

**Dog Bite Stream Restoration Site
Monitoring Report – MY02
Mitchell County, NC
Basin 06010108 - Contract # D06056-A**



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TABLE OF CONTENTS

1.0	PROJECT BACKGROUND.....	1
1.1	Project Location	1
1.2	Project Goals and Objectives	1
1.3	Project Structure, Restoration Type, and Approach	1
2.0	PROJECT CONDITIONS AND MONITORING RESULTS.....	7
2.1	Vegetation Assessment	7
2.2	Stream Assessment	8
2.2.1	Bankfull Events.....	8
2.2.2	Quantitative Measures Summary Tables	9

LIST OF TABLES

Table 1.	Project Components	4
Table 2.	Project Activity and Reporting History	6
Table 3.	Project Contact Table.....	6
Table 4.	Project Background Table.....	7
Table 5.	Verification of Bankfull Events	8
Table 6.	Baseline Stream Summary	9
Table 7.	Morphology and Hydraulic Monitoring Summary	12

LIST OF FIGURES

Figure 1.	Vicinity Map	3
Figure 2.	Site Map	5

APPENDIX A – VEGETATION DATA

A1.	Vegetation Data	16
A2.	Vegetation Monitoring Plot Photos	18

APPENDIX B – GEOMORPHOLOGIC DATA

B1.	Stream Photos	23
B2.	Cross-Section Plots	32
B3.	Longitudinal Profile	42
B4.	Pebble Count Data	50

APPENDIX C – CURRENT CONDITIONS PLAN VIEW

C1.	Current Conditions Plan View	60
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EXECUTIVE SUMMARY

The Dog Bite Site (DBS) is located in the Blue Ridge physiographic province in central Mitchell County, North Carolina. The project will provide mitigation for stream impacts within the 8-digit hydrologic cataloging unit 06010108 in the French Broad River Basin by restoring and enhancing 3,707 linear feet on the DBS, generating 3,335 stream mitigation units (SMU's.) The goals of the project include restoring the stream's riparian buffer and creating a stable stream system. In order to reach these goals, the project objectives included planting a functional Montane Alluvial Forest community along with Montane Oak-Hickory Forest to create an effective riparian buffer, removing livestock from the riparian areas with fencing, stopping bank erosion by developing the appropriate channel dimension, arresting bed elevation lowering, creating in-stream habitat by restoring a profile with defined pools and adding woody debris habitat structures, and removing a livestock waste pond previously adjacent to the stream. This report describes the results from the second year of monitoring that took place in 2011.

The project generally flows from east to west and has a contributing drainage area of approximately 0.54 square mile. The project is made up of the headwaters of White Oak Creek, including the main stem of White Oak Creek (WOC) and two tributaries (UT1 and UT2). The project watershed is rural and faces low development pressure from the surrounding area. The stream design and the restoration plan were completed in July 2008 and construction began in August 2009 and ended in September 2009.

The site was planted with bare root trees and shrubs and live stakes in December 2009. A total of 19 different species were planted at the site. Seven vegetation monitoring plots were established during the as-built survey. The riparian vegetation must meet a minimum survival success rate of 260 stems/acre after five years. The plots were monitored following the CVS-EEP monitoring protocol and the second-year monitoring counted an average of 422 stems/ acre. Isolated invasive species, most notably multiflora rose (*Rosa multiflora*), were noted in the restored stream buffer and will be controlled over the course of the monitoring period. The second-year monitoring found the vegetation component of the project to be on track to meeting the success criterion.

The stream restoration included eight separate reaches, which have each been enhanced or restored based on a combination of Priority 2 and 3 approaches. Log cross vanes, log step pools, and log j-hooks were used to control grade and create feature diversity throughout the profile. The streams were restored to a B/C3, stream type. The second year of monitoring found the project streams to be functioning as designed. Without any large rain events in 2011, the stream came close to bankfull on several occasions, but did not have a bankfull event.

1.0 PROJECT BACKGROUND

1.1 Project Location

The Dog Bite Site is located at the end of Wilson Dairy Road in central Mitchell County, North Carolina (Figure 1). The project is centered at approximately 35.9956 degrees north and -82.1302 degrees west (WGS84). To reach the site from Raleigh, begin by proceeding west on I-40 for approximately 200 miles. Then take Exit 86 for NC-226 toward Shelby/Marion. Take a right onto NC-226, traveling north. Follow NC-226 through Marion and Spruce Pine. Just before reaching Bakersville, make a right onto White Oak Road. Follow White Oak Road for approximately 1.5 miles and then make a left onto Wilson Dairy Road. The road will dead end at the Wilson property and the site is on the left. Due to the close proximity of the landowner's residence to the property, the landowner has asked to be contacted before any site visits are made.

1.2 Project Goals and Objectives

Restoration Goals:

- Restore the stream's riparian buffer.
- Create a stable network of headwater streams.

Restoration Objectives:

- Plant a functional Montane Alluvial Forest community along with a Montane Oak-Hickory Forest to create an effective riparian buffer.
- Arrest bed elevation lowering and stream widening.
- Create in-stream habitat by restoring a profile with defined pools and adding woody debris habitat structures.
- Stop bank erosion by developing the appropriate channel dimension and by stabilizing with vegetation.
- Remove the livestock waste pond adjacent to the stream.
- Exclude livestock from the riparian areas with fencing.

1.3 Project Structure, Restoration Type, and Approach

The project streams had become degraded primarily through poor grazing management, vegetation removal, and channelization. Historically, the site was cleared and converted into pasture except for isolated, narrow strips of riparian vegetation along the streams. White Oak Creek (WOC) was also channelized to go around two ponds. Prior to restoration, many of the project streams were experiencing severe bank erosion and bed degradation. Restoration and enhancement of 3,707 linear feet of channel was accomplished utilizing a combination of Priority 2 and 3 approaches (Table 1). WOC-1 (Station 10+00 to 12+54) was enhanced by grading back the existing eroding banks, narrowing over-widened portions of the channel, building a bankfull bench, and developing distinct riffles and pools with step pool structures. Many of the existing trees on the left bank of this reach were left intact. The restoration of WOC-2 (Station 12+70 to 19+50) established stable riffle and pool features with in-stream structures and created a new stable planform, moving the stream away from the constructed pond berm. WOC-3 (Station 19+50 to 22+69) was enhanced by grading back the existing eroding banks, narrowing over-widened portions of the channel, building a bankfull bench, and developing distinct riffle and pools with step pool structures. Many of the existing trees in the middle portion of this reach were left intact. The restoration of WOC-4 (Station 22+85 to 36+35) established stable riffle and pool features with in-stream structures and created a new stable planform. This reach was also moved away from a constructed pond berm (a dairy holding pond closed as a part of this project in May 2009) on the left bank of the top portion of this reach. The reach receives drainage from barns

that support a small number of livestock. A water detention structure was built to receive this drainage and hold it before it flows into WOC. WOC-5 (Station 36+35 to 40+82) is the last reach of WOC and was enhanced by grading back the existing eroding banks, narrowing over-widened portions of the channel, building a bankfull bench, and developing distinct riffles and pools with step pool and log vane structures. Throughout most of this reach, one of the two stream banks was left intact where there were mature trees.

The two tributaries to WOC were also restored or enhanced. UT1 is divided into two reaches. Reach UT1-1 (Station 50+00 to 50+97) was enhanced by grading back the existing eroding banks, building a bankfull bench, and developing distinct riffles and pools with a step pool for grade control. Mature trees surround this reach until the beginning of UT1-2 (Station 50+97 to 54+45). The restoration of UT1-2 returned the stream to its natural valley position and established stable riffle and pool features with in-stream structures and created a new stable planform. The last project reach is the second tributary, UT2 (Station 60+00 to 62+45), an intermittent stream that had been historically straightened. This reach was restored by developing stable riffle and pool features with step pool structures and creating a new stable planform.

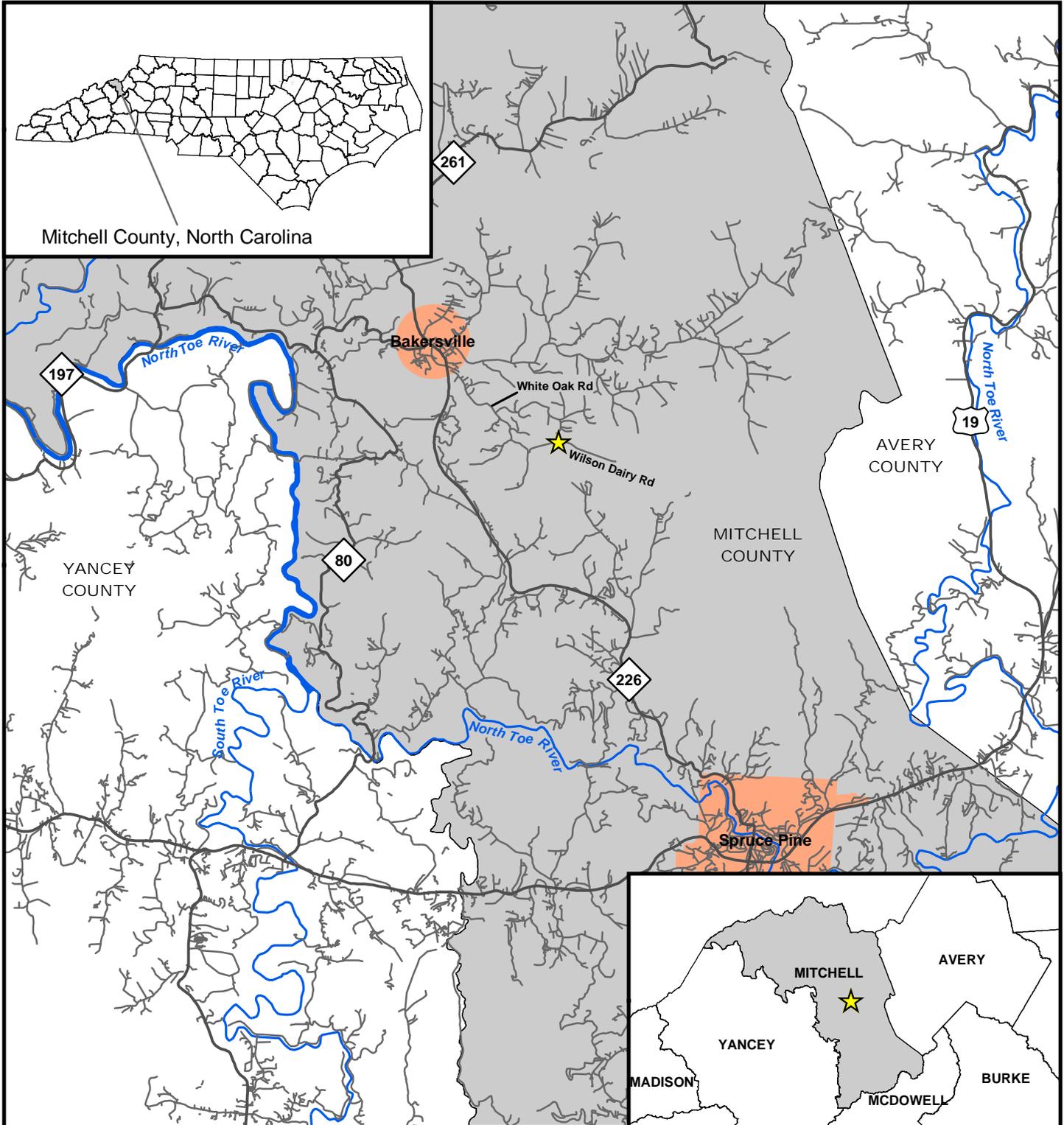


Figure 1. Vicinity Map

- ★ Project Site Location
- Major Roads
- Other Roads
- ~ Major Rivers
- Cities and Towns



1:126,720
1 inch = 2 miles



Table 1. Project Components Dog Bite Stream Restoration Site									
Project Component or Reach ID	Existing Feet	Restoration Level	Approach	Restored / Enhanced Footage	Stationing	Mitigation Ratio	Mitigation Units	BMP Elements	Comment
WOC-1	254	EI	-	253	10+00 - 12+53	1.5 : 1	169	-	Regraded eroding banks and created bankfull benches, created distinct riffles and pools, and installed in-stream grade control and habitat structures.
WOC-2	633	R	P2/3	663	12+70 - 19+50	1 : 1	663	-	Adjusted planform, created stable cross-section with bankfull bench and a profile with distinct riffles and pools, and installed in-stream structures. A 15' easement exception in the middle of the reach has been excluded from the project length.
WOC-3	349	EI	-	317	19+51 - 22+68	1.5 : 1	211	-	Regraded eroding banks and created bankfull benches, created distinct riffles and pools, and installed in-stream grade control and habitat structures.
WOC-4	1,374	R	P2/3	1,332	22+85 - 36+34	1 : 1	1,332	Water Quality Detention Structure	Adjusted planform, created stable cross-section with bankfull bench and a profile with distinct riffles and pools, and installed in-stream structures. A 15' easement exception in the middle of the reach has been excluded from the project length.
WOC-5	458	EI	-	447	36+35 - 40+82	1.5 : 1	298	-	Regraded eroding banks and created bankfull benches, created distinct riffles and pools, and installed in-stream grade control and habitat structures.
T1-1	95	EI	-	96	50+00 - 50+96	1.5 : 1	64	-	Regraded eroding banks and created bankfull benches, created distinct riffles and pools, and installed in-stream grade control and habitat structures.
T1-2	336	R	P2/3	331	50+97 - 54+45	1 : 1	331	-	Adjusted planform, created stable cross-section with bankfull bench and a profile with distinct riffles and pools, and installed in-stream structures. A 15' easement exception in the middle of the reach has been excluded from the project length.
T2	219	R	P2/3	245	60+00 - 62+45	1 : 1	245	-	Adjusted planform, created stable cross-section with bankfull bench and a profile with distinct riffles and pools and installed in-stream structures
Totals	3,718			3,684			3,313		Note: The discrepancy between the existing and project footage is due to a highly detailed existing conditions survey of an unstable thalweg.

EI = Enhancement I P2/3 = Combination of Priority 2 and 3

R = Restoration

Note: 15'-wide easement exceptions on WOC-2, WOC-4, and T2 have been excluded from the restored/enhanced footage and mitigation unit calculations.

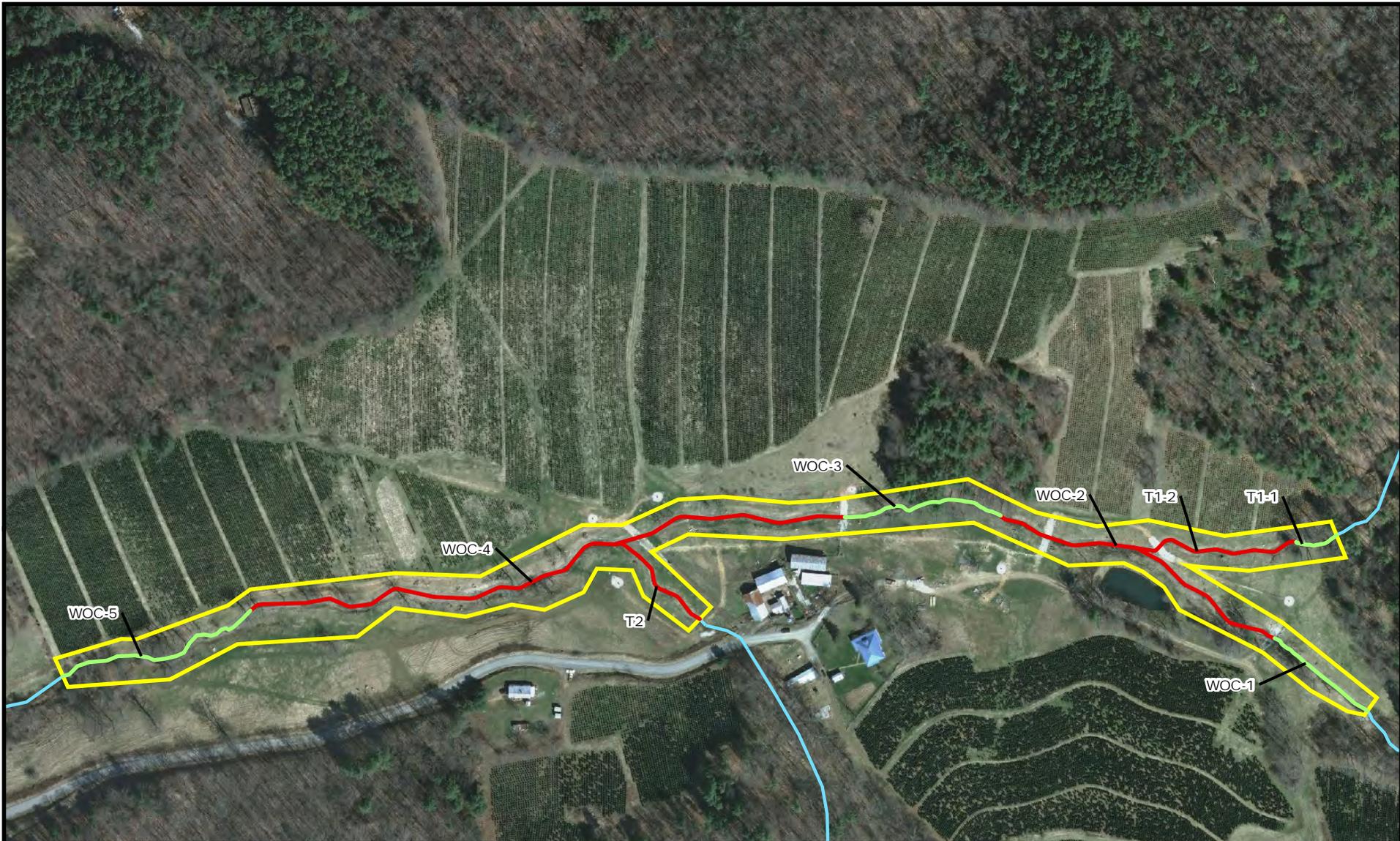


Figure 2. Site Map

-  Project Easement Boundary
-  Enhancement I Reach
-  Restoration Reach
-  Other Streams

Source: NC Statewide Orthoimagery, 2010.



1:3,600
1 inch = 300 feet



Table 2. Project Activity and Reporting History		
Dog Bite Stream Restoration Site		
Activity or Report	Data Collection Complete	Completion or Delivery
Restoration Plan	2007/2008	Jul 08
Final Design	-	Feb 09
Construction	-	Sep 09
Planting	-	Dec 09
As-Built / Baseline Monitoring (Year 0)	Oct 09 / Mar 10	Apr 10
First Year Monitoring	Oct 10	Dec 10
Second Year Monitoring	Oct 11	Dec 11

Table 3. Project Contact Table	
Dog Bite Stream Restoration Site	
Design Firm	KCI Associates of NC, PA Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 783-9214 Fax: (919) 783-9266
Construction Contractors	Land Mechanics, Inc. 126 Circle G Lane Willow Springs, NC 27592 Contact: Mr. Lloyd Glover Phone: (919) 639-6132 Fax: (919) 639-7079
Planting Contractor	Bruton Nurseries & Landscapes 150 Black Creek Rd. Fremont, NC 27830 Contact: Charles Bruton Phone: (919) 242-6555
Monitoring Performers	
MY-00 - MY-05	KCI Associates of NC, PA Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266

Table 4. Project Background Table	
Dog Bite Stream Restoration Site	
Project County	Mitchell County
Physiographic Region	Mountains
Ecoregion	Southern Crystalline Ridges and Mountains
Project River Basin	French Broad
USGS HUC for Project and Reference	06010108040010 (WOC) 03040101090010 (UT Fisher River - reference)
NCDWQ Sub-basin for Project and Reference	04-03-06 (WOC) 03-07-02 (UT Fisher River - reference)
Drainage Area	0.54 sq. mi.
Stream Order	First Order
Watershed Type (Rural, Urban, Developing, etc.)	Rural
Watershed LULC Distribution	Urban <1% Ag-Row Crop 2% Ag-Livestock 17% Forested 80% Water/Wetlands <1%
Watershed impervious cover (%)	<1%
Rosgen Classification of As-built (Stream)	C3b (WOC, T1, T2)
NCDWQ Classification for Project	Class C (WOC)
Within EEP Watershed Plan?	No
Any portion of the project segment upstream of a 303d listed segment?	No
Reasons for 303d Listing or Stressor	N/A
Total project acreage of easement	7.0 Acres
Total planted acreage	5.8 Acres
WRC Class (Warm, Cool, Cold)	Cool, Trout Waters
Species of concern, endangered etc.	None
Pre-construction Beaver activity?	No
Dominant Soil Types	Banadana, Dellwood-Reddies, and Thunder-Saunook
% of Project Easement Fenced	100%

2.0 PROJECT CONDITIONS AND MONITORING RESULTS

2.1 Vegetation Assessment

The survivability of the original planted vegetation has been variable across the site. Overall the site is well vegetated, with some areas of low planted stem density. These areas received supplemental planting in early 2011.

Some scattered populations of invasive species have been identified in the floodplain and surrounding areas. Multiflora rose (*Rosa multiflora*) is the most prominent of these. Spraying to control multiflora rose was again conducted in 2011. There will be additional spraying to control invasive species over the course of the monitoring period. In the future spraying will also target the invasive species burdock (*Articum minus*), which has recently also been found growing in the easement.

The seven monitored vegetation plots were monitored using the Level 2 CVS-EEP vegetation monitoring protocol, which revealed an average planted stem density of 422 stems/acre. There are three monitoring plots (Plots 4, 6, and 7) that have a calculated planted stem density less than 260 stems/acre. These parts

of the site may again receive supplemental planting during the dormant season. Any additional supplemental planting will be reported in next year’s monitoring report. Given the mature trees that still exist on the site, there is a high potential for desirable volunteers to become established across the site. Like natural vegetative communities, some areas will have slightly higher densities than others, but the data from the vegetation monitoring plots reveal that the site has an adequate average stem density. The vegetation assessment found the site to be on track to meeting the vegetative success criteria. The vegetative monitoring results are displayed in Appendix A.

2.2 Stream Assessment

During the 2011 growing season, the project streams have been functioning as designed. Since construction there have been some subtle changes to the profile, with some pools filling in with small gravels and sand and bed lowering at one riffle. These types of adjustment are not problematic and are typical of stream restoration projects immediately following construction. The 2011 profiles and cross-sections show that these initial adjustments have not continued into the second year of monitoring. The onsite stream gauges did not record any bankfull events in 2011.

The stream assessment found the stream to be stable overall, with the structures performing well and as designed.

Additional stream assessment data can be found in Appendix B and the Current Condition Plan View in Appendix C.

2.2.1 Bankfull Events

Table 5. Verification of Bankfull Events			
Dog Bite Stream Restoration Site			
Date of Data Collection	Date of Occurrence	Method	Photo Number
None in 2010 or 2011			

2.2.2 Quantitative Measures Summary Tables

Table 6a. WOC-2 Baseline Stream Summary																	
Dog Bite Stream Restoration Site																	
Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built				
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n	
Bankfull Width (ft)	5.0	6.9	7.3	8.3	3	9.0	9.5		10.0	2	8.6		6.8	7.1	7.4	2	
Floodprone Width (ft)	9	10	10	11	3	13	17		20	2	19		21	24	26	2	
Bankfull Mean Depth (ft)	0.6	0.8	0.9	0.9	3	1.1	1.2		1.2	2	0.7		0.7	0.7	0.7	2	
Bankfull Max Depth (ft)	0.8	1.2	1.3	1.4	3	1.3	1.4		1.5	2	0.9		1.0	1.1	1.2	2	
Bankfull Cross-Sectional Area (ft ²)	4.6	5.4	5.0	6.7	3	10.4	10.6		10.7	2	6.3		4.8	5.2	5.5	2	
Width/Depth Ratio	5.4	9.1	8.0	13.8	3	8.0	9.0		10.0	2	12.3		9.6	9.8	10.0	2	
Entrenchment Ratio	1.2	1.5	1.3	2.1	3	1.3	1.8		2.3	2	2.2		2.8	3.3	3.8	2	
Bank Height Ratio	1.6	2.1	2.0	2.6	3			1.0		2	1.0		1.0	1.0	1.0	2	
Pattern																	
Channel Beltwidth (ft)		21						45			80	140	80		140		
Radius of Curvature (ft)	8			15		13			42		15	30	15	25	30	11	
Rc:Bankfull width (ft/ft)	1			3		1.3			4.4		1.7	3.5	2.1	3.5	4.2		
Meander Wavelength (ft)	32			45		93			136		80	140	80	125	140	7	
Meander Width Ratio	2.5			4.2		4.5			5.0		9.3	16.3	11.3		19.7		
Profile																	
Riffle Length (ft)													19	37	58	13	
Riffle Slope (ft/ft)	0.0301			0.0898		0.013			0.028		0.043	0.074	0.041	0.063	0.098	13	
Pool Length (ft)						3			25		5	8	5	11	20	12	
Pool Spacing (ft)						30			59		25	78	33	53	77	12	
Substrate and Transport Parameters																	
SC% / Sa% / G% / C% / B% / Be%	4% / 26% / 56% / 13% / 1% / 0%					0% / 15% / 78% / 7% / 0% / 0%					0% / 3% / 46% / 50% / 1% / 0%						
d16 / d35 / d50 / d84 / d95 (mm)	0.6 / 6.2 / 12 / 60 / 150					2.0 / 4.2 / 6.9 / 30 / 70					32 / 44 / 65 / 130 / 170						
Additional Reach Parameters																	
Channel length (ft)	633					297					639		663				
Drainage Area (SM)	0.36					0.38					0.36		0.36				
Rosgen Classification	E/B4a					B4c					B4a		C3b				
Sinuosity	1.00					1.20					1.00		1.00				
Water Surface Slope (ft/ft)	0.0617					0.0130					0.0593		0.0631				

Table 6b. WOC-4 Baseline Stream Summary

Dog Bite Stream Restoration Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built				
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n	
Bankfull Width (ft)	9.2	10.0	10.2	10.6	4	9.0	9.5		10.0	2	9.8		8.6	8.9	9.1	3	
Floodprone Width (ft)	12	16	15	21	4	13	17		20	1	20		26	27	28	3	
Bankfull Mean Depth (ft)	0.6	0.7	0.7	0.9	4	1.1	1.2		1.2	2	0.8		0.7	0.8	0.9	3	
Bankfull Max Depth (ft)	0.9	1.2	1.2	1.3	4	1.3	1.4		1.5	2	1.0		1.2	1.3	1.3	3	
Bankfull Cross-Sectional Area (ft ²)	6.4	6.9	6.7	7.9	4	10.4	10.6		10.7	2	7.7		6.2	7.3	8.1	3	
Width/Depth Ratio	10.7	14.8	15.7	17.2	4	8.0	9.0		10.0	2	12.5		9.7	11.0	13.4	3	
Entrenchment Ratio	1.1	1.6	1.6	2.0	4	1.3	1.8		2.3	1	2.0		2.8	3.0	3.3	3	
Bank Height Ratio	1.8	2.8	2.8	3.7	4			1.0		2	1.0		1.0	1.0	1.0	3	
Pattern																	
Channel Beltwidth (ft)	31			80				45			15	40	15		40		
Radius of Curvature (ft)	14			52		13			42		20	40	20	29	40	20	
Rc:Bankfull width (ft/ft)	1.3			5.7		1.3			4.4		2.0	4.1	2.2	3.3	4.5		
Meander Wavelength (ft)	81			244		93			136		95	160	94	128	153	18	
Meander Width Ratio	2.9			8.7		4.5			5.0		1.5	4.1	1.7		4.5		
Profile																	
Riffle Length (ft)													18	44	89	22	
Riffle Slope (ft/ft)	0.041			0.077		0.013			0.028		0.032	0.064	0.027	0.047	0.098	22	
Pool Length (ft)	7			14		3			25		5	16	5	9	30	23	
Pool Spacing (ft)		231				30			59		30	83	33	61	100	23	
Substrate and Transport Parameters																	
SC% / Sa% / G% / C% / B% / Be%	14% / 11% / 39% / 29% / 7% / 0%					0% / 15% / 78% / 7% / 0% / 0%					0% / 1% / 21% / 76% / 2% / 0%						
d16 / d35 / d50 / d84 / d95 (mm)	0.10 / 5.2 / 11 / 120 / 360					2.0 / 4.2 / 6.9 / 30 / 70					55 / 77 / 94 / 150 / 210						
Additional Reach Parameters																	
Channel length (ft)	1,374					297					1,325		1,332				
Drainage Area (SM)	0.50					0.38					0.50		0.50				
Rosgen Classification	G/F4b					B4c					B4a		C3b				
Sinuosity	1.10					1.20					1.10		1.10				
Water Surface Slope (ft/ft)	0.0399					0.0130					0.0405		0.0404				

Table 6c. T1-2 Baseline Stream Summary																
Dog Bite Stream Restoration Site																
Parameter	Pre-Existing Condition*					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	19.5				1	9.0	9.5		10.0	2	6.6		5.5			1
Floodprone Width (ft)	38				1	13	17		20	1	14		21			1
Bankfull Mean Depth (ft)	0.3				1	1.1	1.2		1.2	2	0.5		0.5			1
Bankfull Max Depth (ft)	0.8				1	1.3	1.4		1.5	2	0.6		0.7			1
Bankfull Cross-Sectional Area (ft ²)	6.5				1	10.4	10.6		10.7	2	3.2		3.0			1
Width/Depth Ratio	58.5				1	8.0	9.0		10.0	2	13.6		10.1			1
Entrenchment Ratio	1.9				1	1.3	1.8		2.3	1	2.1		3.8			1
Bank Height Ratio	1.0				1			1.0		2	1.0		1.0			1
Pattern																
Channel Beltwidth (ft)								45			15	30	15		30	
Radius of Curvature (ft)						13			42		10	25	10	18	25	8
Rc:Bankfull width (ft/ft)						1.3			4.4		1.5	3.8	1.8	3.3	4.5	
Meander Wavelength (ft)						93			136		70	105	70	83	105	8
Meander Width Ratio						4.5			5.0		2.3	4.5	2.7		5.5	
Profile																
Riffle Length (ft)													18	26	32	7
Riffle Slope (ft/ft)						0.013			0.028		0.050	0.058	0.051	0.062	0.075	7
Pool Length (ft)						3			25		5	17	2	9	13	7
Pool Spacing (ft)						30			59		35	45	28	40	45	7
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	71% / 29% / 0% / 0% / 0% / 0%					0% / 15% / 78% / 7% / 0% / 0%							3% / 3% / 27% / 61% / 7% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)	0.06 / 0.06 / 0.06 / 0.09 / 0.11					2.0 / 4.2 / 6.9 / 30 / 70							26 / 68 / 90 / 170 / 240			
Additional Reach Parameters																
Channel length (ft)	336					297					336		331			
Drainage Area (SM)	0.08					0.38					0.08		0.08			
Rosgen Classification	B5a					B4c					B4a		C3b			
Sinuosity	1.00					1.20					1.10		1.10			
Water Surface Slope (ft/ft)	0.0601					0.0130					0.0590		0.0613			

* T1-2 was historically filled and only a shallow swale with no discernible bed features or pattern present during the existing conditions survey.

Table 7a. Morphology and Hydraulic Monitoring Summary																		
Dog Bite Stream Restoration Site																		
Parameter	Cross-Section 1						Cross-Section 2						Cross-Section 3					
	Riffle						Pool						Riffle					
Reach	WOC-2						WOC-2						WOC-2					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	6.8	6.4	7.3				9.1	9.6	10.1				7.4	7.4	7.9			
Floodprone Width (ft)	26	29	30				-	-	-				21	22	21			
Bankfull Cross-Sectional Area (ft ²)	4.8	7.1	7.7				12.7	11.9	12.0				5.5	5.4	5.2			
Bankfull Mean Depth (ft)	0.7	1.1	1.1				1.4	1.2	1.2				0.7	0.7	0.7			
Bankfull Max Depth (ft)	1.0	1.6	1.7				2.3	2.0	1.9				1.2	1.2	1.2			
Width/Depth Ratio	9.6	5.8	6.9				-	-	-				10.0	10.1	12.0			
Entrenchment Ratio	3.8	4.5	4.1				-	-	-				2.8	3.0	2.7			
Bank Height Ratio	1.0	1.0	1.0				-	-	-				1.0	1.0	1.0			
Substrate																		
d50 (mm)	51	44	18				9.6	2.7	22				65	15	60			
d84 (mm)	100	87	60				47	50	41				130	120	130			

Table 7b. Morphology and Hydraulic Monitoring Summary continued																		
Dog Bite Stream Restoration Site																		
Parameter	Cross-Section 4						Cross-Section 5						Cross-Section 6					
	Riffle						Pool						Riffle					
Reach	WOC-4						WOC-4						WOC-4					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	9.1	10.7	10.6				11.6	12.3	12.7				8.6	8.5	9.2			
Floodprone Width (ft)	26	27	26				-	-	-				28	29	30			
Bankfull Cross-Sectional Area (ft ²)	6.2	7.2	6.0				16.9	16.7	15.6				7.6	7.7	7.9			
Bankfull Mean Depth (ft)	0.7	0.7	0.6				1.5	1.4	1.2				0.9	0.9	0.9			
Bankfull Max Depth (ft)	1.2	1.2	1.0				2.6	2.6	2.4				1.3	1.4	1.5			
Width/Depth Ratio	13.4	15.9	18.7				-	-	-				9.7	9.4	10.7			
Entrenchment Ratio	2.8	2.5	2.5				-	-	-				3.3	3.4	3.3			
Bank Height Ratio	1.0	1.0	1.0				-	-	-				1.0	1.0	1.0			
Substrate																		
d50 (mm)	94	82	38				0.062	0.062	0.062				100	90	71			
d84 (mm)	150	160	110				0.11	0.15	0.17				150	130	120			

Table 7c. Morphology and Hydraulic Monitoring Summary continued																		
Dog Bite Stream Restoration Site																		
Parameter	Cross-Section 7						Cross-Section 8						Cross-Section 9					
	Riffle						Riffle						Pool					
Reach	WOC-4						T1-2						T1-2					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	9.0	8.5	8.2				5.5	5.8	6.7				6.9	7.1	7.4			
Floodprone Width (ft)	26	26	25				21	27	21				-	-	-			
Bankfull Cross-Sectional Area (ft ²)	8.1	7.0	6.1				3.0	3.3	2.9				6.8	6.2	4.5			
Bankfull Mean Depth (ft)	0.9	0.8	0.7				0.5	0.6	0.4				1.0	0.9	0.6			
Bankfull Max Depth (ft)	1.3	1.1	1.1				0.7	0.9	0.7				1.3	1.6	1.1			
Width/Depth Ratio	10.0	10.3	11.0				10.1	10.2	15.5				-	-	-			
Entrenchment Ratio	2.9	3.1	3.0				3.8	4.6	3.1				-	-	-			
Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0				-	-	-			
Substrate																		
d50 (mm)	90	68	98				90	97	74				0.062	0.062	0.062			
d84 (mm)	130	120	170				170	150	240				0.10	0.062	0.062			

Table 7d. Morphology and Hydraulic Monitoring Summary continued																
Dog Bite Stream Restoration Site																
Reach WOC-2																
Parameter	MY - 01 (2010)			MY - 02 (2011)			MY - 03 (2012)			MY - 04 (2013)			MY - 05 (2014)			
Profile	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	
Riffle Length (ft)	21	42	80	13	32	59										
Riffle Slope (ft/ft)	0.0353	0.0579	0.0984	0.0261	0.0672	0.1076										
Pool Length (ft)	2	7	13	2	6	9										
Pool Spacing (ft)	31	57	122	32	70	159										
Additional Reach Parameters																
Water Surface Slope (ft/ft)	0.0560			0.0533												
Rosgen Classification	C3			C3												

Table 7e. Morphology and Hydraulic Monitoring Summary continued															
Dog Bite Stream Restoration Site															
Reach WOC-4															
Parameter	MY - 01 (2010)			MY - 02 (2011)			MY - 03 (2012)			MY - 04 (2013)			MY - 05 (2014)		
Profile	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max
Riffle Length (ft)	10	45	102	6	31	72									
Riffle Slope (ft/ft)	0.0090	0.0480	0.0902	0.0372	0.0590	0.1091									
Pool Length (ft)	2	8	20	1	7	19									
Pool Spacing (ft)	6	54	100	7	52	145									
Additional Reach Parameters															
Water Surface Slope (ft/ft)	0.0407			0.0403											
Rosgen Classification	C3			C3											

* Pattern measurements will only be taken after MY-00 if it is visually apparent that the pattern has changed.

Table 7f. Morphology and Hydraulic Monitoring Summary continued															
Dog Bite Stream Restoration Site															
Reach T1-2															
Parameter	MY - 01 (2010)			MY - 02 (2011)			MY - 03 (2012)			MY - 04 (2013)			MY - 05 (2014)		
Profile	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max
Riffle Length (ft)	15	27	31	8	22	28									
Riffle Slope (ft/ft)	0.0461	0.0599	0.0744	0.0271	0.0597	0.0962									
Pool Length (ft)	3	9	14	4	10	24									
Pool Spacing (ft)	26	39	44	24	39	51									
Additional Reach Parameters															
Water Surface Slope (ft/ft)	0.0578			0.0571											
Rosgen Classification	C3			C3											

* Pattern measurements will only be taken after MY-00 if it is visually apparent that the pattern has changed.

Appendix A

Vegetation Data

Appendix A1: Vegetation Data

Table A1. Vegetation Metadata Dog Bite Stream Restoration Site							
Report Prepared By	April Helms						
Date Prepared	12/28/2011 8:03						
Database Name	KCI-2011-D.mdb						
Database Location	M:\2006\12065439 - Dog Bite\Veg_Database						
PROJECT SUMMARY -----							
Project Code	Project Name	Description	Length (ft)	Stream-to-Edge Width (ft)	Area (sq m)	Required Plots (calculated)	Sampled Plots
Dog Bite	Dog Bite	This is a Full-Delivery Stream Restoration in Mitchell County, North Carolina	3,707	35	24,116	7	7

Table A1b. Vegetation History (stems/acre) Dog Bite Stream Restoration Site										
Plot Number	MY-00	MY-01	MY-02		MY-03		MY-04		MY-05	
			planted	total	planted	total	planted	total	planted	total
1	809	647	567	647						
2	688	647	850	850						
3	647	567	567	567						
4	567	242	202	202						
5	607	324	445	445						
6	728	202	40	40						
7	567	283	283	324						
Buffer Average			422	439						

Table A2. CVS Stem Count Total and Planted by Plot and Species

Dog Bite Stream Restoration Site

Scientific Name	Common Name	Species Type	Annual Means																																
			Dog Bite-A-0001			Dog Bite-A-0002			Dog Bite-A-0003			Dog Bite-A-0004			Dog Bite-A-0005			Dog Bite-A-0006			Dog Bite-A-0007			MY2 (2011)			MY1 (2010)			MY0 (2010)					
			P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T															
<i>Alnus serrulata</i>	hazel alder	Shrub Tree				2	2	2				1	1	1													3	3	3	3	3	3			
<i>Amelanchier arborea</i>	common serviceberry	Shrub Tree	1	1	1																						1	1	1	1	1	1			
<i>Betula nigra</i>	river birch	Tree				1	1	1																			3	3	3	6	6	6	7	7	7
<i>Calycanthus floridus</i>	eastern sweetshrub	Shrub	1	1	1																						1	1	1	1	1	1	4	4	4
<i>Carpinus caroliniana var. virginiana</i>																																			
<i>Carya alba</i>	mockernut hickory	Tree							1	1	1																1	1	1	1	1	1			
<i>Fraxinus pennsylvanica</i>	green ash	Tree				1																					1								
<i>Hamamelis virginiana</i>	American witchhazel	Shrub Tree				2	2	2							1	1	1										3	3	3	3	3	3			
<i>Ilex verticillata</i>	common winterberry	Shrub Tree				1	1	1																			1	1	1	1	1	1			
<i>Juglans nigra</i>	black walnut	Tree							3	3	3							3	3	3				1	1	1	7	7	7	4	4	4			
<i>Liriodendron tulipifera</i>	tuliptree	Tree	3	3	4	5	5	5	1	1	1	1	1	1	1	1	1				1	1	2	12	12	14	8	8	8						
<i>Nyssa sylvatica</i>	blackgum	Tree	2	2	2				1	1	1										2	2	2	5	5	5	6	6	6						
<i>Platanus occidentalis</i>	American sycamore	Tree	6	6	6																						6	6	6	6	6	6	6	6	6
<i>Quercus sp.</i>	oak	Shrub Tree				2	2	2																			2	2	2	3	3	3	15	15	15
<i>Quercus alba</i>	white oak	Tree	1	1	1				6	6	6	3	3	3	2	2	2	1	1	1	3	3	3	16	16	16	16	16	16	16	16	16	6	6	6
<i>Quercus michauxii</i>	swamp chestnut oak	Tree																															1	1	1
<i>Quercus montana</i>		Tree							2	2	2							2	2	2							4	4	4	3	3	3	5	5	5
<i>Quercus phellos</i>	willow oak	Tree				8	8	8																			8	8	8	8	8	8			
Unknown		unknown																												2	2	2	70	70	70
	Stem count		14	14	16	21	21	21	14	14	14	5	5	5	11	11	11	1	1	1	7	7	8	73	73	76	72	72	73	114	114	114			
	size (ares)		1			1			1			1			1			1			7			7			7								
	size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.17			0.17			0.17								
	Species count		6	6	7	7	7	7	6	6	6	3	3	3	6	6	6	1	1	1	4	4	4	15	15	16	16	16	17	8	8	8			
	Stems per ACRE		567	567	647	850	850	850	567	567	567	202	202	202	445	445	445	40	40	40	283	283	324	422	422	439	416	416	422	659	659	659			

Appendix A2: Vegetation Monitoring Plot Photos



Plot 1 Photo – 9/27/11 - MY 02



Plot 2 Photo – 9/27/11 - MY 02



Plot 3 Photo – 9/27/11 - MY 02



Plot 4 Photo – 9/27/11 - MY 02



Plot 5 Photo – 9/27/11 - MY 02



Plot 6 Photo – 9/27/11 - MY 02



Plot 7 Photo – 9/27/11 - MY 02

Appendix B

Geomorphologic Data

Appendix B1: Stream Photos



Photo Point 1: View looking upstream, from ford crossing near Station 12+50. 11/9/11 – MY02



Photo Point 2: View looking downstream, near Station 14+00. 11/9/11 – MY02



Photo Point 3: View looking upstream at the confluence of WOC and T1. 11/9/11 – MY02



Photo Point 4: View looking upstream taken near Station 20+50. 11/9/11 – MY02

*Dog Bite Stream Restoration Site
Contract # D06056-A*

*KCI Associates of North Carolina
2011 - MY02*



Photo Point 4: View looking downstream near Station 20+50. 11/9/11 – MY02



Photo Point 5: View looking upstream at WOC, near Station 26+25. 11/9/11 – MY02



Photo Point 5: View looking at water treatment pool, near Station 26+25. 11/9/11 – MY02



Photo Point 6: View looking upstream at T2, near Station 27+75. 11/9/11 – MY02



Photo Point 7: View looking upstream near Station 29+25. 11/9/11 – MY02



Photo Point 7: View looking downstream near Station 29+25. 11/9/11 – MY02



Photo Point 8: View looking upstream near Station 34+00. 11/9/11 – MY02



Photo Point 9: View looking upstream near Station 39+25. 11/9/11 – MY02



Photo Point 9: View looking downstream near Station 34+00. 11/9/11 – MY02



Photo Point 10: View looking upstream on T1 near Station 51+00. 11/9/11 – MY02



Photo Point 10: View looking downstream on T1 near Station 51+00. 11/9/11 – MY02



Photo Point 11: View looking upstream on T1 near Station 52+50. 11/9/11 – MY02



Photo Point 12: View looking upstream on T2 near Station 60+50. 11/9/11 – MY02

Appendix B2 – Cross-Section Plots

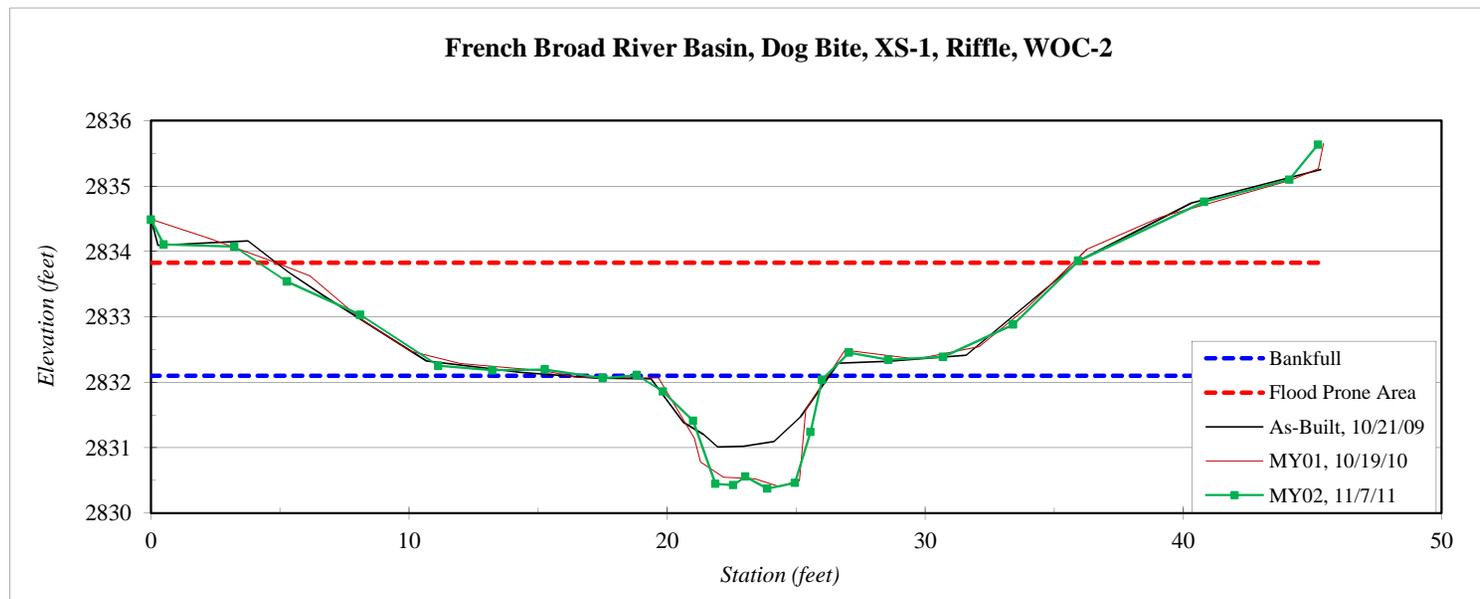
River Basin:	French Broad
Watershed:	Dog Bite
XS ID	XS-1, Riffle, WOC-2
Drainage Area (sq mi):	0.36
Date:	11/7/2011
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	2834.49
0.5	2834.11
3.2	2834.07
5.3	2833.54
8.1	2833.03
11.1	2832.25
13.2	2832.18
15.3	2832.20
17.5	2832.06
18.8	2832.11
19.8	2831.86
21.0	2831.41
21.9	2830.45
22.6	2830.43
23.0	2830.56
23.9	2830.37
25.0	2830.46
25.6	2831.24
26.0	2832.04
27.0	2832.45
28.6	2832.34
30.7	2832.39
33.4	2832.88
35.9	2833.86
40.8	2834.76
44.1	2835.10
45.2	2835.64

SUMMARY DATA	
Bankfull Elevation:	2832.1
Bankfull Cross-Sectional Area:	7.7
Bankfull Width:	7.3
Flood Prone Area Elevation:	2833.8
Flood Prone Width:	30
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	1.1
W / D Ratio:	6.9
Entrenchment Ratio:	4.1
Bank Height Ratio:	1.0



Stream Type	C3b
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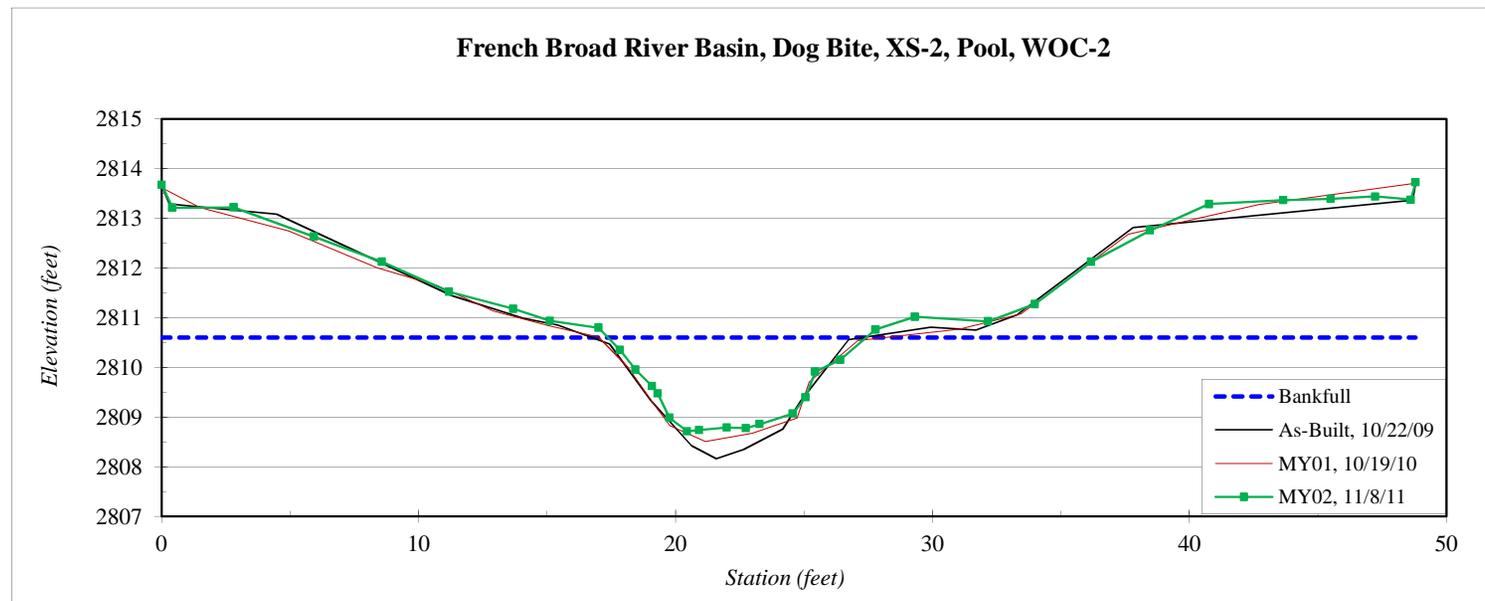
River Basin:	French Broad
Watershed:	Dog Bite
XS ID	XS-2, Pool, WOC-2
Drainage Area (sq mi):	0.36
Date:	11/8/2011
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	2813.67
0.4	2813.21
2.8	2813.22
5.9	2812.63
8.6	2812.12
11.2	2811.52
13.7	2811.18
15.1	2810.93
17.0	2810.79
17.8	2810.35
18.4	2809.95
19.1	2809.62
19.3	2809.47
19.8	2808.98
20.5	2808.71
20.9	2808.73
22.0	2808.79
22.7	2808.77
23.3	2808.85
24.6	2809.07
25.1	2809.40
25.4	2809.91
26.4	2810.15
27.8	2810.76
29.3	2811.02
32.2	2810.92
34.0	2811.27
36.2	2812.12
38.5	2812.76
40.8	2813.29
43.7	2813.37
45.5	2813.39
47.2	2813.44
48.6	2813.38
48.8	2813.73

SUMMARY DATA	
Bankfull Elevation:	2810.6
Bankfull Cross-Sectional Area:	12.0
Bankfull Width:	10.1
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	1.9
Mean Depth at Bankfull:	1.2
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-



Stream Type	C3b
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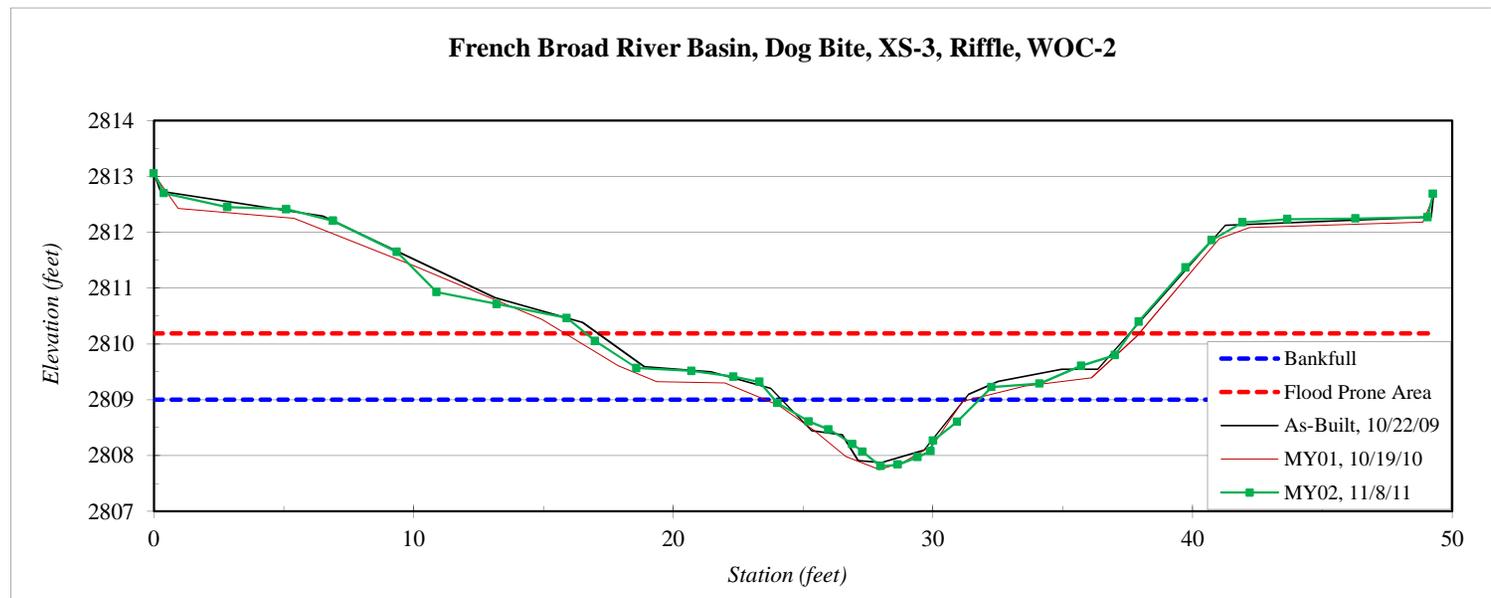
River Basin:	French Broad
Watershed:	Dog Bite
XS ID	XS-3, Riffle, WOC-2
Drainage Area (sq mi):	0.36
Date:	11/8/2011
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	2813.06
0.4	2812.70
2.8	2812.45
5.1	2812.42
6.9	2812.21
9.4	2811.65
10.9	2810.93
13.2	2810.71
15.9	2810.46
17.0	2810.05
18.6	2809.57
20.7	2809.52
22.3	2809.41
23.3	2809.32
24.0	2808.94
25.2	2808.61
26.0	2808.47
26.9	2808.21
27.3	2808.07
28.0	2807.81
28.7	2807.84
29.4	2807.97
29.9	2808.08
30.0	2808.27
30.9	2808.60
32.3	2809.23
34.1	2809.29
35.7	2809.61
37.0	2809.80
37.9	2810.40
39.7	2811.37
40.7	2811.86
41.9	2812.18
43.7	2812.23

SUMMARY DATA	
Bankfull Elevation:	2809.0
Bankfull Cross-Sectional Area:	5.2
Bankfull Width:	7.9
Flood Prone Area Elevation:	2810.2
Flood Prone Width:	21
Max Depth at Bankfull:	1.2
Mean Depth at Bankfull:	0.7
W / D Ratio:	12.0
Entrenchment Ratio:	2.7
Bank Height Ratio:	1.0



Stream Type	C3b
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*Other shots not included due to space

River Basin:	French Broad
Watershed:	Dog Bite
XS ID	XS-4, Riffle, WOC-4
Drainage Area (sq mi):	0.54
Date:	11/8/2011
Field Crew:	A. French, A. Helms

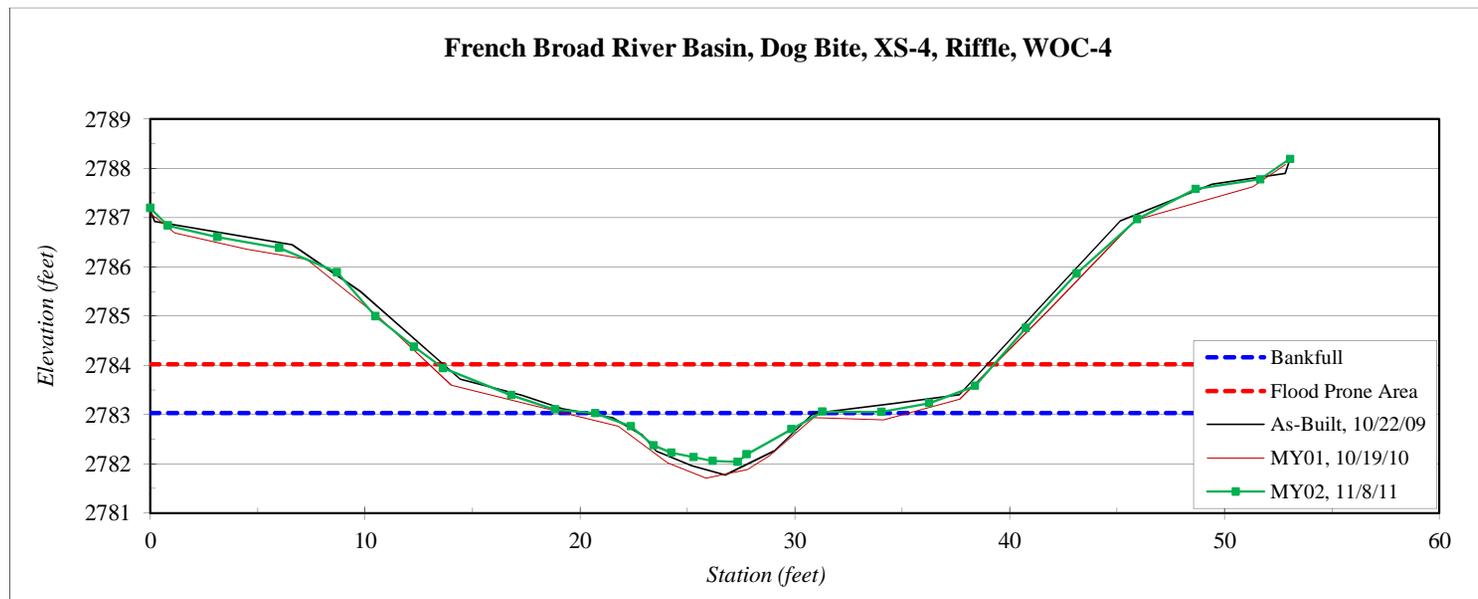
Station	Elevation
0.0	2787.19
0.8	2786.84
3.1	2786.60
6.0	2786.38
8.7	2785.89
10.5	2785.00
12.3	2784.38
13.6	2783.95
16.8	2783.39
18.8	2783.10
20.7	2783.03
22.4	2782.76
23.4	2782.37
24.2	2782.23
25.3	2782.13
26.2	2782.06
27.3	2782.04
27.8	2782.19
29.8	2782.70
31.3	2783.06
34.0	2783.05
36.3	2783.23
38.4	2783.58
40.8	2784.76
43.1	2785.86
45.9	2786.96
48.7	2787.58
51.7	2787.78
53.1	2788.19

SUMMARY DATA	
Bankfull Elevation:	2783.0
Bankfull Cross-Sectional Area:	6.0
Bankfull Width:	10.6
Flood Prone Area Elevation:	2784.0
Flood Prone Width:	26
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.6
W / D Ratio:	18.7
Entrenchment Ratio:	2.5
Bank Height Ratio:	1.0



Stream Type	C3b
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French Broad River Basin, Dog Bite, XS-4, Riffle, WOC-4



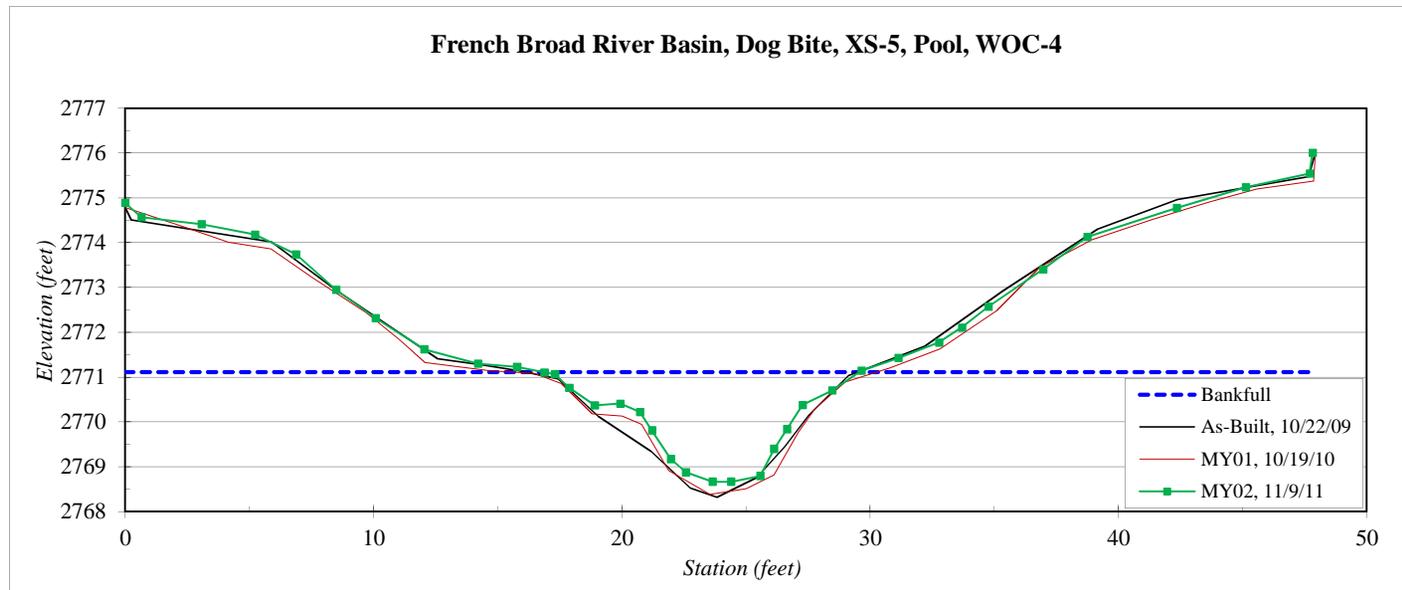
River Basin:	French Broad
Watershed:	Dog Bite
XS ID	XS-5, Pool, WOC-4
Drainage Area (sq mi):	0.54
Date:	11/9/2011
Field Crew:	A. French, A. Helms



Station	Elevation
0.0	2774.89
0.6	2774.57
3.1	2774.41
5.2	2774.18
6.9	2773.74
8.5	2772.95
10.1	2772.32
12.0	2771.62
14.2	2771.30
15.8	2771.23
16.9	2771.11
17.3	2771.06
17.9	2770.76
18.9	2770.37
19.9	2770.41
20.7	2770.22
21.2	2769.81
22.0	2769.17
22.6	2768.87
23.7	2768.67
24.4	2768.67
25.6	2768.79
26.1	2769.40
26.7	2769.84
27.3	2770.38
28.5	2770.70
29.7	2771.15
31.1	2771.43
32.8	2771.77
33.7	2772.11
34.8	2772.57
37.0	2773.41
38.8	2774.13
42.4	2774.78
45.1	2775.24
47.7	2775.54
47.8	2776.01

SUMMARY DATA	
Bankfull Elevation:	2771.1
Bankfull Cross-Sectional Area:	15.6
Bankfull Width:	12.7
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	2.4
Mean Depth at Bankfull:	1.2
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C3b
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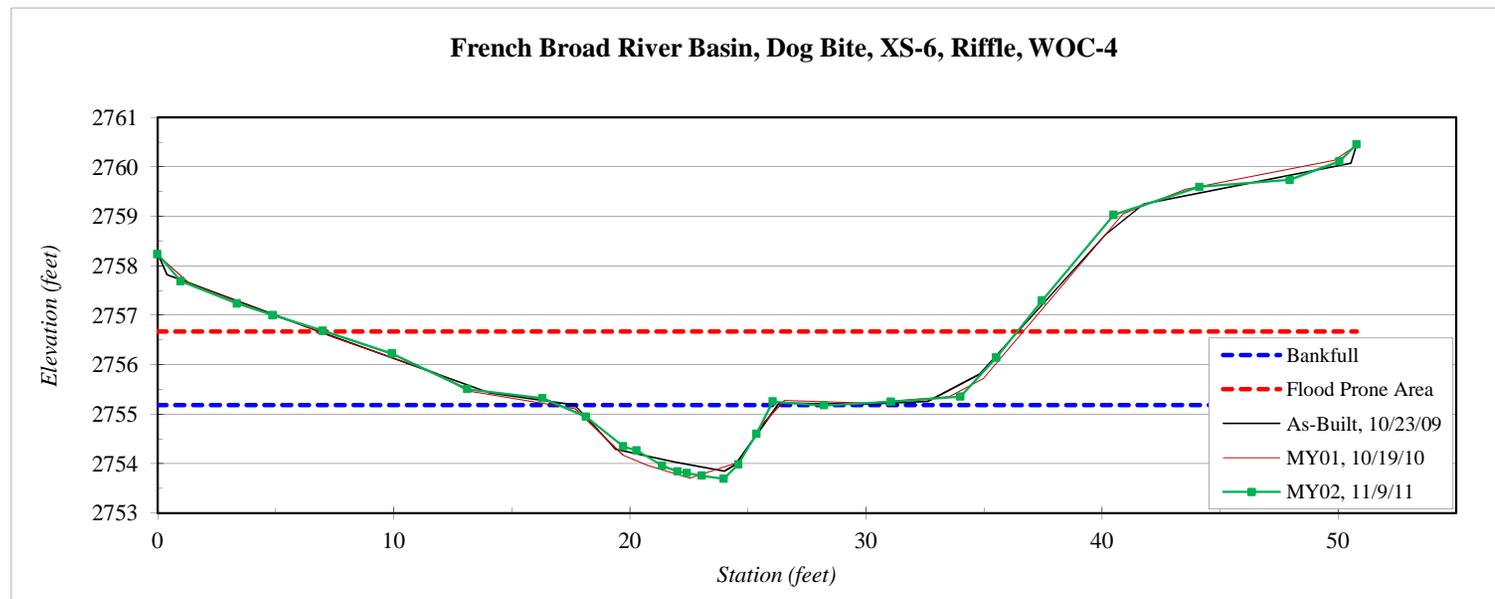
River Basin:	French Broad
Watershed:	Dog Bite
XS ID	XS-6, Riffle, WOC-4
Drainage Area (sq mi):	0.54
Date:	11/9/2011
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	2758.24
1.0	2757.69
3.4	2757.24
4.9	2757.00
7.0	2756.69
9.9	2756.23
13.1	2755.50
16.3	2755.32
18.2	2754.95
19.7	2754.35
20.3	2754.27
21.4	2753.96
22.0	2753.84
22.4	2753.81
23.1	2753.75
24.0	2753.69
24.6	2753.98
25.4	2754.60
26.1	2755.25
28.2	2755.18
31.1	2755.25
34.0	2755.35
35.5	2756.15
37.5	2757.30
40.5	2759.03
44.1	2759.59
48.0	2759.74
50.1	2760.11
50.8	2760.46

SUMMARY DATA	
Bankfull Elevation:	2755.2
Bankfull Cross-Sectional Area:	7.9
Bankfull Width:	9.2
Flood Prone Area Elevation:	2756.7
Flood Prone Width:	30
Max Depth at Bankfull:	1.5
Mean Depth at Bankfull:	0.9
W / D Ratio:	10.7
Entrenchment Ratio:	3.3
Bank Height Ratio:	1.0



Stream Type	C3b
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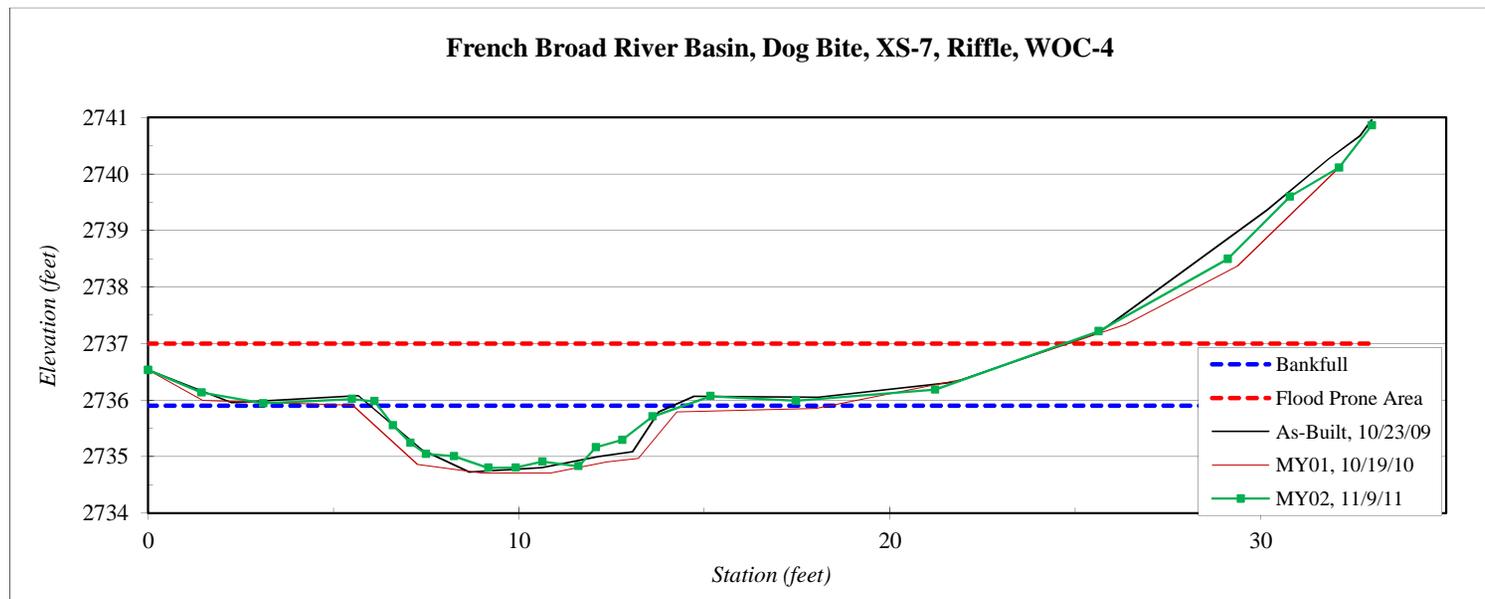
River Basin:	French Broad
Watershed:	Dog Bite
XS ID	XS-7, Riffle, WOC-4
Drainage Area (sq mi):	0.54
Date:	11/9/2011
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	2736.53
1.4	2736.13
3.1	2735.94
5.5	2736.02
6.1	2735.98
6.6	2735.55
7.1	2735.24
7.5	2735.05
8.2	2735.00
9.2	2734.80
9.9	2734.80
10.6	2734.91
11.6	2734.83
12.1	2735.16
12.8	2735.29
13.6	2735.71
15.2	2736.07
17.5	2735.99
21.2	2736.18
25.6	2737.22
29.1	2738.50
30.8	2739.60
32.1	2740.11
33.0	2740.86

SUMMARY DATA	
Bankfull Elevation:	2735.9
Bankfull Cross-Sectional Area:	6.1
Bankfull Width:	8.2
Flood Prone Area Elevation:	2737.0
Flood Prone Width:	>25
Max Depth at Bankfull:	1.1
Mean Depth at Bankfull:	0.7
W / D Ratio:	11.0
Entrenchment Ratio:	3.0
Bank Height Ratio:	1.0



Stream Type	C3b
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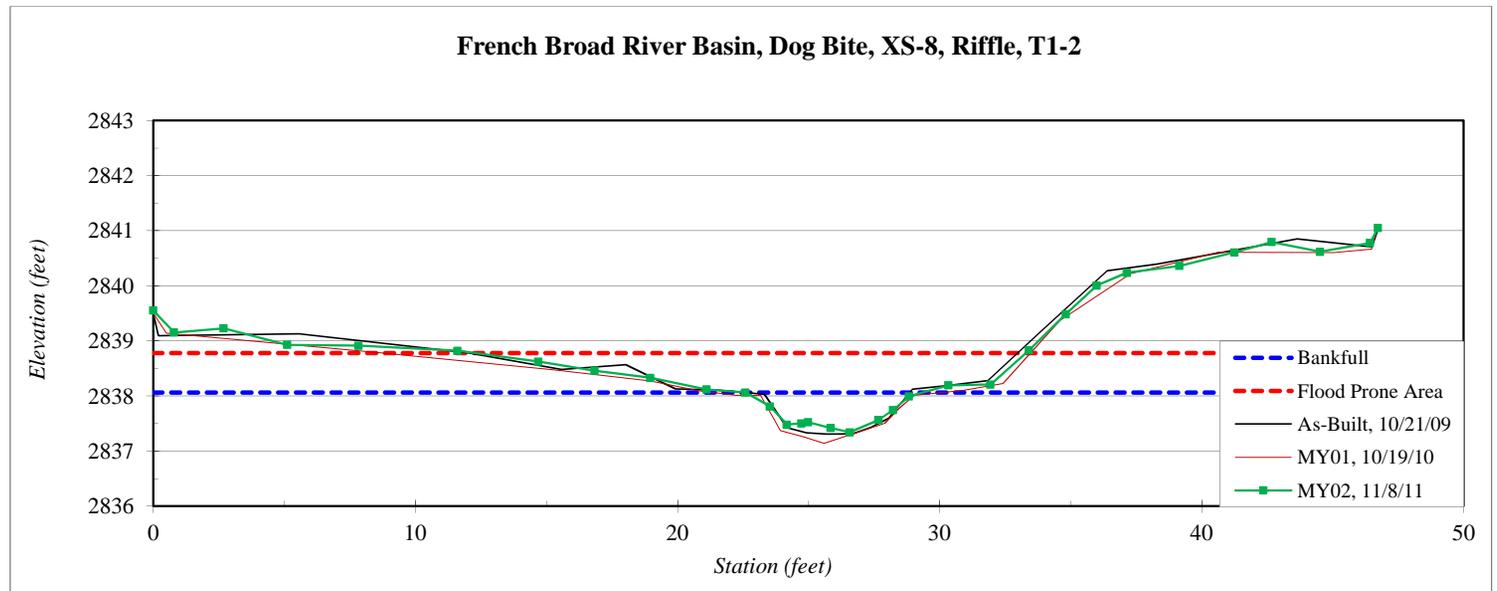
River Basin:	French Broad
Watershed:	Dog Bite
XS ID	XS-8, Riffle, T1-2
Drainage Area (sq mi):	0.08
Date:	11/8/2011
Field Crew:	A. French, A. Helms



Station	Elevation
0.0	2839.55
0.8	2839.15
2.7	2839.23
5.1	2838.93
7.8	2838.91
11.6	2838.82
14.7	2838.62
16.8	2838.46
19.0	2838.33
21.1	2838.12
22.6	2838.06
23.5	2837.81
24.2	2837.48
24.7	2837.50
25.0	2837.52
25.9	2837.42
26.6	2837.34
27.7	2837.57
28.2	2837.74
28.8	2837.99
30.3	2838.20
31.9	2838.21
33.4	2838.83
34.8	2839.48
36.0	2840.00
37.1	2840.24
39.2	2840.36
41.3	2840.61
42.7	2840.80
44.5	2840.62
46.4	2840.78
46.7	2841.05

SUMMARY DATA	
Bankfull Elevation:	2838.1
Bankfull Cross-Sectional Area:	2.9
Bankfull Width:	6.7
Flood Prone Area Elevation:	2838.8
Flood Prone Width:	21
Max Depth at Bankfull:	0.7
Mean Depth at Bankfull:	0.4
W / D Ratio:	15.5
Entrenchment Ratio:	3.1
Bank Height Ratio:	1.0

Stream Type	C3b
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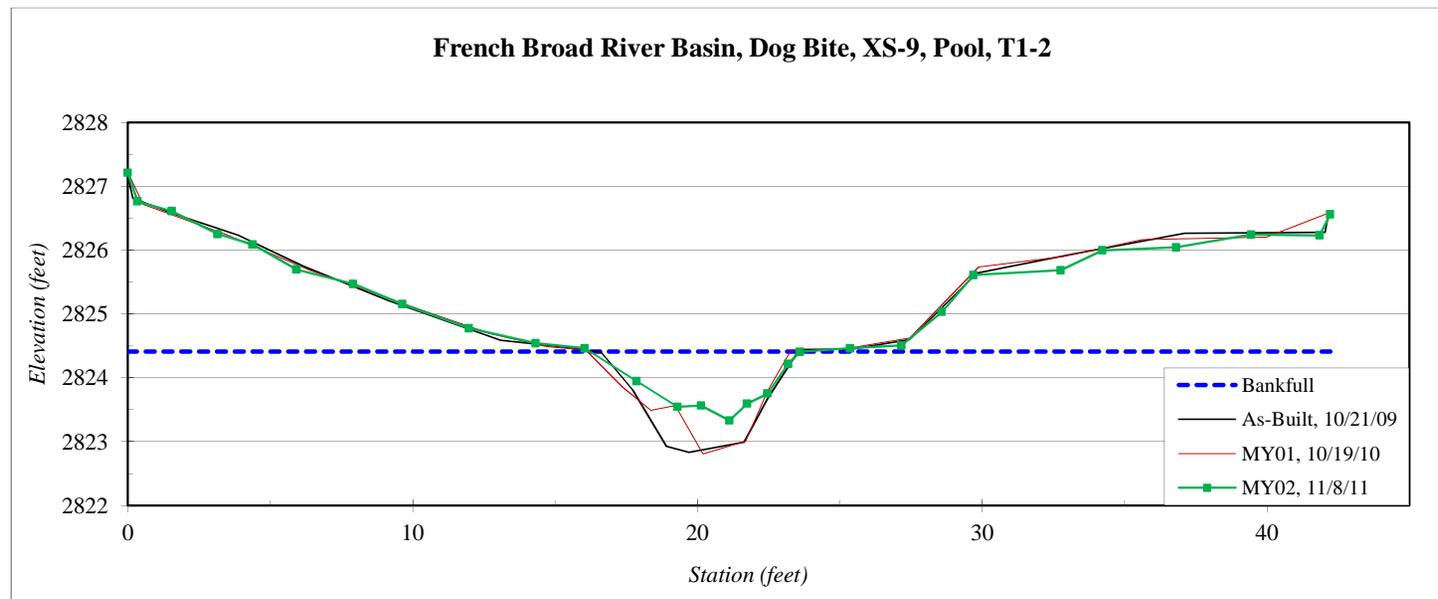
River Basin:	French Broad
Watershed:	Dog Bite
XS ID	XS-9, Pool, T1-2
Drainage Area (sq mi):	0.08
Date:	11/8/2011
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	2827.21
0.3	2826.76
1.5	2826.61
3.2	2826.25
4.4	2826.09
5.9	2825.70
7.9	2825.47
9.6	2825.15
12.0	2824.78
14.3	2824.54
16.0	2824.46
17.9	2823.95
19.3	2823.54
20.1	2823.56
21.1	2823.33
21.7	2823.60
22.5	2823.75
23.2	2824.22
23.6	2824.41
25.4	2824.46
27.2	2824.51
28.6	2825.03
29.7	2825.61
32.8	2825.68
34.2	2825.99
36.8	2826.04
39.4	2826.24
41.8	2826.23
42.2	2826.56

SUMMARY DATA	
Bankfull Elevation:	2824.4
Bankfull Cross-Sectional Area:	4.5
Bankfull Width:	7.4
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	1.1
Mean Depth at Bankfull:	0.6
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

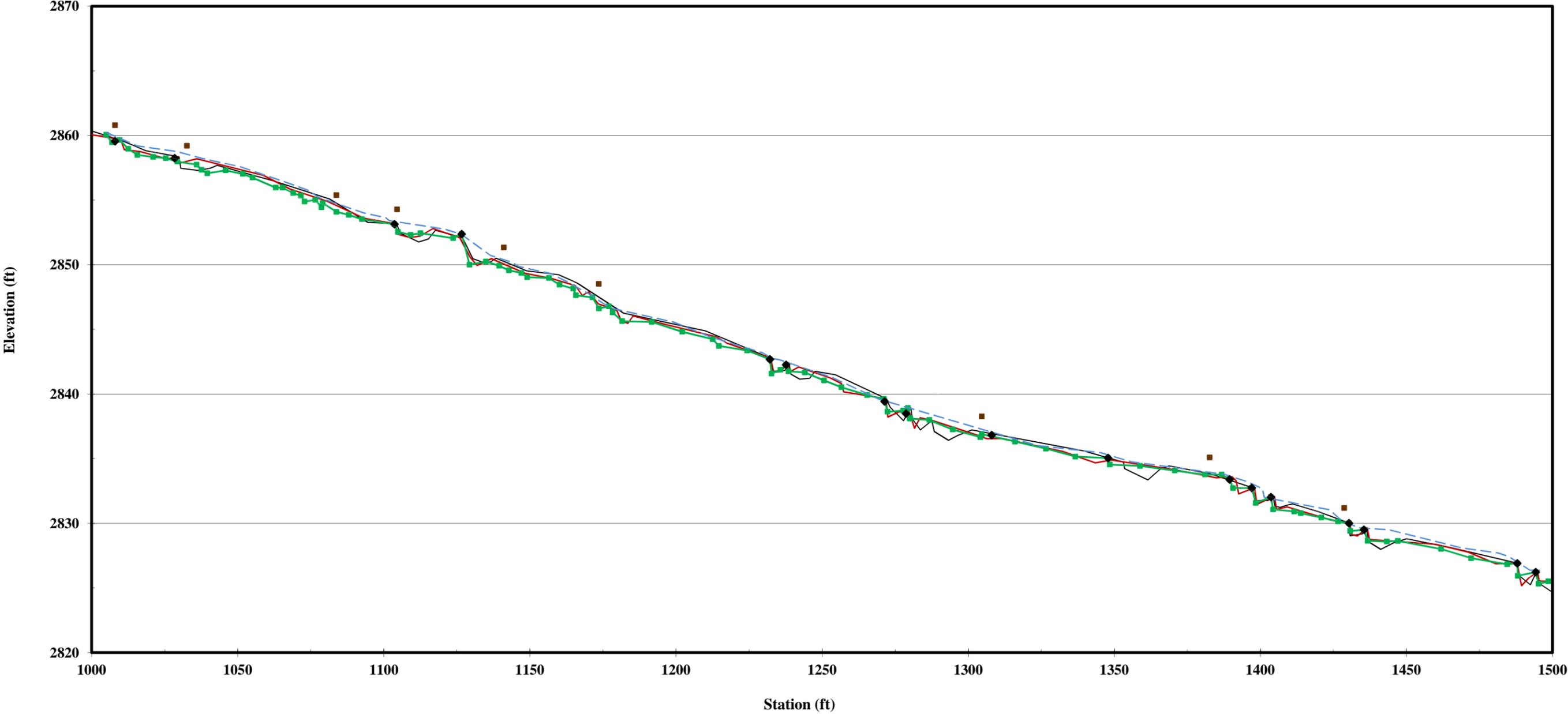


Stream Type	C3b
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Appendix B3 – Longitudinal Profile

**Dog Bite Site
Longitudinal Profile
White Oak Creek, MY02
Stations 10+00 - 15+00**



— MY00, 10/22/09 — MY01, 10/19/10 —■— MY02, 11/8/11 - - - Water Surface ■ Bankfull ◆ Grade Control Structures

**Dog Bite Site
Longitudinal Profile
White Oak Creek, MY02
Stations 15+00 - 20+00**



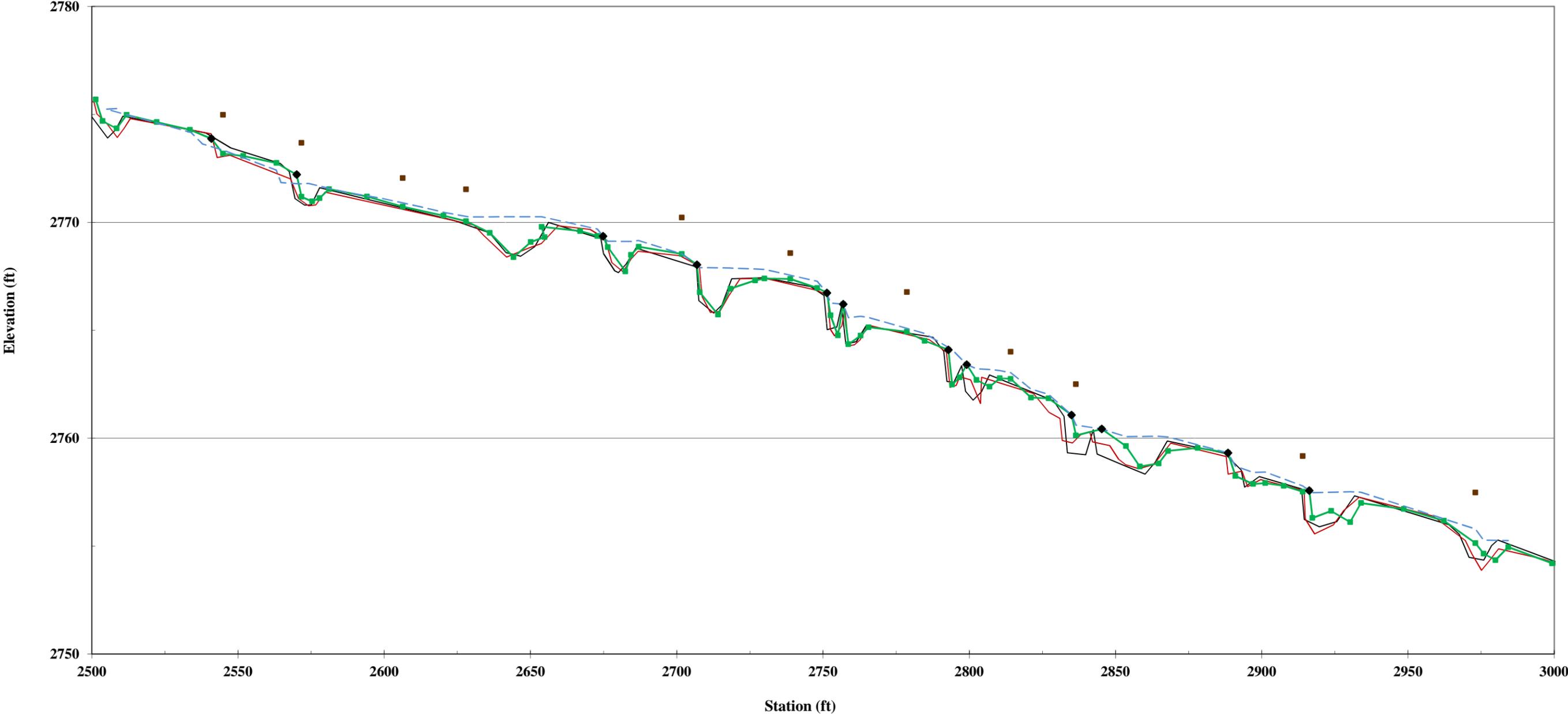
— MY00, 10/22/09 — MY01, 10/19/10 —■ MY02, 11/8/11 ■ Bankfull

**Dog Bite Site
Longitudinal Profile
White Oak Creek, MY02
Stations 20+00 - 25+00**



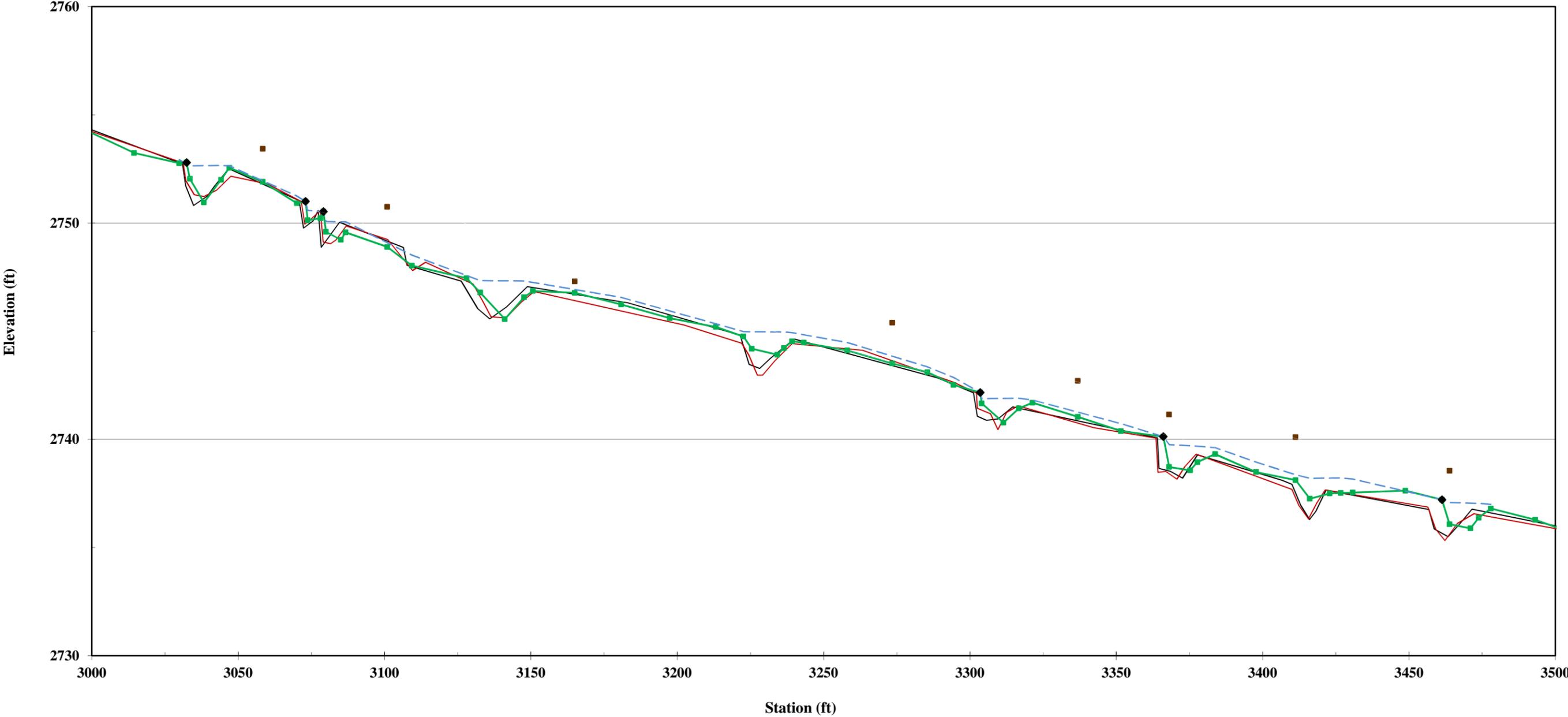
— MY00, 10/22/09 — MY01, 10/19/10 —■— MY02, 11/8/11 - - - Water Surface

**Dog Bite Site
Longitudinal Profile
White Oak Creek, MY02
Stations 25+00 - 30+00**



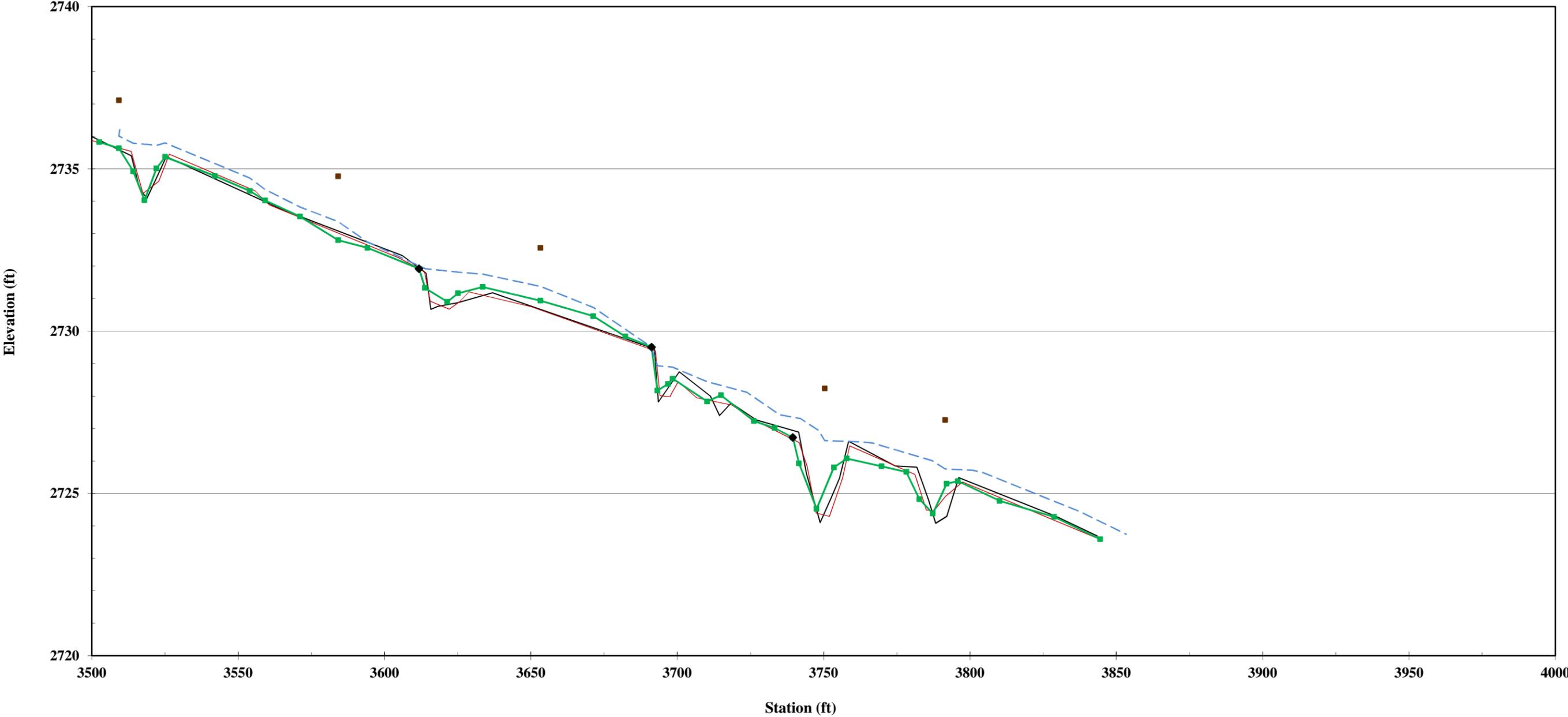
— MY00, 10/22/09 — MY01, 10/22/10 —■— MY02, 11/8/11 - - - Water Surface ■ Bankfull ◆ Grade Control Structures

**Dog Bite Site
Longitudinal Profile
White Oak Creek, MY02
Stations 30+00 - 35+00**



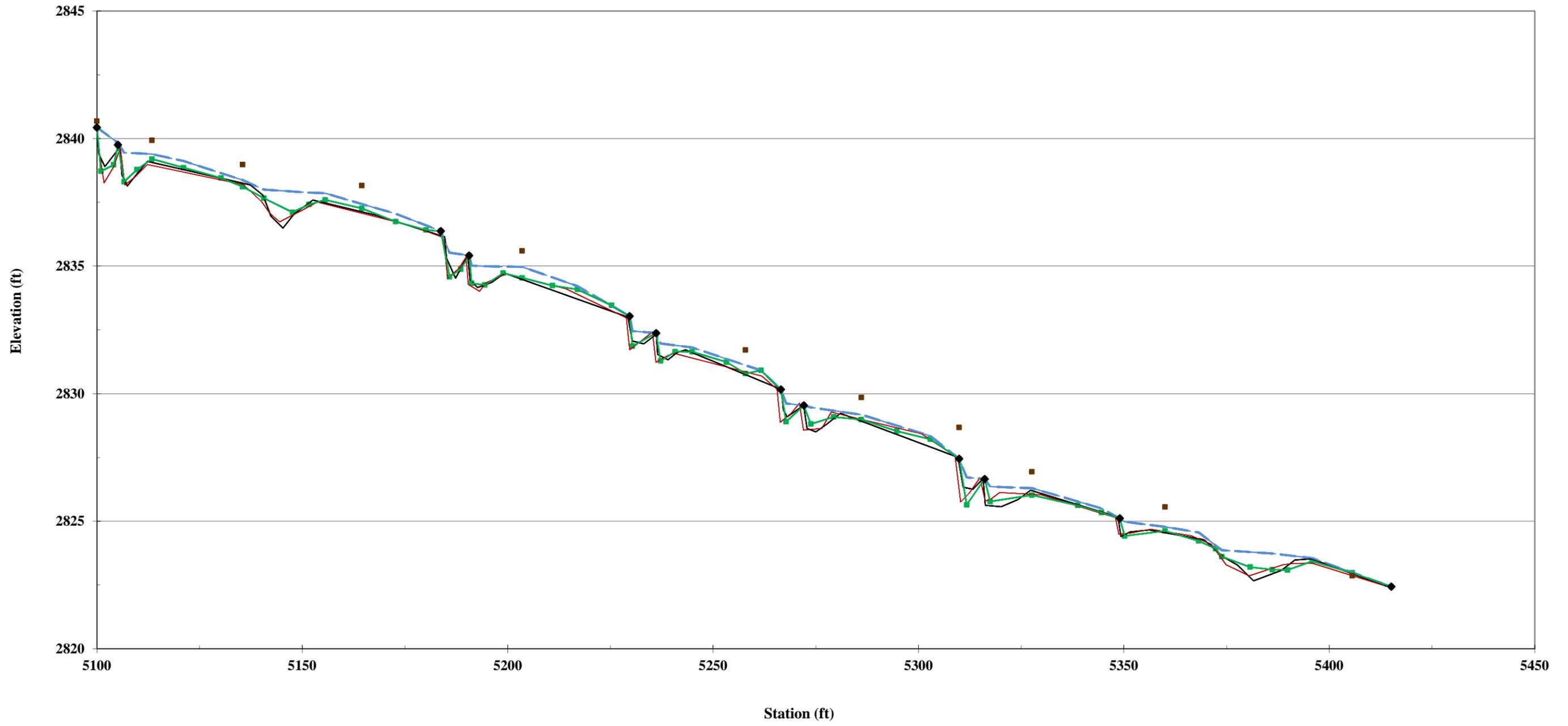
— MY00, 10/22/09 — MY01, 10/19/10 —■— MY02, 11/8/11 - - - Water Surface ■ Bankfull ◆ Grade Control Structures

**Dog Bite Site
Longitudinal Profile
White Oak Creek, MY02
Stations 35+00 - 40+00**



— MY00, 10/22/09 — MY01, 10/19/10 —■— MY02, 11/8/11 - - - Water Surface ■ Bankfull ◆ Grade Control Structures

**Dog Bite Site
Longitudinal Profile
T1, MY02
Stations 51+00 - 54+15**

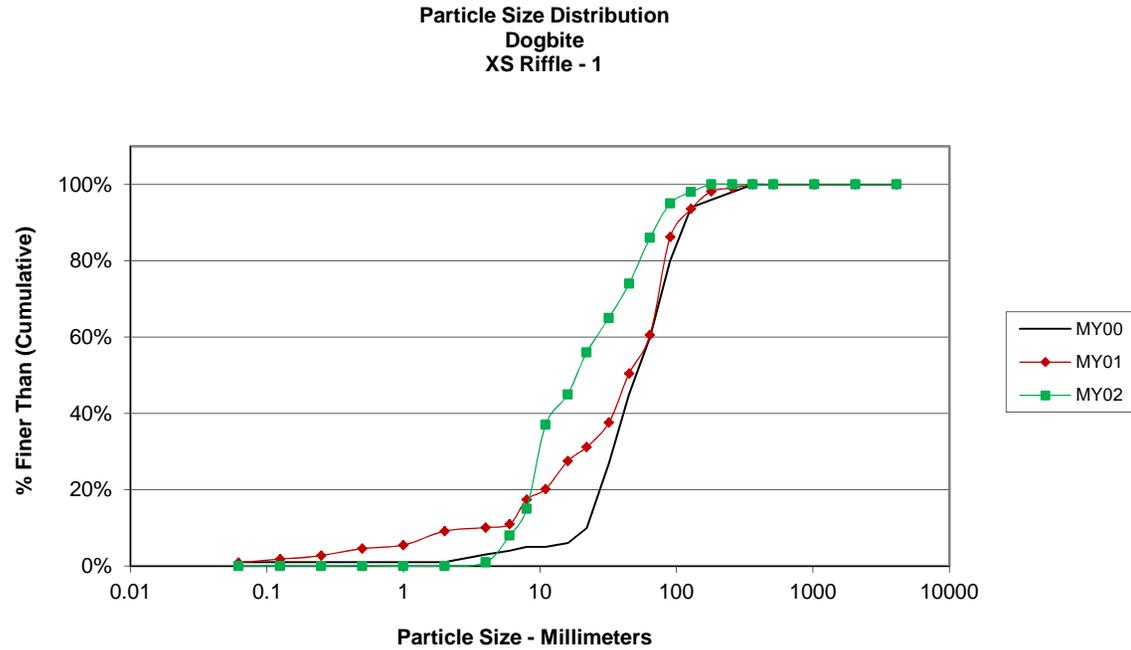


— MY00, 10/22/09 — MY01, 10/19/10 —■— MY02, 11/8/11 - - - Water Surface ■ Bankfull ◆ Grade Control Structures

Appendix B4 – Pebble Count Data

Pebble Count Plots

Cross-Section Riffle 1 - MY02			
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	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		1
Fine	4 - 5.7	G	7
Fine	5.7 - 8	R	7
Medium	8 - 11.3	A	22
Medium	11.3 - 16	V	8
Coarse	16 - 22.6	E	11
Coarse	22.6 - 32	L	9
Very Coarse	32 - 45	S	9
Very Coarse	45 - 64		12
Small	64 - 90	C	9
Small	90 - 128	O	3
Large	128 - 180	B	2
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	
		Total	100
Note:			

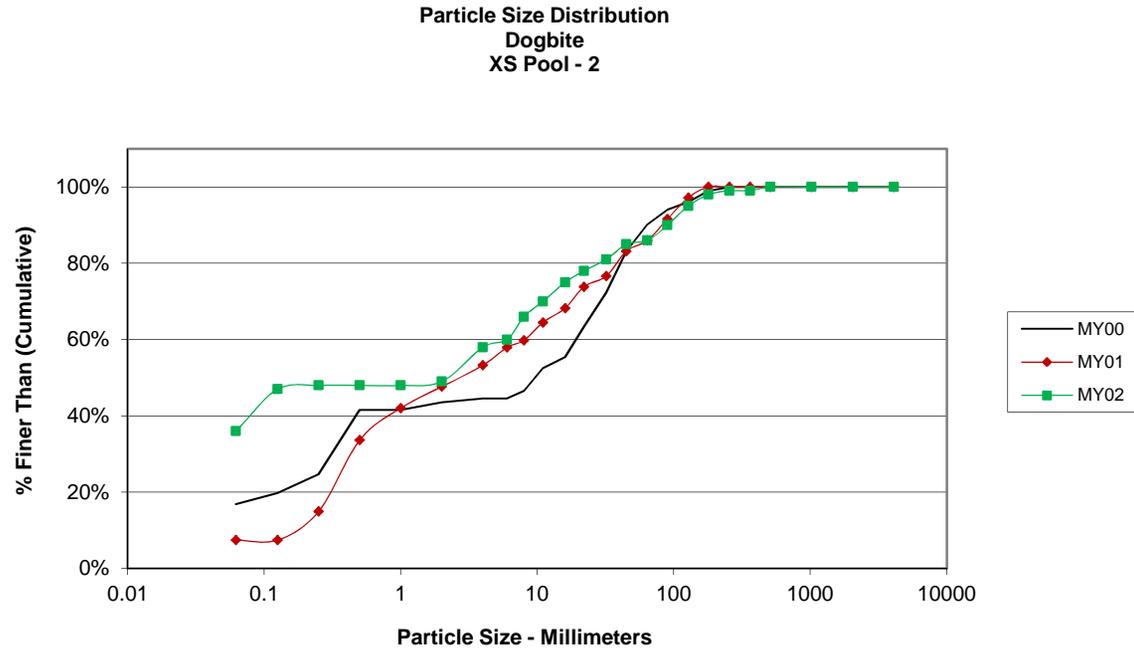


Size (mm)	
D16	8.1
D35	11
D50	18
D65	32
D84	60
D95	90

Size Distribution	
mean	22.0
dispersion	2.8
skewness	0.09

Type	
silt/clay	0%
sand	0%
gravel	86%
cobble	14%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section Pool 2 - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	36
Very Fine	.062 - .125	S	11
Fine	.125 - .25	A	1
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	1
Very Fine	2 - 4		9
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	6
Medium	8 - 11.3	A	4
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	3
Coarse	22.6 - 32	L	3
Very Coarse	32 - 45	S	4
Very Coarse	45 - 64		1
Small	64 - 90	C	4
Small	90 - 128	O	5
Large	128 - 180	B	3
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	1
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100
Note:			

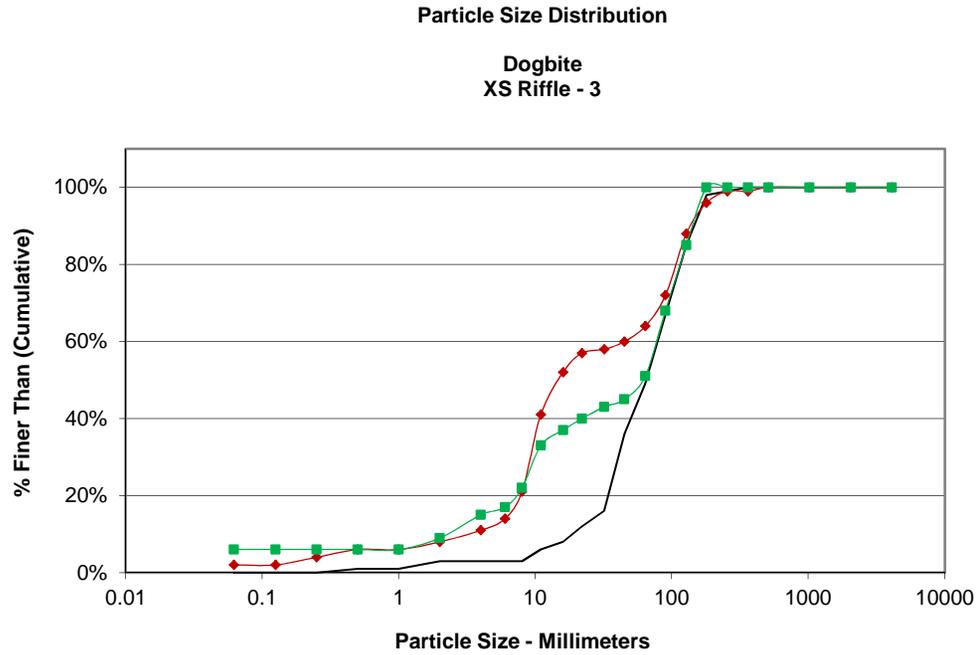


Size (mm)	
D16	0.062
D35	0.062
D50	2.2
D65	7.6
D84	41
D95	130

Size Distribution	
mean	1.6
dispersion	27.1
skewness	-0.08

Type	
silt/clay	36%
sand	13%
gravel	37%
cobble	13%
boulder	1%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section Riffle 3 - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	6
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	3
Very Fine	2 - 4		6
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	5
Medium	8 - 11.3	A	11
Medium	11.3 - 16	V	4
Coarse	16 - 22.6	E	3
Coarse	22.6 - 32	L	3
Very Coarse	32 - 45	S	2
Very Coarse	45 - 64		6
Small	64 - 90	C	17
Small	90 - 128	O	17
Large	128 - 180	B	15
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	
		Total	100
Note:			

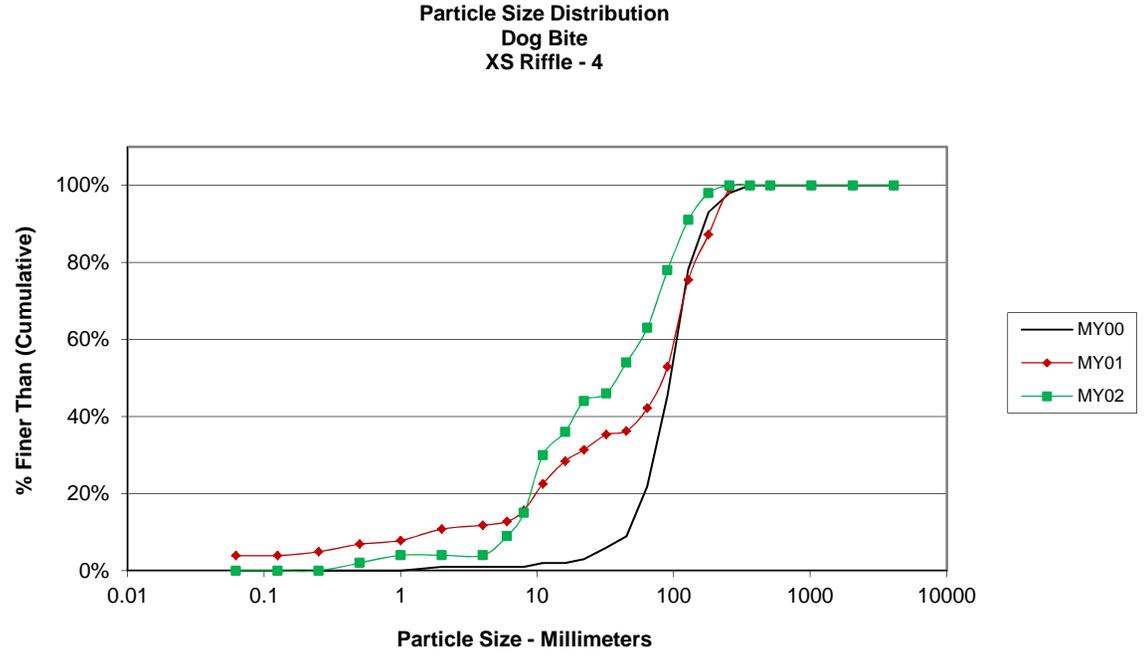


Size (mm)	
D16	4.9
D35	13
D50	60
D65	85
D84	130
D95	160

Size Distribution	
mean	25.2
dispersion	7.2
skewness	-0.32

Type	
silt/clay	6%
sand	3%
gravel	42%
cobble	49%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section Riffle 4 - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	2
Coarse	.50 - 1	D	2
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	5
Fine	5.7 - 8	R	6
Medium	8 - 11.3	A	15
Medium	11.3 - 16	V	6
Coarse	16 - 22.6	E	8
Coarse	22.6 - 32	L	2
Very Coarse	32 - 45	S	8
Very Coarse	45 - 64		9
Small	64 - 90	C	15
Small	90 - 128	O	13
Large	128 - 180	B	7
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	
		Total	100
Note:			

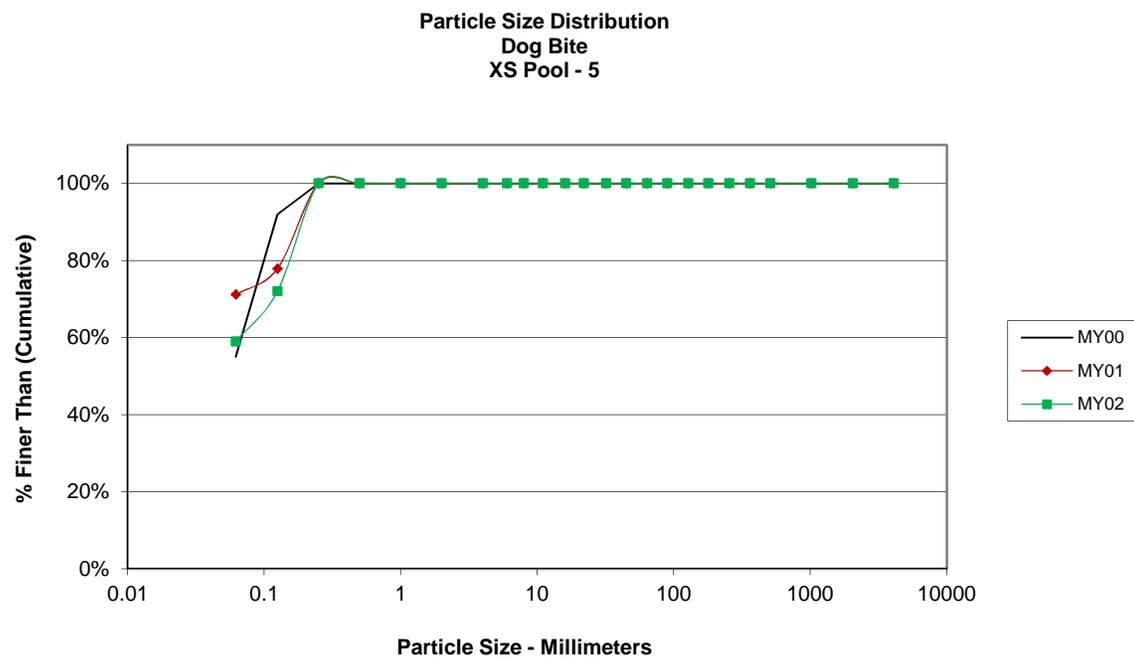


Size (mm)	
D16	8.2
D35	15
D50	38
D65	67
D84	110
D95	160

Size Distribution	
mean	30.0
dispersion	3.8
skewness	-0.10

Type	
silt/clay	0%
sand	4%
gravel	59%
cobble	37%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section Pool 5 - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	59
Very Fine	.062 - .125	S	13
Fine	.125 - .25	A	28
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
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	
		Total	100
Note:			

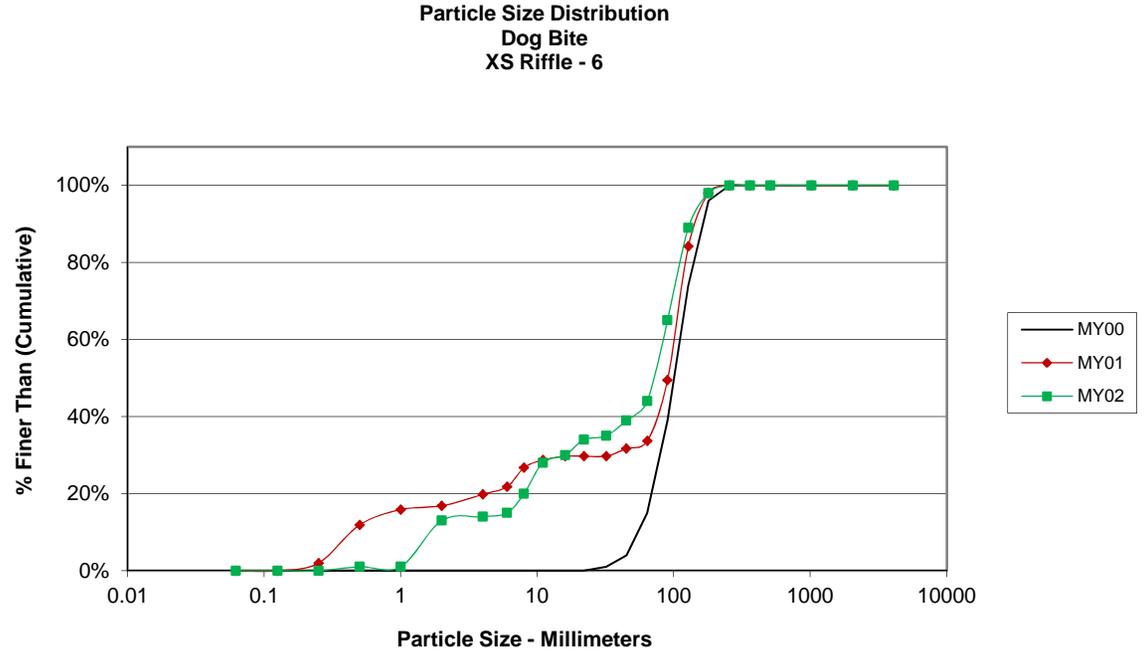


Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.086
D84	0.17
D95	0.22

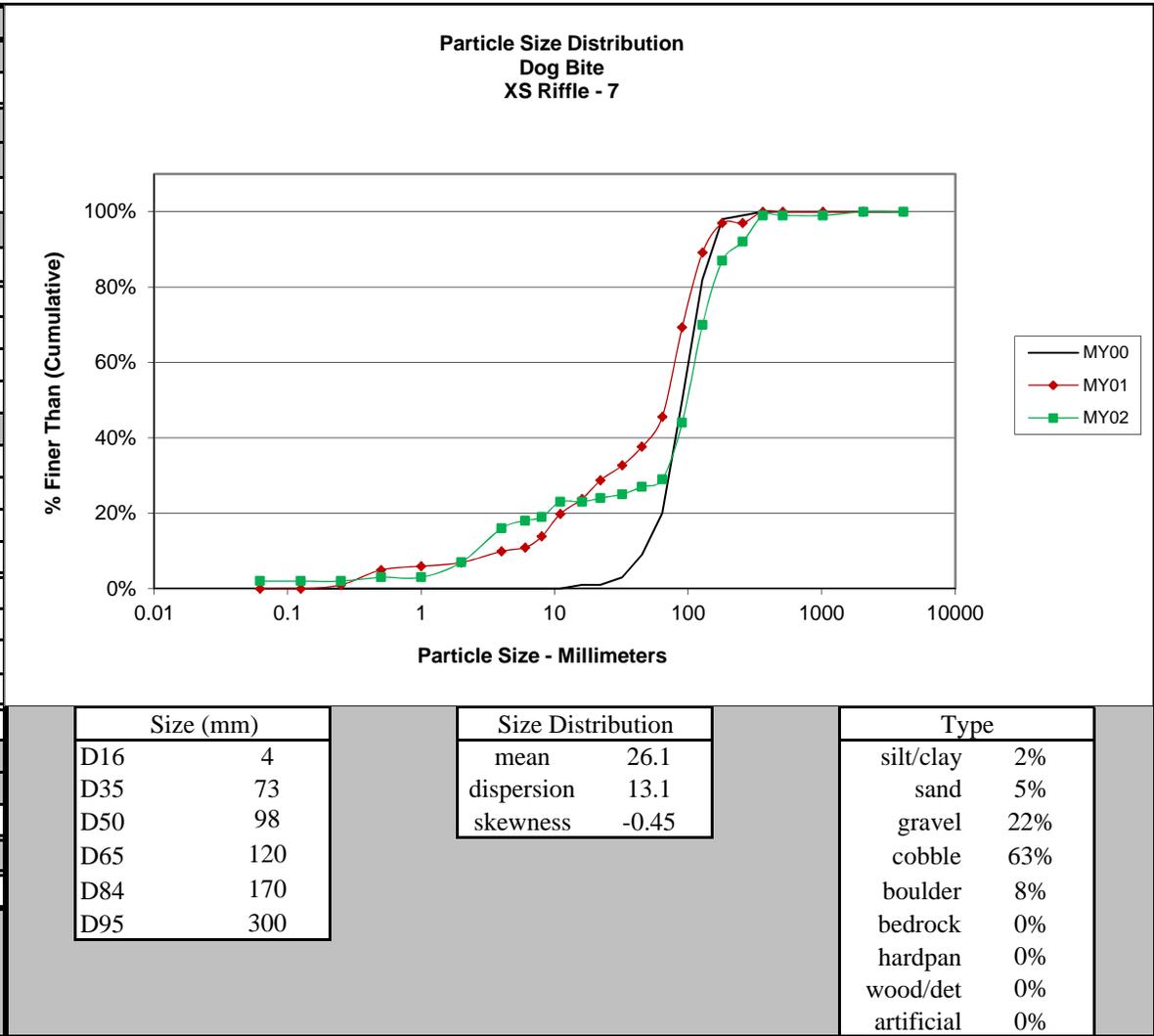
Size Distribution	
mean	0.1
dispersion	1.9
skewness	0.33

Type	
silt/clay	59%
sand	41%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

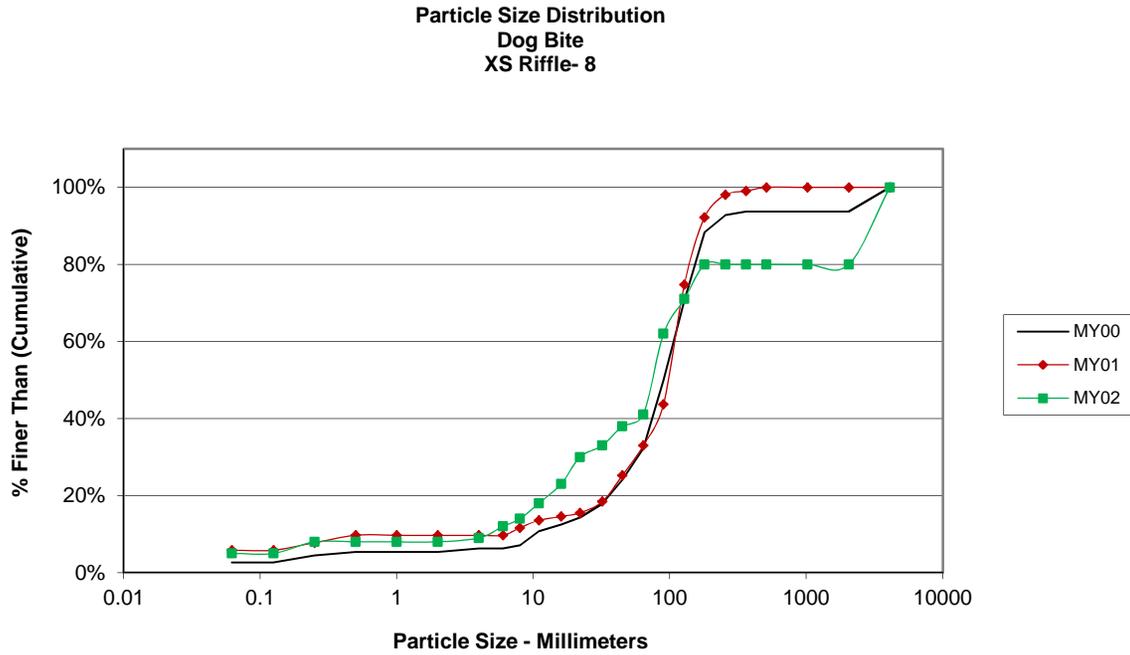
Cross-Section Riffle 6 - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	1
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	12
Very Fine	2 - 4		1
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	5
Medium	8 - 11.3	A	8
Medium	11.3 - 16	V	2
Coarse	16 - 22.6	E	4
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	4
Very Coarse	45 - 64		5
Small	64 - 90	C	21
Small	90 - 128	O	24
Large	128 - 180	B	9
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	
		Total	100
Note:			



Cross-Section Riffle 7 - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	2
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	1
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	4
Very Fine	2 - 4		9
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	4
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	1
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	2
Very Coarse	45 - 64		2
Small	64 - 90	C	15
Small	90 - 128	O	26
Large	128 - 180	B	17
Large	180 - 256	L	5
Small	256 - 362	B	7
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	1
Bedrock	>2048	BDRK	
		Total	100
Note:			



Cross-Section Riffle 8 - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	5
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	3
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		1
Fine	4 - 5.7	G	3
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	4
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	7
Coarse	22.6 - 32	L	3
Very Coarse	32 - 45	S	5
Very Coarse	45 - 64		3
Small	64 - 90	C	21
Small	90 - 128	O	9
Large	128 - 180	B	9
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	20
		Total	100
Note:			

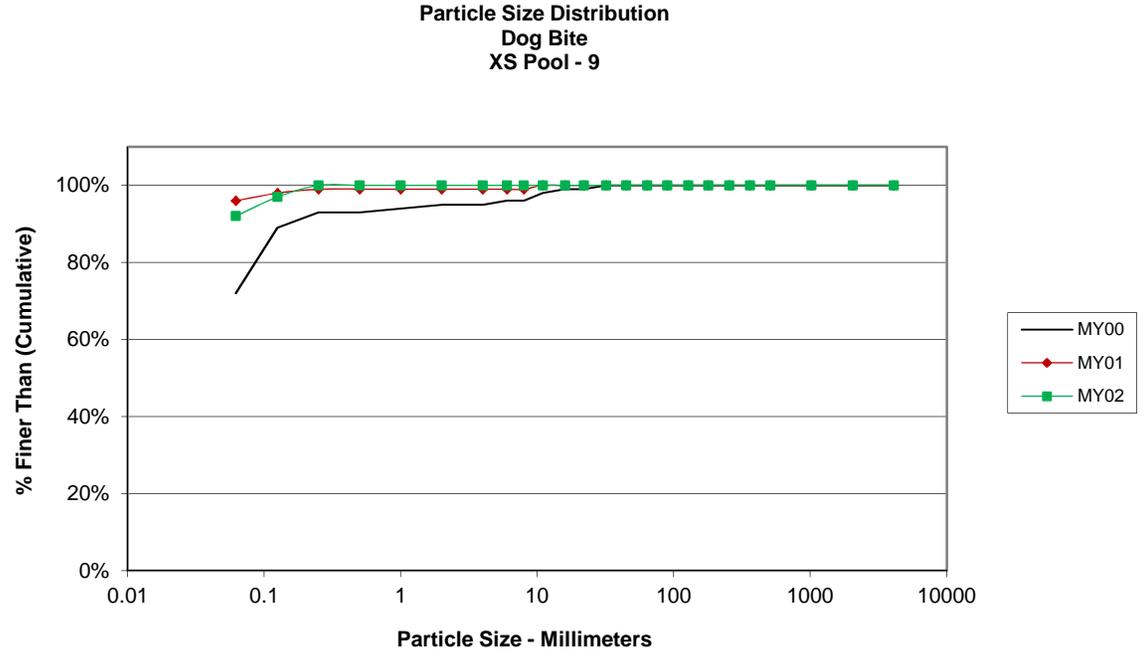


Size (mm)	
D16	9.4
D35	37
D50	74
D65	100
D84	2400
D95	3400

Size Distribution	
mean	150.2
dispersion	20.2
skewness	0.20

Type	
silt/clay	5%
sand	3%
gravel	33%
cobble	39%
boulder	20%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section Pool 9 - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	92
Very Fine	.062 - .125	S	5
Fine	.125 - .25	A	3
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
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	
		Total	100
Note:			



Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.094

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	92%
sand	8%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Appendix C

Current Conditions Plan View

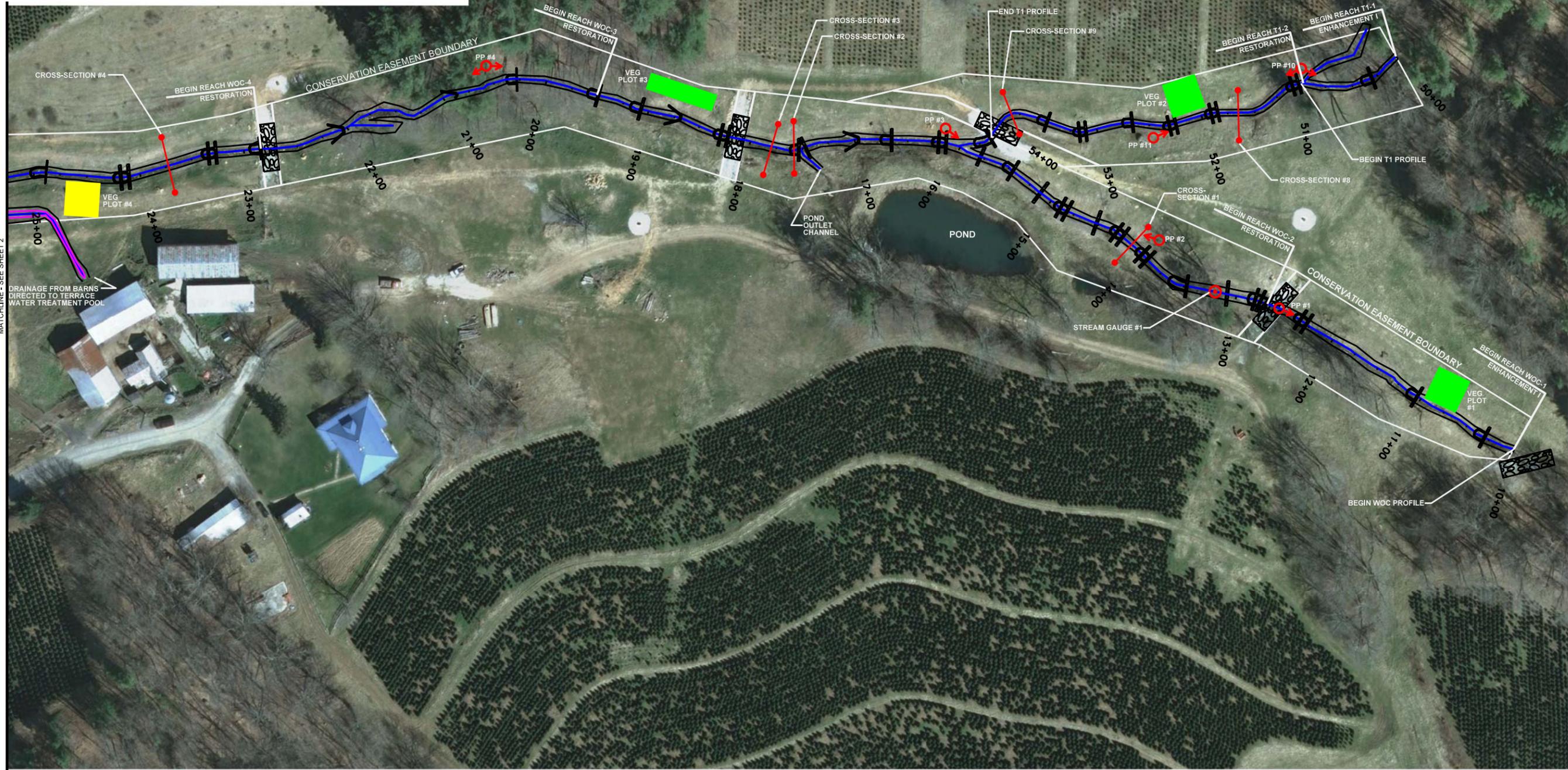
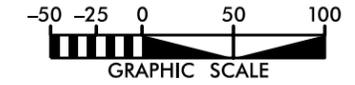
LEGEND

- EASEMENT BOUNDARY..... [Symbol: Dashed line with diagonal hatching]
- AS-BUILT STATIONED CENTERLINE AND TOP OF BANK..... [Symbol: Blue line with '1+00' and '12+00' labels]
- PHOTO POINT..... [Symbol: Red circle with arrow]
- CROSS-SECTION..... [Symbol: Red line with vertical tick marks]
- BMP..... [Symbol: Pink rectangle]
- STREAM GAUGE..... [Symbol: Red circle with crosshair]

IMAGE SOURCE: NC STATEWIDE ORTHOIMAGERY, 2010

PROJECT CONDITION

- VEG PLOT ACHIEVING DENSITY ABOVE 320 STEMS/ACRE..... [Symbol: Green square]
- VEG PLOT WITH DENSITY BELOW 320 STEMS/ACRE..... [Symbol: Yellow square]



NO.	DATE	APPROVED	REVISIONS



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

DOG BITE
STREAM RESTORATION PROJECT
BAKERSVILLE, MITCHELL COUNTY, NORTH CAROLINA
WOC STATION 10+00 TO STATION 25+25; T1

DATE: DECEMBER 2011
SCALE: 1" = 100'
CURRENT
CONDITION
PLAN VIEW
MY 2 OF 5
SHEET 1 OF 2

LEGEND

- EASEMENT BOUNDARY.....
- AS-BUILT STATIONED CENTERLINE AND TOP OF BANK.....
- PHOTO POINT.....
- CROSS-SECTION.....
- BMP.....
- STREAM GAUGE.....

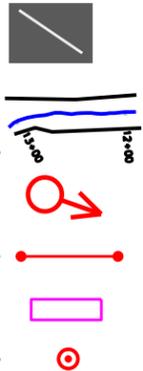
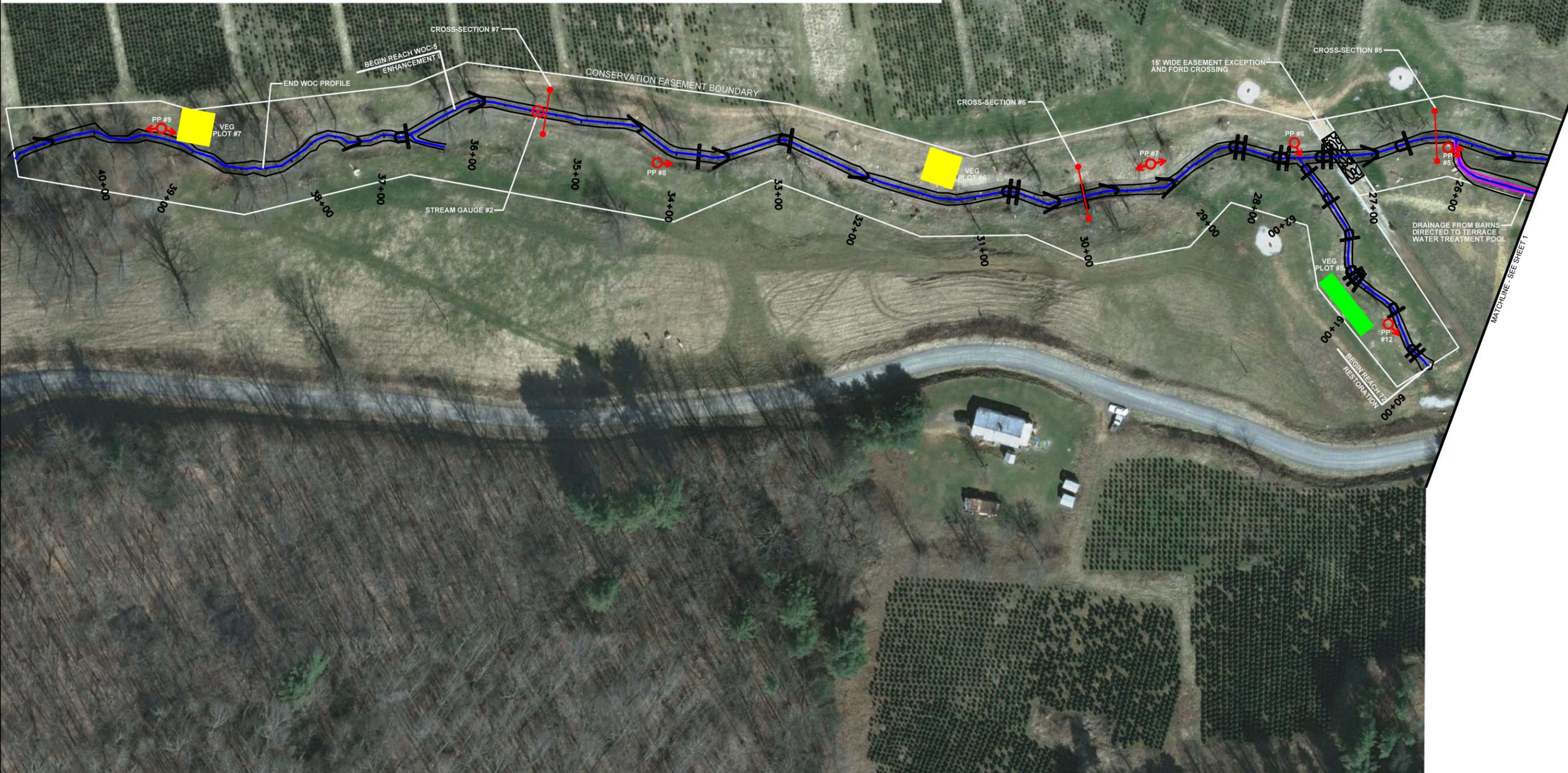
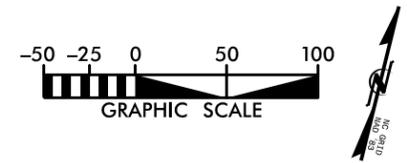


IMAGE SOURCE: NC STATEWIDE ORTHOIMAGERY, 2010

PROJECT CONDITION

- VEG PLOT ACHIEVING DENSITY ABOVE 320 STEMS/ACRE.....
- VEG PLOT WITH DENSITY BELOW 320 STEMS/ACRE.....



NO.	DATE	REVISIONS



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4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

DOG BITE
STREAM RESTORATION PROJECT
BAKERSVILLE, MITCHELL COUNTY, NORTH CAROLINA
WOC STATION 25+25 TO STATION 40+82; T2

DATE: DECEMBER 2011
SCALE: 1" = 100'
CURRENT
CONDITION
PLAN VIEW
MY 2 OF 5
SHEET 2 OF 2