2L	2016957.7640	827541.2870
CR2R	2016933.5100	827520.8490
Photopoints		
HB-P1	2015577.0052	827347.3258
HB-P2	2015623.7143	827314.4264
HB-P3	2015802.5285	827349.0571
HB-P4	2015961.3634	827401.3361
HB-P5	2016127.5574	827481.3197
HB-P6&P7	2016301.8430	827496.7037
HB-P8	2016523.1130	827464.0709
HB-P9	2016749.2114	827430.4392
HB-P10	2016966.4524	827439.7628
CR-P1	2016781.3114	828053.9579
CR-P2	2016818.9390	827855.0313
CR-P3	2016919.4678	827582.3480



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- NCDOT Stormwater Structures

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N

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Vegetation Plot Coordinates: Albany Reach			
Plot Side	AL-V1	AL-V2	AL-V3
Pin Coordinate	E 20117272.5870 N 827357.3090	E 2017822.8120 N 827293.6640	E 2018339.7600 N 827077.4290
A	19.8'	33.1'	30.4'
B	54.7'	33.9'	45.8'
C	20.6'	36.1'	34.3'
D	51.5'	37.7'	45.8'

	Easting	Northing
Cross-sections		
AL1L	2019638.8850	827132.4120
AL1R	2019653.3780	827052.7850
AL2L	2019670.2730	827138.9190
AL2R	2019716.0120	827068.9910
AL3L	2019819.4940	827182.5337
AL3R	2019825.5310	827101.4830
AL4L	2019845.6470	827189.0390
AL4R	2019867.0530	827112.7780
Photopoints		
AL-P1	2018922.3866	826950.6711
AL-P2	2019315.6779	827040.2114
AL-P3	2019581.5016	827088.1615
AL-P4	2019822.0184	827155.9245
AL-P5	2020004.7951	827193.1524
AL-P6	2020248.1090	827221.4564
AL-P7	2020410.0740	827196.1493
AL-P8	2020545.5332	827244.7655

Match Line

Figure 2.2

Figure 2.3

4850 4950 5050 5150 5250 5350 5450 5550 5650 5750 5850 5950 6050 6150 6250 6350 6450 6550 6650

4800 4900 5000 5100 5200 5300 5400 5500 5600 5700 5800 5900 6000 6100 6200 6300 6400 6500 6600

Figure 2.3 - 2007 Plan View - Monitoring Year 3

Ellerbe Creek Stream Restoration - Durham, NC - NCEEP Project #127

LEGEND

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III. Project Conditions and Monitoring Results

RJG&A's initial 2007 qualitative evaluation was conducted in April and the project appeared to be functioning as designed. Subsequent evaluations in July and October 2006 also revealed relatively complete design compliance, with a few minor exceptions, detailed below.

A. Vegetation Assessment

Hillsborough Reach

Three vegetation problem areas were observed in the Hillsborough reach during the second growing season. Two of them are on the slopes between the terrace and the golf course. They are likely to have resulted from rill and gully erosion in compacted subsoil. The third, and largest, vegetation problem area involves both rill and gully erosion on the slopes as well as bare soil on the floodplain which appears to be result of poor growth medium (i.e. too compact/not enough organic material/nutrients). In addition to the three large vegetation problem areas, originally identified in the 2006 monitoring, small, isolated rill and gully areas exist throughout the project that have poor vegetative cover, as well (Appendix A.1 and A.2).

Replanting, mulching, and installation of erosion control devices (e.g. coir matting) in the rill and gully areas is recommended. Although poor soil/conditions in the larger vegetation problem area has resulted in bare soil and sparse herbaceous cover, the vegetation monitoring plot (HB-V3) located adjacent to the area contains 22 live, planted stems (or 890 stems per acre). Because the area is far exceeding the goal of 320 stems per acre, no remedial work appears to be necessary at this time. These areas should continue to be closely monitored.

Although one beaverdam was observed, and subsequently removed during the geomorphological survey by an EEP subcontractor, no evidence of beaver browsing was observed in this, or any other reach in the project.

Croasdaile Reach

The only vegetation problem area observed in the Croasdaile reach was where the NCDOT rip-rap spillway crosses the stream buffer. No remedial action is recommended/possible at this time.

Hillandale Reach

A small rill and gully vegetation problem area was observed on the slope from the golf coarse in the Hillandale reach, immediately downstream from cross section four. As described above, this vegetation problem area is likely to be the result of the lack of an adequate substrate.

Albany Reach

Two vegetation problem areas were observed in the Albany Reach. Both are a combination of rill and gully erosion on the slopes and bare soil on the floodplain, due to poor/compacted soil. Similar to the Hillsborough Reach, vegetation monitoring plots in the vicinity of these areas have 21 and 36 live planted stems (850 and 1457 stems per acre respectively), so no remedial action is recommended at this time.

All Reaches

The average live, planted woody stem density for all plots was 20.8 individuals per plot, (843 stems per acre). This exceeds the required 320 stems per acre in the third monitoring year by 263 percent, in spite of the 62.8 percent survival of planted woody stems (Table VII).

B. Stream Assessment

1. Morphometric Criteria

RJG&A staff evaluated the Ellerbe Creek Stream Restoration site during April, June, and October 2007. The RJG&A staff collected the third year monitoring quantitative geomorphological data during July 2007.

As the quantitative data and qualitative evaluations indicate, after the third growing season the structure and function of the entire restoration project very closely match the as built conditions and nearly all structures appear to be functioning as designed.

One high priority structural failure was observed at a cross vane on Ellerbe Creek's right bank at station 6330 (Appendix B1.3). The vane's downstream-most header rock has become entirely dislodged from the underlying footer and is in the channel below. From the header's former location, the downstream bank is eroding severely and slumping into the creek for approximately 30 more feet. Several low priority areas of scour, aggradation, and structure undermining were observed at other locations (Exhibit Table X, Appendix B1).

One beaverdam was found in the Hillsborough reach and removed by a subcontractor during data collection. The removal occurred on 2 July 2007 and the results of which can be seen in the longitudinal profile data (Appendix B.6). Beaver were subsequently removed from the site.

The most obvious structural difference from monitoring year 2, was the increased number of aggradation areas, mostly in the form of bars. This may be due to a combination of high beaver activity in 2006 that trapped a large amount of sediment behind the dams, followed by the low flow conditions of 2007 that resulted in downcutting through the remaining sediment, instead of moving sediment though the system. The result appears to be an increase in the size and number of bars, especially in the Albany reach.

The lowest portion of the Albany reach continues to be "backwatered", presumably due to downstream beaver impoundments, resulting in flooded structures and aggregation in the two downstream-most pools.

Several slopes with rill and gully erosion are still present throughout the site. These will continue to be evaluated. If erosion continues, organic material and secured stability matting may need to be remedially installed.

Although construction overflow spillway that serves the I-85 stormwater settling basin has altered a portion of the Croasdaile Reach's right bank and the dimensions of the adjacent constructed wetland, it appears to be stable and functioning.

2. Hydrologic Criteria

A crest gauge was installed at this site to document bankfull events on 13 June 2007. As of 02 October 2007, at least one bankfull event had occurred. Based on NC CRONOS data from the 312515 Durham weather station during this time period, a bankfull event most likely occurred in response to a storm that occurred on 28 July 07, when the highest amount of precipitation (1.08 in) was recorded. Previous to this, potential occurrence was based on USGS stream gauge discharge data for Ellerbe Creek near Gorman (USGS 02086849). This gauge is located approximately 10 miles downstream of the restoration site and has a drainage area of 21.9 square miles. According to the bankfull regional curves, a stream with a drainage area of 21.9 square miles would reach a bankfull discharge at 2,144.5 cubic feet per second (cfs) using the urban piedmont regional curves, and 819.7 cfs using the rural piedmont regional curve (Doll et al., 2002). Presumably due to a drought in the area, there have been no bankfull flow events at this USGS stream gauge in 2007 (Figure 2).

Qualitative evaluation (rack and drift lines, downed herbaceous and woody vegetation on the floodplain) indicated at least one high flow event between 7 December 2006 and 11 April 2007. It is likely that another bankfull event occurred on 12 April 2007, based on on-site observation by RJG&A staff, of the water level in the channel being two to three inches below bankfull and rising.

Exhibit Table V. Verification of Bankfull Events – Ellerbe Creek Stream Restoration – Project #127

Date of Data Collection	Date of Occurrence	Method	Photo # (if available)
11 April 07	Between 7 December 06 and 12 April 07	On-site high water indicators	NA
02 October 07	Between 13 June 07 and 02 October 07	Crest Gauge	NA

Figure 2. USGS 2007 stream gauge discharge data for Ellerbe Creek near Gorman, N.C.

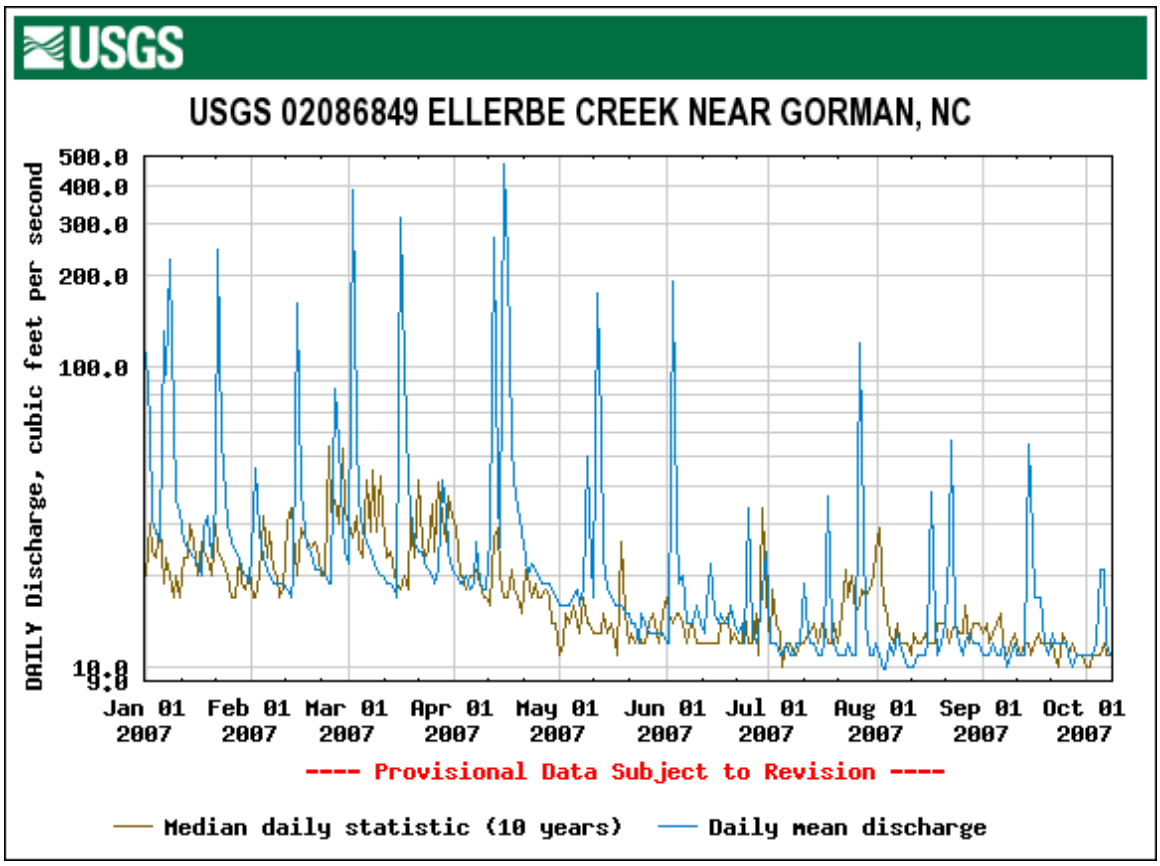

Table IX BEHI and Sediment Export Estimates only apply to Monitoring year 5 and were, therefore, not performed during 2007 (monitoring year 3).

Exhibit Table VII. Categorical Stream Feature Visual Stability Assessment - Ellerbe Creek Stream Restoration – Project #127						
Hillsborough Reach (1,663 ft)						
Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
A. Riffles	100%	95%	87%	90%		
B. Pools	100%	80%	69%	94%		
C. Thalweg	100%	95%	78%	87%		
D. Meanders	100%	98%	94%	100%		
E. Bed General	100%	85%	100%	100%		
G. Bank				98%		
F. Vanes/J Hooks, etc.	100%	95%	89%	100%		
H. Wads and Boulders	100%	95%	75%	66.5%		
Croasdaile Reach (703 ft)						
A. Riffles	100%	95%	100%	100%		
B. Pools	100%	95%	100%	100%		
C. Thalweg	100%	95%	100%	100%		
D. Meanders	100%	95%	100%	100%		
E. Bed General	100%	95%	100%	100%		
G. Bank				100%		
F. Vanes/J Hooks, etc.	100%	95%	100%	100%		
H. Wads and Boulders	100%	95%	100%	100%		
Hillandale Reach (1,939 ft)						
A. Riffles	100%	90%	93%	95%		
B. Pools	100%	85%	89%	96%		
C. Thalweg	100%	95%	80%	75%		
D. Meanders	100%	95%	83%	92%		
E. Bed General	100%	75%	100%	100%		
G. Bank				94%		
F. Vanes/J Hooks, etc.	100%	95%	92%	89%		
H. Wads and Boulders	100%	95%	50%	100%		
Albany Reach (1,974 ft)						
A. Riffles	100%	60%	75%	60%		
B. Pools	100%	60%	62%	79%		
C. Thalweg	100%	80%	75%	45%		
D. Meanders	100%	95%	77%	77%		
E. Bed General	100%	50%	100%	100%		
G. Bank				89%		
F. Vanes/J Hooks, etc.	100%	95%	79%	85%		
H. Wads and Boulders	100%	95%	75%	75%		

Exhibit Table VIII. Baseline Morphology and Hydraulic Summary - Ellerbe Creek Stream Restoration – Project #127 Reaches: Hillsborough, Hillandale, Albany*

Parameters	USGS Data	Regional Curve Interval	Project Reference Stream		Pre-Existing Condition			Design			As-built		
Dimension			**Min**	**Max**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**
Bankfull Width (ft)	NA	NA	10.1	14.3	19.9	20.7	NA	22	26	NA	16.3	24.8	NA
Floodprone Width (ft)	NA	NA	47	59	25	40	NA	48	57	NA	50	100	NA
BF Cross Sectional Area (sq ft)	NA	NA	7.2	21.4	37.9	48.3	NA	28.9*	42.3*	NA	25.8	82.4	NA
BF Mean Depth (ft)	NA	NA	0.7	1.5	1.5	2.4	NA	1.8	2.2	NA	1.3	3.3	NA
BF Maximum Depth (ft)	NA	NA	1.3	2.2	37.*	4.0	NA	2.7	3.2	NA	2.2	4.8	NA
Width/Depth Ratio	NA	NA	10	14	8	13	NA	28.9*	42.3*	NA	12.7	19.2	NA
Entrenchment Ratio	NA	NA	3.3	5.8	1.2	2.0	NA	2.2	2.2	NA	2.4	3.9	NA
Bank Height Ratio	NA	NA	-	-	-	-	-	-	-	-	1.02	1.31	1.07
Wetted Perimeter (ft)	NA	NA	11.61	17.25	28.28	24.77	NA	21.89	24.59	NA	19.9	38.4	NA
Hydraulic Radius (ft)	NA	NA	0.62	1.24	1.34	1.95	NA	1.32	1.72	NA	1.3	2.6	NA
Substrate													
d50 (mm)	NA	NA	NA	NA	NA	NA	8.3	NA	5	NA	0.01	4.4	NA
d84 (mm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	49	NA
Pattern													
Channel Beltwidth (ft)	NA	NA	38	80	25	33	--	90	105	NA	11.6	55.38	36.7
Radius of Curvature (ft)	NA	NA	37.73	160	NA	19	15	45	95	NA	34.78	114	67
Meander Wavelength	NA	NA	32	105	NA	129	65	85	295	NA	103	304	185
Meander Width ratio	NA	NA	3.74	7.89	1.3	1.6	--	4.0	4.1	NA	0.47	2.41	1.48
Profile													
Riffle length (ft)	NA	NA	NA	NA	NA	NA	NA	2	103	NA	NA	NA	NA
Riffle slope (ft/ft)	NA	NA	NA	NA	0.906	1.091	0.011	0.001	0.002	NA	NA	NA	NA
Pool length (ft)	NA	NA	NA	NA	NA	NA	NA	2	27	NA	NA	NA	NA
Pool spacing (ft)	NA	NA	5	49	19	29	24	24	160	NA	NA	NA	NA
Additional Reach Parameters													
Valley Length (ft)	NA	NA	NA	NA	NA	5200							
Channel Length (ft)	NA	NA	NA		NA			NA			5576		
Sinuosity	NA	NA	1.2		1.03			1.11			1.05		
Water Surface Slope (ft/ft)	NA	NA	NA		0.994			NA			0.97		
BF slope (ft/ft)	NA	NA	NA		NA			NA			NA		
Rosgen Classification	NA	NA	C4b, C5		G4			C4			C4		
Habitat Index	NA	NA	NA		NA			NA			NA		
Macrobenthos	NA	NA	NA		NA			NA			NA		

*All numbers have been copied directly from the first year monitoring report. Numbers that seem questionable have been identified with an asterisk (*).

Exhibit Table VIII. Baseline Morphology and Hydraulic Summary - Ellerbe Creek Stream Restoration – Project #127 - Reach: Croasdaile*

Parameters	USGS Data	Regional Curve Interval	Project Reference Stream		Pre-Existing Condition			Design			As-built		
Dimension			**Min**	**Max**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**
Bankfull Width (ft)	NA	NA	10.1	14.3	19.9	20.7	NA	NA	NA	17.5	9.1	11.5	NA
Floodprone Width (ft)	NA	NA	47	59	25	40	NA	NA	NA	50	NA	NA	21.2
BF Cross Sectional Area (sq ft)	NA	NA	7.2	21.4	37.9	48.3	NA	NA	NA	16.9	14.5	19.7	NA
BF Mean Depth (ft)	NA	NA	0.7	1.5	1.5	2.4	NA	NA	NA	1.5	1.3	2.2	NA
Maximum Depth (ft)	NA	NA	1.3	2.2	37.*	4.0	NA	NA	NA	2.1	1.9	2.8	NA
Width/Depth Ratio	NA	NA	10	14	8	13	NA	NA	NA	12	NA	NA	9.0
Entrenchment Ratio	NA	NA	3.3	5.8	1.2	2.0	NA	NA	NA	2.9	NA	NA	1.9
Bank Height Ratio	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.34	2.75	NA
Wetted Perimeter (ft)	NA	NA	11.61	17.25	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hydraulic Radius (ft)	NA	NA	0.62	1.24	1.34	1.95	NA	NA	NA	1.01	1.1	1.6	NA
Pattern													
Channel Beltwidth (ft)	NA	NA	38	80	25	33	NA	NA	NA	82.63	NA	NA	NA
Radius of Curvature (ft)	NA	NA	37.73	160	NA	19	15	36	44	NA	NA	NA	NA
Meander Wavelength	NA	NA	32	105	NA	129	65	156	233	NA	NA	NA	NA
Meander Width ratio	NA	NA	3.74	7.89	1.3	1.6	NA	NA	NA	4.7	NA	NA	NA
Profile													
Riffle length (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Riffle slope (ft/ft)	NA	NA	NA	NA	0.906	1.091	0.011	NA	NA	0.002	NA	NA	NA
Pool length (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pool spacing (ft)	NA	NA	NA	NA	19	29	24	29.2	78	NA	NA	NA	NA
Substrate													
d50 (mm)	NA	NA	NA	NA	NA	NA	8.3	NA	NA	NA	NA	NA	NA
d84 (mm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Additional Reach Parameters													
Valley Length (ft)	NA	NA	NA		NA			NA			687		
Channel Length (ft)	NA	NA	NA		NA			NA			703		
Sinuosity	NA	NA	1.20-1.23		1.03			1.05			1.02		
Water Surface Slope (ft/ft)	NA	NA	NA		0.994			NA			NA		
BF slope (ft/ft)	NA	NA	NA		NA			NA			NA		
Rosgen Classification	NA	NA	C4b, C5		G4			C4			B4		
Habitat Index	NA	NA	NA		NA			NA			NA		
Macrobenthos	NA	NA	NA		NA			NA			NA		

Exhibit Table IX. Morphology and Hydraulic Monitoring Summary - Ellerbe Creek Stream Restoration – Project #127 - Hillsborough Reach

	HB-XS1				HB-XS2				HB-XS3				HB-XS4			
Dimension	As-built	Mon 01	Mon 02	Mon 03	As-built	Mon 01	Mon 02	Mon 03	As-built	Mon 01	Mon 02	Mon 03	As-built	Mon 01	Mon 02	Mon 03
Bankfull Width (ft)	19.3	21.8	21.47	23.24	16.3	16.1	34.03	31.9	21.9	38	22.11	22.36	24.8	24.4	34.71	33.43
Floodprone Width (ft)	50	100	100	100	NA	100	100	100	85	100	100	100	NA	100	100	100
Bankfull Area (sq ft)	25.8	33.1	31.26	31.37	54.2	54	61.43	62.76	37.7	38.2	35.71	35.25	59.1	56.3	59.18	68.94
Mean Depth (ft)	1.3	1.5	1.46	1.35	3.3	3.4	1.81	1.97	1.7	1	1.61	1.58	2.4	2.3	1.71	2.06
Maximum Depth (ft)	2.2	2.6	2.62	2.72	4.5	4.6	5.02	4.96	3.1	2.8	3.12	3.19	4.5	4.4	4.29	4.4
Width/Depth Ratio	14.5	14.3	14.75	17.22	NA	4.8	18.85	16.21	12.7	37.7	13.69	14.19	NA	10.6	20.36	16.21
Entrenchment Ratio	2.6	4.6	4.66	4.30	NA	6.2	2.94	3.13	3.9	2.6	4.52	4.47	NA	4.1	2.88	2.99
Bank Height Ratio	1.16	NA	NA	1.01	1.07	NA	NA	1.04	1.08	NA	NA	1.08	1.03	NA	NA	1.05
Wetted Perimeter (ft)	19.9	22.8	22.45	24.27	21.1	21.5	39.3	37.54	23.2	38.7	23.28	23.7	28	27.3	37.72	36.86
Hydraulic Radius (ft)	1.3	1.5	1.39	1.29	2.6	2.5	1.56	1.67	1.6	1	1.53	1.49	2.1	2.1	1.57	1.87
Substrate																
d50 (mm)	11.7	12	4	5.7	11	9.6	0.06	0.06	NA	0.062	0.04	6.6	4.4	0.83	1.56	1.4
d84 (mm)	49	30	39.8	19	23	41	15.53	4	NA	1200	3	20.8	11	13	13.65	20.5

Entire Longitudinal Profile (all HB and part of HD)

	Mon 01			Mon 02			Mon 03		
Pattern	min	max	mean	min	max	mean	min	max	mean
Channel Beltwidth (ft)	NA	NA	NA	9.57	57.91	35.66	12.2	60.9	39.3
Radius of Curvature (ft)	NA	NA	NA	39.1	126.49	69.6	31	126.2	60.5
Meander Wavelength	NA	NA	NA	155.44	384.31	384.31	153.5	388.5	248.4
Meander Width ratio	NA	NA	NA			1.21			1.21
Profile									
Riffle length (ft)	NA	NA	NA	3.54	70.53	22.91	19.1	158.5	56.6
Riffle slope (ft/ft)	NA	NA	NA	0.001	0.175	0.042	0	0.03	0.011
Pool length (ft)	NA	NA	NA	18.18	425.86	118.6	17.3	93.9	44.2
Pool spacing (ft)	NA	NA	NA	0.77	51.72	18.78	14.5	344	104.1

Additional Reach Parameters	Mon 01	Mon 02*	Mon 03*
Valley Length (ft)	1586	3,050	3,089
Channel Length (ft)	1663	3,398	3,389
Sinuosity	1.05	1.11	1.10
Water Surface Slope (ft/ft)	0.97	0.0035	0.0047
BF slope (ft/ft)	NA	0.0018	0.0035
Rosgen Classification	C4	C5	C5
Habitat Index	NA	NA	NA
Macrobenthos	NA	NA	NA

* For entire longitudinal profile only

Exhibit Table IX. Morphology and Hydraulic Monitoring Summary - Ellerbe Creek Stream Restoration – Project #127 - Hillandale Reach

	HD-XS1				HD-XS2				HD-XS3				HD-XS4			
Dimension	**As-built**	**Mon 01**	**Mon 02**	**Mon 03**	**As-built**	**Mon 01**	**Mon 02**	**Mon 03**	**As-built**	**Mon 01**	**Mon 02**	**Mon 03**	**As-built**	**Mon 01**	**Mon 02**	**Mon 03**
Bankfull Width (ft)	37.1	30	31.09	45.03	23.9	41.9	36.08	33.00	40.4	45.2	45.08	45.27	34.7	39.2	38.71	34.83
Floodprone Width (ft)	NA	100	100	100	75	100	100	100.00	NA	100	100	101.5	100	105	105	105
BF Cross Sectional Area (sq f	49.1	37.3	36.45	46.23	33.2	38.8	33.7	31.53	89.1	101.2	100.5	98.82	62.7	69.2	64.24	64.27
BF Mean Depth (ft)	1.3	1.2	1.17	1.03	1.4	0.9	0.93	0.96	2.2	2.2	2.23	2.18	1.8	1.8	1.66	1.85
BF Maximum Depth (ft)	3.2	3	3.02	2.96	3	2.9	2.83	2.87	4.2	4.5	4.63	4.83	3.2	4	3.74	4.08
Width/Depth Ratio	NA	24.2	26.52	43.86	17.2	45.1	38.62	34.53	NA	20.1	20.22	20.74	19.2	22.3	23.33	18.88
Entrenchment Ratio	NA	3.3	3.22	2.22	3.1	2.4	2.77	3.03	NA	2.2	2.22	0.23	2.9	2.7	2.71	0.22
Bank Height Ratio	1.13	NA	NA	1.14	1.02	NA	NA	1.08	1.07	NA	NA	1.02	1.09	NA	NA	1.12
Wetted Perimeter (ft)	38.4	31.2	32.73	46.61	25.1	43.3	37.55	34.34	41.7	46.6	46.71	47.04	35.6	40.4	40.26	36.56
Hydraulic Radius (ft)	1.3	1.2	1.11	0.99	1.3	0.9	0.9	0.92	2.1	2.2	2.15	2.10	1.8	1.7	1.6	1.76
Substrate																
d50 (mm)	0.4	0.59	0.06	3	NA	0.062	0.13	0.06	1.7	7	9.57	0.8	1.8	0.062	0.05	6.9
d84 (mm)	5	8	6.36	13	10	0.062	0.84	0.42	10	18	15.46	14.4	6	0.062	7.49	15.6

Additional Reach Parameters	**Mon 01**
Valley Length (ft)	1804
Channel Length (ft)	1939
Sinuosity	1.07
Water Surface Slope (ft/ft)	NA
BF slope (ft/ft)	NA
Rosgen Classification	C4
Habitat Index	NA
Macrobenthos	NA

Exhibit Table IX. Morphology and Hydraulic Monitoring Summary - Ellerbe Creek Stream Restoration – Project #127 - Albany Reach

	AL-XS1				AL-XS2				AL-XS3				AL-XS4			
Dimension	**As-built**	**Mon 01**	**Mon 02**	**Mon 03**	**As-built**	**Mon 01**	**Mon 02**	**Mon 03**	**As-built**	**Mon 01**	**Mon 02**	**Mon 03**	**As-built**	**Mon 01**	**Mon 02**	**Mon 03**
Bankfull Width (ft)	29	31.7	53.05	48.02	27	28	45.36	46.60	27.4	21.3	23.99	21.40	28.6	28.9	35.88	26.27
Floodprone Width (ft)	NA	100	100	100.00	100	100	100	100.00	NA	100	100	100.00	70	71.9	100	100.00
BF Cross Sectional Area (sq ft)	60.5	69.1	84.87	79.45	68.4	70.1	73.36	78.63	82.4	71.4	65.9	61.50	55.4	55.7	48.23	45.30
BF Mean Depth (ft)	2.1	2.2	1.6	1.65	2.5	2.5	1.62	1.69	3	3.3	2.75	2.87	1.9	1.9	1.34	1.72
BF Maximum Depth (ft)	3.5	3.9	4.12	4.34	4.8	4.6	4.67	4.71	5.1	4.4	4.4	4.31	3.2	3.3	3.32	3.14
Width/Depth Ratio	NA	14.5	33.16	29.03	10.7	11.2	28.04	27.62	NA	6.4	8.73	7.45	14.8	15	26.7	15.23
Entrenchment Ratio	NA	3.2	1.89	2.08	3.7	3.6	2.21	2.15	NA	4.7	4.17	0.58	2.4	2.5	2.79	0.21
Bank Height Ratio	1.07	NA	NA	1.03	1.08	NA	NA	1.06	1.14	NA	NA	1.14	1.31	NA	NA	1.23
Wetted Perimeter (ft)	30.2	33.5	55.09	50.24	30.7	30.7	49.46	50.24	32.3	25.3	28.15	24.92	29.6	30	37.42	27.38
Hydraulic Radius (ft)	2	2.1	1.54	1.58	2.2	2.3	1.48	1.57	2.5	2.8	2.34	2.47	1.9	1.9	1.29	1.65
Substrate																
d50 (mm)	0.1	0.062	2.29	0.2	0.2	0.86	0.29	0.2	0.4	9.2	6.98	0.6	0.2	3.5	0.8	2.8
d84 (mm)	6	3.8	12.24	5.7	9	10	9.1	1	22	22	16.83	9.7	5	12	6.47	8.8

Additional Reach Parameters	**Mon 01**
Valley Length (ft)	1888
Channel Length (ft)	1974
Sinuosity	1.04
Water Surface Slope (ft/ft)	NA
BF slope (ft/ft)	NA
Rosgen Classification	C4
Habitat Index	NA
Macrobenthos	NA

Exhibit Table IX. Morphology and Hydraulic Monitoring Summary - Ellerbe Creek Stream Restoration – Project #127 - Croasdaile Reach

	CR-XS1				CR-XS2			
Dimension	As-built	Mon 01	Mon 02	Mon 03	As-built	Mon 01	Mon 02	Mon 03
Bankfull Width (ft)	9.1	9.4	8.59	9.05	11.5	13.4	10.28	11.4
Floodprone Width (ft)	NA	9.8	9.8	21.88	21.2	23.3	23.3	21.78
BF Cross Sectional Area (sq ft)	19.7	20.4	18.36	20.45	14.5	17.9	11.67	13.98
BF Mean Depth (ft)	2.2	2.2	2.1	2.26	1.3	1.3	1.14	1.23
BF Maximum Depth (ft)	2.8	2.5	2.59	2.81	1.9	2.1	1.73	2
Width/Depth Ratio	NA	4.4	4.02	4	9	10	9.06	9.3
Entrenchment Ratio	NA	1	1.14	2.42	1.9	1.7	2.27	1.91
Bank Height Ratio	2.34	NA	NA	2.35	2.75	NA	NA	2.78
Wetted Perimeter (ft)	12.7	11.1	12.05	12.62	12.8	14.8	11.36	12.48
Hydraulic Radius (ft)	1.6	1.8	1.52	1.62	1.1	1.2	1.03	1.12
Substrate								
d50 (mm)	9.9	12	13.85	5.7	14	12	9.47	8.3
d84 (mm)	19	24	23.85	30.9	27	20	27.3	20.2

Additional Reach Parameters	**Mon 01**
Valley Length (ft)	687
Channel Length (ft)	703
Sinuosity	1.02
Water Surface Slope (ft/ft)	NA
BF slope (ft/ft)	NA
Rosgen Classification	B4
Habitat Index	NA
Macrobenthos	NA

C. Wetland Assessment

As part of the project design, a stormwater wetland and 11 pocket wetlands were created throughout the Ellerbe Creek floodplain. No monitoring wells were established in relation to any of these wetlands and EEP did not claim any mitigation credit for them. By all appearances, all of the wetlands appear to be functioning as designed. The NCDOT rip-rap stormwater spillway could negatively impact hydrology in the Croasdaile Reach's constructed wetland.

IV. Methodology

Methods employed were a combination those specified in the Mitigation Plan, the First Annual Monitoring Report, and standard regulatory guidance and procedures documents. Stream monitoring data was collected using the techniques described in US ACE Stream Mitigation Guidelines, US Forest Service's Stream Channel Reference Sites, and Applied River morphology (USACE, 2003; Harrelson et al., 1994; Rosgen, 1996). Vegetation data collection followed the methodology described in the Mitigation Plan and the First Annual Monitoring Report. The taxonomic standard used to identify vegetation is *Flora of the Carolinas, Virginia Georgia, and Surrounding Areas* (Weakly, 2007).

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Appendix A. Vegetation Data
Ellerbe Creek Stream Restoration – Project #127

Table A1. Vegetation Data Tables
Table 5. Stem Count by Plot and Species
Table 6. Vegetation Problem Areas

Figure A1. Vegetation Current Condition Plan View

Table A2. Vegetation Problem Area Photos

Table A3. Vegetation Monitoring Plot Photos

A1. Vegetation Data Tables

Table 5. Stem Counts and Summary Data by Species and Plot - Ellerbe Creek Stream Restoration – Project #127

					Hillsborough			Croasdaile		Hillandale			Albany		
Species	**Total Planted**	**Year 3 Total Live (2007)**	**% Survival**	**Total Dead (all plots)**	**Plot HB - 1**	**Plot HB - 2**	**Plot HB - 3**	**Plot CR - 1**	**Plot CR - 2**	**Plot HD - 1**	**Plot HD - 2**	**Plot HD - 3**	**Plot AL - 1**	**Plot AL - 2**	**Plot AL - 3**
Aronia arbutifolia	33	17	52	0	0	0	2	0	0	0	9	3	1	2	0
Betula nigra	42	24	57	7	3	0	5	0	0	0	3	0	0	1	12
*Cephalanthus occidentalis**	0	16	*	0	0	0	0	4	0	6	0	0	3	3	0
Clethra alnifolia	8	12	100	0	0	2	0	1	8	0	1	0	0	0	0
Cornus amomum	93	63	68	2	7	9	12	12	5	1	0	4	3	8	2
Cornus florida	1	1	100	0	0	0	1	0	0	0	0	0	0	0	0
Fraxinus pennsylvanica	35	23	66	0	6	0	0	0	0	0	0	6	0	0	11
Ilex verticillata	3	2	67	0	2	0	0	0	0	0	0	0	0	0	0
Juniperus virginiana	5	2	40	0	0	0	0	0	0	0	2	0	0	0	0
Morella cerifera	2	2	100	0	0	0	1	1	0	0	0	0	0	0	0
Quercus coccinea	7	3	43	2	0	0	0	1	0	0	0	0	0	0	2
Quercus phellos	24	16	67	0	2	0	1	0	0	0	3	2	0	0	8
Salix sericea	23	17	74	0	0	8	0	0	0	0	0	2	0	7	0
Sambucus canadensis	51	15	29	0	0	1	0	0	4	0	1	0	8	0	1
*Spirea tomentosa***	0	7	**	0	0	0	0	0	7	0	0	0	0	0	0
Symphoricarpos orbiculatus	4	6	100	0	0	0	0	0	5	1	0	0	0	0	0
Vaccinium corymbosum	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viburnum nudum	7	3	43	0	0	0	0	0	0	0	0	0	3	0	0
Unknown spp.	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0
Total per plot					**20**	**20**	**22**	**19**	**29**	**8**	**19**	**17**	**18**	**21**	**36**
All Plots	**364**	**229**	**62.8**												
Average woody stems per acre	**1,339**	**843**													

* *C. occidentalis* may have been identified as *V. nudum* during Year 1. There is no record of the plant in Year 1's vegetation plot data.
** *S. tomentosa* may have been identified as *C. alnifolia* during Year 1. There is no record of the plant in Year 1's vegetation plot data.

Exhibit Table 6. Vegetation Problem Areas – Ellerbe Creek Stream Restoration – Project #127			
Feature/Issue	**Station/Range**	**Probable Cause**	**Photo #**
Bare soil/eroded slopes	1140-1280	Compated soil/high runoff from golf course	VP1
Bare soil/eroded slopes	1840-2025	Compated soil/high runoff from golf course	VP1
Bare soil/eroded slopes, including floodplain	1890-2070	Compated soil/high runoff from golf course	VP1, VP2
Bare soil/eroded slopes	3540-3630	Compated soil/high runoff from golf course	VP1
Bare soil/eroded slopes, including floodplain	5555-5840	Compated soil/high runoff from golf course	VP1, VP2
Bare soil/eroded slopes, including floodplain	6315-6570	Compated soil/high runoff from golf course	VP1, VP2

Vegetation Plot Coordinates: Hillandale Reach			
Plot Side	HD-V1	HD-V2	HD-V3
Pin Coordinate	E 20117272.5870 N 827357.3090	E 2017822.8120 N 827293.6640	E 2018339.7600 N 827077.4290
A	19.9'	30.8'	20'
B	48.4'	31.1'	44.6'
C	22.2'	34.2'	14.2'
D	44.7'	32'	46.1'

	Easting	Northing
Cross-sections		
HD1L	2017297.3510	827444.6380
HD1R	2017305.8250	827358.5730
HD2L	2017374.0400	827421.2960
HD2R	2017358.2570	827357.0970
HD3L	2017882.0380	827326.3380
HD3R	2017835.7280	827218.0475
HD4L	2017870.4020	827311.3050
HD4R	2017919.3160	827220.8030
Photopoints		
HD-P1	2017158.5527	827368.2372
HD-P2	2017423.2777	827370.9011
HD-P3	2017633.3927	827372.5660
HD-P4	2017780.9060	827327.6127
HD-P5	2018032.6444	827207.0713
HD-P6	2018319.0135	827067.8826
HD-P7	2018632.0216	826962.3256

Match Line

2850 2900 2950 3000 3050 3100 3150 3200 3250 3300 3350 3400 3450 3500 3550 3600 3650 3700 3750 3800 3850 3900 3950 4000 4050 4100 4150 4200 4250 4300 4350 4400 4450 4500 4550 4600 4650 4700 4750 4800 4850 4900 4950

Figure A1.1

Figure A1.2

Figure A1.2

Figure A1.3

Hillandale Road

Match Line

Figure A1.2 - Current Conditions Plan View - 2007 - Monitoring Year 3
Ellerbe Creek Stream Restoration - Durham, NC - NCEEP Project #127

LEGEND

- Bare/Eroded Soil (rill and gully)
- Thalweg-2007 Survey
- NCDOT Stormwater Structures

As-built Drawings
(Supplied by Stantec)

- Ellerbe Easement Boundary
- Thalweg - As-built
- Top of Bank
- Vegetation Monitoring Plots
- Monitoring Cross Sections
- Photo Points
- As-built Features
- Pre-existing Features

Ecosystem Enhancement Program

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Feet
0 150

Vegetation Plot Coordinates: Hillsborough Reach			
Plot Side	HB-V1	HB-V2	HB-V3
Pin Coordinate	E 20115741.5610 N 827358.3480	E 20116120.1110 N 827428.6750	E 2016551.0870 N 827505.1970
A	19.5'	31.1'	31.9'
B	52.1'	35.4'	32.6'
C	23.2'	33.1'	31.3'
D	53'	36.2'	39.4'

Vegetation Plot Coordinates: Croasdaile Reach		
Plot Side	CR-V1	CR-V2
Pin Coordinate	E 2016811.8250 N 827741.1850	E 2016933.510 N 827520.8490
A	32.4'	18.3'
B	33.2'	65.5'
C	29.9'	21.7'
D	31.9'	64.1'

	Easting	Northing
Cross-sections		
HB1L	2015742.0022	827332.7693
HB1R	2015772.552	827290.9634
HB2L	2015799.2852	827350.0513
HB2R	2015803.356	827295.5714
HB3L	2016595.6390	827499.8180
HB3R	2016610.0550	827433.3600
HB4L	2015654.5640	827499.8920
HB4R	20116634.3500	827432.4490
CR1L	2016939.2680	827570.7490
CR1R	2016915.6680	827552.4340
CR2L	2016957.7640	827541.2870
CR2R	2016933.5100	827520.8490
Photopoints		
HB-P1	2015577.0052	827347.3258
HB-P2	2015623.7143	827314.4264
HB-P3	2015802.5285	827349.0571
HB-P4	2015961.3634	827401.3361
HB-P5	2016127.5574	827481.3197
HB-P6&P7	2016301.8430	827496.7037
HB-P8	2016523.1130	827464.0709
HB-P9	2016749.2114	827430.4392
HB-P10	2016966.4524	827439.7628
CR-P1	2016781.3114	828053.9579
CR-P2	2016818.9390	827855.0313
CR-P3	2016919.4678	827582.3480

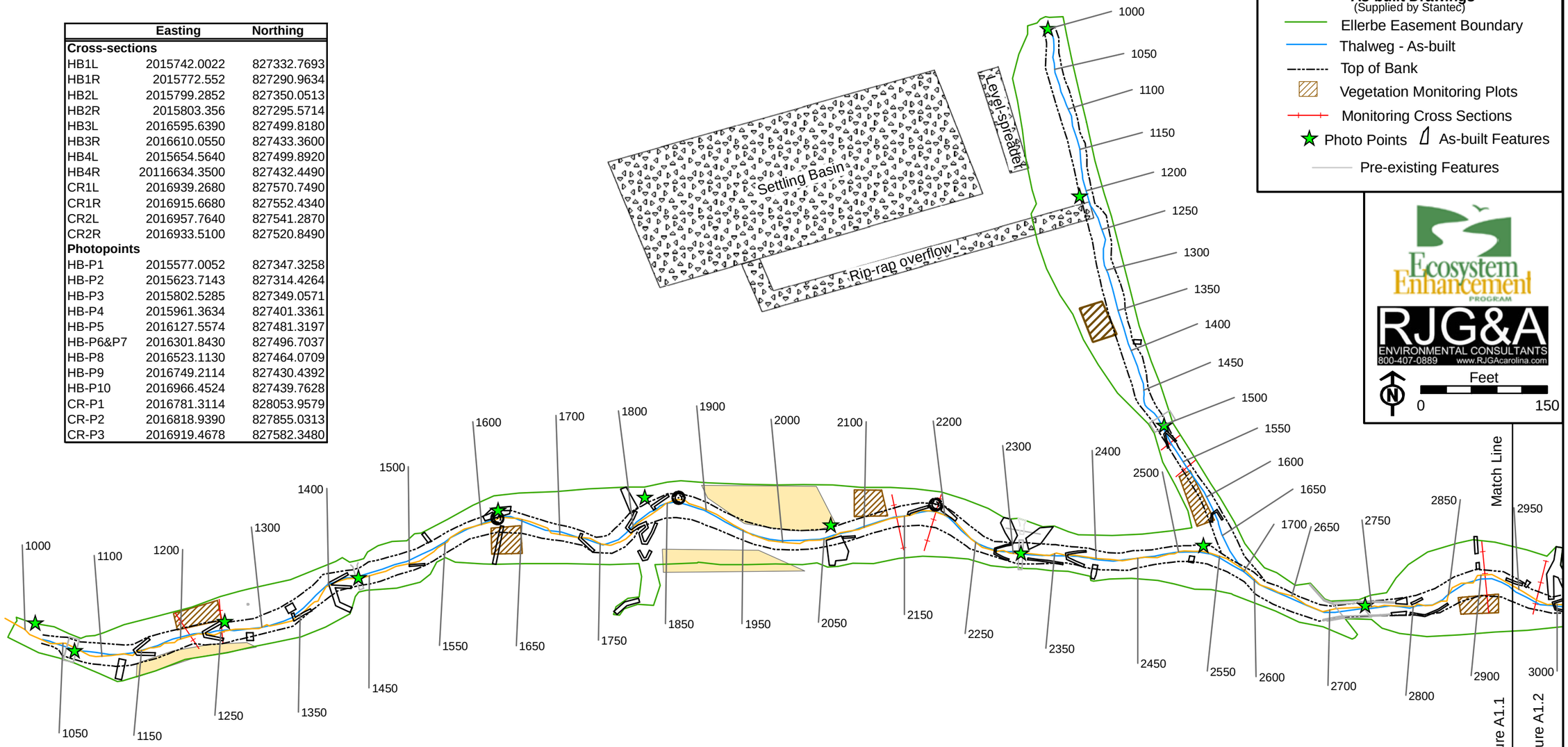

Figure A1.1 - Current Conditions Plan View - 2007 - Monitoring Year 3
Ellerbe Creek Stream Restoration - Durham, NC - NCEEP Project #127

LEGEND

- Bare/Eroded Soil (rill and gully)
- Thalweg-2007 Survey
- NCDOT Stormwater Structures

As-built Drawings
(Supplied by Stantec)

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- Pre-existing Features

Ecosystem Enhancement Program

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N

Feet
0 150

Vegetation Plot Coordinates: Albany Reach			
Plot Side	AL-V1	AL-V2	AL-V3
Pin Coordinate	E 20117272.5870 N 827357.3090	E 2017822.8120 N 827293.6640	E 2018339.7600 N 827077.4290
A	19.8'	33.1'	30.4'
B	54.7'	33.9'	45.8'
C	20.6'	36.1'	34.3'
D	51.5'	37.7'	45.8'

	Easting	Northing
Cross-sections		
AL1L	2019638.8850	827132.4120
AL1R	2019653.3780	827052.7850
AL2L	2019670.2730	827138.9190
AL2R	2019716.0120	827068.9910
AL3L	2019819.4940	827182.5337
AL3R	2019825.5310	827101.4830
AL4L	2019845.6470	827189.0390
AL4R	2019867.0530	827112.7780
Photopoints		
AL-P1	2018922.3866	826950.6711
AL-P2	2019315.6779	827040.2114
AL-P3	2019581.5016	827088.1615
AL-P4	2019822.0184	827155.9245
AL-P5	2020004.7951	827193.1524
AL-P6	2020248.1090	827221.4564
AL-P7	2020410.0740	827196.1493
AL-P8	2020545.5332	827244.7655

Figure A1.3 - Current Conditions Plan View - 2007 - Monitoring Year 3

Ellerbe Creek Stream Restoration - Durham, NC - NCEEP Project #127

LEGEND

- Bare/Eroded Soil (rill and gully)
- Thalweg-2007 Survey
- NCDOT Stormwater Structures

As-built Drawings
(Supplied by Stantec)

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- Pre-existing Features

Ecosystem Enhancement Program

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Feet
0 150

Match Line
Figure B1.2
Figure B1.3

4850 4900 4950 5000 5050 5100 5150 5200 5250 5300 5350 5400 5450 5500 5550 5600 5650 5700 5750 5800 5850 5900 5950 6000 6050 6100 6150 6200 6250 6300 6350 6400 6450 6500 6550 6600 6650

Appendix A2. Vegetation Problem Area Photographs - 2007 - Ellerbe Creek Stream Restoration - Project #127

VP1. Bare soil/eroded slopes

VP2. Bare soil on floodplain

Appendix A3. Vegetation Monitoring Plot Photographs - 2007 - Ellerbe Creek Stream Restoration

HB-V1 (September 2006)

HB-V1 (July 2007)

HB-V2 (September 2006)

HB-V2 (July 2007)

Appendix A3. Vegetation Monitoring Plot Photographs - 2007 - Ellerbe Creek Stream Restoration

Photo not available

HB-V3 (September 2006)

HB-V3 (July 2007)

CR-V1 (September 2006)

CR-V1 (July 2007)

Appendix A3. Vegetation Monitoring Plot Photographs - 2007 - Ellerbe Creek Stream Restoration

CR-V2 (September 2006)

CR-V2 (July 2007)

Photo not available

HD-V1 (September 2006)

HD-V1 (July 2007)

Appendix A3. Vegetation Monitoring Plot Photographs - 2007 - Ellerbe Creek Stream Restoration

HD-V2 (September 2006)

HD-V2 (July 2007)

HD-V3 (September 2006)

HD-V3 (July 2007)

Appendix A3. Vegetation Monitoring Plot Photographs - 2007 - Ellerbe Creek Stream Restoration

AL-V1 (September 2006)

AL-V1 (July 2007)

AL-V2 (September 2006)

AL-V2 (July 2007)

Appendix A3. Vegetation Monitoring Plot Photographs - 2007 - Ellerbe Creek Stream Restoration

AL-V3 (September 2006)

AL-V3 (July 2007)

Appendix B. Stream Data
Ellerbe Creek Stream Restoration – Project #127

1. Figure B1. Stream Current Condition Plan View
2. Table B1. Stream Problem Areas
3. Stream Problem Area Photos
4. Stream Photostation Photos
5. Table B2. Qualtitative Visual Stability Assessment
6. Cross section Plots
7. Longitudinal Plots and As-Built Profile
8. Pebble Count Frequency Distribution Plots

Vegetation Plot Coordinates: Hillandale Reach			
Plot Side	HD-V1	HD-V2	HD-V3
Pin Coordinate	E 20117272.5870 N 827357.3090	E 2017822.8120 N 827293.6640	E 2018339.7600 N 827077.4290
A	19.9'	30.8'	20'
B	48.4'	31.1'	44.6'
C	22.2'	34.2'	14.2'
D	44.7'	32'	46.1'

	Easting	Northing
Cross-sections		
HD1L	2017297.3510	827444.6380
HD1R	2017305.8250	827358.5730
HD2L	2017374.0400	827421.2960
HD2R	2017358.2570	827357.0970
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HD3R	2017835.7280	827218.0475
HD4L	2017870.4020	827311.3050
HD4R	2017919.3160	827220.8030
Photopoints		
HD-P1	2017158.5527	827368.2372
HD-P2	2017423.2777	827370.9011
HD-P3	2017633.3927	827372.5660
HD-P4	2017780.9060	827327.6127
HD-P5	2018032.6444	827207.0713
HD-P6	2018319.0135	827067.8826
HD-P7	2018632.0216	826962.3256

Figure B1.2 - Current Conditions Plan View - 2007 - Monitoring Year 3
Ellerbe Creek Stream Restoration - Durham, NC - NCEEP Project #127

Stream Problem Areas

High Priority
- Boulder failure

Low Priority
- Bank undercut/scour
- Aggradation (bar)
- Boulder undercut
- Aggradation (pool)
- Root wad undercut
- Rill and gully
- Thalweg-2007 Survey
- NCDOT Stormwater Structures

As-built Drawings
(Supplied by Stantec)
- Ellerbe Easement Boundary
- Thalweg - As-built
- Top of Bank
- Vegetation Monitoring Plots
- Monitoring Cross Sections
- Photo Points
- As-built Features
- Pre-existing Features

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Feet 0 150

Match Line
Figure B1.1
Figure B1.2
Figure B1.2
Figure B1.3
Match Line
Hillandale Road

Vegetation Plot Coordinates: Hillsborough Reach			
Plot Side	HB-V1	HB-V2	HB-V3
Pin Coordinate	E 20115741.5610 N 827358.3480	E 20116120.1110 N 827428.6750	E 2016551.0870 N 827505.1970
A	19.5'	31.1'	31.9'
B	52.1'	35.4'	32.6'
C	23.2'	33.1'	31.3'
D	53'	36.2'	39.4'

Vegetation Plot Coordinates: Croasdaile Reach		
Plot Side	CR-V1	CR-V2
Pin Coordinate	E 2016811.8250 N 827741.1850	E 2016933.510 N 827520.8490
A	32.4'	18.3'
B	33.2'	65.5'
C	29.9'	21.7'
D	31.9'	64.1'

	Easting	Northing
Cross-sections		
HB1L	2015742.0022	827332.7693
HB1R	2015772.552	827290.9634
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HB2R	2015803.356	827295.5714
HB3L	2016595.6390	827499.8180
HB3R	2016610.0550	827433.3600
HB4L	2015654.5640	827499.8920
HB4R	20116634.3500	827432.4490
CR1L	2016939.2680	827570.7490
CR1R	2016915.6680	827552.4340
CR2L	2016957.7640	827541.2870
CR2R	2016933.5100	827520.8490
Photopoints		
HB-P1	2015577.0052	827347.3258
HB-P2	2015623.7143	827314.4264
HB-P3	2015802.5285	827349.0571
HB-P4	2015961.3634	827401.3361
HB-P5	2016127.5574	827481.3197
HB-P6&P7	2016301.8430	827496.7037
HB-P8	2016523.1130	827464.0709
HB-P9	2016749.2114	827430.4392
HB-P10	2016966.4524	827439.7628
CR-P1	2016781.3114	828053.9579
CR-P2	2016818.9390	827855.0313
CR-P3	2016919.4678	827582.3480

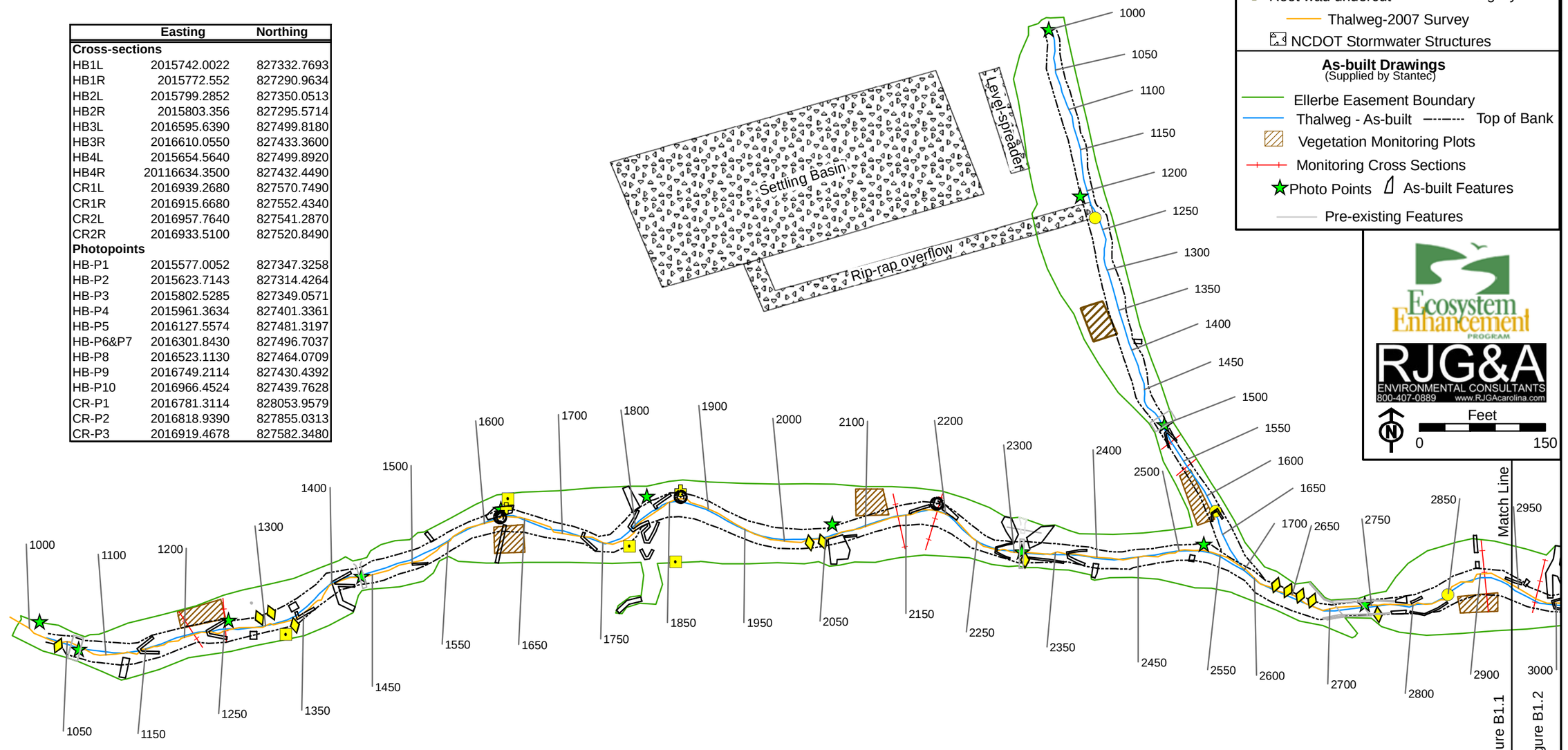

Figure B1.1 - Current Conditions Plan View - 2007 - Monitoring Year 3
Ellerbe Creek Stream Restoration - Durham, NC - NCEEP Project #127

Stream Problem Areas

High Priority

- Boulder failure

Low Priority

- Bank undercut/scour
- Boulder undercut
- Root wad undercut
- Aggradation (bar)
- Aggradation (pool)
- Rill and gully
- Thalweg-2007 Survey
- NCDOT Stormwater Structures

As-built Drawings
(Supplied by Stantec)

- Ellerbe Easement Boundary
- Thalweg - As-built
- Top of Bank
- Vegetation Monitoring Plots
- Monitoring Cross Sections
- Photo Points
- As-built Features
- Pre-existing Features

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N

Feet
0 150

Figure B1.3 - Current Conditions Plan View - 2007 - Monitoring Year 3
Ellerbe Creek Stream Restoration - Durham, NC - NCEEP Project #127

Vegetation Plot Coordinates: Albany Reach			
Plot Side	AL-V1	AL-V2	AL-V3
Pin Coordinate	E 20117272.5870 N 827357.3090	E 2017822.8120 N 827293.6640	E 2018339.7600 N 827077.4290
A	19.8'	33.1'	30.4'
B	54.7'	33.9'	45.8'
C	20.6'	36.1'	34.3'
D	51.5'	37.7'	45.8'

	Easting	Northing
Cross-sections		
AL1L	2019638.8850	827132.4120
AL1R	2019653.3780	827052.7850
AL2L	2019670.2730	827138.9190
AL2R	2019716.0120	827068.9910
AL3L	2019819.4940	827182.5337
AL3R	2019825.5310	827101.4830
AL4L	2019845.6470	827189.0390
AL4R	2019867.0530	827112.7780
Photopoints		
AL-P1	2018922.3866	826950.6711
AL-P2	2019315.6779	827040.2114
AL-P3	2019581.5016	827088.1615
AL-P4	2019822.0184	827155.9245
AL-P5	2020004.7951	827193.1524
AL-P6	2020248.1090	827221.4564
AL-P7	2020410.0740	827196.1493
AL-P8	2020545.5332	827244.7655

Match Line
Figure B1.2
Figure B1.3

4800 4850 4900 4950 5000 5050 5100 5150 5200 5250 5300 5350 5400 5450 5500 5550 5600 5650 5700 5750 5800 5850 5900 5950 6000 6050 6100 6150 6200 6250 6300 6350 6400 6450 6500 6550 6600 6650

Stream Problem Areas

High Priority
- Boulder failure

Low Priority
- Bank undercut/scour
- Boulder undercut
- Root wad undercut
- Aggradation (bar)
- Aggradation (pool)
- Rill and gully
- Thalweg-2007 Survey
- NCDOT Stormwater Structures

As-built Drawings
(Supplied by Stantec)
- Ellerbe Easement Boundary
- Thalweg - As-built
- Top of Bank
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Ecosystem Enhancement Program

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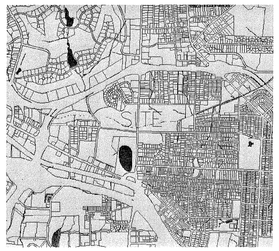
Feet
0 150



VICINITY MAP
NOT TO SCALE

LEGEND

- CONTROL IRON FOUND
- 36" RCP — REINFORCED CONCRETE PIPE
- ⊕ TBM — BENCHMARK
- TREE LINE
- RIP RAP
- ROCK STRUCTURE
- ROOT WAD
- THALWEG
- LEFT BANKFULL
- RIGHT BANKFULL

-N-

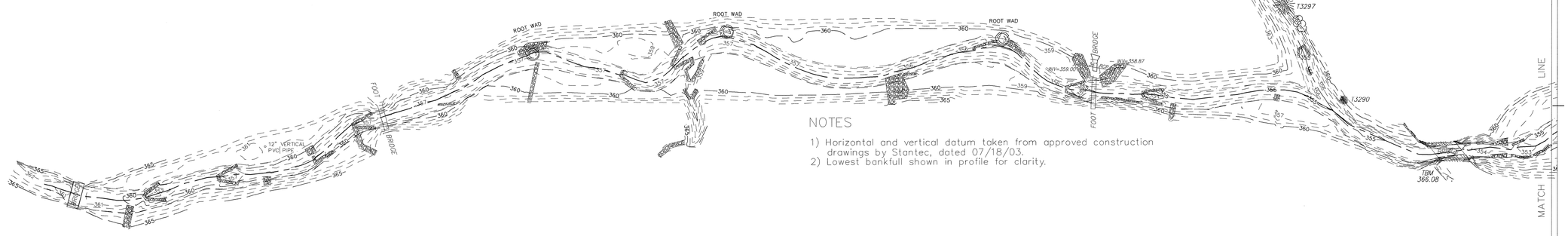
60 0 30 60 120
1 INCH = 60FEET

I, Lawrence F. Lee III, hereby certify that this Topographic Survey map was prepared under my supervision, that the survey was conducted under my supervision according to the Standards of Practice for Land Surveying in North Carolina; that this survey is a Class A topographic survey, and the vertical error does not exceed .10 times the square root of the number of miles run from the reference datum; witness my hand and seal this 25TH day of MARCH, 2005.

Lawrence F. Lee III, PLS L-3884

TREE TABLE

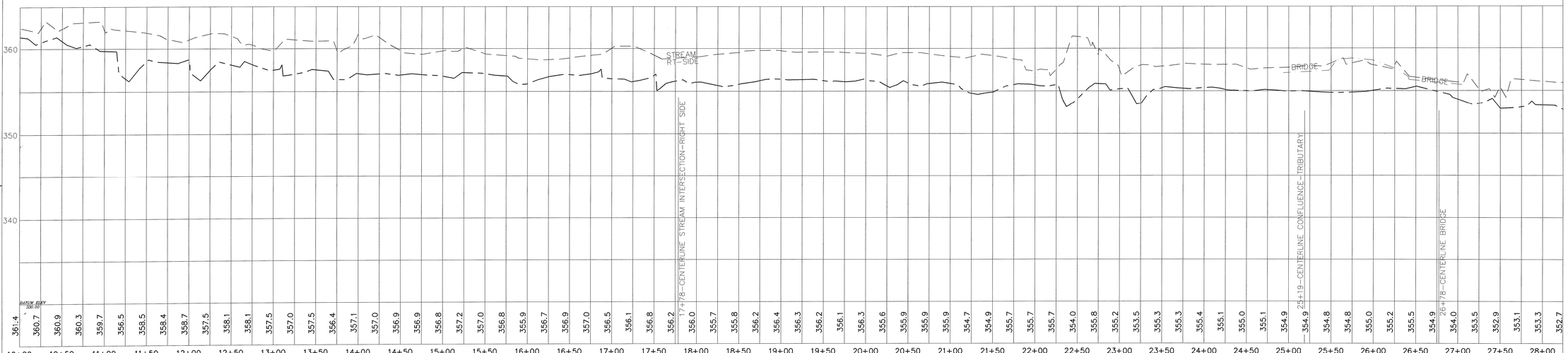
T2096	18" CEDAR
T2172	20" MAPLE
T2178	30" OAK
T2179	30" OAK
T2940	12" CEDAR
T2941	12" TWIN CEDAR
T2942	14" CEDAR
T3290	10" CEDAR
T3297	24" PINE
T3299	14" GUM
T3300	20" GUM
T3322	10" TRIPLET CEDAR
T3564	12" PEAR
T4909	34" PINE
T4913	22" PINE
T4914	25" PINE
T4916	18" CEDAR



NOTES

1) Horizontal and vertical datum taken from approved construction drawings by Stantec, dated 07/18/03.
2) Lowest bankfull shown in profile for clarity.

PROFILE MAIN LINE HORIZONTAL SCALE 1"=60'
VERTICAL SCALE 1"=60'



Dewberry

Dewberry & Davis, Inc.
2301 REXWOODS DRIVE
SUITE 200
RALEIGH, NC 27607
PHONE: 919.881.9939
FAX: 919.881.9923

SURVEY FOR
SEI ENVIRONMENTAL, INC.
TOPOGRAPHIC ASBUILT SURVEY
ELLERBEE CREEK
HILLANDALE GOLF COURSE
DURHAM, NC

SEAL

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-3884 LAWRENCE F. LEE III 3/25/05

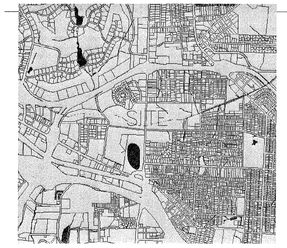
#	DATE	BY	REVISIONS
1	3/24/05	LFL	ADD PROFILE

DURHAM COUNTY
TOWNSHIP
PIN

DRAWN BY LFL
APPROVED BY REB
CHECKED BY JP
DATE 02/11/05

PROJECT NO. 73125900
SHEET NO. 1 OF 4

P:\73125900\CADD\Survey\ELLERBEE AS-BUILTS\dwg\ELLERBEE-TOPO-BASE.dwg 3/28/2005 9:45:52 AM EST



VICINITY MAP
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T3322	10" TRIPLET CEDAR
T3564	12" PEAR
T4909	34" PINE
T4913	22" PINE
T4914	25" PINE
T4916	18" CEDAR

N

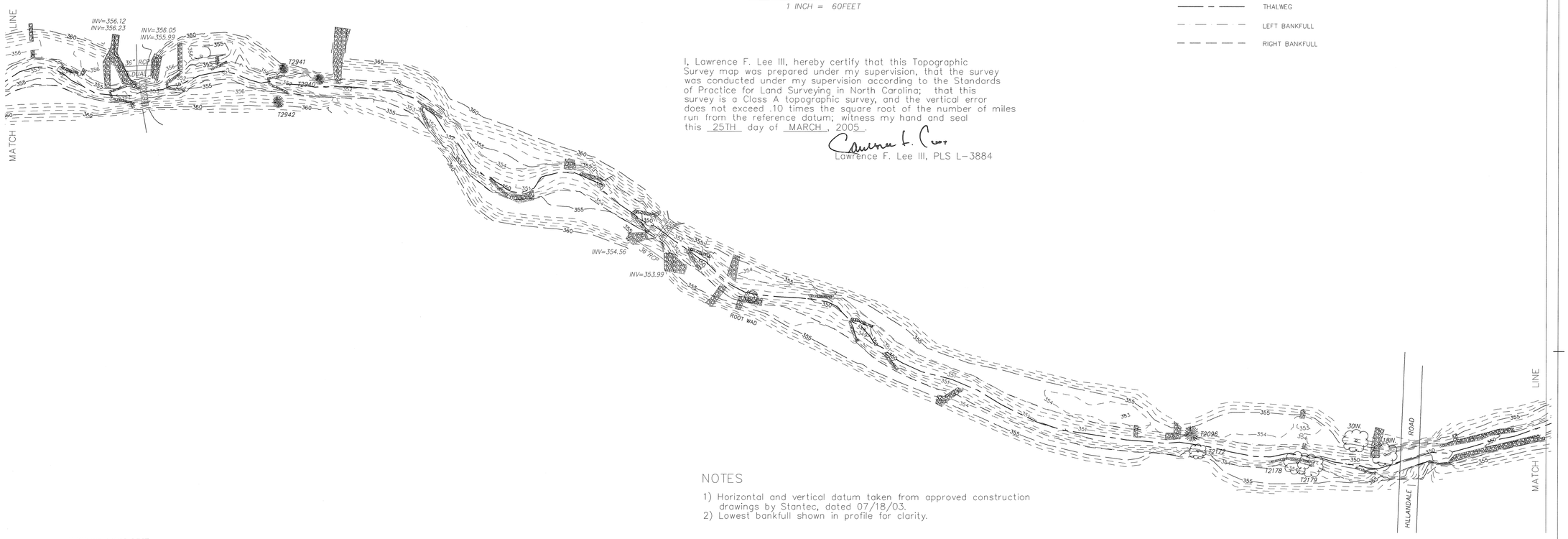
60 0 30 60 120
1 INCH = 60FEET

LEGEND

- CONTROL IRON FOUND
- 36" RCP — REINFORCED CONCRETE PIPE
- ⊕ TBM — BENCHMARK
- TREE LINE
- RIP RAP
- ROCK STRUCTURE
- ROOT WAD
- THALWEG
- LEFT BANKFULL
- RIGHT BANKFULL

I, Lawrence F. Lee III, hereby certify that this Topographic Survey map was prepared under my supervision, that the survey was conducted under my supervision according to the Standards of Practice for Land Surveying in North Carolina; that this survey is a Class A topographic survey, and the vertical error does not exceed .10 times the square root of the number of miles run from the reference datum; witness my hand and seal this 25TH day of MARCH, 2005.

Lawrence F. Lee III, PLS L-3884



NOTES

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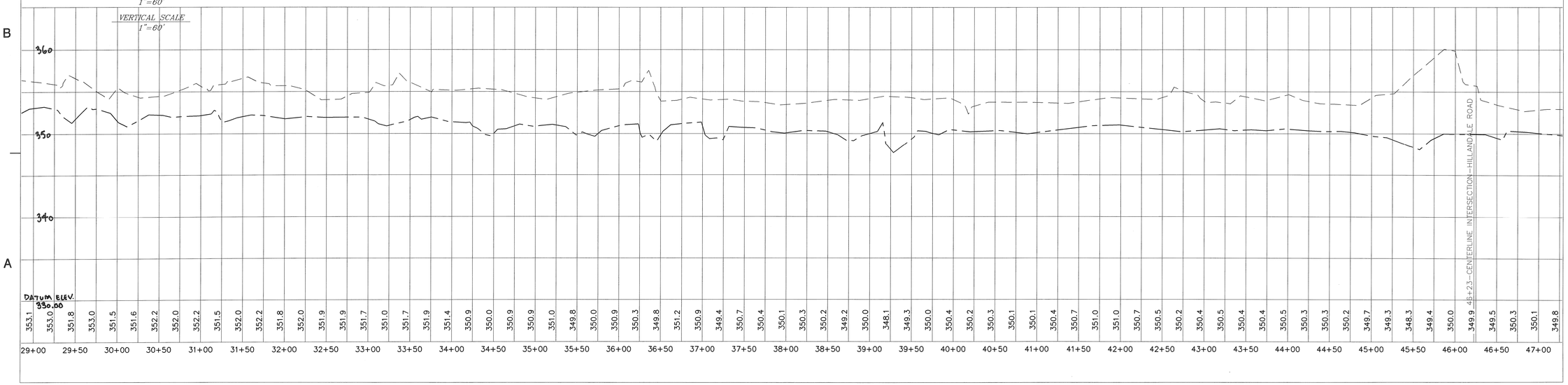
2) Lowest bankfull shown in profile for clarity.

PROFILE MAIN LINE
HORIZONTAL SCALE
1"=60'
VERTICAL SCALE
1"=60'



Dewberry

Dewberry & Davis, Inc.
2301 REXWOODS DRIVE
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RALEIGH, NC 27607
PHONE: 919.881.9939
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SURVEY FOR
SEI ENVIRONMENTAL, INC.
TOPOGRAPHIC ASBUILT SURVEY
ELLERBEE CREEK
HILLANDALE GOLF COURSE
DURHAM, NC

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 3884 SURVEYOR LAWRENCE F. LEE III
03/25/05

#	DATE	BY	DESCRIPTION
1	5/24/05	LFL	ADD PROFILE

REVISIONS

DURHAM COUNTY
TOWNSHIP
PIN

DRAWN BY LFL
APPROVED BY REB
CHECKED BY JP
DATE 02/11/05

PROJECT NO. 73125900
SHEET NO. 2 OF 4

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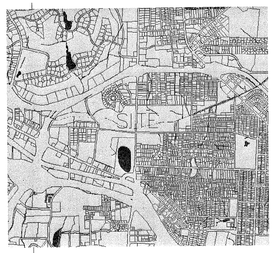
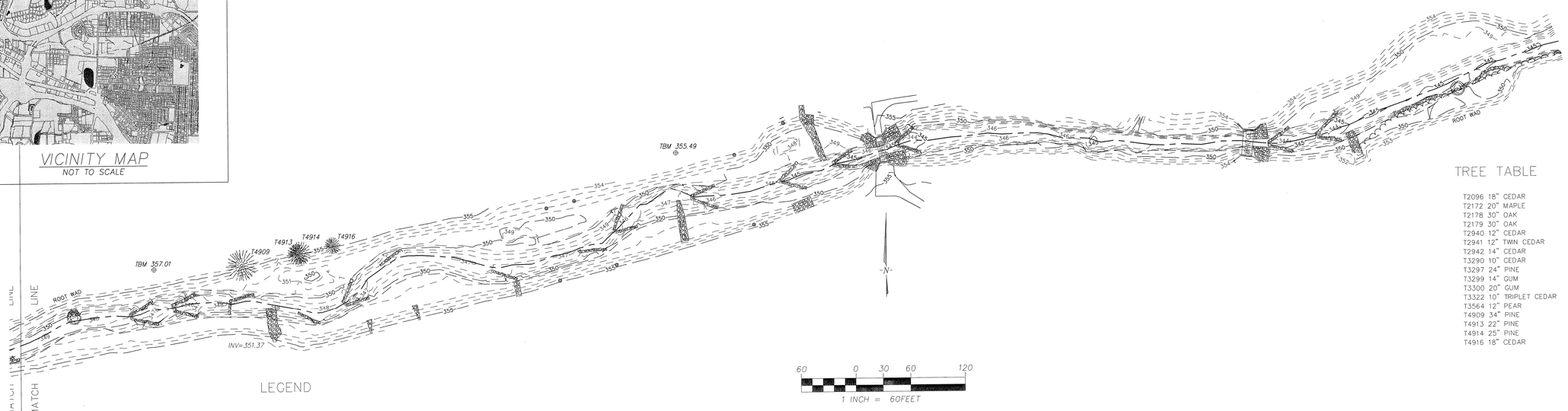


VICINITY MAP
NOT TO SCALE



TREE TABLE

T2096	18" CEDAR
T2172	20" MAPLE
T2178	30" OAK
T2179	30" OAK
T2940	12" CEDAR
T2941	12" TWIN CEDAR
T2942	14" CEDAR
T3290	10" CEDAR
T3297	24" PINE
T3299	14" GUM
T3300	20" GUM
T3322	10" TRIPLET CEDAR
T3564	12" PEAR
T4909	34" PINE
T4913	22" PINE
T4914	25" PINE
T4916	18" CEDAR

60 0 30 60 120
1 INCH = 60FEET

LEGEND

●	CONTROL IRON FOUND
36" RCP	REINFORCED CONCRETE PIPE
⊕ TBM	BENCHMARK
	TREE LINE
	RIP RAP
	ROCK STRUCTURE
	ROOT WAD
	THALWEG
	LEFT BANKFULL
	RIGHT BANKFULL

I, Lawrence F. Lee III, hereby certify that this Topographic Survey map was prepared under my supervision, that the survey was conducted under my supervision according to the Standards of Practice for Land Surveying in North Carolina; that this survey is a Class A topographic survey, and the vertical error does not exceed .10 times the square root of the number of miles run from the reference datum; witness my hand and seal this 24TH day of MARCH, 2005.

Lawrence F. Lee III, PLS L-3884

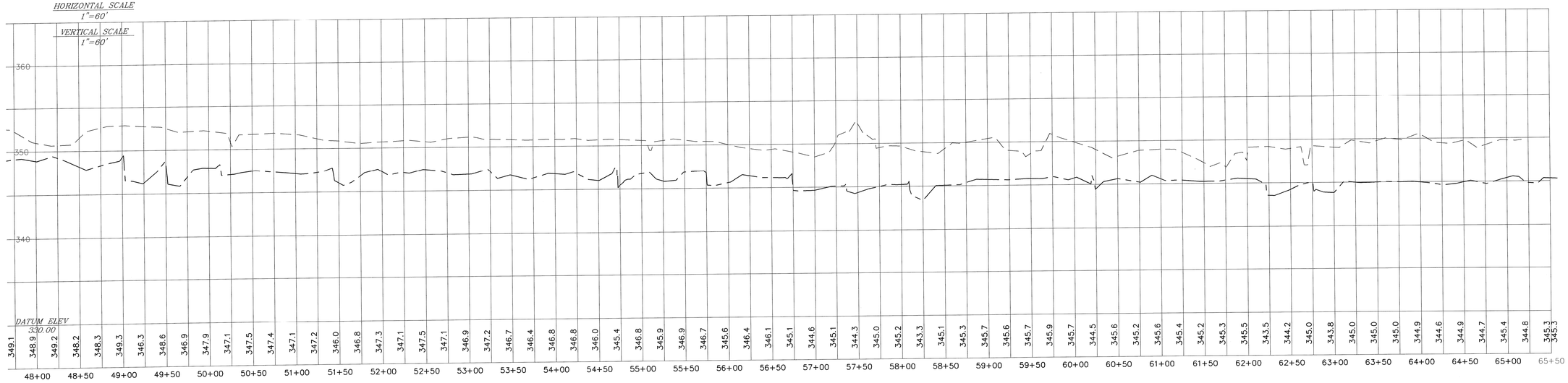
NOTES

1) Horizontal and vertical datum taken from approved construction drawings by Stantec, dated 07/18/03.
2) Lowest bankfull shown in profile for clarity.

PROFILE MAIN LINE

HORIZONTAL SCALE
1"=60'

VERTICAL SCALE
1"=60'



Dewberry

Dewberry & Davis, Inc.
2301 REXWOODS DRIVE
SUITE 200
RALEIGH, NC 27607
PHONE: 919.881.9939
FAX: 919.881.9923

SURVEY FOR
SEI ENVIRONMENTAL, INC.
TOPOGRAPHIC ASBUILT SURVEY
ELLERBEE CREEK
HILLANDALE GOLF COURSE
DURHAM, NC

SEAL

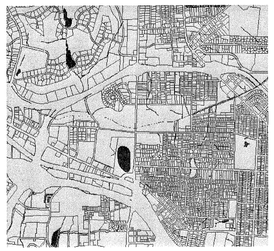
NORTH CAROLINA PROFESSIONAL LAND SURVEYOR L-3884 LAWRENCE F. LEE III 03/15/05

#	DATE	BY	REVISIONS
1	3/24/05	LFL	ADD PROFILE

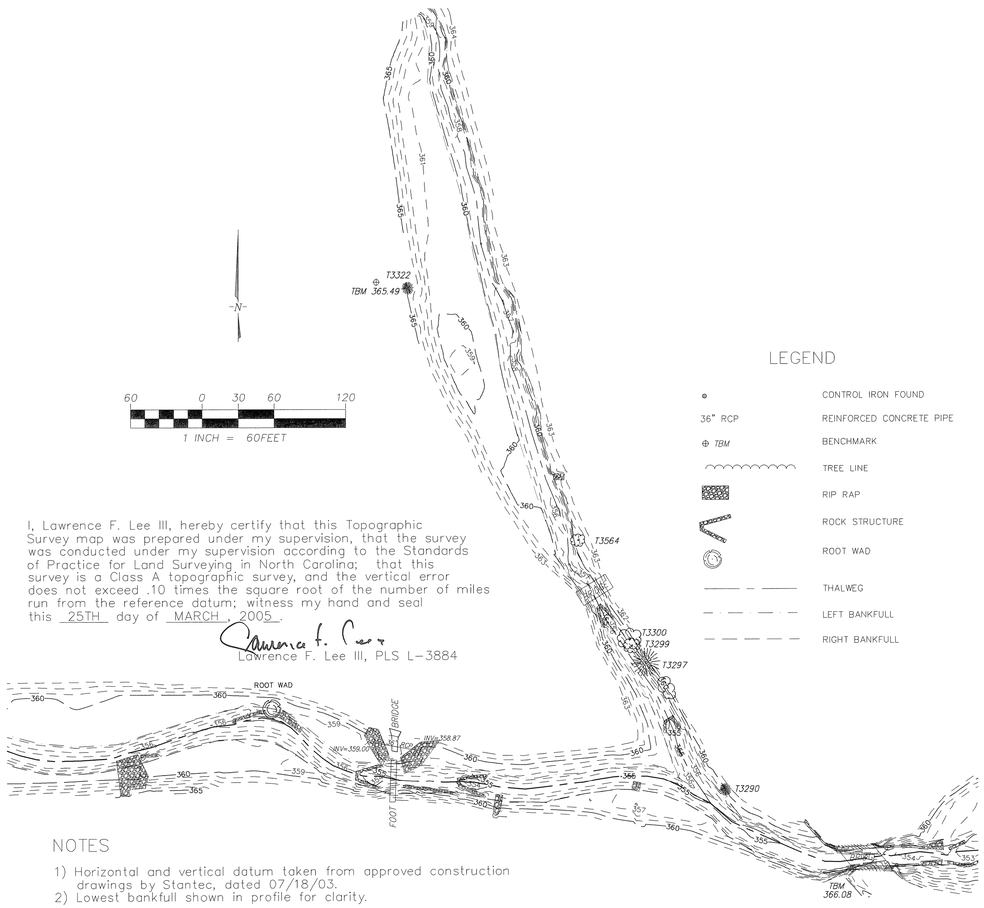
DURHAM COUNTY
TOWNSHIP
PIN

DRAWN BY LFL
APPROVED BY REB
CHECKED BY JP
DATE 02/11/05

PROJECT NO. 73125900
SHEET NO. 3 OF 4



VICINITY MAP
NOT TO SCALE



LEGEND

⊕	CONTROL IRON FOUND
36" RCP	REINFORCED CONCRETE PIPE
⊕ TBM	BENCHMARK
	TREE LINE
	RIP RAP
	ROCK STRUCTURE
	ROOT WAD
	THALWEG
	LEFT BANKFULL
	RIGHT BANKFULL

I, Lawrence F. Lee III, hereby certify that this Topographic Survey map was prepared under my supervision, that the survey was conducted under my supervision according to the Standards of Practice for Land Surveying in North Carolina; that this survey is a Class A topographic survey, and the vertical error does not exceed .10 times the square root of the number of miles run from the reference datum; witness my hand and seal this 25TH day of MARCH, 2005.

Lawrence F. Lee III, PLS L-3884

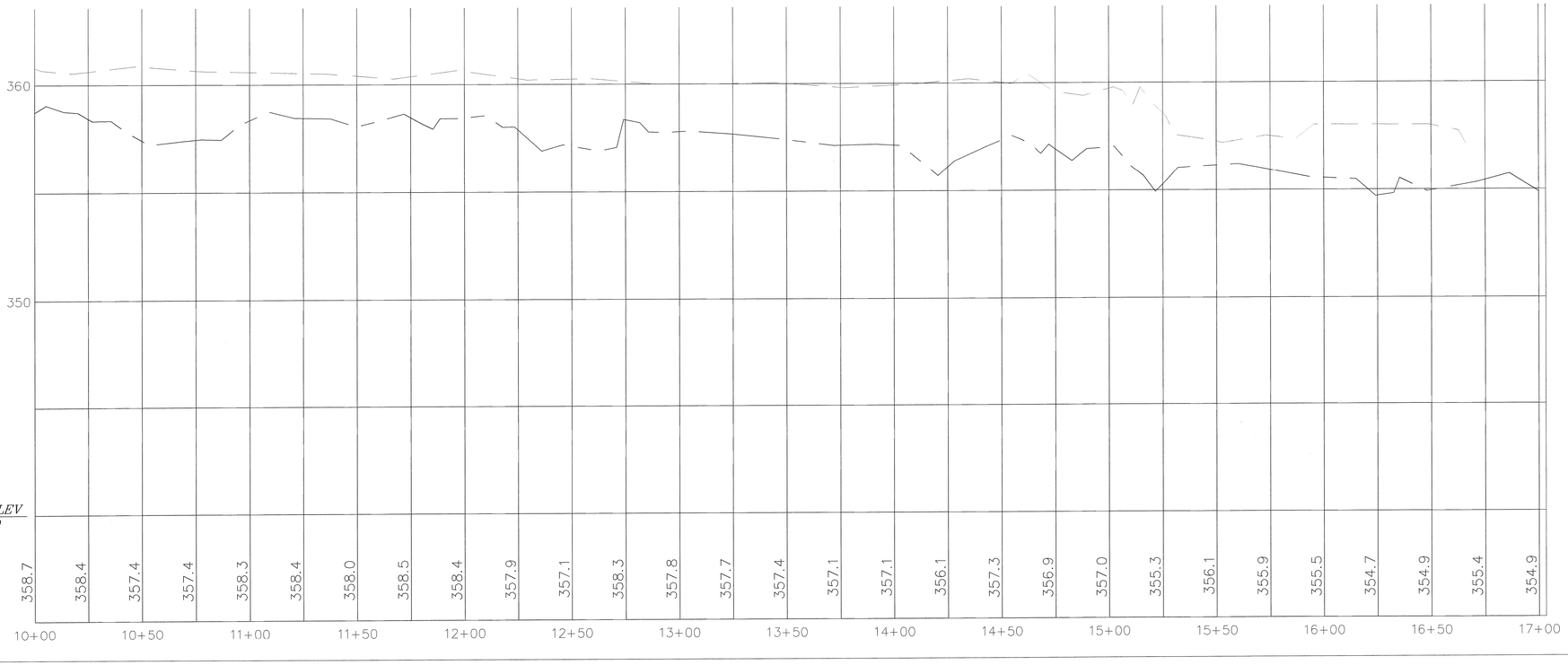
NOTES

1) Horizontal and vertical datum taken from approved construction drawings by Stantec, dated 07/18/03.
2) Lowest bankfull shown in profile for clarity.

PROFILE TRIBUTARY

HORIZONTAL SCALE
SCALE: 1"=30'
VERTICAL SCALE
SCALE: 1"=30'

DATUM ELEV
340.00



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SUITE 200
RALEIGH, NC 27607
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SURVEY FOR
SEI ENVIRONMENTAL, INC.
TOPOGRAPHIC ASBUILT SURVEY
ELLERBEE CREEK
HILLANDALE GOLF COURSE
DURHAM, NC

SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-3884 SURVEYOR LAWRENCE F. LEE III
03/25/05

#	DATE	BY	DESCRIPTION
1	3/24/05	LFL	ADD PROFILE

REVISIONS

DURHAM COUNTY
TOWNSHIP
PIN

DRAWN BY LFL
APPROVED BY REB
CHECKED BY JP
DATE 02/11/05

PROJECT NO. 73125900
SHEET NO. 4 OF 4

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Exhibit Table B.1 Stream Problem Areas – Ellerbe Stream Restoration – Project #127			
Feature/Issue	Station	Suspected Cause	Photo
Bank undercut/scour	1040	Insufficient rootwad/armoring	SP4
Bank undercut/scour	1050	Insufficient rootwad/armoring	SP4
Bank undercut/scour	1290-1320	Insufficient rootwad/armoring	SP4
Rill and gully	1335	Insufficient growth medium	SP3
Bank undercut/scour	1340	Insufficient rootwad/armoring	SP4
Rootwad under/backcut	1625	Unknown	SP5
Rill and gully	1627	Insufficient growth medium	SP3
Rill and gully	1780	Insufficient growth medium	SP3
Rill and gully	1860	Insufficient growth medium	SP3
Rootwad under/backcut	1870	Unknown	SP5
Bank undercut/scour	2020-2055	Insufficient rootwad/armoring	SP4
Bank undercut/scour	2300-2320	Insufficient rootwad/armoring	SP4
Aggradation (bar)	1230 *	Level spreader	SP1
Aggradation (pool)	1625 *	Upstream sediment sources	SP2
Bank undercut/scour	2620-2685	Insufficient rootwad/armoring	SP4
Bank undercut/scour	2750	Insufficient rootwad/armoring	SP4
Aggradation (bar)	2850	Upstream sediment sources	SP1
Bank undercut/scour	3275	Insufficient rootwad/armoring	SP4
Rill and gully	3480	Insufficient growth medium	SP3
Rill and gully	3550	Insufficient growth medium	SP3
Aggradation (bar)	3580	Upstream sediment sources	SP1
Rill and gully	3600	Insufficient growth medium	SP3
Rill and gully	3635	Insufficient growth medium	SP3
Boulder undercut	3650	Insufficient coarse backfill	SP6
Rill and gully	3790	Insufficient growth medium	SP3
Aggradation (bar)	3845	Upstream sediment sources	SP1
Bank undercut/scour	4410	Insufficient rootwad/armoring	SP4
Bank undercut/scour	4440-4455	Insufficient rootwad/armoring	SP4
Aggradation (bar)	4475	Upstream sediment sources	SP1
Aggradation (bar)	4860	Upstream sediment sources	SP1
Aggradation (bar)	4890	Upstream sediment sources	SP1
Rootwad under/backcut	4940	Upstream sediment sources	SP5
Bank undercut/scour	4960-5000	Insufficient rootwad/armoring	SP4
Aggradation (bar)	5140	Upstream sediment sources	SP1
Aggradation (bar)	5145	Upstream sediment sources	SP1
Bank undercut/scour	5150	Insufficient rootwad/armoring	SP4
Aggradation (pool)	5190	Upstream sediment sources	SP2
Aggradation (bar)	5200	Upstream sediment sources	SP1
Aggradation (bar)	5275	Upstream sediment sources	SP1
Aggradation (bar)	5280	Upstream sediment sources	SP1
Aggradation (bar)	5400	Upstream sediment sources	SP1
Rill and gully	5460	Insufficient growth medium	SP3
Rill and gully	5540	Insufficient growth medium	SP3
Aggradation (bar)	5760	Upstream sediment sources	SP1

Aggradation (bar)	6030	Upstream sediment sources	SP1
Aggradation (bar)	6075	Upstream sediment sources	SP1
Bank undercut/scour	6075-6180	Insufficient rootwad/armoring	SP4
Aggradation (bar)	6110	Upstream sediment sources	SP1
Bank undercut/scour	6220-6250	Insufficient rootwad/armoring	SP4
Bank undercut/scour	6270	Insufficient rootwad/armoring	SP4
Boulder failure	6330	Insufficient coarse backfill	SP7
Bank undercut/scour	6340-6360	Insufficient rootwad/armoring	SP4
Aggradation (bar)	6410	Upstream sediment sources	SP1
Rill and gully	6425	Insufficient growth medium	SP3
Rill and gully	6510	Insufficient growth medium	SP3
* Croasdaile Reach			

Appendix B2. Stream Problem Area Photographs - 2007 - Ellerbe Creek Stream Restoration - Project #127

SP1. Aggradation (bar)

SP2. Aggradation (pool)

SP3. Rill and gully

SP4. Bank undercut/scour

Appendix B2. Stream Problem Area Photographs - 2007 - Ellerbe Creek Stream Restoration - Project #127

SP5. Root wad undercut

SP6. Boulder undercut

SP7. Boulder failure

SP8. Stream after beaverdam removal

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

HB-P01 facing downstream (12/05/06)

HB-P01 facing downstream (07/10/07)

HB-P02 facing downstream (12/05/06)

HB-P02 facing downstream (07/10/07)

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

HB-P03 facing downstream (12/04/06)

HB-P03 facing downstream (07/10/07)

HB-P04 facing downstream (12/04/06)

HB-P04 facing downstream (07/10/07)

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

HB-P05 facing downstream (12/04/06)

HB-P05 facing downstream (07/10/07)

HB-P06 looking south across stream (12/04/06)

HB-P06 looking south across stream (07/10/07)

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

HB-P07 facing downstream (12/04/06)

HB-P07 facing downstream (07/10/07)

HB-P08 facing downstream (12/04/06)

HB-P08 facing downstream (07/10/07)

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

HB-P09 facing downstream (12/04/06)

HB-P09 facing downstream (07/10/07)

HB-P10 facing downstream (12/04/06)

HB-P10 facing downstream (07/10/07)

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

CR-P01 facing downstream (12/04/06)

CR-P01 facing downstream (07/10/07)

CR-P02 facing downstream (12/04/06)

CR-P02 facing downstream (07/10/07)

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

CR-P03 facing downstream (12/04/06)

CR-P03 facing downstream (07/10/07)

HD-P01 facing downstream (12/04/06)

HD-P01 facing downstream (07/10/07)

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

HD-P02 facing downstream (12/04/06)

HD-P02 facing downstream (07/10/07)

HD-P03 facing downstream (12/04/06)

HD-P03 facing downstream (07/27/07)

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

HD-P04 facing downstream (12/04/06)

HD-P04 facing downstream (07/27/07)

HD-P05 facing downstream (12/04/06)

HD-P05 facing downstream (07/27/07)

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

HD-P06 facing downstream (12/04/06)

HD-P06 facing downstream (07/27/07)

HD-P07 facing downstream (12/04/06)

HD-P07 facing downstream (07/27/07)

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

AL-P01 facing downstream (12/05/06)

AL-P01 facing downstream (07/27/07)

AL-P02 facing downstream (12/05/06)

AL-P02 facing downstream (07/27/07)

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

AL-P03 facing downstream (12/05/06)

AL-P03 facing downstream (07/27/07)

AL-P04 facing downstream (12/05/06)

AL-P04 facing downstream (07/27/07)

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

AL-P05 facing downstream (12/05/06)

AL-P05 facing downstream (07/27/07)

AL-P06 facing downstream (12/05/06)

AL-P06 facing downstream (07/27/07)

Appendix B3. Permanent Photopoint Photographs - Ellerbe Creek Stream Restoration

AL-P07 facing downstream (12/05/06)

AL-P07 facing downstream (07/27/07)

AL-P08 facing downstream (12/05/06)

AL-P08 facing downstream (07/27/07)

Table B2. Visual Morphological Assessment Ellerbe Stream Restoration Project - Hillsborough Reach - Project #127

Feature Category	Metric (per As-built and reference baselines)	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number/ feet in Unstable State	Percent Performing in Stable Condition	Feature Performing Mean (%)
A. Riffles	1. Present	10	12	2/76	83	
	2. Armor stable	10	12	2/22	83	
	3. Facet grade appears stable	11	12	1/16	92	
	4. Minimal evidence of embedding/fining	11	12	1/13	92	
	5. Length appropriate	12	12	0/0	100	**90**
B. Pools	1. Present	12	12	0/0	100	
	2. Sufficiently deep	10	12	2/44	83	
	3. Length appropriate	12	12	0/0	100	**94**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering	8	11	3/32	73	
	2. Downstream of meander (glide/inflection) centering	12	12	0/0	100	**86**
D. Meanders	1. Outer bend in state of limited/controlled erosion	12	12	0/0	100	
	2. Of those eroding, # w/concomitant point bar formation			NA	NA	
	3. Apparent Rc within spec	12	12	0/0	100	
	4. Sufficient floodplain access and relief	12	12	0/0	100	**100**
E. Bed (General)	1. General channel bed aggradation areas (bar formation)	1	1		NA	
	2. Channel bed degradation – areas of increasing downcutting or head cutting				NA	**100**
F. Bank	1. Actively eroding, wasting or slumping bank	NA	NA	4/36	98	**98**
G. Vanes	1. Free of back or arm scour	7	7	0/0	100	
	2. Height appropriate	7	7	0/0	100	
	3. Angle and geometry appear appropriate	7	7	0/0	100	
	4. Free of piping or other structural failures	7	7	0/0	100	**100**
H. Wads/Bould	1. Free of scour	1	3	2/11	33	
	2. Footing stable	3	3	0/0	100	**67**

Table B2. Visual Morphological Assessment Ellerbe Stream Restoration Project - Croasdaile Reach - Project #127

Feature Category	Metric (per As-built and reference baselines)	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number/ feet in Unstable State	Percent Performing in Stable Condition	Feature Performing Mean (%)
A. Riffles	1. Present	4	4	0/0	100	
	2. Armor stable	2	2	0/0	100	
	3. Facet grade appears stable	4	4	0/0	100	
	4. Minimal evidence of embedding/fining	4	4		100	
	5. Length appropriate	4	4		100	**100**
B. Pools	1. Present	5	5	0/0	100	
	2. Sufficiently deep	5	5	0/0	100	
	3. Length appropriate	5	5	0/0	100	**100**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering	4	4	0/0	100	
	2. Downstream of meander (glide/inflection) centering	4	4	0/0	100	**100**
D. Meanders	1. Outer bend in state of limited/controlled erosion	4	4	0/0	100	
	2. Of those eroding, # w/concomitant point bar formation	4	4	0/0	NA	
	3. Apparent Rc within spec	4	4	0/0	100	
	4. Sufficient floodplain access and relief	4	4	0/0	100	**100**
E. Bed (General)	1. General channel bed aggradation areas (bar formation)	1	NA	1/15	NA	
	2. Channel bed degradation – areas of increasing downcutting or head cutting	0		0/0	NA	**NA**
F. Bank	1. Actively eroding, wasting or slumping bank	NA	NA	0/0	100	**100**
G. Vanes	1. Free of back or arm scour	2	2	0/0	100	
	2. Height appropriate	2	2	0/0	100	
	3. Angle and geometry appear appropriate	2	2	0/0	100	
	4. Free of piping or other structural failures	2	2	0/0	100	**100**
H. Wads/Bould	1. Free of scour	0	0	0/0	NA	
	2. Footing stable	0	0	0/0	NA	**NA**

Table B2. Visual Morphological Assessment Ellerbe Stream Restoration Project - Hillandale Reach - Project #127

Feature Category	Metric (per As-built and reference baselines)	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number/ feet in Unstable State	Percent Performing in Stable Condition	Feature Performing Mean (%)
A. Riffles	1. Present	8	8	0/0	100	
	2. Armor stable	7	8	1/14	88	
	3. Facet grade appears stable	8	8	0/0	100	
	4. Minimal evidence of embedding/fining	7	8	1/11	88	
	5. Length appropriate	8	8	1/7	100	**95**
B. Pools	1. Present	9	9	0/0	100	
	2. Sufficiently deep	9	9	2/14	100	
	3. Length appropriate	8	9	1/24	89	**96**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering	5	8	3/53	63	
	2. Downstream of meander (glide/inflection) centering	6	7	1/12	86	**74**
D. Meanders	1. Outer bend in state of limited/controlled erosion	7	8	1/6	88	
	2. Of those eroding, # w/concomitant point bar formation	1			NA	
	3. Apparent Rc within spec	8	8	0/0	100	
	4. Sufficient floodplain access and relief	7	8	1/12	88	**92**
E. Bed (General)	1. General channel bed aggradation areas (bar formation)	2	2	NA	NA	
	2. Channel bed degradation – areas of increasing downcutting or head cutting	NA	NA	NA	NA	**NA**
F. Bank	1. Actively eroding, wasting or slumping bank	NA	NA	5/124	94	**94**
G. Vanes	1. Free of back or arm scour	8	9	1/5	89	
	2. Height appropriate	7	9	2/15	78	
	3. Angle and geometry appear appropriate	8	9	1/13	89	
	4. Free of piping or other structural failures	9	9	0/0	100	**89**
H. Wads/Bould	1. Free of scour	1	1	0/0	100	
	2. Footing stable	1	1	0/0	100	**100**

Table B2. Visual Morphological Assessment Ellerbe Stream Restoration Project - Albany Reach - Project #127

Feature Category	Metric (per As-built and reference baselines)	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number/ feet in Unstable State	Percent Performing in Stable Condition	Feature Performing Mean (%)
A. Riffles	1. Present	3	4	1/25	75	
	2. Armor stable	3	4	3/15	75	
	3. Facet grade appears stable	2	4	2/32	50	
	4. Minimal evidence of embedding/fining	2	4	2/11	50	
	5. Length appropriate	2	4	2/23	50	**60**
B. Pools	1. Present	13	13	0/0	100	
	2. Sufficiently deep	9	13	3/48	69	
	3. Length appropriate	9	13	5/17	69	**79**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering	8	10	2/9	80	
	2. Downstream of meander (glide/inflection) centering	7	10	3/42	70	**75**
D. Meanders	1. Outer bend in state of limited/controlled erosion	5	10	5/38	50	
	2. Of those eroding, # w/concomitant point bar formation	4		4/24	NA	
	3. Apparent Rc within spec	10	10	0/0	100	
	4. Sufficient floodplain access and relief	8	10	2/18	80	**77**
E. Bed (General)	1. General channel bed aggradation areas (bar formation)	28			NA	
	2. Channel bed degradation – areas of increasing downcutting or head cutting	0			NA	**NA**
F. Bank	1. Actively eroding, wasting or slumping bank	NA	NA	8/216	89	**89**
G. Vanes	1. Free of back or arm scour	10	12	2/26	83	
	2. Height appropriate	9	12	3/31	75	
	3. Angle and geometry appear appropriate	12	12	0/0	100	
	4. Free of piping or other structural failures	10	12	2/8	83	**85**
H. Wads/Bould	1. Free of scour	1	2	1/4	50	
	2. Footing stable	2	2	0/0	100	**75**

River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	HB-1 (riffle)
Reach:	Hillsboro
Date:	7/6/2007
Field Crew:	K.B. and J.O.

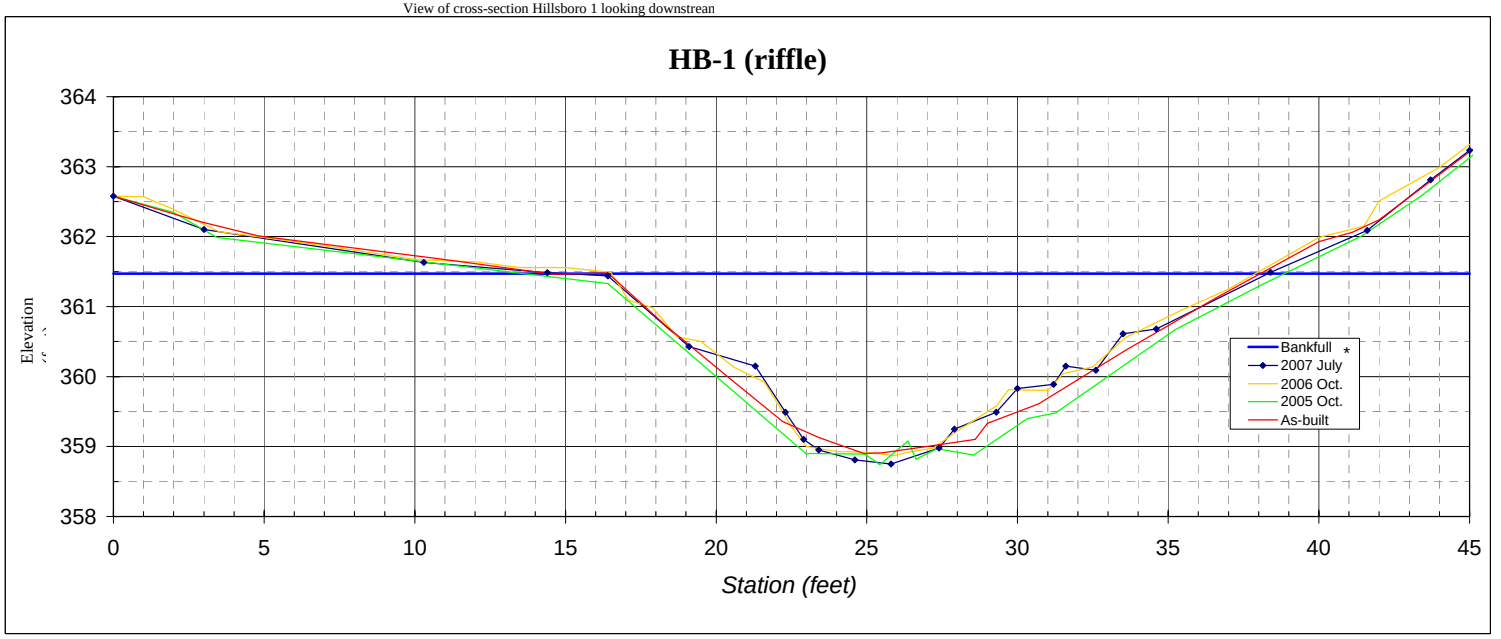
Station	Rod Ht.	Elevation
0	4.05	362.58
3	4.53	362.10
10.3	5	361.63
14.4	5.145	361.49
16.4	5.19	361.44
19.1	6.2	360.43
21.3	6.48	360.15
22.3	7.14	359.49
22.9	7.53	359.10
23.4	7.68	358.95
24.6	7.82	358.81
25.8	7.88	358.75
27.4	7.65	358.98
27.9	7.38	359.25
29.3	7.14	359.49
30	6.8	359.83
31.2	6.74	359.89
31.6	6.48	360.15
32.6	6.54	360.09
33.5	6.02	360.61
34.6	5.95	360.68
38.4	5.14	361.49
41.6	4.54	362.09
43.7	3.82	362.81
45	3.4	363.23

SUMMARY DATA

Floodprone Elevation (ft)	364.19
Bankfull Elevation (ft)	361.47
Floodprone Width (ft)	45.00
Bankfull Width (ft)	23.24
Entrenchment Ratio	1.94
Mean Depth (ft)	1.35
Maximum Depth (ft)	2.72
Width/Depth Ratio	17.22
Bankfull Area (sq ft)	31.37
Wetted Perimeter (ft)	24.27
Hydraulic Radius (ft)	1.29

Stream Type: C4

View of cross-section Hillsboro 1 looking downstrean



River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	HB-2 (pool)
Reach:	Hillsboro
Date:	7/6/2007
Field Crew:	K.B. and J.O.

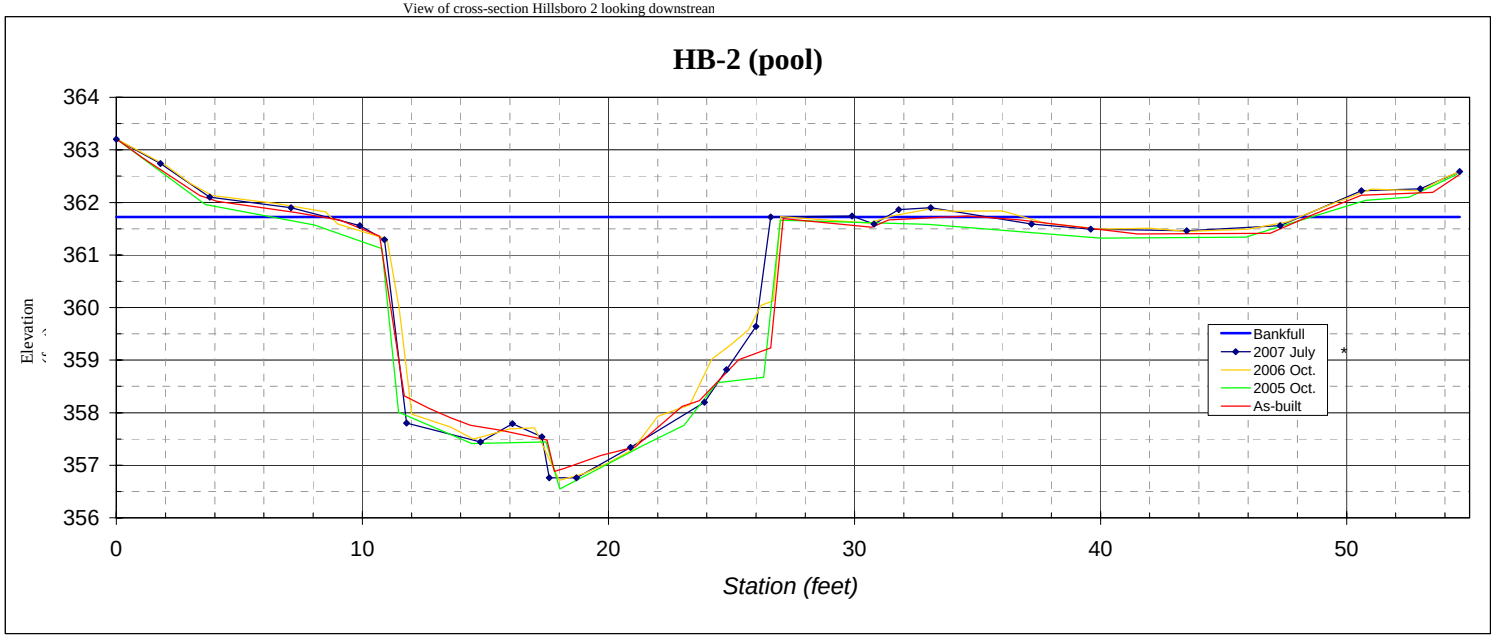
Station	Rod Ht.	Elevation
54.6	4.15	362.59
53	4.48	362.26
50.6	4.52	362.22
47.3	5.18	361.56
43.5	5.28	361.46
39.6	5.25	361.49
37.2	5.15	361.59
33.1	4.84	361.90
31.8	4.88	361.86
30.8	5.15	361.59
29.9	5	361.74
26.6	5.02	361.72
26	7.1	359.64
24.8	7.92	358.82
23.9	8.54	358.20
20.9	9.4	357.34
18.7	9.98	356.76
17.6	9.98	356.76
17.3	9.2	357.54
16.1	8.95	357.79
14.8	9.3	357.44
11.8	8.94	357.80
10.9	5.45	361.29
9.9	5.18	361.56
7.1	4.84	361.90
3.8	4.64	362.10
1.8	4	362.74
0	3.54	363.20

SUMMARY DATA

Floodprone Elevation (ft)	366.68
Bankfull Elevation (ft)	361.72
Floodprone Width (ft)	100.00
Bankfull Width (ft)	31.90
Entrenchment Ratio	3.13
Mean Depth (ft)	1.97
Maximum Depth (ft)	4.96
Width/Depth Ratio	16.21
Bankfull Area (sq ft)	62.76
Wetted Perimeter (ft)	37.54
Hydraulic Radius (ft)	1.67

Stream Type: C6

View of cross-section Hillsboro 2 looking downstrean



River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	HB-3 (riffle)
Reach:	Hillsboro
Date:	7/9/2007
Field Crew:	K.B. and J.O.

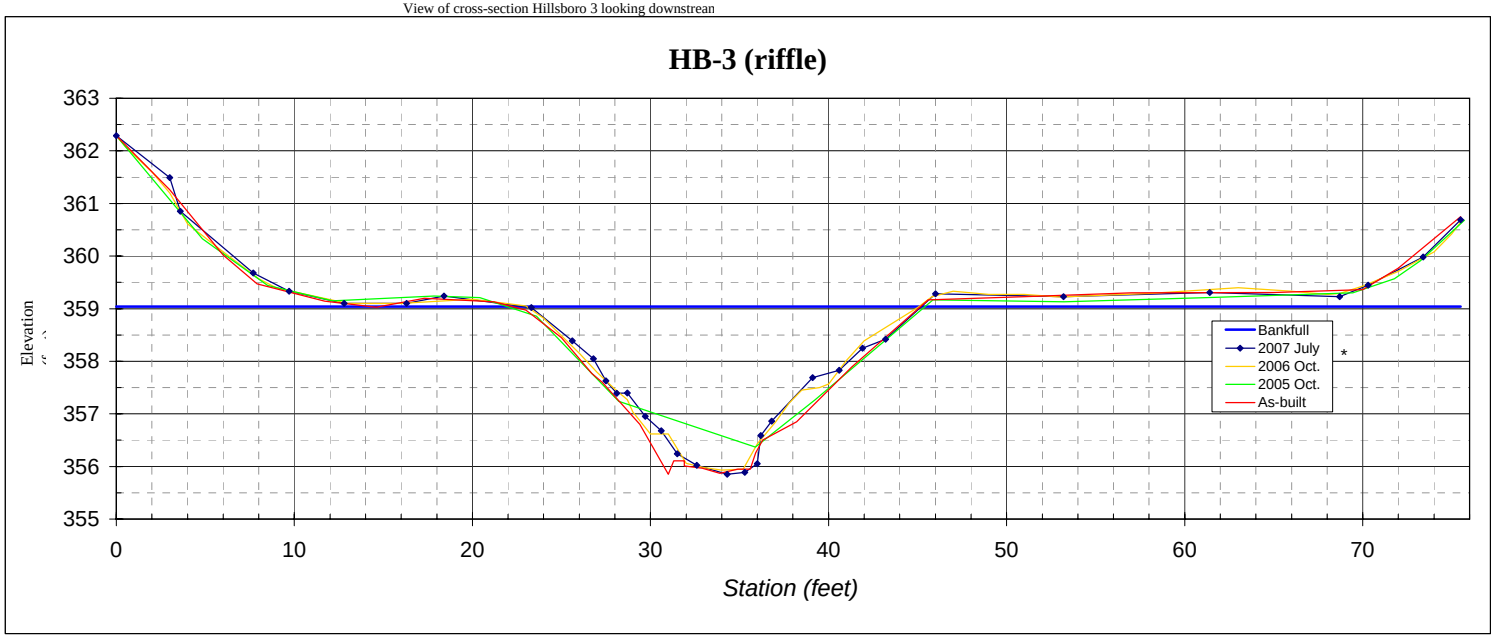
Station	Rod Ht.	Elevation
0	2.54	362.29
3	3.34	361.49
3.6	3.98	360.85
7.7	5.15	359.68
9.7	5.5	359.33
12.8	5.73	359.10
16.3	5.73	359.10
18.4	5.59	359.24
23.3	5.81	359.02
25.6	6.44	358.39
26.8	6.78	358.05
27.5	7.2	357.63
28.1	7.44	357.39
28.7	7.43	357.40
29.7	7.88	356.95
30.6	8.15	356.68
31.5	8.59	356.24
32.6	8.81	356.02
34.3	8.98	355.85
35.3	8.94	355.89
36	8.78	356.05
36.2	8.24	356.59
36.8	7.97	356.86
39.1	7.14	357.69
40.6	7	357.83
41.9	6.58	358.25
43.2	6.41	358.42
46	5.55	359.28
53.2	5.6	359.23
61.4	5.52	359.31
68.7	5.6	359.23
70.3	5.38	359.45
73.4	4.85	359.98
75.5	4.14	360.69

SUMMARY DATA

Floodprone Elevation (ft)	362.23
Bankfull Elevation (ft)	359.04
Floodprone Width (ft)	100.00
Bankfull Width (ft)	22.36
Entrenchment Ratio	4.47
Mean Depth (ft)	1.58
Maximum Depth (ft)	3.19
Width/Depth Ratio	14.19
Bankfull Area (sq ft)	35.25
Wetted Perimeter (ft)	23.70
Hydraulic Radius (ft)	1.49

Stream Type: C6

View of cross-section Hillsboro 3 looking downstrean



River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	HB-3 (pool)
Reach:	Hillsboro
Date:	7/9/2007
Field Crew:	K.B. and J.O.

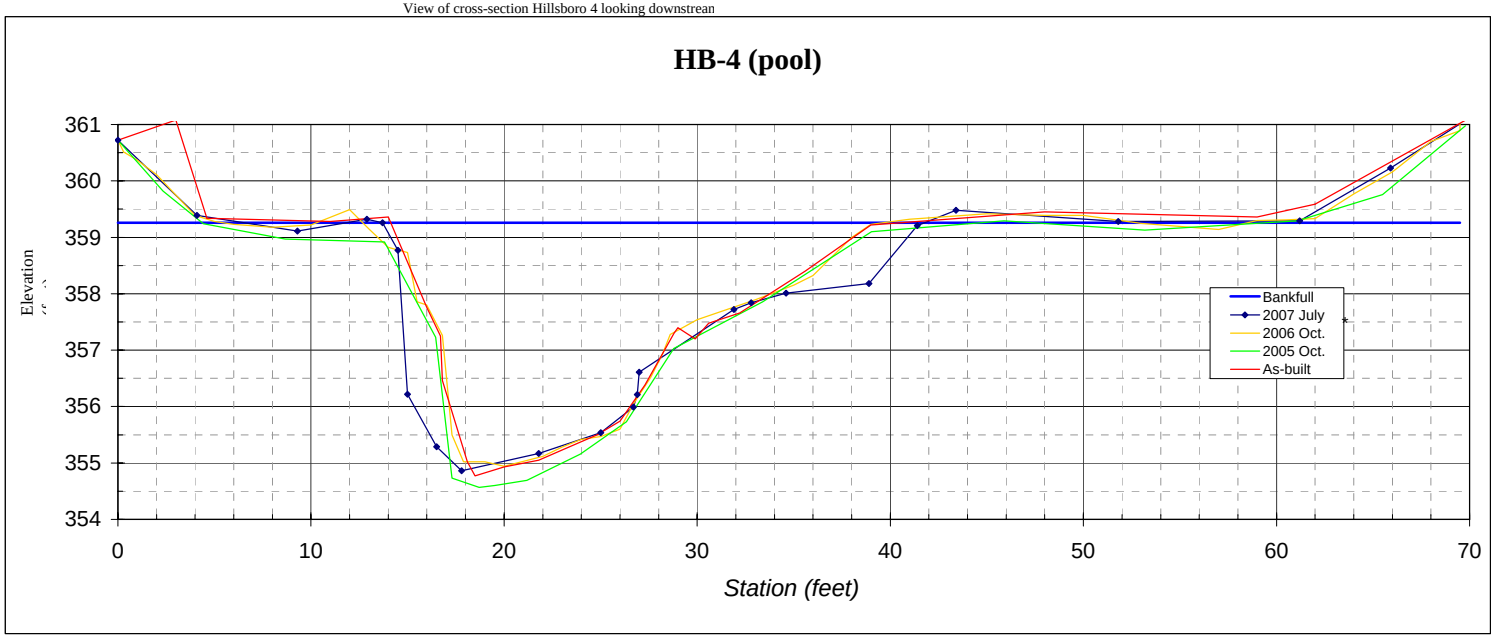
Station	Rod Ht.	Elevation
0	3.14	360.72
4.1	4.47	359.39
9.3	4.75	359.11
12.9	4.54	359.32
13.7	4.6	359.26
14.5	5.09	358.77
15	7.64	356.22
16.5	8.57	355.29
17.8	9	354.86
21.8	8.69	355.17
25	8.32	355.54
26.7	7.87	355.99
26.9	7.65	356.21
27	7.25	356.61
31.9	6.14	357.72
32.8	6.02	357.84
34.6	5.85	358.01
38.9	5.68	358.18
41.4	4.65	359.21
43.4	4.38	359.48
51.8	4.58	359.28
61.2	4.57	359.29
65.9	3.63	360.23
69.5	2.85	361.01

SUMMARY DATA

Floodprone Elevation (ft)	363.66
Bankfull Elevation (ft)	359.26
Floodprone Width (ft)	100.00
Bankfull Width (ft)	33.43
Entrenchment Ratio	2.99
Mean Depth (ft)	2.06
Maximum Depth (ft)	4.40
Width/Depth Ratio	16.21
Bankfull Area (sq ft)	68.94
Wetted Perimeter (ft)	36.86
Hydraulic Radius (ft)	1.87

Stream Type: C5

View of cross-section Hillsboro 4 looking downstrean



River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	HD-1 (pool)
Reach:	Hillandale
Date:	7/6/2007
Field Crew:	K.B. and J.O.

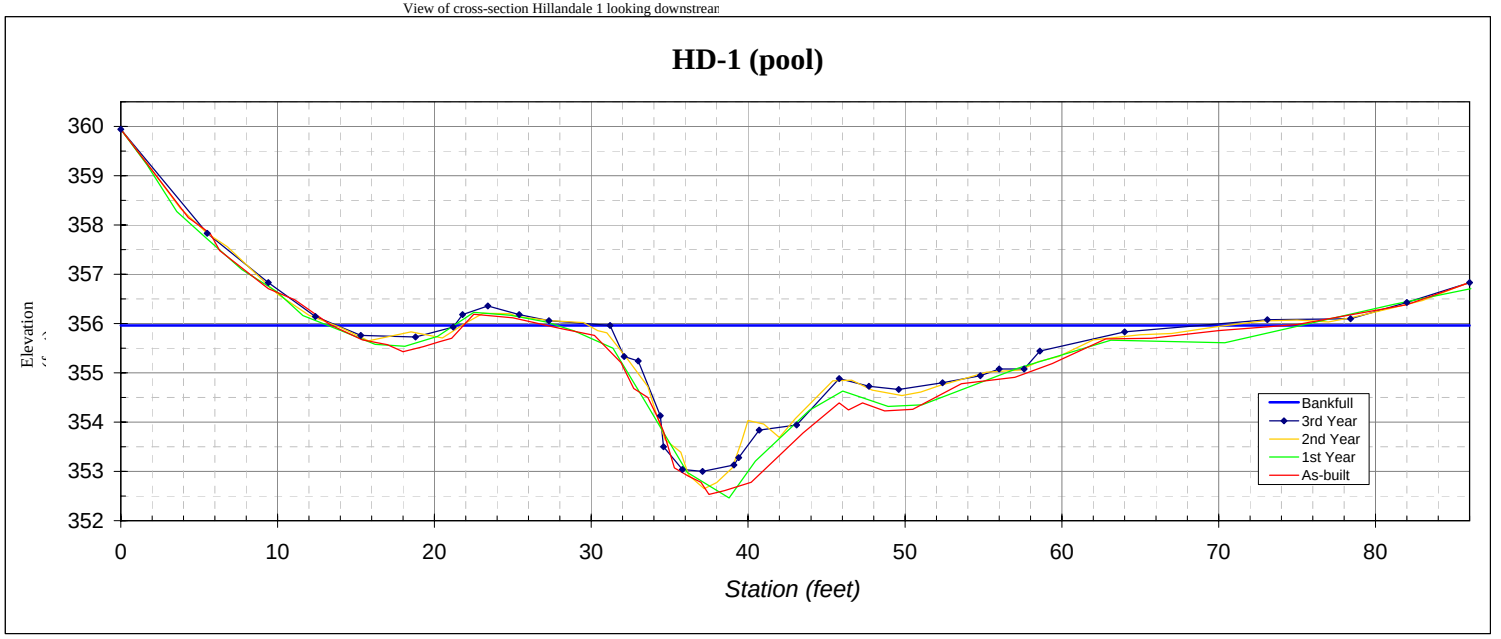
Station	Rod Ht.	Elevation
0	3.04	359.94
5.5	5.15	357.83
9.4	6.15	356.83
12.4	6.84	356.14
15.3	7.22	355.76
18.8	7.25	355.73
21.2	7.05	355.93
21.8	6.8	356.18
23.4	6.62	356.36
25.4	6.8	356.18
27.3	6.92	356.06
31.2	7.02	355.96
32.1	7.65	355.33
33	7.74	355.24
34.4	8.85	354.13
34.6	9.48	353.50
35.8	9.94	353.04
37.1	9.98	353.00
39.1	9.85	353.13
39.4	9.7	353.28
40.7	9.14	353.84
43.1	9.04	353.94
45.8	8.1	354.88
47.7	8.25	354.73
49.6	8.32	354.66
52.4	8.18	354.80
54.8	8.04	354.94
56	7.9	355.08
57.6	7.9	355.08
58.6	7.54	355.44
64	7.15	355.83
73.1	6.9	356.08
78.4	6.88	356.10
82	6.55	356.43
86	6.15	356.83

SUMMARY DATA

Floodprone Elevation (ft)	358.92
Bankfull Elevation (ft)	355.96
Floodprone Width (ft)	100.00
Bankfull Width (ft)	45.03
Entrenchment Ratio	2.22
Mean Depth (ft)	1.03
Maximum Depth (ft)	2.96
Width/Depth Ratio	43.86
Bankfull Area (sq ft)	46.23
Wetted Perimeter (ft)	46.61
Hydraulic Radius (ft)	0.99

Stream Type: C6

View of cross-section Hillandale 1 looking downstrean



River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	HD-2 (riffle)
Reach:	Hillandale
Date:	7/6/2007
Field Crew:	K.B. and J.O.

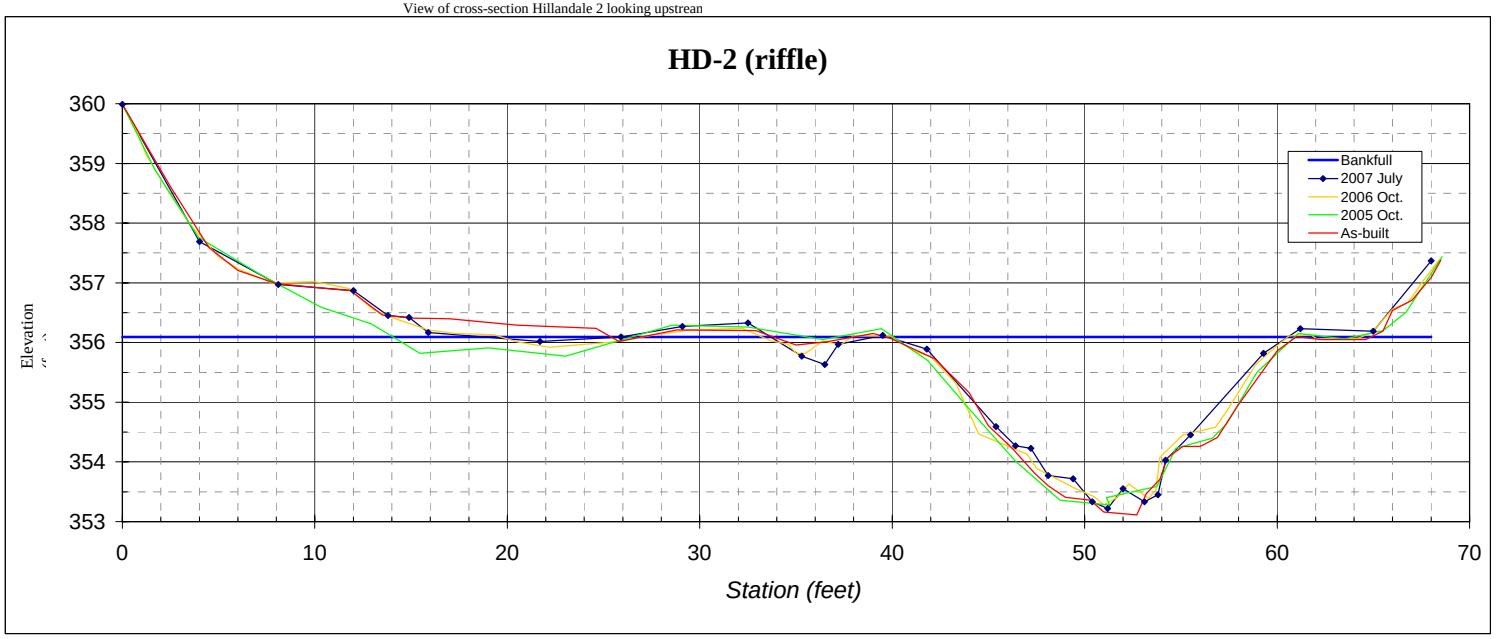
Station	Rod Ht.	Elevation
0	2.98	359.99
4	5.28	357.69
8.1	6	356.97
12	6.1	356.87
13.8	6.52	356.45
14.9	6.55	356.42
15.9	6.8	356.17
21.7	6.95	356.02
25.9	6.88	356.09
29.1	6.7	356.27
32.5	6.64	356.33
35.3	7.2	355.77
36.5	7.34	355.63
37.2	7	355.97
39.5	6.85	356.12
41.8	7.08	355.89
45.4	8.38	354.59
46.4	8.7	354.27
47.2	8.74	354.23
48.1	9.2	353.77
49.4	9.25	353.72
50.4	9.64	353.33
51.2	9.75	353.22
52	9.42	353.55
53.1	9.64	353.33
53.8	9.52	353.45
54.2	8.94	354.03
55.5	8.52	354.45
59.3	7.15	355.82
61.2	6.74	356.23
65	6.78	356.19
68	5.6	357.37

SUMMARY DATA

Floodprone Elevation (ft)	358.96
Bankfull Elevation (ft)	356.09
Floodprone Width (ft)	100.00
Bankfull Width (ft)	33.00
Entrenchment Ratio	3.03
Mean Depth (ft)	0.96
Maximum Depth (ft)	2.87
Width/Depth Ratio	34.53
Bankfull Area (sq ft)	31.53
Wetted Perimeter (ft)	34.34
Hydraulic Radius (ft)	0.92

Stream Type: C5

View of cross-section Hillandale 2 looking upstrean



River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	HD-3 (pool)
Reach:	Hillandale
Date:	7/5/2007
Field Crew:	S.D. and K.R.

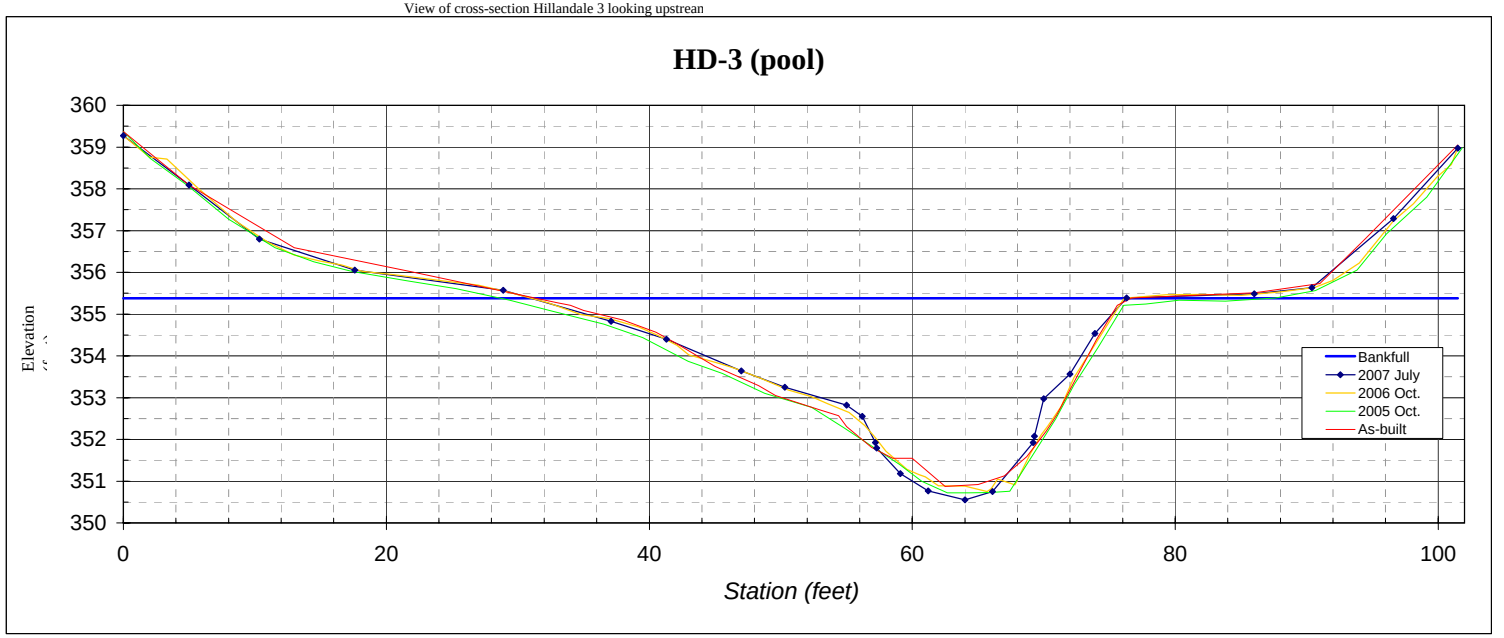
Station	Rod Ht.	Elevation
0	1.3	359.27
5	2.48	358.09
10.35	3.77	356.80
17.6	4.52	356.05
28.9	5	355.57
37.1	5.74	354.83
41.3	6.17	354.40
47	6.93	353.64
50.3	7.32	353.25
55	7.75	352.82
56.2	8.02	352.55
57.2	8.65	351.92
57.3	8.78	351.79
59.1	9.39	351.18
61.2	9.8	350.77
64	10.02	350.55
66.1	9.82	350.75
69.2	8.65	351.92
69.3	8.49	352.08
70	7.6	352.97
72	7.01	353.56
73.9	6.03	354.54
76.3	5.18	355.39
86	5.08	355.49
90.4	4.94	355.63
96.6	3.28	357.29
101.5	1.6	358.97

SUMMARY DATA

Floodprone Elevation (ft)	360.21
Bankfull Elevation (ft)	355.38
Floodprone Width (ft)	101.50
Bankfull Width (ft)	45.27
Entrenchment Ratio	2.24
Mean Depth (ft)	2.18
Maximum Depth (ft)	4.83
Width/Depth Ratio	20.74
Bankfull Area (sq ft)	98.82
Wetted Perimeter (ft)	47.04
Hydraulic Radius (ft)	2.10

Stream Type: C4

View of cross-section Hillandale 3 looking upstrean



River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	HD-4 (riffle)
Reach:	Hillandale
Date:	7/5/2007
Field Crew:	S.D. and K.R.

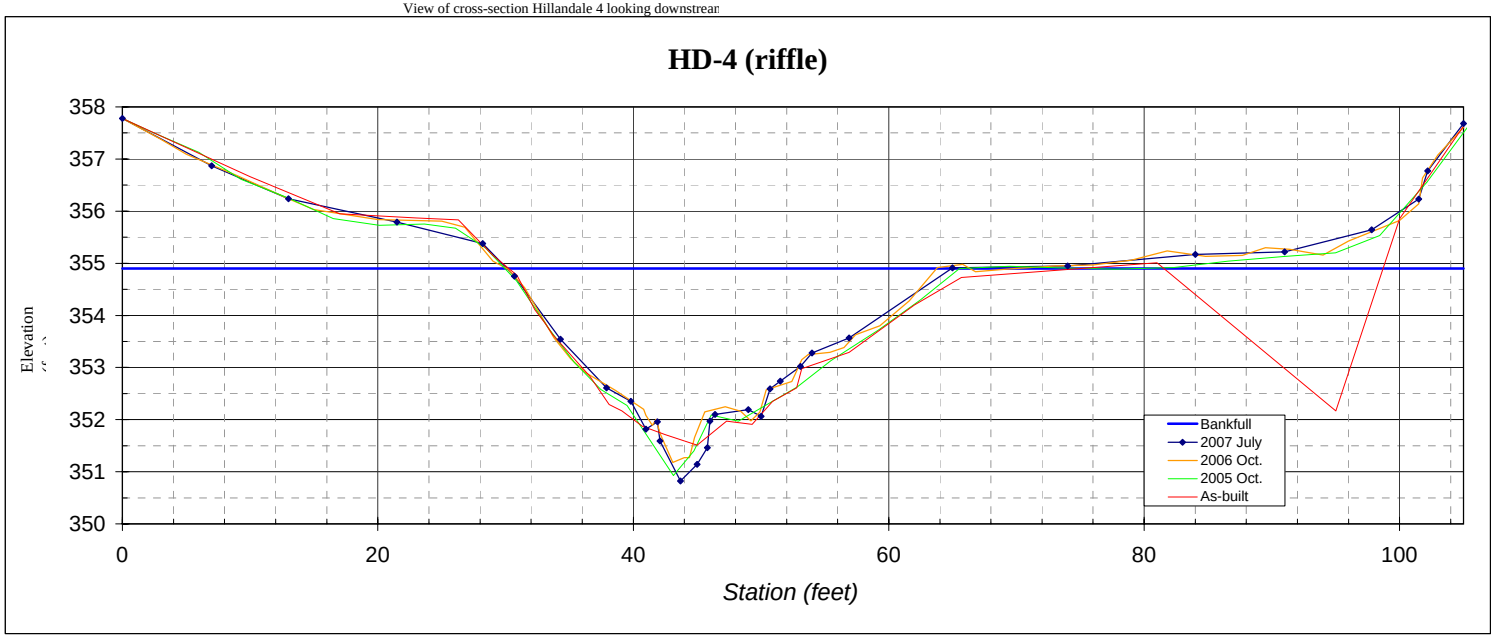
Station	Rod Ht.	Elevation
0	2.82	357.78
7	3.73	356.87
13	4.36	356.24
21.5	4.81	355.79
28.2	5.22	355.38
30.7	5.85	354.75
34.3	7.06	353.54
37.9	7.99	352.61
39.8	8.25	352.35
41	8.78	351.82
41.9	8.64	351.96
42.1	9.01	351.59
43.7	9.78	350.82
45	9.46	351.14
45.8	9.14	351.46
46	8.63	351.97
46.4	8.5	352.10
49	8.41	352.19
50	8.54	352.06
50.7	8.01	352.59
51.5	7.86	352.74
53.1	7.58	353.02
54	7.32	353.28
56.9	7.03	353.57
65	5.69	354.91
74	5.65	354.95
84	5.43	355.17
91	5.38	355.22
97.8	4.96	355.64
101.5	4.37	356.23
102.2	3.83	356.77
105	2.92	357.68

SUMMARY DATA

Floodprone Elevation (ft)	358.98
Bankfull Elevation (ft)	354.90
Floodprone Width (ft)	105.00
Bankfull Width (ft)	34.83
Entrenchment Ratio	3.01
Mean Depth (ft)	1.85
Maximum Depth (ft)	4.08
Width/Depth Ratio	18.88
Bankfull Area (sq ft)	64.27
Wetted Perimeter (ft)	36.56
Hydraulic Radius (ft)	1.76

Stream Type: C6

View of cross-section Hillandale 4 looking downstream



River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	AL-1 (riffle)
Reach:	Albany
Date:	7/9/2007
Field Crew:	K.B., K.R. and J.O.

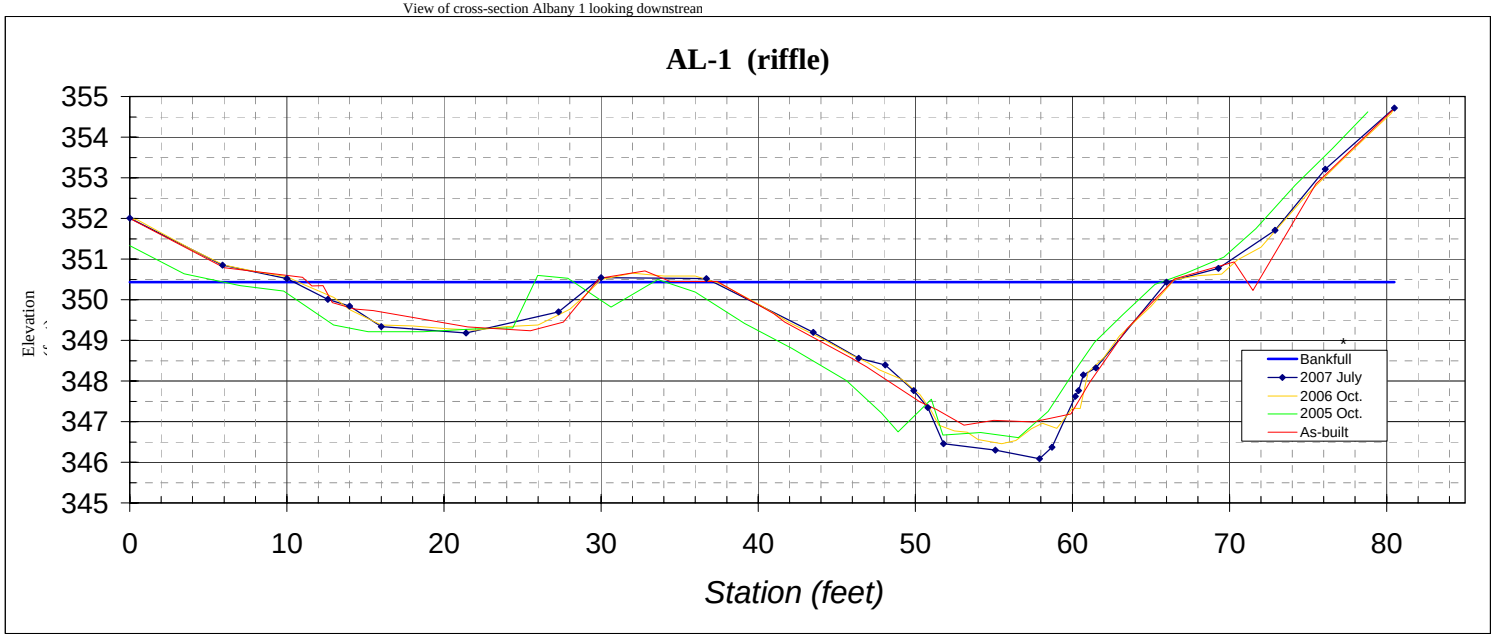
Station	Rod Ht.	Elevation
0	6.8	352.01
5.9	7.96	350.85
10	8.29	350.52
12.6	8.8	350.01
14	8.97	349.84
16	9.47	349.34
21.4	9.63	349.18
27.3	9.11	349.70
30	8.27	350.54
36.7	8.29	350.52
43.5	9.61	349.20
46.4	10.25	348.56
48.1	10.42	348.39
49.9	11.05	347.76
50.8	11.46	347.35
51.8	12.35	346.46
55.1	12.51	346.30
57.9	12.72	346.09
58.7	12.44	346.37
60.2	11.19	347.62
60.4	11.05	347.76
60.7	10.66	348.15
61.5	10.49	348.32
66	8.38	350.43
69.3	8.04	350.77
72.9	7.1	351.71
76.1	5.6	353.21
80.5	4.09	354.72

SUMMARY DATA

Floodprone Elevation (ft)	354.77
Bankfull Elevation (ft)	350.43
Floodprone Width (ft)	100.00
Bankfull Width (ft)	48.02
Entrenchment Ratio	2.08
Mean Depth (ft)	1.65
Maximum Depth (ft)	4.34
Width/Depth Ratio	29.03
Bankfull Area (sq ft)	79.45
Wetted Perimeter (ft)	50.24
Hydraulic Radius (ft)	1.58

Stream Type: C4

View of cross-section Albany 1 looking downstrean



River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	AL-2 (pool)
Reach:	Albany
Date:	7/10/2007
Field Crew:	J.O. and S.D.

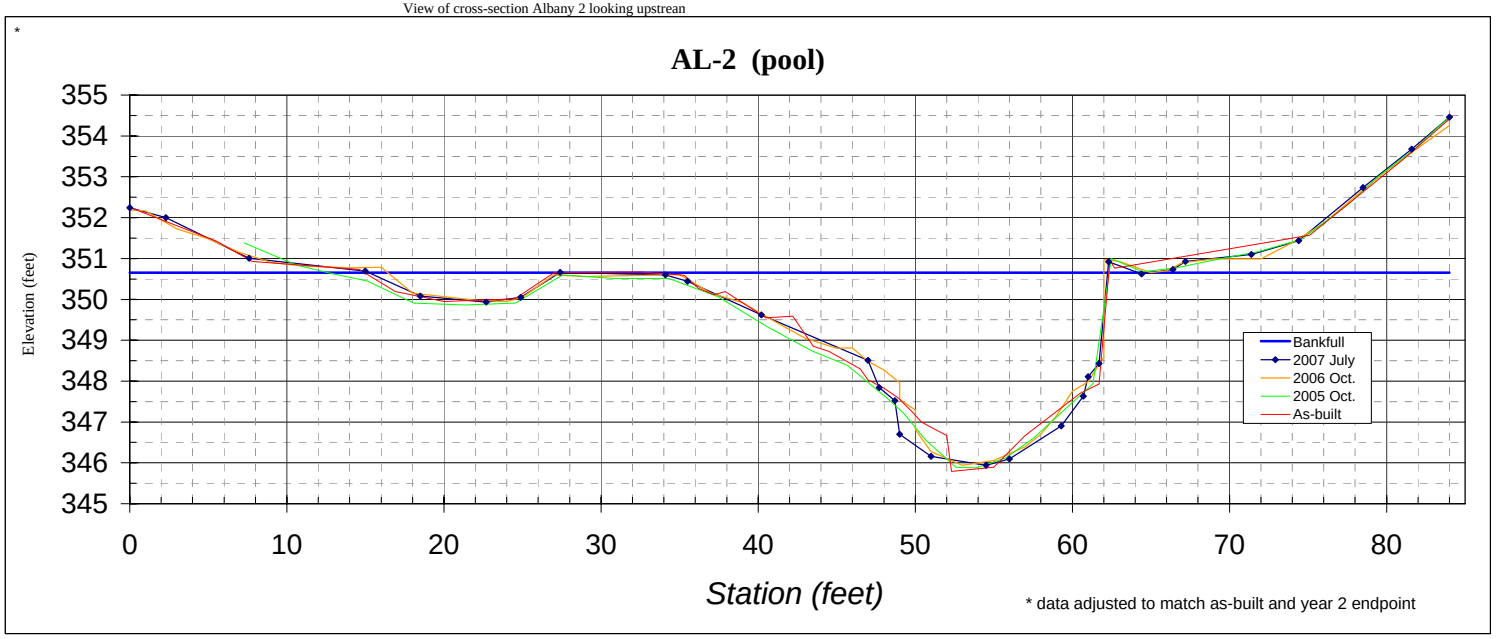
Station	Rod Ht.	Elevation
0	7.32	352.24
2.3	7.56	352
7.6	8.55	351.01
15	8.87	350.69
18.5	9.48	350.08
22.7	9.63	349.93
24.9	9.51	350.05
27.4	8.9	350.66
34.1	8.96	350.6
35.5	9.12	350.44
40.2	9.94	349.62
47	11.05	348.51
47.7	11.72	347.84
48.7	12.04	347.52
49	12.86	346.7
51	13.4	346.16
54.5	13.62	345.94
56	13.46	346.1
59.3	12.66	346.9
60.7	11.93	347.63
61	11.45	348.11
61.7	11.13	348.43
62.3	8.64	350.92
64.4	8.94	350.62
66.4	8.83	350.73
67.2	8.63	350.93
71.4	8.46	351.1
74.4	8.12	351.44
78.5	6.82	352.74
81.6	5.88	353.68
84	5.1	354.46

SUMMARY DATA

Floodprone Elevation (ft)	355.36
Bankfull Elevation (ft)	350.65
Floodprone Width (ft)	100.00
Bankfull Width (ft)	46.60
Entrenchment Ratio	2.15
Mean Depth (ft)	1.69
Maximum Depth (ft)	4.71
Width/Depth Ratio	27.62
Bankfull Area (sq ft)	78.63
Wetted Perimeter (ft)	50.24
Hydraulic Radius (ft)	1.57

Stream Type: C4

View of cross-section Albany 2 looking upstrean



River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	AL-3 (pool)
Reach:	Albany
Date:	7/10/2007
Field Crew:	J.O. and S.D.

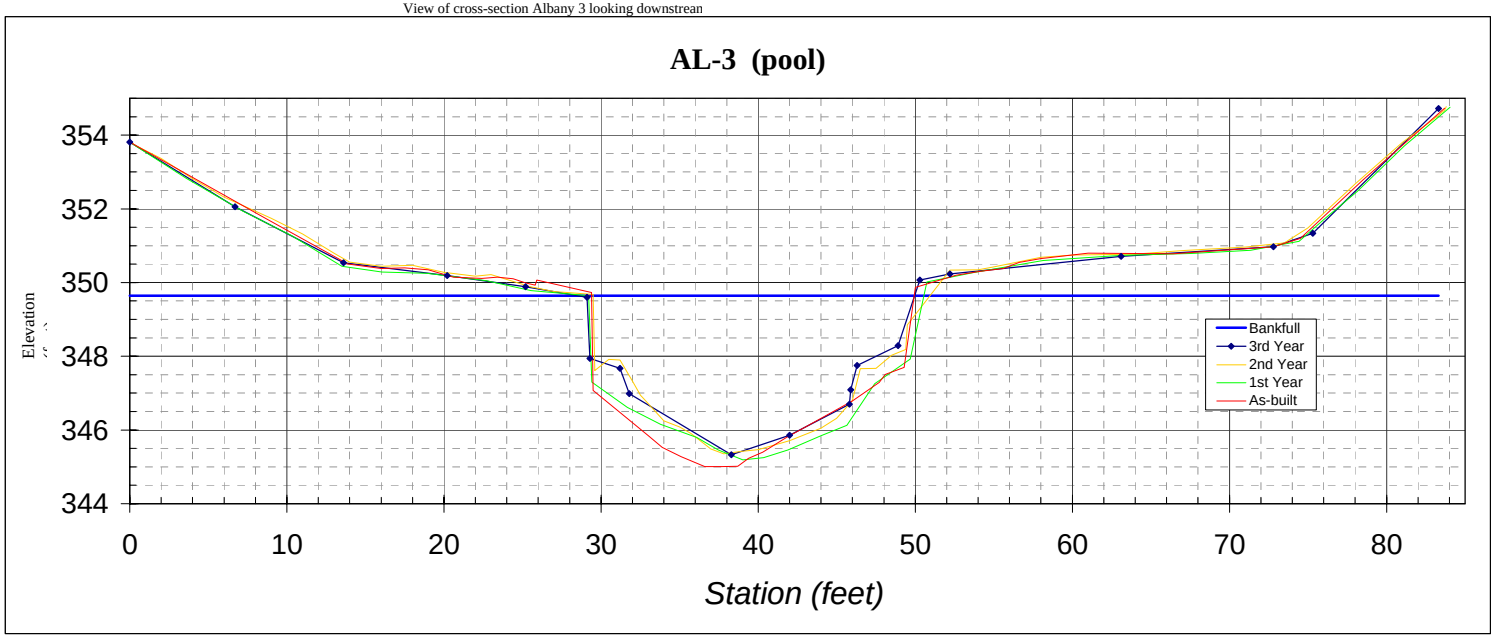
Station	Rod Ht.	Elevation
0	6.32	353.81
6.7	8.07	352.06
13.6	9.59	350.54
20.2	9.94	350.19
25.2	10.24	349.89
29.1	10.53	349.60
29.3	12.19	347.94
31.2	12.46	347.67
31.8	13.14	346.99
38.3	14.8	345.33
42	14.27	345.86
45.8	13.43	346.70
45.9	13.04	347.09
46.3	12.38	347.75
48.9	11.84	348.29
50.3	10.06	350.07
52.2	9.9	350.23
63.1	9.42	350.71
72.8	9.16	350.97
75.3	8.79	351.34
83.3	5.41	354.72

SUMMARY DATA

Floodprone Elevation (ft)	353.95
Bankfull Elevation (ft)	349.64
Floodprone Width (ft)	100.00
Bankfull Width (ft)	21.40
Entrenchment Ratio	4.67
Mean Depth (ft)	2.87
Maximum Depth (ft)	4.31
Width/Depth Ratio	7.45
Bankfull Area (sq ft)	61.50
Wetted Perimeter (ft)	24.92
Hydraulic Radius (ft)	2.47

Stream Type: C4

View of cross-section Albany 3 looking downstrean



River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	AL-4 (riffle)
Reach:	Albany
Date:	7/10/2007
Field Crew:	J.O. and S.D.

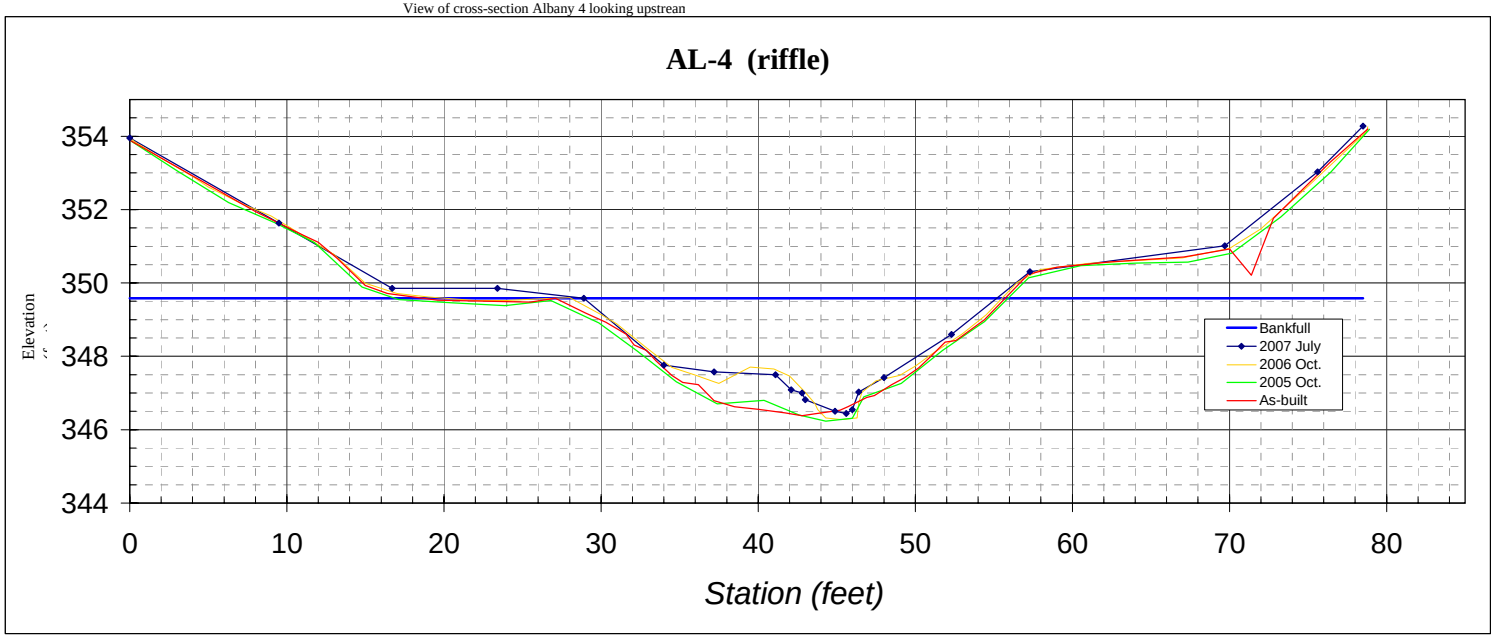
Station	Rod Ht.	Elevation
0	6.24	353.95
9.5	8.56	351.63
16.7	10.34	349.85
23.4	10.34	349.85
28.9	10.61	349.58
34	12.43	347.76
37.2	12.61	347.58
41.1	12.69	347.50
42.1	13.1	347.09
42.8	13.19	347.00
43	13.37	346.82
44.9	13.69	346.50
45.6	13.75	346.44
46	13.64	346.55
46.4	13.16	347.03
48	12.77	347.42
52.3	11.59	348.60
57.3	9.88	350.31
69.7	9.18	351.01
75.6	7.16	353.03
78.5	5.91	354.28

SUMMARY DATA

Floodprone Elevation (ft)	352.72
Bankfull Elevation (ft)	349.58
Floodprone Width (ft)	100.00
Bankfull Width (ft)	26.27
Entrenchment Ratio	3.81
Mean Depth (ft)	1.72
Maximum Depth (ft)	3.14
Width/Depth Ratio	15.23
Bankfull Area (sq ft)	45.30
Wetted Perimeter (ft)	27.38
Hydraulic Radius (ft)	1.65

Stream Type: C5

View of cross-section Albany 4 looking upstrean



River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	CR-1 (pool)
Reach:	Croasdaile
Date:	7/9/2007
Field Crew:	J.O. and K.B.

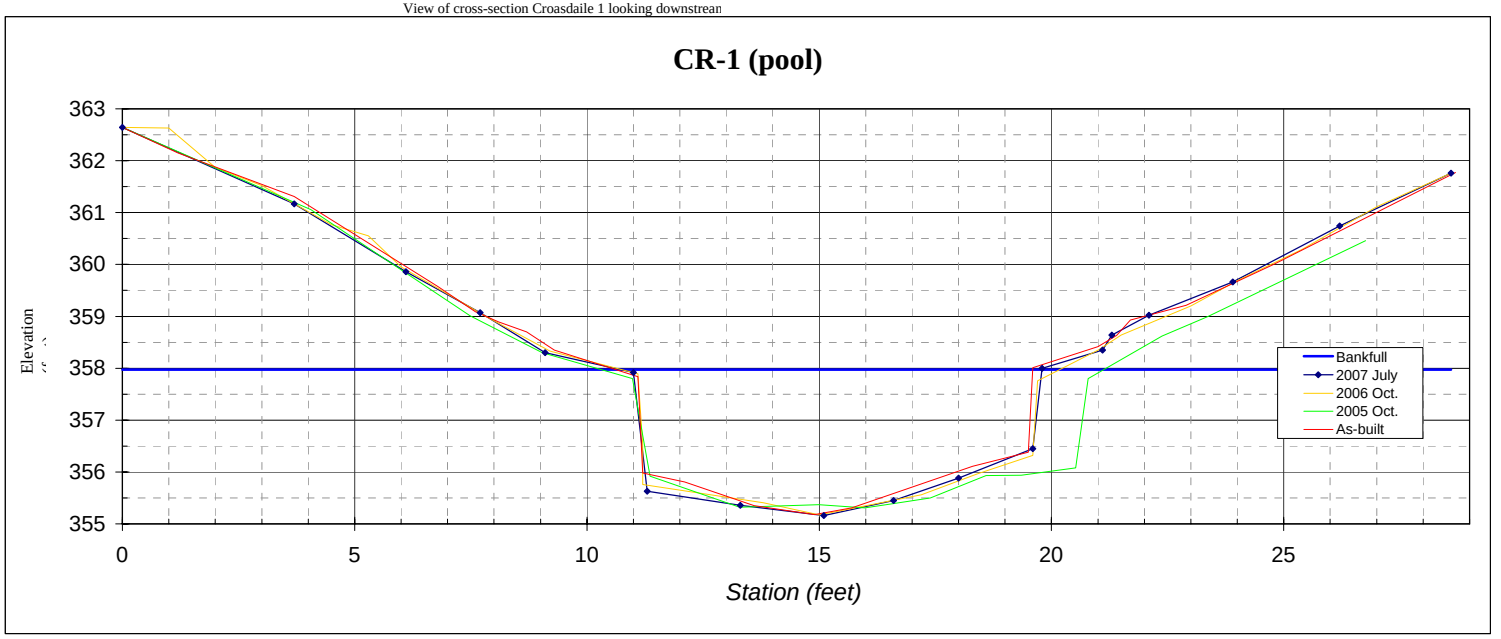
Station	Rod Ht.	Elevation
0	4.72	362.64
3.7	6.19	361.17
6.1	7.5	359.86
7.7	8.29	359.07
9.1	9.06	358.3
11	9.44	357.92
11.3	11.73	355.63
13.3	12	355.36
15.1	12.2	355.16
16.6	11.91	355.45
18	11.48	355.88
19.6	10.91	356.45
19.8	9.36	358
21.1	9.01	358.35
21.3	8.72	358.64
22.1	8.34	359.02
23.9	7.7	359.66
26.2	6.62	360.74
28.6	5.6	361.76

SUMMARY DATA

Floodprone Elevation (ft)	360.78
Bankfull Elevation (ft)	357.97
Floodprone Width (ft)	21.88
Bankfull Width (ft)	9.05
Entrenchment Ratio	2.42
Mean Depth (ft)	2.26
Maximum Depth (ft)	2.81
Width/Depth Ratio	4.00
Bankfull Area (sq ft)	20.45
Wetted Perimeter (ft)	12.62
Hydraulic Radius (ft)	1.62

Stream Type: C4

View of cross-section Croasdaile 1 looking downstrean



River Basin:	Neuse
Watershed:	Ellerbe Creek
XS ID	CR-2 (riffle)
Reach:	Croasdaile
Date:	7/9/2007
Field Crew:	J.O. and K.B.

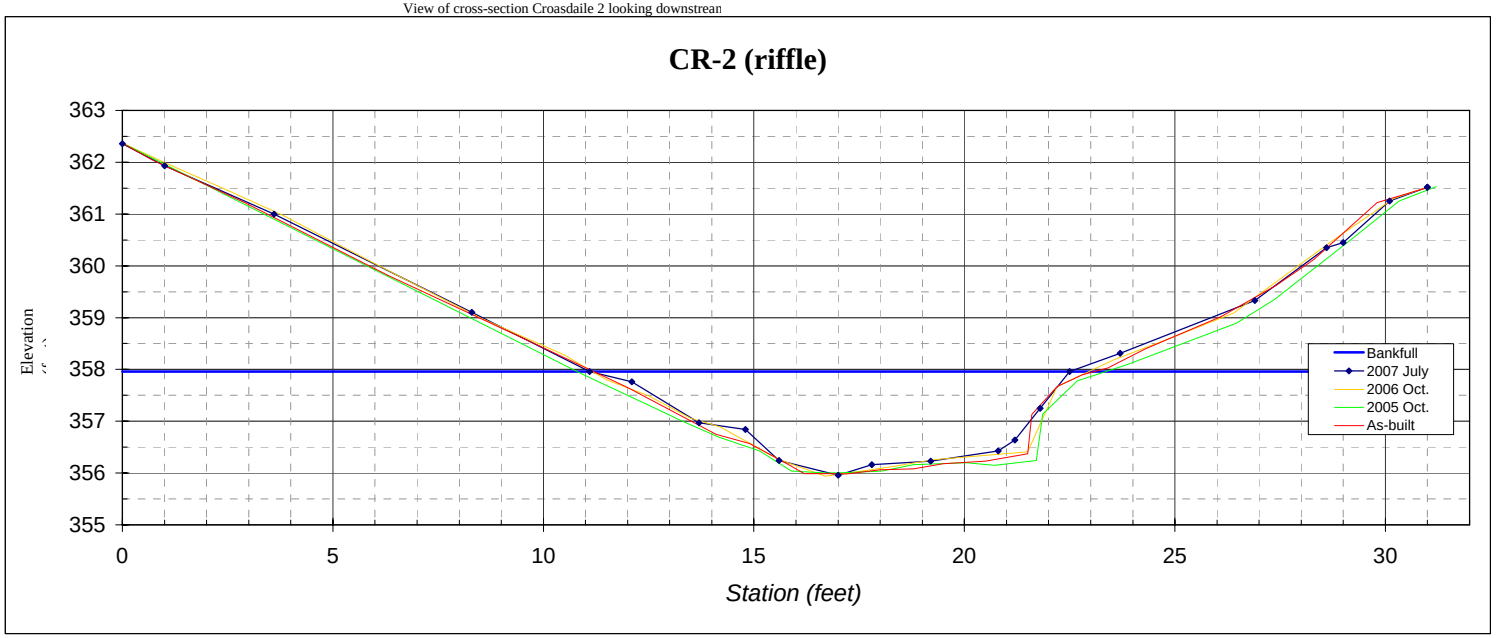
Station	Rod Ht.	Elevation
0	4.99	362.36
1	5.42	361.93
3.6	6.35	361
8.3	8.25	359.1
11.1	9.39	357.96
12.1	9.59	357.76
13.7	10.38	356.97
14.8	10.51	356.84
15.6	11.11	356.24
17	11.39	355.96
17.8	11.19	356.16
19.2	11.12	356.23
20.8	10.92	356.43
21.2	10.71	356.64
21.8	10.1	357.25
22.5	9.39	357.96
23.7	9.04	358.31
26.9	8.02	359.33
28.6	7	360.35
29	6.9	360.45
30.1	6.1	361.25
31	5.83	361.52
31	4.16	361.52

SUMMARY DATA

Floodprone Elevation (ft)	359.96
Bankfull Elevation (ft)	357.96
Floodprone Width (ft)	21.78
Bankfull Width (ft)	11.40
Entrenchment Ratio	1.91
Mean Depth (ft)	1.23
Maximum Depth (ft)	2.00
Width/Depth Ratio	9.30
Bankfull Area (sq ft)	13.98
Wetted Perimeter (ft)	12.48
Hydraulic Radius (ft)	1.12

Stream Type: C4

View of cross-section Croasdaile 2 looking downstrean



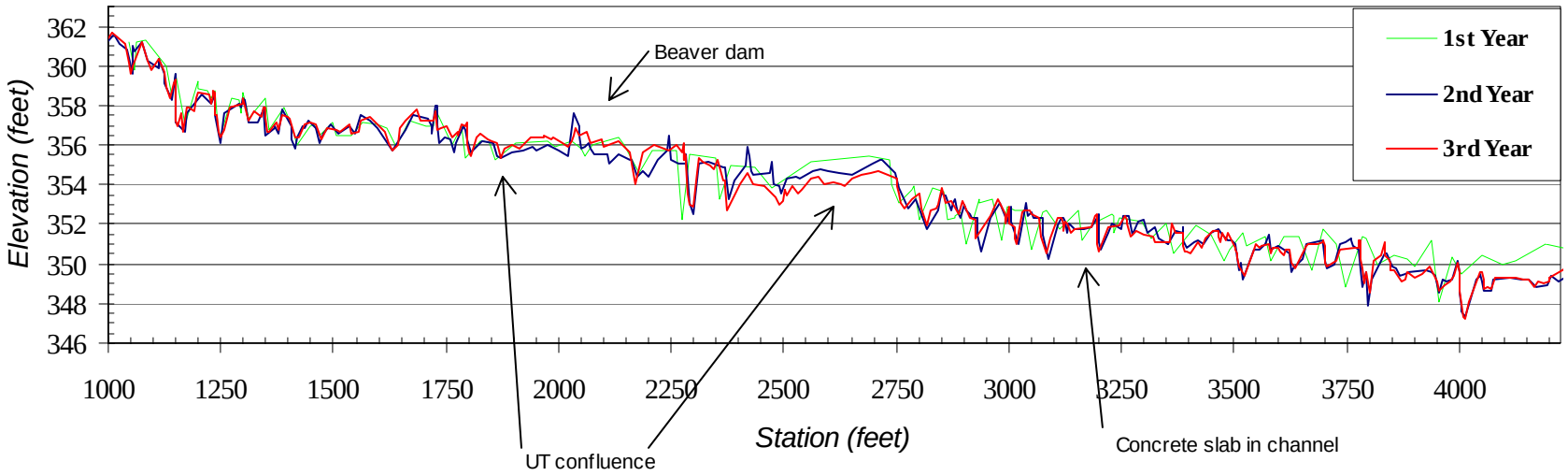
B6. Longitudinal Plots and Raw Data Tables – Ellerbe Creek Stream Restoration – Monitoring Year 3 (2007) – Project #127

	Mon 03		
Pattern	min	max	average
Channel Beltwidth (ft)	12.2	60.9	39.3
Radius of Curvature (ft)	31	126.2	60.5
Meander Wavelength	153.5	388.5	248.4
Meander Width ratio			1.21
Profile	min	max	average
Riffle length (ft)	19.1	158.5	56.6
Riffle slope (ft/ft)	0	0.03	0.011
Pool length (ft)	17.3	93.9	44.2
Pool spacing (ft)	14.5	344	104.1

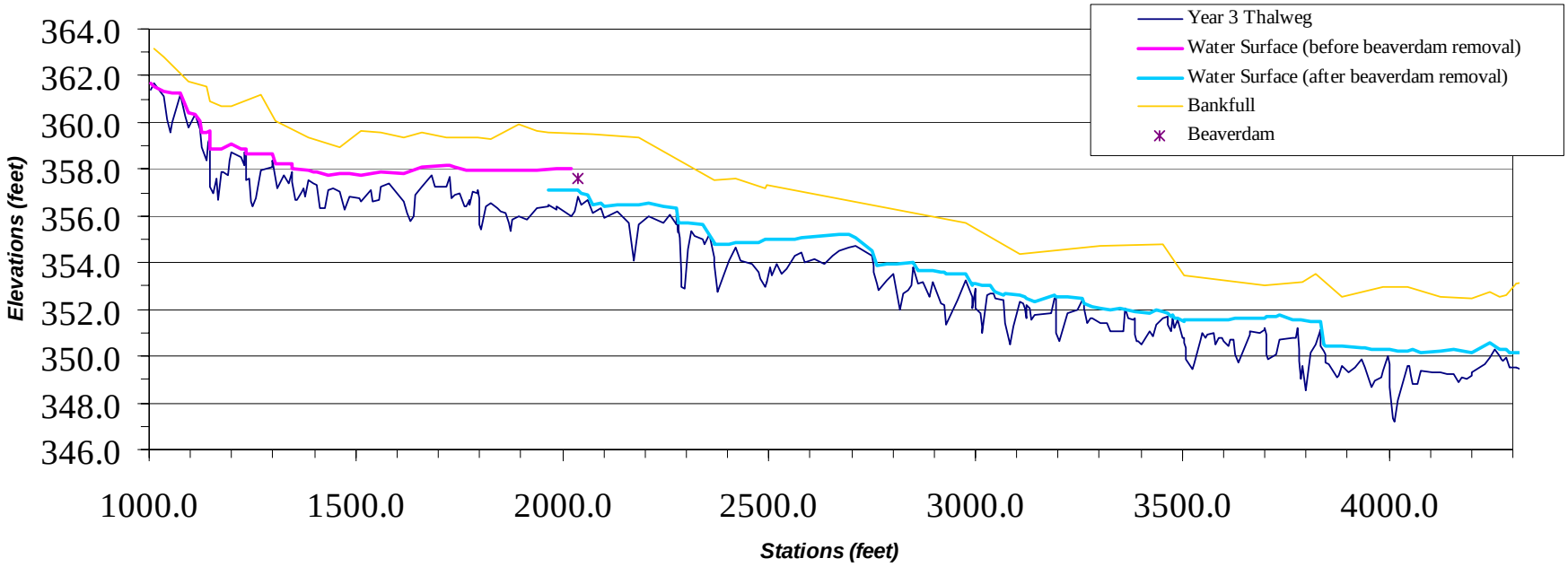
Additional Reach Parameters	Mon 03*
Valley Length (ft)	3,089
Channel Length (ft)	3,389
Sinuosity	1.10
Water Surface Slope (ft/ft)	0.0047
BF slope (ft/ft)	0.0035
Rosgen Classification	C5
Habitat Index	NA
Macrobenthos	NA

* For entire longitudinal profile only

Ellerbe Creek 2005-2007 Longitudinal Profiles



Ellerbe Creek 2007 Longitudinal Profile



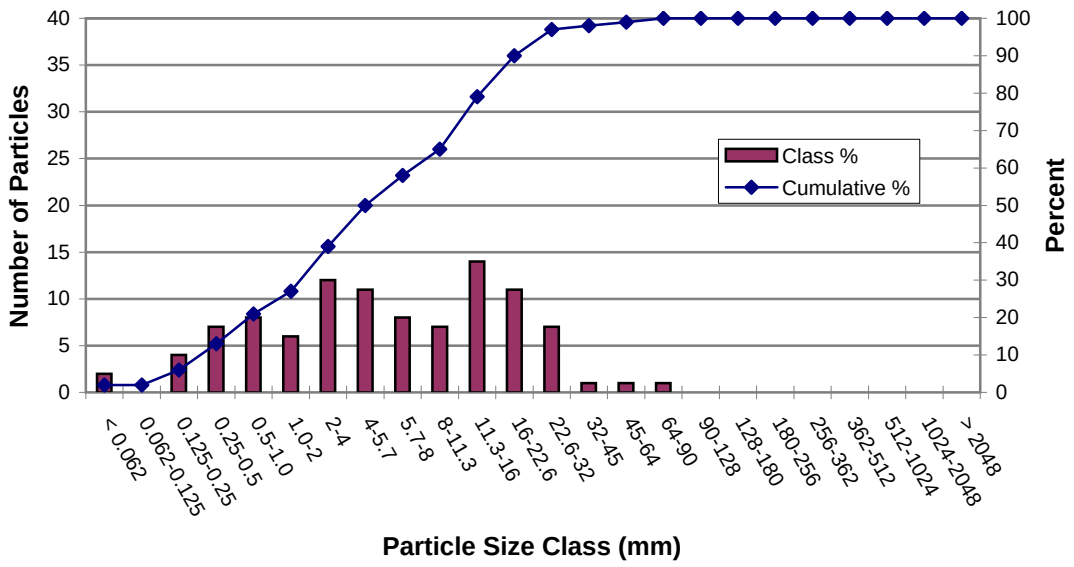
B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section HB-XS1

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	2	2	2
Sand	Very Fine Sand	0.062-0.125	0	0	2
	Fine Sand	0.125-0.25	4	4	6
	Medium Sand	0.25-0.5	7	7	13
	Coarse Sand	0.5-1.0	8	8	21
	Very Course Sand	1.0-2	6	6	27
Gravel	Very Fine Gravel	2-4	12	12	39
	Fine Gravel	4-5.7	11	11	50
	Fine Gravel	5.7-8	8	8	58
	Medium Gravel	8-11.3	7	7	65
	Medium Gravel	11.3-16	14	14	79
	Coarse Gravel	16-22.6	11	11	90
	Coarse Gravel	22.6-32	7	7	97
	Very Course Gravel	32-45	1	1	98
	Very Course Gravel	45-64	1	1	99
Cobble	Small Cobble	64-90	1	1	100
	Small Cobble	90-128	0	0	100
	Medium Cobble	128-180	0	0	100
	Large Cobble	180-256	0	0	100
Boulder	Small Boulders	256-362	0	0	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 5.7 mm

d_{84} = 19.0 mm



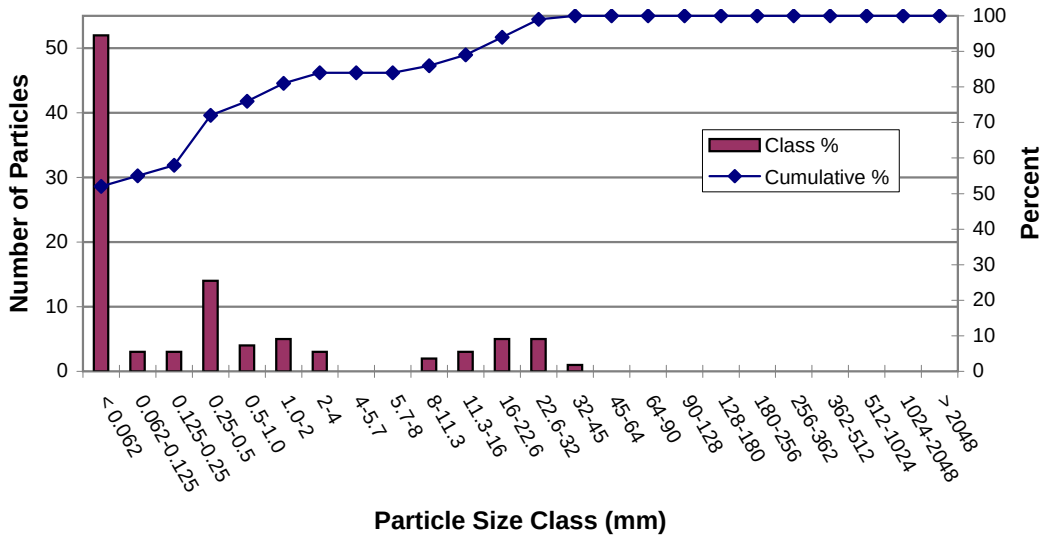
B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section HB-XS2

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	52	52	52
Sand	Very Fine Sand	0.062-0.125	3	3	55
	Fine Sand	0.125-0.25	3	3	58
	Medium Sand	0.25-0.5	14	14	72
	Coarse Sand	0.5-1.0	4	4	76
	Very Course Sand	1.0-2	5	5	81
Gravel	Very Fine Gravel	2-4	3	3	84
	Fine Gravel	4-5.7	0	0	84
	Fine Gravel	5.7-8	0	0	84
	Medium Gravel	8-11.3	2	2	86
	Medium Gravel	11.3-16	3	3	89
	Coarse Gravel	16-22.6	5	5	94
	Coarse Gravel	22.6-32	5	5	99
	Very Course Gravel	32-45	1	1	100
	Very Course Gravel	45-64	0	0	100
Cobble	Small Cobble	64-90	0	0	100
	Small Cobble	90-128	0	0	100
	Medium Cobble	128-180	0	0	100
	Large Cobble	180-256	0	0	100
Boulder	Small Boulders	256-362	0	0	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 0.06 mm

d_{84} = 4.0 mm



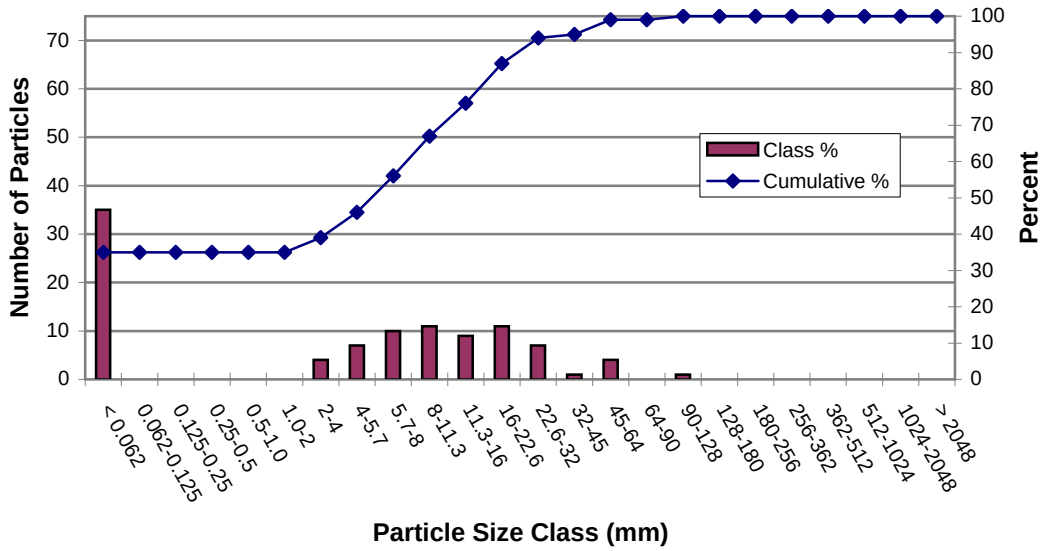
B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section HB-XS3

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	35	35	35
Sand	Very Fine Sand	0.062-0.125	0	0	35
	Fine Sand	0.125-0.25	0	0	35
	Medium Sand	0.25-0.5	0	0	35
	Coarse Sand	0.5-1.0	0	0	35
	Very Course Sand	1.0-2	0	0	35
Gravel	Very Fine Gravel	2-4	4	4	39
	Fine Gravel	4-5.7	7	7	46
	Fine Gravel	5.7-8	10	10	56
	Medium Gravel	8-11.3	11	11	67
	Medium Gravel	11.3-16	9	9	76
	Coarse Gravel	16-22.6	11	11	87
	Coarse Gravel	22.6-32	7	7	94
	Very Course Gravel	32-45	1	1	95
	Very Course Gravel	45-64	4	4	99
Cobble	Small Cobble	64-90	0	0	99
	Small Cobble	90-128	1	1	100
	Medium Cobble	128-180	0	0	100
	Large Cobble	180-256	0	0	100
Boulder	Small Boulders	256-362	0	0	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 6.6 mm

d_{84} = 20.8 mm



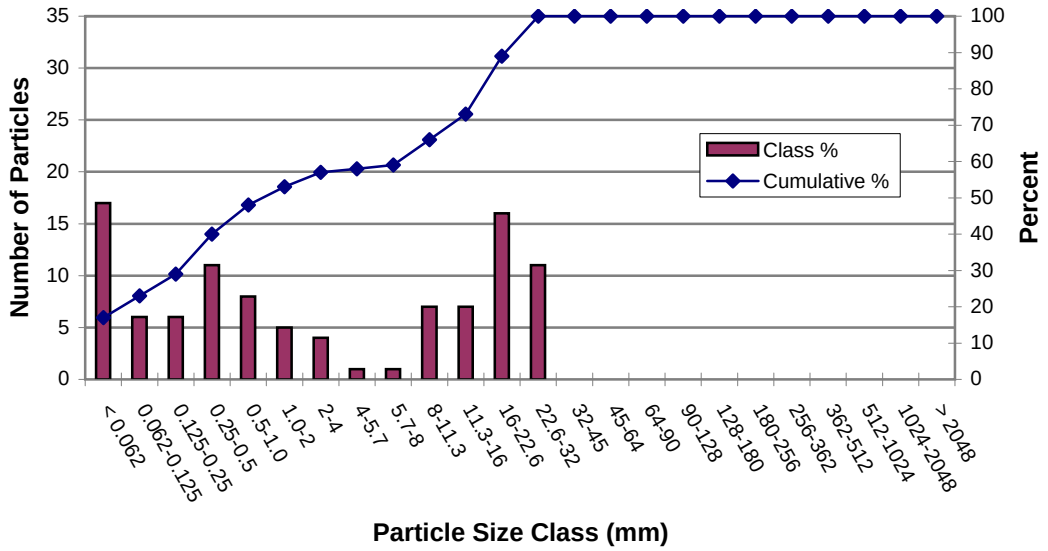
B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section HB-XS4

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	17	17	17
Sand	Very Fine Sand	0.062-0.125	6	6	23
	Fine Sand	0.125-0.25	6	6	29
	Medium Sand	0.25-0.5	11	11	40
	Coarse Sand	0.5-1.0	8	8	48
	Very Course Sand	1.0-2	5	5	53
Gravel	Very Fine Gravel	2-4	4	4	57
	Fine Gravel	4-5.7	1	1	58
	Fine Gravel	5.7-8	1	1	59
	Medium Gravel	8-11.3	7	7	66
	Medium Gravel	11.3-16	7	7	73
	Coarse Gravel	16-22.6	16	16	89
	Coarse Gravel	22.6-32	11	11	100
	Very Course Gravel	32-45	0	0	100
	Very Course Gravel	45-64	0	0	100
Cobble	Small Cobble	64-90	0	0	100
	Small Cobble	90-128	0	0	100
	Medium Cobble	128-180	0	0	100
	Large Cobble	180-256	0	0	100
Boulder	Small Boulders	256-362	0	0	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 1.4 mm

d_{84} = 20.5 mm



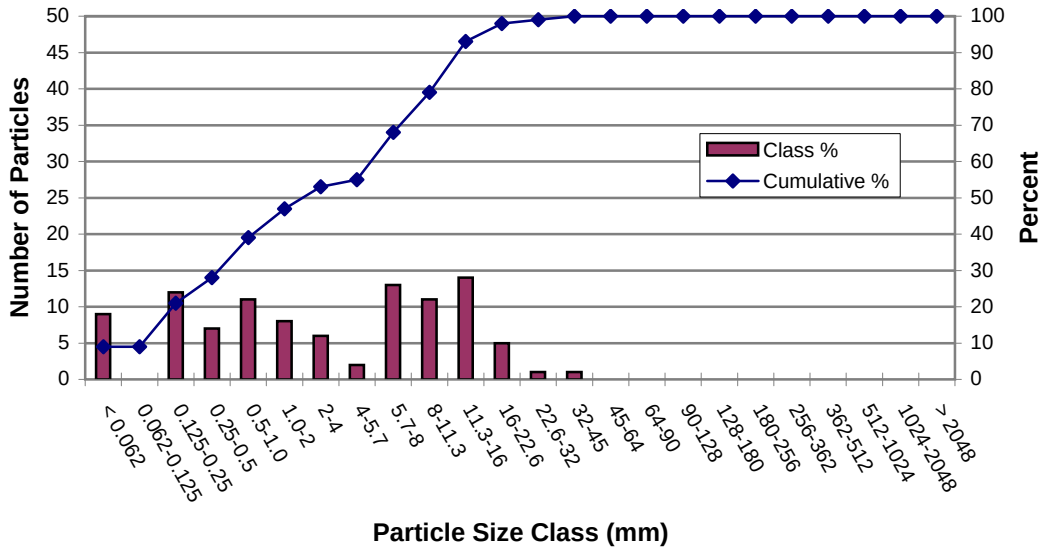
B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section HD-XS1

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	9	9	9
Sand	Very Fine Sand	0.062-0.125	0	0	9
	Fine Sand	0.125-0.25	12	12	21
	Medium Sand	0.25-0.5	7	7	28
	Coarse Sand	0.5-1.0	11	11	39
	Very Course Sand	1.0-2	8	8	47
Gravel	Very Fine Gravel	2-4	6	6	53
	Fine Gravel	4-5.7	2	2	55
	Fine Gravel	5.7-8	13	13	68
	Medium Gravel	8-11.3	11	11	79
	Medium Gravel	11.3-16	14	14	93
	Coarse Gravel	16-22.6	5	5	98
	Coarse Gravel	22.6-32	1	1	99
	Very Course Gravel	32-45	1	1	100
	Very Course Gravel	45-64	0	0	100
Cobble	Small Cobble	64-90	0	0	100
	Small Cobble	90-128	0	0	100
	Medium Cobble	128-180	0	0	100
	Large Cobble	180-256	0	0	100
Boulder	Small Boulders	256-362	0	0	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 3.0 mm

d_{84} = 13.0 mm



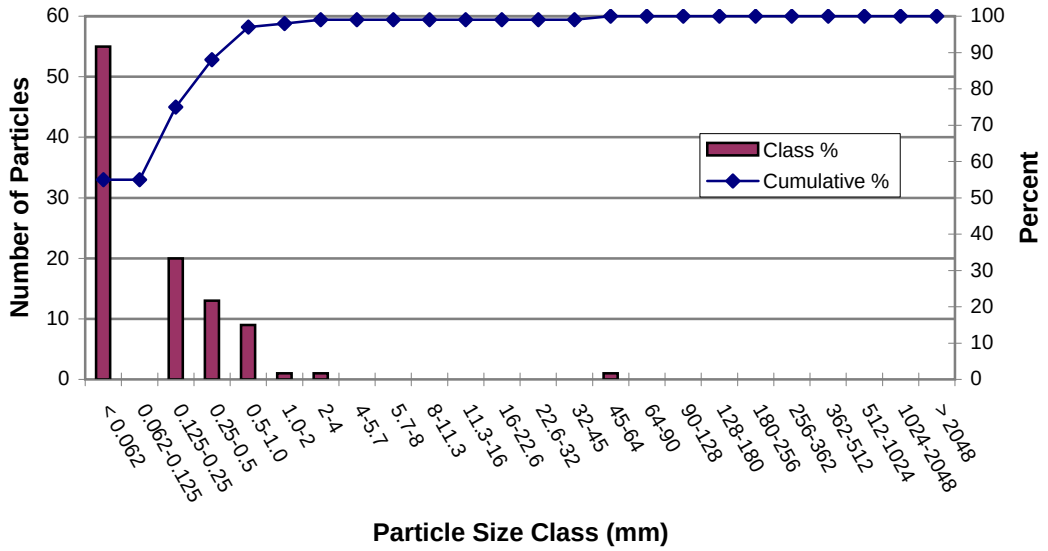
B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section HD-XS2

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	55	55	55
Sand	Very Fine Sand	0.062-0.125	0	0	55
	Fine Sand	0.125-0.25	20	20	75
	Medium Sand	0.25-0.5	13	13	88
	Coarse Sand	0.5-1.0	9	9	97
	Very Course Sand	1.0-2	1	1	98
Gravel	Very Fine Gravel	2-4	1	1	99
	Fine Gravel	4-5.7	0	0	99
	Fine Gravel	5.7-8	0	0	99
	Medium Gravel	8-11.3	0	0	99
	Medium Gravel	11.3-16	0	0	99
	Coarse Gravel	16-22.6	0	0	99
	Coarse Gravel	22.6-32	0	0	99
	Very Course Gravel	32-45	0	0	99
	Very Course Gravel	45-64	1	1	100
Cobble	Small Cobble	64-90	0	0	100
	Small Cobble	90-128	0	0	100
	Medium Cobble	128-180	0	0	100
	Large Cobble	180-256	0	0	100
Boulder	Small Boulders	256-362	0	0	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 0.06 mm

d_{84} = 0.42 mm



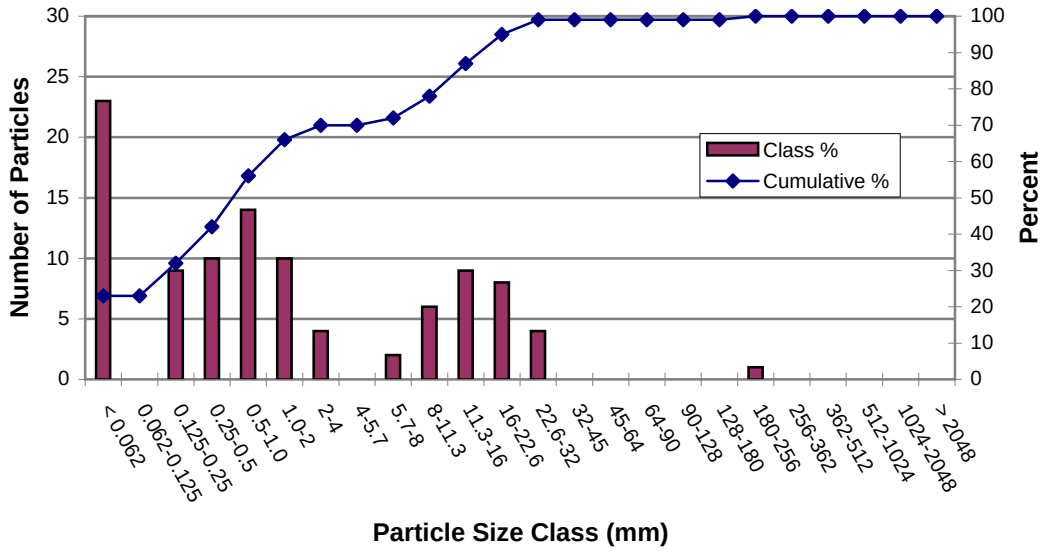
B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section HD-XS3

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	23	23	23
Sand	Very Fine Sand	0.062-0.125	0	0	23
	Fine Sand	0.125-0.25	9	9	32
	Medium Sand	0.25-0.5	10	10	42
	Coarse Sand	0.5-1.0	14	14	56
	Very Course Sand	1.0-2	10	10	66
Gravel	Very Fine Gravel	2-4	4	4	70
	Fine Gravel	4-5.7	0	0	70
	Fine Gravel	5.7-8	2	2	72
	Medium Gravel	8-11.3	6	6	78
	Medium Gravel	11.3-16	9	9	87
	Coarse Gravel	16-22.6	8	8	95
	Coarse Gravel	22.6-32	4	4	99
	Very Course Gravel	32-45	0	0	99
	Very Course Gravel	45-64	0	0	99
Cobble	Small Cobble	64-90	0	0	99
	Small Cobble	90-128	0	0	99
	Medium Cobble	128-180	0	0	99
	Large Cobble	180-256	1	1	100
Boulder	Small Boulders	256-362	0	0	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 0.8 mm

d_{84} = 14.4 mm



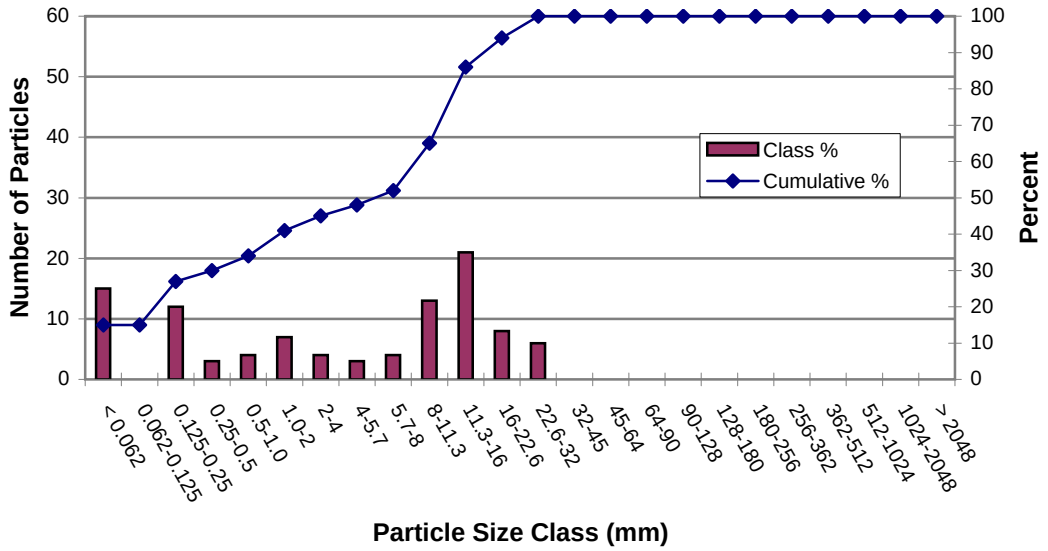
B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section HD-XS4

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	15	15	15
Sand	Very Fine Sand	0.062-0.125	0	0	15
	Fine Sand	0.125-0.25	12	12	27
	Medium Sand	0.25-0.5	3	3	30
	Coarse Sand	0.5-1.0	4	4	34
	Very Course Sand	1.0-2	7	7	41
Gravel	Very Fine Gravel	2-4	4	4	45
	Fine Gravel	4-5.7	3	3	48
	Fine Gravel	5.7-8	4	4	52
	Medium Gravel	8-11.3	13	13	65
	Medium Gravel	11.3-16	21	21	86
	Coarse Gravel	16-22.6	8	8	94
	Coarse Gravel	22.6-32	6	6	100
	Very Course Gravel	32-45	0	0	100
	Very Course Gravel	45-64	0	0	100
Cobble	Small Cobble	64-90	0	0	100
	Small Cobble	90-128	0	0	100
	Medium Cobble	128-180	0	0	100
	Large Cobble	180-256	0	0	100
Boulder	Small Boulders	256-362	0	0	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 6.9 mm

d_{84} = 15.6 mm



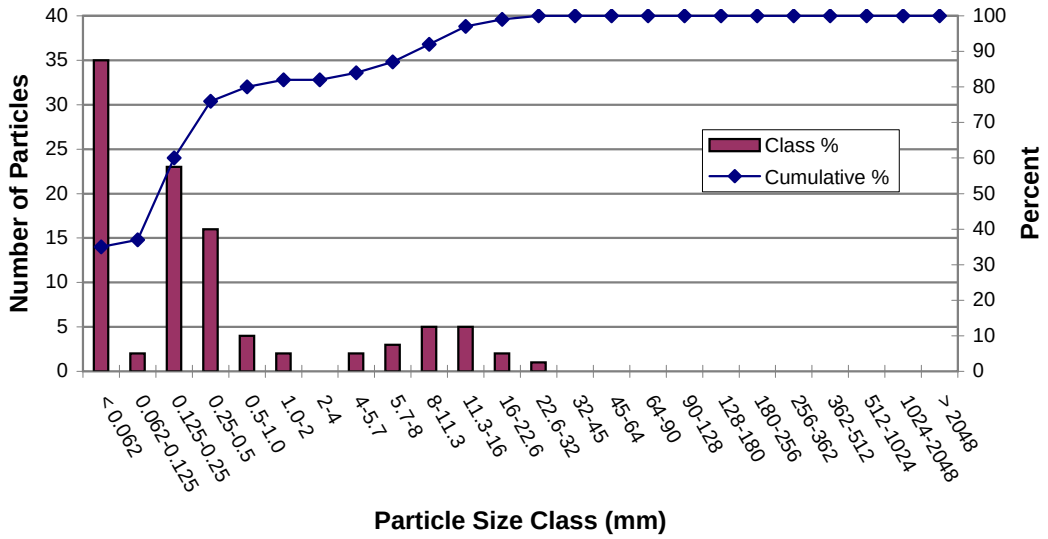
B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section AL-XS1

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	35	35	35
Sand	Very Fine Sand	0.062-0.125	2	2	37
	Fine Sand	0.125-0.25	23	23	60
	Medium Sand	0.25-0.5	16	16	76
	Coarse Sand	0.5-1.0	4	4	80
	Very Course Sand	1.0-2	2	2	82
Gravel	Very Fine Gravel	2-4	0	0	82
	Fine Gravel	4-5.7	2	2	84
	Fine Gravel	5.7-8	3	3	87
	Medium Gravel	8-11.3	5	5	92
	Medium Gravel	11.3-16	5	5	97
	Coarse Gravel	16-22.6	2	2	99
	Coarse Gravel	22.6-32	1	1	100
	Very Course Gravel	32-45	0	0	100
	Very Course Gravel	45-64	0	0	100
Cobble	Small Cobble	64-90	0	0	100
	Small Cobble	90-128	0	0	100
	Medium Cobble	128-180	0	0	100
	Large Cobble	180-256	0	0	100
Boulder	Small Boulders	256-362	0	0	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 0.2 mm

d_{84} = 5.7 mm



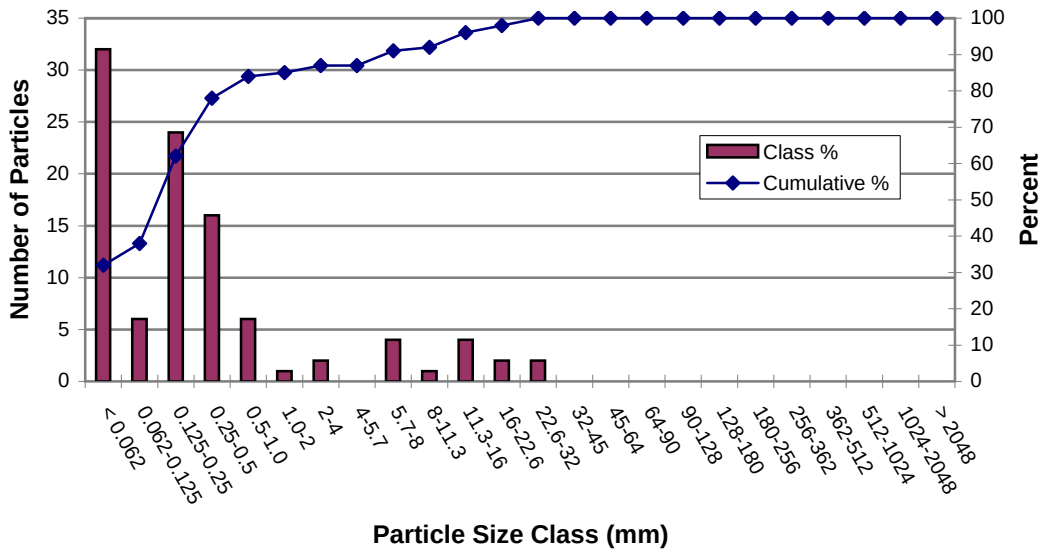
B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section AL-XS2

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	32	32	32
Sand	Very Fine Sand	0.062-0.125	6	6	38
	Fine Sand	0.125-0.25	24	24	62
	Medium Sand	0.25-0.5	16	16	78
	Coarse Sand	0.5-1.0	6	6	84
	Very Course Sand	1.0-2	1	1	85
Gravel	Very Fine Gravel	2-4	2	2	87
	Fine Gravel	4-5.7	0	0	87
	Fine Gravel	5.7-8	4	4	91
	Medium Gravel	8-11.3	1	1	92
	Medium Gravel	11.3-16	4	4	96
	Coarse Gravel	16-22.6	2	2	98
	Coarse Gravel	22.6-32	2	2	100
	Very Course Gravel	32-45	0	0	100
	Very Course Gravel	45-64	0	0	100
Cobble	Small Cobble	64-90	0	0	100
	Small Cobble	90-128	0	0	100
	Medium Cobble	128-180	0	0	100
	Large Cobble	180-256	0	0	100
Boulder	Small Boulders	256-362	0	0	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 0.2 mm

d_{84} = 1.0 mm



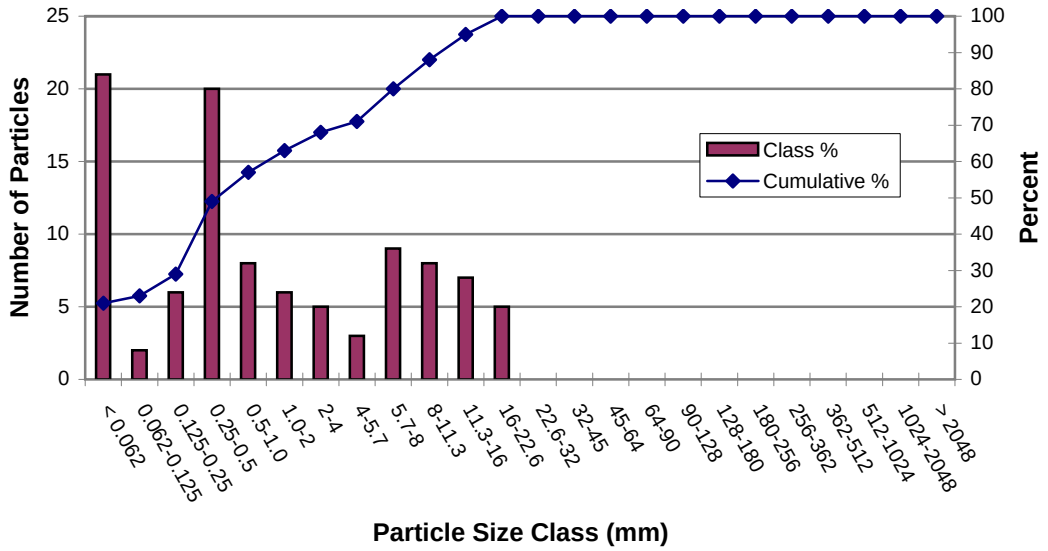
B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section AL-XS3

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	21	21	21
Sand	Very Fine Sand	0.062-0.125	2	2	23
	Fine Sand	0.125-0.25	6	6	29
	Medium Sand	0.25-0.5	20	20	49
	Coarse Sand	0.5-1.0	8	8	57
	Very Course Sand	1.0-2	6	6	63
Gravel	Very Fine Gravel	2-4	5	5	68
	Fine Gravel	4-5.7	3	3	71
	Fine Gravel	5.7-8	9	9	80
	Medium Gravel	8-11.3	8	8	88
	Medium Gravel	11.3-16	7	7	95
	Coarse Gravel	16-22.6	5	5	100
	Coarse Gravel	22.6-32	0	0	100
	Very Course Gravel	32-45	0	0	100
	Very Course Gravel	45-64	0	0	100
Cobble	Small Cobble	64-90	0	0	100
	Small Cobble	90-128	0	0	100
	Medium Cobble	128-180	0	0	100
	Large Cobble	180-256	0	0	100
Boulder	Small Boulders	256-362	0	0	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 0.6 mm

d_{84} = 9.7 mm



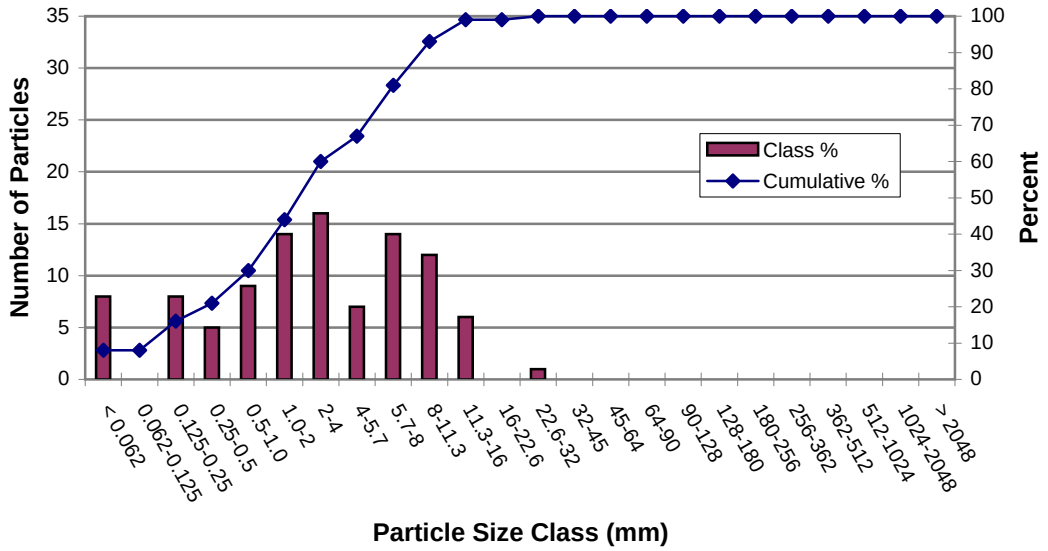
B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section AL-XS4

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	8	8	8
Sand	Very Fine Sand	0.062-0.125	0	0	8
	Fine Sand	0.125-0.25	8	8	16
	Medium Sand	0.25-0.5	5	5	21
	Coarse Sand	0.5-1.0	9	9	30
	Very Course Sand	1.0-2	14	14	44
Gravel	Very Fine Gravel	2-4	16	16	60
	Fine Gravel	4-5.7	7	7	67
	Fine Gravel	5.7-8	14	14	81
	Medium Gravel	8-11.3	12	12	93
	Medium Gravel	11.3-16	6	6	99
	Coarse Gravel	16-22.6	0	0	99
	Coarse Gravel	22.6-32	1	1	100
	Very Course Gravel	32-45	0	0	100
	Very Course Gravel	45-64	0	0	100
Cobble	Small Cobble	64-90	0	0	100
	Small Cobble	90-128	0	0	100
	Medium Cobble	128-180	0	0	100
	Large Cobble	180-256	0	0	100
Boulder	Small Boulders	256-362	0	0	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 2.8 mm

d_{84} = 8.8 mm



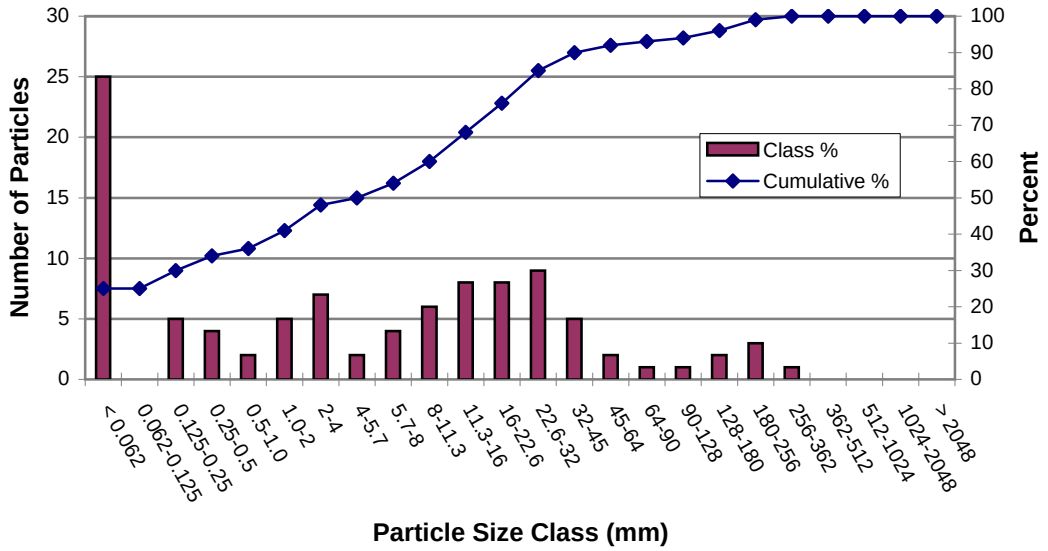
B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section CR-XS1

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	25	25	25
Sand	Very Fine Sand	0.062-0.125	0	0	25
	Fine Sand	0.125-0.25	5	5	30
	Medium Sand	0.25-0.5	4	4	34
	Coarse Sand	0.5-1.0	2	2	36
	Very Course Sand	1.0-2	5	5	41
Gravel	Very Fine Gravel	2-4	7	7	48
	Fine Gravel	4-5.7	2	2	50
	Fine Gravel	5.7-8	4	4	54
	Medium Gravel	8-11.3	6	6	60
	Medium Gravel	11.3-16	8	8	68
	Coarse Gravel	16-22.6	8	8	76
	Coarse Gravel	22.6-32	9	9	85
	Very Course Gravel	32-45	5	5	90
	Very Course Gravel	45-64	2	2	92
Cobble	Small Cobble	64-90	1	1	93
	Small Cobble	90-128	1	1	94
	Medium Cobble	128-180	2	2	96
	Large Cobble	180-256	3	3	99
Boulder	Small Boulders	256-362	1	1	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 5.7 mm

d_{84} = 30.9 mm



B7. Pebble Count - Ellerbe Creek Stream Restoration Third Year Monitoring 07/01/2007

Cross Section CR-XS2

	Particle	Size Range (mm)	Total #	Class %	Cumulative %
S/C	Silt/Clay	< 0.062	15	15	15
Sand	Very Fine Sand	0.062-0.125	0	0	15
	Fine Sand	0.125-0.25	1	1	16
	Medium Sand	0.25-0.5	7	7	23
	Coarse Sand	0.5-1.0	6	6	29
	Very Course Sand	1.0-2	4	4	33
Gravel	Very Fine Gravel	2-4	9	9	42
	Fine Gravel	4-5.7	1	1	43
	Fine Gravel	5.7-8	6	6	49
	Medium Gravel	8-11.3	10	10	59
	Medium Gravel	11.3-16	18	18	77
	Coarse Gravel	16-22.6	11	11	88
	Coarse Gravel	22.6-32	3	3	91
	Very Course Gravel	32-45	1	1	92
	Very Course Gravel	45-64	0	0	92
Cobble	Small Cobble	64-90	1	1	93
	Small Cobble	90-128	3	3	96
	Medium Cobble	128-180	1	1	97
	Large Cobble	180-256	3	3	100
Boulder	Small Boulders	256-362	0	0	100
	Small Boulders	362-512	0	0	100
	Medium Boulders	512-1024	0	0	100
	Large Boulders	1024-2048	0	0	100
	Bedrock	> 2048	0	0	100
	Total		100		

d_{50} = 8.3 mm

d_{84} = 20.2 mm