Mill Branch Stream Restoration Project
Columbus County
North Carolina

EEP Project No. 251
CU: 03040206
SCO# 020611301A

Year 5 of 5 Monitoring Report
Data Collection: June through October 2011
Submission Date: February 17, 2012

Prepared for:

North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
2728 Capital Boulevard, Suite 1H-103
Raleigh, NC 27606

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Prepared by:

Rummel, Klepper & Kahl, LLP
900 Ridgefield Drive
Suite 350
Raleigh, NC 27609

2.0 Table of Contents

3.0 EXECUTIVE SUMMARY/PROJECT ABSTRACT

Project goals and objectives for the Mill Branch stream restoration project included:

Goal – Reduce Erosion

i. Objective – Restoration of the stream channel and banks will reduce sediment loads and erosion.

Goal – Improve water quality

i. Objective – Reduce nutrients from entering the stream from cattle by fencing the conservation easement and restoring a vegetative buffer.

Goal – Provide wildlife habitat

i. Objective – Protect floral and biotic diversity via preservation.
ii. Objective – Restore the riparian buffer by planting native species.

Goal - Improve aquatic habitat

i. Objective – Enhance instream habitat with woody debris .
ii. Restore the stream bed structure.

The North Carolina Ecosystem Enhancement Program (EEP) restored 3,507.5 linear feet of an Unnamed Tributary (UT) to Mill Branch located on the Jones property, south of Whiteville, in Columbus County, North Carolina. Construction of the project began on October 30, 2006, the stream restoration was completed on January 25, 2007 and planting was completed on January 31, 2007. Approximately 1,750 linear feet of Mill Branch and 37.3 acres of associated riparian and non-riparian wetlands along Mill Branch downstream of the restoration area were also preserved as part of this project.

Four (4) permanent vegetation plots were initially established and used in annual vegetation monitoring. For 2011, five (5) additional random transect plots were added (Figure 2-2e). Overall, the site is exceeding the minimum success requirements yielding a site average of 291 stems per acre. The vegetative success criteria is based on the US Army Corps of Engineers Stream Mitigation Guidelines (USACE, 2003). As per the mitigation plan, the vegetative success criteria will be the survival of 260 planted woody stems per acre at the end of the year 5 monitoring period. Monitoring for 2011 demonstrated that vegetation plots VP2, VP3, and RT4 fall below the minimum success requirements. Vegetation plots VP1, VP4, RT1, RT2, RT3, and RT5 meet or exceed minimum success requirements. Vegetation plot and Random Transect Plots are identified in Figure 2b-2e. Supplemental planting for areas with low woody stem densities have been put under contract by EEP.

The majority of the stream is functioning well and holding grade, however, the stream has areas of concern that may require repair due to sediment aggradation in the western and upper reaches. Overall the project is performing adequately. Channel dimension and pattern are similar to as-built conditions. The channel profile appears to be holding grade and maintaining bedform features. Since project construction, North Carolina has experienced a moderate to severe drought. Although conditions have improved over the past growing season, the drought has caused low flow periods resulting in vegetation growing within the stream channel. The western reach has constricted water flow due to substantial amount of rooted vegetation within the constructed channel. This condition is a result of long periods of low to zero flow conditions. The vegetation has caused disruption of sediment transport resulting in areas of sediment deposition on parts of the project.

Wetland restoration or enhancement was not a part of the Mill Branch Stream Restoration Site. Therefore, no wetland monitoring is required.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the mitigation and restoration plan documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

4.0 METHODOLOGY

Stream monitoring was completed by utilizing total station survey along with Rosgen Level II techniques to determine stream stability and performance. The annual cross-sectional survey included points surveyed at all breaks in slope, bankfull, inner berm, edge of water, and thalweg, if the features were present. Longitudinal profile survey was conducted for the entire length of the restored channel for stream reaches. Measurements included thalweg, water surface, and bankfull. Existing onsite benchmarks were used for survey control.

Vegetative sample plots were quantitatively monitored during the growing season. Four $100m^2$ plots were established for site monitoring. Species composition, density, vigor and survival were all monitored. Each plot corner is permanently located with rebar. For 2011, five (5) additional random transect plots were utilized for vegetation monitoring. The random transect plot origin corner was selected utilizing an XY random scatter utility in GIS software then a frisbee was thrown to determine a random bearing for plot direction. Once the plot location and bearing was determined, a measured plot of $100m^2$ was established and GPS located (plot layout was 5x20 meter). A stem count was then conducted within the plot limits to ascertain trees per acre. Year 5 vegetation monitoring was completed in September 2011 utilizing the Carolina Vegetation Survey (CVS) – EEP protocol Level 1 (version 4.1) and random plot sampling as described.

Photo monitoring was conducted by walking each stream reach and taking photos at each predetermined photo point location using a digital camera.

5.0 References

USACOE (2003). *Stream Mitigation Guidelines*. USACOE, USEPA, NCWRC, NCDENR-DWQ.

USACOE (1987). *Corps of Engineers Wetlands Delineation Manual*. Tech report Y-87-1. AD/A176.

Rosgen, D.L. (1996) *Applied River Morphology*. Wildland Hydrology books, Pagosa Springs, CO.

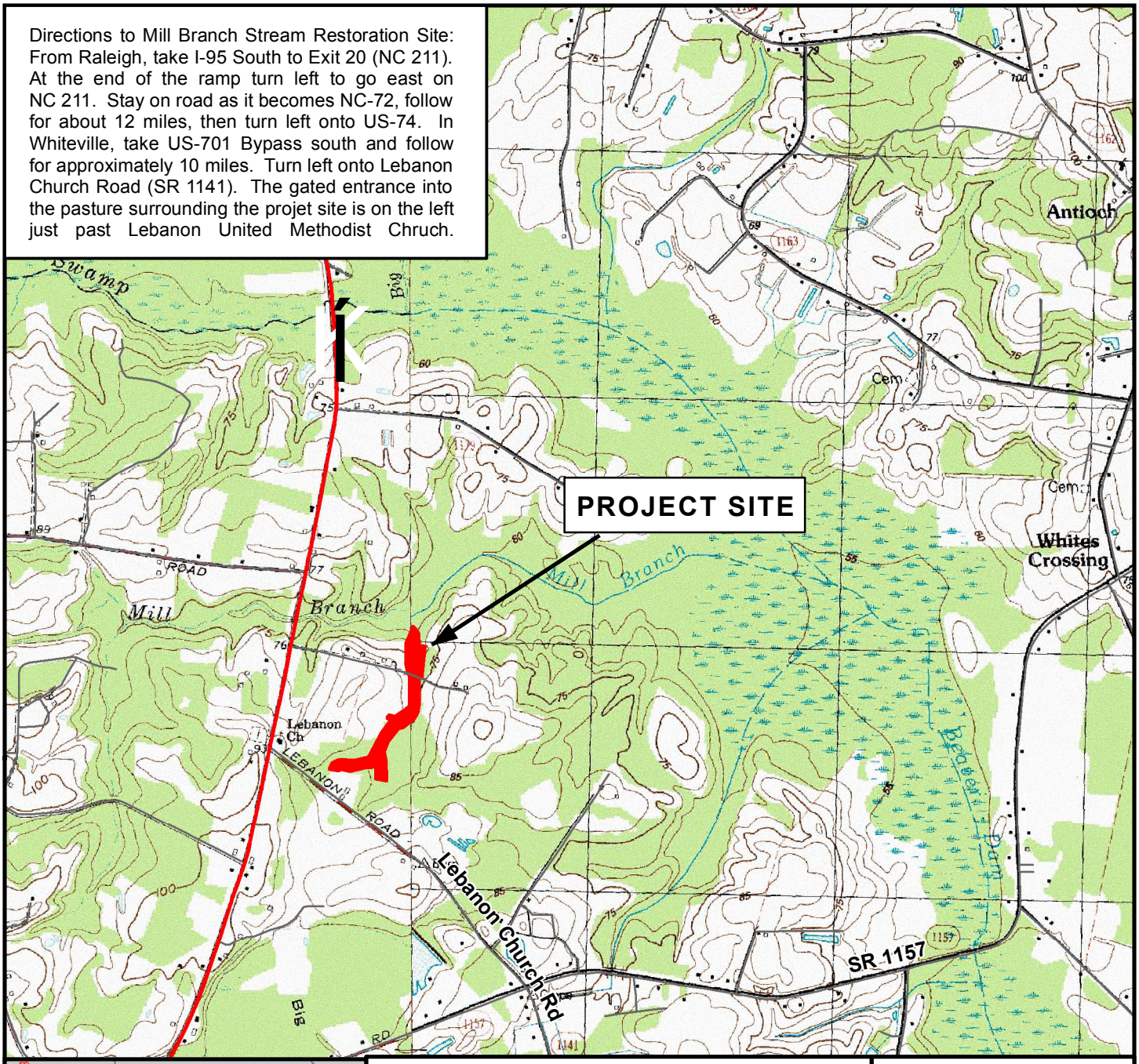
Lee, M.T., R.K. Peet, S.D. Roberts, T.R. Wentworth. (2006). CVS-EEP Protocol for Recording Vegetation Version 4.0

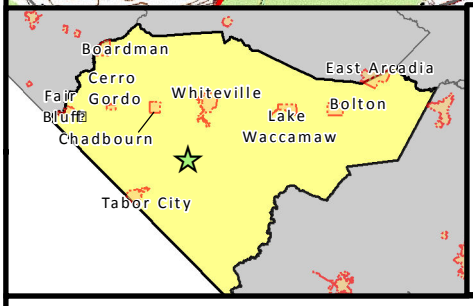
6.0 Project Condition and Monitoring Data Appendices

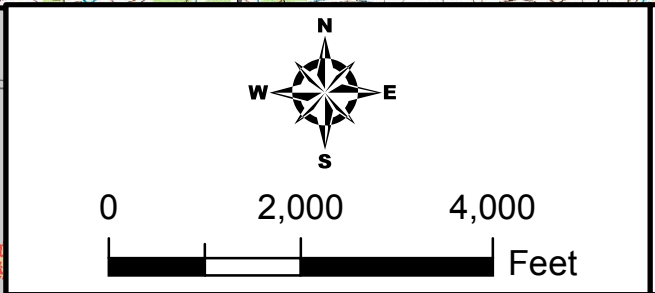
APPENDIX A

Source: USGS 7.5 Minute Quadrangle, Nikina & Tarbor City East, NC

Directions to Mill Branch Stream Restoration Site: From Raleigh, take I-95 South to Exit 20 (NC 211). At the end of the ramp turn left to go east on NC 211. Stay on road as it becomes NC-72, follow for about 12 miles, then turn left onto US-74. In Whiteville, take US-701 Bypass south and follow for approximately 10 miles. Turn left onto Lebanon Church Road (SR 1141). The gated entrance into the pasture surrounding the projet site is on the left just past Lebanon United Methodist Chruch.







Ecosystem Enhancement Program

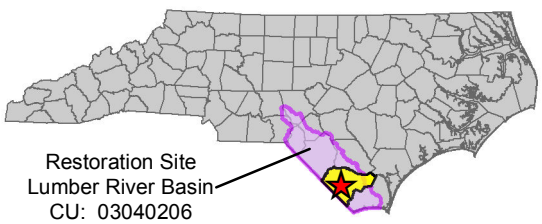


FIGURE 1

Site Location Map

Mill Branch Stream Restoration Project

EEP No. 0251

Columbus County, North Carolina

October 2011

Table 1. Project Components and Mitigation Credits
Mill Branch Stream Restoration Site, EEP No. 251

Mitigation Credits

	Stream (LF)		Riparian Wetland (acres)		Non-Riparian Wetland (acres)		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	3507.5*	350		7.2		0.3			

Project Components

Project Component	Stationing/Location	Existing Footage/Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
Western Reach	10+00 to 17+65.2	660	Priority 2		765.2	1:1
Upper Reach	10+00.0 to 14+39.2	340	Priority 2		439.2	1:1
Middle Reach	10+00.0 to 25+55.3	1265	Priority 2		1,555.3	1:1
Lower Reach	10+00.0 to 17+47.8	670	Priority 2		747.8	1:1
Mill Branch		1750	Preservation	350.0		5:1
Riparian Wetland		35.8	Preservation	7.16		5:1
Non-Riparian Wetland		1.5	Preservation	0.3		5:1

Component Summation

Restoration Level	Stream (Linear Feet)	Riparian Wetland (acres)	Non-riparian Wetland (acres)	Buffer (acres)	Upland (acres)
Restoration and Preservation	3677	7.2	0.3		

*180 LF deduction from the total stream restoration credits due to the three (3) potential stream crossings.

Table 2. Project Activity and Reporting History
Mill Branch Stream Restoration Site, EEP No. 251

Activity or Report	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	NA	Jan 2005
Final Design - 90%	NA	Sept 2005
Construction	Jan 2007	Jan 2007
Temporary S&E mix applied to entire project area	Jan 2007	Jan 2007
Permanent seed mix applied to entire project area	Jan 2007	Jan 2007
Containerized and B&B plantings	Jan 2007	Jan 2007
Mitigation Plan / As-built (Year 0 Monitoring - baseline)	April 2007	June 2007
Year 1 Monitoring	Nov 2007	Dec 2007
Year 2 Monitoring	Nov 2008	Jan 2009
Year 3 Monitoring	Nov 2009	Nov 2009
Year 4 Monitoring	Oct 2010	Nov 2010
Year 5 Monitoring	October 2011	October 2011

Table 3. Project Contacts Table Mill Branch Stream Restoration Site, EEP No. 251	
Designer Primary project design POC	Stantec Consulting Services, Inc. 801 Jones Franklin Road Suite 300 Raleigh, NC 27606 Brad Fairley, (919) 851-6866
Construction Contractor Construction contractor POC	North State Environmental, Inc 2889 Lowery St. Suite B Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2405
Planting Contractor Planting Contractor POC	North State Environmental, Inc 2889 Lowery St. Suite B Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2405
Seeding Contractor Seeding Contractor POC	North State Environmental, Inc 2889 Lowery St. Suite B Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2405
Seed Mix Sources	Contact North State Environmental, Inc
Nursery Stock Suppliers	Dykes & Son Nursery 825 Maude Etter Rd McMinnville, TN 37110 North State Environmental, Inc 2889 Lowery St. Suite B Winston-Salem, NC 27101 Stephen C. Joyce (336) 725-2405
Monitoring Performers (MY2, MY3, MY4, MY5)	Rummel, Klepper, and Kahl, LLP 900 Ridgefield Drive Suite 250 Raleigh, NC 27609
Stream Monitoring POC Vegetation Monitoring POC Wetland Monitoring POC	Pete Stafford (919)878-9560 Pete Stafford (919)878-9560 NA

Table 4. Project Baseline Information and Attributes Mill Branch Stream Restoration Site, EEP No. 251				
Project Information				
Project Name	Mill Branch Stream Restoration Project			
Project County	Columbus			
Project Area	N/A			
Project Coordinates (Lat and Long)	34.219130, -78.751094			
Project Watershed Summary Information				
Physiographic Region	Coastal Plain			
River Basin	Lumber			
USGS HUC 8 Digit 03040206	USGS HUC 14 Digit 03040206060020			
NCDWQ Subbasin	03-07-57			
Project Drainage Area	178 acres			
Project Drainage impervious cover estimate (%)	< 1 percent			
CGIA Land Use Classification				
Reach Summary Information				
Parameters	Western	Upper	Middle	Lower
Length of Reach	765.2	439.2	1,555.3	747.8
Valley Classification				
Drainage Area				178 acres
NCDWQ Stream Identification Score				
NCDWQ Water Quality Classification	C, SW	C	SW	C
Morphological Description (stream type)	C			
Evolutionary Trend	N/A			
Underlying Mapped Soils	Muckalee	Goldsboro, Wagram	Muckale e	Muckalee
Drainage Class	Poorly Drained	Moderately Drained	Poorly Drained	Poorly Drained
Soil Hydric Status	Hydric A	Hydric B	Hydric A	Hydric A
Slope				
FEMA Classification				
Native Vegetation Community				
Percent Composition Exotic Invasive Vegetation				
Wetland Summary Information				
37.3 acres of wetlands preserved as part of this project. Preservation information available by request from EEP.				
Regulatory Considerations				
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**	
Waters of the United States – Section 404	Yes	Yes	Upon Request	
Waters of the United States – Section 401	Yes	Yes	Upon Request	
Endangered Species Act	Yes	Yes	Upon Request	
Historic Preservation Act	Yes	Yes	Upon Request	
Coastal Zone Management Act (CZMA) Coastal Area Management Act (CAMA)	No			
FEMA Floodplain Compliance	Yes	Yes	Upon Request	
Essential Fisheries Habitat	No			

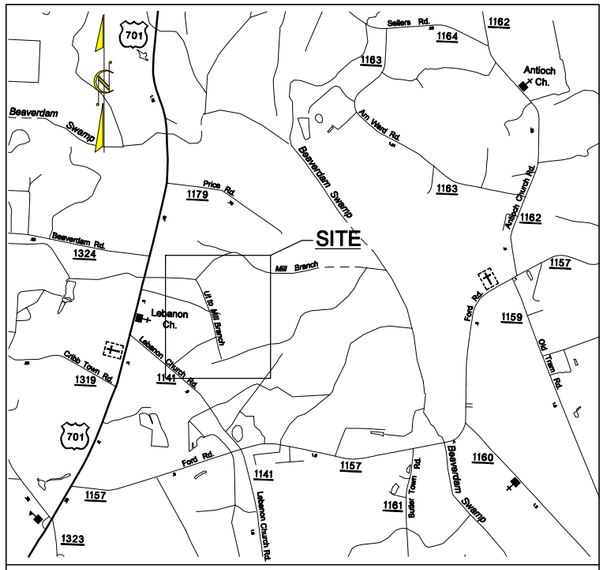
APPENDIX B

STATE	EEP SCO# NO.	SHEET NO.	TOTAL SHEETS
N.C.	02-06113-01A	1	7

STATE OF NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM

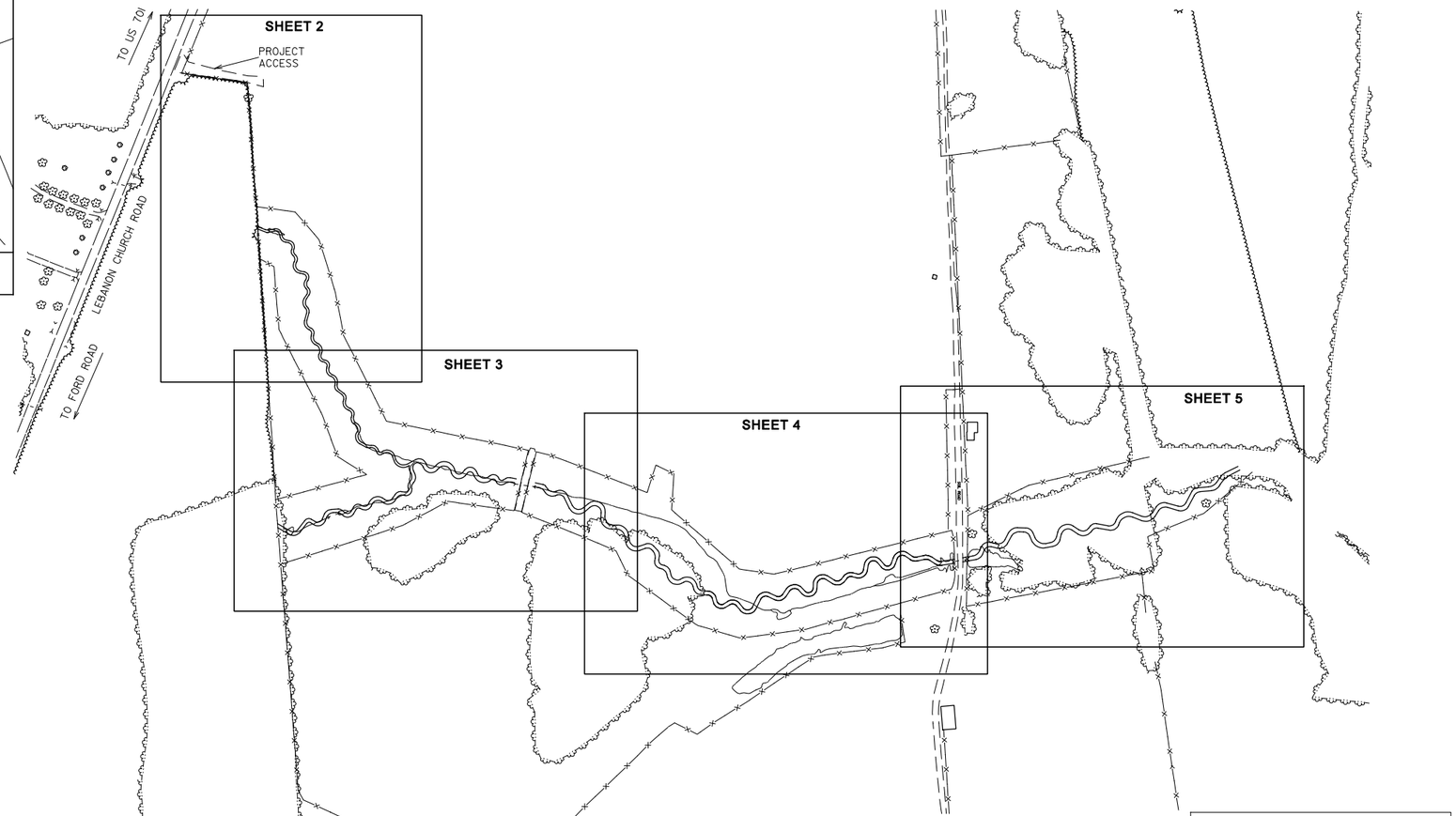
UNNAMED TRIBUTARY TO MILL BRANCH

LOCATION: COLUMBUS COUNTY, NORTH CAROLINA
TYPE OF WORK: AS-BUILT DRAWINGS
SCO# 02-06113-01A



VICINITY MAP

Columbus County, NC



INDEX OF SHEETS

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

5 2.5 0 5 10
PROFILE (VERTICAL)

Prepared In the Office of:
Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866 Fax. 919.851.7024
www.stantec.com

October 20, 2011

SIGNATURE

PROJECT: 17030983

6/25/2007
10:30:09 AM
U:\17\30\167\em\design\plan\Asbuilts_design_overlay\17300167_EM_ASBUILTDESIGNOVERLAY_sheet1.dgn

PROJECT NO.	SHEET NO.
SCO# 02-06113-01A	2

FIGURE 2b

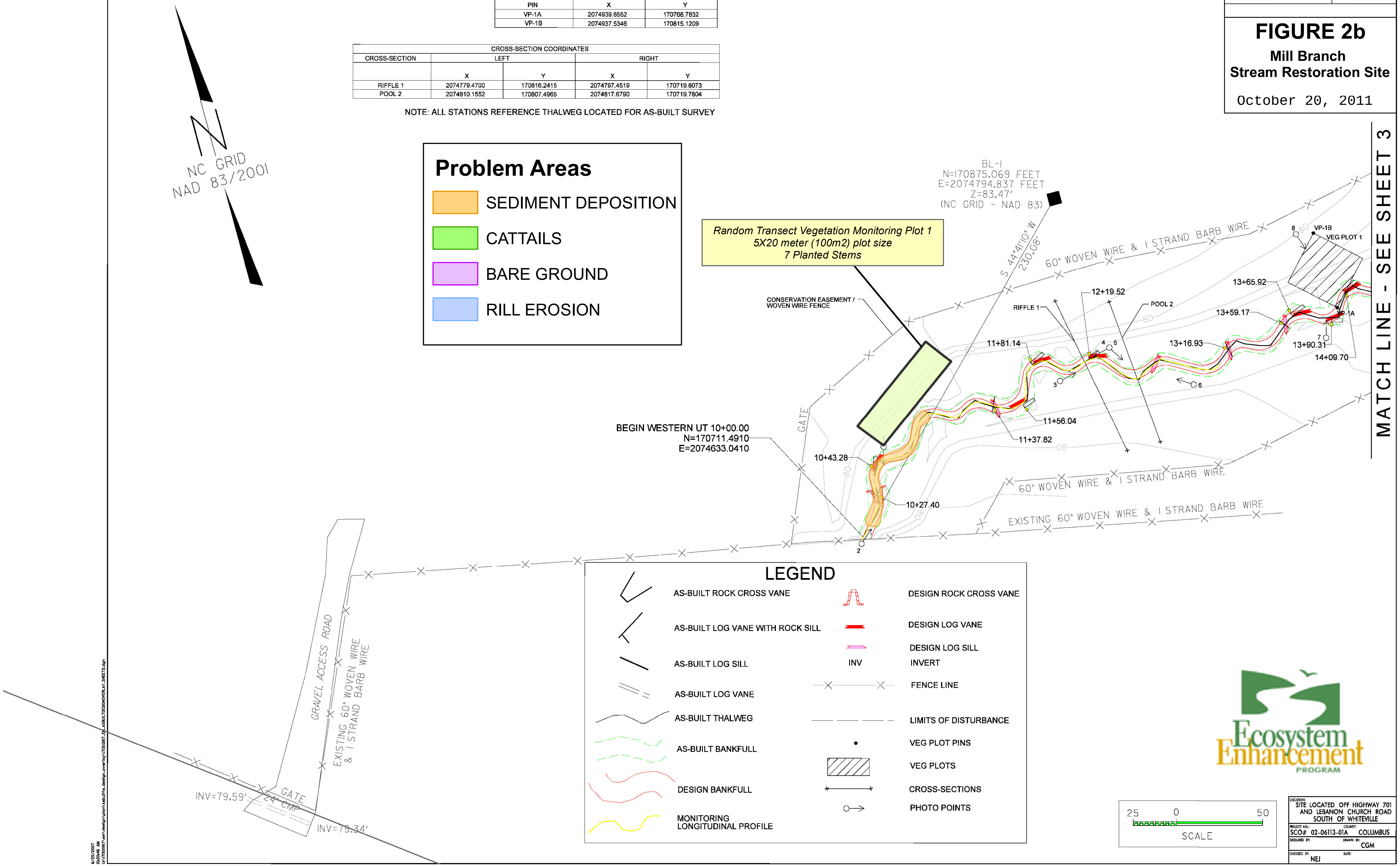
Mill Branch Stream Restoration Site

October 20, 2011

VEG PLOT PIN COORDINATES		
PIN	X	Y
VP-1A	2074939.6552	170768.7832
VP-1B	2074937.5346	170815.1209

CROSS-SECTION COORDINATES				
CROSS-SECTION	LEFT		RIGHT	
	X	Y	X	Y
RIFFLE 1	2074779.4700	170816.2415	2074797.4519	170719.8073
POOL 2	2074810.1552	170807.4965	2074817.6790	170719.7804

NOTE: ALL STATIONS REFERENCE THALWEG LOCATED FOR AS-BUILT SURVEY



NC GRID
NAD 83/2001
Problem Areas
SEDIMENT DEPOSITION
CATTAILS
BARE GROUND
RILL EROSION
BL-1
N=170875.069 FEET
E=2074794.837 FEET
Z=83.47'
(NC GRID - NAD 83)
S 44°41'10" W
230.08'
Random Transect Vegetation Monitoring Plot 1
5X20 meter (100m2) plot size
7 Planted Stems
CONSERVATION EASEMENT / WOVEN WIRE FENCE
60" WOVEN WIRE & 1 STRAND BARB WIRE
VP-1B
VEG PLOT 1
13+65.92
12+19.52
RIFFLE 1
POOL 2
13+59.17
11+81.14
13+16.93
13+90.31
14+09.70
11+56.04
11+37.82
GATE
BEGIN WESTERN UT 10+00.00
N=170711.4910
E=2074633.0410
10+43.28
10+27.40
EXISTING 60" WOVEN WIRE & 1 STRAND BARB WIRE
GRAVEL ACCESS ROAD
EXISTING 60" WOVEN WIRE & 1 STRAND BARB WIRE
INV=79.59'
24" CMP
INV=79.34'
MATCH LINE - SEE SHEET 3
LEGEND
AS-BUILT ROCK CROSS VANE
AS-BUILT LOG VANE WITH ROCK SILL
AS-BUILT LOG SILL
AS-BUILT LOG VANE
AS-BUILT THALWEG
AS-BUILT BANKFULL
DESIGN BANKFULL
MONITORING LONGITUDINAL PROFILE
DESIGN ROCK CROSS VANE
DESIGN LOG VANE
DESIGN LOG SILL
INV
INVERT
FENCE LINE
LIMITS OF DISTURBANCE
VEG PLOT PINS
VEG PLOTS
CROSS-SECTIONS
PHOTO POINTS
25
0
50
SCALE

LOCATION: SITE LOCATED OFF HIGHWAY 701 AND LEBANON CHURCH ROAD SOUTH OF WHITEVILLE

PROJECT NO.: SCO# 02-06113-01A COUNTY: COLUMBUS

DRAWN BY: CGM

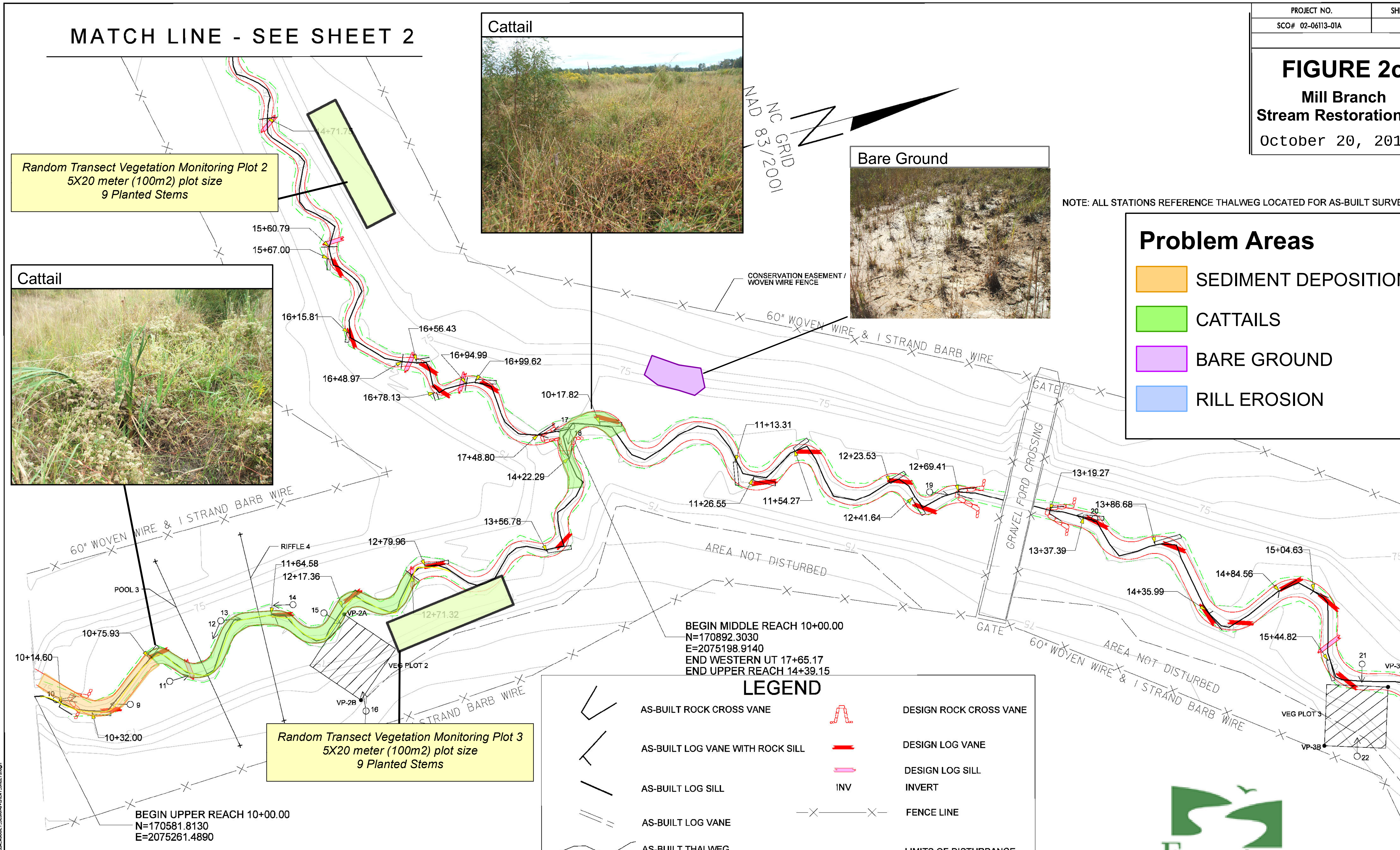
CHECKED BY: NEJ

PROJECT NO. SCO# 02-06113-01A | SHEET NO. 3

FIGURE 2c

Mill Branch Stream Restoration Site

October 20, 2011


MATCH LINE - SEE SHEET 2
MATCH LINE - SEE SHEET 4
Cattail
Cattail
Bare Ground
NC GRID NAD 83/2001
NOTE: ALL STATIONS REFERENCE THALWEG LOCATED FOR AS-BUILT SURVEY
Random Transect Vegetation Monitoring Plot 2
5X20 meter (100m2) plot size
9 Planted Stems
Random Transect Vegetation Monitoring Plot 3
5X20 meter (100m2) plot size
9 Planted Stems
CONSERVATION EASEMENT / WOVEN WIRE FENCE
60" WOVEN WIRE & 1 STRAND BARB WIRE
GATE
GRAVEL FORD CROSSING
AREA NOT DISTURBED
15+60.79
15+67.00
16+15.81
16+56.43
16+48.97
16+78.13
16+94.99
16+99.62
17+48.80
10+17.82
14+22.29
13+56.78
12+79.96
11+64.58
12+17.36
RIFFLE 4
POOL 3
10+75.93
10+14.60
10+32.00
11+13.31
11+26.55
11+54.27
12+23.53
12+41.64
12+69.41
13+19.27
13+86.68
13+37.39
15+04.63
14+84.56
14+35.99
15+44.82
VP-2A
VP-2B
VEG PLOT 2
VEG PLOT 3
VP-3A
VP-3B
BEGIN MIDDLE REACH 10+00.00
N=170892.3030
E=2075198.9140
END WESTERN UT 17+65.17
END UPPER REACH 14+39.15
BEGIN UPPER REACH 10+00.00
N=170581.8130
E=2075261.4890

Problem Areas

- SEDIMENT DEPOSITION
- CATTAILS
- BARE GROUND
- RILL EROSION

LEGEND

- AS-BUILT ROCK CROSS VANE
- AS-BUILT LOG VANE WITH ROCK SILL
- AS-BUILT LOG SILL
- AS-BUILT LOG VANE
- AS-BUILT THALWEG
- AS-BUILT BANKFULL
- DESIGN BANKFULL
- MONITORING LONGITUDINAL PROFILE
- DESIGN ROCK CROSS VANE
- DESIGN LOG VANE
- DESIGN LOG SILL
- INV INVERT
- FENCE LINE
- LIMITS OF DISTURBANCE
- VEG PLOT PINS
- VEG PLOTS
- CROSS-SECTIONS
- PHOTO POINTS

VEG PLOT PIN COORDINATES

PIN	X	Y
VP-2A	2075262.6162	170751.6045
VP-2B	2075308.8812	170748.2524

CROSS-SECTION COORDINATES

CROSS-SECTION	LEFT		RIGHT	
	X	Y	X	Y
POOL 3	2075209.2535	170662.4179	2075315.2216	170679.9107
RIFFLE 4	2075207.3409	170709.5291	2075308.6113	170705.9738

SCALE 25 0 50

Ecosystem Enhancement PROGRAM

LOCATION: SITE LOCATED OFF HIGHWAY 701 AND LEBANON CHURCH ROAD SOUTH OF WHITEVILLE
PROJECT NO.: SCO# 02-06113-01A | COUNTY: COLUMBUS
DESIGNED BY: | DRAWN BY: CGM
CHECKED BY: NEJ | DATE:

PROJECT NO.	SHEET NO.
SCO# 02-06113-01A	4

FIGURE 2d

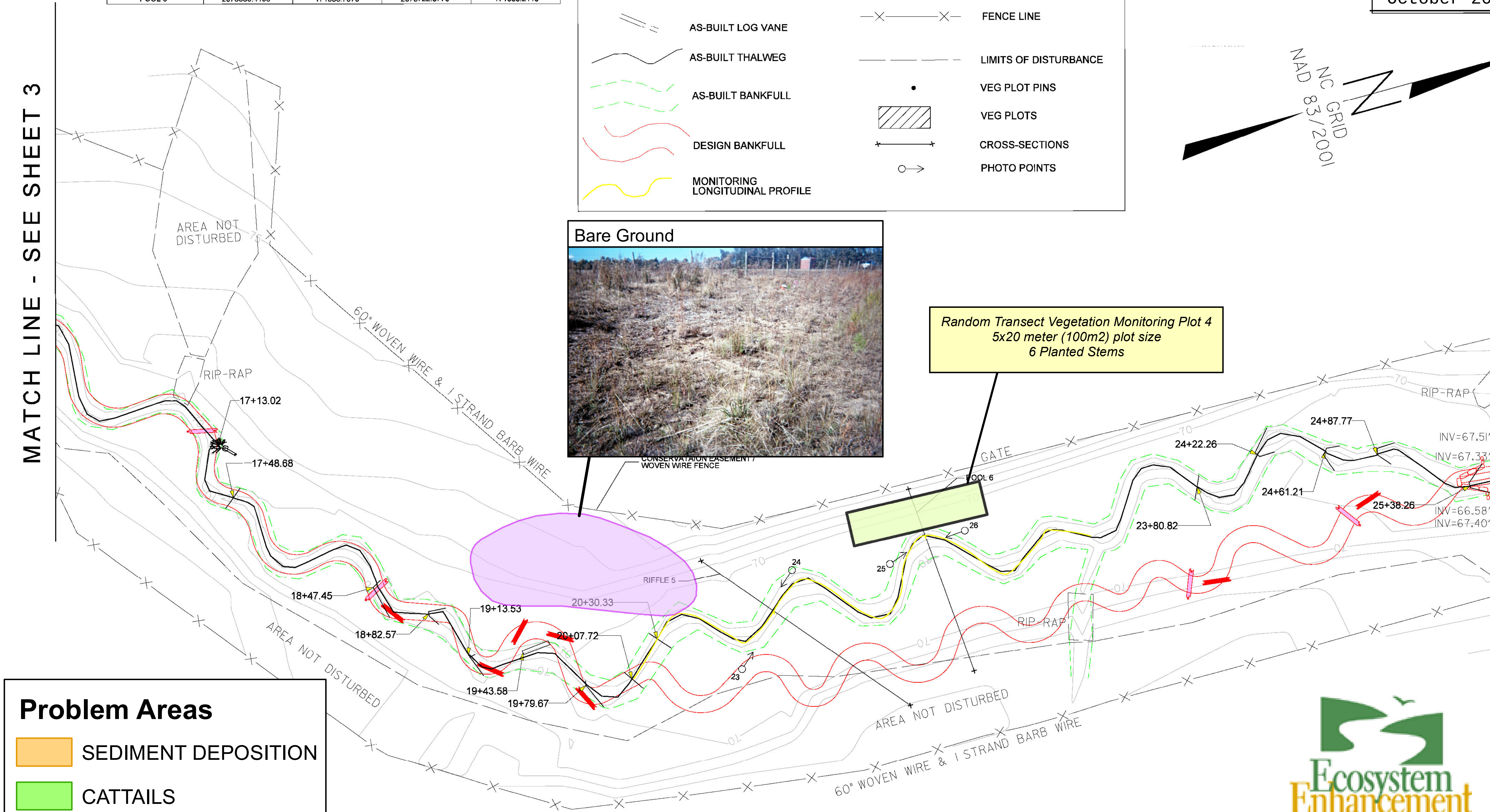
Mill Branch
Stream Restoration Site
October 20, 2011

VEG PLOT PIN COORDINATES		
PIN	X	Y
VP-3A	2075466.5710	171234.5650
VP-3B	2075445.3470	171275.3682

CROSS-SECTION COORDINATES				
CROSS-SECTION	LEFT		RIGHT	
	X	Y	X	Y
RIFFLE 5	2075637.4170	171554.0230	2075730.5940	171632.4420
POOL 6	2075830.4130	171658.7970	2075722.6770	171666.2110

LEGEND

- AS-BUILT ROCK CROSS VANE
- AS-BUILT LOG VANE WITH ROCK SILL
- AS-BUILT LOG SILL
- AS-BUILT LOG VANE
- AS-BUILT THALWEG
- AS-BUILT BANKFULL
- DESIGN BANKFULL
- MONITORING LONGITUDINAL PROFILE
- DESIGN ROCK CROSS VANE
- DESIGN LOG VANE
- DESIGN LOG SILL
- INV — INVERT
- FENCE LINE
- LIMITS OF DISTURBANCE
- VEG PLOT PINS
- VEG PLOTS
- CROSS-SECTIONS
- PHOTO POINTS



Problem Areas

- SEDIMENT DEPOSITION
- CATTAILS
- BARE GROUND
- RILL EROSION

NOTE: ALL STATIONS REFERENCE THALWEG LOCATED FOR AS-BUILT SURVEY

SCALE: 25 0 50

Ecosystem Enhancement PROGRAM

LOCATION: SITE LOCATED OFF HIGHWAY 701 AND LEBANON CHURCH ROAD SOUTH OF WHITEVILLE	
PROJECT NO.: SCO# 02-06113-01A	COUNTY: COLUMBUS
DESIGNED BY:	DRAWN BY: CGM
CHECKED BY: NEJ	DATE:

PROJECT NO.	SHEET NO.
SCO# 02-06113-01A	5

FIGURE 2e

Mill Branch
Stream Restoration Site

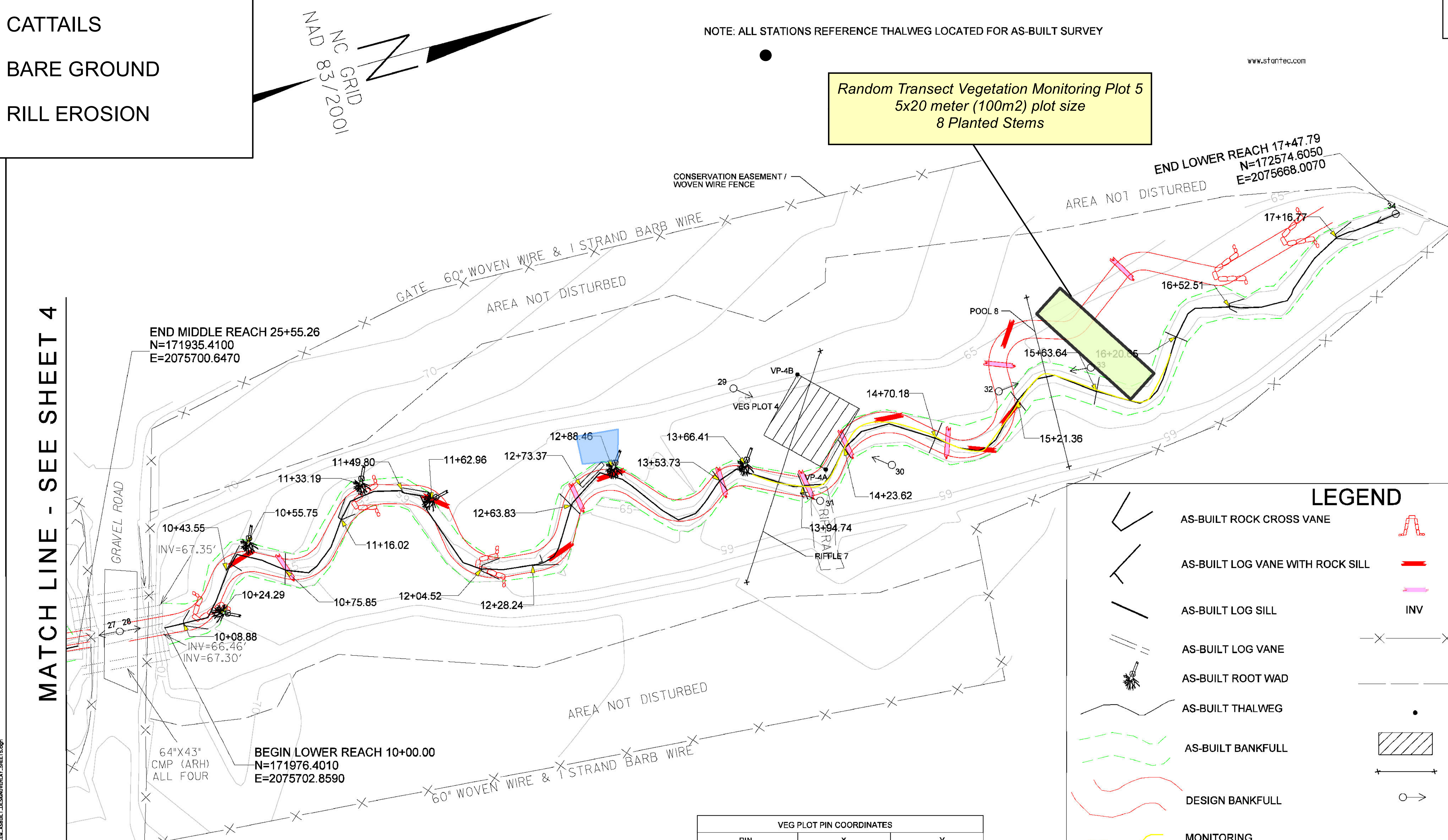
October 20, 2011

Problem Areas

- SEDIMENT DEPOSITION
- CATTAILS
- BARE GROUND
- RILL EROSION

NOTE: ALL STATIONS REFERENCE THALWEG LOCATED FOR AS-BUILT SURVEY

Random Transect Vegetation Monitoring Plot 5
5x20 meter (100m2) plot size
8 Planted Stems



LEGEND

- AS-BUILT ROCK CROSS VANE
- AS-BUILT LOG VANE WITH ROCK SILL
- AS-BUILT LOG SILL
- AS-BUILT LOG VANE
- AS-BUILT ROOT WAD
- AS-BUILT THALWEG
- AS-BUILT BANKFULL
- DESIGN BANKFULL
- MONITORING LONGITUDINAL PROFILE
- DESIGN ROCK CROSS VANE
- DESIGN LOG VANE
- DESIGN LOG SILL
- INV — INVERT
- FENCE LINE
- LIMITS OF DISTURBANCE
- VEG PLOT PINS
- VEG PLOTS
- CROSS-SECTIONS
- PHOTO POINTS

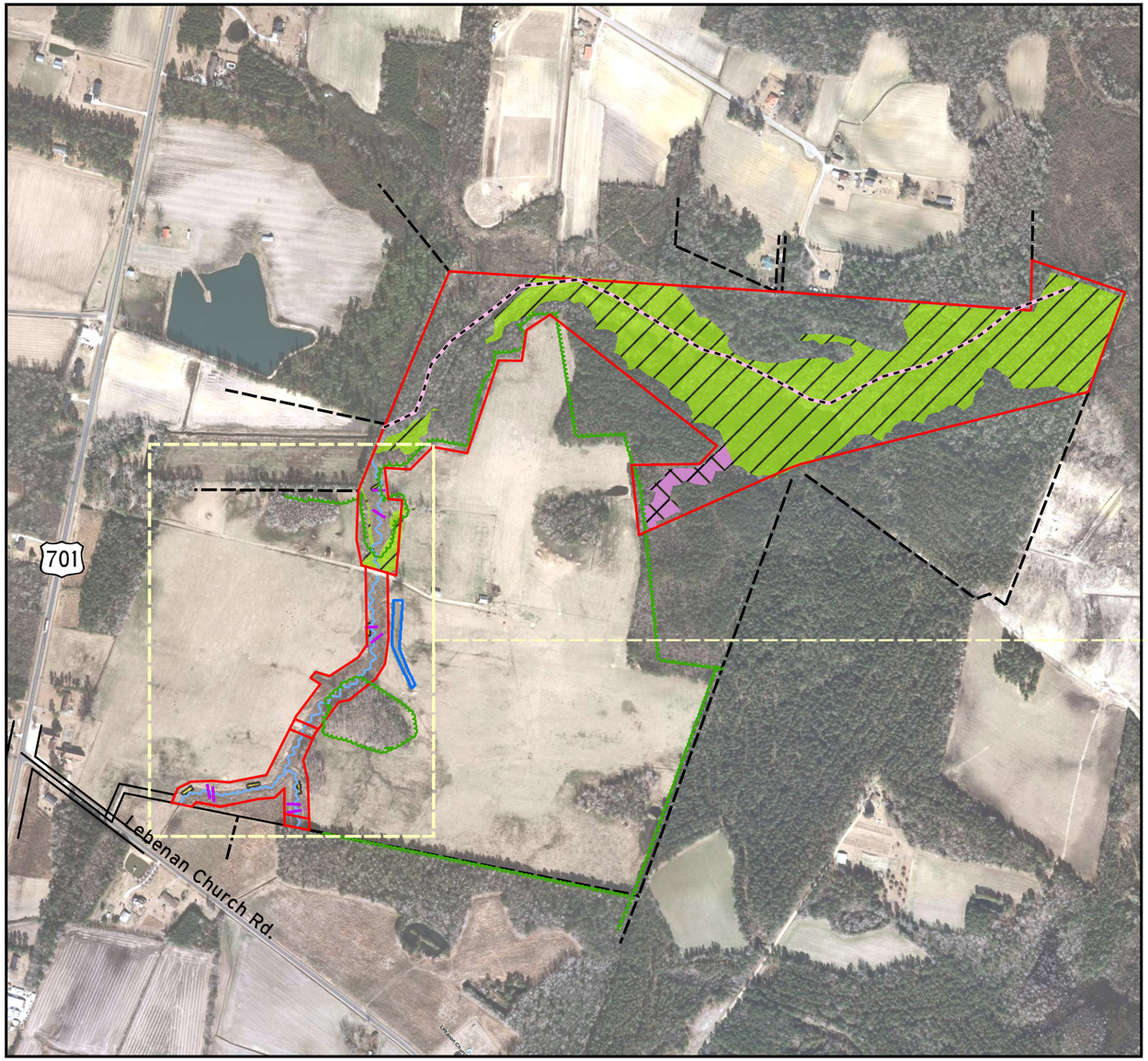
VEG PLOT PIN COORDINATES		
PIN	X	Y
VP-4A	2075666.9960	172287.9660
VP-4B	2075712.6850	172288.9580

CROSS-SECTION COORDINATES				
CROSS-SECTION	LEFT		RIGHT	
	X	Y	X	Y
RIFFLE 7	2075659.3700	172300.9220	2075753.1770	172240.1770
POOL 8	2075660.5760	172399.0200	2075740.8880	172397.2830

25 0 50
SCALE

SITE LOCATED OFF HIGHWAY 701 AND LEBANON CHURCH ROAD SOUTH OF WHITEVILLE

PROJECT NO.: SCO# 02-06113-01A	COUNTY: COLUMBUS
DESIGNED BY:	DRAWN BY: CGM
CHECKED BY: NEJ	DATE:



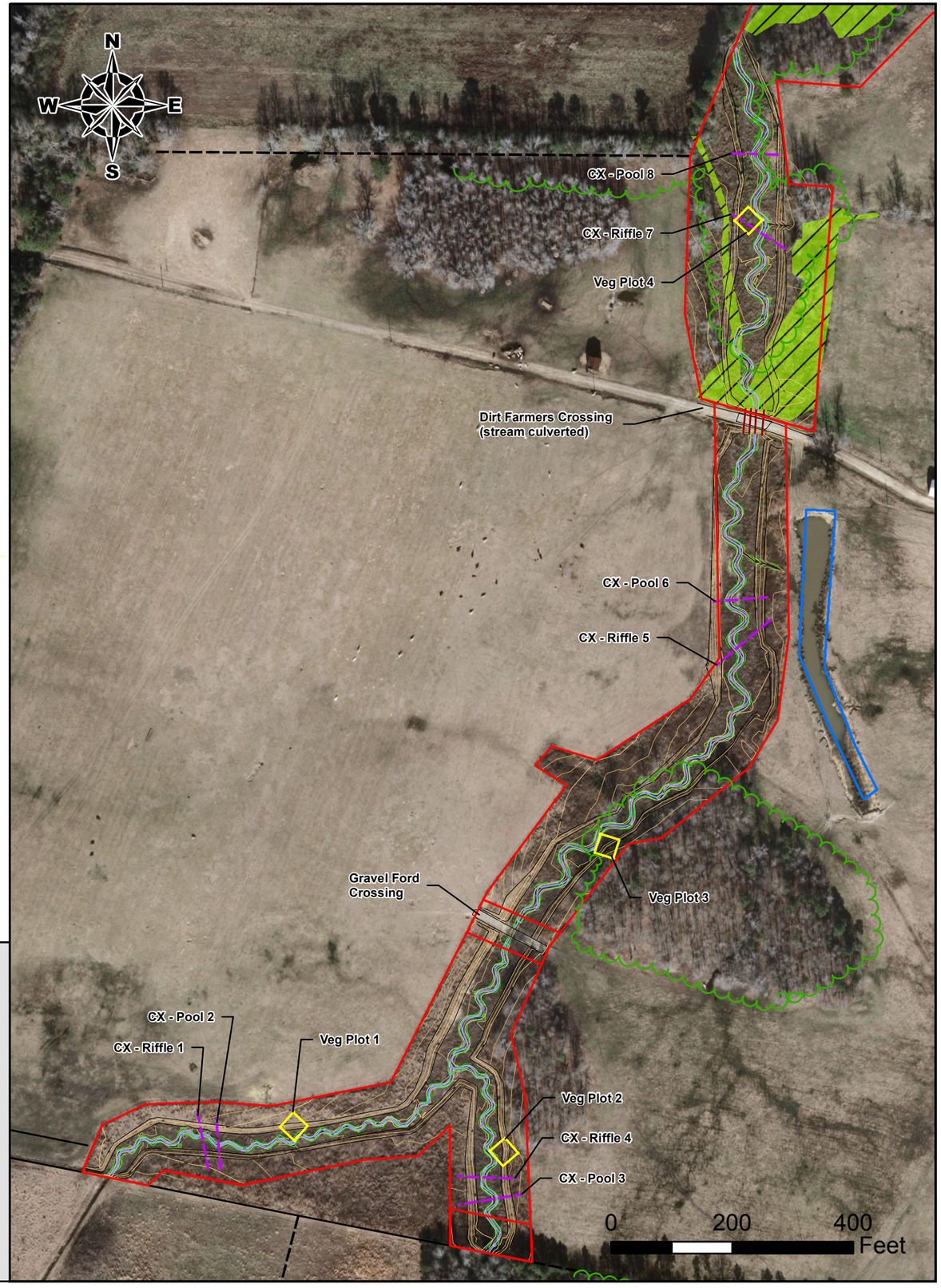


FIGURE 3

Mill Branch Stream Restoration Site

EEP Project No. 251
CU: 03040206
SCO# 020611301A

Legend

- Cross Sections
- Vegetation Plot
- Contours (1 ft)
- Project Boundary
- Vegetation Line
- Stream Preservation (1750 LF)
- Riverine Wetland Preservation (35.8 Ac.)
- Non-Riverine Wetland Preservation (1.5 Ac.)
- As-built Thalwag
- As-built Bankfull
- Pond

Aerial Source: NCCGIA 2010 Orthoimagery

Table 5a - Visual Stream Morphological Stability Assessment
Reach ID - Western
Assessed Length – 765.2 lf

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. Aggradation			1	050	93.5%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	12	13			92%			
	3. Meander Pool Condition	1. Depth	11	12			92%			
		2. Length	11	12			92%			
	4. Thalweg Condition	1. Thalweg at upstream of meander bend	NA	NA			NA			
		2. Thalweg centering at downstream of meander	NA	NA			NA			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover from poor growth and/or scour and erosion			0	0	100%	NA	NA	100%
	2. Undercut	Banks undercut/overhanging			0	0	100%	NA	NA	100%
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	NA	NA	100%
				Totals	0	0	100%	NA	NA	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	2	2			100%			
	2. Grade Control	Grade Control exhibiting maintenance of grade across the sill	2	2			100%			
	2a. Piping	Structures Lacking any substantial flow underneath sills or arms	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	N/A	N/A			100%			
	4. Habitat	Pool forming structures maintaining – Max Pool Depth: Mean Bankfull Depth Ratio $\geq$ 1.6 Rootwads/logs providing some cover at base flow.	N/A	N/A			NA			

Table 5b - Visual Stream Morphological Stability Assessment
Reach ID - Upper
Assessed Length – 439.2 lf

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. Aggradation			2	75	83%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	6	8			75%			
	3. Meander Pool Condition	1. Depth	8	10			80%			
		2. Length	8	10			80%			
	4. Thalweg Condition	1. Thalweg at upstream of meander bend	NA	NA			NA			
		2. Thalweg centering at downstream of meander	NA	NA			NA			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover from poor growth and/or scour and erosion			0	0	100%	NA	NA	100%
	2. Undercut	Banks undercut/overhanging			0	0	100%	NA	NA	100%
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	NA	NA	100%
				Totals	0	0	100%	NA	NA	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	3	3			100%			
	2. Grade Control	Grade Control exhibiting maintenance of grade across the sill	3	3			100%			
	2a. Piping	Structures Lacking any substantial flow underneath sills or arms	3	3			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	3	3			100%			
	4. Habitat	Pool forming structures maintaining – Max Pool Depth: Mean Bankfull Depth Ratio $\geq$ 1.6 Rootwads/logs providing some cover at base flow.	NA	NA			NA			

Table 5c - Visual Stream Morphological Stability Assessment
Reach ID - Middle
Assessed Length – 1555.3 lf

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	8	8			100%			
	3. Meander Pool Condition	1. Depth	7	7			100%			
		2. Length	7	7			100%			
	4. Thalweg Condition	1. Thalweg at upstream of meander bend	NA	NA			NA			
		2. Thalweg centering at downstream of meander	NA	NA			NA			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover from poor growth and/or scour and erosion			0	0	100%	NA	NA	100%
	2. Undercut	Banks undercut/overhanging			0	0	100%	NA	NA	100%
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	NA	NA	100%
				Totals	0	0	NA	NA	NA	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	2	2			100%			
	2. Grade Control	Grade Control exhibiting maintenance of grade across the sill	2	2			100%			
	2a. Piping	Structures Lacking any substantial flow underneath sills or arms	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	NA	NA			NA			
	4. Habitat	Pool forming structures maintaining – Max Pool Depth: Mean Bankfull Depth Ratio $\geq$ 1.6 Rootwads/logs providing some cover at base flow.	NA	NA			NA			

Table 5d - Visual Stream Morphological Stability Assessment
Reach ID - Lower
Assessed Length – 747.8 lf

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	3	3			100%			
	3. Meander Pool Condition	1. Depth	4	4			100%			
		2. Length	4	4			100%			
	4. Thalweg Condition	1. Thalweg at upstream of meander bend	NA	NA			NA			
		2. Thalweg centering at downstream of meander	NA	NA			NA			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover from poor growth and/or scour and erosion			0	0	100%	NA	NA	100%
	2. Undercut	Banks undercut/overhanging			0	0	100%	NA	NA	100%
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	NA	NA	100%
				Totals	0	0	100%	NA	NA	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	5	5			100%			
	2. Grade Control	Grade Control exhibiting maintenance of grade across the sill	5	5			100%			
	2a. Piping	Structures Lacking any substantial flow underneath sills or arms	5	5			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	NA	NA			NA			
	4. Habitat	Pool forming structures maintaining – Max Pool Depth: Mean Bankfull Depth Ratio $\geq$ 1.6 Rootwads/logs providing some cover at base flow.	NA	NA			NA			

Table 6 – Vegetation Condition Assessment
Planted Acreage - NA

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very Limited Cover of both woody and herbaceous material	Various	Violet	2	.25 acre	2.2%
2. Low Stem Density Areas*	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria	100 m^2 0.0247 acre	RED	3	.17 acre	2%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year	100 m^2 0.0247 acre	RED	3	.17 acre	2%

*Areas quantified via CVS monitoring. Other areas throughout the site have low stem densities quantified visually. Supplemental planting areas with low woody stem densities have been put under contract by EEP.

Stream Problem Areas Mill Branch Stream Restoration Site EEP Project No. 251			
Feature Issue	**Station Number**	**Suspected Cause**	**Photo Number**
Sediment Deposition	Western 10+00 to 13+50	Trapped Sediment/Low Flow	SPA 1
Sediment Deposition	Upper 10+00 to 14+00	Trapped Sediment/Low Flow	
Bare Ground	Figure 2c, Figure 2b	Dry Conditions/Possible Rill Erosion outside of Easement Boundary	VPA 1

Vegetation Problem Areas Mill Branch Stream Restoration Site EEP Project No. 251			
Feature Category	**Station Number**	**Suspected Cause**	**Photo Number**
Cattail	Throughout	Low Flow Conditions	VPA 2

Stream Photo Station Photos (all photos recorded on September 23, 2011)

Photo Station 1. Beginning of Western Reach – Upstream

Photo Station 2. Beginning of Western Reach – Downstream

Photo Station 3. Riffle Cross-section 1 – Downstream – Western Reach

Photo Station 4 Riffle Cross-section 1 – Upstream – Western Reach

Photo Station 5. Pool Cross-section 2 - Downstream – Western Reach

Photo Station 6. Pool Cross-section – Upstream – Western Reach

Photo Station 9. Beginning of Upper Reach – Upstream

Photo Station 10. Beginning of Upper Reach – Downstream

Photo Station 11. Pool Cross-section 3 – Downstream – Upper Reach

Photo Station 12. Pool Cross-section 3 – Upstream – Upper Reach

Photo Station 13. Riffle Cross-section 4 – Downstream – Upper Reach

Photo Station 14. Riffle Cross-section 4 – Upstream – Upper Reach

Photo Station 17. Confluence of Western and Upper Reaches – Western Reach

Photo Station 18. Confluence of Western and Upper Reaches – Upper Reach

Photo Station 19. Ford Crossing – Downstream – Middle Reach

Photo Station 20. Ford Crossing – Upstream – Middle Reach

Photo Station 23. Riffle Cross-section 5 - Downstream – Middle Reach

Photo Station 24. Riffle Cross-section 5 - Upstream – Middle Reach

Photo Station 25. Pool Cross-section 6 - Downstream – Middle Reach

Photo Station 26. Pool Cross-section 6 - Upstream – Middle Reach

Photo Station 27. Gravel Crossing- Upstream – Middle Reach

Photo Station 28. Gravel Crossing - Downstream – Lower Reach

Photo Station 31. Riffle Cross-section 7 – Upstream – Lower Reach

Photo Station 32. Riffle Cross-section 7 – Downstream – Lower Reach

Photo Station 33. Pool Cross-Section 8 – Upstream – Lower Reach

Photo Station 34. End of Project – Upstream – Lower Reach

Stream Problem Area Photos (all photos recorded on September 23, 2011)

SPA 1 – Rooted woody vegetation growing in the stream bed. Western Reach and Lower Reach

SPA 2 – Cattail growing in stream channel – Throughout project site

SPA 3 - Vegetation growing in the channel bed. Middle Reach

Vegetation Monitoring Plot Photos (all photos recorded on September 23, 2011)

Vegetation Plot 1

Vegetation Plot 2

Vegetation Plot 3

Vegetation Plot 4

APPENDIX C

Table 7. Vegetation Plot Criteria Attainment Mill Branch Stream Restoration Project EEP No: 251			
Tract	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**	**Tract Mean**
Western	VP1	Y	100%
Upper	VP2	N	0%
Middle	VP3	N	0%
Lower	VP4	Y	100%

Table 8. CVS Vegetation Plot Metadata Mill Branch Stream Restoration Project EEP No: 251	
Report Prepared By	William (Pete) Stafford
Date Prepared	10/11/2011 11:15
Database Name	MillBranch-2011-A.mdb
Database Location	C:\Documents and Settings\pstafford\Desktop\CVS Veg Data
Computer Name	STAFFORDP
Description Worksheets In This Document	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
Project Summary	
Project Code	251
Project Name	Mill Branch Stream Restoration
Description	Stream and Wetland Restoration
River Basin	Lumber
Length(ft)	
Stream-to-edge width (ft)	
Area (sq m)	
Required Plots (calculated)	

Table 9 - Planted and Total Counts (Species by Plot with Annual Means)

			CURRENT DATA (MY5 2011)								ANNUAL MEANS											
			Plot 1		Plot 2		Plot 3		Plot 4		Current Mean		MY4 (2010)		MY3 (2009)		MY2 (2008)		MY1 (2007)*		AB (2007)**	
Scientific Name	Common Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Betula nigra	River Birch	Tree	1	1	1	1	1				3	2	3	2	3	2	3	2	3	3	3	3
Carpinus caroliniana var. caroliniana	American Hornbeam	Tree	2		1				2	1	5	1	5	1	5	1	5	2	5	5	5	5
Cephalanthus occidentalis	Buttonbush	Shrub		1						1	0	2	0	2	0	1	0	1	0	0	0	0
Cornus amomum	Silky Dogwood	Tree	1		2		4		1	1	8	1	8	1	8	3	8	5	8	8	8	8
Liriodendron tulipifera var. tulipifera	Tulip Poplar	Tree	2	1		1		3		1	2	6	2	6	2	2	2	2	2	2	2	2
Platanus occidentalis var. occidentalis	Sycamore	Tree	1	1	1		1		1		4	1	4	1	4	3	4	3	4	4	4	4
Quercus lyrata	Overcup Oak	Tree	1	1	3		1	1			5	2	5	2	5	5	5	4	5	5	5	5
Quercus pagoda	Cherrybark Oak	Tree		1		2		1	1		1	4	1	4	1	1	1	1	1	1	1	1
Quercus phellos	Willow Oak	Tree	2				1		3	1	6	1	6	1	6	5	6	6	6	6	6	6
Quercus nigra	Water Oak	Tree		2					1	3	1	5	1	5	1	0	1	1	1	1	1	1
Salix sericea	Silky Willow	Tree			3		1	1	4	1	8	2	8	2	8	3	8	4	8	8	8	8
		Plot Area	0.025 acre		0.025 acre		0.025 acre		0.025 acre													
*No baseline data for this project		Species Count		7		3		4		7		11		11		10		11		10		10
Type = Tree or Shrub		Stem Count		8		4		6		9		27		27		26		31		43		43
P = Planted, T = Total		Stems/Acre		320		160		240		360		270		270		260		310		430		430

Table 9a - Random Transect Plot Total Count

Plot	Size and Layout	Planted Stem Count	Trees Per Acre
Random Transect Plot 1	0.025 acre	7	280
Random Transect Plot 2	0.025 acre	9	360
Random Transect Plot 3	0.025 acre	9	360
Random Transect Plot 4	0.025 acre	6	240
Random Transect Plot 5	0.025 acre	8	320
Random Transect Plot Totals	0.125 acre	39	312
Site Totals: Permanent and Random Plots	0.225 acre	70	291

Table 9b. Vegetation History: Stems/Acre Planted

PLOT #	YEAR 0 Planted	YEAR 1 Planted	YEAR 2 Planted	YEAR 3 Planted	YEAR 4 Planted	YEAR 5 Planted
Plot 1	467	440	360	280	320	320
Plot 2	647	480	160	200	160	160
Plot 3	728	320	280	240	240	240
Plot 4	647	560	480	320	360	360

APPENDIX D

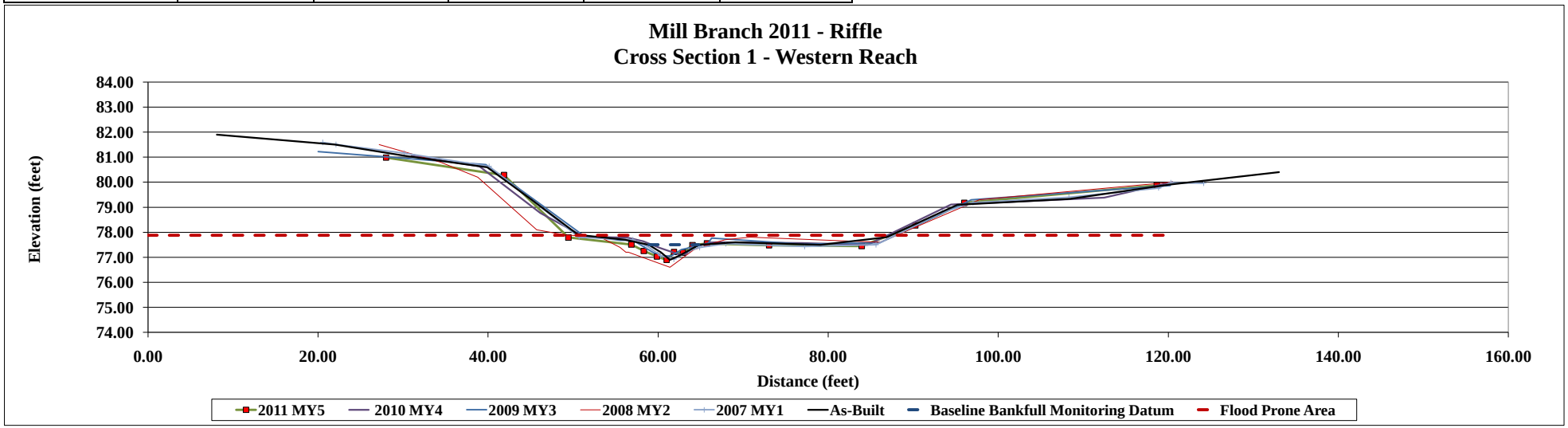
Project Name Mill Branch, MY5
Watershed
Cross Section 1
Drainage Area NA
Date Mar-11
Crew Tutt, Stafford

As-Built Survey			2007.00			2008.00			2009.00			2010.00			2011.00		
As-Built Survey			2007 MY1			2008 MY2			2009 MY3			2010 MY4			2011 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
8.10	81.90		20.54	81.59		27.20	81.50		20.00	81.22		31.00	81.06		28.00	80.98	
22.00	81.50	LPIN	22.12	81.51		34.40	80.80		39.72	80.70		38.96	80.63		41.87	80.28	
30.60	81.03		30.12	81.16		38.80	80.20		46.69	78.99		46.14	78.77		49.45	77.79	
39.90	80.60		40.13	80.63		45.70	78.10		51.21	77.87		51.27	77.82		56.85	77.51	
45.10	79.30		50.70	77.80		49.00	77.90		55.58	77.67		56.42	77.78		58.32	77.25	
50.60	77.90		57.01	77.70		53.20	77.80		57.00	77.69		58.23	77.65		59.86	77.03	
56.10	77.70		58.64	77.46		55.50	77.40		59.49	77.18		60.19	77.38		60.99	76.90	
58.90	77.50	LBKF	60.30	77.06		56.20	77.20		59.92	77.18		62.41	77.12		61.86	77.21	
60.30	77.20		61.85	76.92		56.50	77.20		60.25	77.05		63.23	77.13		62.92	77.19	
61.40	76.90		63.60	77.26		61.40	76.60		61.55	77.06		64.35	77.44		64.04	77.49	
62.70	77.10		64.88	77.39		64.20	77.30		62.75	77.31		66.13	77.59		65.73	77.55	
64.80	77.50	RBKF	67.97	77.54		66.80	77.60		65.86	77.55		66.71	77.60		73.04	77.48	
69.10	77.60		77.23	77.43		67.90	77.70		66.28	77.77		76.92	77.57		83.93	77.45	
79.10	77.50		85.63	77.50		70.80	77.80		76.98	77.52		84.64	77.50		90.25	78.28	
86.90	77.80		93.42	78.79		86.10	77.60		86.11	77.58		94.43	79.11		96.00	79.18	
95.20	79.10		97.04	79.18		97.80	79.30		96.84	79.29		112.46	79.38		118.64	79.88	
108.40	79.33		108.31	79.40		120.50	80.00		120.24	79.87		120.48	80.01				
120.10	79.90	RPIN	118.85	79.77													
133.00	80.40		120.29	79.98													
			124.16	79.96													

Summary Data	
Bankfull Elv.	77.5
BF Area	2.7
BF Width	21.1
Flood Prone Elv.	78
Flood Prone Width	40.4
Max Depth	0.6
Mean Depth	0.1
W/D Ratio	166.9
ER	1.9
Bank Height Ratio	
Stream Type	C5

Photo of Cross-Section 1 - Looking Downstream @ STA 2+15

Picture Taken September 23, 2011



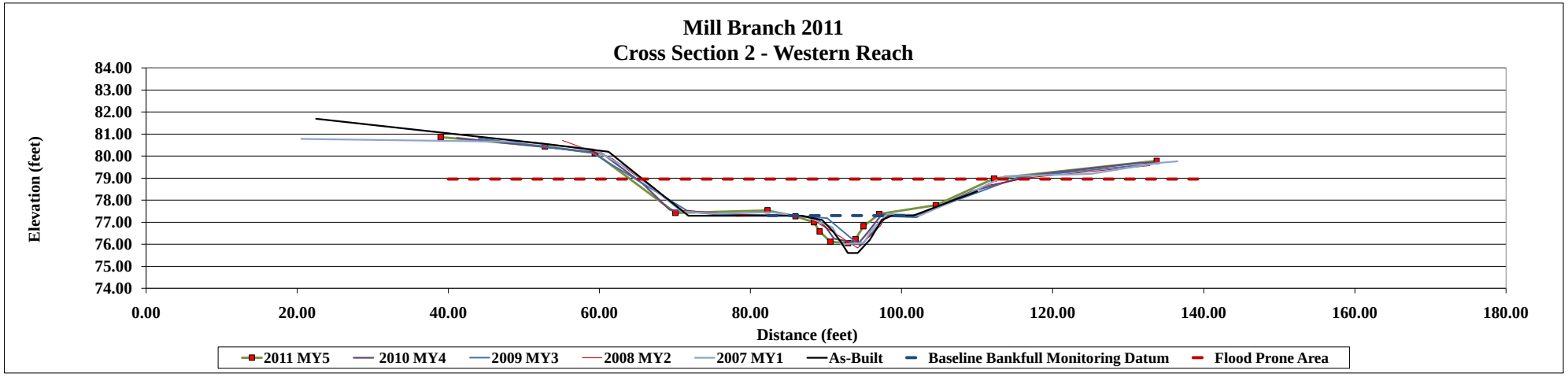
Project Name	Mill Branch, MY5
Watershed	
Cross Section	2
Drainage Area	NA
Date	Mar-11
Crew	Tutt, Stafford

Photo of Cross-Section 2 - Looking Downstream @ STA 1+35

Picture Taken September 23, 2011

As-Built Survey As-Built Survey			2007 2007 MY1			2008 2008 MY2			2009 2009 MY3			2010 2010 MY4			2011 2011 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
22.50	81.70		20.54	80.78		55.10	80.71		44.00	80.81		41.15	80.83		39.00	80.87	
46.10	80.80	LPIN	49.95	80.64		61.79	79.88		59.09	80.14		60.29	80.15		52.80	80.44	
52.60	80.56		59.14	80.31		71.05	77.53		71.59	77.53		65.73	78.76		59.40	80.14	
61.20	80.20		63.79	79.44		80.99	77.31		78.17	77.29		69.29	77.57		70.07	77.43	
71.80	77.30		70.90	77.49		84.05	77.32		84.70	77.34		75.45	77.36		82.26	77.54	
82.30	77.30	LBKF	75.34	77.40		87.63	77.22		90.13	77.19		86.76	77.30		85.95	77.27	
86.70	77.30		82.81	77.45		90.42	76.67		94.53	75.93		88.77	77.18		88.39	77.00	
89.50	77.10		87.69	77.22		94.20	75.83		98.08	77.28		90.07	76.73		89.16	76.58	
90.90	76.60		90.87	76.77		97.23	76.85		101.98	77.22		91.07	76.26		90.57	76.12	
92.00	76.10		92.02	75.99		97.99	77.34		103.17	77.48		93.78	76.07		92.90	76.05	
92.90	75.60		93.64	76.04		102.41	77.34		115.44	79.04		94.32	76.04		93.90	76.23	
94.20	75.60		95.07	76.07		111.29	78.67		134.15	79.68		95.22	76.42		94.96	76.82	
95.80	76.20		95.93	76.60		116.92	79.02					97.38	77.35		97.05	77.37	
97.40	77.10		98.10	77.37		132.86	79.57					102.17	77.31		104.55	77.77	
98.70	77.30		102.53	77.32								109.51	78.43		112.25	78.99	
101.60	77.31	RBKF	107.26	78.03								117.38	79.15		133.77	79.79	
110.00	78.40		113.67	79.09								131.26	79.68				
118.90	79.10		125.03	79.19								133.74	79.72				
134.20	79.60	RPIN	134.13	79.70													
150.80	80.10		136.53	79.76													

Summary Data	
Bankfull Elv.	77.3
BF Area	7.4
BF Width	11.2
Flood Prone Elv.	78.5
Flood Prone Width	43.9
Max Depth	1.3
Mean Depth	0.7
W/D Ratio	17.1
ER	3.9
Bank Height Ratio	
Stream Type	C5



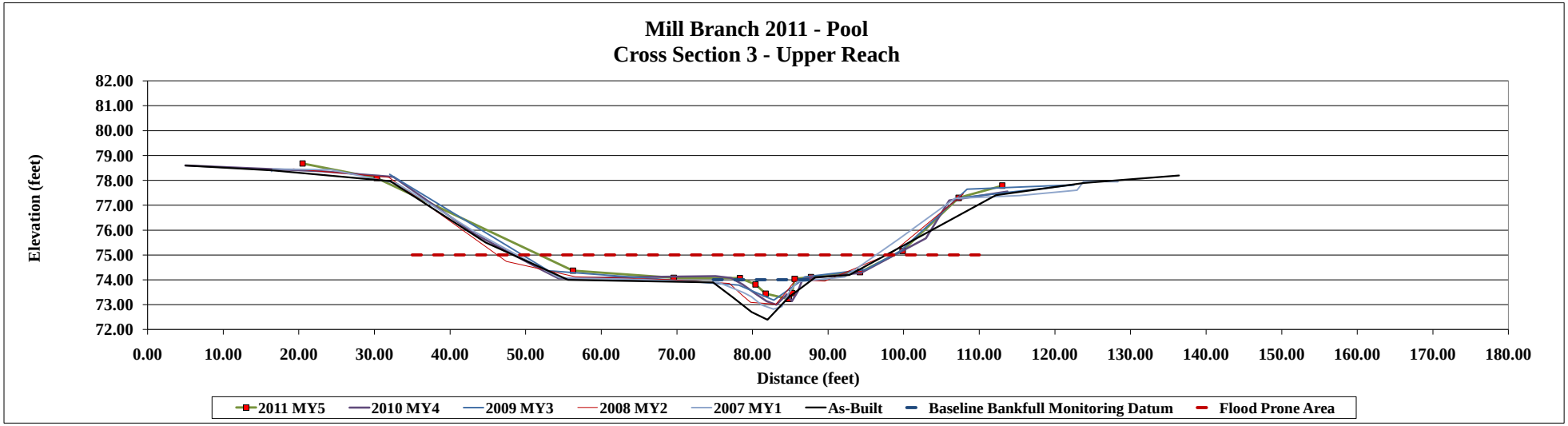
Project Nam Mill Branch, MY5
Watershed
Cross Sectior 3
Drainage Are NA
Date Mar-11
Crew Tutt, Stafford

Photo of Cross-Section 3 - Looking Downstream @ STA 1+07

Picture Taken September 23, 2011

As-Built Survey As-Built Survey			2007 2007 MY1			2008 2008 MY2			2009 2009 MY3			2010 2010 MY4			2011 2011 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
5.00	78.60		16.37	78.36		19.25	78.46		32.00	78.25		5.00	78.60		20.50	78.68	
16.50	78.40	LPIN	16.57	78.46		31.88	78.12		53.03	74.37		23.00	78.37		30.31	78.10	
32.10	77.97		24.25	78.43		47.44	74.74		67.89	74.03		32.52	78.14		56.26	74.37	
44.70	75.50		33.02	77.87		56.58	74.13		78.20	73.79		43.37	75.83		69.60	74.08	
55.60	74.00		43.29	75.93		68.91	74.01		82.83	73.19		51.84	74.45		78.33	74.07	
74.80	73.90	LBKF	54.40	74.09		76.96	73.85		86.07	73.88		54.36	74.06		80.40	73.81	
77.40	73.30		64.66	74.02		78.67	73.37		86.92	74.12		66.49	74.12		81.75	73.44	
79.90	72.70		71.46	73.93		79.76	73.09		95.02	74.42		75.12	74.15		84.82	73.23	
82.00	72.40		75.54	73.89		83.12	73.02		99.58	75.16		77.17	74.08		85.25	73.47	
84.80	73.30		78.79	73.49		84.69	73.60		108.39	77.65		78.72	73.80		85.59	74.04	
88.30	74.10	RBKF	79.85	73.33		85.72	74.00		122.55	77.83		80.53	73.42		87.74	74.11	
92.80	74.20		81.23	72.99		89.58	73.95		107.39	77.30		81.86	73.14		94.22	74.31	
112.20	77.40		82.80	72.82		98.49	75.09					83.16	73.00		99.86	75.17	
123.90	77.90	RPIN	83.89	72.92		107.90	77.46					84.54	73.42		107.28	77.30	
136.40	78.20		84.85	73.49								85.21	73.15		113.04	77.79	
			85.92	73.92								86.01	73.53				
			92.18	74.12								86.63	74.04				
			99.48	75.67								94.40	74.28				
			106.77	77.28								102.93	75.67				
			115.33	77.39								106.04	77.19				
			122.93	77.61								113.72	77.55				
			123.83	77.97													
			128.35	77.94													

Summary Data	
Bankfull Elv.	74
BF Area	3
BF Width	6.7
Flood Prone Elv.	74.7
Flood Prone Width	42.3
Max Depth	0.8
Mean Depth	0.5
W/D Ratio	14.7
ER	6.3
Bank Height Ratio	
Stream Type	C5



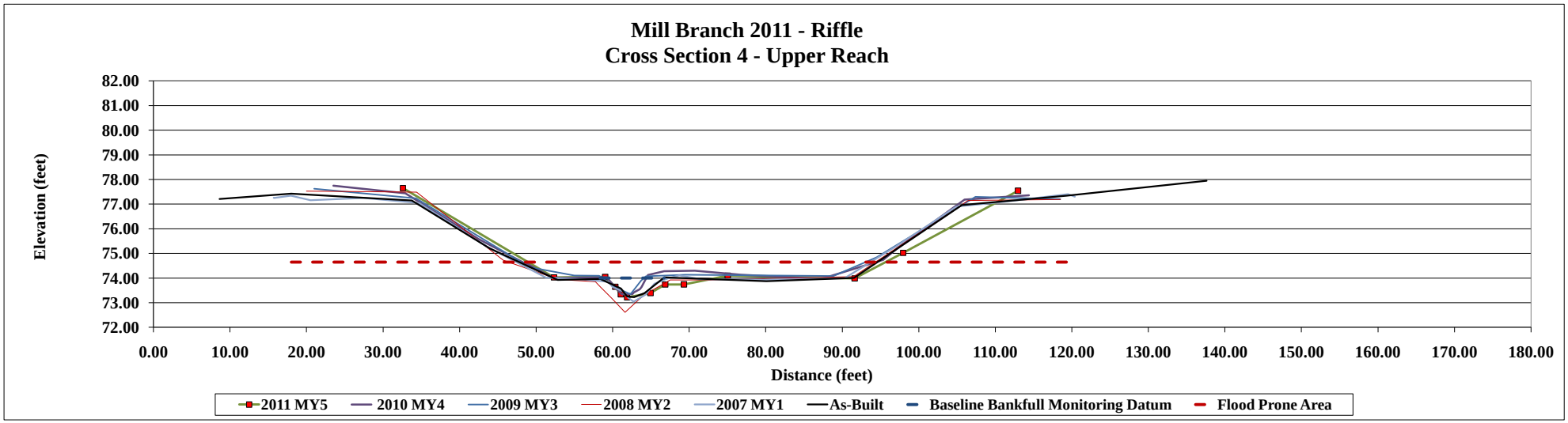
Project Name Mill Branch, MY5
Watershed
Cross Section 4
Drainage Area NA
Date Mar-11
Crew Tutt, Stafford

Photo of Cross-Section 1 - Looking Downstream @ STA 1+53

Picture Taken September 23, 2011

As-Built Survey As-Built Survey			2007 2007 MY1			2008 2008 MY2			2009 2009 MY3			2010 2010 MY4			2011 2011 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
8.63	77.21		15.71	77.26		20.00	77.53		21.00	77.62		23.50	77.75		32.60	77.65	
18.00	77.43	LPIN	15.74	77.25		34.38	77.49		34.31	77.24		32.90	77.44		52.33	74.03	
33.76	77.15		17.97	77.34		45.71	74.73		49.14	74.44		42.54	75.58		59.03	74.04	
43.99	75.20		20.51	77.16		52.87	73.95		54.99	74.10		48.73	74.57		60.34	73.65	
52.83	73.92		27.45	77.25		57.74	73.85		58.22	74.09		48.90	74.57		61.06	73.34	
58.36	73.97	LBKF	34.71	77.05		58.36	73.65		60.25	73.65		52.25	74.00		61.89	73.22	
61.09	73.58		43.48	75.29		59.89	73.17		62.34	73.34		59.22	74.04		64.94	73.39	
61.89	73.26		51.28	74.02		61.62	72.61		63.73	73.90		60.52	73.56		66.86	73.74	
62.82	73.23		55.19	73.97		64.14	73.33		64.36	74.07		61.20	73.35		69.31	73.74	
64.17	73.39		59.44	73.85		66.74	73.78		69.53	74.13		62.58	73.35		75.04	74.10	
66.74	74.03	RBKF	60.02	73.63		67.52	73.92		88.85	74.08		62.75	73.42		91.62	73.99	
80.08	73.87		61.39	73.46		72.80	73.92		94.50	74.85		63.54	73.55		97.96	75.02	
91.55	74.01		62.01	73.21		91.46	74.06		107.40	77.30		63.80	73.64		112.96	77.54	
105.64	76.96		62.76	73.04		106.47	77.15		118.50	77.20		64.25	73.92				
119.34	77.34	RPIN	64.31	73.33		118.51	77.19					64.60	74.13				
137.60	77.95		65.45	73.77								66.72	74.28				
			67.10	73.98								70.74	74.30				
			68.70	74.11								76.73	74.13				
			71.52	73.96								87.31	73.97				
			79.67	73.93								95.36	74.74				
			90.30	74.00								97.40	75.26				
			97.10	75.30								105.97	77.18				
			104.90	76.90								114.39	77.36				
			111.20	77.10													
			119.50	77.40													
			120.40	77.30													

Summary Data	
Bankfull Elv.	74
BF Area	5.3
BF Width	15.9
Flood Prone Elv.	46.2
Flood Prone Width	74.78
Max Depth	0.8
Mean Depth	0.3
W/D Ratio	47.4
ER	3
Bank Height Ratio	
Stream Type	C5



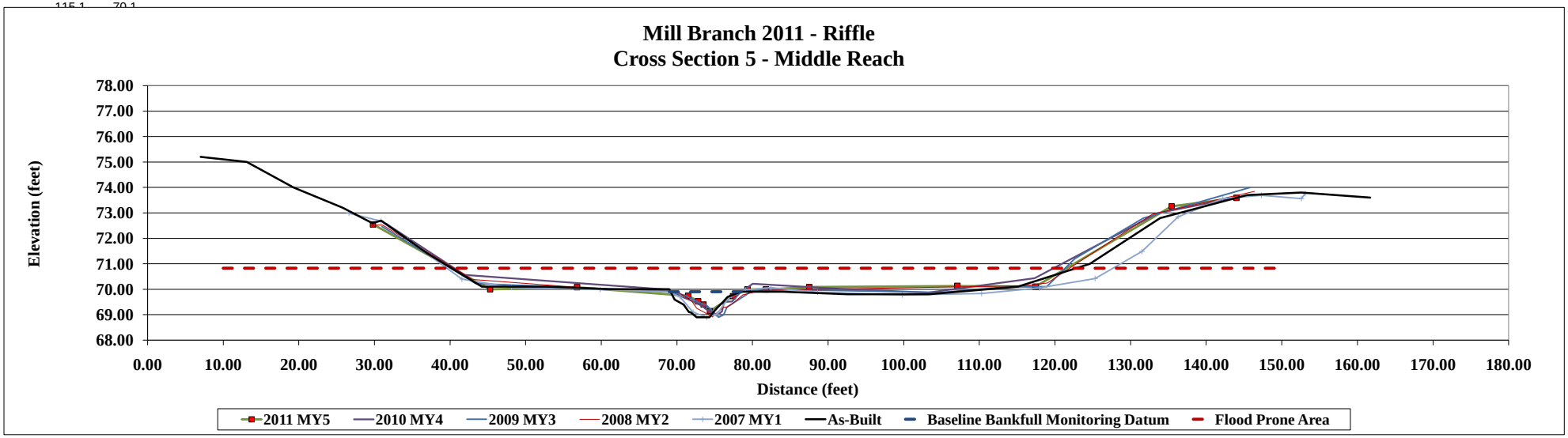
Project Name	Mill Branch, MY5
Watershed	
Cross Section	5
Drainage Area	NA
Date	Mar-11
Crew	Tutt, Stafford

Photo of Cross-Section 5 - Looking Downstream @ STA 0+94

Picture Taken September 23, 2011

As-Built Survey			2007			2008			2009			2010			2011		
As-Built Survey			2007 MY1			2008 MY2			2009 MY3			2010 MY4			2011 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
7.00	75.20		26.63	72.99		29.70	72.52		31.00	72.47		31.50	72.59		29.80	72.55	
13.10	75.00		30.90	72.68		31.08	72.52		43.40	70.22		41.92	70.56		45.30	70.00	
19.30	74.00		34.38	71.95		42.94	70.39		69.20	69.92		68.24	70.00		56.80	70.08	
25.80	73.20		41.58	70.40		60.00	70.01		71.15	69.74		71.77	69.57		71.50	69.74	
29.70	72.60		48.12	70.07		70.22	69.88		72.60	69.52		73.30	69.35		72.81	69.52	
30.90	72.70	LPIN	59.86	69.99		71.95	69.54		74.01	69.35		73.83	69.22		73.53	69.40	
37.00	71.40		68.98	69.89		72.63	69.25		75.51	68.90		75.30	68.97		74.36	69.14	
44.20	70.10		70.44	69.70		73.55	69.10		76.19	69.00		75.97	69.14		77.41	69.73	
52.90	70.10		72.13	69.10		74.69	68.91		76.61	69.30		76.23	69.50		79.33	70.00	
61.10	70.00		73.93	68.90		76.15	69.29		80.02	69.96		77.31	69.52		81.78	69.99	
66.90	70.00		75.27	69.02		76.65	69.30		85.32	69.98		78.20	69.83		87.51	70.09	
69.00	70.00	LBKF	76.90	69.68		77.27	69.42		104.81	69.87		80.02	70.21		107.09	70.13	
69.70	69.60		79.08	69.97		78.72	69.78		114.00	70.10		91.46	70.01		117.43	70.11	
70.90	69.40		82.45	70.06		81.18	69.96		118.90	70.10		103.22	69.87		135.43	73.26	
71.60	69.10		88.60	69.88		88.29	70.00		122.60	71.20		117.32	70.44		144.00	73.59	
71.80	69.10		99.81	69.77		115.81	70.14		131.70	72.80		133.60	72.99				
72.60	68.90		110.30	69.83		119.00	70.25		145.80	74.00		144.87	73.66				
73.00	68.90		117.95	70.05		123.58	71.15										
73.40	68.90		125.31	70.42		132.88	72.95										
74.30	68.90		131.50	71.48		146.38	73.85										
74.80	69.10		136.29	72.85													
75.40	69.30		142.21	73.56													
76.10	69.50		147.31	73.69													
76.70	69.70		152.59	73.56													
78.50	69.90	RBKF	153.10	73.76													
81.30	69.90																
84.00	69.90																
92.60	69.80																
103.30	69.80																
115.1	70.1																

Summary Data	
Bankfull Elv.	69.9
BF Area	3.3
BF Width	14
Flood Prone Elv.	70.66
Flood Prone Width	79.3
Max Depth	0.8
Mean Depth	0.2
W/D Ratio	60.3
ER	5.6
Bank Height Ratio	
Stream Type	C5



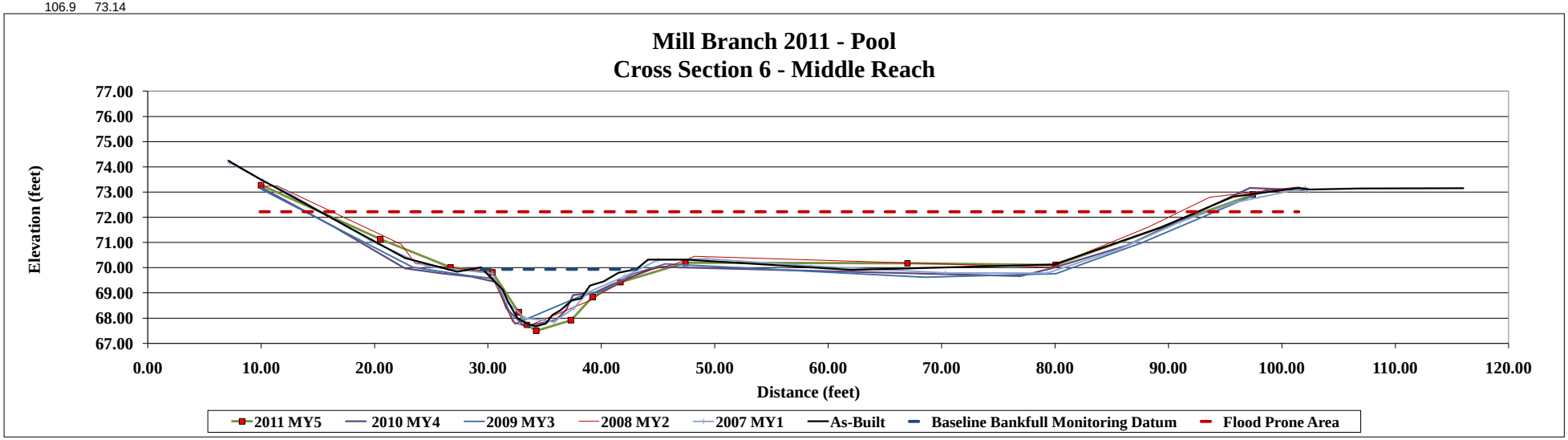
Project Name Mill Branch, MY5
Watershed
Cross Section 6
Drainage Are NA
Date Mar-11
Crew Tutt, Stafford

Cross Section 6 - Middle Reach - Pool - Sta. 2+06 - Downstream

Picture Taken September 23, 2011

As-Built Survey			2007			2008			2009			2010			2011		
As-Built Survey			2007 MY1			2008 MY2			2009 MY3			2010 MY4			2011 MY5		
Station	Elv.	Notes	Station	Elv.	Notes	Station	Elv.	Notes	Station	Elv.	Notes	Station	Elv.	Notes	Station	Elv.	Notes
7.10	74.24		7.23	74.17		9.90	73.21		10.00	73.12		10.00	73.18		10.00	73.27	
9.90	73.52	LPIN	10.15	73.44		11.37	73.25		23.38	70.02		16.41	71.63		20.50	71.13	
15.80	72.07		12.22	73.02		22.34	70.93		28.16	69.69		22.68	69.97		26.70	70.01	
22.70	70.38		19.78	71.05		23.60	70.17		30.61	69.56		26.01	69.76		30.40	69.82	
27.30	69.84		24.65	70.05		29.84	69.84		32.38	67.76		28.54	69.64		32.71	68.23	
29.40	70.01	LBKF	30.36	69.77		30.42	69.59		38.10	68.85		30.81	69.42		33.43	67.73	
30.20	69.63		31.75	68.63		32.19	67.85		40.14	69.09		31.62	68.39		34.26	67.50	
31.30	69.13		33.25	67.99		33.39	67.66		42.75	69.75		33.24	67.66		37.31	67.92	
31.80	68.63		34.99	67.92		39.12	68.72		45.63	70.15		36.01	67.93		39.23	68.84	
32.60	68.01		35.82	67.85		40.12	69.04		68.55	69.62		36.87	68.31		41.68	69.42	
33.40	67.78		37.55	68.39		43.68	69.85		80.09	69.76		37.51	68.92		47.41	70.19	
34.20	67.67		38.81	69.02		46.44	70.14		87.65	70.98		39.42	69.02		66.99	70.18	
35.10	67.78		42.08	69.66		48.24	70.45		98.70	73.10		40.86	69.32		80.05	70.11	
35.70	68.13		44.99	70.30		79.56	70.01		102.30	73.10		44.97	70.03		97.44	72.90	
36.40	68.31		49.30	70.36		88.20	71.60					76.95	69.66				
37.40	68.70		58.47	70.07		93.65	72.80					79.77	69.98				
38.20	68.78		70.35	69.79		101.50	73.20					86.31	70.88				
39.00	69.29		79.29	69.78								97.18	73.16				
40.20	69.45		85.54	70.71								101.98	73.08				
41.50	69.80		91.02	71.81													
43.10	69.94	RBKF	95.76	72.58													
44.10	70.32		102.06	73.17													
47.50	70.32		102.23	73.01													
62.10	69.91																
79.90	70.13																
89.20	71.57																
95.70	72.82																
101.50	73.16	RPIN															
102.50	73.10																
106.9	73.14																

Summary Data	
Bankfull Elv.	69.94
BF Area	18.2
BF Width	18
Flood Prone Elv.	72.3
Flood Prone Width	86.5
Max Depth	2.4
Mean Depth	1
W/D Ratio	17.8
ER	4.8
Bank Height Ratio	
Stream Type	C5



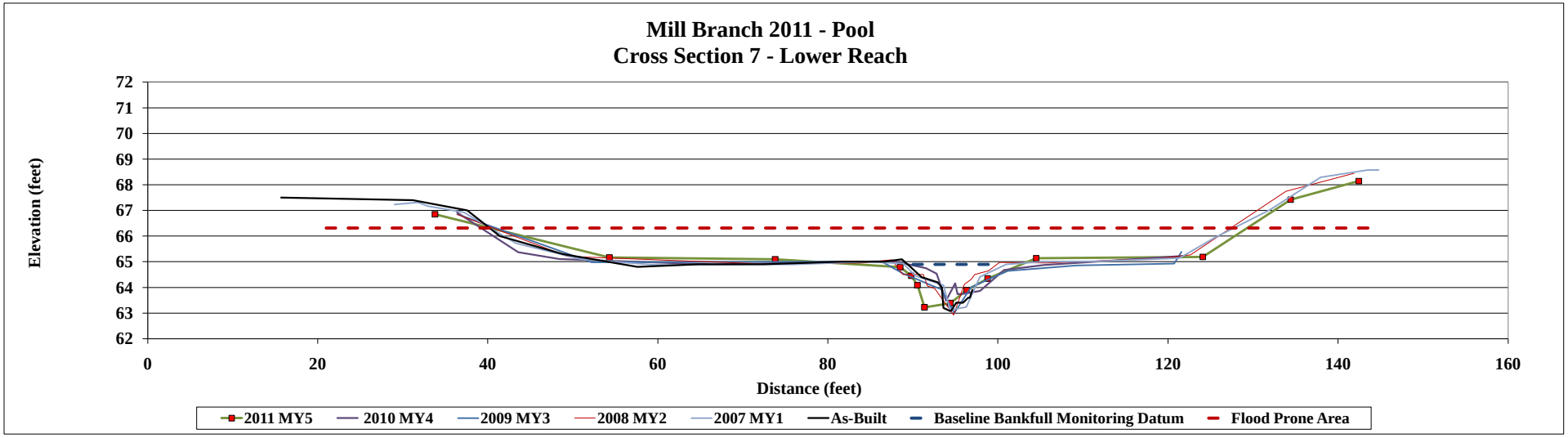
Project Name	Mill Branch, MY5
Watershed	
Cross Section	7
Drainage Area	NA
Date	Mar-11
Crew	Tutt, Stafford

Photo of Cross-Section 7 - Looking Upstream @ STA 0+12

Picture Taken September 23, 2011

As-Built Survey			2007			2008			2009			2010			2011		
As-Built Survey			2007 MY1			2008 MY2			2009 MY3			2010 MY4			2011 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
15.7	67.5		29.01	67.23		36.40	66.85		36.4	66.85		36.4	66.92		33.8	66.85	
31.2	67.4	LPIN	31.77	67.31		49.36	65.21		52.2	64.98		43.58	65.37		54.3	65.17	
37.6	67		32.93	67.17		72.83	64.91		86.33	65.01		48.41	65.1		73.8	65.09	
41.4	66		37.21	66.93		83.97	64.95		88.89	64.53		66.49	64.89		88.5	64.79	
48.8	65.3		43.28	65.72		87.54	65.08		90.7	64.29		80.93	64.99		89.81	64.46	
57.6	64.8		50.94	65.10		88.83	64.51		92.28	64.07		87.76	65.03		90.53	64.09	
64.9	64.9		59.60	64.88		91.22	64.51		93.34	63.93		91.53	64.75		91.36	63.22	
72.4	64.9		66.87	64.89		91.70	64.06		94.9	63.01		92.78	64.53		94.41	63.39	
81.7	65		76.08	64.90		92.57	63.95		96.8	64.0		93.89	63.49		96.33	63.89	
86.6	65		84.71	65.00		94.80	62.93		98.8	64.3		94.96	64.16		98.78	64.34	
88.7	65.1		88.86	64.93		96.06	64.12		101.2	64.6		95.24	63.74		104.5	65.13	
89.7	64.8		90.30	64.45		96.88	64.32		109.3	64.9		95.75	63.74		124.1	65.19	
91	64.4		93.60	64.08		97.28	64.51		120.7	64.9		97.89	63.86		134.4	67.42	
92.9	64.2	LBKF	94.34	63.13		98.90	64.65		121.6	65.4		100.7	64.68		142.4	68.14	
93.4	64		95.31	63.18		100.16	64.97					105.4	64.88				
93.6	63.2		96.29	63.24		105.74	64.95					121.9	65.23				
94.4	63.08		97.89	64.41		118.90	65.13										
94.5	63.1		100.96	64.90		122.66	65.27										
95.1	63.4		105.06	65.00		133.88	67.75										
95.9	63.4		112.02	65.02		141.91	68.45										
96.5	63.6		121.33	65.14													
96.7	63.6		125.49	65.94													
97	63.9		131.95	67.02													
97.00	64.20	RBKF	137.94	68.29													
98.10	64.40		143.52	68.58													
101.00	64.90		144.78	68.58													
103.70	64.80																
113.90	65.00																
121.90	65.10																
124	65.8																

Summary Data	
Bankfull Elv.	64.9
BF Area	12.5
BF Width	19.7
Flood Prone Elv.	66.5
Flood Prone Width	93.4
Max Depth	1.7
Mean Depth	0.6
W/D Ratio	31.2
ER	4.7
Bank Height Ratio	
Stream Type	C5



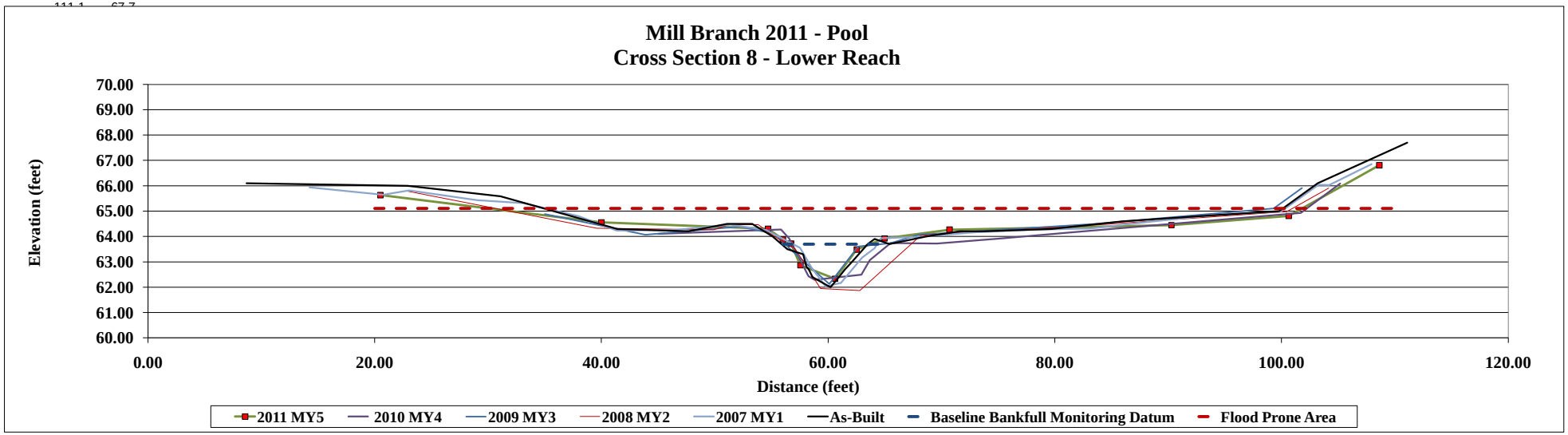
Project Name	Mill Branch, MY5
Watershed	
Cross Section	8
Drainage Area	NA
Date	Mar-11
Crew	Tutt, Stafford

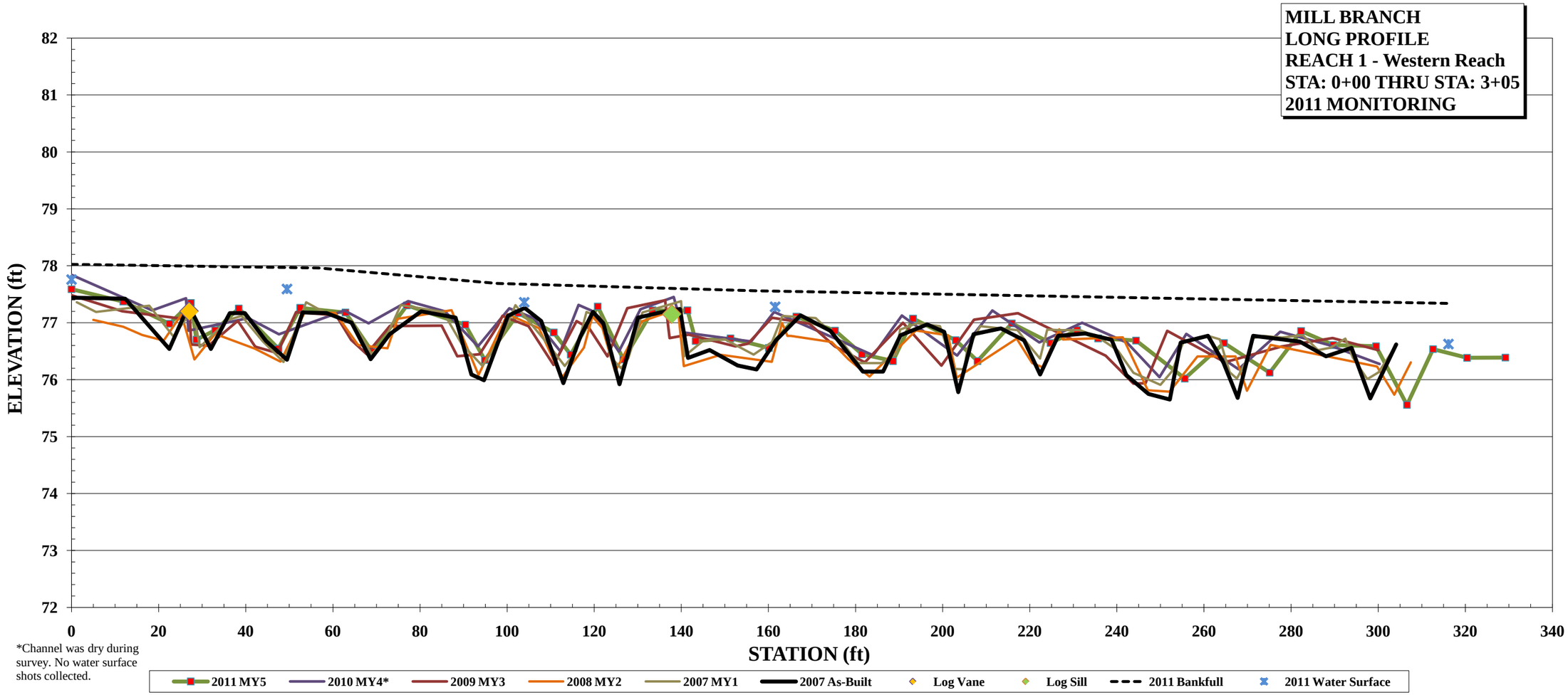
Photo of Cross-Section 8 - Looking Downstream @ STA 1+71

Picture Taken September 23, 2011

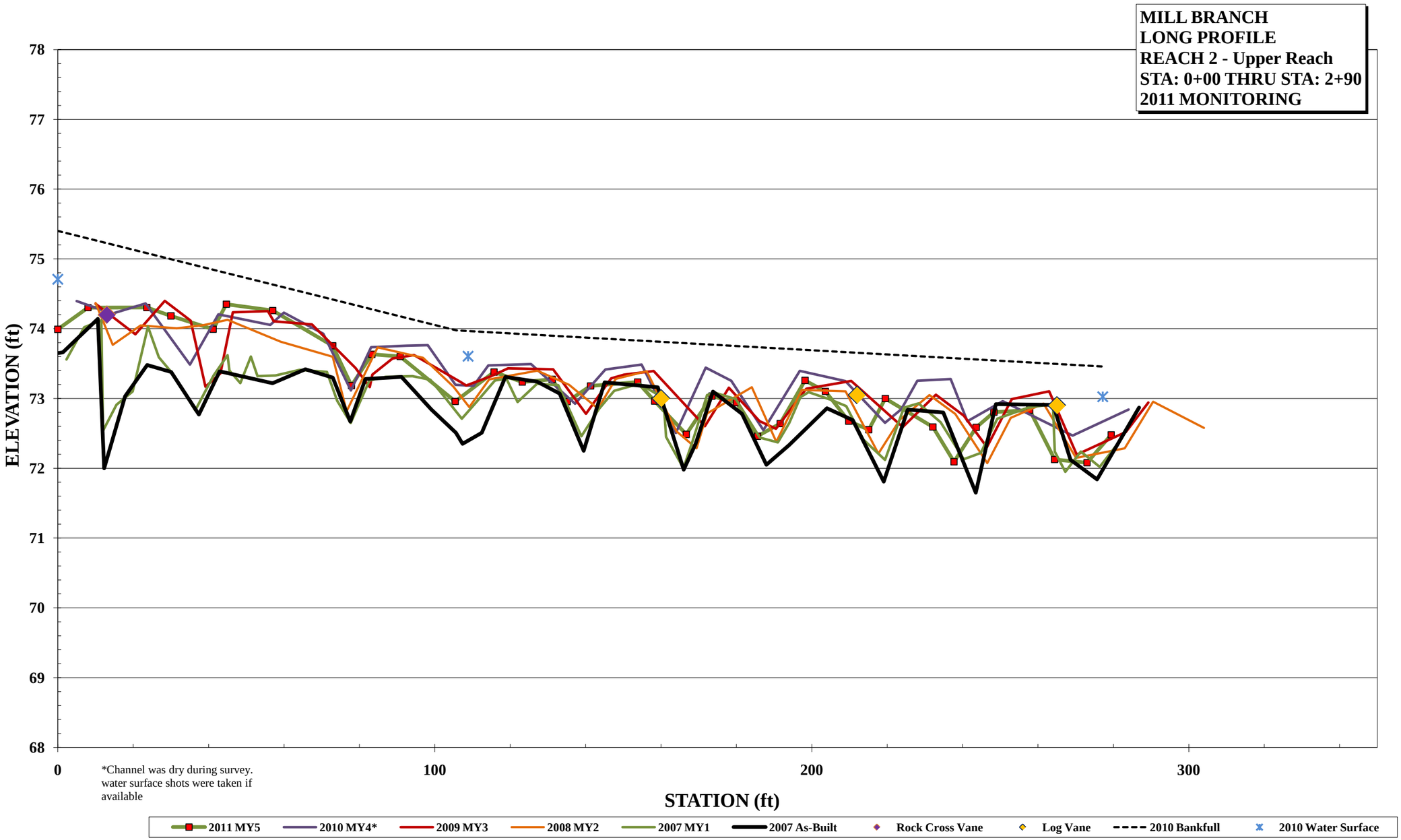
As-Built Survey			2007			2008			2009			2010			2011		
As-Built Survey			2007 MY1			2008 MY2			2009 MY3			2010 MY4			2011 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
8.70	66.10		14.25	65.94		22.90	65.79		35.00	64.88		45.00	64.10		20.50	65.63	
22.90	66.00	LPIN	20.74	65.64		39.58	64.33		43.87	64.07		55.85	64.27		40.00	64.56	
31.10	65.58		23.03	65.82		49.89	64.26		52.26	64.39		56.56	63.93		54.70	64.31	
41.40	64.30		29.00	65.43		51.26	64.47		55.28	64.10		58.27	62.43		56.01	63.88	
47.70	64.20		33.14	65.31		53.84	64.47		56.82	63.43		58.82	62.29		56.73	63.72	
51.10	64.50		38.00	64.80		54.93	64.10		60.10	62.13		62.93	62.49		57.56	62.86	
53.30	64.50		41.35	64.23		55.66	63.89		62.66	63.61		63.67	63.07		60.61	62.33	
55.10	64.00		46.47	64.25		57.08	63.52		65.51	63.74		65.53	63.74		62.53	63.49	
56.40	63.50	LBKF	51.39	64.47		59.33	61.95		67.98	64.06		69.59	63.72		64.98	63.92	
57.80	63.30		54.54	64.25		62.79	61.87		83.44	64.49		75.55	63.94		70.71	64.27	
58.10	62.80		57.52	63.55		68.17	64.04		99.31	65.11		81.00	64.14		90.29	64.45	
58.30	62.70		58.51	62.78		71.86	64.15		101.80	65.91		101.70	64.93		100.63	64.81	
58.40	62.60		59.77	62.03		81.13	64.38					105.17	66.09		108.63	66.81	
58.60	62.40		61.13	62.17		100.46	64.98										
60.20	62.00		63.00	63.17		104.15	65.91										
60.80	62.31		64.09	63.53													
61.50	62.70		64.67	63.93													
62.10	63.00		67.97	63.98													
63.50	63.70	RBKF	72.93	64.16													
64.10	63.90		77.92	64.26													
65.40	63.70		83.14	64.32													
68.70	64.00		88.51	64.59													
71.60	64.20		93.85	64.84													
73.80	64.20		99.97	64.99													
79.70	64.30		103.26	66.04													
86.00	64.60		104.20	66.03													
92.70	64.80		107.95	66.85													
99.80	65.00																
103.20	66.10	RPIN															

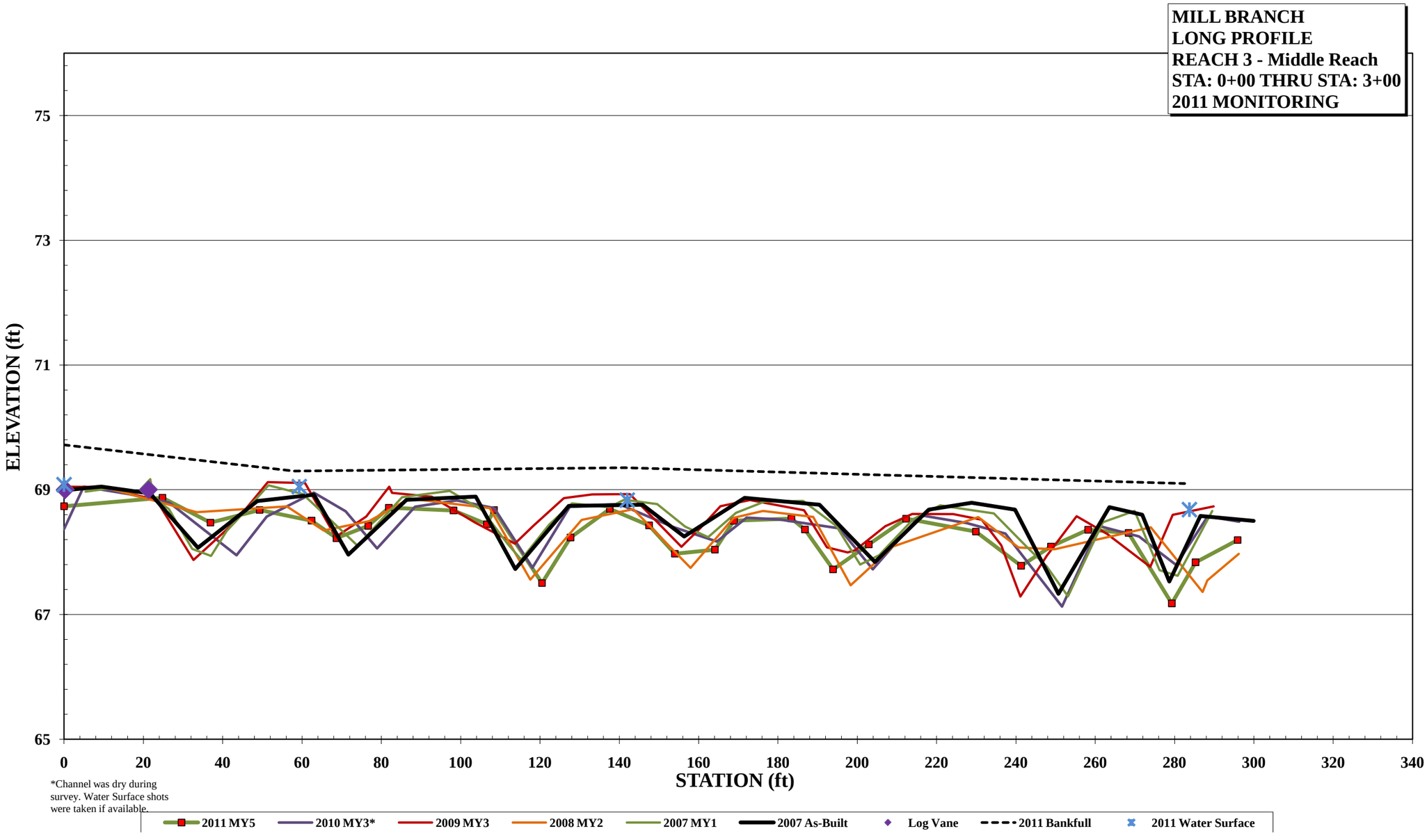
Summary Data	
Bankfull Elv.	63.7
BF Area	5.4
BF Width	7
Flood Prone Elv.	65.07
Flood Prone Width	71
Max Depth	1.4
Mean Depth	0.8
W/D Ratio	9.1
ER	10.2
Bank Height Ratio	
Stream Type	C5

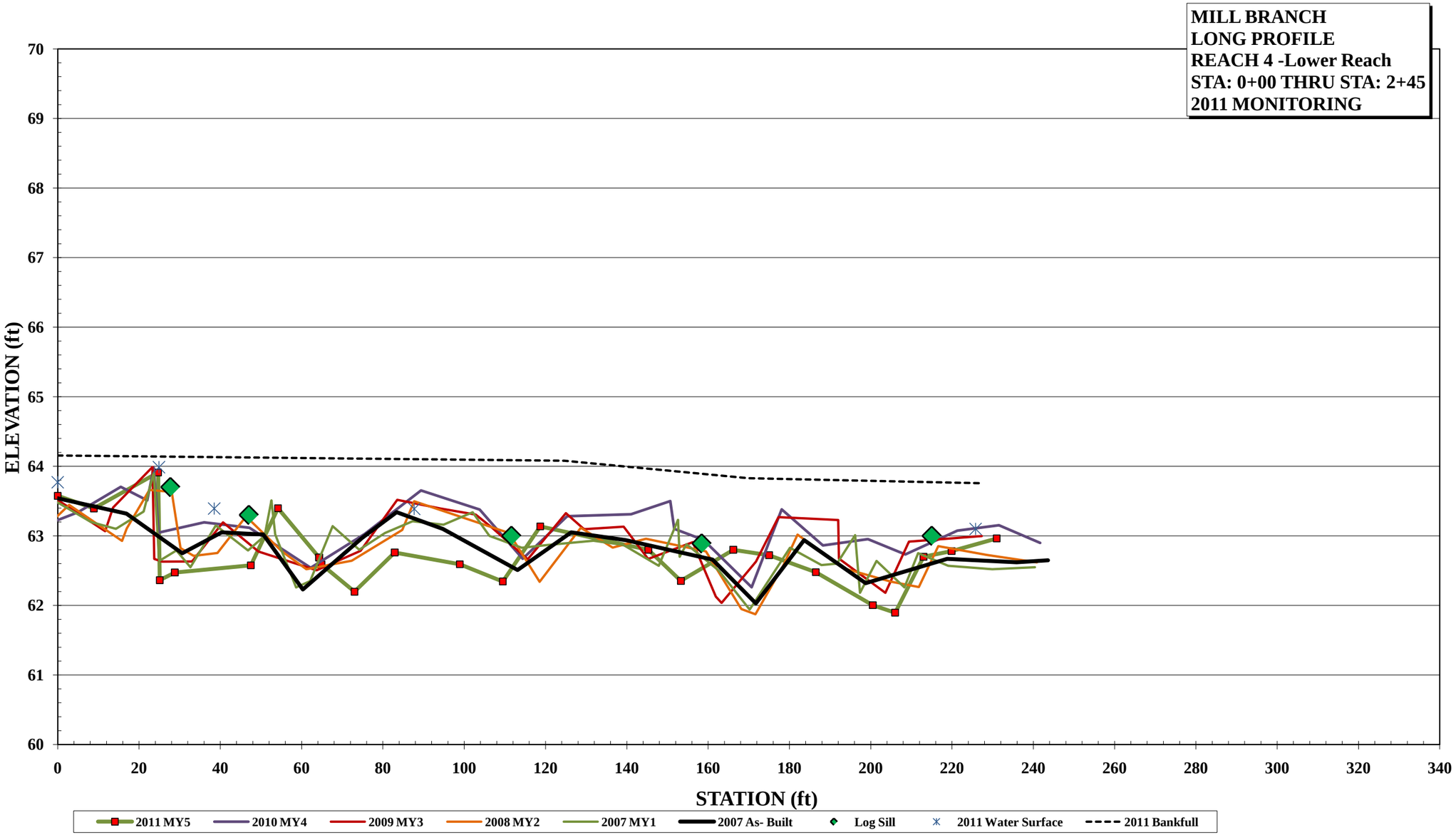




*Channel was dry during survey. No water surface shots collected.

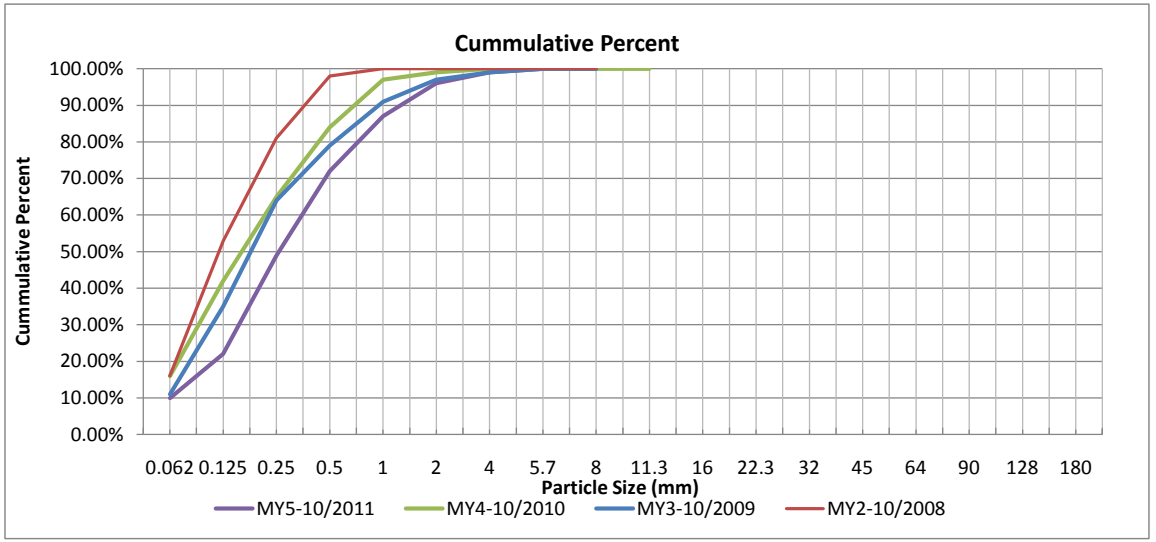

MILL BRANCH
LONG PROFILE
REACH 2 - Upper Reach
STA: 0+00 THRU STA: 2+90
2011 MONITORING
ELEVATION (ft)
78
77
76
75
74
73
72
71
70
69
68
0
100
200
300
STATION (ft)
*Channel was dry during survey. water surface shots were taken if available
2011 MY5
2010 MY4*
2009 MY3
2008 MY2
2007 MY1
2007 As-Built
Rock Cross Vane
Log Vane
2010 Bankfull
2010 Water Surface

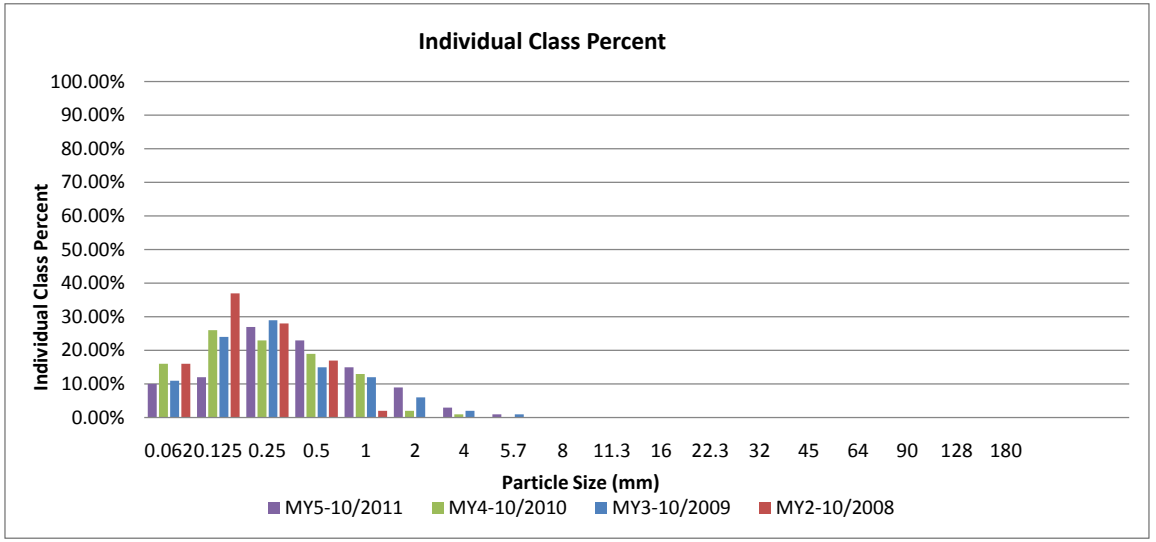

MILL BRANCH
LONG PROFILE
REACH 3 - Middle Reach
STA: 0+00 THRU STA: 3+00
2011 MONITORING
ELEVATION (ft)
75
73
71
69
67
65
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
STATION (ft)
*Channel was dry during survey. Water Surface shots were taken if available.
2011 MY5
2010 MY3*
2009 MY3
2008 MY2
2007 MY1
2007 As-Built
Log Vane
2011 Bankfull
2011 Water Surface


MILL BRANCH
LONG PROFILE
REACH 4 -Lower Reach
STA: 0+00 THRU STA: 2+45
2011 MONITORING
ELEVATION (ft)
70
69
68
67
66
65
64
63
62
61
60
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
STATION (ft)
2011 MY5
2010 MY4
2009 MY3
2008 MY2
2007 MY1
2007 As- Built
Log Sill
2011 Water Surface
2011 Bankfull

Project Name: Mill Branch Western Reach Monitoring Year 5 - 2011					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	10	10.00%	10.00%
	very fine sand	0.125	12	12.00%	22.00%
	fine sand	0.25	27	27.00%	49.00%
	medium sand	0.5	23	23.00%	72.00%
	coarse sand	1	15	15.00%	87.00%
	very coarse sand	2	9	9.00%	96.00%
GRAVEL	very fine gravel	4	3	3.00%	99.00%
	fine gravel	5.7	1	1.00%	100.00%
	fine gravel	8			
	medium gravel	11.3			
	medium gravel	16			
	coarse gravel	22.3			
	coarse gravel	32			
	very coarse gravel	45			
	very coarse gravel	64			
COBBLE	small cobble	90			
	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
TOTAL % of whole count:			**100**	**100%**	**100%**

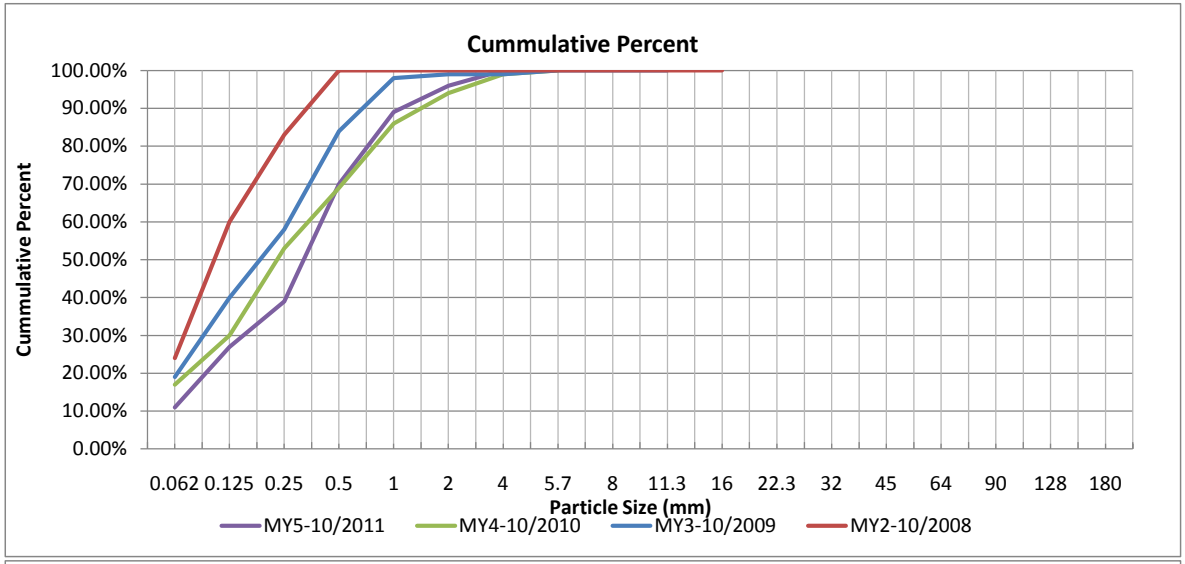
Sumamry Data	
D50	0.26
D84	0.87
D95	1.9

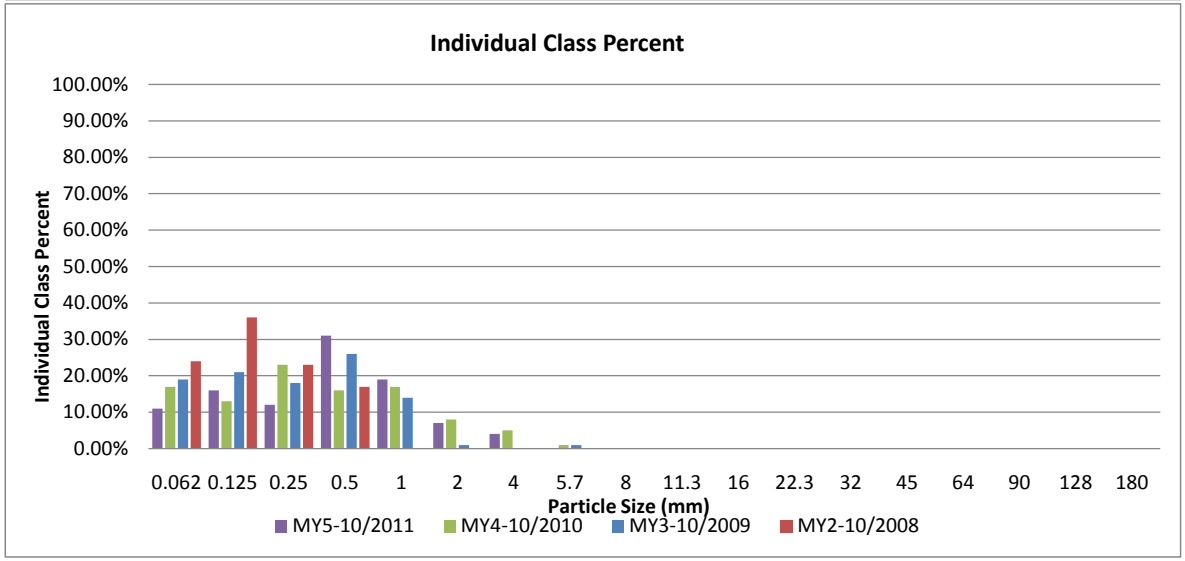




Project Name: Mill Branch Upper Reach Monitoring Year 5 - 2011					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	11	11.00%	11.00%
	very fine sand	0.125	16	16.00%	27.00%
	fine sand	0.25	12	12.00%	39.00%
	medium sand	0.5	31	31.00%	70.00%
	coarse sand	1	19	19.00%	89.00%
	very coarse sand	2	7	7.00%	96.00%
GRAVEL	very fine gravel	4	4	4.00%	100.00%
	fine gravel	5.7	0	0.00%	
	fine gravel	8	0	0.00%	
	medium gravel	11.3	0	0.00%	
	medium gravel	16	0	0.00%	
	coarse gravel	22.3	0	0.00%	
	coarse gravel	32	0	0.00%	
	very coarse gravel	45	0	0.00%	
	very coarse gravel	64	0	0.00%	
COBBLE	small cobble	90	0	0.00%	
	medium cobble	128	0	0.00%	
	large cobble	180	0	0.00%	
	very large cobble	256	0	0.00%	
BOULDER	small boulder	362	0	0.00%	
	small boulder	512	0	0.00%	
	medium boulder	1024	0	0.00%	
	large boulder	2048	0	0.00%	
TOTAL % of whole count:			**100**	**100%**	**100%**

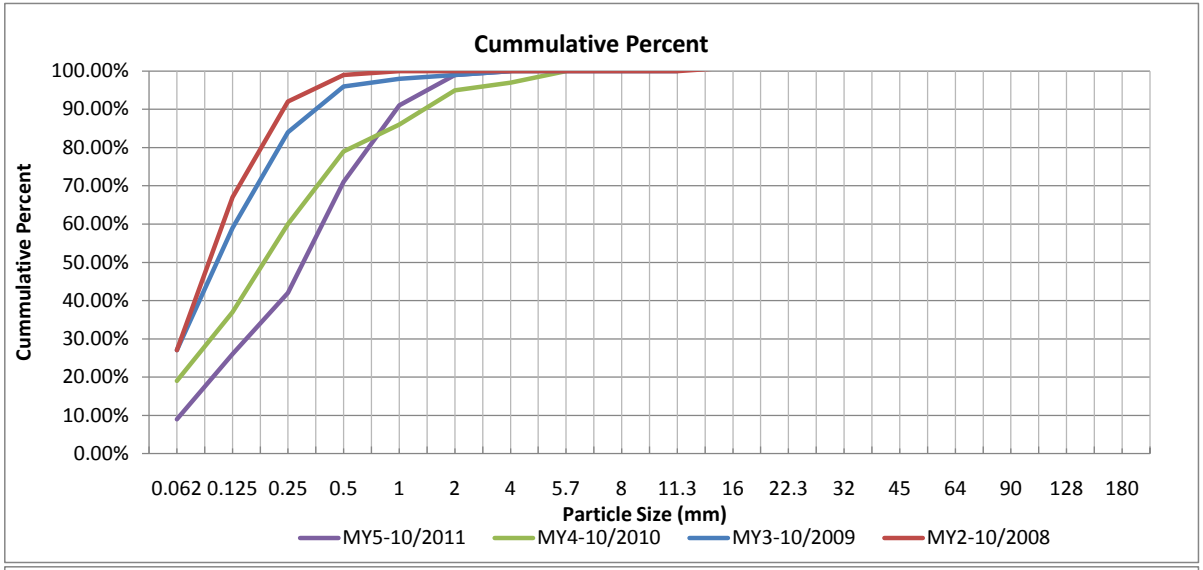
Sumamry Data	
D50	0.32
D84	0.83
D95	1.8

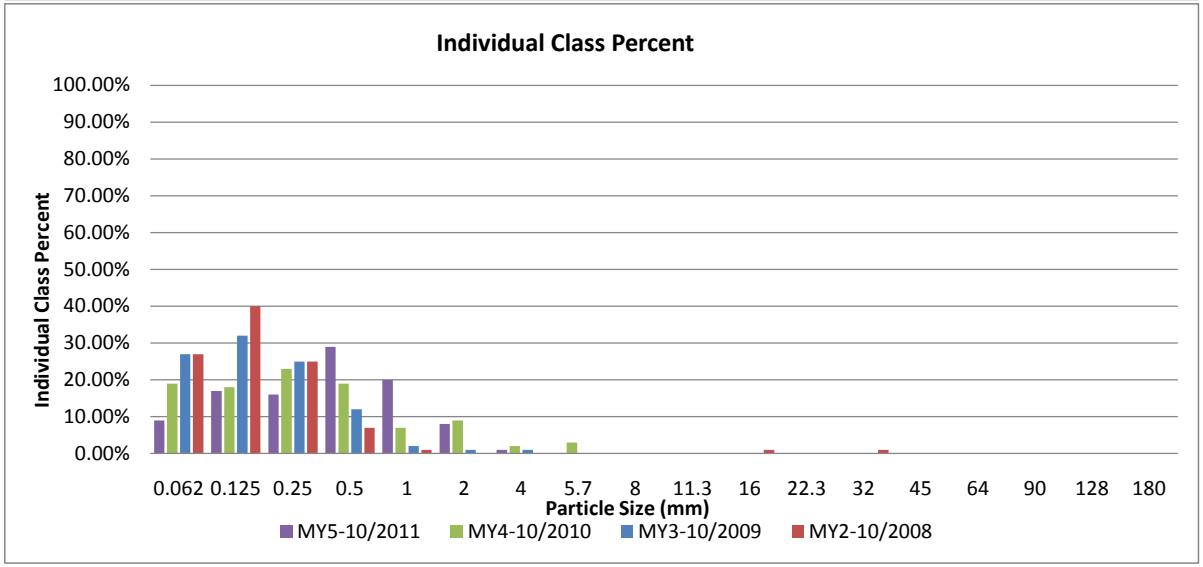




Project Name: Mill Branch Middle Reach Monitoring Year 5 - 2011					
Desc.	Material	Size (MM)	Count	% of Total	Cumulative %
SAND	silt/clay	0.062	9	9.00%	9.00%
	very fine sand	0.125	17	17.00%	26.00%
	fine sand	0.25	16	16.00%	42.00%
	medium sand	0.5	29	29.00%	71.00%
	coarse sand	1	20	20.00%	91.00%
	very coarse sand	2	8	8.00%	99.00%
GRAVEL	very fine gravel	4	1	1.00%	100.00%
	fine gravel	5.7	0	0.00%	
	fine gravel	8	0	0.00%	
	medium gravel	11.3	0	0.00%	
	medium gravel	16	0	0.00%	
	coarse gravel	22.3	0	0.00%	
	coarse gravel	32	0	0.00%	
	very coarse gravel	45	0	0.00%	
	very coarse gravel	64	0	0.00%	
COBBLE	small cobble	90	0	0.00%	
	medium cobble	128	0	0.00%	
	large cobble	180	0	0.00%	
	very large cobble	256	0	0.00%	
BOULDER	small boulder	362	0	0.00%	
	small boulder	512	0	0.00%	
	medium boulder	1024	0	0.00%	
	large boulder	2048	0	0.00%	
TOTAL % of whole count:			100	100%	100%

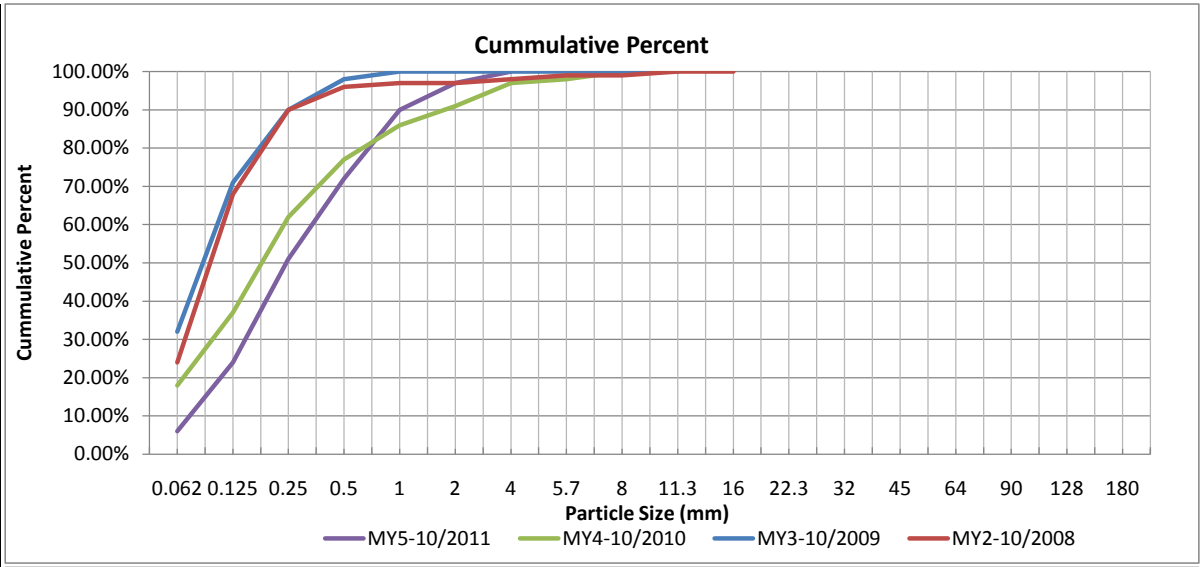
Sumamry Data	
D50	0.3
D84	0.78
D95	1.4





Project Name: Mill Branch Lower Reach Monitoring Year 5 - 2011					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	6	6.00%	6.00%
	very fine sand	0.125	18	18.00%	24.00%
	fine sand	0.25	27	27.00%	51.00%
	medium sand	0.5	21	21.00%	72.00%
	coarse sand	1	18	18.00%	90.00%
	very coarse sand	2	7	7.00%	97.00%
GRAVEL	very fine gravel	4	3	3.00%	100.00%
	fine gravel	5.7	0	0.00%	
	fine gravel	8	0	0.00%	
	medium gravel	11.3	0	0.00%	
	medium gravel	16	0	0.00%	
	coarse gravel	22.3	0	0.00%	
	coarse gravel	32	0	0.00%	
	very coarse gravel	45	0	0.00%	
	very coarse gravel	64	0	0.00%	
COBBLE	small cobble	90	0	0.00%	
	medium cobble	128	0	0.00%	
	large cobble	180	0	0.00%	
	very large cobble	256	0	0.00%	
BOULDER	small boulder	362	0	0.00%	
	small boulder	512	0	0.00%	
	medium boulder	1024	0	0.00%	
	large boulder	2048	0	0.00%	
TOTAL % of whole count:			**100**	**100%**	**100%**

Sumamry Data	
D50	0.24
D84	0.79
D95	1.6



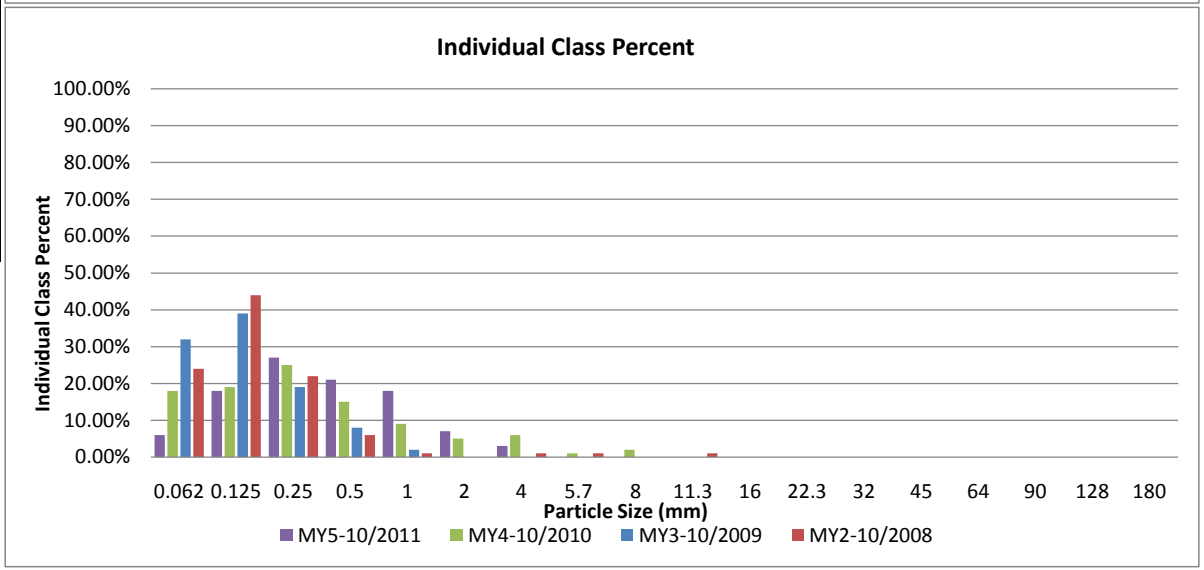


Table 10a. Baseline Stream Data Summary Mill Branch Stream Restoration Site - EEP Project No. 251																		
Parameter	**USGS Gage Data**			**Regional Curve Interval**			**Pre-Existing Condition**			**Project Stream Reference**			**Design**			**As-Built**		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)							2.8	6.5	4.7	3.8	14.2	9.0	6.0	12.0	9.0	5.9	10.8	8.4
Flood Prone Width (ft)							2.9	70.0	36.5	100.0	300.0	200.0	38.0	90	64.0	40.6	85.8	63.2
BF Cross Sectional Area (SF)							0.9	5.6	3.3	1.5	21.0	11.3	2.0	9	5.5	2.2	9.0	5.6
BF Mean Depth (ft)							0.3	0.9	0.59	0.5	1.9	1.2	0.4	1.1	0.7	0.4	0.8	0.6
BF Max Depth (ft)							0.5	2.0	1.2	0.7	2.6	1.7	0.6	2	1.3	0.7	1.8	1.3
Width/Depth Ratio							4.0	8.7	6.4	6.1	15	10.7	12.0	18	15.0	13.1	20.2	16.6
Entrenchment Ratio							1.00	10.8	5.9	20.4	26.6	23.5	4.0	10	7.0	6.3	8.7	7.5
Bank Height Ratio																		
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Pattern																		
Channel Beltwidth (ft)							50	85	67.5	10	59	34.5	18	38	28	20	36	28
Radius of Curvature (ft)							10	25	17.5	10	46	28	10	18	14	11	20	15
Meander Wavelength (ft)							210	260	235	12	97	54.5	32	80	56	36	82	59
Meander Width ratio							40	78.6	59.3	2.1	4.4	3.25	5.0	9.0	7	6.00	7.50	7
Profile																		
Riffle Length																6.3	12.5	9
Riffle Slope																0.003	0.005	0.004
Pool Length																13	19.1	16
Pool Spacing							1.3	1.3	1.3	1	5.4	3.2				26.9	41.00	34
Substrate																		
d50 (mm)																0.09	0.1	0.1
d84 (mm)																0.27	0.4	0.34
Additional Reach Parameters																		
Valley Length (ft)																		
Channel Length (ft)																		
Sinuosity																		
Water Surface Slope																		
BF Slope																		
Rosgen Classification																		
*Habitat Index																		
*Macrobenthos																		

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Mill Branch EEP No. 251 Western Reach

	Cross Section 1 (Riffle)							Cross Section 2 (Pool)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	77.5				77.5	77.5		77.3				77.3	77.3																					
Bankfull Width (ft)	6	8.7	28.1	23.4	5.7	21.1		11.7	11.2	17.4	23.7	10.5	11.2																					
Floodprone Width (ft)	45	45	47	39.5	36	40.4		52	43	45.6	46	44.6	43.9																					
Bankfull Mean Depth (ft)	0.3	0.3	0.2	0.2	0.2	0.1		0.7	0.7	0.5	0.3	0.7	0.7																					
Bankfull Max Depth (ft)	0.6	0.6	1.2	0.6	0.4	0.6		1.7	1.3	1.4	1.4	1.3	1.3																					
Bankfull Cross Sectional Area (ft^2)	1.8	2.3	6.5	4.1	1.2	2.7		8.7	7.5	8.2	6.7	7	7.4																					
Bankfull Width/Depth Ratio	33.5	19.8	121.8	133	28	166.9		15.7	16.7	37.1	83.2	15.8	17.1																					
Bankfull Entrenchment Ratio	7.5	5.2	1.7	1.7	6.3	1.9		4.4	3.8	2.6	1.9	4.2	3.9																					
Bankfull Bank Height Ratio																																		
Cross Sectional Area between end pins (ft^2)																																		
d50 (mm)		0.12	0.11	0.18	0.16	0.26			0.12	0.11	0.18	0.16	0.26																					

	Cross Section 6 (Riffle)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)							Cross Section 9 (Riffle)							Cross Section 10 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																			
Bankfull Width (ft)																																			
Floodprone Width (ft)																																			
Bankfull Mean Depth (ft)																																			
Bankfull Max Depth (ft)																																			
Bankfull Cross Sectional Area (ft^2)																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Mill Branch EEP No. 251 Upper Reach

	Cross Section 1 (Pool)							Cross Section 2 (Riffle)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	74				74	74		74				74	74																					
Bankfull Width (ft)	8.1	8.4	4.5	6.7	9	6.7		8.1	8.4	4.5	6.7	7.4	15.9																					
Floodprone Width (ft)	47	45	23.8	14.1	50.4	42.3		47	45	23.8	14.1	46.2	48.2																					
Bankfull Mean Depth (ft)	0.4	0.4	0.5	0.3	0.6	0.5		0.4	0.4	0.5	0.3	0.3	0.3																					
Bankfull Max Depth (ft)	0.7	0.9	1.3	0.8	1	0.8		0.9	0.9	1.3	0.8	0.7	0.8																					
Bankfull Cross Sectional Area (ft^2)	3.2	3.7	2.2	1.7	5.2	3		3.2	3.7	2.2	1.7	2.3	5.3																					
Bankfull Width/Depth Ratio	20.3	18.9	9	26.8	15.4	14.7		20.3	18.9	9	26.8	23.7	47.4																					
Bankfull Entrenchment Ratio	5.8	5.4	5.3	2.1	5.6	6.3		5.8	5.4	5.3	2.1	6.3	3																					
Bankfull Bank Height Ratio																																		
Cross Sectional Area between end pins (ft^2)																																		
d50 (mm)		0.1	0.07	0.09	0.23	0.32			0.1	0.07	0.086	0.23	0.32																					

	Cross Section 6 (Riffle)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)							Cross Section 9 (Riffle)							Cross Section 10 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																		
Bankfull Width (ft)																																		
Floodprone Width (ft)																																		
Bankfull Mean Depth (ft)																																		
Bankfull Max Depth (ft)																																		
Bankfull Cross Sectional Area (ft^2)																																		
Bankfull Width/Depth Ratio																																		
Bankfull Entrenchment Ratio																																		
Bankfull Bank Height Ratio																																		
Cross Sectional Area between end pins (ft^2)																																		
d50 (mm)																																		

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Mill Branch EEP No. 251 Middle Reach

	Cross Section 5 (Riffle)							Cross Section 6 (Pool)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	69.9				69.9	69.9		69.94				69.94	69.94																						
Bankfull Width (ft)	9.5	9.7	15.1	14.1	12.7	14		13.7	14.2	19	20.6	47.9	18																						
Floodprone Width (ft)	88	93	79.5	61.9	79.3	79.3		77	75	31.5	28.5	78.8	86.5																						
Bankfull Mean Depth (ft)	0.6	0.5	0.3	0.3	0.3	0		1.1	1.2	0.8	0.5	0.5	1																						
Bankfull Max Depth (ft)	1	1	1	1	0.9	0.8		2.2	2.3	2.5	2.2	2.3	2.4																						
Bankfull Cross Sectional Area (ft^2)	5.2	5.1	4.8	4	4	3.3		15.5	16.6	14.8	11	21.8	18.2																						
Bankfull Width/Depth Ratio	17.2	18.8	47.9	61.9	40.3	60.3		12.2	12.1	24.4	38.6	104.9	17.8																						
Bankfull Entrenchment Ratio	9.1	9.8	5.3	3.9	6.2	5.6		4.5	5.4	1.7	1.4	1.6	4.8																						
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)		0.09	0.0622	0.18	0.18	0.3			0.09	0.0622	0.18	0.18	0.3																						

	Cross Section 6 (Riffle)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)							Cross Section 9 (Riffle)							Cross Section 10 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																			
Bankfull Width (ft)																																			
Floodprone Width (ft)																																			
Bankfull Mean Depth (ft)																																			
Bankfull Max Depth (ft)																																			
Bankfull Cross Sectional Area (ft^2)																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Mill Branch EEP No. 251 Lower Reach

	Cross Section 7 (Run)							Cross Section 8 (Pool)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	64.9				64.9	64.9		63.7				63.7	63.7																					
Bankfull Width (ft)	10.8	11.8	18.3	10.3	18.9	19.7		17	16.9	11.2	15.4	8.6	7																					
Floodprone Width (ft)	84	84	92.7	72.3	82.7	93.4		-	-	17.5	26.8	57.2	71																					
Bankfull Mean Depth (ft)	0.8	0.8	0.5	0.5	0.4	0.6		0.7	0.7	0.8	0.5	1	0.8																					
Bankfull Max Depth (ft)	1.8	1.7	2	1.5	1.4	1.7		2.2	2.2	2.6	2.3	1.4	1.4																					
Bankfull Cross Sectional Area (ft^2)	8.9	8.9	8.5	5.2	8.2	12.5		12.6	12.5	8.7	7	8.3	5.4																					
Bankfull Width/Depth Ratio	13.6	15.6	39.4	20.4	43.6	31.2		22.9	22.8	14.5	34	8.9	9.1																					
Bankfull Entrenchment Ratio	7.8	7.2	5.1	7	4.4	4.7		-	-	1.5	1.7	6.7	10.2																					
Bankfull Bank Height Ratio																																		
Cross Sectional Area between end pins (ft^2)																																		
d50 (mm)		0.1	0.067	0.1	0.18	0.24			0.1	0.067	0.1	0.18	0.24																					

	Cross Section 6 (Riffle)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)							Cross Section 9 (Riffle)							Cross Section 10 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																		
Bankfull Width (ft)																																		
Floodprone Width (ft)																																		
Bankfull Mean Depth (ft)																																		
Bankfull Max Depth (ft)																																		
Bankfull Cross Sectional Area (ft^2)																																		
Bankfull Width/Depth Ratio																																		
Bankfull Entrenchment Ratio																																		
Bankfull Bank Height Ratio																																		
Cross Sectional Area between end pins (ft^2)																																		
d50 (mm)																																		

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
Mill Branch - EEP No. 251 - Western Reach

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	6		8.85	11.7			8.7		9.95	11.2			17.4		22.8	28.1			23.4		23.6		23.7		5.7		8.1	10.5			11.2		16.2	7.4		
Floodprone Width (ft)	45		48.5	52			4.5		23.8	43			45.6		46.3	47			39.5		42.8		46		36		40.3	44.6			40.4		42.2	43.9		
Bankfull Mean Depth (ft)	0.3		0.5	0.7			0.3		0.5	0.7			0.2		0.35	0.5			0.2		0.25		0.3		0.2		0.45	0.7			0.1		0.4	0.7		
[1]Bankfull Max Depth (ft)	0.6		1.15	1.7			0.6		0.95	1.3			1.2		1.3	1.4			0.6		1		1.4		0.4		0.85	1.3			0.6		0.95	1.3		
Bankfull Cross Sectional Area (ft^2)	1.8		5.25	8.7			2.3		4.9	7.5			6.5		7.35	8.2			4.1		5.4		6.7		1.2		4.1	7			2.7		5.05	7.4		
Width/Depth Ratio	15.7		24.6	33.5			16.7		18.3	19.8			37.1		79.5	122			83.2		108		133		15.8		21.9	28			17.1		92	167		
Entrenchment Ratio	4.4		5.95	7.5			3.8		4.5	5.2			1.7		2.15	2.6			1.7		1.8		1.9		4.2		5.25	6.3			1.9		2.9	3.9		
[1]Bank Height Ratio																																				
Profile																																				
Riffle Length (ft)			6																						3		10.8	18.5			13.4		13.4	22.1		
Riffle Slope (ft/ft)																															0.01		0.04	0.06		
Pool Length (ft)			23																						8		28	48			4.9		13.1	23.8		
Pool Max depth (ft)			1.15																						0.4		1.25	2.1			0.4		0.97	1.22		
Pool Spacing (ft)			40																						7.1		36.4	65.7			6.2		27.7	40		
Pattern																																				
Channel Beltwidth (ft)			26																																	
Radius of Curvature (ft)			15																																	
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)			42																																	
Meander Width Ratio			7.12																																	
Additional Reach Parameters																																				
Rosgen Classification	C5																																			
Channel Thalweg length (ft)	439.2																																			
Sinuosity (ft)	1.2																																			
Water Surface Slope (Channel) (ft/ft)																																				
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
Mill Branch - EEP No. 251 - Upper Reach

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	8.1		10.4	12.7			8.4		9.78	11.2			4.5		5.9	7.3			6.7		7.55	8.4			5.7		8.1	10.5			6.7		11.3	5.3		
Floodprone Width (ft)	47		52	57			45		46.5	48			23.1		23.5	23.8			14.1		19.5	24.8			36		40.3	44.6			42.3		58.5	74.8		
Bankfull Mean Depth (ft)	0.4		0.6	0.8			0.4		0.45	0.5			0.3		0.4	0.5			0.3		0.3	0.3			0.2		0.45	0.7			0.3		0.4	0.5		
[1]Bankfull Max Depth (ft)	0.7		1.1	1.5			0.7		0.9	1.1			1		1.15	1.3			0.8		0.8	0.8			0.4		0.85	1.3			0.8		0.8	0.8		
Bankfull Cross Sectional Area (ft^2)	3.2		6.5	9.8			3.7		4.75	5.8			2		2.1	2.2			1.7		2.15	2.6			1.2		4.1	7			3		4.15	5.3		
Width/Depth Ratio	20.3		18.5	16.6			18.9		20.1	21.2			9		18	26.9			26.8		27.2	27.7			15.8		21.9	28			14.7		31.1	47.4		
Entrenchment Ratio	5.8		5.15	4.5			4.3		4.85	5.4			5.3		5.75	6.2			2.1		2.5	2.9			4.2		5.25	6.3			3		4.65	6.3		
[1]Bank Height Ratio																																				
Profile																																				
Riffle Length (ft)	5		9.5	14																					6		24	42			12.2		17.9	28.2		
Riffle Slope (ft/ft)	0		0	0																											0.02		0.04	0.06		
Pool Length (ft)	5		13	21																					5		9.9	14.8			4.5		12.3	20.1		
Pool Max depth (ft)																									0.5		1	1.5			0.3		0.5	0.9		
Pool Spacing (ft)	23		31.5	40																					4.8		23.8	42.7			18.9		27.9	35		
Pattern																																				
Channel Beltwidth (ft)	23		26	29																																
Radius of Curvature (ft)	11		14.5	18																																
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)	39		49	59																																
Meander Width Ratio	2.94		3.33	3.72																																
Additional Reach Parameters																																				
Rosgen Classification	C5																																			
Channel Thalweg length (ft)	286																																			
Sinuosity (ft)	1.25																																			
Water Surface Slope (Channel) (ft/ft)	0.0026																																			
BF slope (ft/ft)	0.0027																																			
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in.

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
Mill Branch - EEP No. 251 - Middle Reach

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	9.5		11.6	13.7			9.7		12	14.2			15		17	19			15.8		18.2	20.6			12.7		30.3	47.9			14		16	18.2		
Floodprone Width (ft)	77		82.5	88			75		84	93			31.5		55.5	79.5			28.5		45.2	61.9			79.3		79.1	78.8			79.3		82.9	86.5		
Bankfull Mean Depth (ft)	0.6		0.85	1.1			0.5		0.85	1.2			0.3		0.55	0.8			0.3		0.4	0.5			0.3		0.4	0.5			0.2		0.6	1		
[1]Bankfull Max Depth (ft)	1		1.6	2.2			1		1.65	2.3			1		1.75	2.5			1		1.6	2.2			0.9		1.6	2.3			0.8		1.6	2.4		
Bankfull Cross Sectional Area (ft^2)	5.2		10.4	15.5			5.1		10.9	16.6			4.8		9.8	14.8			4		7.5	11			4		12.9	21.8			3.3		10.8	18.2		
Width/Depth Ratio	12.2		14.7	17.2			12.1		15.5	18.8			24.4		36.2	47.9			38.6		50.3	61.9			40.3		72.6	105			17.8		39.1	60.3		
Entrenchment Ratio	4.5		6.8	9.1			5.4		7.6	9.8			1.7		3.5	5.3			1.4		2.65	3.9			1.6		3.9	6.2			4.8		5.2	5.6		
[1]Bank Height Ratio																																				
Profile																																				
Riffle Length (ft)	7		12	17																					9		11.2	13.4			10.5		22	30		
Riffle Slope (ft/ft)																															0.01		0.04	0.07		
Pool Length (ft)	10		16.5	23																					8		13.5	19			7.3		15.9	26.4		
Pool Max depth (ft)																									1		1.7	2.4			0.81		1.1	2.4		
Pool Spacing (ft)	28		38	48																					11.3		29.5	47.7			26.4		38.6	47		
Pattern																																				
Channel Beltwidth (ft)	31		36	41																																
Radius of Curvature (ft)	15		17.5	20																																
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)	60		64	68																																
Meander Width Ratio	8		6	4																																
Additional Reach Parameters																																				
Rosgen Classification	C5																																			
Channel Thalweg length (ft)	299																																			
Sinuosity (ft)	1.28																																			
Water Surface Slope (Channel) (ft/ft)	0.0011																																			
BF slope (ft/ft)	0.0011																																			
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
Mill Branch - EEP No. 251 - Lower Reach

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	10.8		13.9	17			11.8		14.4	16.9			18.3		14.8	11.2			10.3		12.9	15.4			8.6		13.8	18.9			7		13.4	12.5		
Floodprone Width (ft)	84		84				84		84				92.7		55.1	17.5			26.8		49.6	72.3			57.2		72.2	87.2			71		82.2	93.4		
Bankfull Mean Depth (ft)	0.7		0.75	0.8			0.7		0.75	0.8			0.5		0.6	0.7			5.2		6.1	7			0.4		0.7	1			0.6		0.7	0.8		
[1]Bankfull Max Depth (ft)	1.8		1.45	2.2			1.7		1.95	2.2			0.8		1.4	2			0.5		0.5	0.5			1.4		1.4	1.4			1.4		1.55	1.7		
Bankfull Cross Sectional Area (ft[2])	8.9		7.2	12.6			8.9		10.7	12.5			2.6		5.55	8.5			1.5		1.9	2.3			8.2		8.25	8.3			5.4		8.95	12.5		
Width/Depth Ratio	13.6		18.3	22.9			15.6		19.2	22.8			14.5		27	39.4			20.4		27.2	34			8.9		26.3	43.6			9.1		20.2	31.2		
Entrenchment Ratio	7.8		7.8				7.2		7.2				1.5		3.3	5.1			1.7		4.35	7			4.4		5.55	6.7			4.7		7.45	10.2		
[1]Bank Height Ratio																																				
Profile																																				
Riffle Length (ft)	4		7.5	11																					5		7.8	10.6			8.9		17.8	26.6		
Riffle Slope (ft/ft)	0		0	0.01																											0.01		0.01	0.01		
Pool Length (ft)	28		40.5	53																					8		26	44			12.9		26.2	39.8		
Pool Max depth (ft)																									1		1.55	2.1			0.65		1.22	1.7		
Pool Spacing (ft)	18		19	20																					9.2		30.6	52			38.5		54.8	80		
Pattern																																				
Channel Beltwidth (ft)	37		37	37																																
Radius of Curvature (ft)	17		20.5	24																																
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)	77		81.5	86																																
Meander Width Ratio	7.1		7.6	8.1																																
Additional Reach Parameters																																				
Rosgen Classification	C5																																			
Channel Thalweg length (ft)	243																																			
Sinuosity (ft)	1.21																																			
Water Surface Slope (Channel) (ft/ft)	0.0036																																			
BF slope (ft/ft)	0.0042																																			
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

APPENDIX E

Table 12. Verification of Bankfull Events			
Date of Data Collection	Date of Occurrence	Method	Photo #
September 13, 2011	September 2011	Photographed on-site (Wrack Line)	Photo Station 9. Appendix B