

**Kentwood Park (Bushy Branch)  
Stream Restoration Monitoring Report  
EEP Project # 205  
Monitoring Year – 03  
2007**



Submitted to:



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

**February 2008**

## Monitoring Firm



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## EXECUTIVE SUMMARY

The Wetlands Restoration Program identified Bushy Branch in Kentwood Park as a restoration project in 2000. The watershed of approximately 1.4 square miles is located within the USGS 14-digit HUC 03020201090010 and the NCDWQ Sub-basin 03-04-02 of the Neuse River Basin. The project restored approximately 1,400 linear feet of channel, 1,070 feet on Bushy Branch and 350 feet on an unnamed tributary to Bushy Branch (UT to Bushy Branch). The restoration was designed to correct various problems with the existing stream corridor including unstable channel configuration, poor water quality, minimal bed features, exotic and invasive vegetation, and poor stream and riparian habitat. The restoration plan was completed in 2002 and called for correcting these problems by stabilizing stream banks, installing in-stream structures, adjusting stream planform, and replanting the riparian areas with native vegetation. Project construction occurred in 2002. This report describes the findings of the third year monitoring that took place in 2007.

The restoration plan called for the removal of all existing problem vegetation along the stream banks and within the riparian buffer. The as-built survey found the original planting of native vegetation to be unsuccessful. To correct the initial failure, a remedial vegetation plan was designed and implemented in 2004. Remedial vegetation was planted at a density of 4,840 stems per acre in the streamside community and 680 stems per acre in the bottomland hardwood community. The vegetation monitoring plots were established during the as-built survey. Three plots were surveyed and the corners marked with metal conduit for future monitoring. The third year monitoring counted an average of 1,984 stems per acre in the streamside community based on plots 1 and 2, and 1,255 stems per acre in the bottomland hardwood community based on plot 3. The use of the park's disc golf course continues to have a detrimental effect on the vegetation of UT to Bushy Branch and on the west bank of the upper 250 feet of Bushy Branch. The damage to the vegetation primarily consists of bare banks due to foot traffic from disc golf players retrieving discs from the stream area. Some damage is due to direct impact of the flying discs on the planted vegetation. *Microstegium (Microstegium vimineum)* is a prominent invasive plant documented throughout the site. There are also a few areas where kudzu (*Pueraria lobata*) is present and should be controlled as soon as possible. The third year monitoring found the vegetation component of the project to be successful excluding these invasive populations.

The stream assessment completed during the third year of monitoring found Bushy Branch to be functioning. Channel dimensions have not changed drastically from the as-built conditions with the exception of some areas of bank erosion and lateral adjustment of the channel. The third year monitoring profile shows bed degradation from Station 16+25 to 16+50 in comparison to the as-built profile. Bed aggradation is also present from Stations 11+10 to 11+60 and 12+50 to 13+00. UT to Bushy Branch also shows areas of bed aggradation and degradation when the profile is compared to the as-built profile. The most notable problem on the UT to Bushy Branch is an area of bed degradation near Station 02+20. The header stone of the upstream structure has fallen into the pool and a headcut has begun. Many of the in-stream structures are functioning across the project site, though several are experiencing stress evidenced by localized erosion on cross vane arms. Overall, the most extensive stream problem is the instability of the banks along various parts of Bushy Branch. These bank erosion issues are detailed in the following report and should be closely monitored to determine if repairs are warranted.

## 1.0 PROJECT BACKGROUND

### 1.1 Project Objectives

- Installation of in-stream structures to define additional bed features.
- Relocate a section of the stream in order to restore stream pattern.
- Grade severely eroding banks and excavate new bankfull benches.
- Install root wads to promote bank stability.
- Revegetate the adjacent banks to promote the establishment of native plant communities.

### 1.2 Project Structure, Restoration Type and Approach

A previously incised channel, Bushy Branch, and an unnamed tributary were restored using channel dimension, pattern, and profile modifications and the establishment of a vegetated riparian zone adjacent to the stream. Channel profile is maintained through the use of rock cross vanes. A new channel pattern was constructed through the use of single vanes, root wads, and vegetation along the channel banks. Due to heavy site use and low planting success, a corrective vegetation and stream maintenance plan have been implemented since initial project completion.

### 1.3 Location and Setting

Bushy Branch and an unnamed tributary are located in Kentwood Recreational Park within the city limits of Raleigh, North Carolina. The 1.33 square mile watershed has a park setting surrounded by urban residential development with little potential for future development.

### 1.4 Project History and Background

Table 1. Project Restoration Components						
Project Number and Name: 205 - Kentwood Park (Bushy Branch)						
Segment / Reach ID	Existing Linear Feet	Type	Approach	Linear Feet	Stationing	Comment
Bushy Branch	N/A	R	P1/2/3	1,070	10+00 - 20+70	
UT to Bushy Branch	N/A	EII	P3	350	00+00 - 03+50	

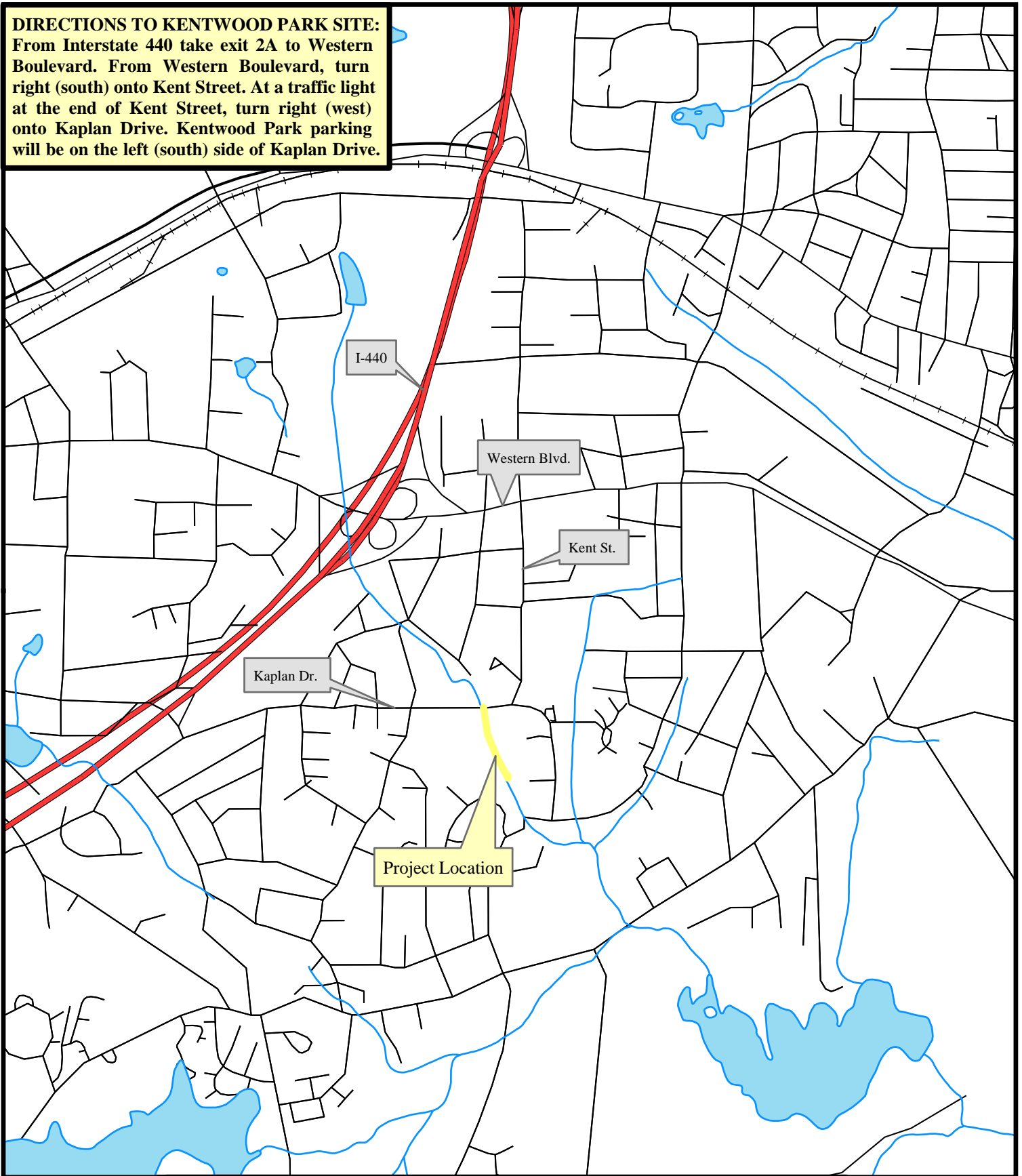
R = Restoration

P1/2/3 = Combination of Priority 1, 2, and 3

EII = Enhancement II

P3 = Priority 3

**DIRECTIONS TO KENTWOOD PARK SITE:**  
From Interstate 440 take exit 2A to Western Boulevard. From Western Boulevard, turn right (south) onto Kent Street. At a traffic light at the end of Kent Street, turn right (west) onto Kaplan Drive. Kentwood Park parking will be on the left (south) side of Kaplan Drive.



**Figure 1. Site Vicinity Map**  
**Kentwood Park, Wake County, EEP Project # 205 - MY03**



Date: 12/04/07

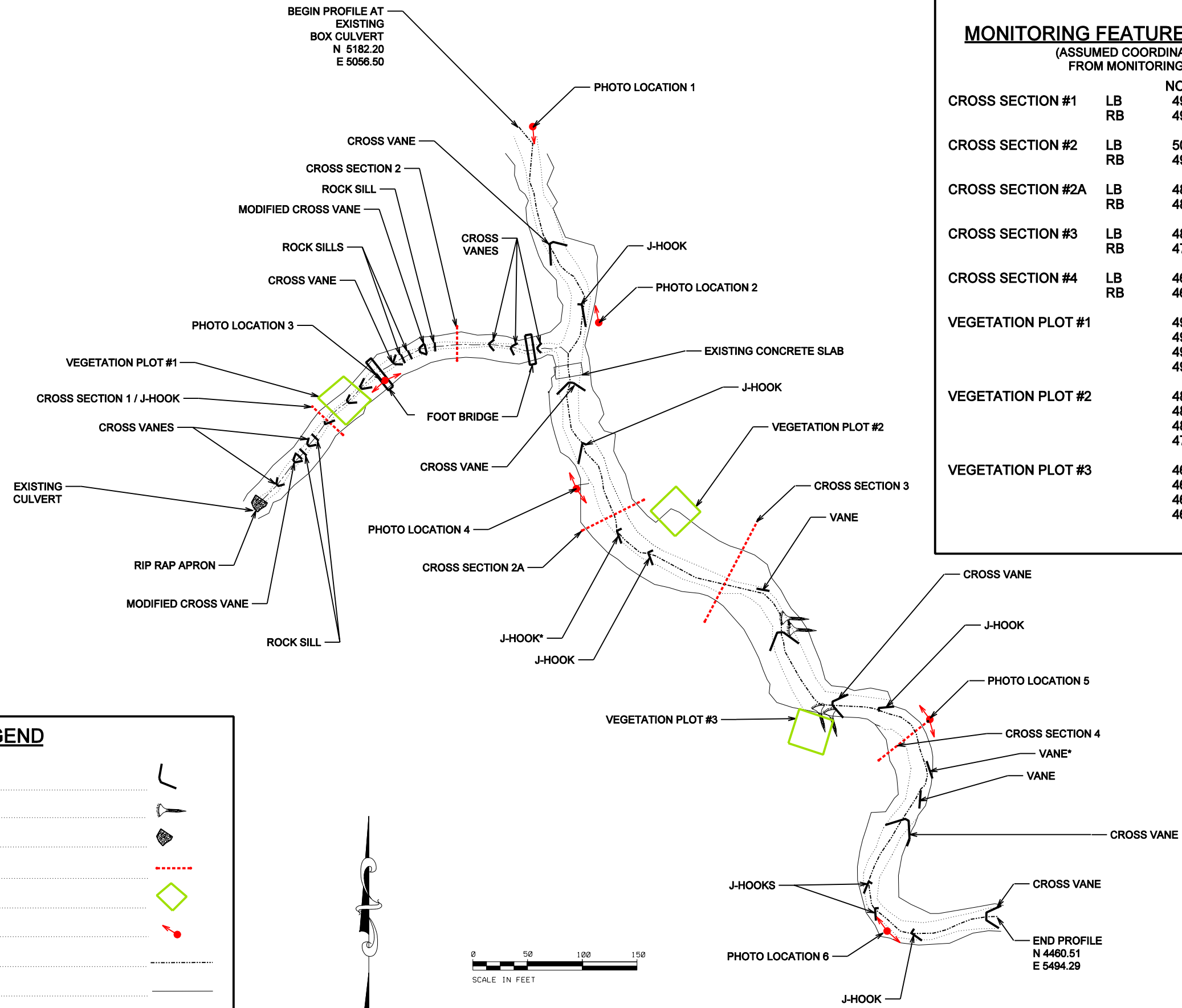


<b>Table 2. Project Activity and Reporting History</b>		
<b>Project Number and Name: 205 - Kentwood Park (Bushy Branch)</b>		
<b>Activity or Report</b>	<b>Data Collection Complete</b>	<b>Actual Completion or Delivery</b>
Restoration Plan	Apr-00	Mar-07
Final Design - 90%		
Construction		2002
Stream Maintenance Plan		Feb-07
Stream Repair and Maintenance Seeding		2004
As-Built Report		Feb-07
Year 1 Monitoring	Jul-07	Jan-07
Year 2 Monitoring	Jun-07	Jan-07
Year 3 Monitoring	Nov-07	Jan-07

<b>Table 3. Project Contact Table</b>	
<b>Project Number and Name: 205 - Kentwood Park (Bushy Branch)</b>	
<b>Design Firms</b>	Arcadis G&M of North Carolina, Inc. 2301 Rexwoods Dr., Suite 102 Raleigh, North Carolina 27607 Contact: Mr. William Scott Hunt, III Phone: (919) 782-5511 Fax: (919) 782-5905
<b>Construction Contractor</b>	Shamrock Environmental Group 6106 Corporate Park Dr. Brown Summit, North Carolina 27214 Contact: Mr. Bill Wright Phone: (336) 375-1989 Fax: (336) 375-1801
<b>Vegetation Design Firm (2004 Vegetation and Stream Maintenance Plan)</b>	EcoScience Corporation 1101 Haynes St., Suite 101 Raleigh, North Carolina 27604 Contact: Mr. Jens Geratz Phone: (919) 828-3433 Fax: (919) 828-3518
<b>Supplemental Vegetation and Structure Repair Contractor</b>	Seal Brothers P.O. Box 86 Dobson, North Carolina 27017 Contact: Mr. Brian Seal Phone: (336) 710-3560
<b>Monitoring Performer MY-01, 02, 03</b>	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



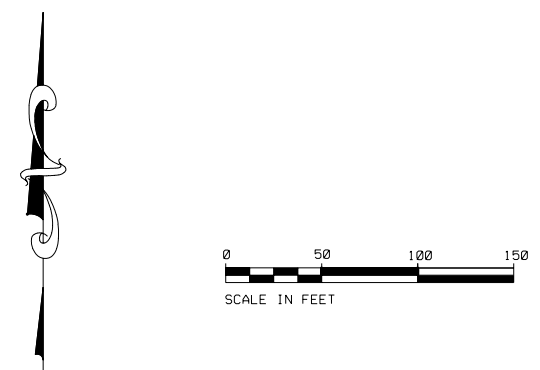
<b>Table 4. Project Background Table</b>	
<b>Project Number and Name: 205 – Kentwood Park (Bushy Branch)</b>	
Project County	Wake County
Drainage Area	1.27 sq. mi. (Bushy Branch)
	0.06 sq. mi. (UT to Bushy Branch)
Drainage Impervious Cover Estimate	45%
Stream Order	Second Order (Bushy Branch)
	First Order (UT to Bushy Branch)
Physiographic Region	Piedmont
Ecoregion	Northern Outer Piedmont
Rosgen Classification of As-built	C4/B4
Dominant Soil Types	Wehadkee and Bibb Soils (Bushy Branch)
	Wehadkee and Bibb Soils ( UT to Bushy Branch)
Reference Site ID	UT to Lake Wheeler
	UT to Mine Creek
USGS HUC for Project and Reference	03020201090010 (Bushy Branch)
	03020201110010 (UT to Lake Wheeler)
	03020201080020 (UT to Mine Creek)
NCDWQ Sub-basin for Project and Reference	3-04-02 (Bushy Branch)
	03-04-02 (UT to Lake Wheeler)
	3-04-02 (UT to Mine Creek)
NCDWQ Classification for Project and Reference	C - NSW (Bushy Branch)
	N/A (UT to Lake Wheeler)
	N/A (UT to Mine Creek)
Any portion of the project segment 303d listed?	No - not rated
Any portion of the project segment upstream of a 303d listed segment?	N/A
Reasons for 303d Listing or Stressor	N/A
% of Project Easement Fenced	0%



MONITORING FEATURE COORDINATES			
(ASSUMED COORDINATE SYSTEM FROM MONITORING SURVEY)			
		NORTHING	EASTING
CROSS SECTION #1	LB	4926.60	4867.91
	RB	4900.65	4895.52
CROSS SECTION #2	LB	5000.00	5000.00
	RB	4968.67	5000.00
CROSS SECTION #2A	LB	4841.45	5170.71
	RB	4813.25	5114.21
CROSS SECTION #3	LB	4820.56	5259.23
	RB	4723.49	5219.47
CROSS SECTION #4	LB	4651.82	5430.88
	RB	4611.46	5389.46
VEGETATION PLOT #1		4931.15	4873.69
		4954.36	4896.34
		4909.86	4898.86
		4932.60	4921.73
VEGETATION PLOT #2		4819.84	5161.42
		4823.76	5206.52
		4844.74	5182.31
		4798.86	5185.63
VEGETATION PLOT #3		4619.82	5305.75
		4651.83	5312.74
		4644.35	5344.63
		4612.48	5338.48

**LEGEND**

- AS-BUILT STRUCTURE
- AS-BUILT ROOT WAD
- RIP RAP
- CROSS SECTION
- VEGETATION PLOT
- PHOTO LOCATION
- AS-BUILT THALWEG
- AS-BUILT TOP OF BANK
- AS-BUILT CHANNEL BOUNDARY



\* INDICATES AS-BUILT STRUCTURE THAT WAS NOT ORIGINALLY INCLUDED IN THE AS-BUILT DRAWING

SYMBOL	DESCRIPTION	DATE	APPROVED

SYMBOL	DESCRIPTION	DATE	APPROVED

**KCI ASSOCIATES OF NC**  
 ENGINEERS • PLANNERS • SCIENTISTS  
 4601 SIX FORKS ROAD  
 RALEIGH, NORTH CAROLINA 27609

KENTWOOD PARK (BUSHY BRANCH)  
 WAKE COUNTY  
 EEP PROJECT NUMBER 205 - MY03

## 2.0 PROJECT CONDITIONS AND MONITORING RESULTS

### 2.1 Vegetation Assessment

See vegetation assessment in Appendix A and Current Conditions Plan View in Appendix C.

### 2.2. Stream Assessment

See stream assessment in Appendix B and Current Conditions Plan View in Appendix C.

#### 2.2.1 Bankfull Event and Stability Assessment

##### 2.2.1.a Verification of Bankfull Events Table

<b>Table 5. Verification of Bankfull Events</b>			
<b>Project Number and Name: 205 - Kentwood Park (Bushy Branch)</b>			
<b>Date of Data Collection</b>	<b>Date of Occurrence</b>	<b>Method</b>	<b>Photo Number</b>
06/15/06	6/14/2006	Site visit to evaluate stage indicators after storm event	N/A
07/11/07	Unknown	Crest Gauge	N/A
11/12/07	Unknown	Crest Gauge	N/A

##### 2.2.1.b BEHI and Sediment Export Table

<b>Table 6. BEHI and Sediment Export Estimates</b>
<b>Project Number and Name: 205 – Kentwood Park (Bushy Branch)</b>
To Be Conducted During Monitoring Year 05

#### 2.2.2 Stability Assessment Table

<b>Table 7a. Categorical Stream Feature Visual Stability Assessment</b>						
<b>Project Number and Name: 205 – Kentwood Park (Bushy Branch)</b>						
<b>Segment/Reach: Bushy Branch (1,070 ft.)</b>						
<b>Feature</b>	<b>Initial</b>	<b>MY - 01</b>	<b>MY - 02</b>	<b>MY - 03</b>	<b>MY - 04</b>	<b>MY - 05</b>
A. Riffles	100%	98%	75%	75%		
B. Pools	100%	92%	94%	94%		
C. Thalweg	100%	75%	75%	75%		
D. Meanders	100%	75%	72%	81%		
E. Bed General	100%	93%	94%	100%		
F. Banks	100%	78%	77%	93%		
G. Vanes / J Hooks etc.	100%	83%	82%	82%		
H. Wads and Boulders	100%	80%	50%	50%		

<b>Table 7b. Categorical Stream Feature Visual Stability Assessment</b>						
<b>Project Number and Name: 205 – Kentwood Park (Bushy Branch)</b>						
<b>Segment/Reach: UT Bushy Branch (350 ft.)</b>						
<b>Feature</b>	<b>Initial</b>	<b>MY - 01</b>	<b>MY - 02</b>	<b>MY - 03</b>	<b>MY - 04</b>	<b>MY - 05</b>
A. Riffles	100%	92%	85%	85%		
B. Pools	100%	90%	90%	90%		
C. Thalweg	100%	100%	100%	100%		
D. Bed General	100%	80%	80%	97%		
E. Banks	100%	95%	95%	91%		
F. Vanes / J Hooks etc.	100%	90%	90%	90%		

## 2.2.3 Quantitative Measures Summary Tables

Table 8a. Baseline Morphology and Hydraulic Summary																		
Project Number and Name: 205 – Kentwood Park (Bushy Branch)																		
Segment Reach: Bushy Branch (1,070 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
<b>Dimension</b>																		
Bankfull Width (ft)			36.0				25.0	36.0	31.0	11.0	12.5	11.5			24.0			18.0
Floodprone Width (ft)			100				67	135	107	70	137	97	52	>100				43
Bankfull Cross Sectional Area (ft <sup>2</sup> )			135.8				51.5	69.8	63.0	11.2	12.8	12.2			40.0			22.2
Bankfull Mean Depth (ft)			3.8				1.8	2.1	2.0	0.9	1.2	1.1			1.7			1.2
Bankfull Maximum Depth (ft)			5.5				2.8	3.1	2.9	1.4	1.8	1.6	2.2	2.7	2.4			1.8
Width/Depth Ratio							12	20	16	9	14	11			14			14.6
Bank Height Ratio							2.2	2.9	2.6	1.1	1.4	1.2						1.3
Entrenchment Ratio			2.2				1.9	4.8	3.6	6.4	12.5		2.2	>6				2.4
Wetted Perimeter (ft)																		19.8
Hydraulic Radius (ft)																		1.1
<b>Pattern</b>																		
Channel Beltwidth (ft)							40	95	77	50	110	69	103	230	144			
Radius of Curvature (ft)							32	204	138	7	66	25	15	137	53			
Meander Wavelength (ft)							180	380	269	45	120	74	94	250	156			
Meander Width Ratio							5.8	12.2	8.7	3.9	10.4	6.5	3.9	10.4	6.5			
<b>Profile</b>																		
Riffle Length (ft)																		
Riffle Slope (ft/ft)							0.001	0.028	0.016	0.013	0.042	0.028	0.017	0.056	0.04			
Pool Length (ft)							16	60.1	34.3	11	112	30	24	233	62			
Pool Spacing (ft)							47	141	111	22	148	57	46	310	120			
<b>Substrate</b>																		
d50 (mm)									12			4			12			6
d84 (mm)									45			17			45			44
<b>Additional Reach Parameters</b>																		
Valley Length (ft)																		
Channel Length (ft)																		
Sinuosity								1.16			1.57			1.3				
Water Surface Slope (ft/ft)																		
BF Slope (ft/ft)								0.009			0.006			0.008				
Rosgen Classification			E					C-E4/1			C-E4/1			C-E4/2				C-E4/2

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

**Table 8b. Baseline Morphology and Hydraulic Summary**  
**Project Number and Name: 205 – Kentwood Park (Bushy Branch)**  
**Segment Reach: UT to Bushy Branch (350 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
<b>Dimension</b>																		
Bankfull Width (ft)			36.0				6.0	6.3	6.2	10.1	10.5	10.4			8.0			6.5
Floodprone Width (ft)			100				8	8.5	8.25	12.3	23	16.3	12	18				16
Bankfull Cross Sectional Area (ft <sup>2</sup> )			135.8				7.3	8	7.7	8.9	10.9	10.1			5			2.9
Bankfull Mean Depth (ft)			3.8				1.2	1.3	1.25	0.8	1.1	1			0.6			0.4
Bankfull Maximum Depth (ft)			5.5				1.6	1.8	1.7	1.5	1.7	1.6	0.9	1.0	1.0			0.8
Width/Depth Ratio									5	9	12	10.3			12			14.5
Entrenchment Ratio			2.2				1.3	1.4	1.35	1.2	2.2	1.6	1.5	2.2				2.5
Bank Height Ratio							1.8	2.1	1.9									1.0
Wetted Perimeter (ft)																		6.9
Hydraulic Radius (ft)																		0.4
<b>Pattern</b>																		
Channel Beltwidth (ft)							58	105	82	19	49	34	14	38	26			
Radius of Curvature (ft)							42	94	75	12	23.4	15.8	10	18	14			
Meander Wavelength (ft)									490			127			98			
Meander Width Ratio									79			12.2			12.2			
<b>Profile</b>																		
Riffle Length (ft)																		
Riffle Slope (ft/ft)										0.01	0.055	0.032	0.012	0.06	0.03			
Pool Length (ft)										3	14	6.7	2.4	10.4	6.4			
Pool Spacing (ft)										27	43	32	21	33	25			
<b>Substrate</b>																		
d50 (mm)									12			11			12			6.3
d84 (mm)									29			176			29			59
<b>Additional Reach Parameters</b>																		
Valley Length (ft)																		
Channel Length (ft)																		
Sinuosity								1.14			1.2			1.14				
Water Surface Slope (ft/ft)																		
BF Slope (ft/ft)								0.033			0.022			0.024				
Rosgen Classification			E					G4			B4/1			B4/2				B4/2

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

<b>Table 9a. Morphology and Hydraulic Monitoring Summary</b>																		
<b>Project Number and Name: 205 – Kentwood Park (Bushy Branch)</b>																		
<b>Segment Reach: Bushy Branch (1,070 ft.)</b>																		
<b>Parameter</b>	<b>Cross Section 2A</b>						<b>Cross Section 3</b>						<b>Cross Section 4</b>					
	<b>Riffle</b>						<b>Riffle</b>						<b>Pool</b>					
<b>Dimension</b>	<b>MY1</b>	<b>MY2</b>	<b>MY3</b>	<b>MY4</b>	<b>MY5</b>	<b>MY+</b>	<b>MY1</b>	<b>MY2</b>	<b>MY3</b>	<b>MY4</b>	<b>MY5</b>	<b>MY+</b>	<b>MY1</b>	<b>MY2</b>	<b>MY3</b>	<b>MY4</b>	<b>MY5</b>	<b>MY+</b>
Bankfull Width (ft)		26.5	26.0				20.3	21.4	20.8				23.3	23.2	21.6			
Floodprone Width (ft)		43	42				36	38	38				> 44	> 46	>46			
Bankfull Cross Sectional Area (ft <sup>2</sup> )		38.5	37.1				34.6	38.2	38.7				50.8	39.7	42.4			
Bankfull Mean Depth (ft)		1.5	1.4				1.7	1.8	1.9				2.2	1.7	2.0			
Bankfull Maximum Depth (ft)		2.0	2.0				2.3	2.6	2.4				3.2	3.0	3.0			
Width/Depth Ratio		18.2	18.2				11.9	12.0	11.2				10.6	13.6	11.0			
Entrenchment Ratio		1.6	1.6				1.8	1.8	1.8				>1.9	>2.0	>2.0			
Bank Height Ratio		1.0	1.0				1.0	1.0	1.3				1.0	1.0	1.1			
Wetted Perimeter (ft)		27.8	27.6				21.8	23.4	22.5				25.4	25.0	23.6			
Hydraulic Radius (ft)		1.4	1.3				1.6	1.6	1.7				2.0	1.6	1.8			
<b>Substrate</b>																		
d50 (mm)		10	16				15	10	9				18	2	4			
d84 (mm)		41	41				38	35	24				59	32	49			

<b>Table 9b. Morphology and Hydraulic Monitoring Summary</b>												
<b>Project Number and Name: 205 – Kentwood Park (Bushy Branch)</b>												
<b>Segment Reach: UT to Bushy Branch (350 ft.)</b>												
<b>Parameter</b>	<b>Cross Section 1</b>						<b>Cross Section 2</b>					
	<b>Pool</b>						<b>Riffle</b>					
<b>Dimension</b>	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	8.9	8.5	8.5				7.9	8.0	6.8			
Floodprone Width (ft)	20	19	20				14	15	15			
Bankfull Cross Sectional Area (ft <sup>2</sup> )	10.8	9.7	9.4				4.1	3.3	3.3			
Bankfull Mean Depth (ft)	1.2	1.1	1.1				0.5	0.4	0.5			
Bankfull Maximum Depth (ft)	1.8	1.7	1.5				0.9	0.9	0.7			
Width/Depth Ratio	7.4	7.4	7.7				15.2	19.4	14.2			
Entrenchment Ratio	2.2	2.2	2.3				1.7	1.9	2.3			
Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0			
Wetted Perimeter (ft)	10.1	12.1	10.1				8.2	8.2	7.1			
Hydraulic Radius (ft)	1.1	0.8	0.8				0.5	0.4	0.5			
<b>Substrate</b>												
d50 (mm)	30	39	23				30	38	21			
d84 (mm)	82	69	76				56	72	57			



**Table 9c. Morphology and Hydraulic Monitoring Summary continued**

**Project Number and Name: 205 - Kentwood Park (Bushy Branch)**

**Segment Reach: Bushy Branch (1,070 ft.)**

Parameter	MY - 01 (2005)			MY - 02 (2006)			MY - 03 (2007)			MY - 04 (2008)			MY - 05 (2009)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
<b>Pattern</b>															
Channel Beltwidth (ft)	26	83	34	36	93	38	36	93	38						
Radius of Curvature (ft)	60	100	90	32	96	60	32	96	60						
Meander Wavelength (ft)	138	219	194	170	210	195	170	210	195						
Meander Width Ratio	1.6	5.3	2.2	1.2	4.5	2.5	1.5	4.0	1.6						
<b>Profile</b>															
Riffle Length (ft)	9	35	16	9	40	23	6	43	19						
Riffle Slope (ft/ft)	0.008	0.049	0.025	0.003	0.036	0.019	0.002	0.090	0.022						
Pool Length (ft)	13	96	32	8	130	33	3	57	9						
Pool Spacing (ft)	5	103	35	43	136	74	27	144	83						
<b>Additional Reach Parameters</b>															
Valley Length (ft)	845			845			845								
Channel Length (ft)	1,070			1,070			1,070								
Sinuosity	1.27			1.27			1.27								
Water Surface Slope (ft/ft)	0.0080			0.0080			0.0086								
Number of Bankfull Events	0			1			2								
Rosgen Classification	C4			C4			C4								

<b>Table 9d. Morphology and Hydraulic Monitoring Summary continued</b>															
<b>Project Number and Name: 205 - Kentwood Park (Bushy Branch)</b>															
<b>Segment Reach: UT to Bushy Branch (350 ft.)</b>															
<b>Parameter</b>	<b>MY - 01 (2005)</b>			<b>MY - 02 (2006)</b>			<b>MY - 03 (2007)</b>			<b>MY - 04 (2008)</b>			<b>MY - 05 (2009)</b>		
<b>Pattern</b>	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)			N/A			N/A			N/A						
Radius of Curvature (ft)			N/A			N/A			N/A						
Meander Wavelength (ft)			N/A			N/A			N/A						
Meander Width Ratio			N/A			N/A			N/A						
<b>Profile</b>															
Riffle Length (ft)	10	38	15	5	38	11	7	35	13						
Riffle Slope (ft/ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A						
Pool Length (ft)	6	46	10	6	36	10	2	15	6						
Pool Spacing (ft)	13	62	45	5	66	28	20	74	41						
<b>Additional Reach Parameters</b>															
Valley Length (ft)	318			318			318								
Channel Length (ft)	350			350			350								
Sinuosity	1.1			1.1			1.1								
Water Surface Slope (ft/ft)	N/A			N/A			N/A								
Number of Bankfull Events	0			1			2								
Rosgen Classification	B4			B4			B4								

# **Appendix A**

## **Vegetation Data**

## A1 - Vegetation Data Tables

Table A1. Stem counts for each species arranged by plot								
Project Number and Name: 205 – Kentwood Park (Bushy Branch)								
Species	Plot			Initial Totals	Year 1 Totals	Year 2 Totals	Year 3 Totals	Survival %
	1	2	3					
<b>Shrubs</b>								
<i>Ilex verticillata</i>	1	6		16	10	7	7	44%
<i>Euonymus americana</i>	3			6	3	4	3	50%
<i>Lindera benzoin</i>	3			4	4	4	3	75%
<i>Sambucus canadensis</i>				7	3	1	0	0%
<i>Cornus amomum</i>		17	2	34	24	20	19	56%
<i>Alnus serrulata</i>		6	1	14	11	7	7	50%
<b>Trees</b>								
<i>Quercus michauxii</i>	8		12	23	22	20	20	87%
<i>Quercus phellos</i>			5	4	5	5	5	125%
<i>Quercus alba</i>			2	2	2	2	2	100%
<i>Fraxinus pennsylvanica</i>	10			10	11	10	10	100%
<i>Nyssa sylvatica</i>	14			13	13	14	14	108%
<i>Oxydendrum arboreum</i>	3			8	4	3	3	38%
<i>Betula nigra</i>	8	12		18	16	21	20	111%
<i>Cornus florida</i>	1			1	1	1	1	100%
<i>Platanus occidentalis</i>		3		8	4	3	3	38%
<i>Liriodendron tulipifera</i>			4	6	4	4	4	67%
<i>Acer negundo</i>			3	4	4	3	3	75%
<i>Ulmus americana</i>			2	2	2	2	2	100%
<i>Hamamelis virginiana</i>	3			3	1	3	3	100%

### Explanation of Probable Causes of Vegetation Mortality

- The *Euonymus americana* mortality can be attributed to the high foot traffic from the disc golf course or browsing in Vegetation Plot 1. Many paths cross through plot 1 and many plants (planted and unplanted) have been trampled.
- The decrease in *Lindera benzoin* in Plot 1 during Monitoring Year 03, could be attributed the heavy foot traffic through the plot or browsing pressure. The direct cause could not be determined, because the plant was missing.
- One *Cornus amomum* and one *Sambucus canadensis* were not found in Vegetation Plot 2. As stated in previous reports, this vegetation plot is located on a bankfull bench and is subject to frequent flooding, which may have caused the plants to become.
- The dead *Betula nigra* in Plot 2, during Monitoring Year 3, was due to insect damage.
- There is over 100% survival for *Quercus phellos* in Plot 3. This is due to a miscount during the as-built stem count.
- There is also over 100% survival for *Nyssa sylvatica* and *Betula nigra* in plots 1 and 2. This is due to either a miscount during the as-built and first year monitoring stem count or resprouts from the original plantings that had died back.

Table A2. Stem Density By Plot																																								
Project Number and Name: 205 -Kentwood Park (Bushy Branch)																																								
Date : 7/13/07																																								
Crew : B. Roberts																																								
Plot #	Winterberry	<i>Ilex verticillata</i>	Swamp Chestnut Oak	<i>Quercus michauxii</i>	Green Ash	<i>Fraxinus pennsylvanica</i>	Black Gum	<i>Nyssa sylvatica</i>	Witch Hazel	<i>Hamelis virginiana</i>	Sourwood	<i>Oxydendrum arboreum</i>	Hearts-a-busting	<i>Euonymus americana</i>	Spice Bush	<i>Lindera benzoin</i>	River Birch	<i>Betula nigra</i>	Flowering Dogwood	<i>Cornus florida</i>	Elderberry	<i>Sambucus canadensis</i>	Silky Dogwood	<i>Cornus amomum</i>	Sycamore	<i>Platanus occidentalis</i>	Tag Alder	<i>Alnus serrulata</i>	Willow Oak	<i>Quercus phellos</i>	Tulip Poplar	<i>Liriodendron tulipifera</i>	White Oak	<i>Quercus alba</i>	Box Elder	<i>Acer negundo</i>	American Elm	<i>Ulmus americana</i>	Total (Year 2)	Density (Trees/Acre)
1	1	8	10	14	3	3	3	3	3	8	1																											54	2,186	
2	6									12							17	3	6																				44	1,781
3		12																								1	5	4	2	3	2							31	1,255	
																											Streamside Community (Plots 1 and 2)		1,984											
																											Bottomland Hardwood Community (Plot 3)		1,255											

## A2 – Representative Vegetation Problem Area Photos



VP1 - English ivy (*Hedera helix*) on stream bank. Photo taken near Station 10+25. 11/12/07 - MY 03



VP2 - Kudzu (*Pueraria lobata*) along stream bank. Photo taken near Station 19+50. 11/12/07 - MY 03



VP3 - Bare terrace that is void of herbaceous vegetation. Photo taken near Station 11+25. 11/12/07 - MY 03



VP4 - Breakdown of coir matting with bare subsoil exposed on stream bank. Photo taken near Station 02+00. 11/12/07 - MY 03



VP5 - Erosion from path worn into stream bank from pedestrian access to the stream. Photo taken near Station 01+00. 11/12/07 - MY 03



## A4 - Vegetation Monitoring Plot Photos



Vegetation Plot 1 Photo – Taken looking south from the north corner. 7/13/07 - MY 03



Vegetation Plot 1 Supplemental Photo – Taken looking upstream toward the center of the plot from established photo station #3. 7/13/07 - MY 03



Vegetation Plot 2 Photo – Taken looking south from the north corner. 7/13/07 - MY 03



Vegetation Plot 2 Supplemental Photo – Taken looking at center of plot from the top of the right bank across the stream from the vegetation plot. 7/13/07 - MY 03



Vegetation Plot 3 Photo – Taken looking east from the west corner. 7/13/07 - MY 03

# **Appendix B**

## **Geomorphologic Data**

## **B1 – Representative Stream Problem Area Photos**



SP1 - Bank erosion. Photo taken near Station 17+95 on left bank. 11/12/07 - MY 03



SP2 - Back arm scour on arm of J-hook. Photo taken near Station 13+50. 11/12/07 - MY 03



SP3 - Piping through boulders in cross vane. Photo taken near Station 16+00. 11/12/07 - MY 03



SP4 - Scour behind root wads. Photo taken near Station 16+00. 11/12/07 - MY 03



SP5 - Head stones of cross vane fallen into pool with headcutting. Photo taken near Station 2+20. 11/12/07 - MY 03

## B2 –Stream Photo Stations

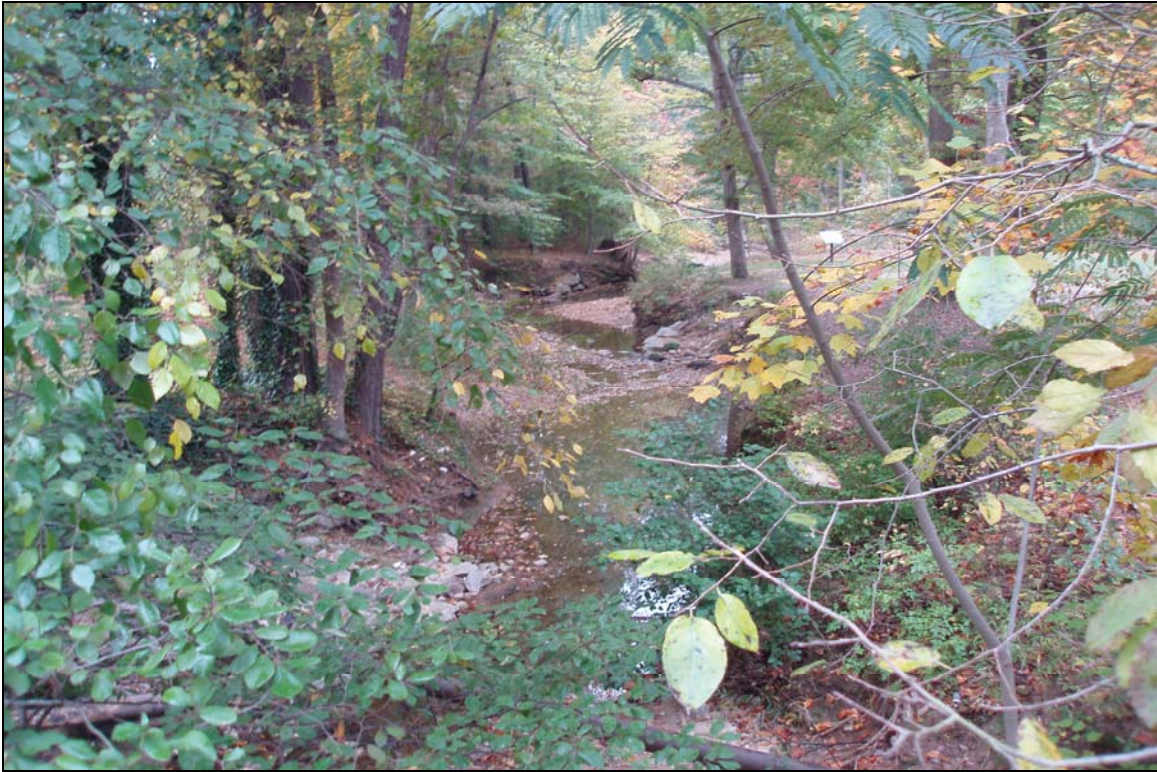


Photo Point 1 – Taken looking downstream from bridge on Kaplan Drive. 11/12/07 - MY 03



Photo Point 1, supplemental – Taken looking downstream from streambed in front of bridge on Kaplan Drive. 11/12/07 - MY 03





Photo Point 2 – Taken looking upstream. 11/12/07 - MY 03



Photo Point 3 – Taken looking upstream. 11/12/07 - MY 03



Photo Point 3 – Taken looking downstream. 11/12/07 - MY 03



Photo Point 4 – Taken looking upstream. 11/12/07 - MY 03



Photo Point 4 – Taken looking downstream. 11/12/07 - MY 03



Photo Point 5 – Taken looking upstream. 11/12/07 - MY 03



Photo Point 5 – Taken looking downstream. 11/12/07 - MY 03



Photo Point 6 – Taken looking upstream. 11/12/07 - MY 03



Photo Point 6 – Taken looking downstream. 11/12/07 - MY 03

## B3 –Qualitative Visual Stability Assessment Table

Table B2. Qualitative Visual Stability Assessment						
Project Number and Name: 205 – Kentwood Park (Bushy Branch)						
Segment/Reach: Bushy Branch (1,070 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?	9	12	N/A	75%	<b>75%</b>
	2. Armor stable (e.g. no displacement)?	9	12	N/A	75%	
	3. Facet grade appears stable?	9	12	N/A	75%	
	4. Minimal evidence of embedding/fining?	9	12	N/A	75%	
	5. Length appropriate?	9	12	N/A	75%	
B. Pools	1. Present? (e.g. no severe aggradation)	11	12	N/A	92%	<b>94%</b>
	2. Sufficiently deep (Dmax pool:Mean Bkf > 1.6?)	11	12	N/A	92%	
	3. Length appropriate?	10	12	N/A	83%	
C. Thalweg	1. Upstream of meander bend centering?	6	8	N/A	75%	<b>75%</b>
	2. Downstream of meander centering?	6	8	N/A	75%	
D. Meanders	1. Outer bend in state of limited/controlled erosion?	6	8	N/A	75%	<b>81%</b>
	2. Of those eroding, # w/ concomitant point bar formation?	2	2	N/A	100%	
	3. Apparent Rc within spec?	8	8	N/A	100%	
	4. Sufficient floodplain access and relief?	5	8	N/A	63%	
E. Bed General	1. General channel bed aggradation areas (bar formation)	N/A	N/A	0/0	100%	<b>100%</b>
	2. Channel bed degradation - areas of increasing down cutting or head cutting?	N/A	N/A	0/0	100%	
F. Bank	1. Actively eroding, wasting, or slumping bank	N/A	N/A	7/150	93%	<b>93%</b>
G. Vanes	1. Free of back or arm scour?	10	17	N/A	59%	<b>82%</b>
	2. Height appropriate?	15	17	N/A	88%	
	3. Angle and geometry appear appropriate?	15	17	N/A	88%	
	4. Free of piping or other structural failures?	16	17	N/A	94%	
H. Wads / Boulders	1. Free of scour?	1	2	N/A	50%	<b>50%</b>
	2. Footing stable?	1	2	N/A	50%	

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

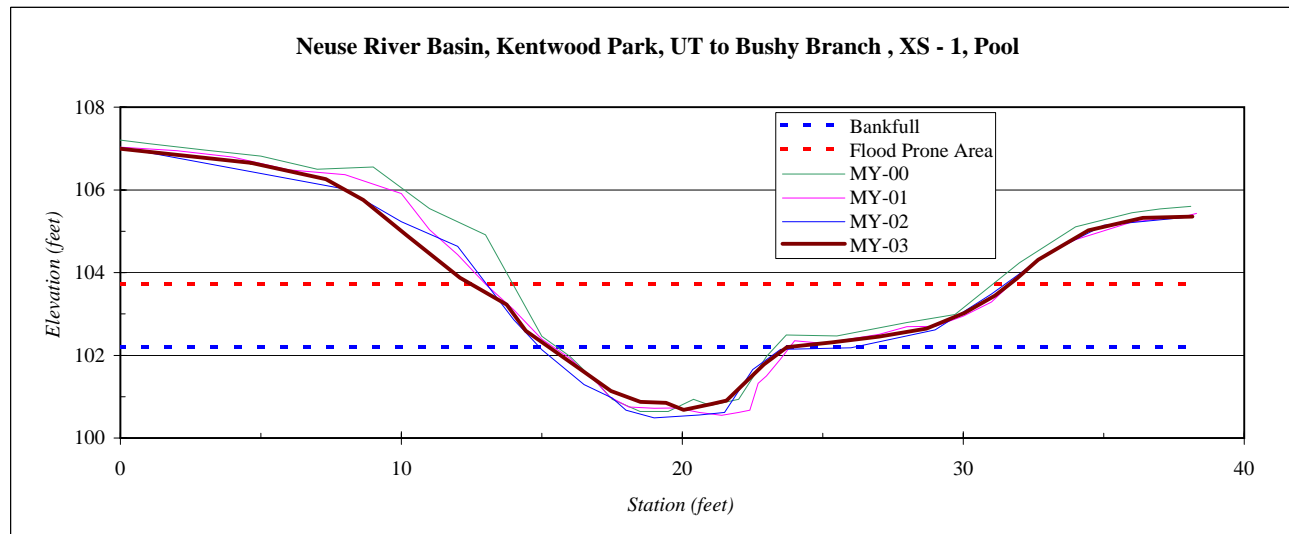
Monitoring Year 03 documented fewer problem areas than the previous year's monitoring. Many of the streambanks that had been eroding in previous years have become stabilized by vegetation, or even if they did not have vegetation covering them, they did not appear to be actively eroding. Some bed instability was apparent during the annual stream assessment. This was evident in a few areas where the features had adjusted their length and appeared to still be undergoing adjustment.

## B4 - Cross Section Plots

<b>River Basin:</b>	Neuse
<b>Watershed:</b>	Kentwood Park, UT to Bushy Branch
<b>XS ID</b>	XS - 1, Pool
<b>Drainage Area (sq mi):</b>	0.06
<b>Date:</b>	7/10/2007
<b>Field Crew:</b>	B. Roberts, C. Wolf

Station	Elevation
0.0	106.99
4.6	106.66
7.3	106.26
8.6	105.76
10.2	104.91
12.1	103.88
13.8	103.22
14.4	102.59
16.3	101.68
17.5	101.14
18.5	100.87
19.4	100.85
20.1	100.68
21.0	100.82
21.6	100.91
22.9	101.78
23.7	102.20
25.3	102.32
27.0	102.45
28.7	102.65
30.0	103.02
31.1	103.44
31.9	103.86
32.7	104.31
34.5	105.02
36.4	105.32
38.2	105.35

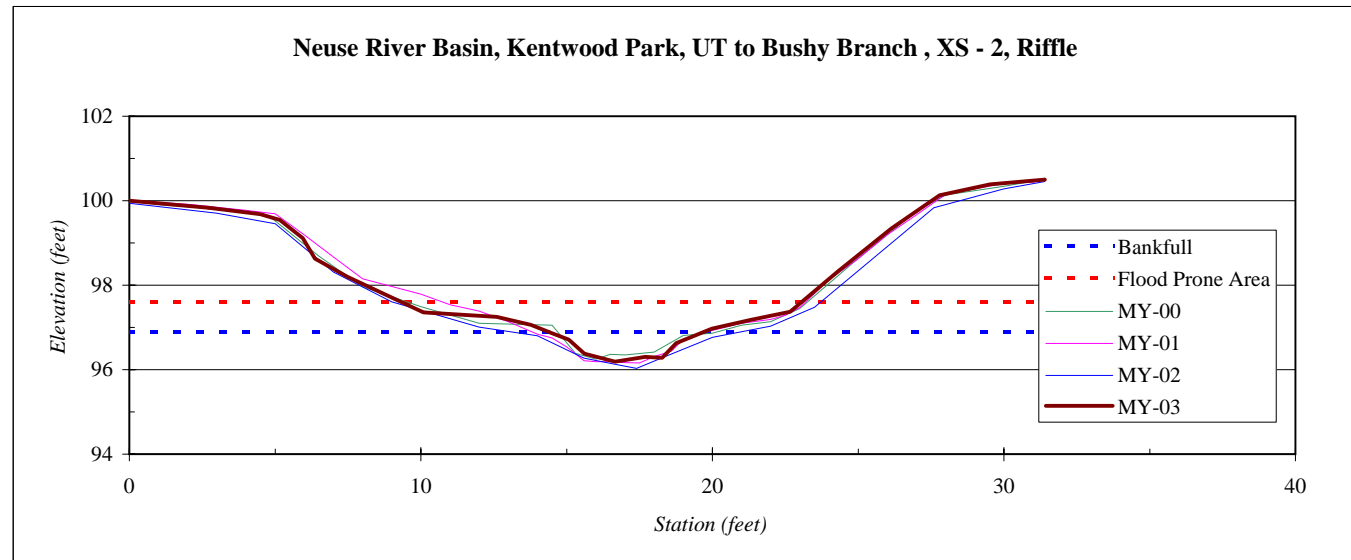
SUMMARY DATA	
<b>Bankfull Elevation:</b>	102.2
<b>Bankfull Cross-Sectional Area:</b>	9.4
<b>Bankfull Width:</b>	8.5
<b>Flood Prone Area Elevation:</b>	103.7
<b>Flood Prone Width:</b>	20
<b>Max Depth at Bankfull:</b>	1.5
<b>Mean Depth at Bankfull:</b>	1.1
<b>W / D Ratio:</b>	7.7
<b>Entrenchment Ratio:</b>	2.3
<b>Bank Height Ratio:</b>	1.0



<b>River Basin:</b>	Neuse
<b>Watershed:</b>	Kentwood Park, UT to Bushy Branch
<b>XS ID</b>	XS - 2, Riffle
<b>Drainage Area (sq mi):</b>	0.06
<b>Date:</b>	7/10/2007
<b>Field Crew:</b>	B. Roberts, C. Wolf

Station	Elevation
0.0	100.00
2.7	99.84
4.5	99.68
5.2	99.54
6.0	99.12
6.4	98.63
7.5	98.20
10.1	97.36
12.6	97.25
13.8	97.06
14.5	96.85
15.1	96.71
15.6	96.38
16.7	96.19
17.7	96.30
18.3	96.28
18.8	96.63
20.0	96.97
21.3	97.17
22.7	97.37
24.3	98.32
26.1	99.34
27.8	100.13
29.5	100.38
31.4	100.5

SUMMARY DATA	
<b>Bankfull Elevation:</b>	96.9
<b>Bankfull Cross-Sectional Area:</b>	3.3
<b>Bankfull Width:</b>	6.8
<b>Flood Prone Area Elevation:</b>	97.6
<b>Flood Prone Width:</b>	15
<b>Max Depth at Bankfull:</b>	0.7
<b>Mean Depth at Bankfull:</b>	0.5
<b>W / D Ratio:</b>	14.2
<b>Entrenchment Ratio:</b>	2.3
<b>Bank Height Ratio:</b>	1.0



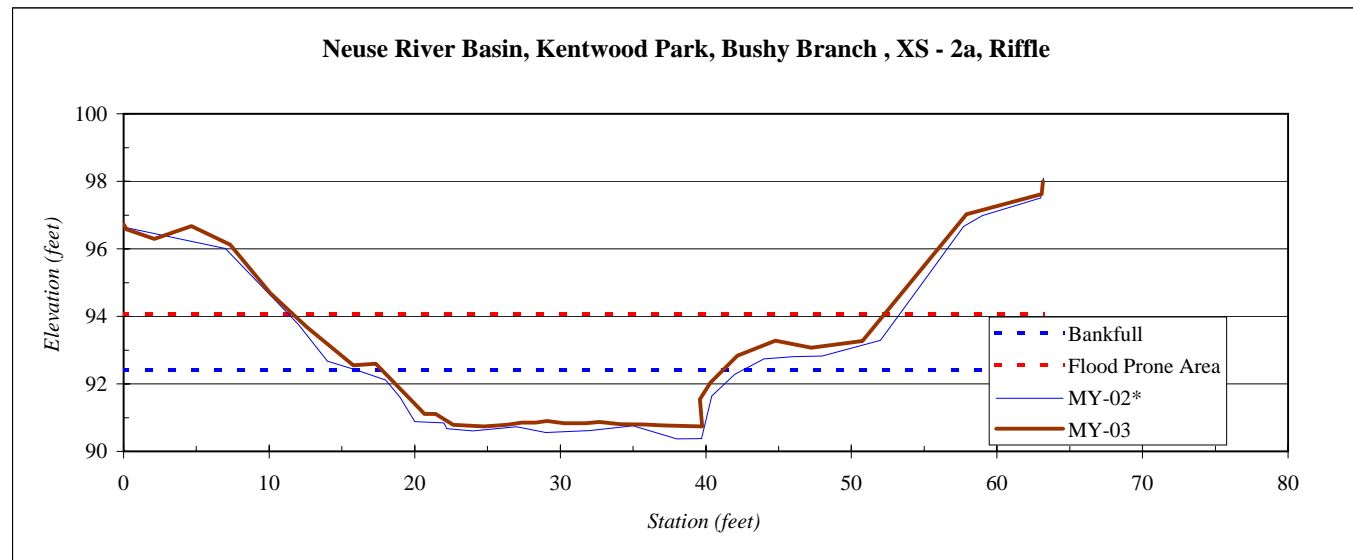


<b>River Basin:</b>	Neuse
<b>Watershed:</b>	Kentwood Park, Bushy Branch
<b>XS ID</b>	XS - 2a, Riffle
<b>Drainage Area (sq mi):</b>	1.27
<b>Date:</b>	7/11/2007
<b>Field Crew:</b>	B. Roberts, C. Wolf



Station	Elevation
0.0	96.73
0.2	96.58
2.1	96.30
4.7	96.67
7.3	96.13
10.1	94.70
12.6	93.68
15.8	92.55
17.3	92.60
20.4	91.24
20.7	91.11
21.4	91.11
22.6	90.78
24.8	90.74
26.3	90.79
27.4	90.85
28.3	90.85
29.1	90.90
30.3	90.84
31.7	90.84
32.7	90.87
34.1	90.80
35.8	90.80
37.2	90.77
39.7	90.74
39.6	91.55
40.3	92.03
42.2	92.84
44.8	93.28
47.2	93.07
50.8	93.27
57.9	97.02
63.1	97.62
63.2	98.00

SUMMARY DATA	
<b>Bankfull Elevation:</b>	92.4
<b>Bankfull Cross-Sectional Area:</b>	37.1
<b>Bankfull Width:</b>	26.0
<b>Flood Prone Area Elevation:</b>	94.1
<b>Flood Prone Width:</b>	42
<b>Max Depth at Bankfull:</b>	1.7
<b>Mean Depth at Bankfull:</b>	1.4
<b>W / D Ratio:</b>	18.2
<b>Entrenchment Ratio:</b>	1.6
<b>Bank Height Ratio:</b>	1.0



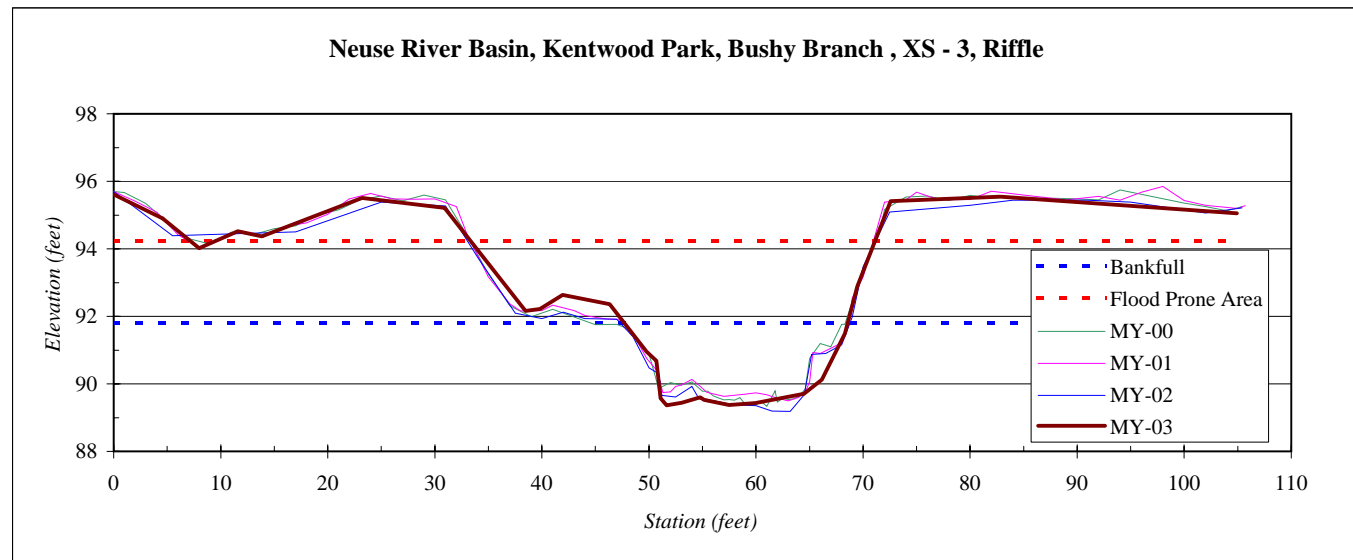
\*Supplemental Cross Section, installed MY02

<b>River Basin:</b>	Neuse
<b>Watershed:</b>	Kentwood Park, Bushy Branch
<b>XS ID</b>	XS - 3, Riffle
<b>Drainage Area (sq mi):</b>	1.27
<b>Date:</b>	7/11/2007
<b>Field Crew:</b>	B. Roberts, C. Wolf



Station	Elevation
0.0	95.61
4.6	94.90
8.0	94.02
11.6	94.52
13.9	94.37
23.2	95.51
30.9	95.21
38.5	92.16
39.8	92.22
41.9	92.64
46.3	92.36
49.8	90.96
50.7	90.68
51.1	89.58
51.7	89.37
53.1	89.44
54.8	89.60
55.1	89.53
57.5	89.37
59.9	89.43
64.5	89.71
66.2	90.12
68.3	91.49
69.5	92.89
72.6	95.41
82.8	95.55
104.9	95.05

SUMMARY DATA	
<b>Bankfull Elevation:</b>	91.8
<b>Bankfull Cross-Sectional Area:</b>	38.7
<b>Bankfull Width:</b>	20.8
<b>Flood Prone Area Elevation:</b>	94.2
<b>Flood Prone Width:</b>	38
<b>Max Depth at Bankfull:</b>	2.4
<b>Mean Depth at Bankfull:</b>	1.9
<b>W / D Ratio:</b>	11.2
<b>Entrenchment Ratio:</b>	1.8
<b>Bank Height Ratio:</b>	1.2



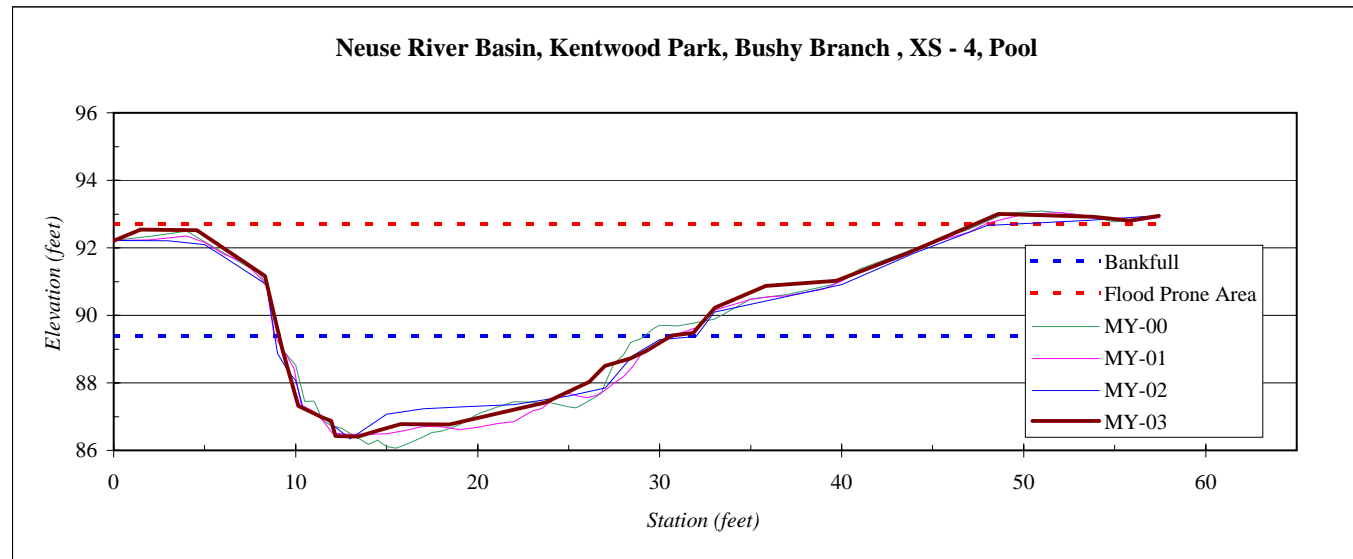
<b>River Basin:</b>	Neuse
<b>Watershed:</b>	Kentwood Park, Bushy Branch
<b>XS ID</b>	XS - 4, Pool
<b>Drainage Area (sq mi):</b>	1.27
<b>Date:</b>	7/11/2007
<b>Field Crew:</b>	B. Roberts, C. Wolf



Station	Elevation
0.0	92.21
1.5	92.54
4.6	92.52
8.3	91.16
8.9	89.90
9.3	89.00
10.1	87.31
11.5	86.98
12.0	86.88
12.2	86.43
13.4	86.41
14.7	86.61
15.8	86.78
18.4	86.77
23.7	87.42
26.1	88.03
27.0	88.50
28.4	88.72
29.2	88.94
30.7	89.40
31.8	89.48
33.0	90.23
35.8	90.87
39.7	91.02
43.6	91.83
48.6	93.01
53.8	92.92
55.8	92.81
57.4	92.95

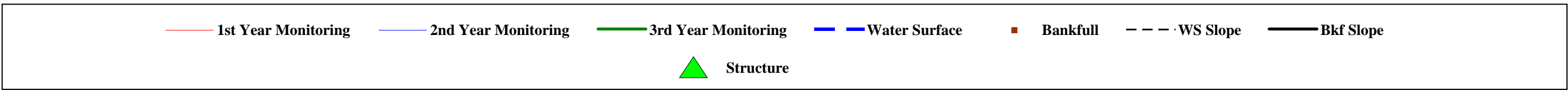
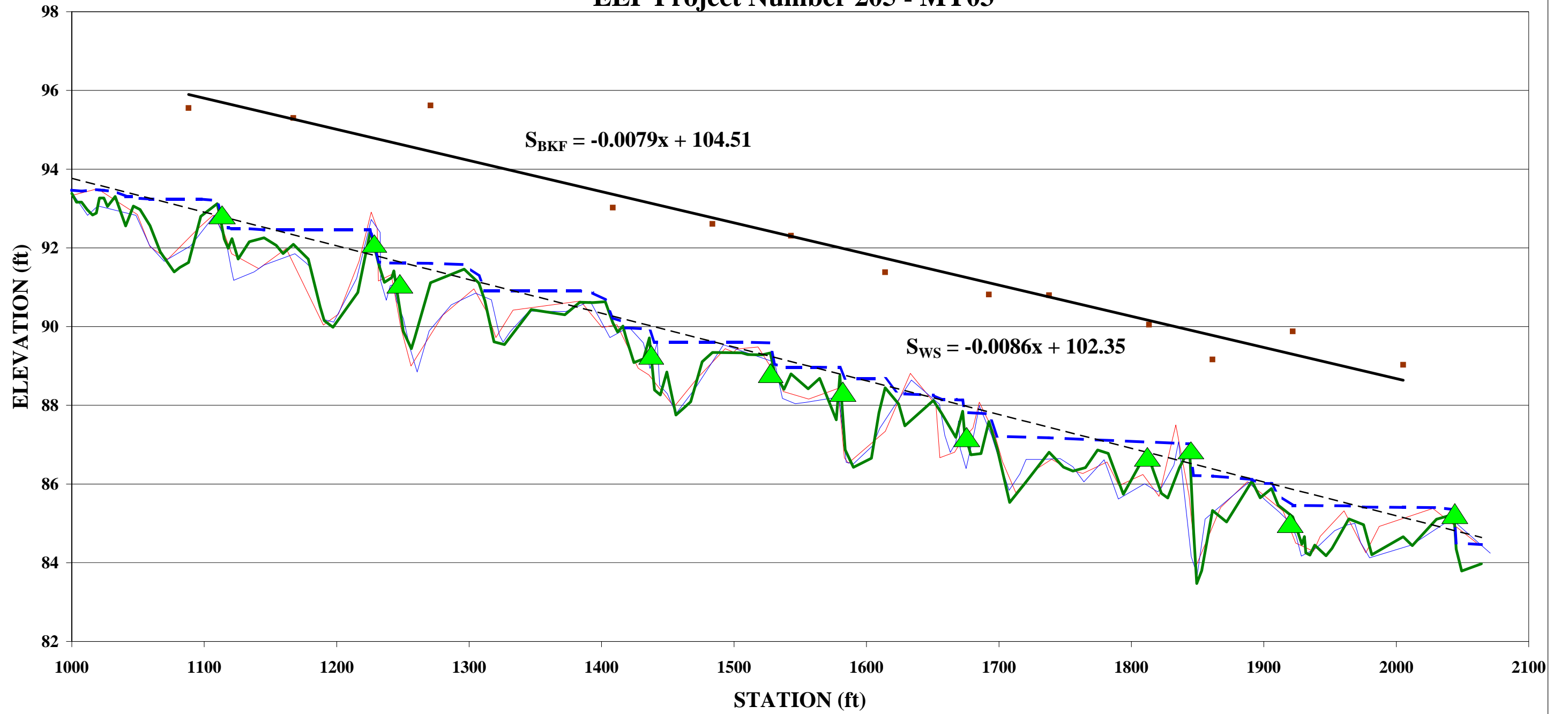
SUMMARY DATA	
<b>Bankfull Elevation:</b>	89.4
<b>Bankfull Cross-Sectional Area:</b>	42.4
<b>Bankfull Width:</b>	21.6
<b>Flood Prone Area Elevation:</b>	92.7
<b>Flood Prone Width:</b>	> 46
<b>Max Depth at Bankfull:</b>	3.0
<b>Mean Depth at Bankfull:</b>	2.0
<b>W / D Ratio:</b>	11.0
<b>Entrenchment Ratio:</b>	> 2.0
<b>Bank Height Ratio:</b>	1.1

Neuse River Basin, Kentwood Park, Bushy Branch , XS - 4, Pool

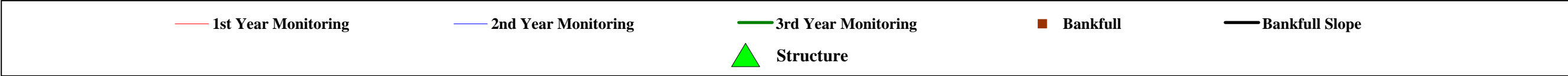


# B5 - Longitudinal Plots

## Longitudinal Profile for Bushy Branch Kentwood Park, Wake County EEP Project Number 205 - MY03



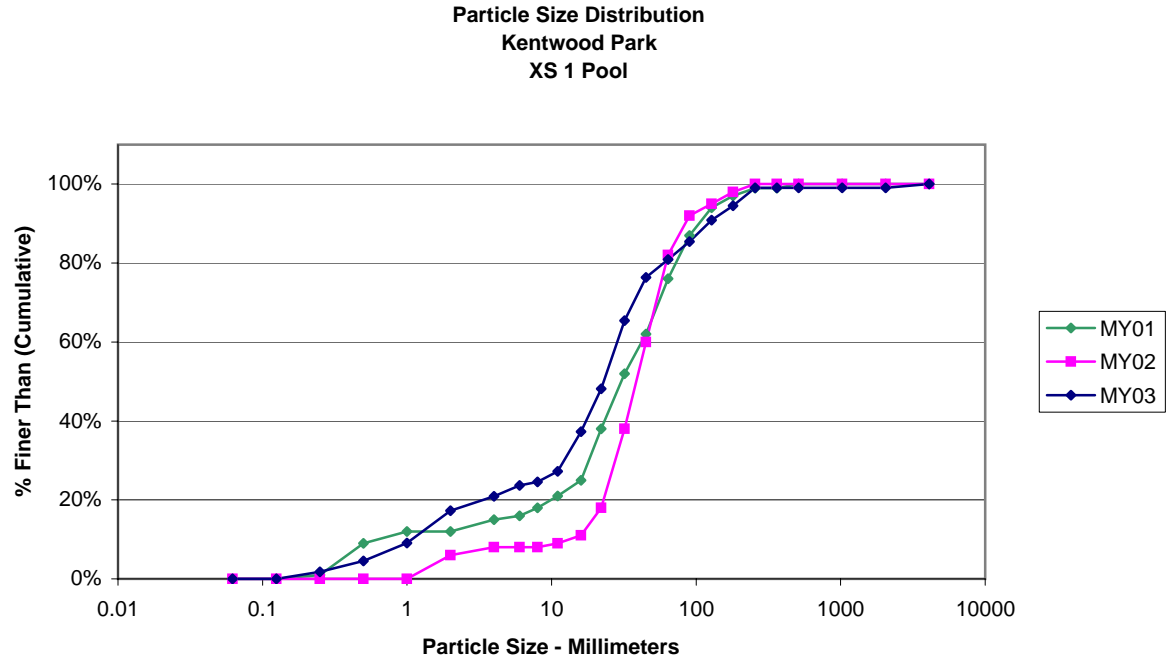
**Longitudinal Profile for UT to Bushy Branch  
Kentwood Park, Wake County  
EEP Project Number 205 - MY03**



\*No Water Surface due to no flow in channel

# B6 - Pebble Count Plots

Cross Section 1 Pool - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	2
Medium	.25 - .50	N	3
Coarse	.50 - 1	D	5
Very Coarse	1 - 2	S	9
Very Fine	2 - 4		4
Fine	4 - 5.7	G	3
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	11
Coarse	16 - 22.6	E	12
Coarse	22.6 - 32	L	19
Very Coarse	32 - 45	S	12
Very Coarse	45 - 64		5
Small	64 - 90	C	5
Small	90 - 128	O	6
Large	128 - 180	B	4
Large	180 - 256	L	5
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	1
		<b>Total</b>	<b>110</b>
Note:			

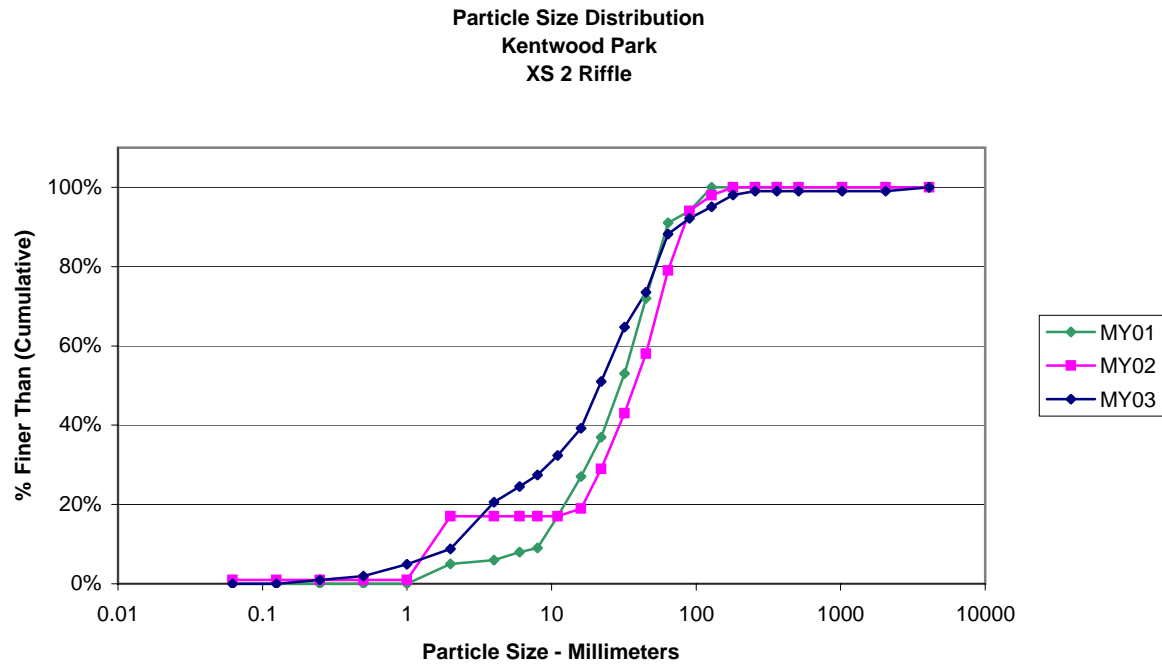


Size (mm)	
D16	1.8
D35	15
D50	23
D65	31
D84	76
D95	170

Size Distribution	
mean	11.7
dispersion	8.0
skewness	-0.23

Type	
silt/clay	0%
sand	17%
gravel	64%
cobble	18%
boulder	0%
bedrock	1%
hardpan	0%
wood/det	0%
artificial	0%

Cross Section 2 Riffle - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	1
Medium	.25 - .50	N	1
Coarse	.50 - 1	D	3
Very Coarse	1 - 2	S	4
Very Fine	2 - 4		12
Fine	4 - 5.7	G	4
Fine	5.7 - 8	R	3
Medium	8 - 11.3	A	5
Medium	11.3 - 16	V	7
Coarse	16 - 22.6	E	12
Coarse	22.6 - 32	L	14
Very Coarse	32 - 45	S	9
Very Coarse	45 - 64		15
Small	64 - 90	C	4
Small	90 - 128	O	3
Large	128 - 180	B	3
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	1
		<b>Total</b>	102
Note:			

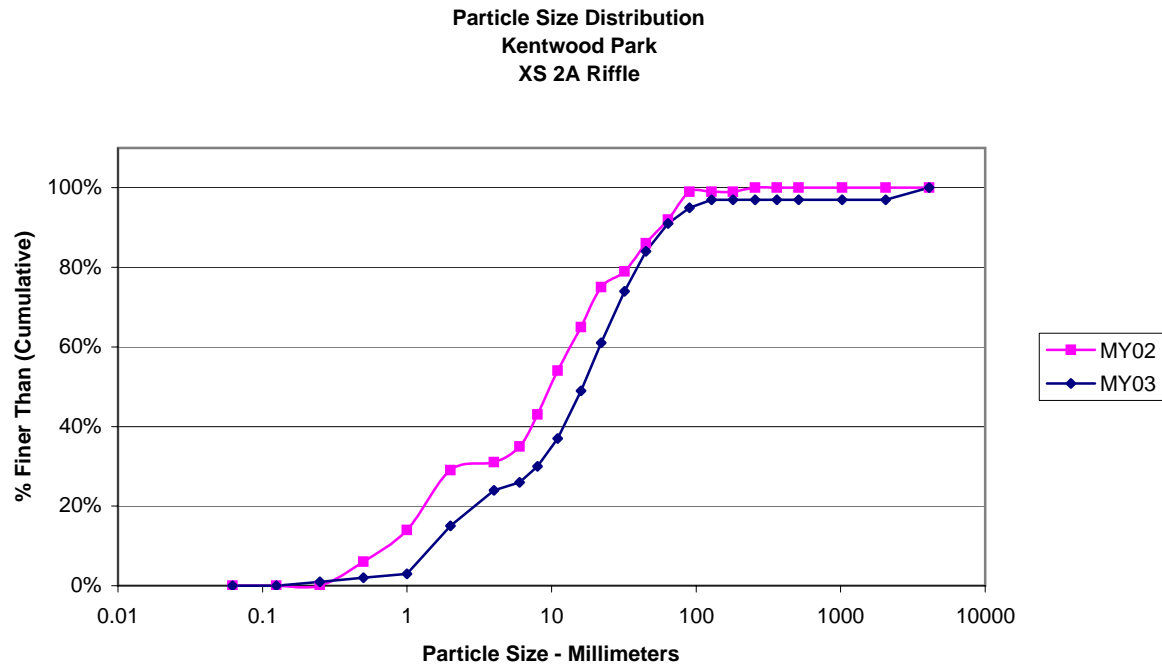


Size (mm)	Count
D16	3
D35	12
D50	21
D65	32
D84	57
D95	110

Size Distribution	
mean	13.1
dispersion	4.9
skewness	-0.18

Type	
silt/clay	0%
sand	9%
gravel	79%
cobble	11%
boulder	0%
bedrock	1%
hardpan	0%
wood/det	0%
artificial	0%

Cross Section 2A Riffle - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	1
Medium	.25 - .50	N	1
Coarse	.50 - 1	D	1
Very Coarse	1 - 2	S	12
Very Fine	2 - 4		9
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	4
Medium	8 - 11.3	A	7
Medium	11.3 - 16	V	12
Coarse	16 - 22.6	E	12
Coarse	22.6 - 32	L	13
Very Coarse	32 - 45	S	10
Very Coarse	45 - 64		7
Small	64 - 90	C	4
Small	90 - 128	O	2
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	3
		<b>Total</b>	100
Note:			



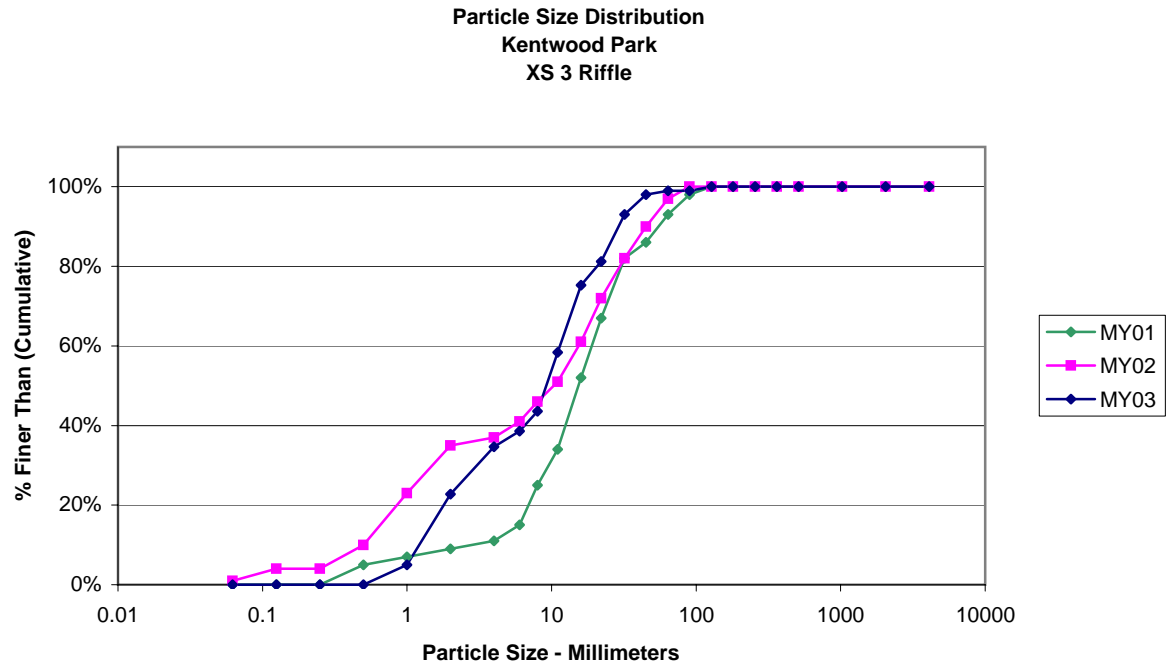
Size (mm)	
D16	2.1
D35	9.6
D50	16
D65	23
D84	41
D95	71

Size Distribution	
mean	9.3
dispersion	5.1
skewness	-0.21

Type	
silt/clay	0%
sand	15%
gravel	76%
cobble	6%
boulder	0%
bedrock	3%
hardpan	0%
wood/det	0%
artificial	0%



Cross Section 3 Riffle - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	5
Very Coarse	1 - 2	S	18
Very Fine	2 - 4		12
Fine	4 - 5.7	G	4
Fine	5.7 - 8	R	5
Medium	8 - 11.3	A	15
Medium	11.3 - 16	V	17
Coarse	16 - 22.6	E	6
Coarse	22.6 - 32	L	12
Very Coarse	32 - 45	S	5
Very Coarse	45 - 64		1
Small	64 - 90	C	
Small	90 - 128	O	1
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	101
Note:			

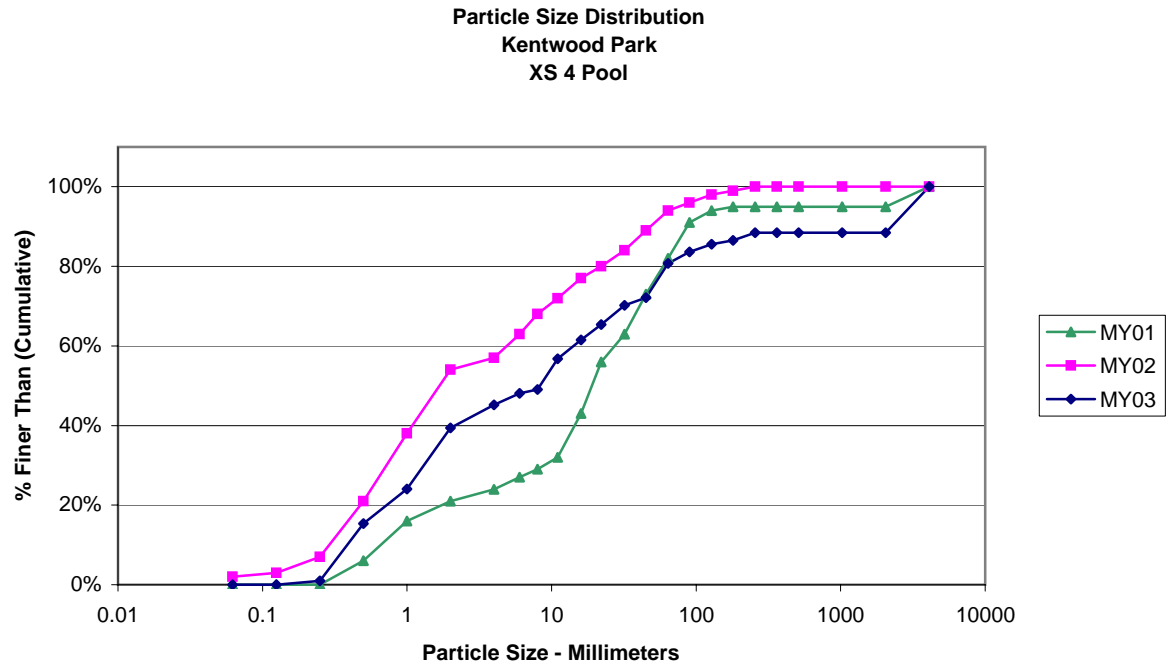


Size (mm)	
D16	1.5
D35	4.1
D50	9.2
D65	13
D84	24
D95	37

Size Distribution	
mean	6.0
dispersion	4.4
skewness	-0.17

Type	
silt/clay	0%
sand	23%
gravel	76%
cobble	1%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross Section 4 Pool - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	1
Medium	.25 - .50	N	15
Coarse	.50 - 1	D	9
Very Coarse	1 - 2	S	16
Very Fine	2 - 4		6
Fine	4 - 5.7	G	3
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	8
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	4
Coarse	22.6 - 32	L	5
Very Coarse	32 - 45	S	2
Very Coarse	45 - 64		9
Small	64 - 90	C	3
Small	90 - 128	O	2
Large	128 - 180	B	1
Large	180 - 256	L	2
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	12
		<b>Total</b>	104
Note:			



Size (mm)	
D16	0.47
D35	1.4
D50	3.6
D65	12
D84	49
D95	97

Size Distribution	
mean	4.8
dispersion	10.6
skewness	0.09

Type	
silt/clay	0%
sand	39%
gravel	41%
cobble	8%
boulder	0%
bedrock	12%
hardpan	0%
wood/det	0%
artificial	0%

# **Appendix C**

## **Current Conditions Plan View**

