

**Prestonwood Golf Course
(Hatchet's Grove)
Stream Restoration Monitoring Report
EEP Project # 289
Monitoring Year – 02
2006**



Submitted to:



NCEEP, 1652 Mail Service Center, Raleigh, NC 27699-1652

January 2007

Monitoring Firm



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EXECUTIVE SUMMARY

The North Carolina Ecosystem Enhancement Program (EEP) has facilitated the restoration of Hatchet's Grove Tributary and an unnamed tributary to Hatchet's Grove (Meadow Creek). Soil and Environmental Consultants, PA (S&EC) designed the restoration. The watershed of approximately 3.7 square miles is located within USGS 14-digit HUC 03020201080010 and NCDWQ Sub-basin 03-04-02 of the Neuse River Basin. The restoration proposed to restore approximately 4,123 linear feet of channel, 3,828 feet on Hatchet's Grove and 295 feet on Meadow Creek and 5.3 acres of riparian buffer. The restoration was designed to correct various problems with the existing stream corridor including channelization and poor vegetation maintenance practices. The restoration construction was completed in 2004, and first year monitoring took place in 2005. This report is a description of the findings of the second year monitoring that took place in 2006.

The riparian buffer zone was planted with 16 different species of trees and shrubs. The bankfull channel area was live staked with three (3) different species. The vegetation monitoring plots were established during the as-built survey. Three buffer plots and three stream bank plots were established. For the second year monitoring, the EEP changed the vegetation monitoring protocol for this project. The new protocol required that the three stream bank plots be repositioned. The three new plots were established during the second year monitoring and all six of the plots were assessed using the new monitoring protocol. The second year monitoring counted an average of 715 stems per acre in the riparian buffer. There were no major problems with exotic / invasive plants. The only vegetation problem areas were a few patches of bare floodplain and bare banks. There are also two areas where the riparian buffer has been mowed almost to the streambanks. These problem areas are depicted in Appendix A, on the Vegetation Problem Area Plan View. The first year monitoring found the vegetation component of the project to be successful.

The physical monitoring of the stream's dimension and profile consisted of an entire longitudinal profile of both Hatchet's Grove and Meadow Creek, and two cross-sections on Meadow Creek and six cross-sections on Hatchet's Grove. The stream assessment completed during the first year monitoring found the stream to have numerous problems with streambank erosion and floodplain scour. The second year monitoring documented many of these same problems, with some previous problems stabilizing and some worsening. While parts of the stream appear to have stable dimensions, some of the streambank erosion is severe enough to warrant timely attention and possible maintenance/remediation. The second year monitoring profile shows large elevation differences from the as-built profile. There is not the same profile-wide elevation difference in comparison to the first year monitoring profile, but there is a mix of local aggradation and degradation throughout the profile. These issues are detailed in the following report and should be closely monitored to determine if corrective actions are warranted.

1.0 PROJECT BACKGROUND

1.1 Project Objectives

- Develop a channel with the appropriate dimension, pattern, and longitudinal profile utilizing the existing channel condition survey and collected reference reach data as a guide.
- Improve and create bed form diversity (riffles, runs, pools, and glides).
- Construct a floodplain (bankfull bench) that is accessible at the proposed bankfull channel elevation (Priority II restoration).
- Ensure channel and stream bank stabilization by integrating grade control structures, root wads, and native vegetation in conjunction with the eradication or modification of current grounds maintenance practices.
- Establish a 30-foot native riparian plant community, when possible, from the edge of the restored reach.
- Integrate existing golf course uses with the proposed restoration plan providing aesthetic and education values.

1.2 Project Structure, Restoration Type, and Approach

Previously incised channels through the Prestonwood Golf Course, Hatchet's Grove and Meadow Creek were restored using channel dimension and profile modifications and the establishment of a vegetated riparian zone adjacent to the streams. Channel profile is maintained through the use of rock cross vanes. Channel pattern is maintained through the use of single vanes, root wads, and vegetation along the channel banks.

1.3 Location and Setting

The Prestonwood site is located on a golf course, which is surrounded by apartments and single family homes. Areas of forested and agricultural land are sporadically spaced throughout the watershed. Development pressure will continue to urbanize the watershed, increasing the amount of impervious areas.

1.4 Project History and Background

Table 1. Project Mitigation Structure and Objectives								
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet's Grove)								
Segment / Reach ID	Existing Linear Feet	Type	Approach	Linear Feet	Mitigation Ratio	Mitigation Units	Stationing	Comment
Hatchet's Grove	3,200	R	P2	3,828	1.0	3,828	00+00 - 38+28	
Meadow Creek	300	R	P2	295	1.0	295	00+00 - 02+95	
Mitigation Unit Summations								
Stream (lf)	Riparian Wetland (Ac)	Nonriparian Wetland (Ac)	Total Wetland (Ac)	Buffer (Ac)	Comment			
4,123				5.3				

R = Restoration

P2 = Priority II

DIRECTIONS TO PRESTONWOOD GOLF COURSE SITE:
 From I-40, take exit 285 Aviation Parkway. Proceed South on Aviation Parkway. Turn left onto Chapel Hill Road (NC 54). Turn right onto Morrisville Pkwy. Turn right on Double Eagle Ct. or into the Legends Apartment Complex. Park in remnant cul-de-sac after passing Stony Ct. on the right. Follow gravel road to golf course.

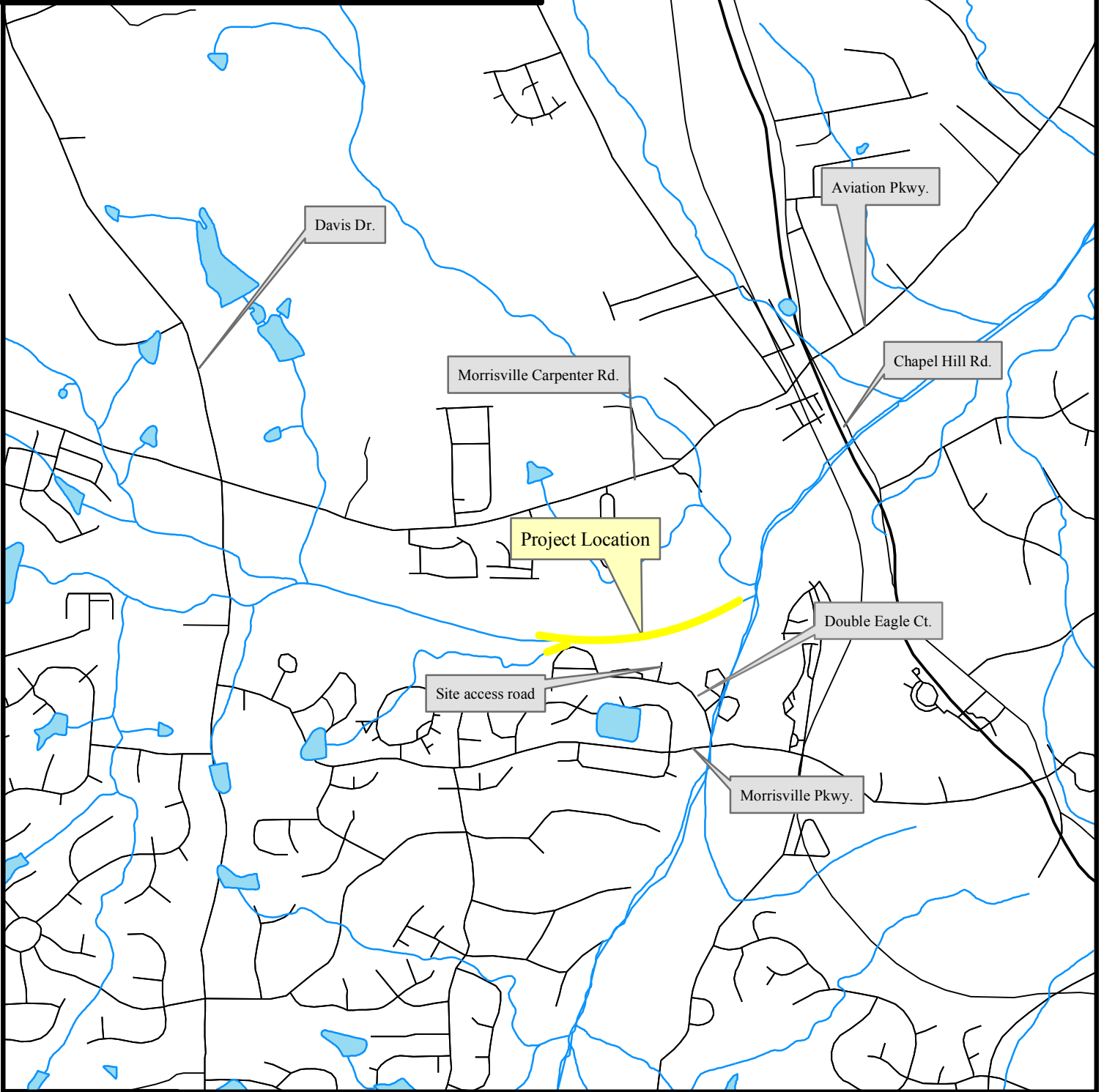


Figure 1. Site Vicinity Map
Prestonwood Golf Course, Wake County, EEP Project # 289 - MY02



Table 2. Project Activity and Reporting History		
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet’s Grove)		
Activity or Report	Data Collection Complete	Actual Completion or Delivery
Restoration Plan		Oct 02
Final Design - 90%		
Construction		May 04
Planting		May 04
Mitigation Plan / As-Built Report		Sep 06
Year 1 Monitoring	Oct 05	Apr 06
Year 2 Monitoring	Sep 06	Jan 07

Table 3. Project Contact Table	
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet’s Grove)	
Design Firms	S&EC, PA 11010 Raven Ridge Rd. Raleigh, North Carolina 27614 Phone: (919) 846-5900 Fax: (919) 846-9467
Construction Contractor	McQueen Construction Co. 619 Patrick Rd. Bahama, North Carolina 27503
Planting Contractor	Carolina Silvics, Inc. 908 Indian Trail Rd. Edenton, North Carolina 27932
Monitoring Performers	
MY-01	S&EC, PA 11010 Raven Ridge Rd. Raleigh, North Carolina 27614 Contact: Ms. Rebecca Wargo and Ms. Jessica Regan Phone: (919) 846-5900 Fax: (919) 846-9467
MY-02	KCI Associates of NC Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 783-9214 Fax: (919) 783-9266

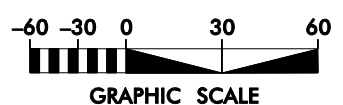
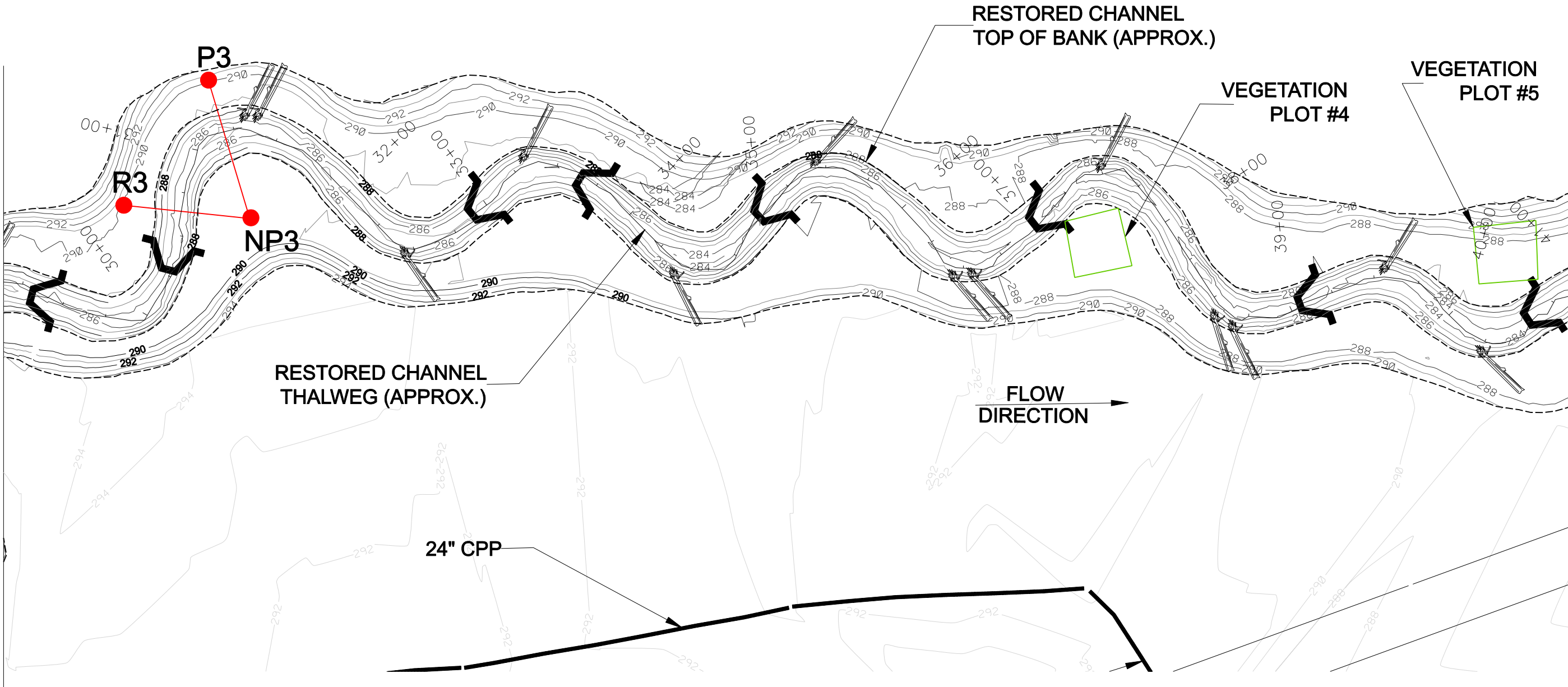
Table 4. Project Background Table	
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet’s Grove)	
Project County	Wake County
Drainage Area	3.7 sq. mi. (Hatchet’s Grove)
	0.23 sq. mi. (Meadow Creek)
Drainage Impervious Cover Estimate (%)	30%
Stream Order	Third Order (Hatchet’s Grove)
	First Order (Meadow Creek)
Physiographic Region	Piedmont
Ecoregion	Triassic Basin
Rosgen Classification of As-built	E5
Dominant Soil Types	Chewacla, Wehadkee
Reference Site ID	Sal’s Branch
	Mill Creek
USGS HUC for Project and Reference	03020201080010 (Hatchet’s Grove)
	03020201080 (Sal’s Branch)
	03040101090 (Mill Creek)
NCDWQ Sub-basin for Project and Reference	03-04-02 (Hatchet’s Grove)
	03-04-02 (Sal’s Branch)
	03-07-02 (Mill Creek)
NCDWQ Classification for Project and Reference	C - NSW
Any portion of the project segment 303d listed?	No
Any portion of the project segment upstream of a 303d listed segment?	No
Reasons for 303d Listing or Stressor	N/A
% of Project Easement Fenced	0%

SEE MATCHLINE SHEET 2

SEE MATCHLINE SHEET 2

SEE MATCHLINE SHEET 4

SEE MATCHLINE SHEET 4



LEGEND	
PHOTO REFERENCE POINT	
VEGETATIVE BUFFER BOUNDARY	
CROSS SECTION	
ROOT WAD	
CHANNEL SILL	
ROCK CROSS VANE	
ROCK J-HOOK	

SYMBOL	DESCRIPTION	DATE	APPROVED



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PRESTONWOOD GOLF COURSE
MONITORING PLAN VIEW
WAKE COUNTY
EEP PROJECT NUMBER 87 - MY03
STATION 29+14 TO STATION 40+87

DATE: JANUARY 2007
SCALE: SEE SHEET
MONITORING PLAN VIEW
SHEET 3
SHEET 3 OF 4

2.0 PROJECT CONDITIONS AND MONITORING RESULTS

2.1 Vegetation Assessment

See vegetation assessment in Appendix A.

2.1.1 Vegetative Problem Areas

See Table A6. Vegetative Problem Areas in Appendix A.

2.1.2 Vegetative Problem Area Plan View

See Vegetative Problem Area Plan View in Appendix A.

2.2 Stream Assessment

2.2.1 Bankfull Event and Stability Assessment

2.2.1.a Verification of Bankfull Events Table

Table 5. Verification of Bankfull Events			
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet's Grove)			
Date of Data Collection	Date of Occurrence	Method	Photo Number
06/15/06	06/14/06	Site visit to evaluate indicators of stage after storm event	

2.2.1.b BEHI and Sediment Export Table

Table 6. BEHI and Sediment Export Estimates
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet's Grove)
BEHI will be completed in monitoring year 05

2.2.2 Stability Assessment Table

Table 7a. Categorical Stream Feature Visual Stability Assessment						
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet's Grove)						
Segment/Reach: Hatchet's Grove (3,828 ft.)						
Feature	Initial	MY - 01	MY - 02	MY - 03	MY - 04	MY - 05
A. Riffles	100%	N/A	70%			
B. Pools	100%	N/A	96%			
C. Thalweg	100%	N/A	68%			
D. Meanders	100%	N/A	61%			
E. Bed General	100%	N/A	89%			
F. Bank Condition	100%	N/A	87%			
G. Vanes / J Hooks etc.	100%	N/A	92%			
H. Wads and Boulders	100%	N/A	74%			

Table 7b. Categorical Stream Feature Visual Stability Assessment						
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet’s Grove)						
Segment/Reach: Meadow Creek (295 ft.)						
Feature	Initial	MY - 01	MY - 02	MY - 03	MY - 04	MY - 05
A. Riffles	100%	N/A	–			
B. Pools	100%	N/A	–			
C. Thalweg	100%	N/A	60%			
D. Meanders	100%	N/A	80%			
E. Bed General	100%	N/A	80%			
F. Bank Condition	100%	N/A	80%			
G. Sills	100%	N/A	60%			
H. Wads and Boulders	100%	N/A	80%			

2.2.3 Quantitative Measures Summary Tables

Table 8a. Baseline Morphology and Hydraulic Summary																		
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet’s Grove)																		
Segment Reach: Hatchet’s Grove (3,828 ft.)																		
Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
	Dimension	Min	Max	Mean	Min	Max	Med	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Bankfull Width (ft)									21.7			18.4			20	19.8	24.5	20.8
Floodprone Width (ft)									170			200			200	60	100	100
Bankfull Cross Sectional Area (ft ²)									45.1			27.5	50	60	55	37.5	52.6	43.1
Bankfull Mean Depth (ft)									2.1			1.5			2.5	1.8	2.2	2.2
Bankfull Maximum Depth (ft)									3.5			2.9	3.5	3.6	3.55	3.1	3.8	3.7
Width/Depth Ratio									10.8			12.0			8	9.1	11.6	11.4
Entrenchment Ratio									7.7			10.9			10	2.9	5.0	4.1
Bank Height Ratio															1.0			1.0
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Pattern																		
Channel Beltwidth (ft)											40	76	58	40	110	75		
Radius of Curvature (ft)											30	44	37	30	60	45		
Meander Wavelength (ft)											40	76	58	80	150	115		
Meander Width Ratio											2.2	4.1	3.2	2	5.5	3.8		
Profile																		
Riffle Length (ft)								27	68	48	12	60	36	15	50	33		
Riffle Slope (ft/ft)								0.003	0.030	0.017	0.007	0.037	0.022	0.005	0.010	0.008		
Pool Length (ft)								60	182	121	21	53	37	20	70	45		
Pool Spacing (ft)								68	202	135	30	84	57	50	140	95		
Substrate																		
d50 (mm)																2		
d84 (mm)																13		
Additional Reach Parameters																		
Valley Length (ft)																		
Channel Length (ft)																		
Sinuosity									1.1			1.8			1.2			
Water Surface Slope (ft/ft)																		
BF Slope (ft/ft)									0.002			0.008			0.002			
Rosgen Classification									E5/F5			E4			E5			

Table 8b. Baseline Morphology and Hydraulic Summary
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet’s Grove)
Segment Reach: Meadow Creek (295 ft.)

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built*		
	Min	Max	Mean	Min	Max	Med	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Bankfull Width (ft)																		8.7
Floodprone Width (ft)																		90
Bankfull Cross Sectional Area (ft ²)																		7.1
Bankfull Mean Depth (ft)																		0.8
Bankfull Maximum Depth (ft)																		1.4
Width/Depth Ratio																		10.8
Entrenchment Ratio																		10.3
Bank Height Ratio																		1.0
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Pattern																		
Channel Beltwidth (ft)																		
Radius of Curvature (ft)																		
Meander Wavelength (ft)																		
Meander Width Ratio																		
Profile																		
Riffle Length (ft)																		
Riffle Slope (ft/ft)																		
Pool Length (ft)																		
Pool Spacing (ft)																		
Substrate																		
d50 (mm)																		
d84 (mm)																		
Additional Reach Parameters																		
Valley Length (ft)																		
Channel Length (ft)																		
Sinuosity																		
Water Surface Slope (ft/ft)																		
BF Slope (ft/ft)																		
Rosgen Classification																		

*As-built data is from a single cross section survey.

Prestonwood Golf Course (Hatchet’s Grove)

EEP Project # 289

Table 9a. Morphology and Hydraulic Monitoring Summary												
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet’s Grove)												
Segment Reach: Meadow Creek (295 ft.)												
Parameter	Cross Section - Riffle 1 Riffle						Cross Section - Pool 1 Pool					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	9.8	9.4					11.8	16.3				
Floodprone Width (ft)	90	90						100				
Bankfull Cross Sectional Area (ft ²)	10.7	9.7					13.6	17.4				
Bankfull Mean Depth (ft)	1.1	1.0					1.2	1.1				
Bankfull Maximum Depth (ft)	2.5	2.3					2.7	2.8				
Width/Depth Ratio	8.9	9.1					10.3	15.3				
Entrenchment Ratio	9.2	9.6						6.1				
Bank Height Ratio	1.0	1.0					1.0	1.0				
Wetted Perimeter (ft)		10.9						18.2				
Hydraulic Radius (ft)		0.9						1.0				
Substrate												
d50 (mm)		0.1						0.7				
d84 (mm)		0.3						2.0				

Table 9b. Morphology and Hydraulic Monitoring Summary																		
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet’s Grove)																		
Segment Reach: Hatchet’s Grove (3,828 ft.)																		
Parameter	Cross Section - Riffle 2 Riffle						Cross Section - Pool 2 Pool						Cross Section - Riffle 3 Riffle					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	22.2	16.8					21.7	21.7						25.3				
Floodprone Width (ft)	60	60						80						100				
Bankfull Cross Sectional Area (ft ²)	52.3	39.7					54.4	58.3						60.7				
Bankfull Mean Depth (ft)	2.4	2.4					2.5	2.7						2.4				
Bankfull Maximum Depth (ft)	2.1	3.2					4.5	4.6						4.4				
Width/Depth Ratio	9.4	7.1					8.7	8.1						10.5				
Entrenchment Ratio	2.7	3.6						3.7						4.0				
Bank Height Ratio	1.0	1.0					1.0	1.0						1.0				
Wetted Perimeter (ft)		19.3						24.4						27.9				
Hydraulic Radius (ft)		2.1						2.4						2.2				
Substrate																		
d50 (mm)		0.6						0.6						0.3				
d84 (mm)		2.0						2.0						1.0				

Table 9b cont. Morphology and Hydraulic Monitoring Summary																		
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet’s Grove)																		
Segment Reach: Hatchet’s Grove (3,828 ft.)																		
Parameter	Cross Section - Pool 3 Pool						Cross Section - Riffle 4 Riffle						Cross Section - Pool 4 Pool					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	29.5	26.7						23.0						20.9				
Floodprone Width (ft)		110						95						95				
Bankfull Cross Sectional Area (ft ²)	64.9	55.9						42.5						47.1				
Bankfull Mean Depth (ft)	2.2	2.1						1.8						2.3				
Bankfull Maximum Depth (ft)	4.8	4.4						3.5						4.5				
Width/Depth Ratio		12.8						12.4						9.3				
Entrenchment Ratio		4.1						4.1						4.5				
Bank Height Ratio	1.0	1.0						1.0						1.0				
Wetted Perimeter (ft)		28.7						20.7						24.2				
Hydraulic Radius (ft)		1.9						2.1						2.0				
Substrate																		
d50 (mm)		0.5						0.7						0.5				
d84 (mm)		1.0						2.0						1.0				

Table 9c. Morphology and Hydraulic Monitoring Summary																
Project Number and Name: 289 - Prestonwood Golf Course (Hatchet's Grove)																
Segment Reach: Meadow Creek (295 ft.)																
Parameter	MY - 01 (2005)			MY - 02 (2006)			MY - 03 (2007)			MY - 04 (2008)			MY - 05 (2009)			
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	
Channel Beltwidth (ft)				30	37	31										
Radius of Curvature (ft)				10	14	11										
Meander Wavelength (ft)				46	59	50										
Meander Width Ratio				3.1	3.9	3.3										
Profile*																
Riffle Length (ft)																
Riffle Slope (ft/ft)																
Pool Length (ft)																
Pool Spacing (ft)																
Additional Reach Parameters																
Valley Length (ft)					206											
Channel Length (ft)					272											
Sinuosity					1.3											
Water Surface Slope (ft/ft)					0.009											
Bankfull Slope (ft/ft)					0.005											
Rosgen Classification					E5											

*Because of the small size of Meadow Creek and inconsistent nature of the stream bed, there are no discernable features on the profile.

Table 9d. Morphology and Hydraulic Monitoring Summary															
Project Number and Name: 289 - Prestonwood Golf Course (Hatchet's Grove)															
Segment Reach: Hatchet's Grove (3,828 ft.)															
Parameter	MY - 01 (2005)			MY - 02 (2006)			MY - 03 (2007)			MY - 04 (2008)			MY - 05 (2009)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)				38	104	52									
Radius of Curvature (ft)				23	55	36									
Meander Wavelength (ft)				106	193	150									
Meander Width Ratio*				1.7	4.5	2.3									
Profile															
Riffle Length (ft)				6	67	19									
Riffle Slope (ft/ft)				0.03%	5.82%	0.17%									
Pool Length (ft)				5	76	18									
Pool Spacing (ft)				22	212	76									
Additional Reach Parameters															
Valley Length (ft)				3,121											
Channel Length (ft)				3,828											
Sinuosity				1.2											
Water Surface Slope (ft/ft)				0.196%											
Bankfull Slope (ft/ft)				0.191%											
Rosgen Classification				E5											

* For calculation, used $W_{bkt} = 23.0$ ft.

Appendix A

Vegetation Raw Data

App A1 –Vegetation Data Tables

Table A1. Vegetation Metadata							
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet's Grove)							
Report Prepared By	Adam Spiller						
Date Prepared	12/26/2006 11:30						
Database Name	ASpiller_veg_dbase_newRep.mdb						
Database Location	M:\2005\12053743_EEP_OpenEnd_Design\F_EEPMon0607\Vegetation database						
PROJECT SUMMARY-----							
Project Code	Project Name	Description	Length (ft)	Stream-to-Edge Width (ft)	Area (sq m)	Required Plots (calculated)	Sampled Plots
289	Prestonwood	Stream restoration site on Golf Course in Cary, NC	3800	25	17,650	6	6

Table A2. Vegetation Vigor by Species							
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet's Grove)							
	Species	4	3	2	1	0	Missing
	<i>Alnus serrulata</i>	1	1				
	<i>Aronia arbutifolia</i>	5	2				
	<i>Betula nigra</i>	2		1			
	<i>Cornus amomum</i>	4	4		1		
	<i>Diospyros virginiana</i>	6	6	2			
	<i>Nyssa sylvatica</i>		1				
	<i>Quercus laurifolia</i>	26	5				
	<i>Quercus michauxii</i>	11	13	1			
	<i>Quercus phellos</i>	5	2				
	<i>Salix nigra</i>	2					
	<i>Hamamelis virginiana</i>	5	1				
TOT:	11	67	35	4	1		

Table A3. Vegetation Damage by Species				
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet's Grove)				
	Species	All Damage Categories	No Damage	Other Damage
	<i>Alnus serrulata</i>	2	2	
	<i>Aronia arbutifolia</i>	7	7	
	<i>Betula nigra</i>	3	3	
	<i>Cornus amomum</i>	9	8	1
	<i>Diospyros virginiana</i>	14	14	
	<i>Hamamelis virginiana</i>	6	6	
	<i>Nyssa sylvatica</i>	1	1	
	<i>Quercus laurifolia</i>	31	31	
	<i>Quercus michauxii</i>	25	25	
	<i>Quercus phellos</i>	7	7	
	<i>Salix nigra</i>	2	2	
TOT:	11	107	106	1

Table A4. Vegetation Damage by Plot				
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet's Grove)				
	Plot	All Damage Categories	No Damage	Other Damage
	289-01-0001	18	17	1
	289-01-0002	8	8	
	289-01-0003	7	7	
	289-01-0004	9	9	
	289-01-0005	30	30	
	289-01-0006	35	35	
TOT:	6	107	106	1

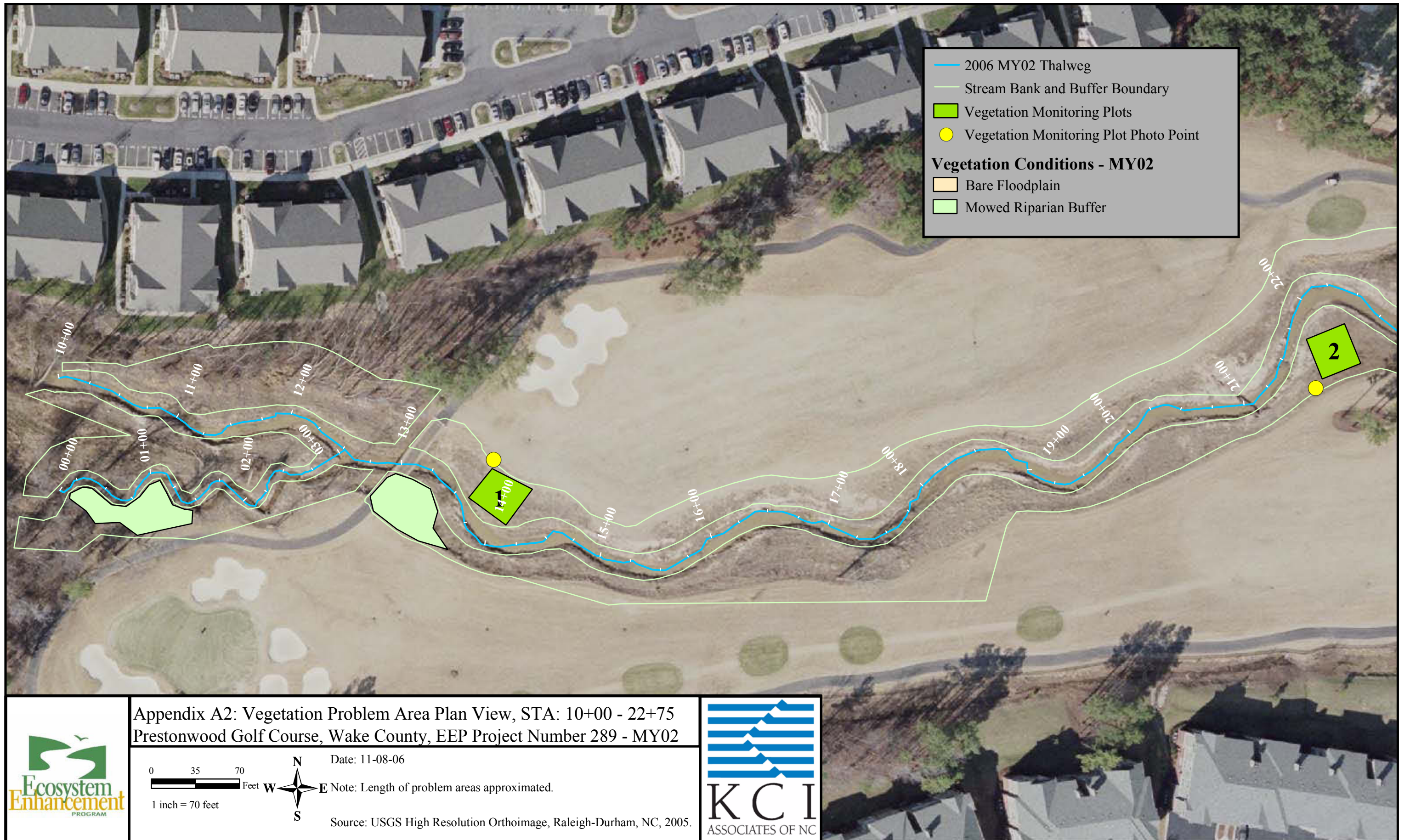
Table A5. Stem Count by Plot and Species										
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet's Grove)										
	Species	Total Stems	# Plots	Avg # Stems	Plot 289-01-0001	Plot 289-01-0002	Plot 289-01-0003	Plot 289-01-0004	Plot 289-01-0005	Plot 289-01-0006
	<i>Alnus serrulata</i>	2	2	1	1					1
	<i>Aronia arbutifolia</i>	7	2	3.5	4					3
	<i>Betula nigra</i>	3	2	1.5		1			2	
	<i>Cornus amomum</i>	9	1	9	9					
	<i>Diospyros virginiana</i>	14	3	4.67				2	11	1
	<i>Hamamelis virginiana</i>	6	2	3	3					3
	<i>Nyssa sylvatica</i>	1	1	1					1	
	<i>Quercus laurifolia</i>	31	4	7.75		3		7	8	13
	<i>Quercus michauxii</i>	25	4	6.25		2	7		6	10
	<i>Quercus phellos</i>	7	3	2.33		1			2	4
	<i>Salix nigra</i>	2	2	1	1	1				
TOT:	11	107	11		18	8	7	9	30	35

The plots have been renumbered according to the new vegetation monitoring protocol. There are now six plots at the site, three of these are the buffer monitoring plots that were set up for first year monitoring, and three are new plots that were set up for second year monitoring. For comparison to the first year monitoring report, the new plot 1 is the same as the first year plot 1, the new plot 3 is the same as the first year plot 2, and the new plot 6 is the same as the first year plot 3. Comparison between monitoring years of these three plots reveals that; plot 1 has the same number of stems, but the species distribution is different; plot 3 has the same species, but reveals less than 50% survival; in plot 6 the number of stems was under reported for the first year and the distribution of species has also changed. The third year of monitoring will provide a better assessment of the survivability of the vegetation in the plots because of consistency in monitoring and reporting.

Table A6a. Vegetative Problem Areas			
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet’s Grove)			
Segment/Reach: Hatchet’s Grove (3,828 ft.)			
Feature/Issue	Station # / Range	Probable Cause	Photo #
Bare Floodplain	29+25 – 29+50	Floodplain erosion	VP1
	29+70 – 30+20	Floodplain erosion	
	30+30 – 30+80	Floodplain erosion	
	31+60 – 32+15	Floodplain erosion	
	32+85 – 33+25	Floodplain erosion	
	35+75 – 36+05	Floodplain erosion	
	37+60 – 38+10	Floodplain erosion	
Mowed Riparian Buffer	12+95 – 13+70	Golf course maintenance	VP2

Table A6b. Vegetative Problem Areas			
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet’s Grove)			
Segment/Reach: Meadow Creek (295 ft.)			
Feature/Issue	Station # / Range	Probable Cause	Photo #
Mowed Riparian Buffer	00+00 – 01+50	Golf course maintenance	VP3

It should be noted that the areas called out in App B2, the Stream Problem Area Table, as bank scour are raw banks and therefore devoid of vegetation. This can be seen in the representative photos for those problem areas.

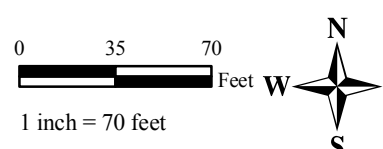


- 2006 MY02 Thalweg
- Stream Bank and Buffer Boundary
- Vegetation Monitoring Plots
- Vegetation Monitoring Plot Photo Point

Vegetation Conditions - MY02

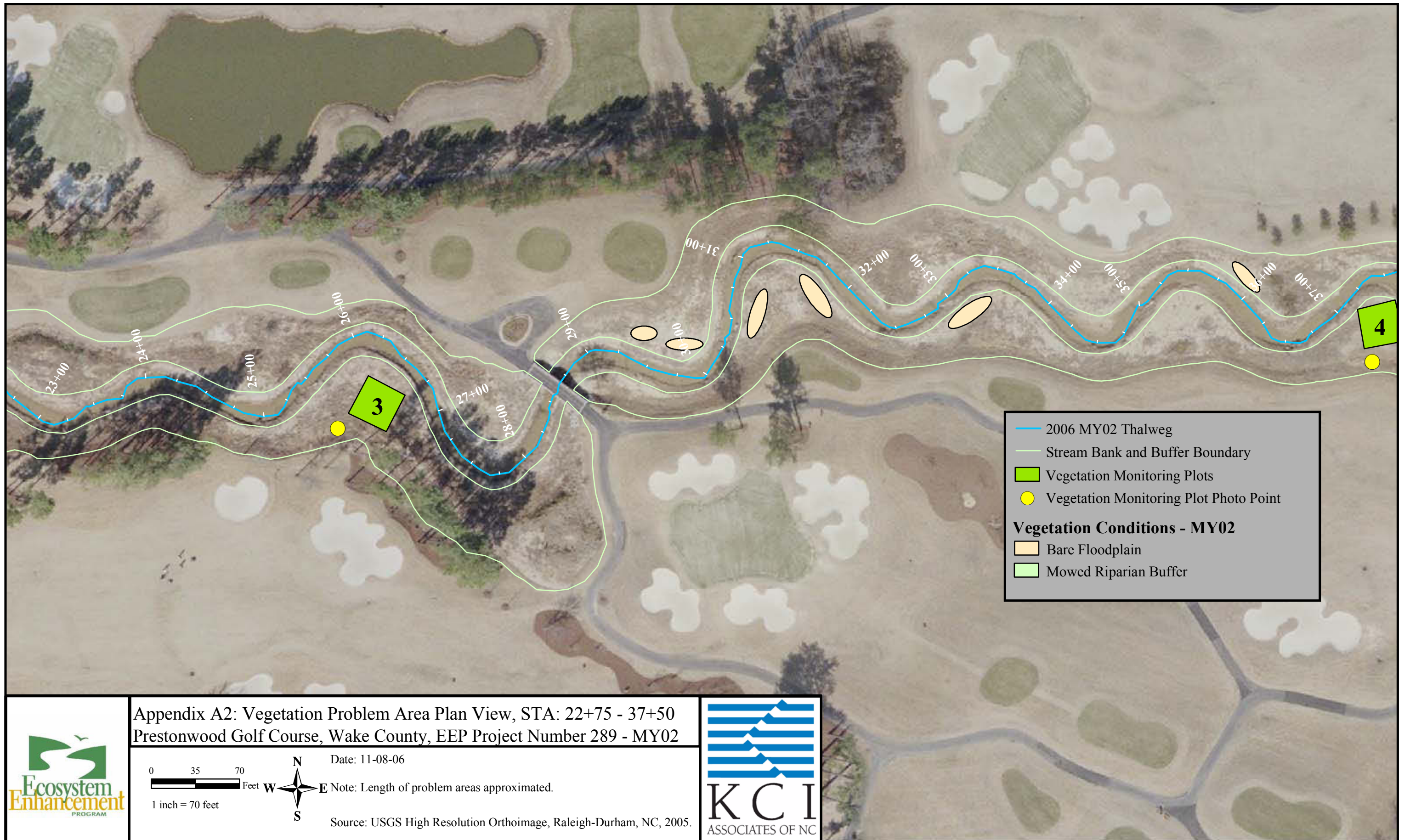
- Bare Floodplain
- Mowed Riparian Buffer

Appendix A2: Vegetation Problem Area Plan View, STA: 10+00 - 22+75
 Prestonwood Golf Course, Wake County, EEP Project Number 289 - MY02



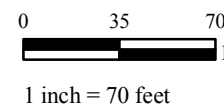
Date: 11-08-06
 Note: Length of problem areas approximated.
 Source: USGS High Resolution Orthoimage, Raleigh-Durham, NC, 2005.





— 2006 MY02 Thalweg
 — Stream Bank and Buffer Boundary
 ■ Vegetation Monitoring Plots
 ● Vegetation Monitoring Plot Photo Point
Vegetation Conditions - MY02
 ○ Bare Floodplain
 ■ Mowed Riparian Buffer

Appendix A2: Vegetation Problem Area Plan View, STA: 22+75 - 37+50
 Prestonwood Golf Course, Wake County, EEP Project Number 289 - MY02



Date: 11-08-06

Note: Length of problem areas approximated.

Source: USGS High Resolution Orthoimage, Raleigh-Durham, NC, 2005.



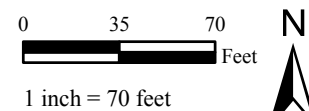


Appendix A2: Vegetation Problem Area Plan View, STA: 37+50 - 49+70
 Prestonwood Golf Course, Wake County, EEP Project Number 289 - MY02

Date: 11-08-06

Note: Length of problem areas approximated.

Source: USGS High Resolution Orthoimage, Raleigh-Durham, NC, 2005.



App A3 – Representative Vegetation Problem Area Photos



VP1 – Mechanically mowed buffer area 00+75. 11/5/06 - MY 02



VP2 – Bare bank / floodplain 35+75. 11/5/06 - MY 02

App A4 – Vegetation Monitoring Plot Photos



Plot 1 Photo – 9/4/06 - MY 02.



Plot 2 Photo – 9/4/06 - MY 02.



Plot 3 Photo – 9/4/06 - MY 02.



Plot 4 Photo – 9/4/06 - MY 02.



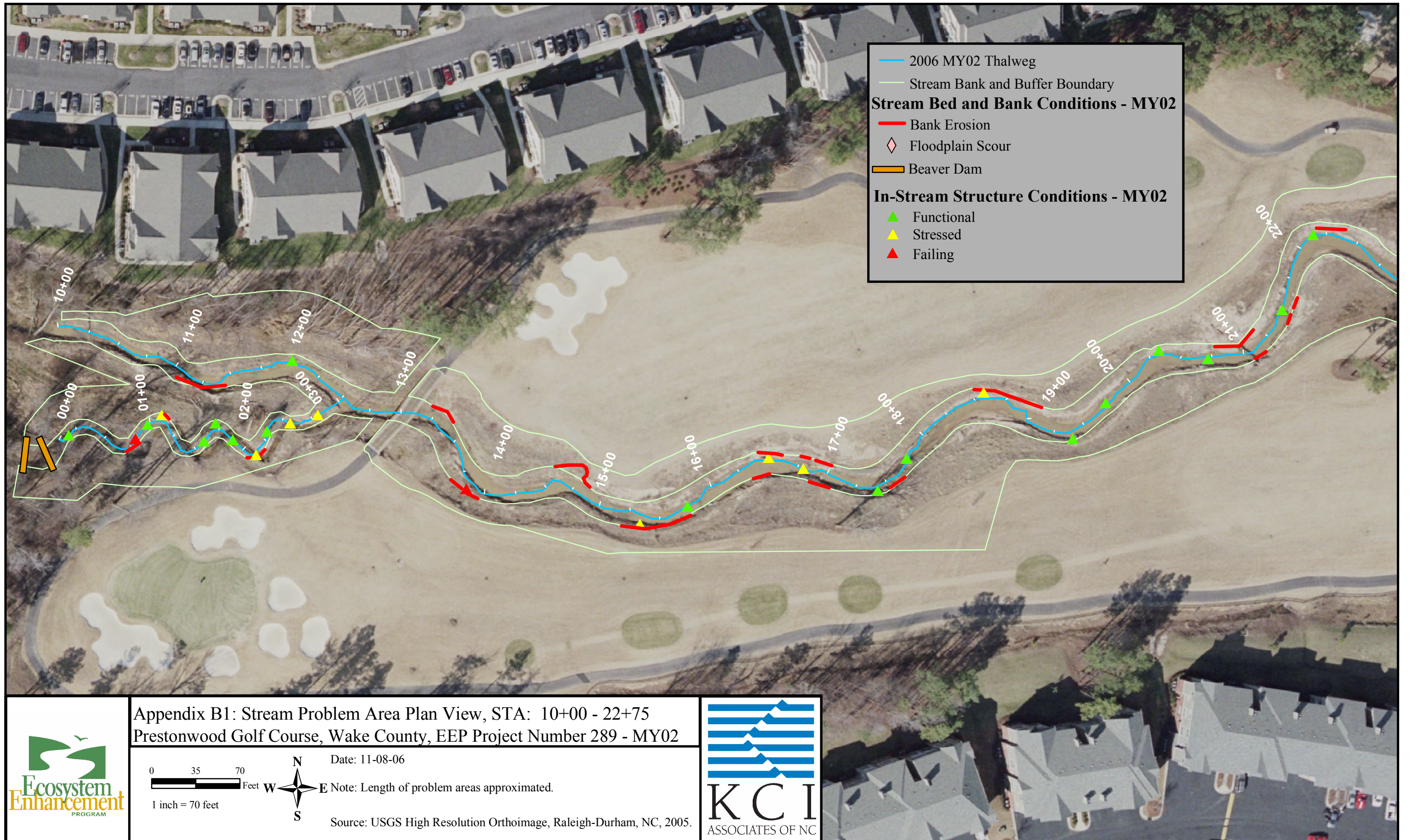
Plot 5 Photo – 9/4/06 - MY 02.

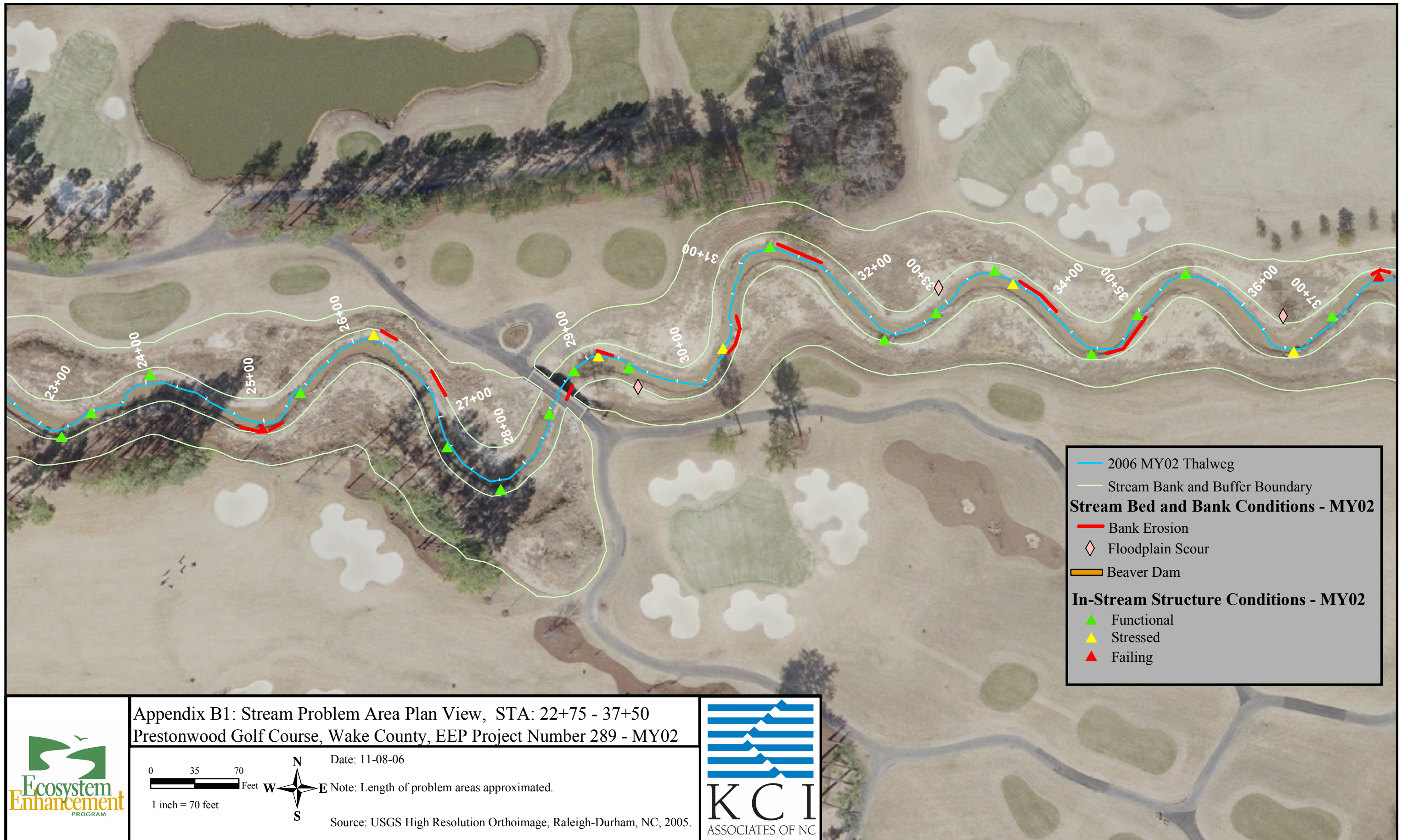


Plot 6 Photo – 9/4/06 - MY 02.

Appendix B

Geomorphologic Raw Data





Appendix B1: Stream Problem Area Plan View, STA: 22+75 - 37+50
 Prestonwood Golf Course, Wake County, EEP Project Number 289 - MY02



0 35 70
 Feet
 1 inch = 70 feet

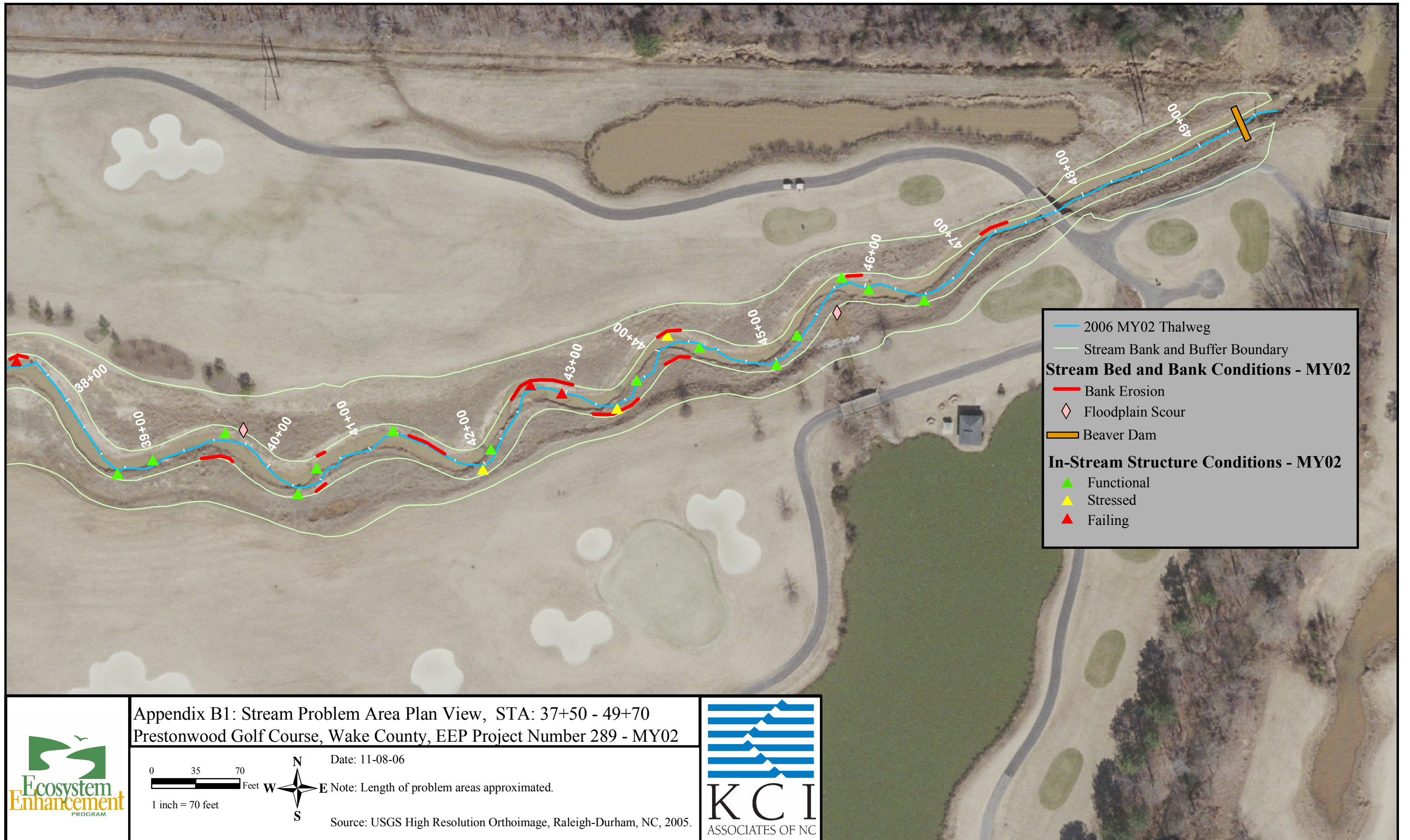


Date: 11-08-06

Note: Length of problem areas approximated.

Source: USGS High Resolution Orthoimage, Raleigh-Durham, NC, 2005.





App B2 – Stream Problem Areas Table

Table B1a. Stream Problem Areas			
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet's Grove)			
Segment/Reach: Hatchet's Grove (3,828 ft.)			
Feature Issue	Station numbers	Suspected Cause	Photo #
Bank Erosion	11+05 – 11+45	unknown	SP1
	13+20 – 13+40	unknown	
	13+70 – 14+00	unknown	
	14+50 – 14+90	unknown	SP2
	15+25 – 15+75	unknown	SP1
	16+40 – 16+65	unknown	
	16+75 – 17+05	unknown	
	17+50 – 17+70	unknown	
	18+50 – 19+00	unknown	
	20+75 – 21+25	unknown	
	21+40 – 21+60	unknown	
	22+20 – 22+40	unknown	
	24+75 – 25+15	unknown	
	26+20 – 26+35	unknown	
	26+60 – 26+90	unknown	
	28+60 – 28+75	unknown	
	29+05 – 29+20	unknown	
	30+25 – 30+60	unknown	
	31+25 – 31+70	unknown	
	33+70 – 34+05	unknown	
	34+60 – 35+00	unknown	
	37+40 – 37+55	unknown	
	39+30 – 39+70	unknown	
	40+45 – 40+65	unknown	
41+30 – 41+70	unknown		
42+50 – 43+05	unknown		
43+25 – 43+60	unknown		
44+00 – 44+25	unknown		
45+80 – 46+00	unknown		
47+15 – 47+35	unknown		
Engineered Structure Problems	15+35	rootwad scour	SP3
	16+50	rootwad scour	
	16+80	cross vane sill collapse	SP4
	18+60	rootwad scour	SP3
	25+00	rootwad scour	
	26+20	rootwad scour	

Table B1a cont. Stream Problem Areas				
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet's Grove)				
Segment/Reach: Hatchet's Grove (3,828 ft.)				
Feature Issue	Station numbers	Suspected Cause	Photo #	
Engineered Structure Problems cont.	29+10	rootwad scour	SP3	
	30+25	cross vane arm erosion	SP4	
	33+70	sill has gaps between boulders		
	36+55	rootwad scour	SP3	
	37+50	rootwad scour		
	41+95	rootwad scour		
	42+75	rootwad scour		
		43+00	cross vane center rock has shifted	SP4
		43+40	rootwad scour	SP3
		44+15	rootwad scour	
Beaver Dam	49+35	beavers	SP5	
Floodplain Scour	29+50	unstable drainage from floodplain		
		headcut from unstable floodplain drainage		
	33+00	headcut from unstable floodplain drainage		
	36+50	headcut from unstable floodplain drainage		
	39+75	unstable drainage from floodplain		
	45+50	unstable floodplain drainage from pond		

Table B1b. Stream Problem Areas			
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet's Grove)			
Segment/Reach: Meadow Creek (295 ft.)			
Feature Issue	Station numbers	Suspected Cause	Photo #
Bank Erosion	00+70 – 00+80	unknown	SP6
	01+05 – 01+15	unknown	
	02+00 – 02+20	unknown	
Engineered Structure Problems	00+80	wood sill undermined	SP7
	01+10	rootwad scour	
	02+10	rootwad scour	
	02+60	scour on downstream side of sill	
	02+80	bed degradation on step pool structure	
Beaver Dam	upstream of STA 00+00	beavers	SP8
	upstream of STA 00+00	beavers	

The primary problem facing the Hatchet's Grove stream are extended areas of severe bank erosion. While the specific cause of the bank erosion is unknown, the radius of curvature applied to many of the meanders appears to be too small for this suburban watershed, causing instability throughout the meanders. These eroded banks should be closely monitored to determine if corrective actions are warranted. Floodplain conditions along the stream varied in terms of erosion and deposition. Between stations 10+00 and 28+00 the floodplain shows signs of aggradation as sand has been deposited on the floodplain during high flow events, see SP5. From station 28+00 to 39+00, the floodplain has eroded creating the bare areas shown in Appendix A2 and areas of floodplain scour as listed above. Most of the floodplain scour appears to have occurred immediately following construction, before vegetation stabilized the floodplain surface. These areas were reevaluated during the second year monitoring and they appear to be stabilizing as vegetation cover becomes more prominent. The lower third of the stream appears to have a stable floodplain. No significant aggradation or degradation was noted during the second monitoring year.

The Monitoring Plan View illustrates how the cross vanes are located at the beginning of tangent sections (heads of riffles) on the stream planform. The action of the cross vane concentrates flow in the center of the channel and can induce scour. This action helps to maintain pools. The arms also slow water in the near bank region before redirecting it. The placement of the structures in their current location likely had a negative/adverse impact on the bed stability of the restored channel in these areas. Hence, the cross vanes on Hatchet's Grove stream act as grade controls, but also promote the formation of pools where riffles should be beginning. The cross vane arms do not extend up to the bankfull elevation or angle out away from the center boulder. Instead of directing water away from the banks the vane arms act as large stone toe bank protection. Because of the cross vane placement they have been evaluated primarily as grade control measures and stone toe stabilization, in which case most are functional.

App B3 – Representative Stream Problem Area Photos



SP1 – Bank erosion. Photo taken near station 18+75. 11/5/06 - MY 02



SP2 – Severe bank erosion and floodplain scour. Photo taken near station 14+75, looking down on an eroded bank and a scour hole in the floodplain. 11/5/06 - MY 02



SP3 – Scour around rootwad. Vegetation and coir matting partially obscure the erosion behind the rootwad. Photo taken near station 29+10. 11/5/06 - MY 02



SP4 – Rock from cross vane has moved and bank has eroded behind cross vane arm. Photo taken near station 16+50. 11/5/06 - MY 02



SP5 – Beaver dam. Photo taken near station 39+45. 11/5/06 - MY 02



SP6 – Bank erosion. Photo taken near station 00+75. 11/5/06 - MY 02



SP7 – Back scour around rootwad and bank erosion. Rootwad partially obscured by coir matting. Photo taken near station 02+10. 11/5/06 - MY 02



SP8 – Beaver dam. Photo taken upstream of station 00+00, looking downstream. 11/5/06 - MY 02

App B4 – Stream Photo Station Photos



Photo Point 1 – Taken looking upstream from golf cart bridge at the upper 300 feet of the Hatchet’s Grove.
11/5/06 - MY 02



Photo Point 2 – Taken looking downstream from golf cart bridge at the lower 300 feet of the Hatchet’s Grove.
11/5/06 - MY 02

App B5 – Qualitative Visual Stability Assessment

Table B2. Qualitative Visual Stability Assessment						
Project Number and Name: 289 – Prestonwood Golf Course (Hatchet's Grove)						
Segment/Reach: Hatchet's Grove (3,828 ft.)						
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	% Perform. in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	33	44	N/A	76	
	2. Armor stable (e.g. no displacement)?**	N/A	44	N/A	N/A	
	3. Facet grade appears stable?	33	44	N/A	76	
	4. Minimal evidence of embedding/fining?	33	44	N/A	76	
	5. Length appropriate?	23	44	N/A	53	70
B. Pools	1. Present? (e.g. no severe aggradation)	44	42	N/A	100	
	2. Sufficiently deep (Dmax pool:Mean Bkf > 1.6?)	39	42	N/A	93	
	3. Length appropriate?	40	42	N/A	95	96
C. Thalweg	1. Upstream of meander bend centering?	30	44	N/A	68	
	2. Downstream of meander centering?	30	44	N/A	68	68
D. Meanders	1. Outer bend in state of limited/controlled erosion?	20	44	N/A	45	
	2. Of those eroding, # w/ concomitant point bar formation?	3	24	N/A	13	
	3. Apparent Rc within spec?	38	44	N/A	86	
	4. Sufficient floodplain access and relief?	44	44	N/A	100	61
E. Bed General	1. General channel bed aggradation areas (bar formation)	N/A	N/A	3 / 225	94	
	2. Channel bed degradation - areas of increasing down cutting or head cutting?	N/A	N/A	8 / 638	83	89
F. Bank	1. Actively eroding, wasting, or slumping bank	N/A	N/A	33 / 965	87	87
G. Vanes	1. Free of back or arm scour?	23	25	N/A	92	
	2. Height appropriate?	24	25	N/A	96	
	3. Angle and geometry appear appropriate?***	N/A	25	N/A	N/A	
	4. Free of piping or other structural failures?	22	25	N/A	88	92
H. Wads / Boulders	1. Free of scour?	20	34	N/A	59	
	2. Footing stable?	30	34	N/A	88	74

* Total number of features per as-built estimated from as-built profile and planview sheets.

** Hatchet's Grove is a sand bed stream so there is no armor on the riffles.

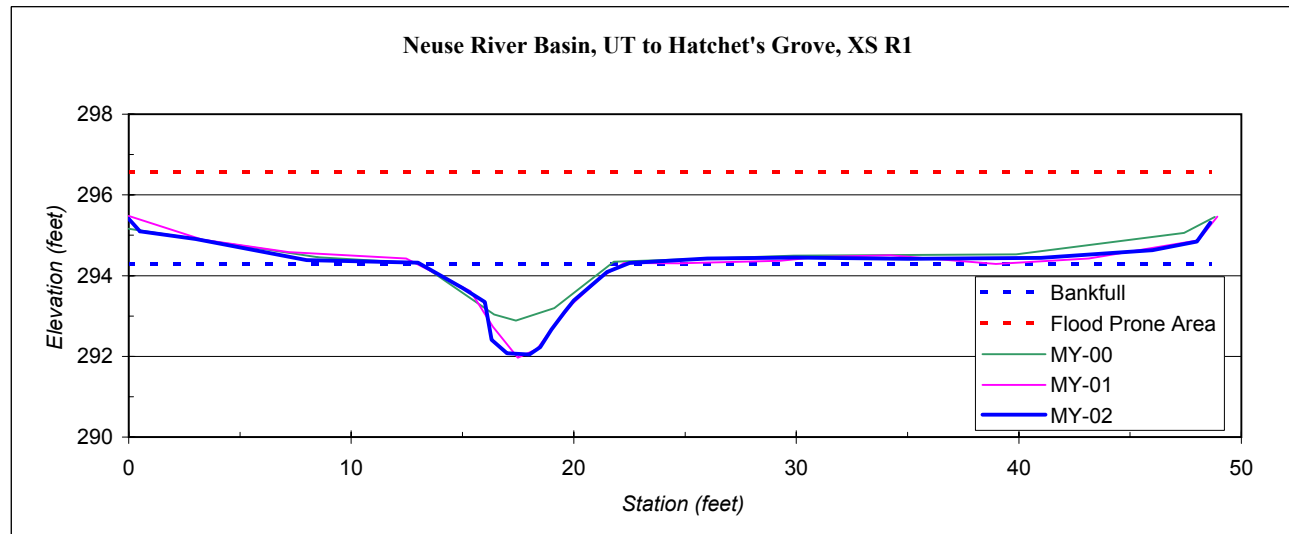
***See note concerning cross vanes in App B2. (These structures generally serve as toe stabilization and are functioning as such)

App B5 - Cross Section Plots and Raw Data Tables

River Basin:	Neuse
Watershed:	UT to Hatchet's Grove
XS ID	XS R1
Drainage Area (sq mi):	0.23
Date:	6/6/2006
Field Crew:	A. Spiller, Z. Mryncza, L. Leiendecker

Station	Elevation
0.0	295.40
0.5	295.10
3.0	294.91
8.0	294.39
13.0	294.32
15.0	293.70
16.0	293.34
16.3	292.41
17.0	292.07
18.0	292.04
18.5	292.23
19.0	292.66
19.6	293.11
20.0	293.39
21.5	294.09
22.5	294.31
26.0	294.42
30.0	294.45
35.0	294.42
41.0	294.44
46.0	294.63
48.0	294.84
48.6	295.31

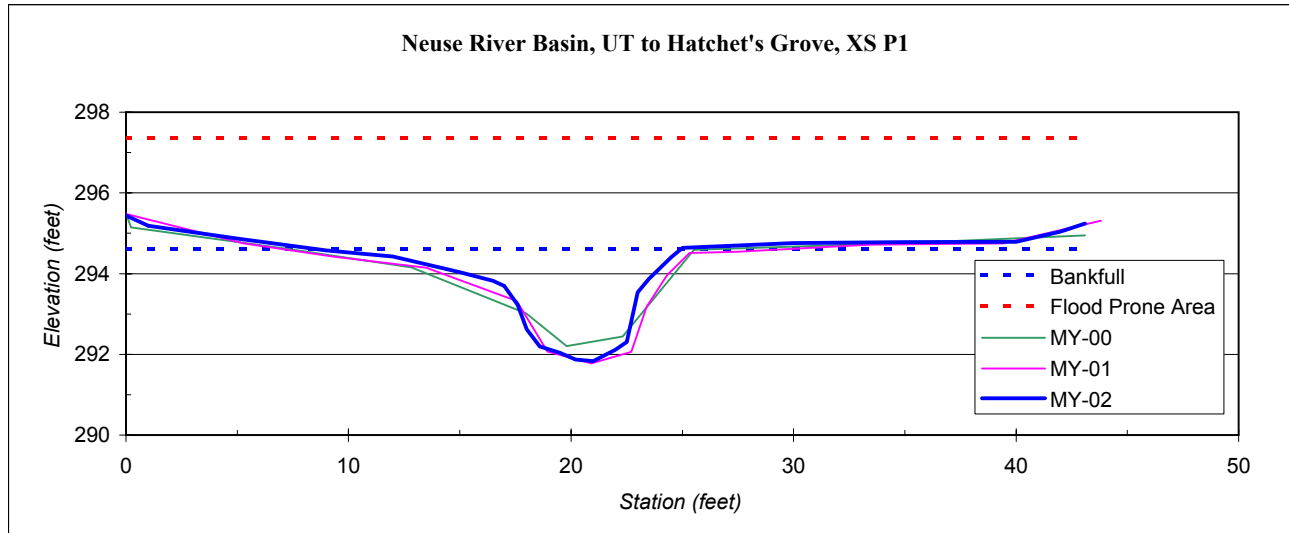
SUMMARY DATA	
Bankfull Elevation:	294.3
Bankfull Cross-Sectional Area:	9.7
Bankfull Width:	9.4
Flood Prone Area Elevation:	296.6
Flood Prone Width:	90.0
Max Depth at Bankfull:	2.3
Mean Depth at Bankfull:	1.0
W / D Ratio:	9.1
Entrenchment Ratio:	9.6
Bank Height Ratio:	1.0



River Basin:	Neuse
Watershed:	UT to Hatchet's Grove
XS ID	XS P1
Drainage Area (sq mi):	0.23
Date:	6/6/2006
Field Crew:	A. Spiller, Z. Mryncza, L. Leiendecker

Station	Elevation
0.0	295.44
1.0	295.18
5.0	294.87
9.0	294.58
12.0	294.42
15.0	294.03
16.5	293.82
17.0	293.70
17.6	293.22
18.0	292.63
18.6	292.19
19.5	292.03
20.2	291.87
21.0	291.84
22.0	292.11
22.5	292.30
23.0	293.53
23.5	293.87
24.5	294.41
25.0	294.64
30.0	294.75
35.0	294.78
40.0	294.79
42.0	295.04
43.1	295.24

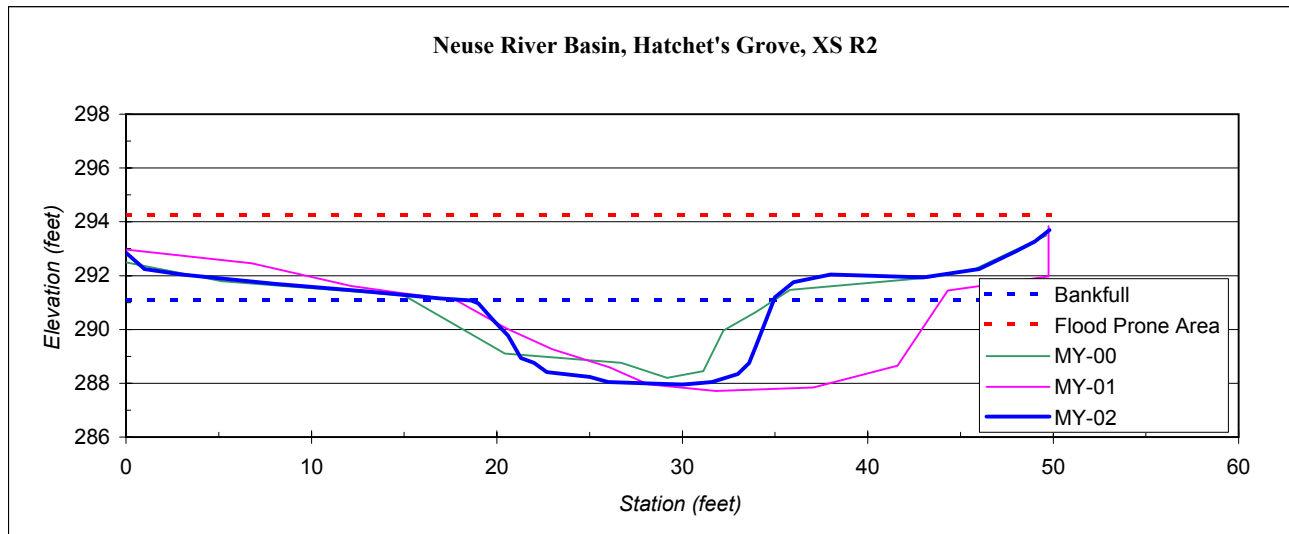
SUMMARY DATA	
Bankfull Elevation:	294.6
Bankfull Cross-Sectional Area:	17.4
Bankfull Width:	16.3
Flood Prone Area Elevation:	297.4
Flood Prone Width:	100.0
Max Depth at Bankfull:	2.8
Mean Depth at Bankfull:	1.1
W / D Ratio:	15.3
Entrenchment Ratio:	6.1
Bank Height Ratio:	1.0



River Basin:	Neuse
Watershed:	Hatchet's Grove
XS ID	XS R2
Drainage Area (sq mi):	3.7
Date:	6/8/2006
Field Crew:	A. Spiller, Z. Mryncza, L. Leiendecker

Station	Elevation
0.0	292.85
1.0	292.25
3.0	292.04
8.0	291.70
13.0	291.42
17.0	291.14
18.6	291.08
19.0	290.97
19.8	290.36
20.6	289.77
21.3	288.94
22.0	288.76
22.7	288.41
25.0	288.23
26.0	288.05
28.0	288.00
30.0	287.95
31.6	288.05
33.0	288.34
33.6	288.75
34.0	289.43
35.0	291.19
36.0	291.76
38.0	292.04
43.0	291.93
46.0	292.25
48.0	292.91
49.0	293.26
49.8	293.69

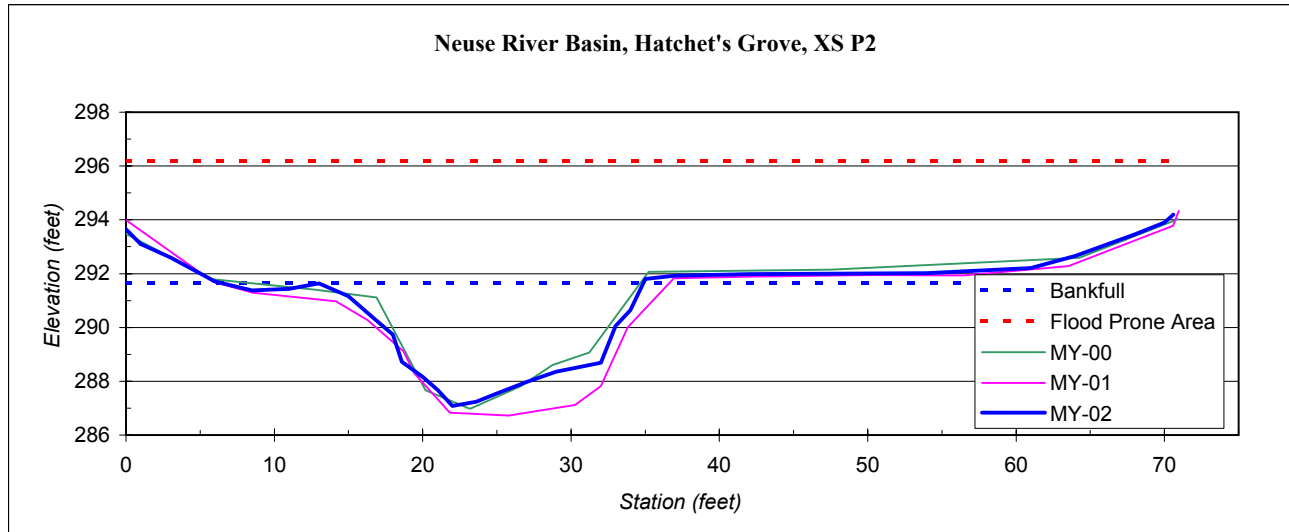
SUMMARY DATA	
Bankfull Elevation:	291.1
Bankfull Cross-Sectional Area:	39.7
Bankfull Width:	16.8
Flood Prone Area Elevation:	294.3
Flood Prone Width:	60.0
Max Depth at Bankfull:	3.2
Mean Depth at Bankfull:	2.4
W / D Ratio:	7.1
Entrenchment Ratio:	3.6
Bank Height Ratio:	1.0



River Basin:	Neuse
Watershed:	Hatchet's Grove
XS ID	XS P2
Drainage Area (sq mi):	3.7
Date:	6/8/2006
Field Crew:	A. Spiller, Z. Mryncza, L. Leiendecker

Station	Elevation
0.0	293.65
1.0	293.11
3.0	292.61
6.0	291.70
8.5	291.38
11.0	291.43
13.0	291.64
15.0	291.16
16.8	290.29
18.0	289.74
18.6	288.73
20.0	288.17
21.0	287.67
22.0	287.09
23.6	287.24
25.0	287.55
27.0	287.97
29.0	288.36
32.0	288.68
33.0	290.06
34.0	290.64
35.0	291.80
37.0	291.92
42.0	291.98
54.0	292.02
61.0	292.20
64.0	292.65
68.0	293.45
70.0	293.90
70.6	294.20

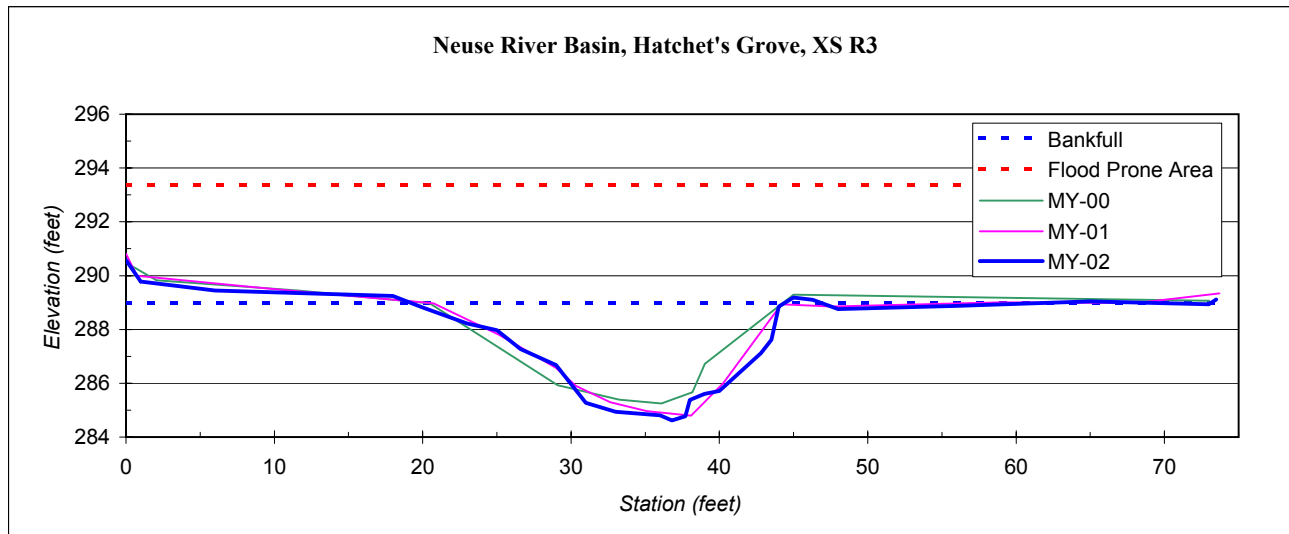
SUMMARY DATA	
Bankfull Elevation:	291.6
Bankfull Cross-Sectional Area:	58.3
Bankfull Width:	21.7
Flood Prone Area Elevation:	296.2
Flood Prone Width:	80.0
Max Depth at Bankfull:	4.6
Mean Depth at Bankfull:	2.7
W / D Ratio:	8.1
Entrenchment Ratio:	3.7
Bank Height Ratio:	1.0



River Basin:	Neuse
Watershed:	Hatchet's Grove
XS ID	XS R3
Drainage Area (sq mi):	3.7
Date:	6/9/2006
Field Crew:	A. Spiller, Z. Mryncza, L. Leiendecker

Station	Elevation
0.0	290.58
1.0	289.78
6.0	289.45
18.0	289.25
20.0	288.82
23.0	288.22
25.0	287.97
26.6	287.27
29.0	286.68
31.0	285.27
33.0	284.95
36.0	284.81
36.8	284.61
37.7	284.77
38.0	285.38
39.0	285.61
40.0	285.72
42.8	287.12
43.5	287.62
44.0	288.85
45.0	289.18
46.3	289.10
48.0	288.76
56.0	288.88
65.0	289.04
73.0	288.93
73.5	289.11

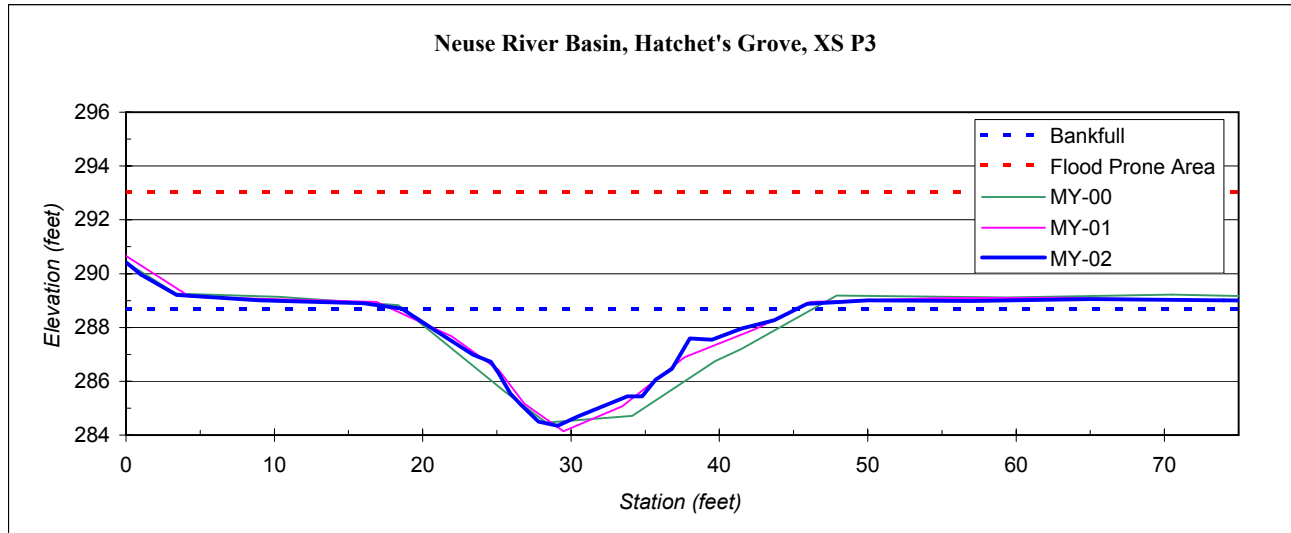
SUMMARY DATA	
Bankfull Elevation:	289.0
Bankfull Cross-Sectional Area:	60.7
Bankfull Width:	25.3
Flood Prone Area Elevation:	293.4
Flood Prone Width:	100.0
Max Depth at Bankfull:	4.4
Mean Depth at Bankfull:	2.4
W / D Ratio:	10.5
Entrenchment Ratio:	4.0
Bank Height Ratio:	1.0



River Basin:	Neuse
Watershed:	Hatchet's Grove
XS ID	XS P3
Drainage Area (sq mi):	3.7
Date:	6/9/2006
Field Crew:	A. Spiller, Z. Mryncza, L. Leiendecker

Station	Elevation
0.0	290.42
1.0	289.97
3.4	289.21
9.0	289.01
16.0	288.90
18.6	288.70
21.0	287.83
23.4	286.99
24.6	286.72
25.1	286.31
25.9	285.54
26.6	285.14
27.8	284.50
29.1	284.35
30.5	284.70
33.8	285.44
34.8	285.44
35.7	286.06
36.8	286.46
38.0	287.59
39.5	287.54
41.5	287.96
43.7	288.27
45.9	288.87
50.0	289.01
57.0	288.98
65.0	289.06
74.0	289.01
80.0	288.98
81.0	289.10

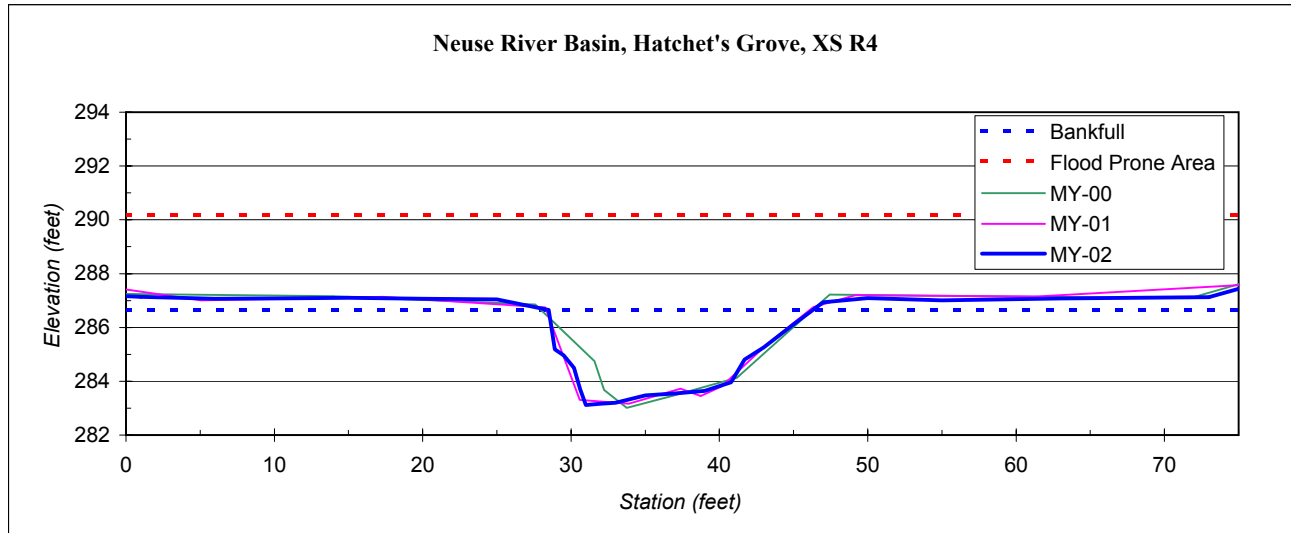
SUMMARY DATA	
Bankfull Elevation:	288.7
Bankfull Cross-Sectional Area:	55.9
Bankfull Width:	26.7
Flood Prone Area Elevation:	293.1
Flood Prone Width:	110.0
Max Depth at Bankfull:	4.4
Mean Depth at Bankfull:	2.1
W / D Ratio:	12.8
Entrenchment Ratio:	4.1
Bank Height Ratio:	1.0



River Basin:	Neuse
Watershed:	Hatchet's Grove
XS ID	XS R4
Drainage Area (sq mi):	3.7
Date:	6/12/2006
Field Crew:	A. Spiller, Z. Mryncza, L. Leiendecker

Station	Elevation
0.0	287.17
1.0	287.14
6.0	287.06
10.0	287.08
15.0	287.10
20.0	287.06
25.0	287.04
28.5	286.65
28.9	285.19
29.5	284.97
30.2	284.49
30.6	283.71
31.0	283.12
32.0	283.16
33.0	283.20
35.0	283.47
37.0	283.55
39.0	283.64
40.8	283.96
41.7	284.80
43.0	285.26
45.0	286.12
47.0	286.93
50.0	287.09
55.0	287.01
63.0	287.08
73.0	287.12
75.0	287.44
76.0	287.82

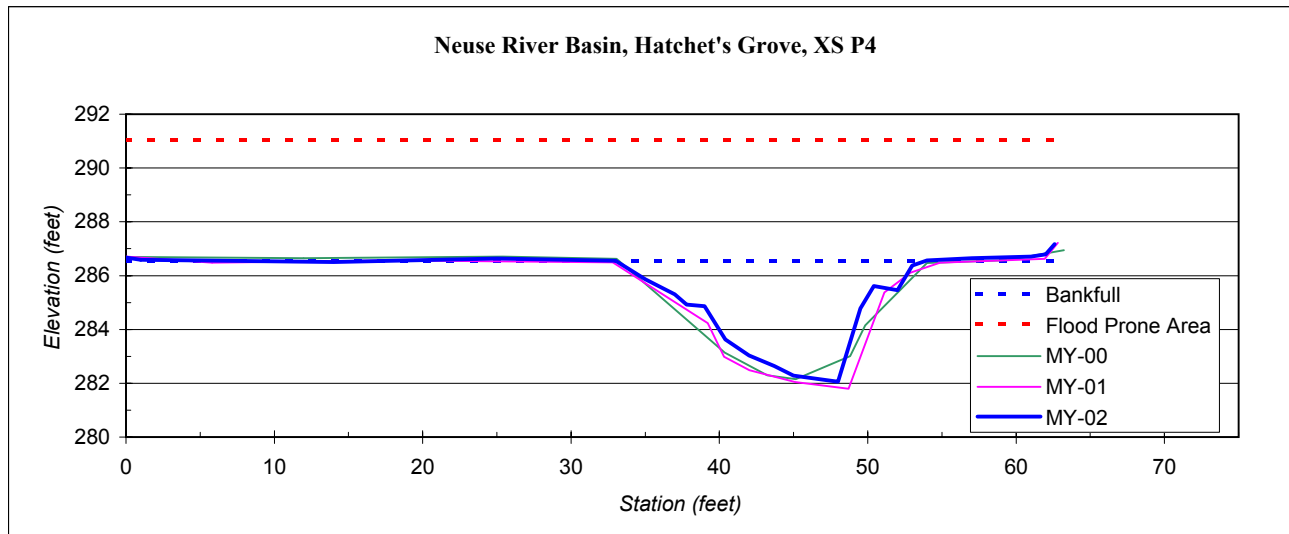
SUMMARY DATA	
Bankfull Elevation:	286.7
Bankfull Cross-Sectional Area:	42.5
Bankfull Width:	23.0
Flood Prone Area Elevation:	290.2
Flood Prone Width:	95.0
Max Depth at Bankfull:	3.5
Mean Depth at Bankfull:	1.8
W / D Ratio:	12.4
Entrenchment Ratio:	4.1
Bank Height Ratio:	1.0



River Basin:	Neuse
Watershed:	Hatchet's Grove
XS ID	XS P4
Drainage Area (sq mi):	3.7
Date:	6/12/2006
Field Crew:	A. Spiller, Z. Mryncza, L. Leiendecker

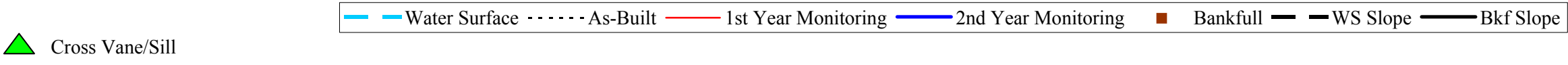
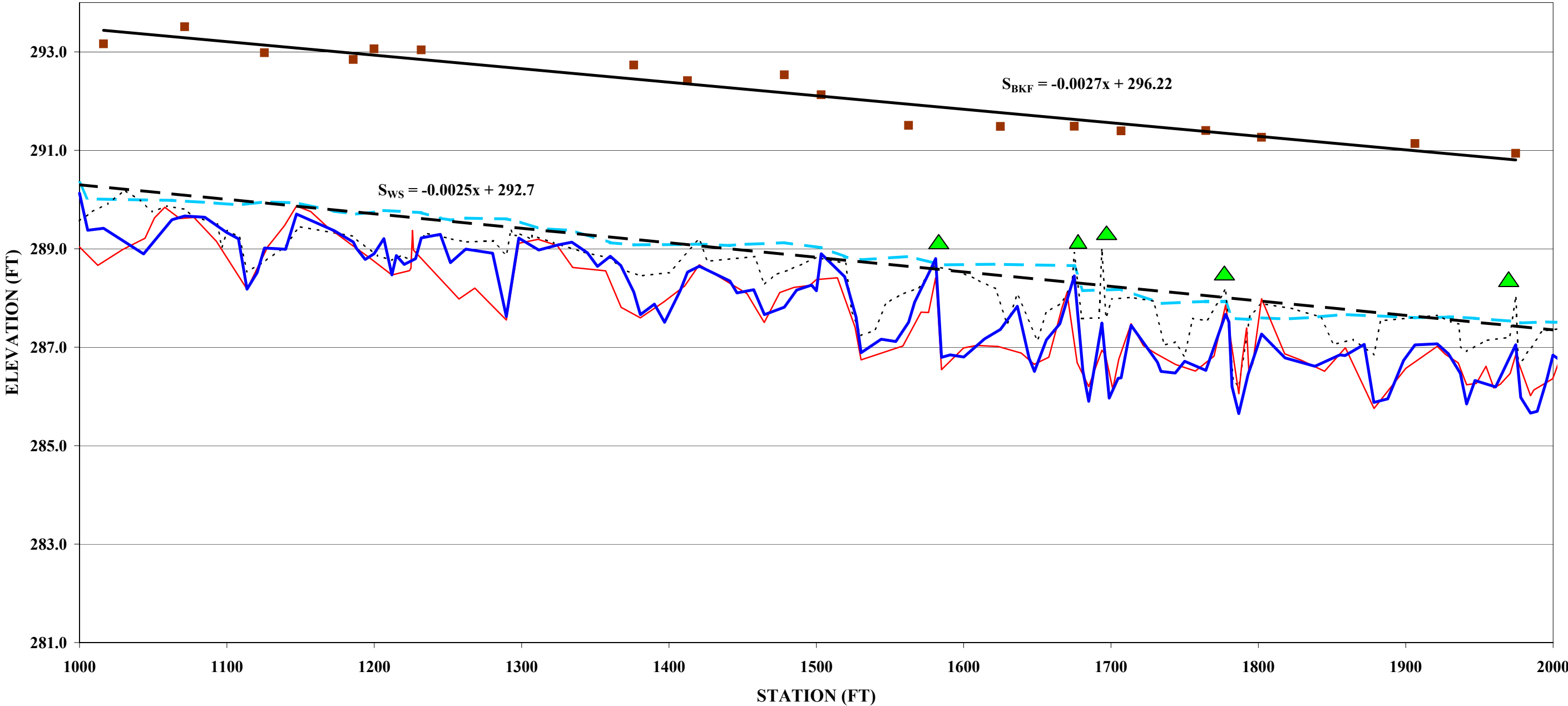
Station	Elevation
0.0	286.68
1.0	286.59
14.0	286.50
25.0	286.64
33.0	286.55
35.0	285.86
37.0	285.30
37.8	284.92
39.0	284.86
40.4	283.63
42.0	283.04
43.7	282.64
45.0	282.29
48.0	282.06
49.5	284.79
50.4	285.61
52.0	285.46
53.0	286.37
54.0	286.57
57.0	286.65
61.0	286.71
62.0	286.79
62.6	287.17

SUMMARY DATA	
Bankfull Elevation:	286.6
Bankfull Cross-Sectional Area:	47.1
Bankfull Width:	20.9
Flood Prone Area Elevation:	291.0
Flood Prone Width:	95.0
Max Depth at Bankfull:	4.5
Mean Depth at Bankfull:	2.3
W / D Ratio:	9.3
Entrenchment Ratio:	4.5
Bank Height Ratio:	1.0

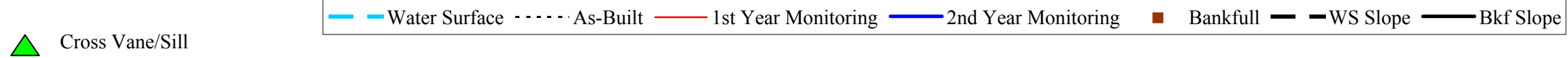
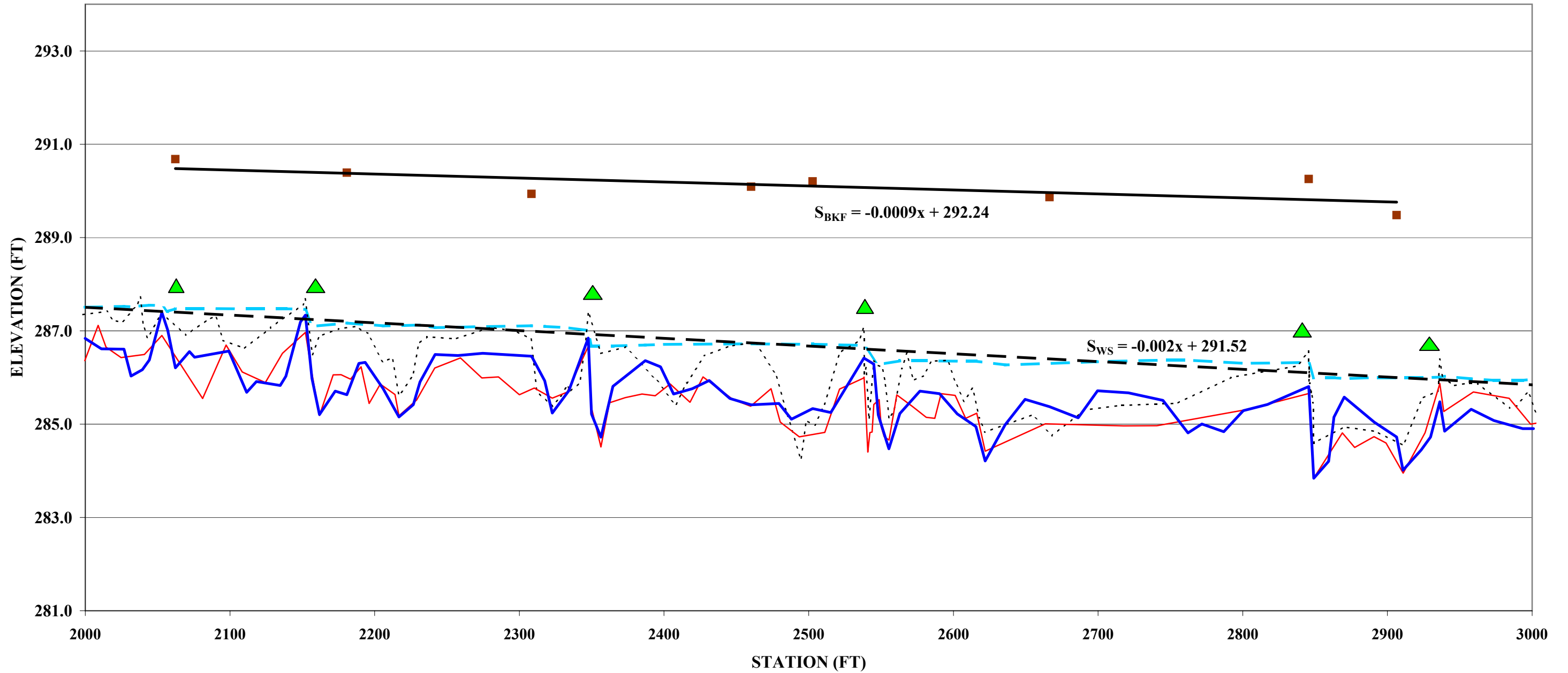


App B7 – Longitudinal Plots

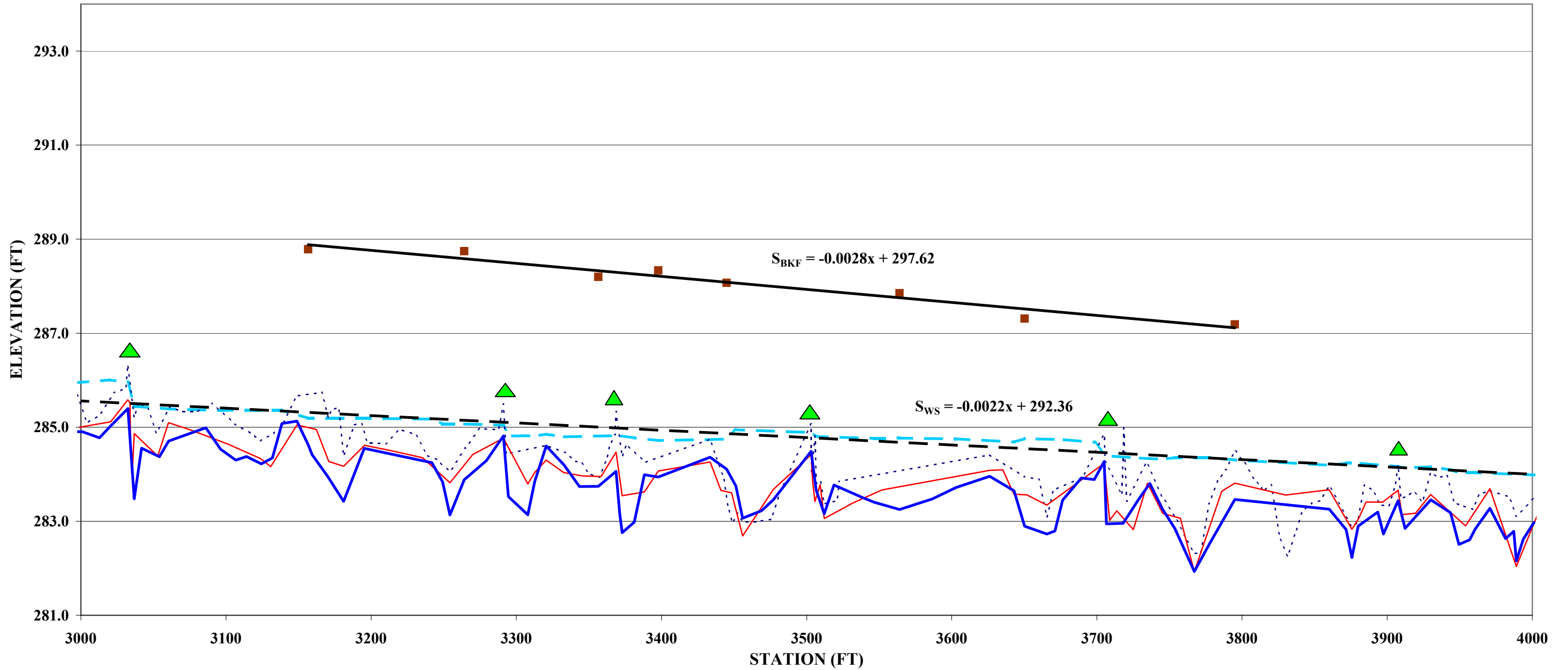
Longitudinal Profile
Prestonwood Golf Course - Hatchet's Grove
EEP Project Number 289 - MY02
Stations 10+00-20+00



Longitudinal Profile
Prestonwood Golf Course - Hatchet's Grove
EEP Project Number 289 - MY02
Stations 20+00-30+00

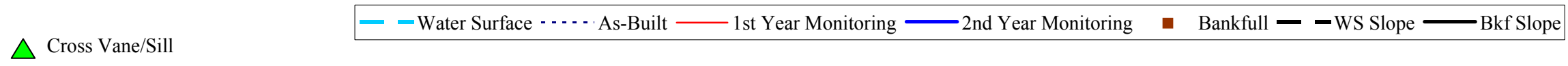
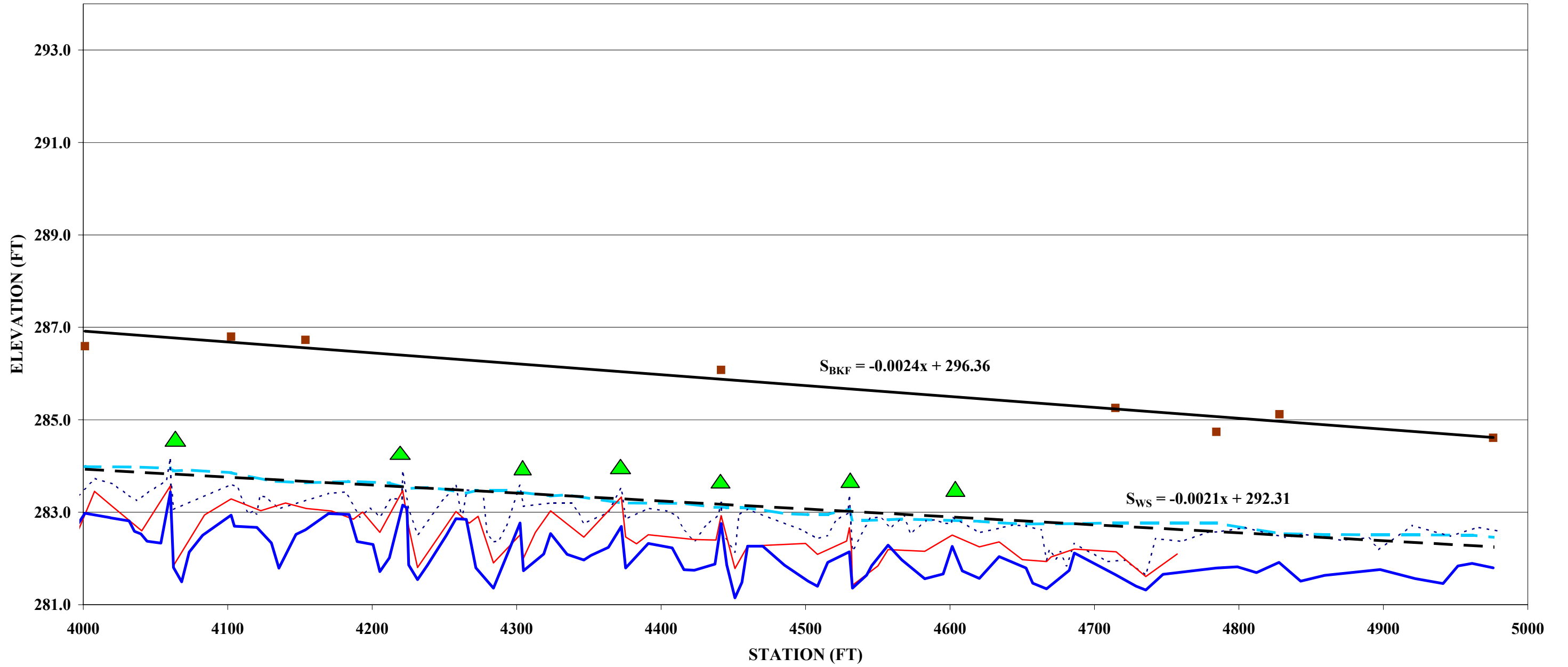


Longitudinal Profile
Prestonwood Golf Course - Hatchet's Grove
EEP Project Number 289 - MY02
Stations 30+00-40+00



- ▲ Cross Vane/Sill
- Water Surface
- ⋯ As-Built
- 1st Year Monitoring
- 2nd Year Monitoring
- Bankfull
- - - WS Slope
- Bkf Slope

Longitudinal Profile
Prestonwood Golf Course - Hatchet's Grove
EEP Project Number 289 - MY02
Stations 40+00-50+00



**Table B3: Thalweg Points for Hatchet's Grove
Prestonwood Golf Course, Wake County
EEP Project Number 289 - MY02**

Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
1000.0	290.1	1397.1	287.5	1743.6	286.5	2118.3	285.9
1005.6	289.4	1407.7	288.1	1750.0	286.7	2134.8	285.8
1016.3	289.4	1412.6	288.5	1764.4	286.5	2138.6	286.0
1043.5	288.9	1420.6	288.6	1775.4	287.5	2148.8	287.2
1062.7	289.6	1441.3	288.3	1777.7	287.7	2152.1	287.3
1071.4	289.7	1446.2	288.1	1780.0	287.5	2156.6	286.0
1085.0	289.6	1457.6	288.2	1782.1	286.2	2161.8	285.2
1099.8	289.3	1464.7	287.7	1786.7	285.6	2172.7	285.7
1107.9	289.2	1478.3	287.8	1792.9	286.4	2180.8	285.6
1113.7	288.2	1486.6	288.2	1802.2	287.3	2189.1	286.3
1120.5	288.5	1496.8	288.3	1818.0	286.8	2193.5	286.3
1125.5	289.0	1500.1	288.1	1838.4	286.6	2205.9	285.8
1134.6	289.0	1503.4	288.9	1855.3	286.8	2216.8	285.2
1139.8	289.0	1519.3	288.4	1858.8	286.8	2226.7	285.4
1147.2	289.7	1526.9	287.6	1871.8	287.1	2231.4	285.9
1159.3	289.5	1530.4	286.9	1878.4	285.9	2241.8	286.5
1172.7	289.4	1544.0	287.2	1887.8	286.0	2257.5	286.5
1185.8	289.1	1554.0	287.1	1898.5	286.7	2274.7	286.5
1188.0	289.0	1562.7	287.5	1906.3	287.0	2308.5	286.5
1193.8	288.8	1566.8	287.9	1921.4	287.1	2317.6	285.9
1199.9	288.9	1578.2	288.6	1929.0	286.9	2322.8	285.2
1206.6	289.2	1581.0	288.8	1937.0	286.5	2334.2	285.7
1212.0	288.5	1585.0	286.8	1941.3	285.8	2347.7	286.8
1215.0	288.9	1590.9	286.8	1947.0	286.3	2349.9	285.2
1220.3	288.7	1600.1	286.8	1961.0	286.2	2356.4	284.7
1228.1	288.8	1614.2	287.2	1974.7	287.0	2364.7	285.8
1232.0	289.2	1624.9	287.4	1978.0	286.0	2377.2	286.1
1244.8	289.3	1636.4	287.8	1984.7	285.7	2387.1	286.4
1251.8	288.7	1644.5	286.8	1989.3	285.7	2397.6	286.2
1262.1	289.0	1648.0	286.5	1995.6	286.3	2406.5	285.6
1280.4	288.9	1656.1	287.1	1999.9	286.8	2419.5	285.8
1289.7	287.6	1665.2	287.5	2011.1	286.6	2431.2	285.9
1298.1	289.2	1675.1	288.4	2026.8	286.6	2445.6	285.6
1311.6	289.0	1680.8	286.5	2031.7	286.0	2460.3	285.4
1325.0	289.1	1684.9	285.9	2039.5	286.2	2479.4	285.4
1334.2	289.1	1691.1	286.9	2044.3	286.4	2488.1	285.1
1344.6	288.9	1693.8	287.5	2052.9	287.4	2502.7	285.3
1351.5	288.6	1698.7	286.0	2056.9	287.0	2515.2	285.2
1360.2	288.8	1704.8	286.4	2062.3	286.2	2523.2	285.7
1367.4	288.7	1706.8	286.4	2072.0	286.6	2538.1	286.4
1376.1	288.1	1713.6	287.4	2075.5	286.4	2545.0	286.3
1380.6	287.7	1731.5	286.7	2099.2	286.6	2548.1	285.2
1390.2	287.9	1733.9	286.5	2111.6	285.7	2555.5	284.5

**Table B3 cont.: Thalweg Points for Hatchet's Grove
Prestonwood Golf Course, Wake County
EEP Project Number 289 - MY02**

Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
2562.9	285.2	3106.7	284.3	3602.9	283.7	4053.7	282.3
2576.8	285.7	3114.1	284.4	3626.2	284	4060.3	283.4
2590.5	285.7	3124.3	284.2	3642.9	283.6	4062.4	281.8
2602.7	285.2	3131.9	284.3	3650.2	282.9	4068.2	281.5
2615.5	284.9	3138.5	285.1	3665.5	282.7	4073.3	282.1
2621.9	284.2	3148.9	285.1	3671.1	282.8	4082.6	282.5
2635.8	285	3156.6	284.6	3676.4	283.4	4102.4	282.9
2649.6	285.5	3159.3	284.4	3689.3	283.9	4104.6	282.7
2666.5	285.4	3169.9	284	3698.2	283.9	4120.2	282.7
2686.2	285.1	3181	283.4	3705.1	284.3	4130.2	282.3
2699.7	285.7	3195.2	284.6	3706.5	282.9	4135.4	281.8
2720.9	285.7	3241.8	284.2	3718	283	4147.2	282.5
2744.9	285.5	3249.2	283.8	3729.1	283.5	4153.8	282.6
2762.1	284.8	3254.2	283.1	3736.5	283.8	4169.8	283
2771.8	285	3264.1	283.9	3745.1	283.3	4184.1	283
2786.9	284.8	3279.4	284.3	3753.8	282.8	4189.6	282.4
2800.4	285.3	3291.1	284.8	3767.1	281.9	4200.6	282.3
2817.1	285.4	3294.6	283.5	3777.6	282.5	4205.3	281.7
2839.8	285.5	3307.9	283.1	3795.1	283.5	4211.9	282
2845.6	285.8	3312.7	283.8	3860.1	283.3	4221.1	283.2
2849	283.8	3320.5	284.6	3871.7	282.8	4224.1	283.1
2859.3	284.2	3332.9	284.2	3875.7	282.2	4225.2	281.9
2863	285.2	3343.5	283.7	3880	282.9	4231.5	281.5
2870.1	285.6	3356.5	283.7	3893.6	283.2	4238.1	281.9
2890.8	285	3368.7	284.1	3897.4	282.7	4251.2	282.5
2906.4	284.7	3371.2	283.2	3907.5	283.4	4257.9	282.9
2910.8	284	3373	282.8	3912.3	282.8	4265.2	282.8
2923.2	284.4	3381.2	283	3930	283.5	4271.8	281.8
2929.7	284.7	3388.2	284	3943.7	283.2	4283.9	281.4
2936.1	285.5	3397.9	283.9	3949.4	282.5	4292.8	282
2939.5	284.8	3433.5	284.4	3956.8	282.6	4302.3	282.8
2957.9	285.3	3444.9	284.1	3960.7	282.8	4304.7	281.7
2973.6	285.1	3451.2	283.8	3970.8	283.3	4318.8	282.1
2993.5	284.9	3455.9	283.1	3981.6	282.6	4323.5	282.5
3001	284.9	3468.9	283.2	3987.2	282.8	4334.9	282.1
3012.9	284.8	3477.1	283.5	3989	282.2	4346.5	282
3019.7	285	3503.1	284.5	3993.8	282.6	4351.5	282.1
3032.3	285.4	3506.6	283.7	4001.1	283	4363.5	282.2
3036.7	283.5	3512.2	283.2	4018.8	282.9	4372.5	282.7
3041.7	284.6	3518.9	283.8	4018.9	282.9	4375.5	281.8
3054.1	284.4	3538.5	283.5	4031.7	282.8	4391.2	282.3
3060.5	284.7	3546.4	283.4	4035.4	282.6	4407.7	282.2
3086	285	3564	283.2	4039.9	282.5	4415.9	281.8
3096.3	284.5	3586.5	283.5	4044.1	282.4	4423	281.7

**Table B3 cont.: Thalweg Points for Hatchet's Grove
Prestonwood Golf Course, Wake County
EEP Project Number 289 - MY02**

Station	Elevation	Station	Elevation
4437.3	281.9	4859.4	281.6
4441.5	282.8	4897.8	281.8
4445.4	281.9	4921.9	281.6
4451.1	281.1	4941.4	281.5
4456.0	281.5	4951.5	281.8
4459.8	282.3	4961.4	281.9
4470.4	282.3	4976.1	281.8
4485.3	281.9		
4501.8	281.5		
4508.2	281.4		
4515.3	281.9		
4530.3	282.1		
4532.4	281.4		
4542.3	281.6		
4545.8	281.8		
4557.2	282.3		
4566.6	282.0		
4582.5	281.6		
4595.3	281.7		
4601.6	282.3		
4608.5	281.7		
4620.3	281.6		
4634.0	282.0		
4652.6	281.8		
4657.2	281.5		
4666.9	281.3		
4682.5	281.7		
4686.1	282.1		
4714.5	281.7		
4728.7	281.4		
4735.5	281.3		
4747.4	281.7		
4784.4	281.8		
4798.9	281.8		
4812.2	281.7		
4827.7	281.9		
4842.8	281.5		

**Table B4: Water Surface Points for Hatchet's Grove
Prestonwood Golf Course, Wake County
EEP Project Number 289 - MY02**

Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
1000.0	290.3	1838.4	287.6	2800.4	286.3	3676.4	284.7
1005.6	290.0	1858.8	287.7	2845.6	286.3	3698.2	284.7
1062.7	290.0	1906.3	287.6	2849.0	286.0	3706.5	284.4
1071.4	290.0	1929.0	287.6	2863.0	286.0	3729.1	284.3
1085.0	289.9	1937.0	287.6	2870.1	286.0	3745.1	284.3
1107.9	289.9	1947.0	287.6	2890.8	286.0	3753.8	284.3
1125.5	290.0	1974.7	287.5	2906.4	286.0	3777.6	284.3
1147.2	289.9	1978.0	287.5	2929.7	286.0	3795.1	284.3
1172.7	289.8	1995.6	287.5	2936.1	286.0	3860.1	284.2
1188.0	289.7	1999.9	287.5	2939.5	286.0	3871.7	284.2
1199.9	289.7	2026.8	287.5	2957.9	286.0	3880.0	284.2
1206.6	289.8	2031.7	287.5	2973.6	285.9	3907.5	284.2
1232.0	289.7	2044.3	287.5	2993.5	285.9	3912.3	284.1
1244.8	289.6	2052.9	287.5	3019.7	286.0	3930.0	284.2
1251.8	289.6	2056.9	287.4	3032.3	286.0	3943.7	284.1
1262.1	289.6	2062.3	287.5	3036.7	285.4	3949.4	284.0
1289.7	289.6	2138.6	287.5	3041.7	285.4	3960.7	284.0
1298.1	289.6	2152.1	287.5	3060.5	285.4	4001.1	284.0
1311.6	289.4	2156.6	287.1	3096.3	285.4	4039.9	284.0
1334.2	289.4	2180.8	287.2	3114.1	285.4	4060.3	283.9
1360.2	289.1	2205.9	287.1	3138.5	285.4	4062.4	283.9
1376.1	289.1	2231.4	287.1	3156.6	285.2	4073.3	283.9
1412.6	289.1	2241.8	287.1	3195.2	285.2	4102.4	283.9
1420.6	289.1	2308.5	287.1	3241.8	285.2	4130.2	283.7
1441.3	289.1	2317.6	287.1	3249.2	285.1	4153.8	283.6
1446.2	289.1	2334.2	287.1	3264.1	285.1	4184.1	283.7
1478.3	289.1	2347.7	287.0	3291.1	285.0	4189.6	283.7
1503.4	289.0	2349.9	286.7	3294.6	284.8	4211.9	283.6
1519.3	288.8	2364.7	286.7	3312.7	284.8	4225.2	283.5
1530.4	288.8	2387.1	286.7	3320.5	284.9	4238.1	283.5
1562.7	288.8	2397.6	286.7	3332.9	284.8	4251.2	283.5
1585.0	288.7	2460.3	286.7	3371.2	284.8	4265.2	283.4
1624.9	288.7	2502.7	286.7	3381.2	284.8	4271.8	283.5
1675.1	288.7	2538.1	286.7	3397.9	284.7	4292.8	283.5
1680.8	288.1	2548.1	286.3	3444.9	284.7	4323.5	283.4
1706.8	288.2	2562.9	286.4	3451.2	284.9	4334.9	283.4
1733.9	287.9	2576.8	286.4	3503.1	284.9	4372.5	283.2
1764.4	287.9	2602.7	286.3	3506.6	284.8	4415.9	283.2
1777.7	287.9	2615.5	286.3	3546.4	284.8	4437.3	283.1
1782.1	287.6	2635.8	286.3	3564.0	284.8	4445.4	283.1
1792.9	287.6	2699.7	286.3	3602.9	284.8	4456.0	283.1
1802.2	287.6	2744.9	286.4	3642.9	284.7	4470.4	283.1
1818.0	287.6	2762.1	286.4	3650.2	284.8	4485.3	283.0

**Table B4 cont.: Water Surface Points for Hatchet's Grove
Prestonwood Golf Course, Wake County
EEP Project Number 289 - MY02**

Station	Elevation	Station	Elevation
4501.8	282.9	4652.6	282.7
4515.3	282.9	4686.1	282.8
4530.3	283.1	4714.5	282.8
4532.4	282.8	4784.4	282.8
4542.3	282.8	4828.1	282.5
4557.2	282.8	4859.4	282.5
4566.6	282.9	4961.4	282.5
4620.3	282.8	4976.1	282.5
4634.0	282.8		

**Table B5: Bankfull Points for Hatchet's Grove
Prestonwood Golf Course, Wake County
EEP Project Number 289 - MY02**

Station	Elevation	Station	Elevation
1016.3	293.2	2845.6	290.3
1071.4	293.5	2906.4	289.5
1125.5	293.0	3156.6	288.8
1185.8	292.8	3264.1	288.7
1199.9	293.1	3356.5	288.2
1232.0	293.0	3397.9	288.3
1376.1	292.7	3444.9	288.1
1412.6	292.4	3564.0	287.8
1478.3	292.5	3650.2	287.3
1503.4	292.1	3795.1	287.2
1562.7	291.5	4001.1	286.6
1624.9	291.5	4102.4	286.8
1675.1	291.5	4153.8	286.7
1706.8	291.4	4441.5	286.1
1764.4	291.4	4714.5	285.3
1802.2	291.3	4784.4	284.7
1906.3	291.1	4828.1	285.1
1974.7	290.9	4976.1	284.6
2062.3	290.7		
2180.8	290.4		
2308.5	289.9		
2460.3	290.1		
2502.7	290.2		
2666.5	289.9		

**Table B6: Riffle and Pool Measurements for Hatchet's Grove
Prestonwood Golf Course, Wake County
EEP Project Number 289 - MY02**

Riffle Measurements			
Station	Length	WS Elev	WS Slope
1000	6	290.3	0.0582
1006		290.0	
1071	14	290.0	0.0017
1085		289.9	
1147	26	289.9	0.0067
1173		289.8	
1232	13	289.7	0.0086
1245		289.6	
1290	8	289.6	0.0059
1298		289.6	
1334	26	289.4	0.0096
1360		289.1	
1421	21	289.1	0.0015
1441		289.1	
1503	16	289.0	0.0113
1519		288.8	
1802	16	287.6	0.0018
1818		287.6	
1906	23	287.6	0.0005
1929		287.6	
2000	27	287.5	0.0006
2027		287.5	
2242	67	287.1	0.0003
2308		287.1	
2387	11	286.7	0.0024
2398		286.7	
2577	26	286.4	0.0003
2603		286.3	
2700	45	286.3	0.0004
2745		286.3	
2870	21	286.0	0.0008
2891		286.0	
2958	16	286.0	0.0022
2974		285.9	
3060	36	285.4	0.0010
3096		285.4	
3138	18	285.4	0.0096
3157		285.2	
3195	47	285.2	0.0003
3242		285.2	
3321	12	284.9	0.0044
3333		284.8	

Riffle Measurements			
Station	Length	WS Elev	WS Slope
3398	47	284.7	0.0004
3445		284.7	
3603	40	284.8	0.0017
3643		284.7	
3729	16	284.3	0.0012
3745		284.3	
3795	65	284.3	0.0017
3860		284.2	
3930	14	284.2	0.0047
3944		284.1	
4154	30	283.6	0.0003
4184		283.6	
4251	14	283.5	0.0058
4265		283.4	
4324	11	283.4	0.0011
4335		283.3	
4470	15	283.1	0.0053
4485		283.0	
4557	9	282.8	0.0020
4567		282.8	
4634	19	282.8	0.0015
4653		282.7	
4686	28	282.8	0.0005
4715		282.7	

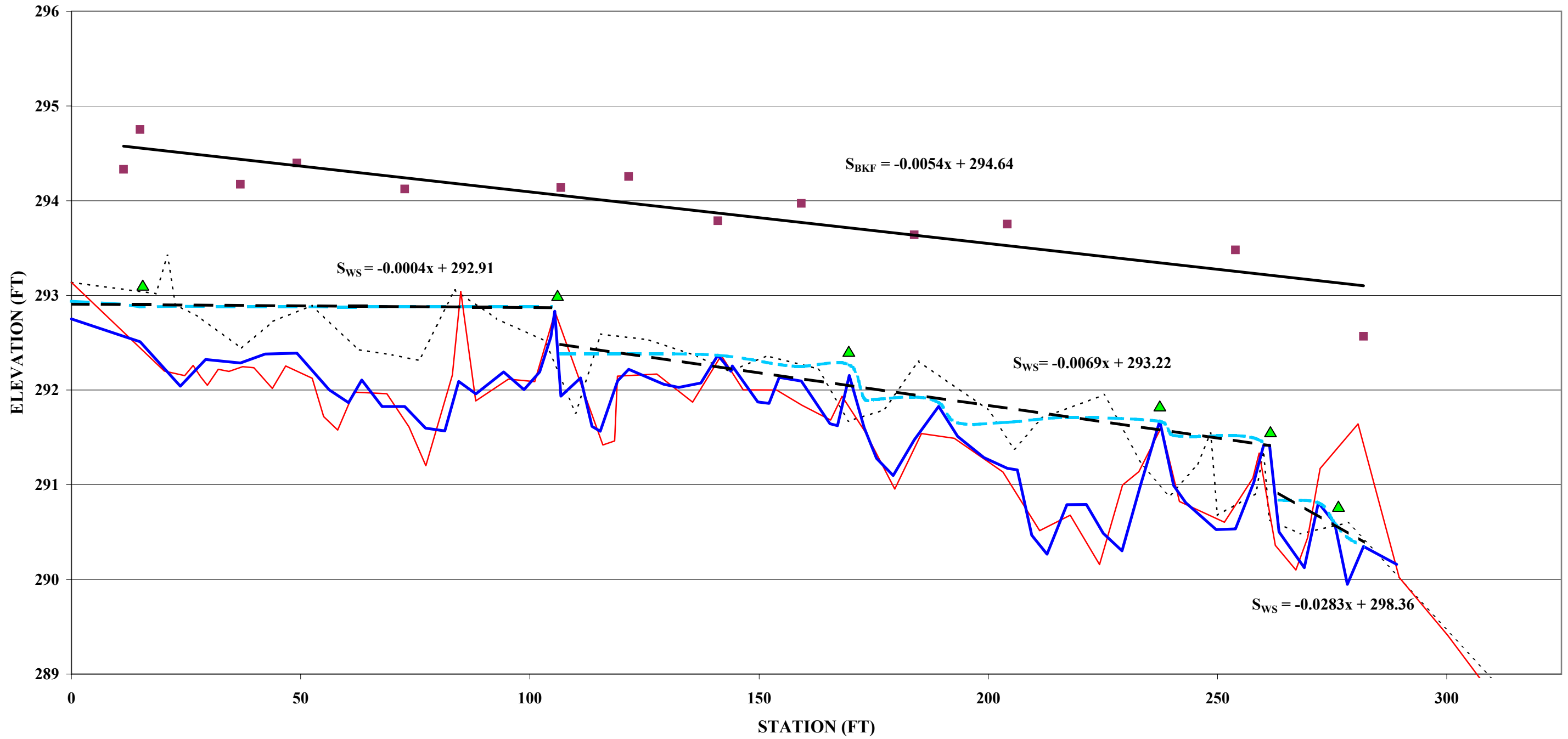
**Table B6 cont.: Riffle and Pool Measurements for Hatchet's Grove
Prestonwood Golf Course, Wake County
EEP Project Number 289 - MY02**

Pool Measurements		
Station	Length	P-P Spacing
1108	18	80
1125		
1188	12	64
1200		
1252	10	124
1262		
1376	36	70
1413		
1446	32	84
1478		
1530	32	55
1563		
1585	40	96
1625		
1681	26	53
1707		
1734	30	48
1764		
1782	11	56
1793		
1838	20	99
1859		
1937	10	41
1947		
1978	18	54
1996		
2032	13	31
2044		
2062	76	94
2139		
2157	24	49
2181		
2206	25	112
2231		
2318	17	32
2334		
2350	15	198
2365		
2548	15	67
2563		
2616	20	147
2636		

Pool Measurements		
Station	Length	P-P Spacing
2762	38	87
2800		
2849	14	57
2863		
2906	23	87
2930		
2994	26	43
3020		
3037	5	213
3042		
3249	15	45
3264		
3295	18	77
3313		
3371	10	80
3381		
3451	52	95
3503		
3546	18	104
3564		
3650	26	104
3676		
3754	24	118
3778		
3872	8	78
3880		
3949	11	90
3961		
4040	14	23
4054		
4062	11	127
4073		
4190	22	36
4212		
4225	13	47
4238		
4272	21	144
4293		
4416	21	30
4437		
4445	11	56
4456		

Pool Measurements		
Station	Length	P-P Spacing
4502	14	31
4515		
4532	10	
4542		

Longitudinal Profile
Prestonwood Golf Course - Meadow Creek
EEP Project Number 289 - MY02
Stations 00+00-03+00



- ▲ Sill / Cross Vane
- Water Surface
- - - - As-Built
- 1st Year Monitoring
- 2nd Year Monitoring
- Bankfull
- - - WS Slope
- Bkf Slope

**Table B7: Thalweg Points for Meadow Creek
Prestonwood Golf Course, Wake County
EEP Project Number 289 - MY02**

Station	Elevation	Station	Elevation
0	292.8	159.2	292.1
11.4	292.6	165.4	291.6
15.0	292.5	167.1	291.6
23.7	292.0	169.7	292.2
29.3	292.3	172.9	291.6
36.9	292.3	175.6	291.3
42.3	292.4	179.2	291.1
49.2	292.4	183.8	291.5
56.2	292.0	189.2	291.8
60.5	291.9	193.3	291.5
63.3	292.1	195.3	291.4
67.8	291.8	199.0	291.3
72.7	291.8	204.1	291.2
77.2	291.6	206.3	291.2
81.4	291.6	209.5	290.5
84.5	292.1	212.8	290.3
88.2	292.0	217.1	290.8
94.3	292.2	221.4	290.8
98.7	292.0	225.1	290.5
102.1	292.2	229.1	290.3
104.6	292.6	233.2	291.0
105.4	292.8	237.4	291.7
106.8	291.9	240.4	291.0
111.1	292.1	243.1	290.8
113.5	291.6	249.7	290.5
115.3	291.6	253.9	290.5
119.1	292.1	257.9	291.0
121.5	292.2	260.0	291.4
129.2	292.1	261.3	291.4
132.5	292.0	263.4	290.5
137.3	292.1	268.9	290.1
141.0	292.4	272.0	290.8
143.8	292.2	275.6	290.6
144.1	292.3	278.3	289.9
149.7	291.9	281.8	290.3
152.2	291.9	289.1	290.2
154.4	292.1		

**Table B8: Water Surface Points for Meadow Creek
Prestonwood Golf Course, Wake County
EEP Project Number 289 - MY02**

Station	WS Elev	Station	WS Elev
0.0	292.9	189.2	291.9
11.4	292.9	193.3	291.7
15.0	292.9	204.1	291.7
23.7	292.9	217.1	291.7
56.2	292.9	237.4	291.7
72.7	292.9	240.4	291.5
104.6	292.9	253.9	291.5
106.8	292.4	257.9	291.5
121.5	292.4	261.3	291.4
141.0	292.4	263.4	290.8
154.4	292.3	272.0	290.8
159.2	292.2	275.6	290.6
169.7	292.3	278.3	290.4
172.9	291.9	281.8	290.3
175.6	291.9		
183.8	291.9		

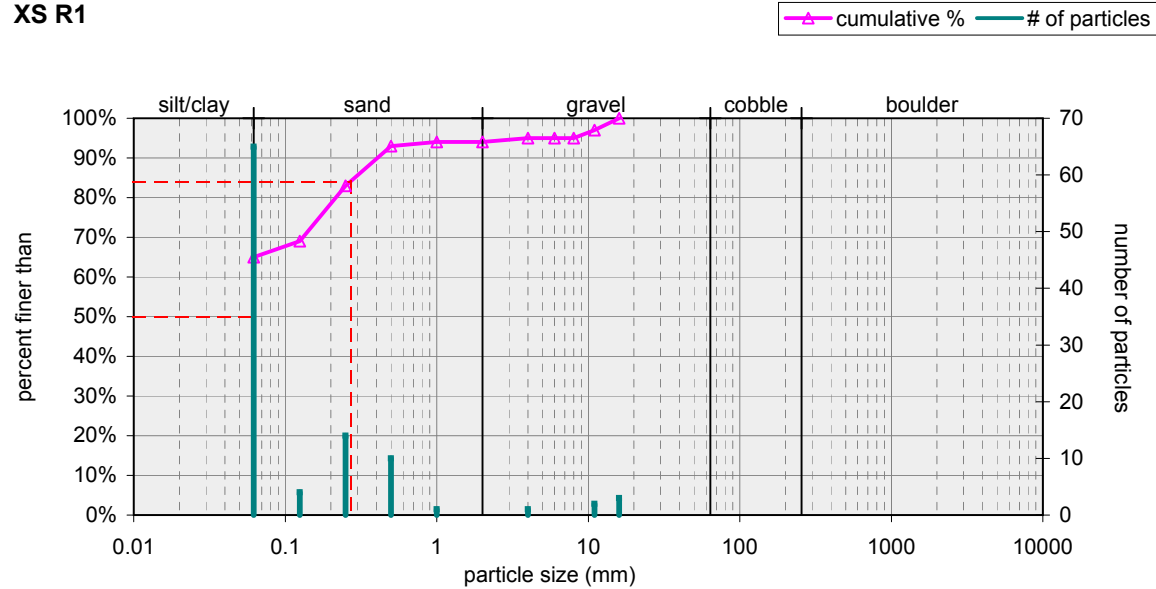
**Table B9: Bankfull Points for Meadow Creek
Prestonwood Golf Course, Wake County
EEP Project Number 289 - MY02**

Station	Bkf Elev
11.4	294.3
15.0	294.8
36.9	294.2
49.2	294.4
72.7	294.1
106.8	294.1
121.5	294.3
141.0	293.8
159.2	294.0
183.8	293.6
204.1	293.8
253.9	293.5
281.8	292.6

App B8 - Pebble Count Plots

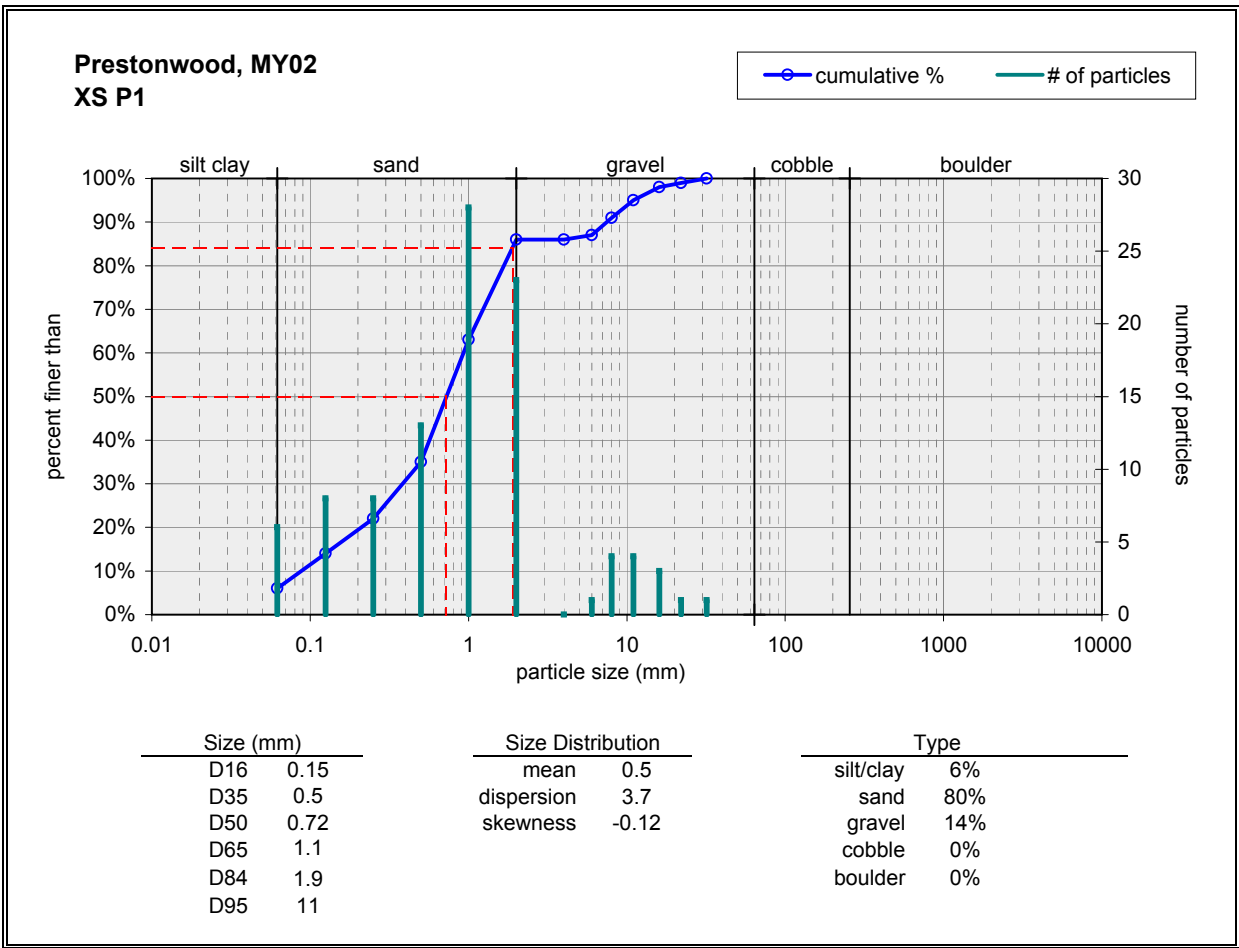
Riffle			
Material	Size Range (mm)		Count
silt/clay	0 - 0.062		65
very fine sand	0.062 - 0.125		4
fine sand	0.125 - 0.25		14
medium sand	0.25 - 0.5		10
coarse sand	0.5 - 1		1
very coarse sand	1 - 2		
very fine gravel	2 - 4		1
fine gravel	4 - 6		
fine gravel	6 - 8		
medium gravel	8 - 11		2
medium gravel	11 - 16		3
coarse gravel	16 - 22		
coarse gravel	22 - 32		
very coarse gravel	32 - 45		
very coarse gravel	45 - 64		
small cobble	64 - 90		
medium cobble	90 - 128		
large cobble	128 - 180		
very large cobble	180 - 256		
small boulder	256 - 362		
small boulder	362 - 512		
medium boulder	512 - 1024		
large boulder	1024 - 2048		
very large boulder	2048 - 4096		
total particle count:			100
bedrock -----			
clay hardpan -----			
detritus/wood -----			
artificial -----			
total count:			100
Note: <input style="width: 100%;" type="text"/>			

**Prestonwood, MY02
XS R1**

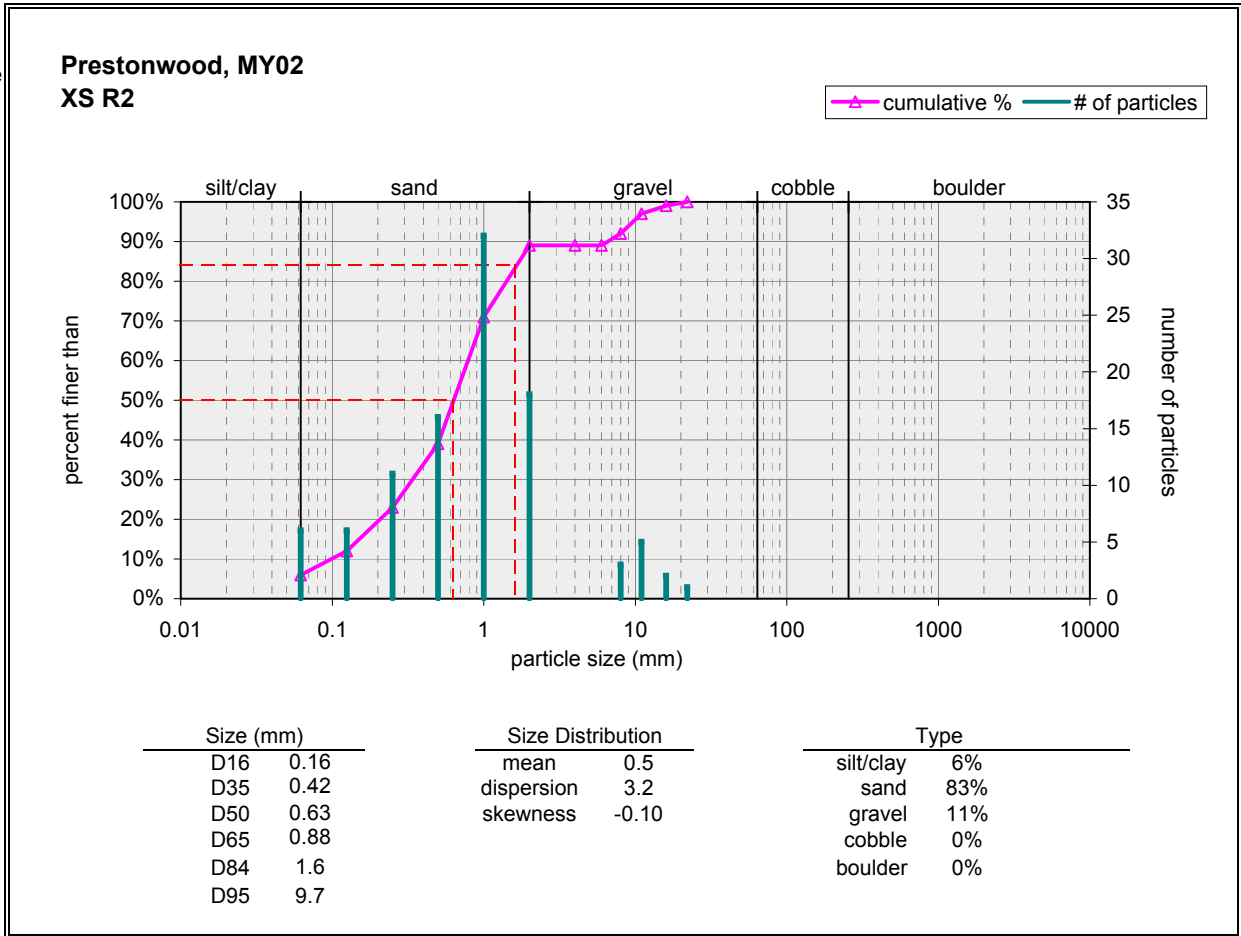


Size (mm)		Size Distribution		Type	
D16	0.062	mean	0.1	silt/clay	65%
D35	0.062	dispersion	2.7	sand	29%
D50	0.062	skewness	0.40	gravel	6%
D65	0.062			cobble	0%
D84	0.27			boulder	0%
D95	#N/A				

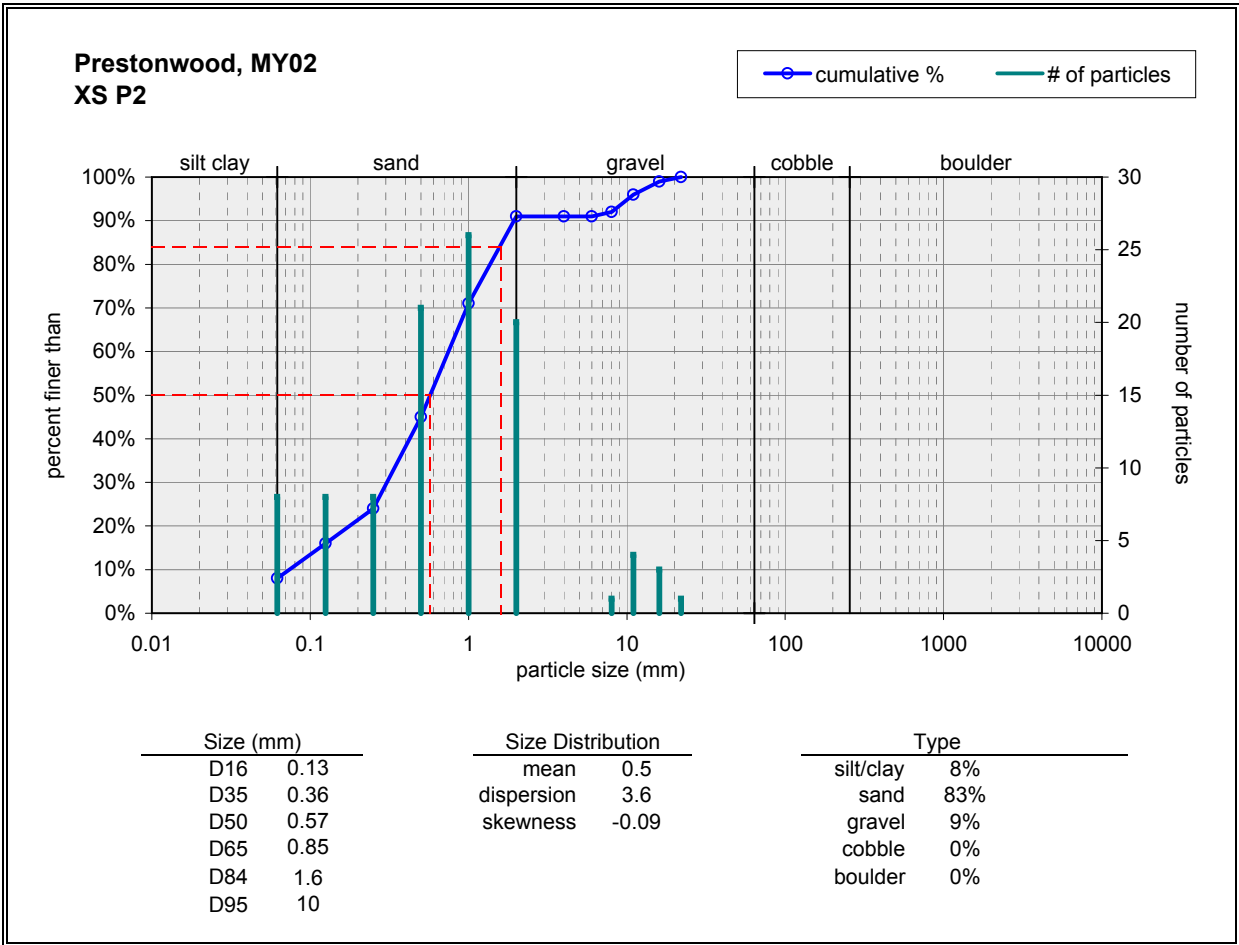
Pool			
Material	Size Range (mm)	Count	
silt/clay	0 - 0.062	6	
very fine sand	0.062 - 0.125	8	
fine sand	0.125 - 0.25	8	
medium sand	0.25 - 0.5	13	
coarse sand	0.5 - 1	28	
very coarse sand	1 - 2	23	
very fine gravel	2 - 4	0	
fine gravel	4 - 6	1	
fine gravel	6 - 8	4	
medium gravel	8 - 11	4	
medium gravel	11 - 16	3	
coarse gravel	16 - 22	1	
coarse gravel	22 - 32	1	
very coarse gravel	32 - 45		
very coarse gravel	45 - 64		
small cobble	64 - 90		
medium cobble	90 - 128		
large cobble	128 - 180		
very large cobble	180 - 256		
small boulder	256 - 362		
small boulder	362 - 512		
medium boulder	512 - 1024		
large boulder	1024 - 2048		
very large boulder	2048 - 4096		
total particle count:		100	
bedrock	-----		
clay hardpan	-----		
detritus/wood	-----		
artificial	-----		
total count:		100	
Note: _____			



Riffle		
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	6
very fine sand	0.062 - 0.125	6
fine sand	0.125 - 0.25	11
medium sand	0.25 - 0.5	16
coarse sand	0.5 - 1	32
very coarse sand	1 - 2	18
very fine gravel	2 - 4	
fine gravel	4 - 6	
fine gravel	6 - 8	3
medium gravel	8 - 11	5
medium gravel	11 - 16	2
coarse gravel	16 - 22	1
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		100
bedrock	-----	
clay hardpan	-----	
detritus/wood	-----	
artificial	-----	
total count:		100
Note: _____		

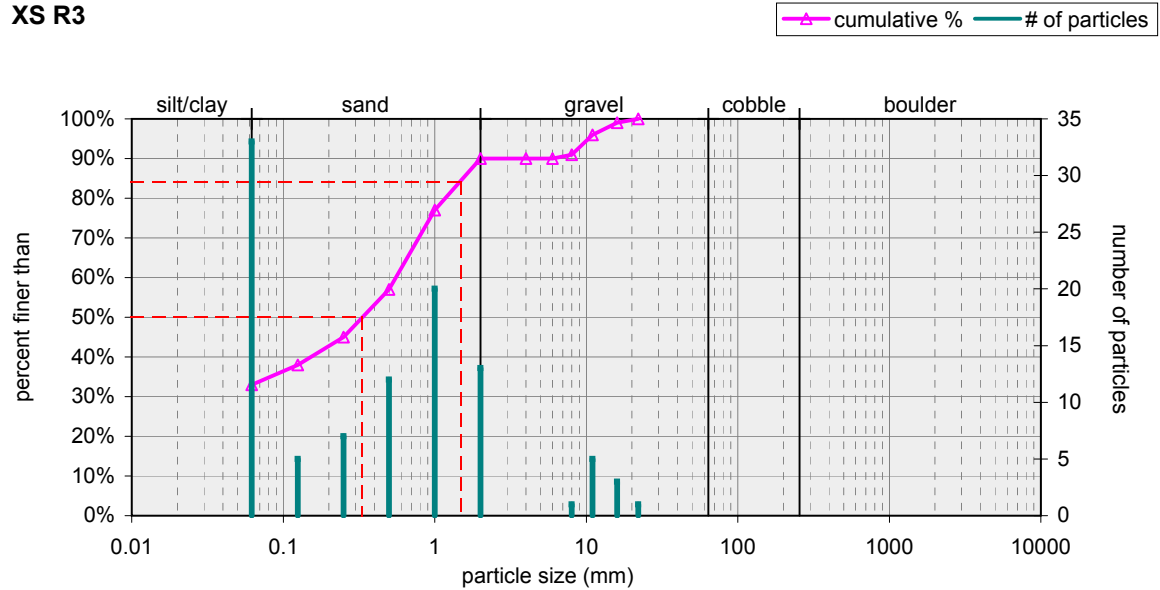


Pool		
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	8
very fine sand	0.062 - 0.125	8
fine sand	0.125 - 0.25	8
medium sand	0.25 - 0.5	21
coarse sand	0.5 - 1	26
very coarse sand	1 - 2	20
very fine gravel	2 - 4	
fine gravel	4 - 6	
fine gravel	6 - 8	1
medium gravel	8 - 11	4
medium gravel	11 - 16	3
coarse gravel	16 - 22	1
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		100
bedrock	-----	
clay hardpan	-----	
detritus/wood	-----	
artificial	-----	
total count:		100
Note: _____		



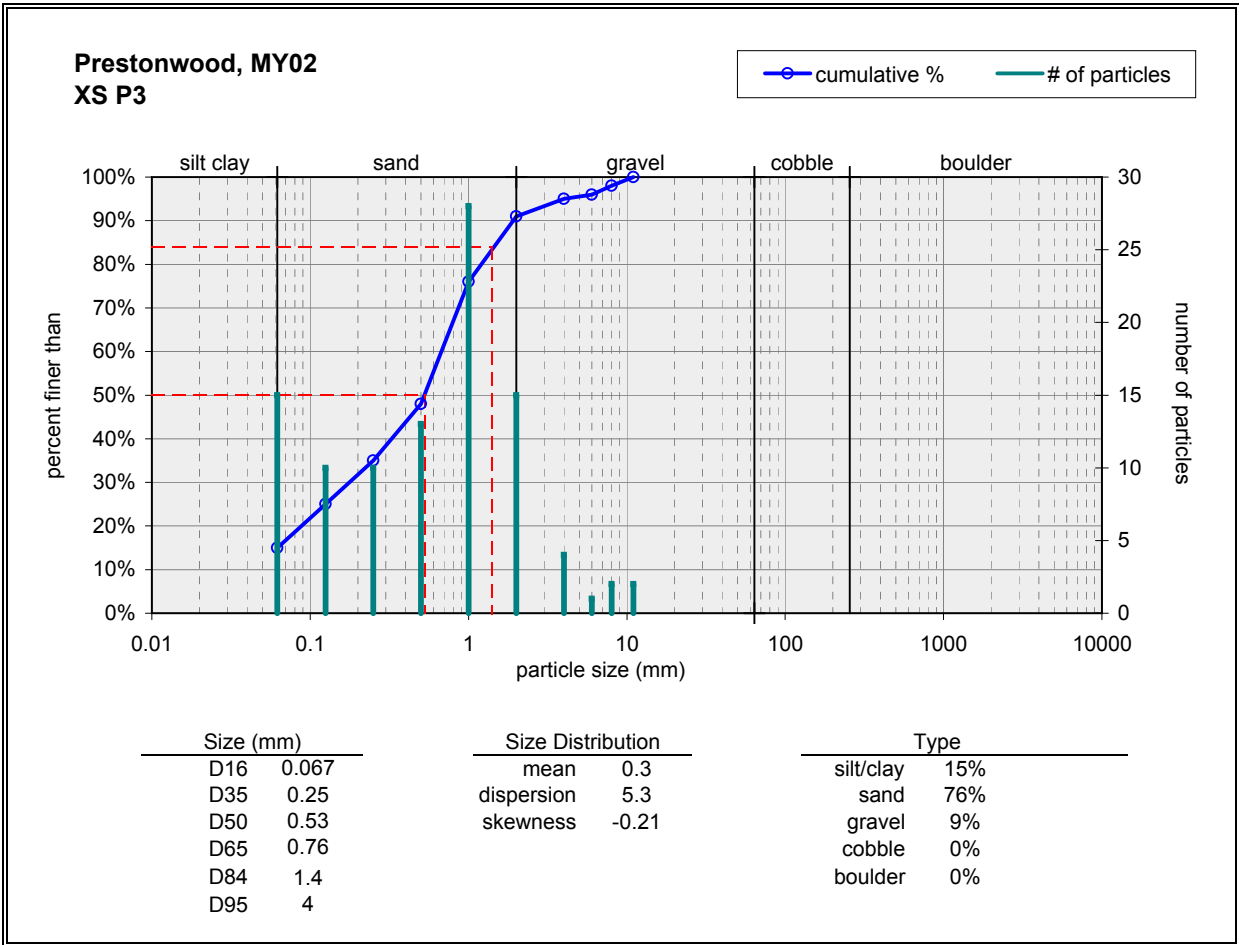
Riffle		
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	33
very fine sand	0.062 - 0.125	5
fine sand	0.125 - 0.25	7
medium sand	0.25 - 0.5	12
coarse sand	0.5 - 1	20
very coarse sand	1 - 2	13
very fine gravel	2 - 4	
fine gravel	4 - 6	
fine gravel	6 - 8	1
medium gravel	8 - 11	5
medium gravel	11 - 16	3
coarse gravel	16 - 22	1
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		100
bedrock	-----	
clay hardpan	-----	
detritus/wood	-----	
artificial	-----	
total count:		100
Note: _____		

**Prestonwood, MY02
XS R3**



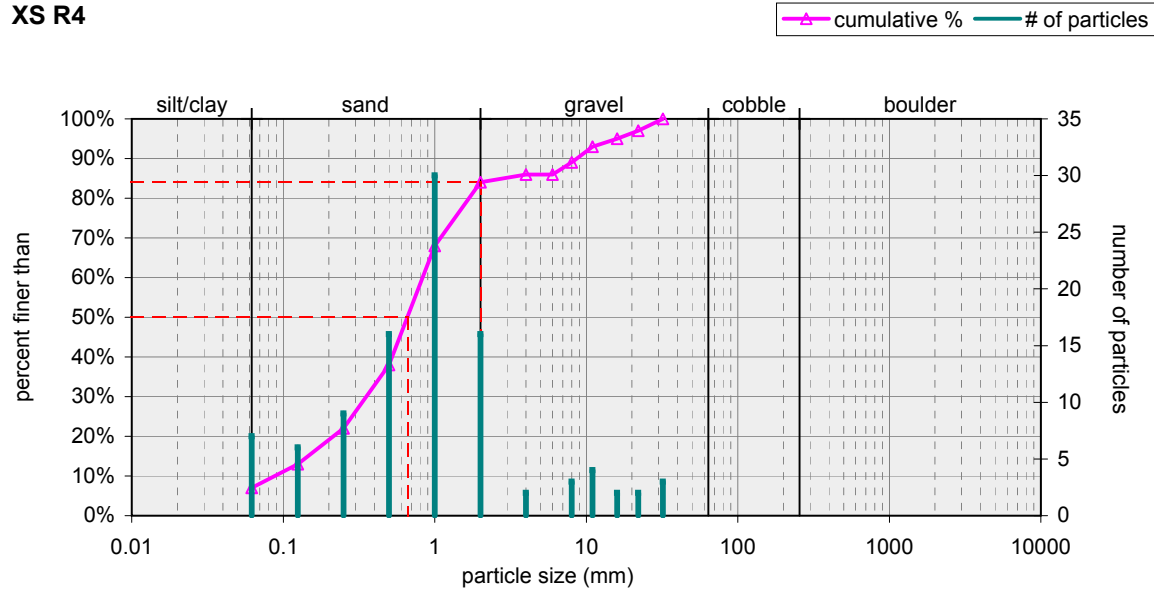
Size (mm)	Size Distribution	Type
D16 0.062	mean 0.3	silt/clay 33%
D35 0.082	dispersion 4.9	sand 57%
D50 0.33	skewness -0.03	gravel 10%
D65 0.66		cobble 0%
D84 1.5		boulder 0%
D95 10		

Pool		
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	15
very fine sand	0.062 - 0.125	10
fine sand	0.125 - 0.25	10
medium sand	0.25 - 0.5	13
coarse sand	0.5 - 1	28
very coarse sand	1 - 2	15
very fine gravel	2 - 4	4
fine gravel	4 - 6	1
fine gravel	6 - 8	2
medium gravel	8 - 11	2
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		100
bedrock	-----	
clay hardpan	-----	
detritus/wood	-----	
artificial	-----	
total count:		100
Note: _____		



Riffle		
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	7
very fine sand	0.062 - 0.125	6
fine sand	0.125 - 0.25	9
medium sand	0.25 - 0.5	16
coarse sand	0.5 - 1	30
very coarse sand	1 - 2	16
very fine gravel	2 - 4	2
fine gravel	4 - 6	
fine gravel	6 - 8	3
medium gravel	8 - 11	4
medium gravel	11 - 16	2
coarse gravel	16 - 22	2
coarse gravel	22 - 32	3
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		100
bedrock	-----	
clay hardpan	-----	
detritus/wood	-----	
artificial	-----	
total count:		100
Note: _____		

**Prestonwood, MY02
XS R4**



Size (mm)		Size Distribution		Type	
D16	0.16	mean	0.6	silt/clay	7%
D35	0.44	dispersion	3.6	sand	77%
D50	0.66	skewness	-0.06	gravel	16%
D65	0.93			cobble	0%
D84	2			boulder	0%
D95	16				

Pool		
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	17
very fine sand	0.062 - 0.125	9
fine sand	0.125 - 0.25	15
medium sand	0.25 - 0.5	5
coarse sand	0.5 - 1	11
very coarse sand	1 - 2	23
very fine gravel	2 - 4	9
fine gravel	4 - 6	
fine gravel	6 - 8	4
medium gravel	8 - 11	7
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		100
bedrock	-----	
clay hardpan	-----	
detritus/wood	-----	
artificial	-----	
total count:		100
Note: _____		

