# Year 3 Monitoring Report for South Muddy Creek Tributaries (Queen Properties)

South Muddy Creek Tributaries McDowell County, NC SCO # D04006-01



Prepared for: NCDENR – EEP 2728 Capital Blvd, Suite 1H 103 Raleigh NC 27604



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## I. EXECUTIVE SUMMARY

The South Muddy Creek Tributaries restoration project is located near Dysartsville in McDowell County, North Carolina. The stream channels included in this project are designated as Tributaries A, A2, B and C. Prior to restoration, Tributaries A and A2 were drainage channels that had experienced modification in the form of ditching and vegetative management. Tributaries B and C were natural channels that were in a degraded condition attributed to head-cutting and streambank erosion exacerbated by cattle intrusion. The project consists of a combination of Priority 1 and Priority 2 Restoration and Enhancement Level 1. The project goal for the restoration plan, completed in 2005, was to re-establish geomorphologic features consistent with natural stream channel characteristics. Elements of the restoration design included grade control and bank stabilization using natural materials and native plantings, reconnection of the channels to functional floodplains, and the incorporation of instream habitat features including riffle/pool complexes to re-establish, sort and transport substrate materials. The following report documents the Year 3 Annual Monitoring for this project.

Vegetative monitoring was completed in September 2008 using the methodology of the Carolina Vegetation Survey. Stem counts completed in 30 vegetation plots showed an average density of 336 stems per acre for the site, which meets the success criteria of 320 stems/acre after three years of monitoring. Thirteen of the thirty vegetation plots fall below this threshold number; these plots are scattered throughout the project area. Despite this, stem counts for Year 3 represent a net gain of 10 stems over the previous year, due to remedial plantings conducted in the spring of 2008. Further plantings will only be conducted as necessary to continue to maintain the required stem counts.

It is likely that the spread of *Sericea lespedeza* throughout much of the project corridor has hindered the growth and survival of woody vegetation. This species is a common component of pasture mixes, and likely spread into the project area from the surrounding pasture lands. Management in 2008 included herbicide treatments, with spraying focused on targeted planted areas to minimize the impact of the invasive on woody survival. This species will be closely monitored, with further spraying conducted as deemed necessary to enhance survival of the planted species.

Monitoring of the stream identified some problem areas along the tributaries of South Muddy Creek, including areas of bank scour. Areas first noted as problems in a previous year of monitoring along Tributaries B and A have extensive vegetative development, which has increased streambank stability. Newly noted problem areas are expected to follow the same trend of vegetative development. Tributary C includes locations with steep stream banks that were not included in enhancement activities. Because these steep banks are remnants of an existing condition and do not appear to be progressing into further instability, they are not included in the monitored problem areas.

Bedform features continue to evolve along the restored reaches as shown on the long-term longitudinal profiles. Riffle lengths and slopes remain stable. Pool to pool spacings are representative of reference reach conditions, adjusted for drainage area and bankfull width. The pools have maintained their as-built depths and have developed excellent glide features, providing spawning habitat for native fishes together with riffle substrates conducive to benthic macro-invertebrate populations to re-emerge. Comparisons of As-Built, Year 1, Year 2 and Year 3 long-term stream monitoring show successive increases in channel-floodplain connectivity and

increasingly stable channel dimensions, interpreted from width/depth ratios, entrenchment ratios, bank height ratios, and channel geomorphologic parameters as shown on the long-term monitoring cross-sections. Median particle sizes of the stream channels ranged from fine to coarse gravel in the riffle/run areas to silt and fine to medium grained sand in the pool/glide areas. Remedial maintenance work on the restored reaches is not warranted at this time.

## II. PROJECT BACKGROUND

## A. Location and Setting

The project is located in McDowell County, North Carolina, approximately two miles south of Interstate 40, between Marion and Morganton near the community of Dysartsville. The tributaries lie east of Muddy Creek Road, north of Pinnacle Church Road and west of Dysartsville Road, as shown on Figure 1. The stream channels included in the project are designated as Tributaries A, A2, B and C. Tributaries A, B and C confluence directly with South Muddy Creek. Tributary A2 confluences with Tributary A.

Directions to the project site are as follow:

From Marion, follow Interstate 40 east to Dysartsville Road (Exit 94). Turn right onto Dysartsville Road to travel south for approximately 2 miles to Pinnacle Church Road. Follow Pinnacle Church Road to Muddy Creek Road, and turn right. The project site is on the east side of the road. This is private property; access to the stream corridor is limited to the dedicated ingress/egress included as part of the recorded Conservation Easement. Coordination with the property owner is encouraged prior to accessing the property.

## **B.** Project Structure, Mitigation Type, Approach and Objectives

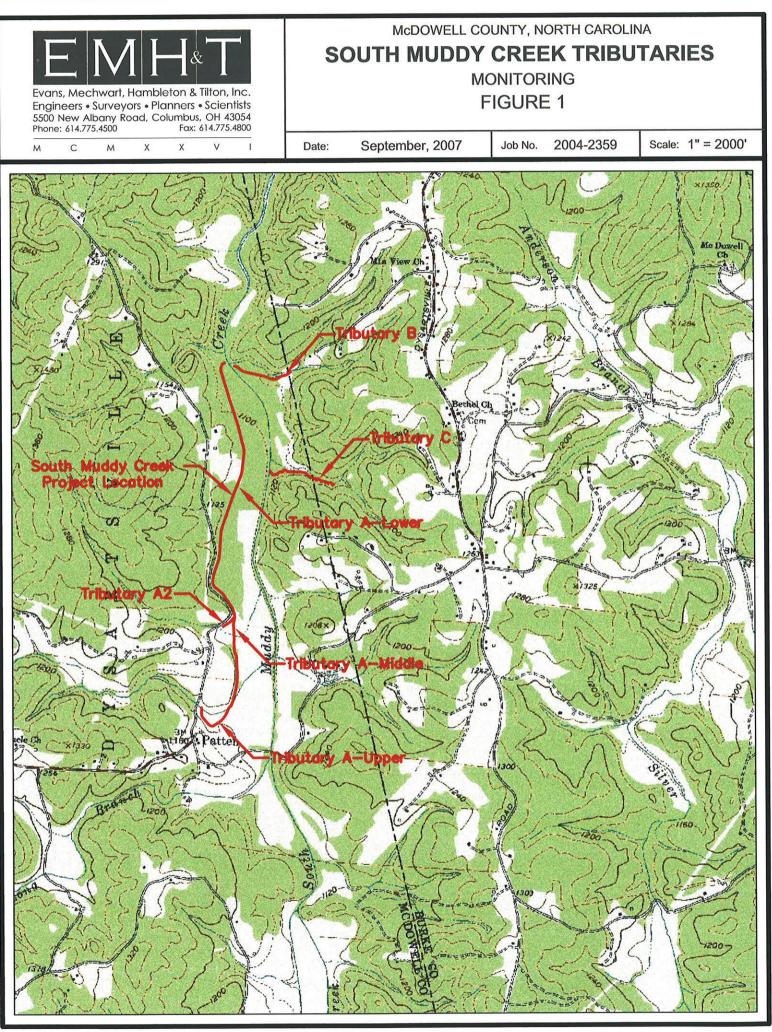
Pre-restoration land use surrounding the project tributaries consisted of agricultural croplands along Tributaries A and A2 and cattle pastureland along Tributaries B and C. The upper reaches of Tributaries A2, B and C were characterized by a mix of pastureland and limited wooded corridor. Tributaries A and A2 were drainage channels that had experienced modification in the form of ditching and vegetative management prior to restoration. Tributaries B and C are natural channels that, prior to restoration, were in a degraded condition attributed to head-cutting and streambank failure and erosion exacerbated by cattle intrusion and associated hoof shear. All of the tributary channels, prior to restoration, had narrow or denuded riparian corridors.

Tributaries A, A2 and B were surrounded by either cropland or pasture with no significant buffer prior to restoration. Tributaries B and C lacked cattle intrusion fencing that adversely impacted streambank stability. Tributary C was less degraded, prior to restoration, in that it had a significant wooded riparian corridor on the south (left) bank with well sorted and well graded bed materials. However, Tributary C was impacted by a significantly degraded riparian corridor on the north (right) bank, with numerous locations of streambank erosion and failure associated with cattle intrusion.

Restoration of the project streams re-established geomorphologic features consistent with natural stream channel characteristics. Results achieved are listed below.

- Bankfull channels constructed with the appropriate geometries to convey bankfull flows and transport suspended and bedload materials available to the streams.
- Stable channel patterns consistent with natural streams in the region.
- Grade control and bank stabilization features that enhance environmental attributes of the stream channels though the use of natural materials and native plantings.

- In-stream habitat features, including riffle/pool complexes to re-establish, sort and transport substrate materials available to the streams.
- Reconnection of project stream channels to functional floodplains.
- Extensive indigenous instream and riparian revetment.



Restoration of Tributaries A, A2 and B was accomplished through the modification of the existing pattern, profile and dimension of the tributary channels to a stable condition. The restored channels are on an alignment that is offset from the pre-existing stream channels. Post-construction, the existing tributary channels were abandoned and filled. Restoration along these reaches was either Priority 2, where the elevation of the floodplain was lowered through excavation to re-connect it to the restored stream channel, or a combination of Priority 2 and Priority 1, where the floodplain was lowered and the stream thalweg was raised above the existing channel profile.

The lower reach of Tributary A has a low gradient, which flattens to 0.0012 ft/ft. Due to a relatively flat profile gradient, a series of successive pool and riffle complexes was not proposed. Instead, the restored stream channel has constructed point bars on the inside of meander bends at pool locations and is transporting its bedload through the run/pool complexes as the bed form of the channel naturally evolves. The steeper gradient associated with the restored stream channels along Tributaries A2 and B allowed the construction of a sinuous channel with constructed riffle/pool sequences.

Enhancement Level I was implemented along one of the reaches on Tributary A by modifying the profile and dimension of the channel. Along this segment, improvements were constructed along the alignment of the existing stream channel. Enhancement Level I on Tributary C provides bank stabilization, through cattle exclusion, with one hard-engineered, fenced and controlled cattle access point for watering, combined with continuous preservation of the riparian buffer zone via live stock exclusion fencing. Stabilization was accomplished by re-grading steep, undercut channel banks, and the use of jute matting and live plantings.

An important component of the restoration of Tributaries B and C is cattle exclusion. As mentioned previously, these channels are adjacent to pastureland, where cattle frequented the streams for shade and drinking water. Prior to restoration, the cattle accessed the streams at random locations and, in doing so, denuded and destabilized the pre-existing channel banks. The restoration of Tributary B includes fencing that permanently excludes cattle from the stream corridor. The fencing along Tributary C limits cattle access to a single point along the stream reinforced with stone underlain by non-woven geotextile to prevent degradation that would otherwise occur. All fencing has been placed at the outer edge of the perpetual conservation easement held by the State of North Carolina. Information regarding the project structure and objectives is included in Tables I and II that follows:

Table I. Project Structure TableSouth Muddy Creek Tributaries Restoration / EEP Project No. D04006-01										
Project Reach/Segment ID Linear Footage										
A (upper)	1,609 l.f.									
A (middle)	1,094 l.f.									
Α	1,052 l.f.									
A (lower)	7,349 l.f.									
A2	480 l.f.									
В	2,041 l.f.									
С	1,601 l.f.									
TOTAL	15,226 l.f.									

South	Table II. Project Mitigation Objectives Table South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01												
Project Segment/ Reach ID	Mitigation Type	Approach	Linear Footage or Acreage	Comment									
A (upper)	Restoration	Priority 1&2	1,609 l.f.	Restore dimension, pattern, and profile									
А	Enhancement	Level 1	1,052 l.f.	Restore dimension and profile									
A (middle)	Restoration	Priority 1&2	1,094 l.f.	Restore dimension, pattern, and profile									
A (lower)	Restoration	Priority 2	7,349 l.f.	Restore dimension, pattern, and profile									
A2	Restoration	Priority 2	480 l.f.	Restore dimension, pattern, and profile									
В	Restoration	Priority 2	2,041 l.f.	Restore dimension, pattern, and profile									
С	Enhancement	Level 1	1,601 l.f.	Restore dimension and pattern									
	TOTAL			15,226 l.f.									

## C. Project History and Background

Project activity and reporting history are provided in Table III. The project contact information is provided in Table IV. The project background history is provided in Table V.

Table III. Project Activity and Reporting History South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01										
Activity or Report	Scheduled Completion	Data Collection Complete	Actual Completion or Delivery							
Restoration plan	Aug 2005	Fall 2004	Mar 2005							
Final Design - 90% <sup>1</sup>	N/A	N/A	N/A							
Construction	Feb 2006	N/A	Apr 2006							
Temporary S&E applied to entire project area <sup>2</sup>	Jul 2005	N/A	Jul 2005							
Permanent plantings	Apr 2006	N/A	Apr 2006							
Mitigation plan/As-built	Jun 2006	Nov 2006	Jan 2007							
Year 1 monitoring	2006	Sep 2006 (vegetation) Apr 2007 (geomorphology)	Jun 2007							
Year 2 monitoring	2007	Sep 2007 (vegetation) Oct 2007 (geomorphology)	Jan 2008							
Year 3 monitoring	2008	Sep 2008 (vegetation) Oct 2008 (geomorphology)	Dec 2008							
Year 4 monitoring	2009									
Year 5 monitoring	2010									

<sup>1</sup>Full-delivery project; 90% submittal not provided.

#### **Evans, Mechwart, Hambleton & Tilton, Inc.** *Monitoring Report – South Muddy Creek Tributaries EEP Contract # D04006-01*

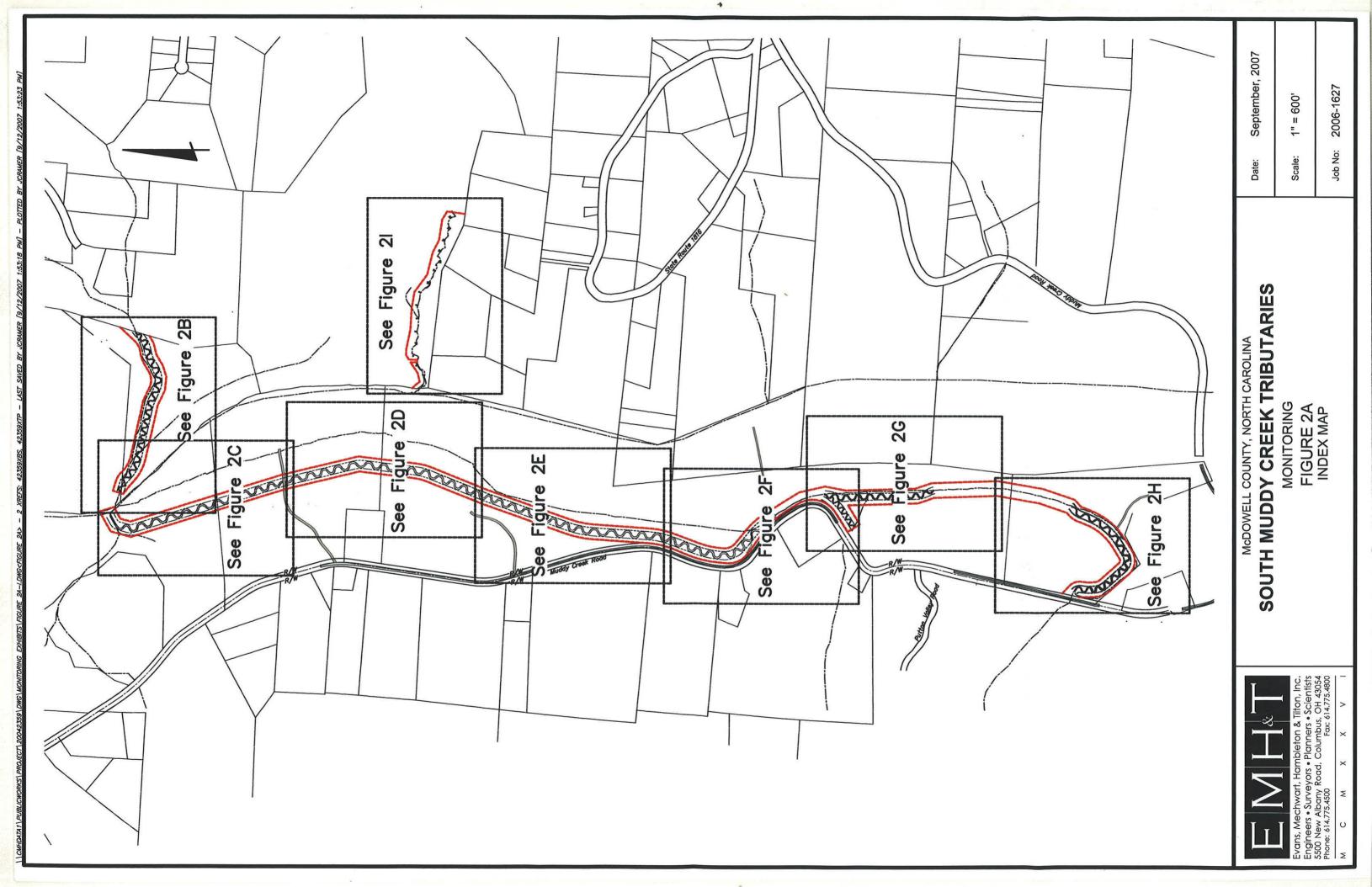
 $^2 Erosion$  and sediment control applied incrementally throughout the course of the project. N/A: Data collection is not an applicable task to these project activities.

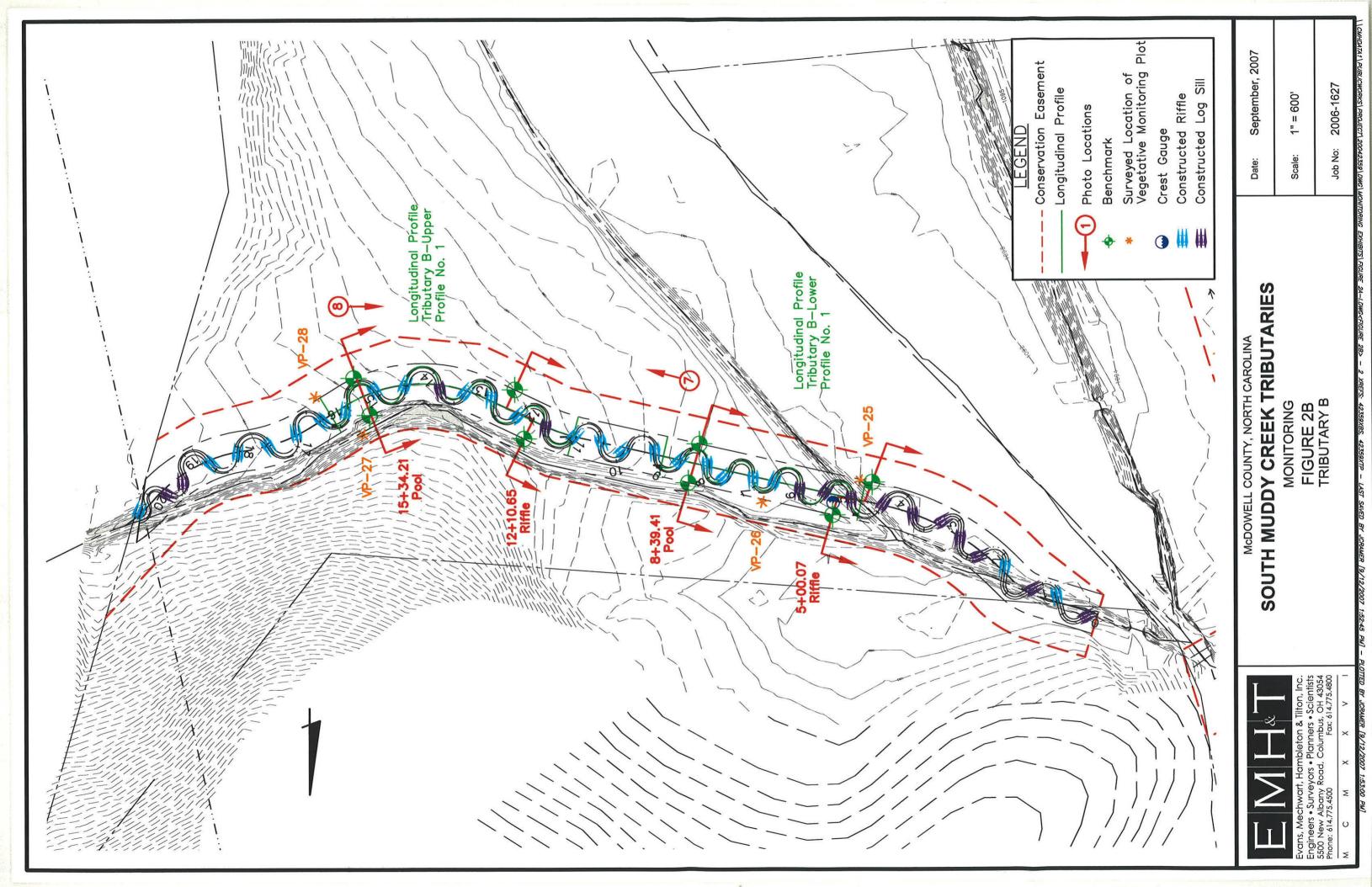
Table IV. Project Contact Table South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01									
Designer	Evans, Mechwart, Hambleton & Tilton, Inc. 5500 New Albany Road, Columbus, OH 43054								
Construction Contractor	South Mountain Forestry 6624 Roper Hollow, Morganton, NC 28655								
Monitoring Performers	Evans, Mechwart, Hambleton & Tilton, Inc. 5500 New Albany Road, Columbus, OH 43054								
Stream Monitoring POC	Warren E. Knotts, P.G., EMH&T								
Vegetation Monitoring POC	Holly Blunck, EMH&T								

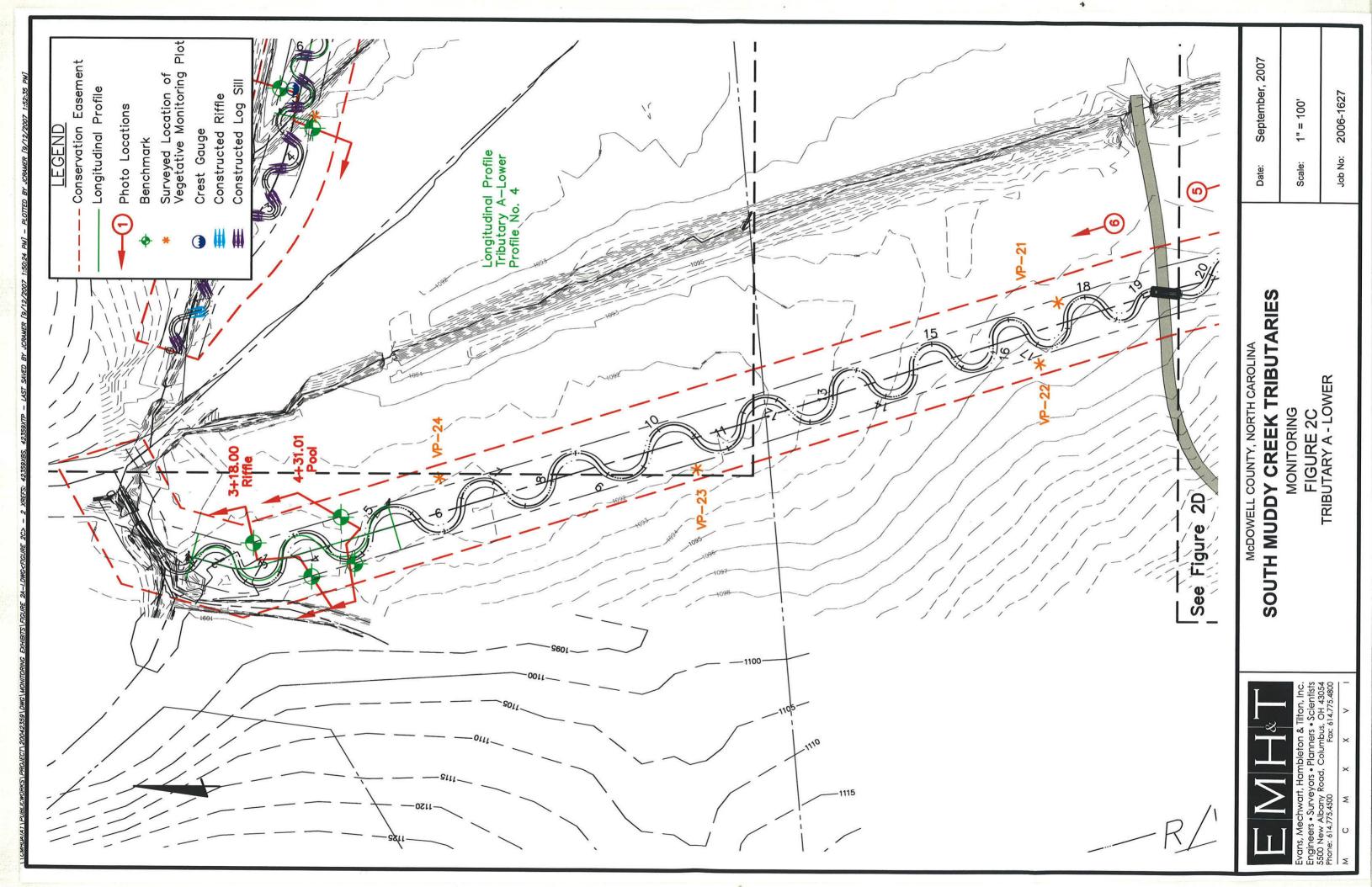
Table V. Project Backgrou           South Muddy Creek Tributaries Restoration	
Project County	McDowell
Drainage Area- A (upper & middle)	1.38 sq mi
Drainage Area-A (lower)	2.03 sq mi
Drainage Area-A2	0.27 sq mi
Drainage Area-B	0.44 sq mi
Drainage Area-C	0.37 sq mi
Drainage Impervious Cover Estimate	2%-6%
Stream Order	Tributary A, B, C -2nd Tributaries A2 – 1st
Physiographic Region	Blue Ridge Mountains
Ecoregion	Eastern Blue Ridge Foothills
Rosgen Classification of As-built	C4/C5
Dominant Soil Types	Iotla sandy loam, Dillard loam
Reference Site ID	South Muddy Birchfield, South Muddy "Tributary 4"
USGS HUC for Project and Reference	3050101
NCDWQ Sub-basin for Project and Reference	03-08-30
NCDWQ Classification for Project and Reference	С
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reason for 303d listing or stressor	N/A
% of project easement fenced	24%

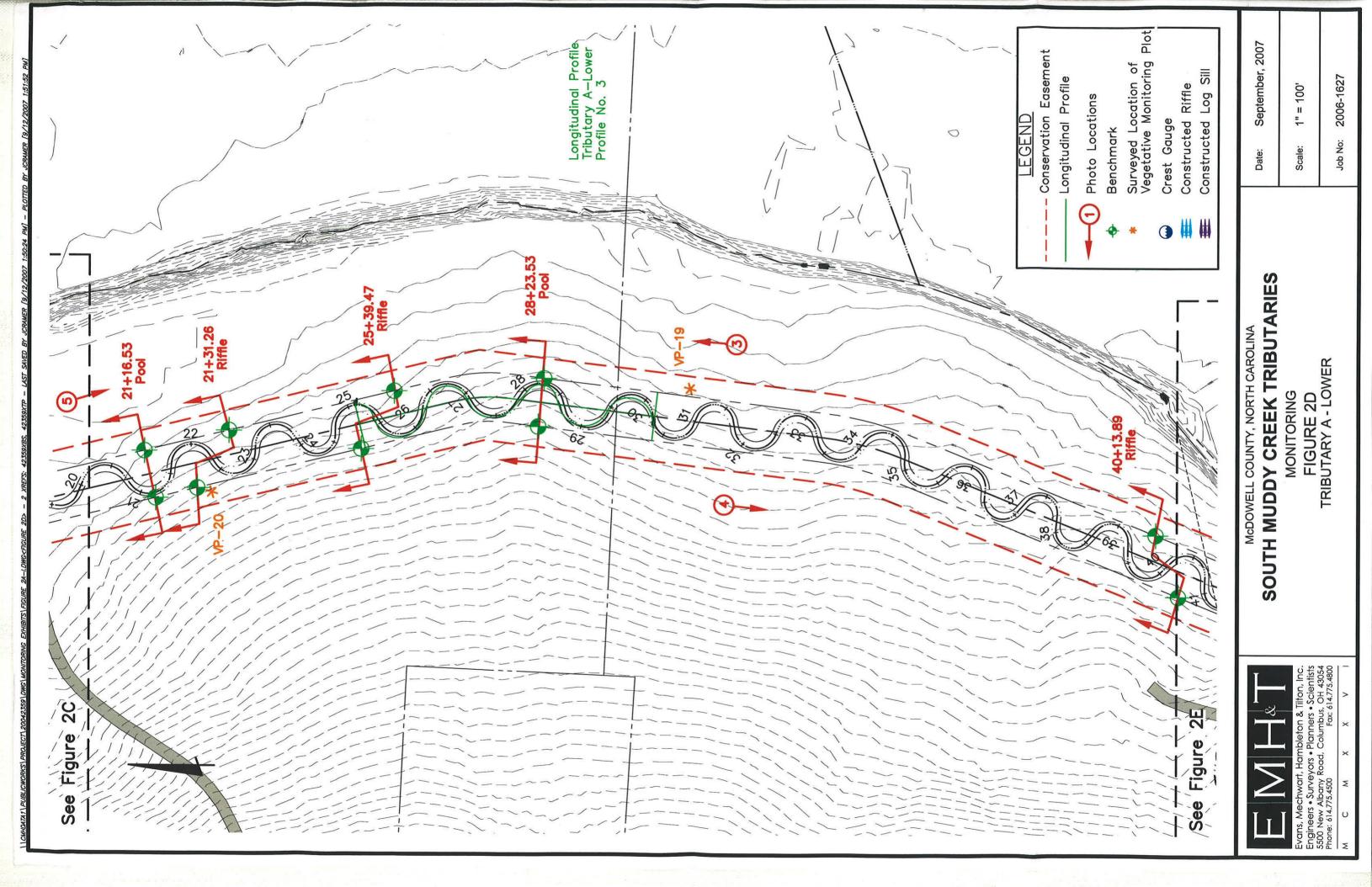
## **D.** Monitoring Plan View

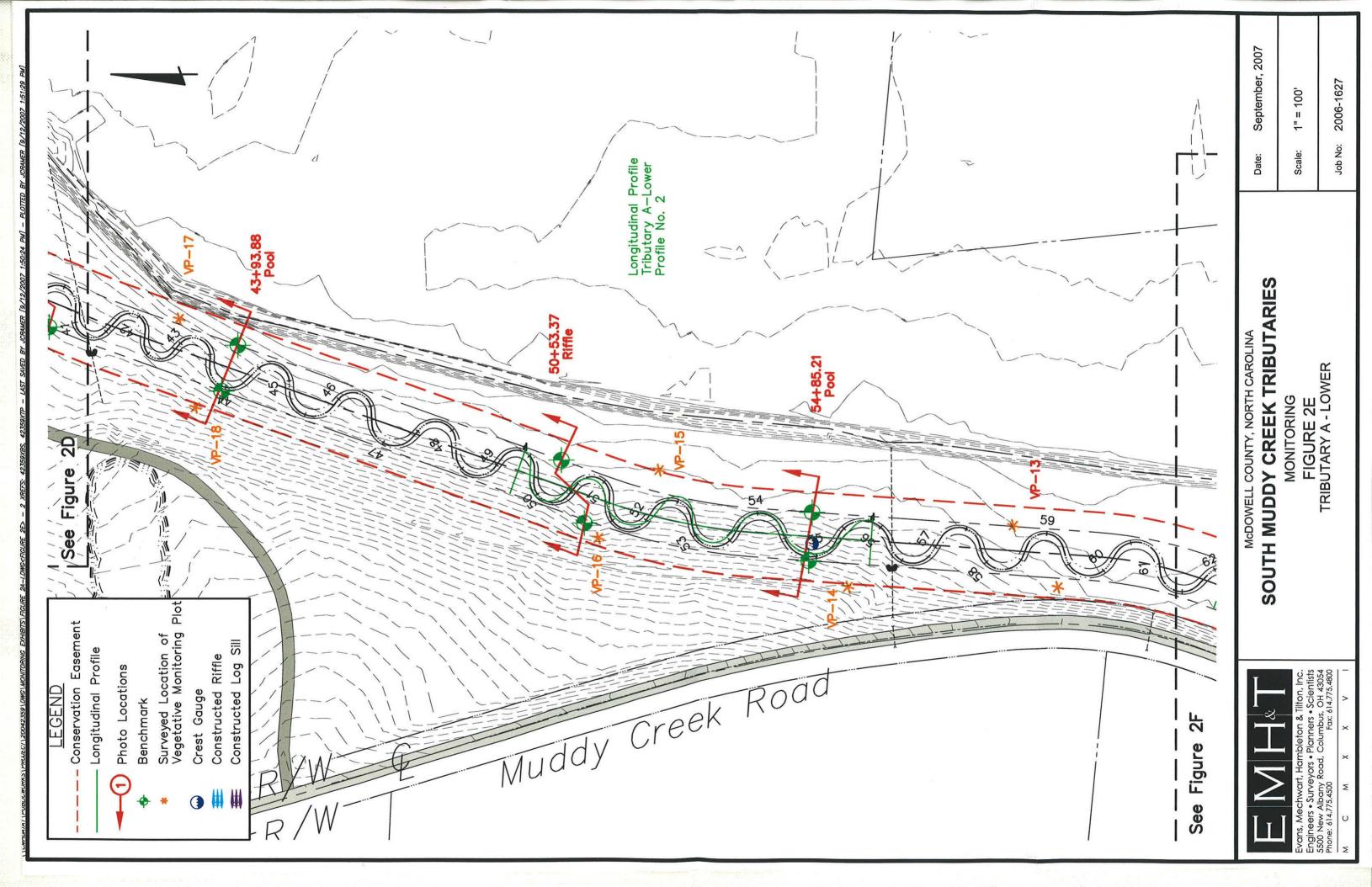
The monitoring plan view is included as Figure 2.

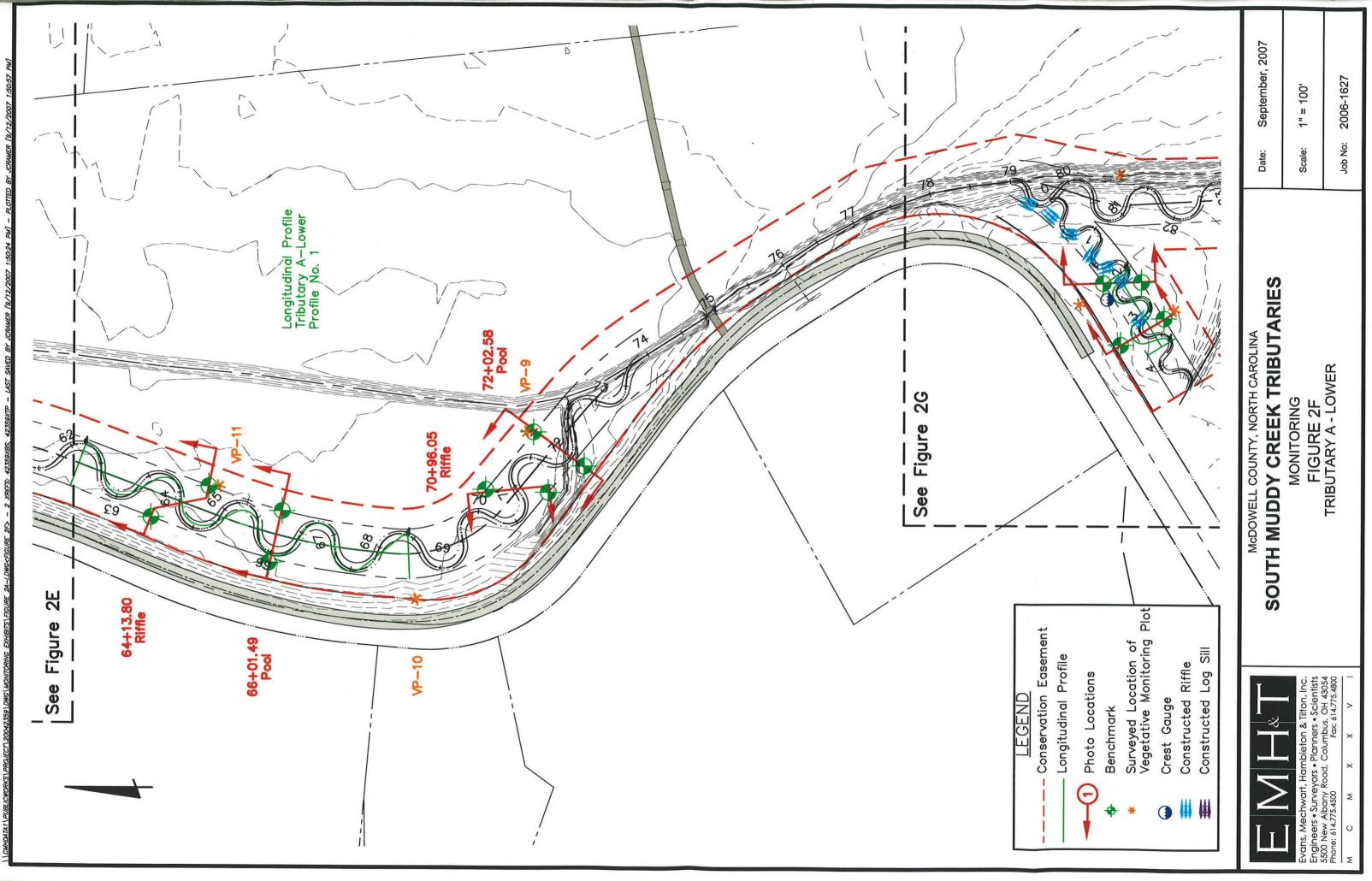


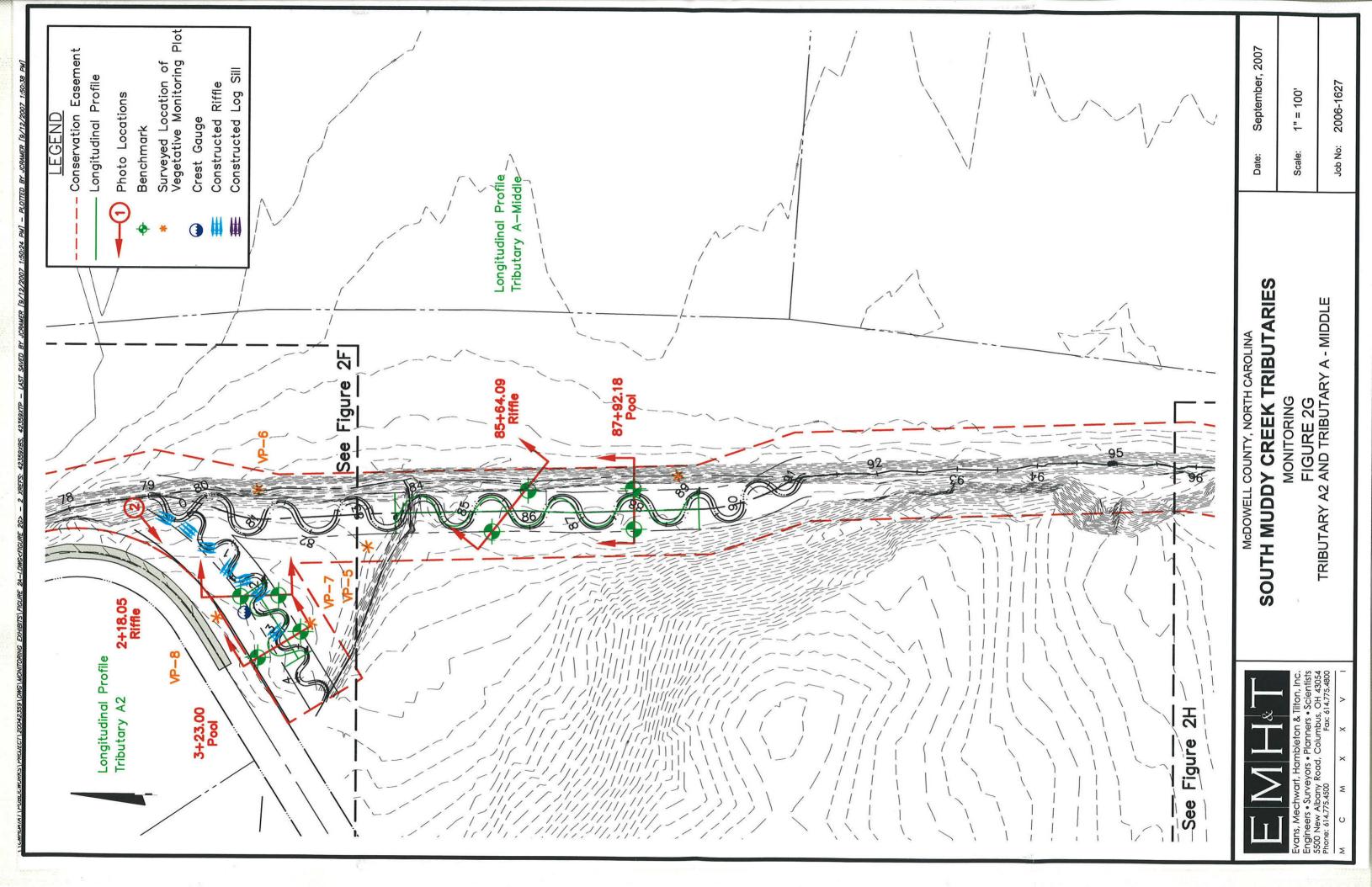


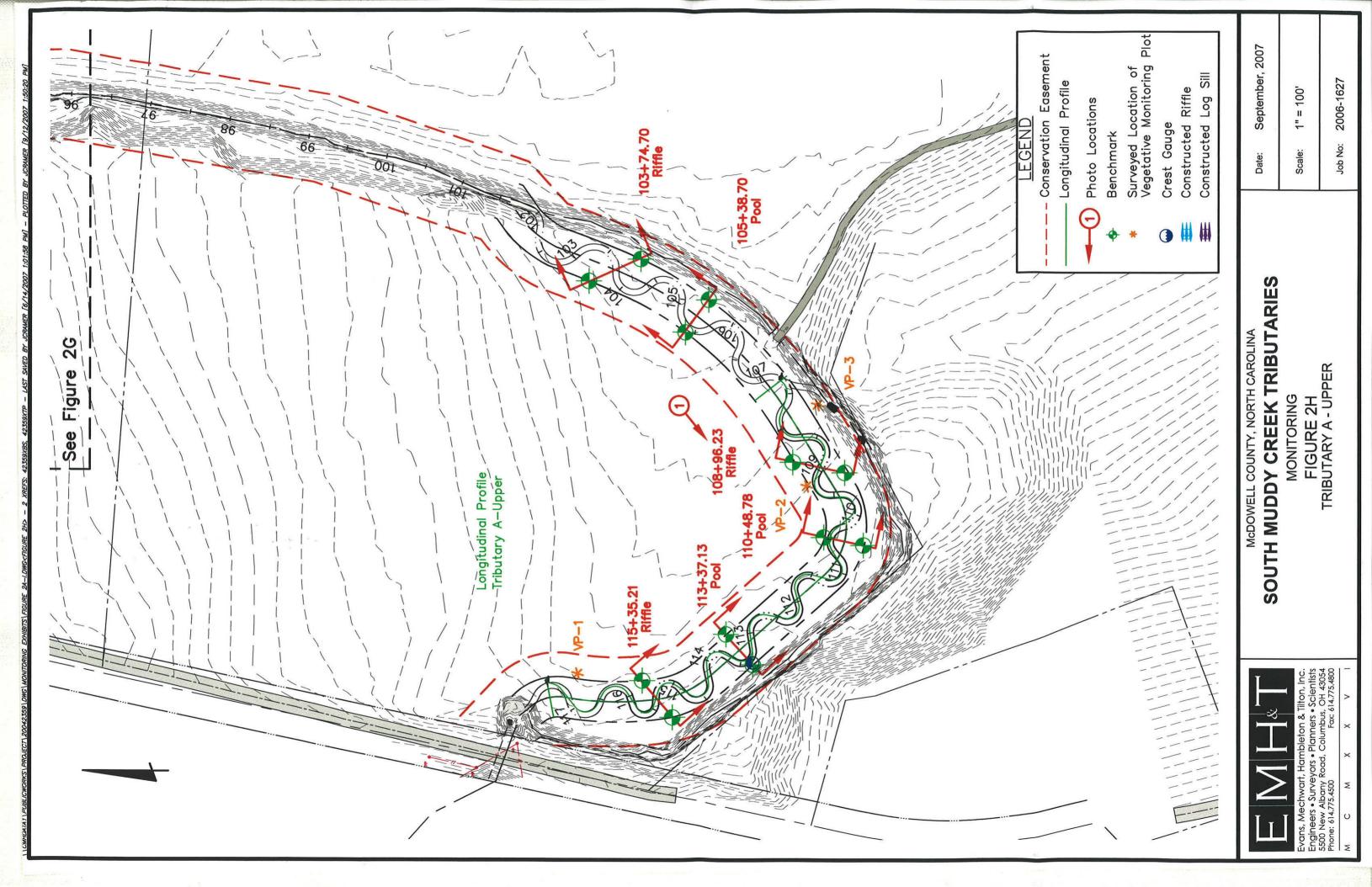


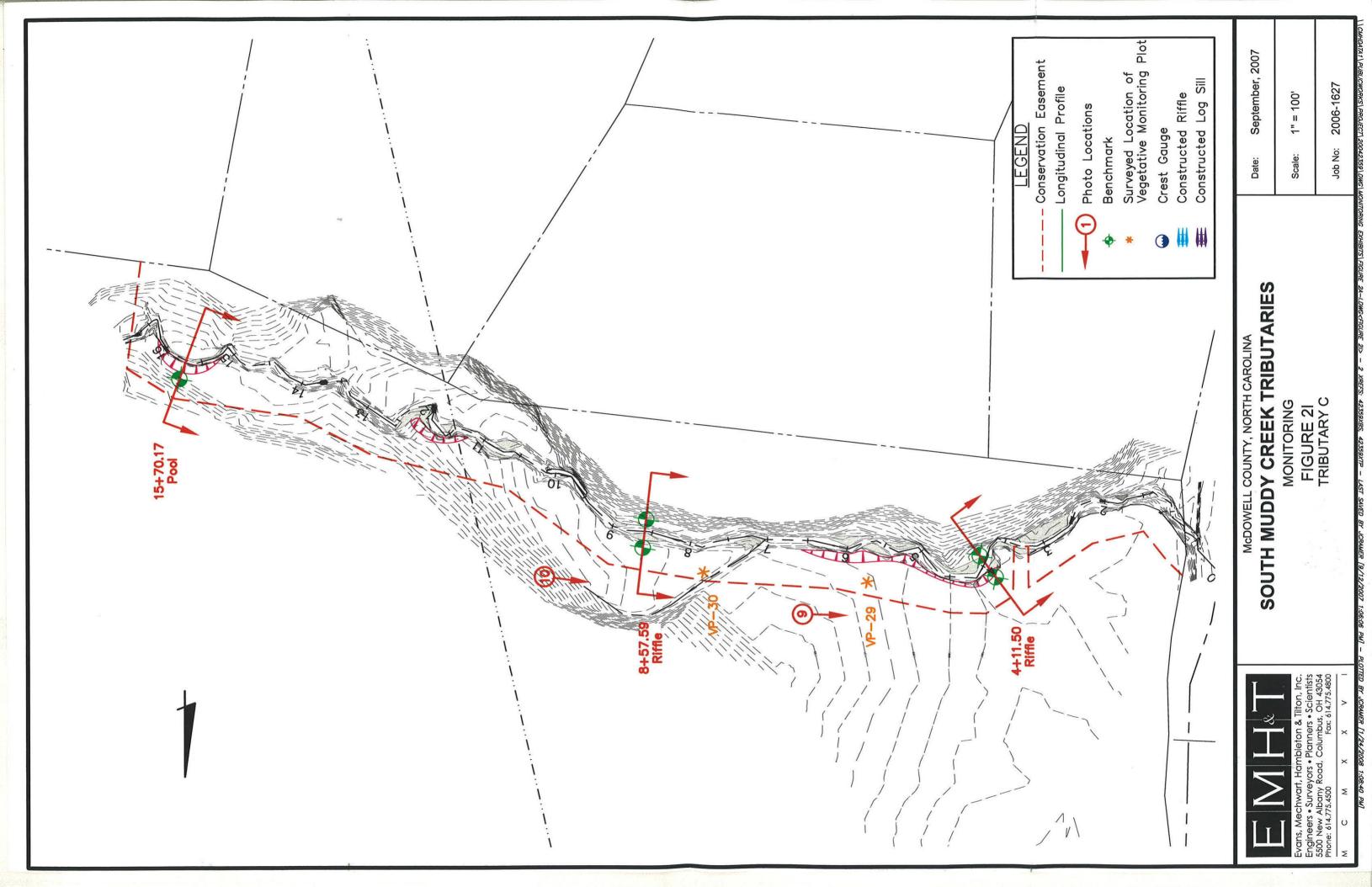












## **III. PROJECT CONDITION AND MONITORING RESULTS**

#### A. Vegetation Assessment

#### 1. Soil Data

The project area is contained within the Iotla-Braddock-Rosman-Potomac soil association. This soil association typically consists of nearly level to very steep, somewhat poorly drained soils, which have a predominantly loamy, clayey or sandy subsoil formed in alluvium on floodplains and stream terraces (USDA, NRCS 1995).

The majority of Tributary A is mapped within Iotla sandy loam with 0-2% slopes, occasionally flooded. The upstream portion of the tributary flows through additional soil units including Elsinboro loam with 1-4% slopes, rarely flooded, Braddock clay loam with 6-15% slopes, eroded and Hayesville-Evard complex with 15-35% slopes. Tributary A2 is mapped in Iotla sandy loam. The portion of tributary B that is included in the restoration is mapped within Dillard loam, 1-4% slopes, rarely flooded. The portion of Tributary C that is included in the restoration is mapped within the Iotla sandy loam unit.

Data on the soils series found within and near the project site is summarized in Table VI.

Table VI. Preliminary Soil Data South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01											
Series	Max. Depth (in.)	% Clay on Surface	K <sup>1</sup>	$T^2$	% Organic Matter						
Braddock clay loam (BrC2)	80+	27-40	0.32	5	0-2						
Dillard loam (DdB)	80+	10-15	0.32	5	4-8						
Elsinboro loam (EsB)	60+	8-18	0.28	5	1-3						
Hayesville-Evard complex (HeD)	60+	7-25	0.24-0.28	5	1-5						
Iotla sandy loam (IoA)	60+	12-18	0.2	5	4-8						

<sup>1</sup>Erosion Factor K indicates the susceptibility of a soil to sheet and rill erosion, ranging from 0.05 to 0.69. <sup>2</sup>Erosion Factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity, measured in tons per acre per year.

#### 2. Vegetative Problem Areas

Vegetative Problem Areas are defined as areas either lacking vegetation or containing populations of exotic vegetation. All problem areas identified during each year of monitoring are summarized in Table VII. Photographs of the vegetative problem areas are shown in Appendix A. There are also a few locations where the density of planted woody stems is not high enough to meet the required stem counts. Densities of planted woody species are discussed in the Stem Counts section of this report.

## Table VII. Vegetative Problem Areas

**Evans, Mechwart, Hambleton & Tilton, Inc.** Monitoring Report – South Muddy Creek Tributaries EEP Contract # D04006-01

South Muddy Creek Stream Restoration / EEP Project No. D04006-01											
Feature/Issue	Station # / Range	Probable Cause	Photo #								
Invasive	Throughout: See		VPA 1,								
Population	VPA Plan View	Sericea lespedeza: encroachment from pasture	VPA 2								

The only type of vegetative problem is the spread of an invasive species, *Sericea lespedeza*. This species is a common component of pasture mixes, and as this project is adjacent to pasture lands, it likely spread into the project area from the surrounding landscape. The spread of the species is extensive throughout the project corridor, and has increased slightly over the past year. Management in 2008 included herbicide treatments, with spraying focused on the areas most densely planted with trees in an attempt to minimize the impact of the invasive on woody survival. This spraying had minimal negative effect on the spread of this species. Further spraying will be conducted throughout the monitoring period as deemed necessary to enhance survival of the planted species. Management of the woody vegetation is discussed in the Stem Counts section of this report.

## 3. Vegetation Problem Area Plan View

The location of each vegetation problem area is shown on the vegetative problem area plan view included in Appendix A. Each problem area is color coded with yellow for areas of low concern (areas to be watched) or red for high concern (areas where maintenance is warranted).

## 4. Stem Counts

A summary of the stem count data for each species arranged by plot is shown in Table VIII. This data was compiled from the information collected on each plot using the *CVS-EEP Protocol for Recording Vegetation, Version 4.0.* 

The average stem density for the entire site just meets the minimum criteria of 320 stems per acre after three years. However, thirteen of the thirty vegetation plots fall below this threshold number. The largest deficit in woody stems is found along Tributary C (Plots 29 and 30), the reach with thick naturally forested cover. Tributary B also exhibits a deficiency in woody stems throughout the entire length of stream; this is the reach most impacted by *Sericea lespedeza*. The remainder of the plots with an insufficient number of stems are scattered along Tributary A, particularly the lower segment.

Throughout the three years of monitoring, it has been clear that the survival of seedlings is being affected on this site, as many of the original and remedial plantings are not surviving through the growing season. It is likely that the stem densities were reduced in these plots largely due to an infestation of invasive *Sericea lespedeza*. Where present, this species is dominant, providing a thick coverage of growth approximately three feet high through which any species must break in order to receive sunlight or rainfall. Herbicide application was conducted within the South Muddy project area just prior to the 2008 vegetation monitoring in an attempt to eradicate the *Sericea lespedeza*. Some yellowing of the plant was observed in response to the herbicide during monitoring; however, sufficient time had not elapsed to realize total die-off. Management of this invasive population will continue through selective herbicide treatments, the results of which will be documented in subsequent monitoring reports.

Remedial plantings were conducted in late April, 2007 to supplement the number of trees along the streams. Approximately 2000 trees were planted at this time, including 500 trees along Tributary C, and 1500 trees along the other reaches. These additional trees brought the average live stem density to 323 stems per acre in Year 2, an increase over the average live stem density of 284 stems per acre in Year 1. An additional round of remedial tree plantings were conducted in 2008, which were intended to bring deficient areas of the site back into compliance with the 320 stems per acre minimum. Due to continued mortality of planted stems which is speculated to be due to the coverage of *Sericea lespedeza*, these plantings did not bring all areas of the site back to the minimum stem count. The remedial plantings did, however, result in a net gain of woody stems for the entire site.

To address the issue of the remaining low plant stem counts, specific areas will be targeted for replanting within the South Muddy Tributary riparian corridors, which will include the deficient sample plots and surrounding areas within the buffer. All deficient portions of the riparian corridors will be supplemented with additional native tree and shrub plantings. These supplemental plantings will follow the specifications of the project proposed in the project Restoration Plan and Mitigation Plan documents. Consideration will be given to using larger woody stock, such as three-gallon potted material versus bare root specimen in performing the remedial plantings. These larger saplings should have a more developed root system and thus be better able to compete with the existing vegetation. Supplemental replanting will occur during spring 2009. The subsequent Year 4 (2009) monitoring report will contain specific documentation of this remedial planting effort including the specific locations of replanting, and the quantity and species of tree and shrub material installed.

## 5. Vegetation Plot Photos

Vegetation plot photos are provided in Appendix A.

															-			-		y pl											
				_Sc	outh	Mu	ddy	Cre	ek [	<u> Frib</u>	uta	ries	Res	tora	tion	ι/Έ	EP J	Proj	ect	<u>No.</u>	D04	006	<u>-01</u>								
															Ple	ots															Year 1
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Totals
Shrubs																															
Alnus serrulata																									5	8	3	7			
Cephalanthus																															
occidentalis												-																			
Cornus amomum	5	5	6		3	5	2	3	4	3	5	2		1	1	1		3	1	2	3	2	6	1							64
Sambucus canadensis										4		1																			5
Trees																															0
Fraxinus pennsylvanica	3	2	2			2		1	2			3		2	1	1	3	3					1	2						1	29
Platanus occidentalis	1		3	2	6			2	1				1		2			1	1	1	1	1		1							24
Quercus alba	1		2	5	1		1	1	3		1		1	2	4	2	1		2		6		1	3							37
Quercus phellos		1										1	5							2	1										10
Quercus pagoda																									3	3	3	4			13
Salix nigra							5																								
Year 1 Totals	10	-					-				Ý	1	7	-					4	5				1	8	11	1		0	1	210
Live Stem Density	405	324	527	284	405	284	324	284	405	284	243	284	284	203	324	162	162	284	162	203	446	122	324	284	324	446	243	446	0	41	
Average Live Stem Density															23	84															

## **B.** Stream Assessment

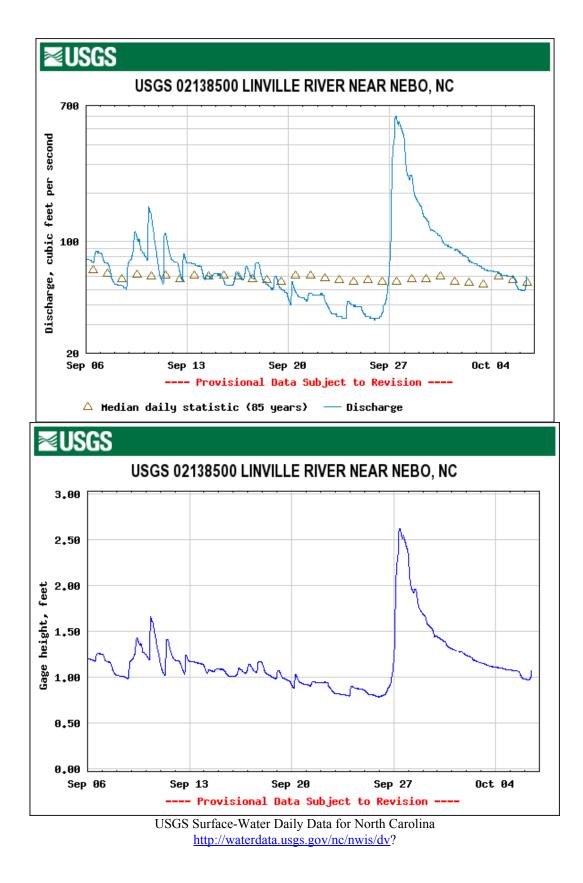
## 1. Hydrologic Criteria

A network of six crest-stage stream gages was installed on each of the project reaches. The locations of the crest-stage stream gages are shown on the monitoring plan view (Figure 2). No bankfull events were documented for this site during the first year of monitoring. Bankfull events were recorded during Year 2, as documented in Table IX. Photographic documentation of the bankfull events is provided in Appendix B.

Table IX. Verification of Bankfull Events										
Date of Data	Date of Occurrence	Method	Photo #							
Collection										
7/18/07	Unknown	Crest gage at Station 5+00 on Tributary B	BF 1							
7/18/07	Unknown (3 events)	Crest gage at Station 54+85 on Tributary A	BF 2							
		(Lower)								
10/19/07	9/14/07-9/15/07*	Crest gage at Station 113+37 on Tributary	BF 3							
		A (Upper)								
9/11/08	9/11/08	Photographed on-site	BF 4, BF 5,							
			BF 6, BF 7							

\*Date is approximate; based on a review of recorded rainfall data

One bankfull event was photographed and observed during the Year 3 monitoring site visit. This corresponds to a high discharge event on September 11, 2008 as recorded at USGS Gage 02138500 at Nebo, North Carolina, located approximately 15 miles west of Morganton and 5 miles east of Marion, NC. The discharge and gage height recorded at the Nebo station are shown on the hydrographs below.



The photographic documentation from Year 3 and onsite crest gage network recorded the second monitoring year with a bankfull discharge event. The crest gages show evidence of this bankfull event during the annual data collection, including the larger bankfull event occurring on September 28, 2008. No additional bankfull events were documented by the onsite crest gage network during Monitoring Year 3.

## 2. Stream Problem Areas

A summary of the areas of concern identified during the visual assessment of the stream for each year of monitoring is included in Tables Xa through Xc.

Sou	Table Xa. Stream Problem Areas – Year 1 South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01									
Feature Issue	Station Numbers	Suspected Cause	Photo Number							
Aggradation	4+50 (A2)	Large bar, 25 feet aggraded	SPA 1							
Aggradation	3+00 (A2)	Overwidened channel, 40 feet aggraded	(Year 1 Report)							
Bank failure	79+50 (A Middle)	Mat failed; scour hole, 5'	SPA 2, SPA 3							
Dank fanure	12+10 (B)	Complete loss of riffle, bank failure.	(Year 1 Report)							
	103+00 (A Upper) 83+30 (A Middle)	Large hole, scour (15 feet) Sloughing, coir log undercut and fallen into pool (15 feet)	-							
	82+70 (A Middle)	Sloughing, coir log undercut and fallen into pool (15 feet)	SPA 4, SPA 5,							
Bank scour	3+00 (A Lower) 19+70 (B)	Sloughing Bank scour around log sill	SPA 6 (Year 1 Report)							
	18+50 (B)	Scour at outside meander bend; significant aggradation	(Tear T Report)							
	16+00 (B)	Scour, matting loose and failing, bank slough								
	15+70 (C)	Bank scour/ sloughing								
	4+50 (C)	Bank scour/ sloughing								

Table Xb. Stream Problem Areas – Year 2 South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01						
Feature Issue	Station Numbers	Suspected Cause	Photo Number			
Bank failure	12+10 (B)	Complete loss of riffle, bank recovering as a result of thick vegetation.	SPA 1			
Bank scour	85+64 (A Middle) 15+70 (C) 4+50 (C)	Minor bank erosion Bank scour/ sloughing Bank scour/ sloughing; heavily vegetated and stable	SPA 2			

Table Xb. Stream Problem Areas – Year 3 South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01						
Feature Issue	Station Numbers	Suspected Cause	Photo Number			
Bank failure	12+10 (B)	Complete loss of riffle; banks are heavily vegetated and stable	SPA 1,2			
	84+75 (A Middle)	Bank scour/sloughing approximately 20 feet from stream at top of slope				
Bank scour	85+64 (A Middle)	Minor bank erosion; heavily vegetated and stable	SPA 3,4			
Dalik scoul	16+50 (B)	Bank scour/sloughing on left bank	51 A 3,4			
	15+25 to15+70 (C)	Bank scour/ sloughing				
	4+11 to 4+50 (C)	Bank scour/ sloughing				

Some unstable areas were found along South Muddy Tributaries in Year 3, including areas of bank scour as noted in Table Xc. Tributaries B and C and the Middle section of Tributary A each had some areas of bank scour and/or bank erosion. Those areas first noted in a previous year, including the bank failure at station 12+10 along Tributary B and station 85+64 on Tributary A Middle, have become heavily vegetated in Year 3, providing streambank stability. The new areas of bank scour noted on Tributaries B and A Middle are expected to follow this same trend in future years of monitoring.

A few areas of bank scour have been noted on Tributary C in previous years of monitoring; these areas remain in Year 3. In addition, there are locations along this tributary with steep stream banks in danger of instability. These locations were not identified as areas for enhancement in the Restoration Plan, and as such, no restoration activities have occurred along these banks. Because these steep banks are remnants of an existing condition and do not appear to be progressing into further instability, they are not included in the monitored problem areas, but will be examined during future monitoring activities to ensure management activities along these stream banks does not become necessary to ensure the stability of restored areas.

## 3. Stream Problem Areas Plan View

The locations of problem areas are shown on the stream problem area plan view included in Appendix B. Each problem area is color coded with yellow for areas of low concern (areas to be watched) or red for high concern (areas where maintenance is warranted).

## 4. Stream Problem Areas Photos

Photographs of the stream problem areas are included in Appendix B.

## 5. Fixed Station Photos

Photographs were taken at each established photograph station on September 10 and September 11, 2008. These photographs are provided in Appendix B.

6. Stability Assessment Table

The visual stream assessment was performed to determine the percentage of stream features that remain in a stable state after the first year of monitoring. A summary of the assessment for each reach is included in Table XIa through Table XIf. This summary was compiled from the more comprehensive Table B1, included in Appendix B. Only those structures included in the as-built survey were assessed during monitoring and reported in the tables.

Table XIa. Categorical Stream Feature Visual Stability Assessment South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01 Segment/Reach: A (Upper)						
Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
A. Riffles <sup>1</sup>	100%	100%	100%	100%		
<b>B. Pools</b> <sup>1</sup>	100%	100%	100%	100%		
C. Thalweg	100%	100%	100%	100%		
D. Meanders	100%	99%*	99%	100%		
E. Bed General	100%	100%	100%	100%		
<b>F. Vanes / J Hooks etc.</b> <sup>2</sup>	N/A	N/A	N/A	N/A		
<b>G. Wads and Boulders</b> <sup>2</sup>	N/A	N/A	N/A	N/A		

Table XIb. Categorical Stream Feature Visual Stability Assessment South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01 Segment/Reach: A (Middle)						
Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
A. Riffles <sup>1</sup>	100%	100%	100%	100%		
<b>B. Pools</b> <sup>1</sup>	100%	100%	100%	100%		
C. Thalweg	100%	100%	100%	100%		
D. Meanders	100%	96%*	99%	99%		
E. Bed General	100%	100%	100%	100%		
F. Vanes / J Hooks etc. <sup>2</sup>	N/A	N/A	N/A	N/A		
<b>G. Wads and Boulders</b> <sup>2</sup>	N/A	N/A	N/A	N/A		

Table XIc. Categorical Stream Feature Visual Stability Assessment South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01 Segment/Reach: A (Lower)						
Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
<b>A. Riffles</b> <sup>1</sup>	100%	100%	100%	100%		
<b>B.</b> Pools <sup>1</sup>	100%	100%	100%	100%		
C. Thalweg	100%	100%	100%	100%		
D. Meanders	100%	99%*	99%	100%		
E. Bed General	100%	100%	100%	100%		
F. Vanes / J Hooks etc. <sup>2</sup>	N/A	N/A	N/A	N/A		
G. Wads and Boulders <sup>2</sup>	N/A	N/A	N/A	N/A		

Table XId. Categorical Stream Feature Visual Stability Assessment South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01 Segment/Reach: Tributary A2						
Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
A. Riffles <sup>1</sup>	100%	97%*	100%	100%		
<b>B.</b> Pools <sup>1</sup>	100%	100%	100%	91%		
C. Thalweg	100%	100%	100%	100%		
D. Meanders	100%	100%	100%	100%		
E. Bed General	100%	93%*	100%	100%		
<b>F. Vanes / J Hooks etc.</b> <sup>2</sup>	N/A	N/A	N/A	N/A		
G. Wads and Boulders <sup>2</sup>	N/A	N/A	N/A	N/A		

Table XIe. Categorical Stream Feature Visual Stability Assessment South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01 Segment/Reach: B						
Feature	FeatureInitialMY-01MY-02MY-03MY-04MY-05					
A. Riffles <sup>1</sup>	100%	99%*	99%	99%		
<b>B.</b> Pools <sup>1</sup>	100%	100%	100%	100%		
C. Thalweg	100%	100%	100%	100%		
D. Meanders	100%	97%*	98%	100%		
E. Bed General	100%	100%	100%	100%		
<b>F. Vanes / J Hooks etc.</b> <sup>2</sup>	N/A	N/A	N/A	N/A		
<b>G.</b> Wads and Boulders <sup>2</sup>	N/A	N/A	N/A	N/A		
H. Log Sills	100%	97%*	100%	100%		

Table XIf. Categorical Stream Feature Visual Stability Assessment South Muddy Creek Tributaries Restoration / EEP Project No. D04006-01 Segment/Reach: C						
Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
A. Riffles <sup>4</sup>	100%	100%	100%	100%		
<b>B. Pools</b> <sup>1</sup>	100%	100%	100%	100%		
C. Thalweg	100%	100%	100%	100%		
D. Meanders	100%	99%*	98%	98%		
E. Bed General	100%	100%	100%	100%		
F. Vanes / J Hooks etc. <sup>2</sup>	N/A	N/A	N/A	N/A		
<b>G. Wads and Boulders</b> <sup>2</sup>	N/A	N/A	N/A	N/A		

\* The percentages for Year 1 were updated, using the percentages derived from Table B1 in Appendix B, using the Feature Performance Mean percentages located in the last column of Table B1. The Feature Performance Mean percentages were used for Year 2; therefore, the percentages are now comparable across the years.

<sup>1</sup>The tables were completed to include a percentage of stability for pool and riffle features using the definitions provided below for the stream reaches along Tributary A.

*Riffle: A portion of the linear stream segment located between two consecutive meander bends. Pool: A portion of the curvilinear stream segment located in each meander bend.* 

 $^{2}$ Those features not included in the stream restoration were labeled N/A. This includes features such as vanes, J-hooks, rootwads and boulders.

The only category that included unstable features for Tributaries Upper A, Middle A, Lower A and C were meanders, where minor erosion occurred along the outer bends. However, the meanders that had been in a state of degradation have improved through Years 2 and 3 due to the increased vegetative cover and associated root mass along the stream corridors. As the vegetation matures, the root mass is expanding in size, depth and density, enhancing streambank stability. As a result, the areas of instability along Tributaries Middle A and C have remained unchanged, with no further degradation, while the areas of instability on Tributaries Upper A and Lower A are stable after three years of monitoring.

The areas along Tributary A2 with unstable features in Year 1 were areas of aggradation and bar formation in the riffles. These areas are no longer considered problem areas in Year 3, as the vegetation cover increased along this reach and areas of aggradation noted during Year 1 are no longer evident. In Year 3, the "flushing" associated with two documented bankfull flows together with continued vegetation development has resulted in pools re-establishing their as-built depths. Based on three years of observations, including the severe draught during 2006 through 2008, are channel instability in future years is not anticipated.

The unstable features on Tributary B were erosion along meander bends and bank scouring around riffles. The overall percentage of stability improved from Year 1 to Year 3, indicating a trend in increased channel stability over time. As discussed for the other reaches, Tributary B is now heavily vegetated, increasing bank and streambed stability. Because of this vegetation development, the riffles have remained in a static state since the previous year, with no further erosion, and meanders have been deemed stable due to the stabilizing quality of the heavy vegetative cover. Log sills are functioning, maintaining grade control, providing aeration and enhancing aquatic habitat features.

## 7. Quantitative Measures

Graphic interpretations of cross-sections, profiles and pebble counts are provided in Appendix B. A summary of the baseline morphology for the site is included in Table XII for comparison with the monitoring data shown in the tables in the appendix.

The data provided in Table XII for Year 1 reflects data from only the long-term monitoring reaches assessed along the Year 1 longitudinal profiles. The As-Built data documents the entire stream restoration project. The stream pattern data provided for Year 1, Year 2 and Year 3 is the same as the data provided from the As-Built survey, as pattern has not changed based on post-construction stream surveys and comprehensive visual field assessments along each of the project reaches.

Bedform features continue to evolve along the restored reaches as shown on the long-term longitudinal profiles. Riffle lengths and slopes remain stable. Pool to pool spacings are representative of reference reach conditions, adjusted for drainage area and bankfull width. The pools have maintained their as-built depths and have developed excellent glide features, providing spawning habitat for native fishes together with riffle substrates conducive to benthic macro-invertebrate populations to re-emerge. Comparisons of As-Built, Year 1, Year 2 and Year 3 long-term stream monitoring show successive increases in channel-floodplain connectivity and increasingly stable channel dimensions, interpreted from width/depth ratios, entrenchment ratios, bank height ratios, and channel geomorphologic parameters as shown on the long-term monitoring the sizes of the stream channels ranged from fine to coarse gravel in the riffle/run areas to silt and fine to medium grained sand in the pool/glide areas. Remedial maintenance work on the restored reaches is not warranted at this time.

South Muddy Creek Tributaries Stream Restoration / EEP Project No. D04006-01 Station/Reach: Upper Tributary A {Long-Term Monitoring Profile Station 0+00 to 9+26.47 (926.47 feet)} Reference Reach Data<sup>1</sup> XS 114+61.61, -35.13 Parameter S. Muddy Birchfield<sup>2</sup> S. Muddy Trib 4<sup>2</sup> **Pre-Existing** Design As-Built<sup>3</sup> Dimension Min Max Med Min Drainage Area - mi.2 1.3 0.14 1.38 1.38 1.38 Bankfull Width (Wbkf) - ft. 10.8 7.35 6.55 12.50 7.60 11.00 14.00 11.00 Flood Prone Width (Wfpa) - ft. 100 43 9.12 50.00 50 Bankfull Cross-Section Area (Abkf) - ft.2 20.7 9.1 5.91 10.44 8.86 10.55 12.24 8.86 Bankfull Mean Depth (Dbkf) - ft. 1.9 1.3 0.90 0.63 1.80 1.11 0.87 0.63 Bankfull Max Depth (Dmax) - ft. 2.5 1.8 1.78 1.28 1.66 1.47 1.28 Width/Depth Ratio 5.6 6.1 7.28 4.22 9.91 22.22 16.07 9.91 Entrenchment Ratio (Wfpa/Wbkf) 9.3 3 1.39 6.58 3.57 4.55 4.06 3.57 Bank Height Ratio 1.0 1.8 3.59 1.00 1.11 Wetted Perimeter - ft. 14.6 9.95 8.35 9.09 12.00 14.38 13.19 12.00 Hydraulic radius - ft. 1.42 0.91 0.71 1.02 0.82 0.62 1.15 0.62 Pattern Belt Width (Wblt) - ft. 50 46.38 64.9 50 Radius of Curvature (Rc) - ft. 10 19.00 10.67 24.71 16.26 10.67 Meander Length (Lm) - ft. 50 106.4 76 60 107 78.5 60 Meander Width Ratio (Wblt/Wbkf) 6.8 6.58 4.00 Profile Min Run Length (Lrif) - ft, 16 10 23.8 130.3 53.3 23.8 Min Run Slope (Srif) - ft./ft. 0.026 0.032 0.0026 0.0069 0.0048 0.0026 Pool Length (Lpool) - ft. 9 24 26.8 96.8 46.8 26.8 40 Pool-Pool Spacing (p-p) - ft. 27 159.9 128.7 85.3 85.3 Substrate d<sub>50</sub> (mm) 20 26 20 3.4 d<sub>84</sub> (mm) 38 76 38 12.5 Additional Reach Parameters Valley Length (ft) 295 2520 1049 1097 Channel Length (ft) 236 479 2644 1539 1609 Sinuosity 1.6 1.05 1.47 1.47 Water Surface Slope (Save) 0.022 0.006 0.0035 0.0030 0.0023 Bankfull Slope (Sval) NA 0.025 0.0044 0.0033 Rosgen Classification E4 E4 F/G E4 C5 Bankfull mean velocity (Vbkf) 4.7 6.9 2.77 1.98 1.98 Bankfull Discharge (Qbkf) 98 60 26.00 20.7 20.7 Data provided by Natural Systems Engineering (NSE) and used in the Restoration Plan for S. Muddy Tributaries Note: Where only two measurements were taken, they are listed as 'Min' and 'Max' values with <sup>2</sup> S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

Exhibit Table XI. Baseline Morphology and Hydraulic Summary

<sup>3</sup>As-Built dimension data includes all run and/or riffle cross-sections in a described reach.

Monitoring Year 1 thru 5 data is derived by EMH&T from the long-term profile reach only

where only one measurement was taken, that is listed as a 'Med' value.

Blank fields indicate either no measurement was taken or data were not available at the time of this report.

Aonitoring Year 1 <sup>4</sup>	<u></u>
Max	Med
	1.38
14.00	-
	50
12.24	
1.11	
1.66	
22.22	
4.55	
	1.11
14.38	
1.02	
	50
24.71	16.26
107	78.5
	4.00
130.3	53.3
0.0069	0.0048
96.8	46.8
159.9	128.7
	3.4
	12.5
	de su sa en el
	660.04
	926.47
	1.40
	0.0023
	0.0023
•	C5
	1.98
	20.7
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time of thi	s report.
11110.01	o repert.

Reference Reach Data<sup>1</sup> XS 114+61.61, -35.13 S. Muddy Birchfield<sup>2</sup> S. Muddy Trib 4<sup>2</sup> **Pre-Existing** As-Built<sup>3</sup> Parameter Design Min Max Med Min Max Med Min Max Međ Min Max Med Min Max Med Min Dimension 0.14 1.38 1.38 Drainage Area - mi. 1.3 1.38 10.8 7.35 6.55 8.00 15.00 Bankfull Width (Wbkf) - ft Flood Prone Width (Wfpa) - ft 100 43 9.12 50.00 60.00 9.1 Bankfull Cross-Section Area (Abkf) - ft.<sup>2</sup> 20.7 5.91 12.00 12.61 1.9 1.3 0.90 2.00 0.84 Bankfull Mean Depth (Dbkf) - ft Bankfull Max Depth (Dmax) - f 2.5 1.8 1.50 1.78 5.6 6.1 17.86 7.28 4.00 Width/Depth Ratio 9.3 3 1.39 6.25 4.00 Entrenchment Ratio (Wfpa/Wbkf) 1.8 3.59 Bank Height Ratio 1.0 1.00 1.11 14.6 9.95 8.35 15.49 Wetted Perimeter - f 9.66 0.81 1.42 0.91 0.71 1.24 Hydraulic radius - ft Pattern Belt Width (Wblt) - ft 50 48.80 68.32 50.00 Radius of Curvature (Rc) - ft 10 20.00 15.04 41.80 20.62 15.04 Meander Length (Lm) - ft 50 80.00 112.00 75.00 91.00 85.00 75.00 Meander Width Ratio (Wblt/Wbkf 6.8 6.25 3.33 Profile Min Run Length (Lrif) - ft 16 10 36.5 72.5 52.3 36.5 0.0032 0.0026 0.026 0.032 0.0012 0.001 Min Run Slope (Srif) - ft./ft. Pool Length (Lpool) - ft. 9 24 18.4 42.5 34.1 18.4 40 27 49.8 83.6 66.5 49.8 Pool-Pool Spacing (p-p) - ft. Substrate 20 26 20 0.23 d<sub>50</sub> (mm d<sub>84</sub> (mm 38 0.41 38 76 Additional Reach Parameters Valley Length (ft) 295 816 816 816 236 479 824 1203 1094 Channel Length (ft) 1.47 1.34 Sinuosity 1.6 1.01 0.022 0.002 0.0017 Water Surface Slope (Save) 0.006 0.0035 NA 0.025 0.003 0.0020 Bankfull Slope (Sval) E4 E4 F/G Е C5 Rosgen Classification 4.7 6.9 2.77 1.71 1.98 Bankfull mean velocity (Vbkf) 98 20.5 20.7 Bankfull Discharge (Qbkf) 60 26.00

Data provided by Natural Systems Engineering (NSE) and used in the Restoration Plan for S. Muddy Tributaries

<sup>2</sup> S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

<sup>3</sup>As-Built dimension data includes all run and/or riffle cross-sections in a described reach.

Monitoring Year 1 thru 5 data is derived by EMH&T from the long-term profile reach only

Note: Where only two measurements were taken, they are listed as 'Min' and 'Max' value

where only one measurement was taken, that is listed as a 'Med' value.

Blank fields indicate either no measurement was taken or data were not available

#### Exhibit Table XI. Baseline Morphology and Hydraulic Summary South Muddy Creek Tributaries Stream Restoration / EEP Project No. D04006-01 Station/Reach: Middle Tributary A {Long-Term Monitoring Profile Station 0+00 to 5+17.09 (517.09 feet)}

		1
1	Monitoring	
	Year I	
	Max	Med
		1.38
		15.00
		60.00
		12.61
		0.84
		1.50
		17.86
		4.00
		1.11
		15.49
		0.81
		50.00
4	41.80	20.62
0	91.00	85.00
		3.33
, 	72.5	52.3
2	0.0032	0.0026
Ļ	42.5	34.1
}	83.6	66.5
		0.23
	· ·	0.41
		375.94
		517.09
		1.38
		0.0017
		0.0020
		C5
		1.98
	•	20.7
	L.	
ies v	with no 'Me	u value;
at ti	ne time of the	us report.

Exhibit Table XI Reseline Morphology and Hydraulie Si

			Reference ]	Reach Data	<b>1</b>		XS	3+61.77, -2	16.17				<b>_</b>			1	Maritania	
Parameter	S. M	uddy Birch			Muddy Tri	b 4 <sup>2</sup>		Pre-Existin			Design			As-Built <sup>3</sup>			Monitorin Year 1 <sup>4</sup>	g
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area - mi. <sup>2</sup>			1.3	Î		0.14		1	0.27			0.27	AVAII1	IVIAN	0.27	IVIIII	IVIAX	0.27
Bankfull Width (Wbkf) - ft.			10.8			7.35		<u> </u>	7.09			5.00			11.65		<u> </u>	
Flood Prone Width (Wfpa) - ft.			100		1	43			11.19			30.00			30			11.6
Bankfull Cross-Section Area (Abkf) - ft. <sup>2</sup>			20.7		<u> </u>	9.1		-	4.29			2.40	l		7.63		<u> </u>	30
Bankfull Mean Depth (Dbkf) - ft.			1.9			1.3			0.60			2.40			0.66		<u> </u>	7.63
Bankfull Max Depth (Dmax) - ft.			2.5			1.8			1.12			2.00			1.41			0.66
Width/Depth Ratio			5.6			6.1			11.82			3.85			17.65			1.41
Entrenchment Ratio (Wfpa/Wbkf)			9.3			3			1.58			6.00			9.44			17.6
Bank Height Ratio			1.0	· · · · ·		1.8			5.85			1.00			1.26			9.44
Wetted Perimeter - ft.			14.6		-	9.95		<u> </u>	7.52			6.08	·······		12.04			1.26
Hydraulic radius - ft.			1.42			0.91			0.57	-		0.79			0.63			12.0
Pattern									<u> </u>					<u> </u>	1 0.05			0.03
Belt Width (Wblt) - ft.		44 H				50				30.5	42.7				10.00		1	
Radius of Curvature (Rc) - ft.						10				50.5	12.1	12.5	8.19	14.26	40.00	0.10	14.26	40.0
Meander Length (Lm) - ft.						50				50	70	12.5	47.00	57.00	12.00 51.00	8.19	14.26	12.0
Meander Width Ratio (Wblt/Wbkf)						6.8					70	6.00	47.00	37.00	3.43	47.00	57.00	51.0
Profile												1 0.00			<u> </u>			3.43
Min Riffle Length (Lrif) - ft.	T		16			10		Ι					8.30	11.20	9.80	8.30	11.20	9.80
Min Riffle Slope (Srif) - ft./ft.			0.026			0.032							0.0534	0.0718	0.0626	0.0534	0.0718	1
Pool Length (Lpool) - ft.			9			24							31.90	47.10	39.50	31.90	47.10	0.062
Pool-Pool Spacing (p-p) - ft.			40			27			:				55.50	79.40	67.60	55.50	79.40	39.5 67.6
Substrate								1	<u> </u>				33.30			55.50	/7.40	
d <sub>50</sub> (mm)			20			26						26			T			I
d <sub>84</sub> (mm)			38			76						76					<u> </u>	<u> </u>
Additional Reach Parameters								<u>I</u>							<u> </u>			
Valley Length (ft)						295			310			334			334			102.4
Channel Length (ft)			236			479			325			462			480			102.4
Sinuosity						1.6	<del></del>		1.05			1.38			1.44			196.0
Water Surface Slope (Save)			0.006			0.022			0.0156			0.0206			0.01025			1.9
Bankfull Slope (Sval)			NA	·		0.025			0.0100			0.0200						0.001
Rosgen Classification			E4			E4			F/G	·		0.0284 E4			0.01035 C4			0.002
Bankfull mean velocity (Vbkf)			4.7		· · · ·	6.9			4.46			3.87			1			C4
Bankfull Discharge (Qbkf)	_		98			60			18.4			<u> </u>			3.87 18.4		<u> </u>	3.87

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		1	Reference F		1		YS	5 1+66.16, -4	1.60								Monitoring	
Parameter	S. Mı	uddy Birch			Muddy Trit	4 <sup>2</sup>		Pre-Existin			Design			As-Built <sup>3</sup>			Year 1 <sup>4</sup>	
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area - mi. <sup>2</sup>			1.3			0.14			2.03			2.03			2.03			2.03
Bankfull Width (Wbkf) - ft.			10.8			7.35		1	6.59			10.00	13.00	23.00	16.00			13.00
Flood Prone Width (Wfpa) - ft.			100			43			10.41			60.00			60.00			60.00
Bankfull Cross-Section Area (Abkf) - ft. <sup>2</sup>			20.7			9.1			4.89		-	20.16	7.10	19.87	13.29			7.10
Bankfull Mean Depth (Dbkf) - ft.			1.9			1.3			0.74			2.80	0.55	1.16	0.83			0.55
Bankfull Max Depth (Dmax) - ft.			2.5			1.8			1.39				1.00	2.09	1.62			1.00
Width/Depth Ratio			5.6			6.1			8.91			4.00	14.79	31.08	19.28			23.64
Entrenchment Ratio (Wfpa/Wbkf)			9.3			3			1.58			6.00	2.61	7.98	16.76			4.62
Bank Height Ratio			1.0			1.8		1	5.85	-		1.00			1.28			1.28
Wetted Perimeter - ft.			14.6			9.95			7.34			12.32	13.28	23.59	16.76			13.28
Hydraulic radius - ft.			1.42			0.91			0.67			1.64	0.53	1.12	0.81	-		0.53
Pattern											ing in livis							
Belt Width (Wblt) - ft.						50				61.00	85.40				60.00		· .	60.00
Radius of Curvature (Rc) - ft.						10						25.00	15.22	39.94	24.86	16.70	26.55	21.70
Meander Length (Lm) - ft.						50				100.00	140.00		90.00	145.00	107.00	90.00	145.00	107.00
Meander Width Ratio (Wblt/Wbkf)						6.8						6.00	2.37	4.62	3.75			4.62
Profile																		
Min Run Length (Lrif) - ft.			16			10	1									124.10	138.10	131.10
Min Run Slope (Srif) - ft./ft.			0.026			0.032										0.00281	0.00283	0.00282
Pool Length (Lpool) - ft.			9			24										3.78	101.40	58.60
Pool-Pool Spacing (p-p) - ft.			40			27										72.70	[18.70	99.70
Substrate																		
d <sub>50</sub> (mm)			20			26									0.13			0.13
d <sub>84</sub> (mm)			38			76									0.29	-		0.29
Additional Reach Parameters																		
Valley Length (ft)						295			5710			5164			5178			419.5
Channel Length (ft)			236			479			5948			7391			7349			588.16
Sinuosity	-					1.6			1.04			1.43			1.42			1.4
Water Surface Slope (Save)			0.006			0.022			0.0019			0.0014	0.0012	0.0012	0.0012			0.0012
Bankfull Slope (Sval)			NA			0.025						0.0020	0.0007	0.00099	0.00084			0.0009
Rosgen Classification			E4			E4			F/G			E			C5			C5
Bankfull mean velocity (Vbkf			4.7			6.9			2.47			1.65			1.65			1.65
Bankfull Discharge (Qbkf)			98			60			40.7			20.70			20.70			20.7
Data provided by Natural Systems Engineerin	ig (NSE) an	d used in th	he Restorati	on Plan for	S. Muddy 7	<b>Tribut</b> aries			Note: Whe	ere only two	measurem	ents were ta	ken, they a	re listed as	Min' and 'M	fax' values	with no 'Me	d' value;
S Muddy Birchfield Ref for Trib A; S. Muddy					-					•		nt was taken						,

## Exhibit Table XI. Baseline Morphology and Hydraulic Summary

		I	Reference <b>F</b>	Reach Data	1		XS	1+66.16, -4	.60		<u></u>	· · · · ·		<u></u>				= n
Parameter	S. Mi	uddy Birchf			Muddy Trib	4 <sup>2</sup>		Pre-Existing			Design			As-Built <sup>3</sup>			Year 1 <sup>4</sup>	
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	-
Drainage Area - mi. <sup>2</sup>			1.3			0.14			2.03			2.03			2.03	-		Ξ
Bankfull Width (Wbkf) - ft.			10.8			7.35			6.59			10.00	13.00	23.00	16.00			-
Flood Prone Width (Wfpa) - ft.			100		Í	43			10.41			60.00			60			
Bankfull Cross-Section Area (Abkf) - ft. <sup>2</sup>			20.7			9.1			4.89			20.16	7.10	19.87	13.29			
Bankfull Mean Depth (Dbkf) - ft.			1.9			1.3			0.74			2.80	0,55	1.16	0.83			
Bankfull Max Depth (Dmax) - ft.			2.5			1.8			1.39				1.00	2.09	1.62			
Width/Depth Ratio			5.6			6.1			8.91			4.00	14.79	31.08	19.28			
Entrenchment Ratio (Wfpa/Wbkf)			9.3			3			1.58			6.00	2.61	7.98	16.76			_
Bank Height Ratio			1.0			1.8			5.85			1.00			1.28			-
Wetted Perimeter - ft.			14.6			9.95			7.34			12.32	13.28	23.59	16.76			
Hydraulic radius - ft.			1.42			0.91			0.67			1.64	0.53	1.12	0.81			
Pattern																		
Belt Width (Wblt) - ft.						50				61.00	85.40				60			
Radius of Curvature (Rc) - ft.						10						25.00	15.22	39.94	24.86	15.22	39.94	
Meander Length (Lm) - ft.						50				100.00	140.00		90	145	107	90	145	
Meander Width Ratio (Wblt/Wbkf)						6.8						6.00	2.37	4.62	3.75			
Profile <sup>3</sup>																		
Min Run Length (Lrif) - ft.			16			10										65,60	78,70	
Min Run Slope (Srif) - ft./ft.		-	0.026			0.032									:	0.00228	0.00344	ł
Pool Length (Lpool) - ft.			9			24										41.90	56.40	
Pool-Pool Spacing (p-p) - ft.			40			27										66.20	124.30	
Substrate <sup>3</sup>																		
d <sub>50</sub> (mm)			20			26		:							0.13			
d <sub>84</sub> (mm)			38			76				-					0.29			
Additional Reach Parameters <sup>3</sup>																		
Valley Length (ft)						295			5710			5164			5178			
Channel Length (ft)			236			479			5948			7391			7349			
Sinuosity						1.6			1.04			1.43			1.42			
Water Surface Slope (Save)			0.006			0.022			0.0019			0.0014	0.0012	0.0012	0.0012			
Bankfull Slope (Sval)		1	NA			0.025						0.0020	0.0007	0.00099	0.00084			
Rosgen Classification			E4			E4			F/G			E			C5			
Bankfull mean velocity (Vbkf)			4.7			6.9			2.47			1.65			1.65			
Bankfull Discharge (Qbkf)			98			60			40.7			20.70			20.70			

		Sta	ation/Reach	: Lower T	ributary A	{Long-Ter	m Monito	ing Profile	e No. 3 Stat	ion 0+00 to	5+18.94 (5	518.94 feet)	}			
			Reference F	leach Data	1		XS	1+66.16, -	4.60	<u> </u>						
Parameter	S. M	uddy Birchi			Muddy Trit	$4^{2}$		Pre-Existin			Design			As-Built <sup>3</sup>		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min
Drainage Area - mi. <sup>2</sup>			1.3			0.14			2.03			2.03			2.03	
Bankfull Width (Wbkf) - ft.			10.8			7.35			6.59			10.00	13.00	23.00	16.00	
Flood Prone Width (Wfpa) - ft.			100			43			10.41			60.00			60.00	
Bankfull Cross-Section Area (Abkf) - ft. <sup>2</sup>			20.7			9.1			4.89			20.16	7.10	19.87	13.29	
Bankfull Mean Depth (Dbkf) - ft.			1.9			1.3			0.74			2.80	0,55	1.16	0.83	
Bankfull Max Depth (Dmax) - ft.			2.5			1.8			1.39				1.00	2.09	1.62	
Width/Depth Ratio			5.6			6.1			8.91			4.00	14.79	31.08	19.28	
Entrenchment Ratio (Wfpa/Wbkf)			9.3			3			1.58			6.00	2.61	7.98	16.76	
Bank Height Ratio			1.0			1.8			5.85	· · ·		1.00			1.28	
Wetted Perimeter - ft.	1		14.6			9.95			7.34			12.32	13.28	23.59	16.76	
Hydraulic radius - ft.		1	1.42			0.91			0.67			1.64	0,53	1.12	0.81	
Pattern		·		ĺ												
Belt Width (Wblt) - ft.						50	I	[		61.00	85.40				60	
Radius of Curvature (Rc) - ft.	1				1	10		1.				25.00	15.22	39.94	24.86	19.56
Meander Length (Lm) - ft.						50				100.00	140.00		90	145	107	90
Meander Width Ratio (Wblt/Wbkf)						6.8						6.00	2.37	4.62	3.75	
Profile <sup>3</sup>																Í
Min Run Length (Lrif) - ft.			16			10							[	[		77.50
Min Run Slope (Srif) - ft./ft.			0.026			0.032										0.00195
Pool Length (Lpool) - ft.			9			24							1			37.90
Pool-Pool Spacing (p-p) - ft.			40			27										101.80
Substrate <sup>3</sup>																
d <sub>50</sub> (mm)			20			26			1						0.13	
d <sub>84</sub> (mm)			38			76			· .						0.29	
Additional Reach Parameters <sup>3</sup>																
Valley Length (ft)				1		295	1	1	5710	Γ		5164			5178	[
Channel Length (ft)			236			479			5948			7391			7349	
Sinuosity	r					· 1.6			1.04			1.43			1.42	
Water Surface Slope (Save)			0.006			0.022			0.0019			0.0014	0.0012	0.0012	0.0012	
Bankfull Slope (Sval)			NA			0.025				-		0.0020	0.0007	0.00099	0.00084	
Rosgen Classification			E4			E4			F/G			Е			C5	
Bankfull mean velocity (Vbkf)			4.7			6.9			2.47			1.65			1.65	·
Bankfull Discharge (Qbkf)			98			60			40.7			20.70			20.70	

#### <sup>1</sup>Data provided by Natural Systems Engineering (NSE) and used in the Restoration Plan for S. Muddy Tributaries

<sup>2</sup>S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

<sup>3</sup>As-Built dimension data includes all run and/or riffle cross-sections in a described reach.

<sup>4</sup> Monitoring Year 1 thru 5 data is derived by EMH&T from the long-term profile reach only

Note: Where only two measurements were taken, they are listed as 'Min' and 'Max' values

where only one measurement was taken, that is listed as a 'Med' value.

Blank fields indicate either no measurement was taken or data were not available at

#### Exhibit Table XI. Baseline Morphology and Hydraulic Summary South Muddy Creek Tributaries Stream Restoration / EEP Project No. D04006-01 Station/Reach: Lower Tributary A {Long-Term Monitoring Profile No. 3 Station 0+00 to 5+18.94 (518.94 feet)}

	<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>	
Ï	Monitoring	
	Year 1 <sup>4</sup>	·
	Max	Med
	<u>.</u>	2.03
		18.00
		60.00
		14.39
<i>.</i> .		0.80
		1.62
		22.50
1		3.33
		1.28
-		
-		18.70 0.77
		0.77
	[	- <u> </u>
_		60.00
	32.82	29.53
	145	107
		3.33
	132.00	104.70
5	0.00289	0.00242
	63.70	53.40
)	106.70	104.30
<u></u>		0.13
		0.29
		·
		369.80
		518.94
		1.40
		0.0012
		0.0012
		0.00099 C5
		1.65
		20.70
es v	with no 'Me	d' value;
it tl	he time of t	his report.

		]	Reference I	Reach Data	1		XS	1+66.16, -4	.60				· · ·			]	Monitoring	
Parameter	S. Mı	uddy Birch	field <sup>2</sup>	<b>S</b> . 1	Muddy Trib	4 <sup>2</sup>		Pre-Existin			Design			As-Built <sup>3</sup>			Year 1 <sup>4</sup>	
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area - mi. <sup>2</sup>			1.3			0.14			2.03			2.03			2.03			2.03
Bankfull Width (Wbkf) - ft.			10.8			7.35			6.59			10.00	13.00	23.00	16.00			16.00
Flood Prone Width (Wfpa) - ft.			100			43			10.41			60.00			60.00			60.00
Bankfull Cross-Section Area (Abkf) - ft. <sup>2</sup>			20.7			9.1			4.89			20.16	7.10	19.87	13.29			13.29
Bankfull Mean Depth (Dbkf) - ft.			1.9			1.3			0.74			2.80	0.55	1.16	0.83			0.83
Bankfull Max Depth (Dmax) - ft.			2.5			1.8			1.39				1.00	2.09	1.62			1.80
Width/Depth Ratio			5.6			6.1			8.91	-		4.00	14.79	31.08	19.28			19.28
Entrenchment Ratio (Wfpa/Wbkf)			9.3			3			1.58			6.00	2.61	7.98	16.76			3.75
Bank Height Ratio			1.0			1.8			5.85			1.00			1.28			1.28
Wetted Perimeter - ft.			14.6			9.95			7.34			12.32	13.28	23.59	16.76			16.76
Hydraulic radius - ft.			1.42			0.91			0.67			1.64	0.53	1.12	0.81			0.79
Pattern										to all states of the								
Belt Width (Wblt) - ft.		ľ				50				61.00	85.40				60			60
Radius of Curvature (Rc) - ft.						10						25.00	15.22	39.94	24.86	24.54	33.26	30.15
Meander Length (Lm) - ft.						50			•	100.00	140.00		90	145	107	90	145	107
Meander Width Ratio (Wblt/Wbkf)						6.8						6.00	2.37	4.62	3.75			3.75
Profile																		
Min Run Length (Lrif) - ft.			16			10										80.40	89.30	84.80
Min Run Slope (Srif) - ft./ft.			0.026			0.032										0.00224	0.00310	0.0026
Pool Length (Lpool) - ft.			9			24												214.1
Pool-Pool Spacing (p-p) - ft.			40			27										28.60	34.40	
Substrate																		
d <sub>50</sub> (mm)			20			26									0.04		-	0.04
d <sub>84</sub> (mm)			38			76									0.07			0.07
Additional Reach Parameters																		
Valley Length (ft)						295		· ·	5710	-		5164			5178			259.0
Channel Length (ft)			236			479			.5948			7391			7349			346.1
Sinuosity						1.6			1.04			1.43			1.42			1.34
Water Surface Slope (Save)			0.006			0.022			0.0019			0.0014	0.0012	0.0012	0.0012			0.001
Bankfull Slope (Sval)			NA			0.025			· -			0.0020	0.0007	0.00099	0.00084			0.000
Rosgen Classification			E4			E4			F/G			E			C5			C5
Bankfull mean velocity (Vbkf)			4.7			6.9			2.47			1.65			1.65			1.65
Bankfull Discharge (Qbkf)			98			60		1	40.7			20.70			20.70			20.7

Monitoring Year 1 thru 5 data is derived by EMH&T from the long-term profile reach only

		J	Reference F	Reach Data	1		XSI	2+28.00, -	35.88							
Parameter	S. M	luddy Birch	field <sup>2</sup>	<b>S</b> . 1	Muddy Tril	04 <sup>2</sup>	]	Pre-Existin	g		Design			As-Built <sup>3</sup>		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min
Drainage Area - mi. <sup>2</sup>			1.3			0.14			0.44			0.44			0.44	
Bankfull Width (Wbkf) - ft.			10.8			7.35			7.83			6.20	5.11	10.98		
Flood Prone Width (Wfpa) - ft.			100			43			11.86			45.38			50.00	
Bankfull Cross-Section Area (Abkf) - ft. <sup>2</sup>			20.7			9.1			4.86			7.36	6.06	7.56		
Bankfull Mean Depth (Dbkf) - ft.			1.9			1.3			0.62			1.60	0.58	0.69		
Bankfull Max Depth (Dmax) - ft.			2.5			1.8			1.22				1.17	1.84		
Width/Depth Ratio			5.6			6.1			12.63			3.88	8.81	15.91		
Entrenchment Ratio (Wfpa/Wbkf)			9.3			3			1.51			7.32	10.02	21.51		
Bank Height Ratio			1.0			1.8			4.40			1.00	1.00	1.18		
Wetted Perimeter - ft.			14.6			9.95			8.22			7.53	5.68	11.84		
Hydraulic radius - ft.			1.42			0.91			0.59			0.98	0.53	0.64		
Pattern																
Belt Width (Wblt) - ft.						50				45.38	52.95	]			50.00	
Radius of Curvature (Rc) - ft.						10				-		15.50	10.20	19.38	14.05	12.95
Meander Length (Lm) - ft.						50				62.00	86.80		60.00	80.00	70.00	60.00
Meander Width Ratio (Wblt/Wbkf)						6.8			·			7.32			,,,,,,	00.00
Profile								<u> </u>								
Min Riffle Length (Lrif) - ft.			16			10										11.50
Min Riffle Slope (Srif) - ft./ft.			0.026			0.032										0.016
Pool Length (Lpool) - ft.			9			24										18.10
Pool-Pool Spacing (p-p) - ft.			40			27										51.90
Substrate		-			1				1			1				
d <sub>50</sub> (mm)		1	20			26									55.06	
d <sub>84</sub> (mm)			38			76									83.88	<u> </u>
Additional Reach Parameters											1					
Valley Length (ft)			l			295			1360			1302			1312	
Channel Length (ft)			236			479			1455			2052			2041	
Sinuosity						1.6			1.07			1.58			1.56	
Water Surface Slope (Save)		1	0.006		-	0.022			0.0124			0.0123	0.0091	0.0099		<u> </u>
Bankfull Slope (Sval)			NA			0.022						0.0078	0.0089	0.0097		
Rosgen Classification			E4			E4			B			E	E4	0.0097 C4		
Bankfull mean velocity (Vbkf)			4.7			6.9			4.18			2.83	124		2.83	<u> </u>
		ł	/	I	1	0.9		1	L 7.10	1	1	2.05	1	L	2.03	

Exhibit Table XI. Baseline Morphology and Hydraulic Summary South Muddy Creek Tributaries Stream Restoration / EEP Project No. D04006-01

<sup>2</sup>S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

<sup>3</sup>As-Built dimension data includes all run and/or riffle cross-sections in a described reach.

Monitoring Year 1 thru 5 data is derived by EMH&T from the long-term profile reach only

where only one measurement was taken, that is listed as a 'Med' value.

Blank fields indicate either no measurement was taken or data were not available at the time of this report.

]	Monitoring	<u>.</u>
_	Year 1	
	Max	Med
		0.44
		5.11
		50.00
		2.99
		0.58
		1.17
		8.81
		21.51
		1.00
		5.68
		0.53
191		
		50.00
	19.38	16.79
)	80.00	70.00
		9.78
	1	
)	15.70	14.50
, ;	0.060	0.040
, )	23.50	20.10
, )		20.10 59.80
,	66.10	39.80
	encal as galage	66.1
		55.1
A. 6.849-0	[	83.9
		320.61
		475.72
		1.48
		0.0099
		0.0097
		E4
		2.83
		20.4
es v	with no 'Me	d' value;

Station/Reach: Tributary B {Lower Tributary B Long-Term Monitoring Profile Station 0+00 to 4+ 4.08 (404.08 feet)} Reference Reach Data<sup>1</sup> XS 12+28.00, -35.88 S. Muddy Trib 4<sup>2</sup> S. Muddy Birchfield<sup>2</sup> As-Built<sup>3</sup> Parameter **Pre-Existing** Design Min Max Med Min Dimension Drainage Area - mi. 1.3 0.14 0.44 0.44 0.44 10.8 Bankfull Width (Wbkf) - ft 7.35 7.83 6.20 10.98 5.11 Flood Prone Width (Wfpa) - ft 100 43 11.86 45.38 50.00 20.7 4.86 7.36 Bankfull Cross-Section Area (Abkf) - ft. 9.1 6.06 7.56 1.9 1.3 0.62 Bankfull Mean Depth (Dbkf) - ft 1.60 0.69 0.58 Bankfull Max Depth (Dmax) - ft 2.5 1.8 1.22 1.17 1.84 Width/Depth Ratio 5.6 6.1 12.63 3.88 8.81 15.91 9.3 3 1.51 7.32 Entrenchment Ratio (Wfpa/Wbkf) 10.02 21.51 Bank Height Ratio 1.0 1.8 4.40 1.00 1.18 1 Wetted Perimeter - ft 14.6 9.95 8.22 7.53 5.68 11.84 Hydraulic radius - ft 1.42 0.91 0.59 0.98 0.53 0.64 Belt Width (Wblt) - ft 50 45.38 52.95 50.00 Radius of Curvature (Rc) - ft 10 15.5 10.20 19.38 14.05 10.20 Meander Length (Lm) - ft 50 62 86.8 60.00 80.00 70.00 60.00 Meander Width Ratio (Wblt/Wbkf 6.8 7.32 Min Riffle Length (Lrif) - fl 16 10 12.00 Min Riffle Slope (Srif) - ft./ft 0.026 0.032 0.02 Pool Length (Lpool) - fi 9 24 13.30 40 27 Pool-Pool Spacing (p-p) - ft. 84.10 Substrate d<sub>50</sub> (mm 20 26 55.06 d<sub>84</sub> (mm 38 83.88 76 Additional Reach Parameters 1312 Valley Length (ft) 295 1360 1302 Channel Length (ft) 236 479 1455 2052 2041

<sup>2</sup>S Muddy Birchfield Ref for Trib A; S. Muddy Trib 4 Ref for Tribs B & C

1.07

0.0124

В

4.18

20.4

1.6

0.022

0.025

E4

6.9

60

0.006

NA

E4

4.7

98

As-Built dimension data includes all run and/or riffle cross-sections in a described reach.

Sinuosit

Water Surface Slope (Save)

Bankfull mean velocity (Vbkf)

Bankfull Discharge (Qbkf)

Bankfull Slope (Sval)

Rosgen Classification

Pattern

Profile

Monitoring Year 1 thru 5 data is derived by EMH&T from the long-term profile reach only

Data provided by Natural Systems Engineering (NSE) and used in the Restoration Plan for S. Muddy Tributaries

Note: Where only two measurements were taken, they are listed as 'Min' and 'Max' values

where only one measurement was taken, that is listed as a 'Med' value.

1.58

0.0123

0.0078

Е

2.83

20.4

1.56

2.83

20.4

Blank fields indicate either no measurement was taken or data were not available at the time of this report.

0.0091

0.0089

E4

0.0099

0.0097

C4

### Exhibit Table XI. Baseline Morphology and Hydraulic Summary South Muddy Creek Tributaries Stream Restoration / EEP Project No. D04006-01

Monitoring	<u> </u>
Year 1 <sup>4</sup>	·
Max	Med
-	0.44
	10.98
	50.00
	7.56
-	0.69
	1.84
	15.91
	10.02
	1.18
	11.84
<u></u>	0.64
	50.00
15.54	13.34
80.00	70.00
-	4.55
25.00	18.60
0.04	0.03
21.40	17.10
113.70	97.50
	55.06
1	83.88
	404.08
	251.58
	1.61
	0.0091
	0.0089
	C4
	2.83

### **IV. METHODOLOGY**

Year 1 vegetation monitoring was conducted in September 2006 using the *CVS-EEP Protocol for Recording Vegetation, Version 4.0* (Lee, M.T., Peet, RK., Roberts, S.R., Wentworth, T.R. 2006). Year 3 vegetation monitoring was conducted in September 2008 using the same protocol as used in Years 1 and 2. Year 1 stream monitoring was conducted in April 2007 to provide adequate time between the as-built survey (accepted in January 2007) and the Year 1 monitoring survey. Stream monitoring for Year 2 occurred in October 2007, to provide six months between the Year 1 and Year 2 surveys. Year 3 monitoring occurred in the fall of 2008 to provide a full year between surveys. Subsequent stream monitoring will occur in the fall of Years 4 and 5 to continue providing adequate time for vegetation to mature between surveys. Vegetation monitoring will continue to be conducted in the fall of each subsequent year of monitoring, providing a full year between vegetative surveys.

# **APPENDIX A** Vegetation Raw Data 1. Vegetation Problem Area Photos 2. Vegetation Problem Area Plan View 3. Vegetation Monitoring Plot Photos 4. Vegetation Data Tables



VPA 1 View of Sericea lespedeza growing along bank of Tributary A (lower), across the stream valley atstation 64+13. (EMH&T, Inc. 9/11/08)



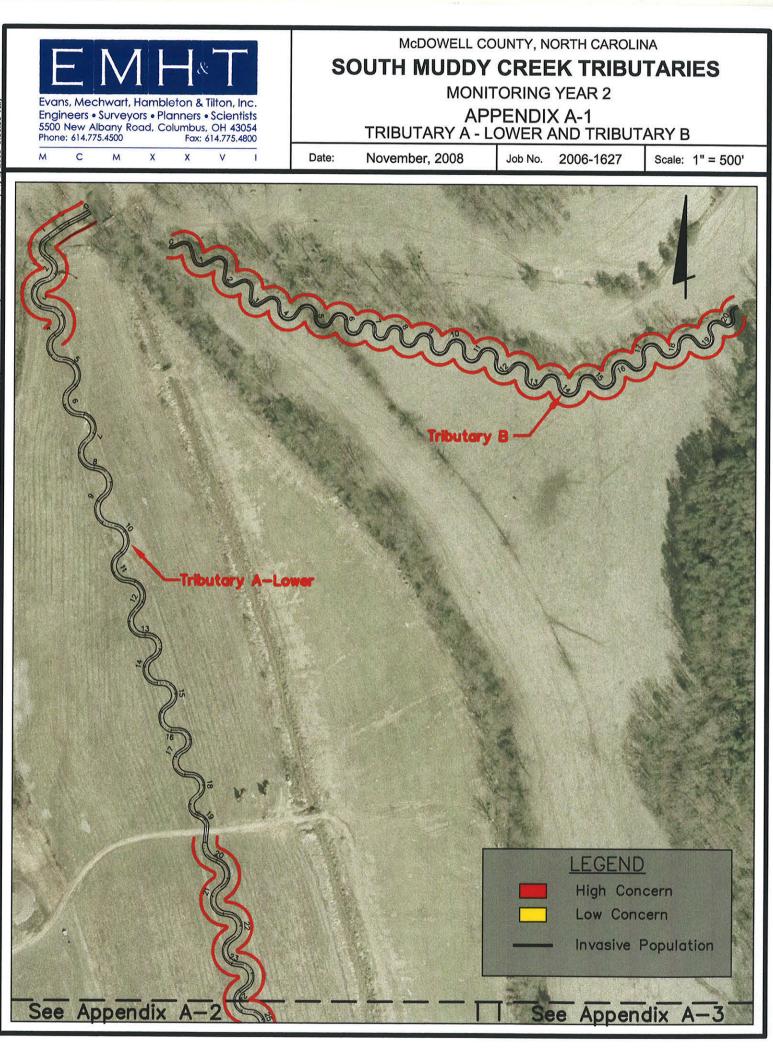
VPA 2 View of Sericea lespedeza growing along bank of Tributary A (lower), looking upstream from station 28+23. (EMH&T, Inc. 9/11/08)

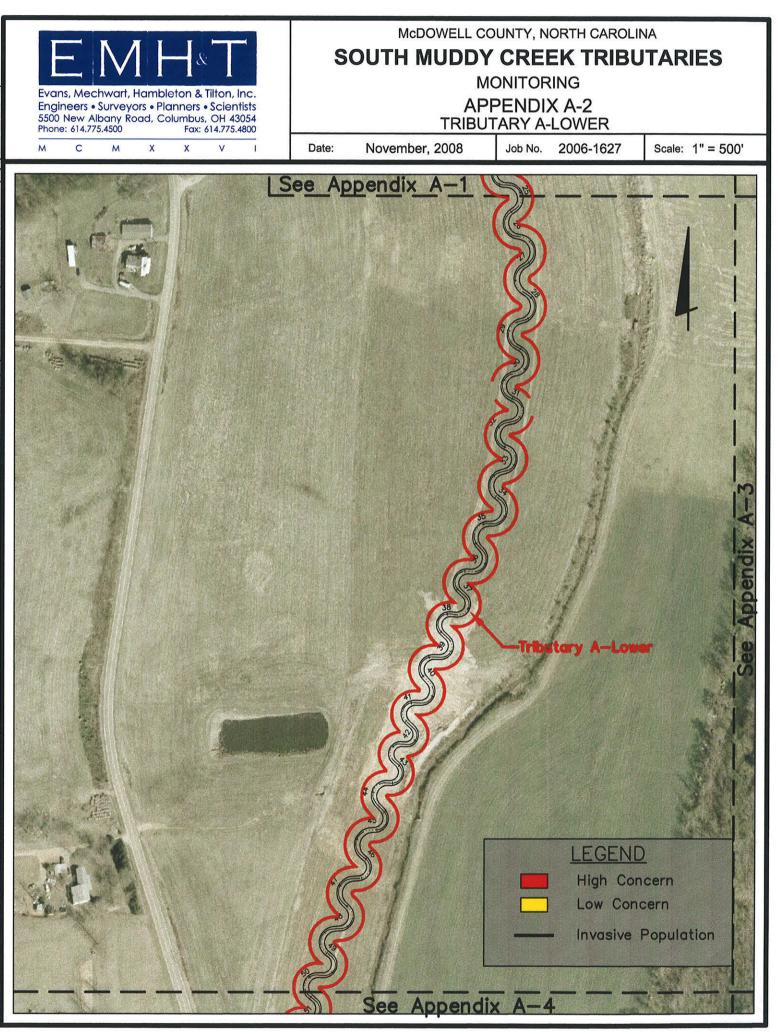


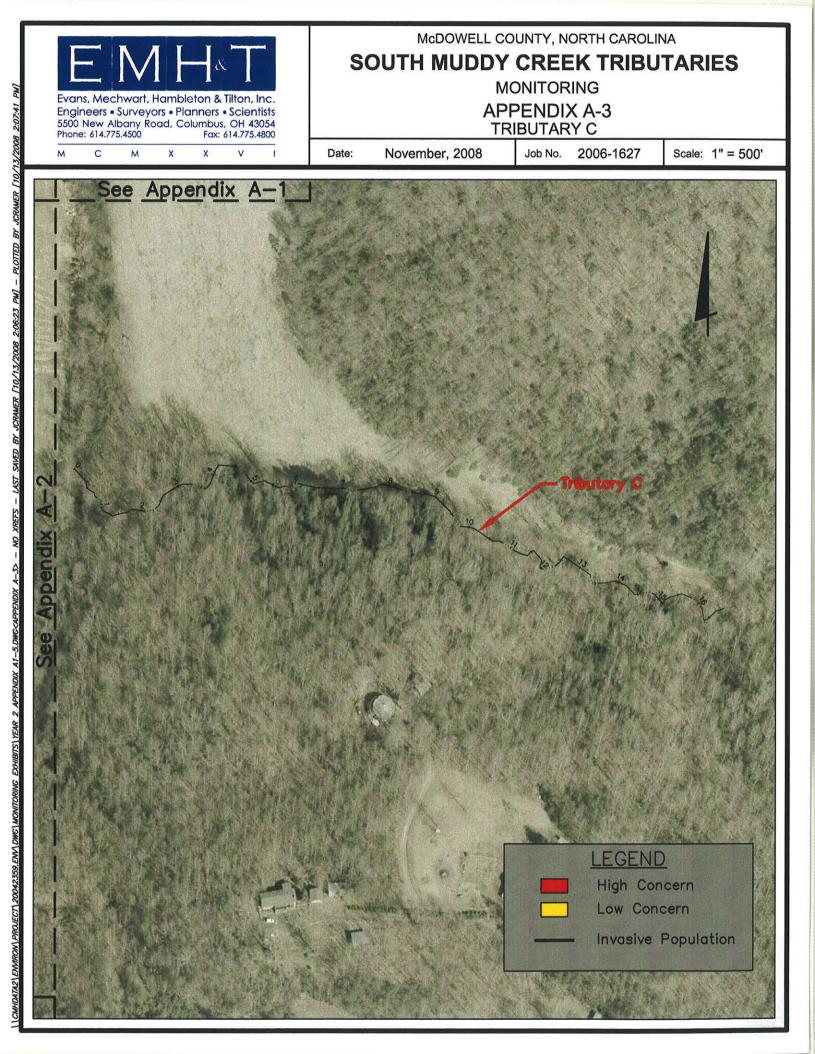
VPA 3 View of Sericea lespedeza growing in Vegetation Plot 2 along Tributary A (upper). (EMH&T, Inc. 9/10/08)

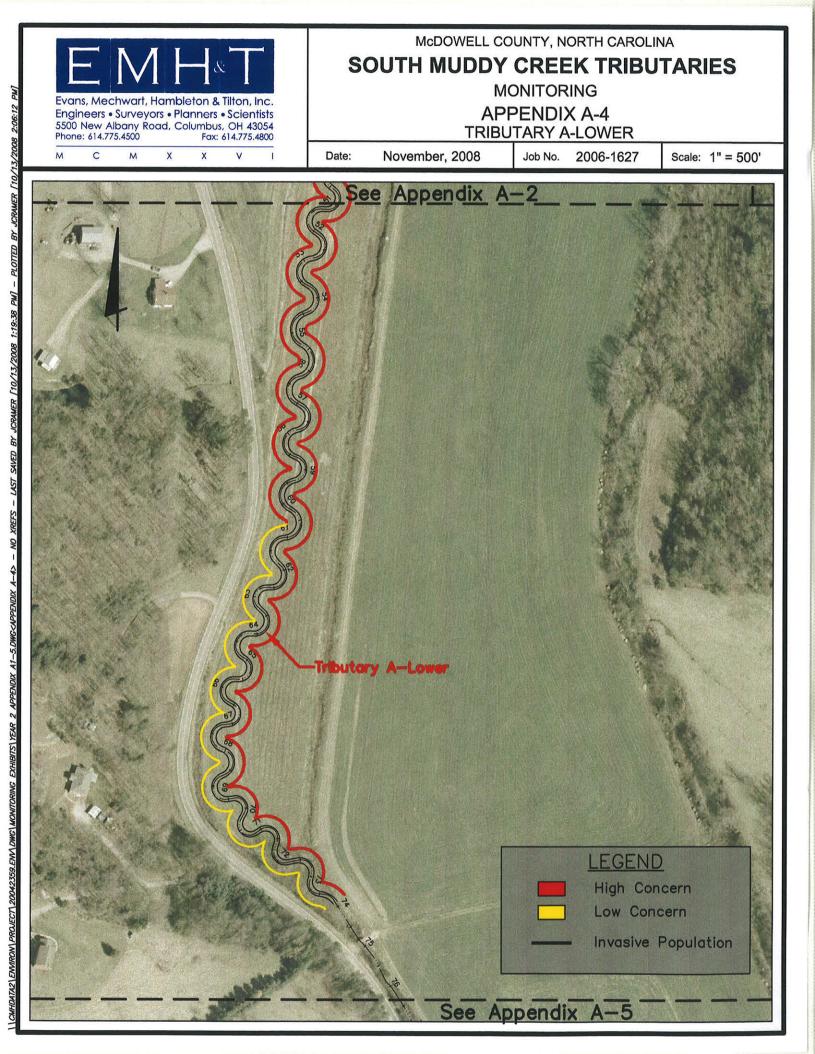


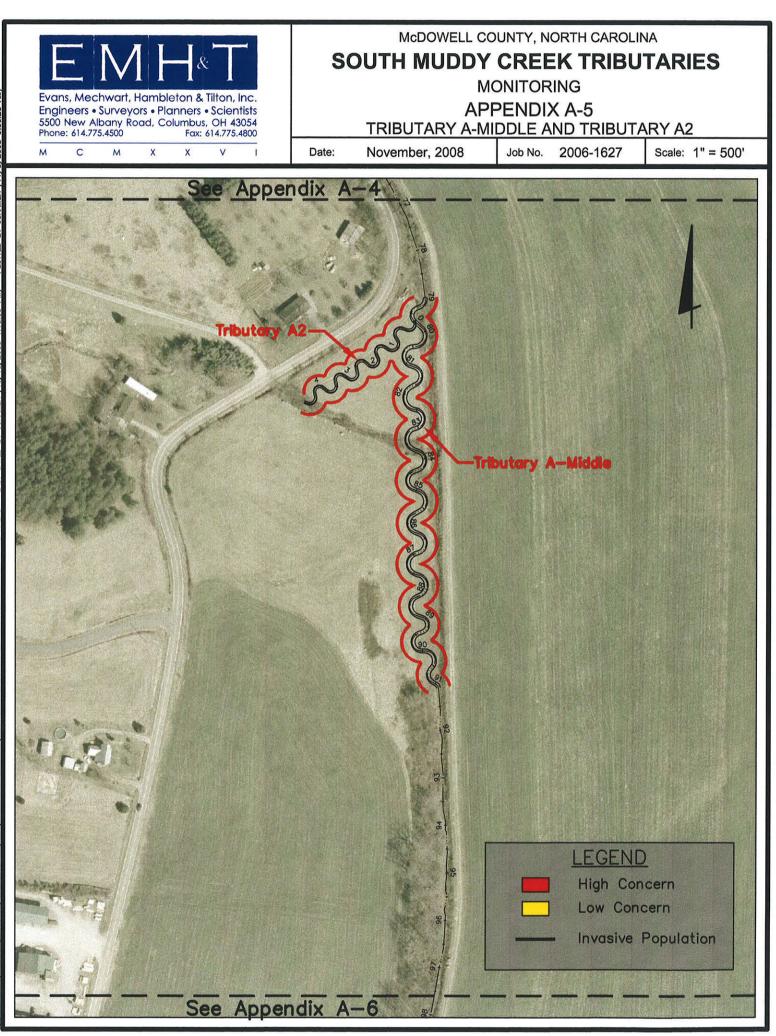
VPA 4 View of Sericea lespedeza growing in Vegetation Plot 5 along Tributary A (middle). (EMH&T, Inc. 9/10/08)

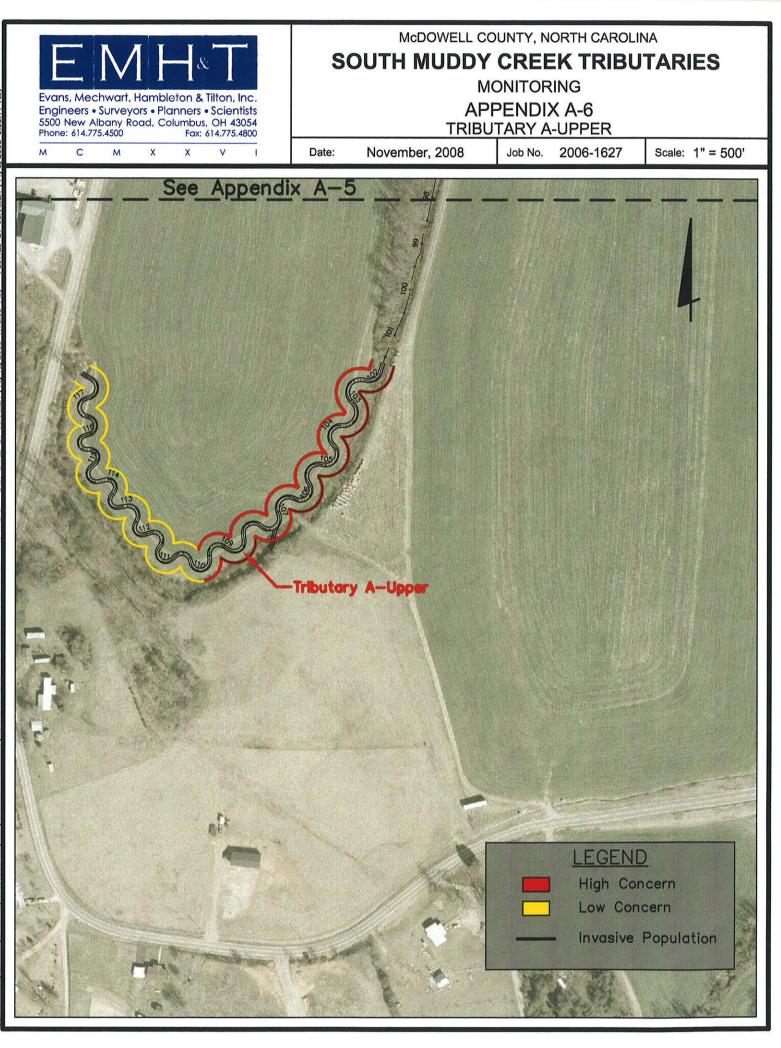










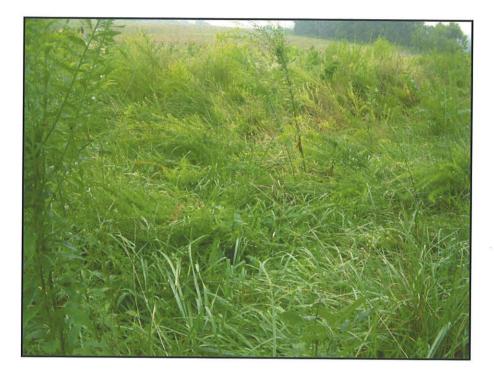




Vegetation Plot 1 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 2 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 3 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 4 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 5 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 6 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 7 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 8 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 9 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 10 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 11 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 12 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 13 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 14 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 15 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 16 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 17 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 18 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 19 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 20 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 21 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 22 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 23 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 24 Monitoring Year 3 (EMH&T, Inc. 9/10/08)



Vegetation Plot 25 Monitoring Year 3 (EMH&T, Inc. 9/11/08)



Vegetation Plot 26 Monitoring Year 3 (EMH&T, Inc. 9/11/08)



Vegetation Plot 27 Monitoring Year 3 (EMH&T, Inc. 9/11/08)



Vegetation Plot 28 Monitoring Year 3 (EMH&T, Inc. 9/11/08)



Vegetation Plot 29 Monitoring Year 3 (EMH&T, Inc. 9/11/08)



Vegetation Plot 30 Monitoring Year 3 (EMH&T, Inc. 9/11/08)

	Table 1. Vegetation Metadata
Report Prepared By	Holly Blunck
Date Prepared	9/30/2008 11:20
database name	CVS_EEP_DataEntry_v202.mdb
database location	Q:\ENVIRONMENTAL\Monitoring\EEP Vegetation Database
DESCRIPTION OF WORKSHEETS	
Metadata	This worksheet, which is a summary of the project and the project data.
Plots	List of plots surveyed.
Vigor	Frequency distribution of vigor classes.
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.
Stem Count by Plot and Spp	Count of living stems of each species for each plot; dead and missing stems are excluded.
PROJECT SUMMARY	
Project Code	D0400601
project Name	South Muddy Creek
Description	Restoration of tributaries A, A2, B and C of South Muddy Creek
length (ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	30

	Table 2. Vegetation V	'igor	by S	pec	ies	5	
	Species	4	3	2	1	0	Missing
	Alnus serrulata	11	10				19
	Betula nigra	1	6	1			
	Cephalanthus occidentalis	2	5				
	Cornus amomum	36	24	6		1	8
	Fraxinus pennsylvanica	18	28	13	4	2	9
	Platanus occidentalis	8	9	3		1	3
	Quercus alba	13	14	5			5
	Quercus pagoda	4	9				6
	Quercus phellos	2	7	2			4
	Salix nigra	7		1			
	Sambucus canadensis	2					
TOT:	11	108	115	33	5	4	54

	Table 3. Veget	ation	Dan	nage	e by	Spe	cies	5				
	Species	All Damage Categories	(no damage)	Dry	Deer	Diseased	Flood	Insects	Other/Unknown Animal	Site Too Dry	Unknown	(other damage)
	Alnus serrulata	21	16			2		2			1	
	Betula nigra	8	7									1
	Cephalanthus occidentalis	7	6									1
	Cornus amomum	66	66									
	Fraxinus pennsylvanica	63	61								1	1
	Platanus occidentalis	20	20									
	Quercus alba	32	32									
	Quercus pagoda	13	12					1				
	Quercus phellos	11	11									
	Salix nigra	8	8									
	Sambucus canadensis	2	2									
TOT:	11	251	241	0	0	2	0	3	0	0	2	3

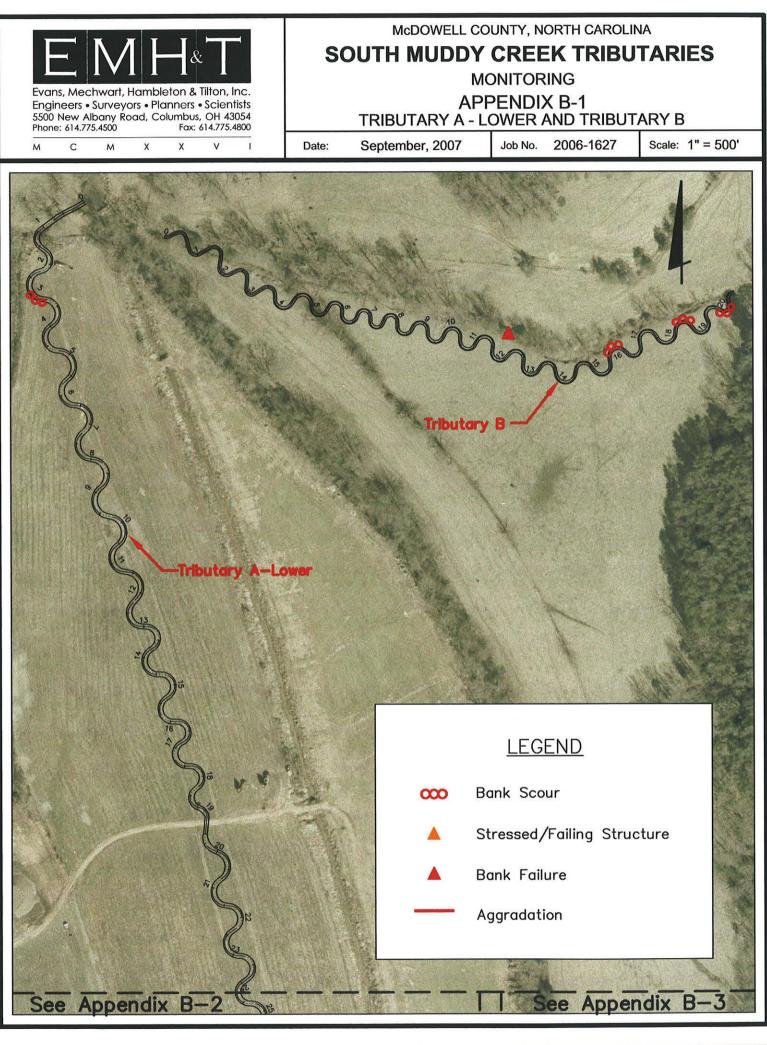
TOT:																																
30	D0400601-01-0030 (year 3)	D0400601-01-0029 (year 3)	D0400601-01-0028 (year 3)	D0400601-01-0027 (year 3)	D0400601-01-0026 (year 3)	(year	D0400601-01-0024 (year 3)	D0400601-01-0023 (year 3)	D0400601-01-0022 (year 3)		D0400601-01-0020 (year 3)	D0400601-01-0019 (year 3)	D0400601-01-0018 (year 3)	D0400601-01-0017 (year 3)	D0400601-01-0016 (year 3)	D0400601-01-0015 (year 3)	D0400601-01-0014 (year 3)		D0400601-01-0012 (year 3)	D0400601-01-0011 (year 3)	D0400601-01-0010 (year 3)	D0400601-01-0009 (year 3)		D0400601-01-0007 (year 3)	D0400601-01-0006 (year 3)	D0400601-01-0005 (year 3)	D0400601-01-0004 (year 3)	D0400601-01-0003 (year 3)	D0400601-01-0002 (year 3)	D0400601-01-0001 (year 3)	plot	Table 4.Vegetation Damage
251	2	0	5	6	7	4	9	9	4	14	4	ω	7	11	5	9	6	8	10	14	12	13	11	9	15	8	7	15	11	13	All Damage Categories	etatio
241	2	0	5	4	0	4	9	8	4	14	4	ω	7	11	5	9	6	8	10	14		12	10	9	14	8	6	15	11	12	(no damage)	n Da
																															_Enter other damage_	maç
0																															Deer	ye by
N																						_									Diseased	y Plot
0																															Flood	ę
ω					<u> </u>			[																	-		1				Insects	
0																															Other/Unknown Animal	
0																															Site Too Dry	
2																							_							-	Unknown	
N				2																											(other damage)	

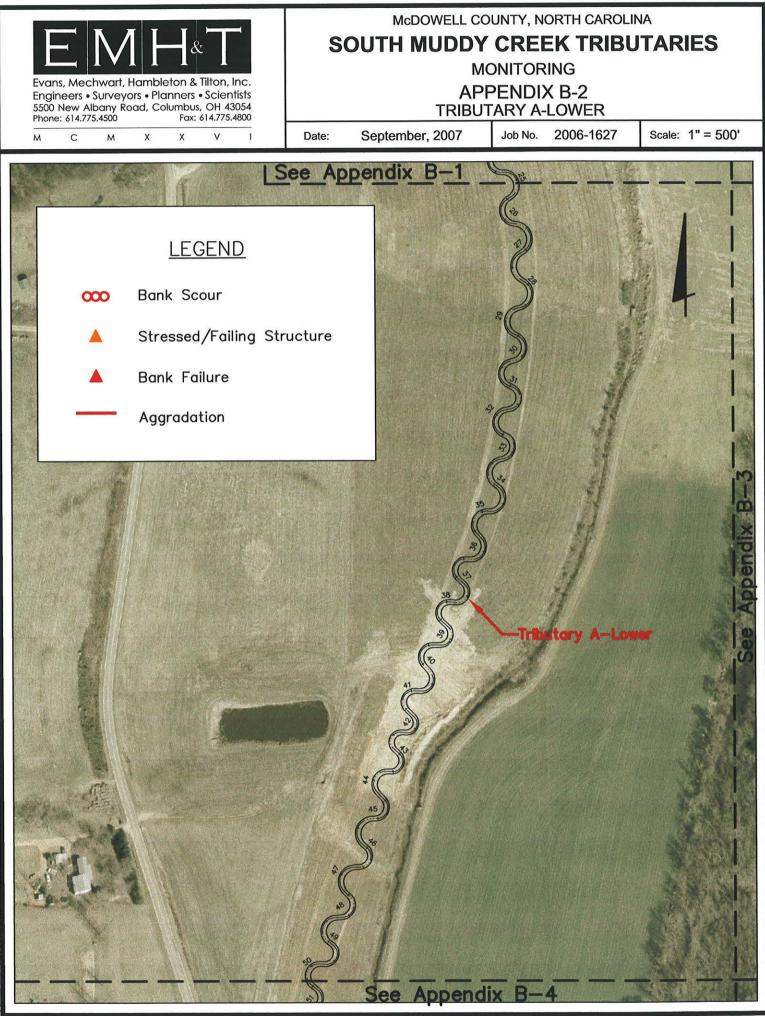
			1	r	1	<b>T</b>		Та	ble	5. S	tem	Cοι	ınt k	эу Р	lot a	and	Spe	cies											1					
	Species	Total Stems	# plots	avg# stems	plot D0400601-01-0001 (year 3)	plot D0400601-01-0002 (year 3)	piot D0400601-01-0003 (year 3)	plot D0400601-01-0004 (year 3)	plot D0400601-01-0005 (year 3)	plot D0400601-01-0006 (year 3)	plot D0400601-01-0007 (year 3)	plot D0400601-01-0008 (year 3)	plot D0400601-01-0009 (year 3)	plot D0400601-01-0010 (year 3)	plot D0400601-01-0011 (year 3)	plot D0400601-01-0012 (year 3)	plot D0400601-01-0013 (year 3)	plot D0400601-01-0014 (year 3)	plot D0400601-01-0015 (year 3)	piot D0400601-01-0016 (year 3)	piot D0400601-01-0017 (year 3)	plot D0400601-01-0018 (year 3)	plot D0400601-01-0019 (year 3)	plot D0400601-01-0020 (year 3)	plot D0400601-01-0021 (year 3)	plot D0400601-01-0022 (year 3)	plot D0400601-01-0023 (year 3)	plot D0400601-01-0024 (year 3)	plot D0400601-01-0025 (year 3)	plot D0400601-01-0026 (year 3)	plot D0400601-01-0027 (year 3)	plot D0400601-01-0028 (year 3)		plot D0400601-01-0030 (year 3)
	Alnus serrulata	21	13					1	3	4	1		1				_			2					-		1	1	1			1		<u></u>
	Betula nigra	8	4	2																									1	2	3	2		
	Cephalanthus occidentalis	7	2	3.5	1									6					1															
	Cornus amomum	66	20	3.3	6	4	5			5	1	4	4	4	10	2		1		1	1	3	2	1	3	2	6	1						
	Fraxinus pennsylvanica	63	24	2.62	4	2	5	1		4	1	2	4		3	6	2	2	3	1	7	3		1	1	2	1	4		1	2			1
	Platanus occidentalis	20	14	1.43	1		3	1	4			2	1		1		1		1			1	1		1			1						1
	Quercus alba	32		2.29			1	4	1		1	1	3				1	2	4	1	1				8		1	3						
	Quercus pagoda	13	7	1.86		}								2			1	1											2	4	1	2		$\neg$
	Quercus phellos	11	6	1.83		2						2				1	3							2	1									
	Salix nigra	8		2.67		1				2	5																					Í		
	Sambucus canadensis	2	2	1												1					1													
TOT:	1	1 251	11		13	11	15	7	8	15	9	11	13	12	14	10	8	6	9	5	11	7	3	4	14	4	9	9	4	7	6	5	0	2

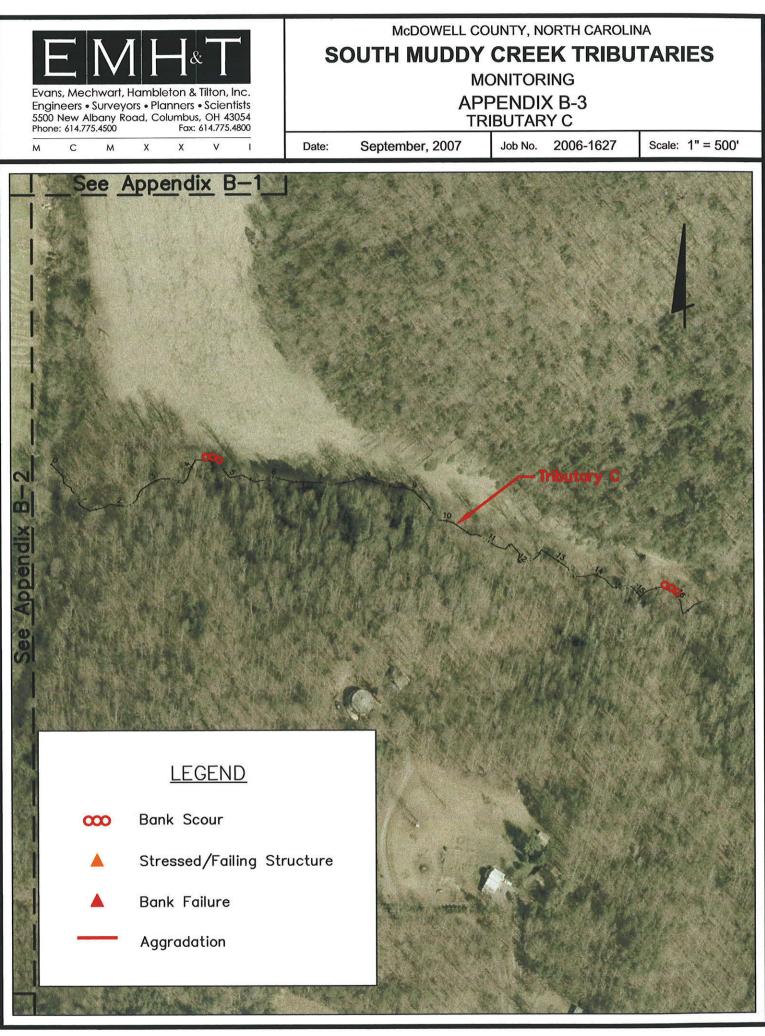
## APPENDIX B Geomorphologic Raw Data 1. Stream Problem Areas Plan View 2. Stream Problem Area Photos

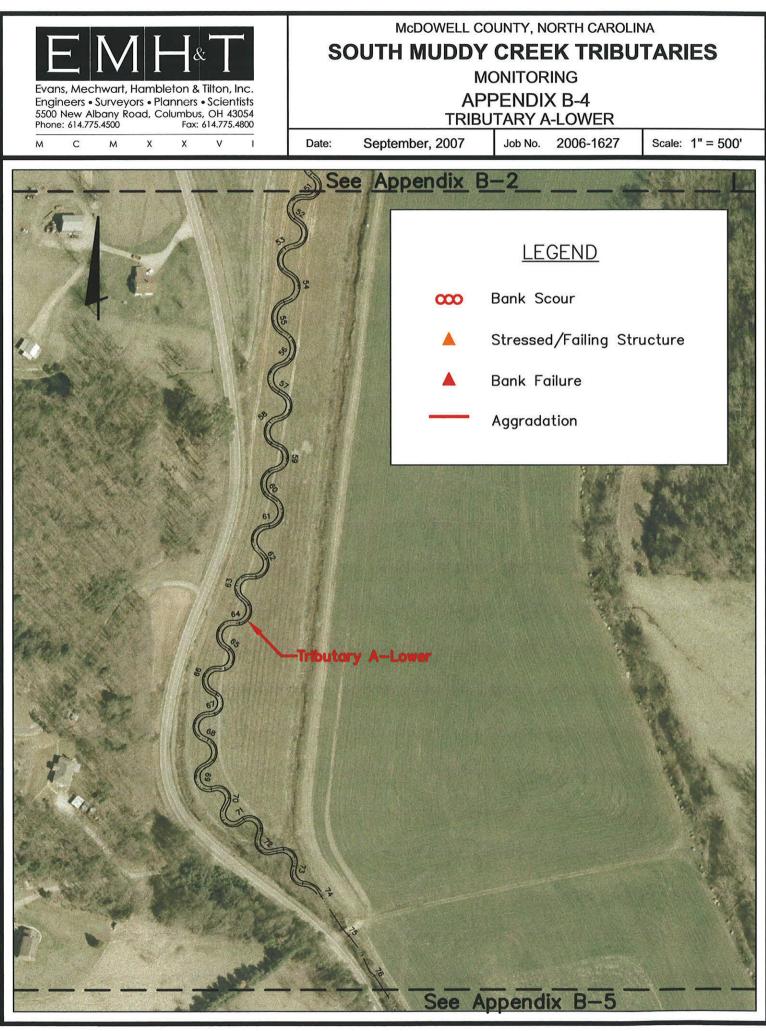
3. Fixed Station Photos
4. Table B1. Qualitative Visual Stability Assessment
5. Cross Section Plots
6. Longitudinal Plots
7. Pebble Count Plots

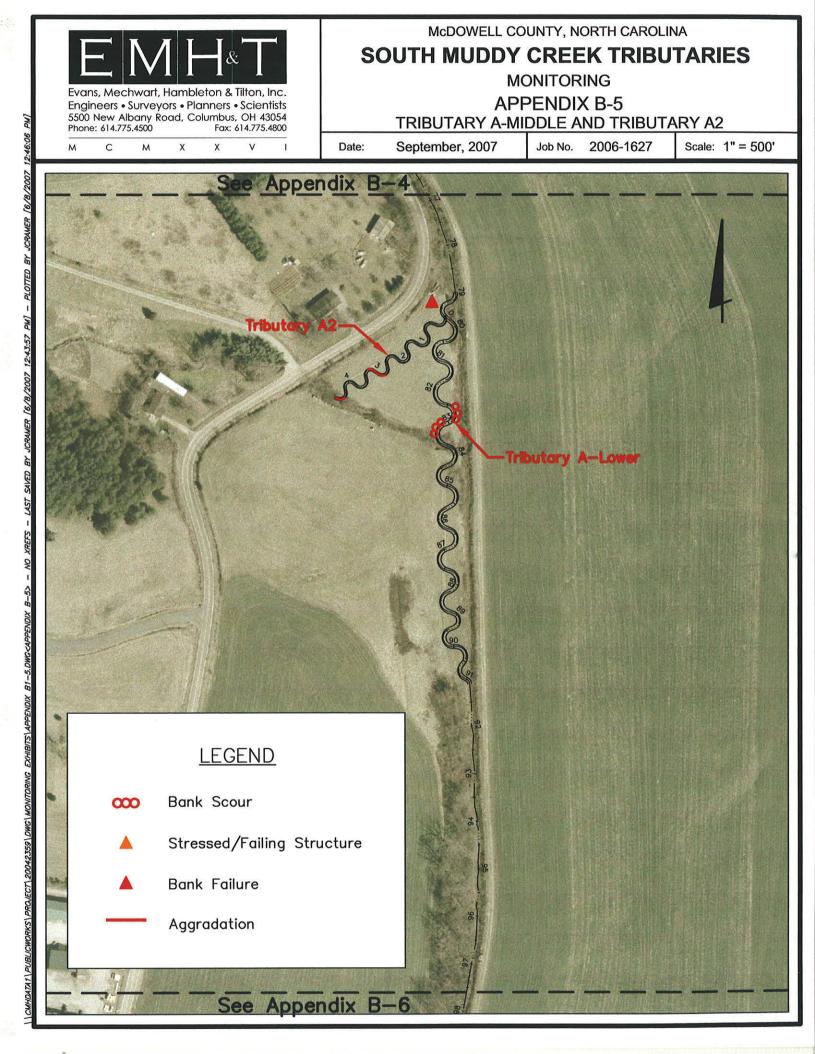
8. Bankfull Event Photos

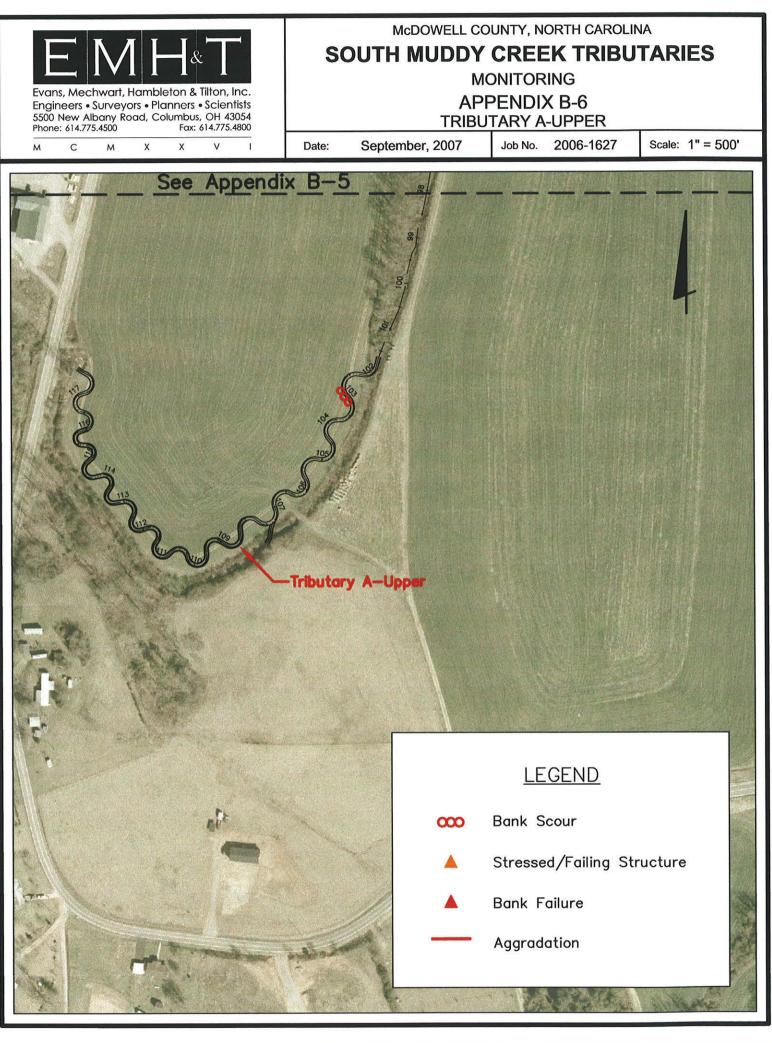












[Md



SPA 1 Aggradation in Tributary A2 at station 3+00. (EMH&T, Inc. 9/19/06)



SPA 2 Bank failure along Tributary B at station 12+10. (EMH&T, Inc. 4/14/07)



SPA 3 Bank failure along Tributary B at station 12+10. (EMH&T, Inc. 4/14/07)



SPA 4 Bank scour along Tributary B at station 19+70. (EMH&T, Inc. 4/14/07)



SPA 5 Bank scour along Tributary A (middle) at station 83+30. (EMH&T, Inc. 4/14/07)



SPA 6 Bank scour along Tributary C at station 15+70. (EMH&T, Inc. 4/14/07)



Fixed Station 1 Overview of Tributary A (upper), facing upstream. (EMH&T, Inc. 9/20/06)



Fixed Station 2 Overview of valley along Tributary A2 at confluence with Tributary A, facing upstream. (EMH&T, Inc. 97/11/06)



Fixed Station 3 Overview of valley along Tributary A (lower) near station 31+50, facing downstream. (EMH&T, Inc. 9/19/06)



Fixed Station 4 Overview of valley along Tributary A (lower) near station 31+50, facing upstream. (EMH&T, Inc. 9/20/06)



Fixed Station 5 Overview of valley on Tributary A (lower) at large culvert, facing upstream. (EMH&T, Inc. 9/19/06)



Fixed Station 6 Overview of valley on Tributary A (lower) at large culvert, facing downstream. (EMH&T, Inc. 9/19/06)



Fixed Station 7 Overview of valley along Tributary B, facing upstream. (EMH&T, Inc. 9/19/06)



**Fixed Station 8 Overview of valley along Tributary B, facing downstream.** (EMH&T, Inc. 9/19/06)



Fixed Station 9 Overview of Tributary C near station 6+50, facing downstream. (EMH&T, Inc. 9/19/06)



Fixed Station 10 Overview of Tributary C near station 8+60, facing downstream. (EMH&T, Inc. 9/19/06)

	Table B1. Visual Morphological St	ability Assess	ment			
	South Muddy Creek Tributaries Restoration /	<b>EEP Project N</b>	lo. D04006-01			
	Segment/Reach: A (up					
		(# Stable) Number	Total	Total Number /		-
Feature Category	Metric (per As-built and reference baselines	Performing as Intended		feet in unstable state		Mean or Total
A. Riffles	1. Present?	24		N/A	100	
71. 141100	2. Armor stable (e.g. no displacement)?	24		N/A	100	
	3. Facet grade appears stable?	24		N/A	100	
	4. Minimal evidence of embedding/fining?	24		N/A	100	
	5. Length appropriate?	24	24	Ň/A	100	100%
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	25	25	N/A	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	25	25	N/A	100	
	3. Length appropriate?	25	25	N/A	100	100%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	25	25	0	100	
	2. Downstream of meander (glide/inflection) centering?	25	25	0	100	100%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	24	25	1	96	
	2. Of those eroding, # w/concomitant point bar formation?	25			1	
	3. Apparent Rc within spec?	25			1	
	4. Sufficient floodplain access and relief?	25	25	0	] 100	99%
E. Bed General	1. General channel bed aggradation areas (bar formation)	N/A	N/A	0/ 0 feet	100	
	2. Channel bed degradation - areas of increasing downcutting or headcutting?	N/A	N/A	0/ 0 feet	100	100%
F. Vanes	1. Free of back or arm scour?	N/A	0	N/A	N/A	
	2. Height appropriate?	N/A	0	N/A	N/A	
	3. Angle and geometry appear appropriate?	N/A		N/A	N/A	
	4. Free of piping or other structural failures?	N/A	0	N/A	N/A	N/A
G. Wads/ Boulders		N/A	0	N/A	N/A	
	2. Footing stable?	N/A	0	N/A	N/A	N/A

	Table B1. Visual Morphological St	ability Assess	ment			
	South Muddy Creek Tributaries Restoration /	EEP Project N	lo. D04006-01			
	Segment/Reach: A (mi					
		(# Stable) Number Performing		Total Number / feet in unstable	in Stable	Mean or
Feature Category	Metric (per As-built and reference baselines	as Intended		state	Condition	Total
A. Riffles	1. Present?	18		N/A	100	
	2. Armor stable (e.g. no displacement)?	18		N/A	100	
	3. Facet grade appears stable?	18		N/A	100	
	4. Minimal evidence of embedding/fining?	18		N/A	100	£
	5. Length appropriate?	18		N/A	100	
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	19		N/A	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	19		N/A	100	
	3. Length appropriate?	19		N/A	] 100	100%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	19	19	0	100	:
	2. Downstream of meander (glide/inflection) centering?	19	19	0	100	100%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	16	19	3	84	
	2. Of those eroding, # w/concomitant point bar formation?	19	19		100	
	3. Apparent Rc within spec?	19		A	100	
	4. Sufficient floodplain access and relief?	19	19	0	100	96%
E. Bed General	1. General channel bed aggradation areas (bar formation)	N/A	N/A	0/ 0 feet	100	
	<ol><li>Channel bed degradation - areas of increasing downcutting or headcutting?</li></ol>	N/A	N/A	0/ 0 feet	100	100%
F. Vanes	1. Free of back or arm scour?	N/A	0	N/A	N/A	
	2. Height appropriate?	N/A	0	N/A	N/A	
	3. Angle and geometry appear appropriate?	N/A		N/A	N/A	
	4. Free of piping or other structural failures?	N/A	0	N/A	N/A	N/A
G. Wads/ Boulders		N/A	0	N/A	N/A	
	2. Footing stable?	N/A	0	N/A	N/A	N/A

	Table B1. Visual Morphological St	ability Assess	ment			
	South Muddy Creek Tributaries Restoration /	-	lo. D04006-01			
	Segment/Reach: A (lov					
		(# Stable) Number Performing	Total	Total Number / feet in unstable		Feature Perform. Mean or
Feature Category	Metric (per As-built and reference baselines	as Intended			Condition	Total
A. Riffles	1. Present?	93	93	N/A	100	
	2. Armor stable (e.g. no displacement)?	93	93	N/A	100	
	3. Facet grade appears stable?	93	93	N/A	100	
	4. Minimal evidence of embedding/fining?	93	93	N/A	100	
	5. Length appropriate?	93	93	N/A	100	100%
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	95		N/A	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	95		N/A	100	
	3. Length appropriate?	95	95	N/A	100	100%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	95	95	0	100	
	2. Downstream of meander (glide/inflection) centering?	95	95	0	100	100%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	94	95	1	98	
	2. Of those eroding, # w/concomitant point bar formation?	95			100	
	3. Apparent Rc within spec?	95				
	4. Sufficient floodplain access and relief?	95	95	0	100	99%
E. Bed General	1. General channel bed aggradation areas (bar formation)	N/A	N/A	0/ 0 feet	100	
	2. Channel bed degradation - areas of increasing downcutting or headcutting?	N/A	N/A	0/ 0 feet	100	100%
F. Vanes	1. Free of back or arm scour?	N/A		N/A	N/A	10078
	2. Height appropriate?	N/A	1	N/A	N/A	
	3. Angle and geometry appear appropriate?	N/A		N/A	N/A	
	4. Free of piping or other structural failures?	N/A		N/A	N/A	N/A
G. Wads/ Boulders		N/A	0	N/A	N/A	
	2. Footing stable?	N/A	0	N/A	N/A	N/A

	Table B1. Visual Morphological St	ability Asses	sment			
	South Muddy Creek Tributaries Restoration /		No. D04006-0	1		
	Segment/Reach: C		<b>2</b>			
Feature Category	Metric (per As-built and reference baselines	(# Stable) Number Performing as Intended		Total Number / feet in unstable state		Feature Perform. Mean or Total
A. Riffles	1. Present?	33	33	N/A	100	
	2. Armor stable (e.g. no displacement)?	33		N/A	100	
	3. Facet grade appears stable?	33	33	N/A	100	
	4. Minimal evidence of embedding/fining?	33	33	N/A	100	
	5. Length appropriate?	33	33	N/A	100	100%
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	34	34	N/A	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	34		N/A	100	
	3. Length appropriate?	34	34	N/A	100	100%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	19		0	100	
	2. Downstream of meander (glide/inflection) centering?	19	19	0	100	100%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	32	I	2		
	2. Of those eroding, # w/concomitant point bar formation?	34		0		
	3. Apparent Rc within spec?	34		0		
	4. Sufficient floodplain access and relief?	34	34	_	100	99%
E. Bed General	1. General channel bed aggradation areas (bar formation)	N/A	N/A	0/ 0 feet	100	
	2. Channel bed degradation - areas of increasing downcutting or headcutting?	N/A	N/A	0/ 0 feet	100	100%
F. Vanes	1. Free of back or arm scour?	N/A	0	N/A	N/A	
	2. Height appropriate?	N/A		N/A	N/A	
	3. Angle and geometry appear appropriate?	N/A		N/A	N/A	
	4. Free of piping or other structural failures?	N/A		N/A	N/A	N/A
G. Wads/ Boulders		N/A		N/A	N/A	
	2. Footing stable?	N/A	0	N/A	N/A	N/A

	Table B1. Visual Morphological St					
	South Muddy Creek Tributaries Restoration /		No. D04006-0	1		
	Segment/Reach: B				E	[f <sup>m</sup> 4
		(# Stable)	Total	Total Number /		Feature Perform.
		Number				Mean or
				feet in unstable state	Condition	Total
Feature Category	Metric (per As-built and reference baselines	as Intended	£	state		
A. Riffles	1. Present?	22		1	96	
	2. Armor stable (e.g. no displacement)?	23		0		
	3. Facet grade appears stable?	23		0		
	4. Minimal evidence of embedding/fining?	23		0		
	5. Length appropriate?	23	1	0	.**	1
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	23		0		
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	23		0		
	3. Length appropriate?	23	2	0	100	100%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	36		0		
	2. Downstream of meander (glide/inflection) centering?	36	36	0	100	100%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	32			89	
	2. Of those eroding, # w/concomitant point bar formation?	35			97	·
	3. Apparent Rc within spec?	36	36	0	100	)
	4. Sufficient floodplain access and relief?	36	36	0	100	97%
E. Bed General	1. General channel bed aggradation areas (bar formation)	N/A	N/A	0/ 0 feet	100	)
	2. Channel bed degradation - areas of increasing downcutting	1				
	or headcutting?	N/A	N/A	0/ 0 feet	100	100%
F. Vanes	1. Free of back or arm scour?	N/A	0	N/A	N/A	
	2. Height appropriate?	N/A	0	N/A	N/A	
	3. Angle and geometry appear appropriate?	N/A	0	N/A	N/A	
	4. Free of piping or other structural failures?	N/A	0	N/A	N/A	N/A
G. Wads/ Boulders	1. Free of scour?	N/A	0	N/A	N/A	
	2. Footing stable?	N/A	0	N/A	N/A	N/A
H. Log Sills	1. Maintaining grade control?	13	14	1	93	5
X	2. Minimal evidence of sedimentation in adjacent pool?	14	14	0	100	97%

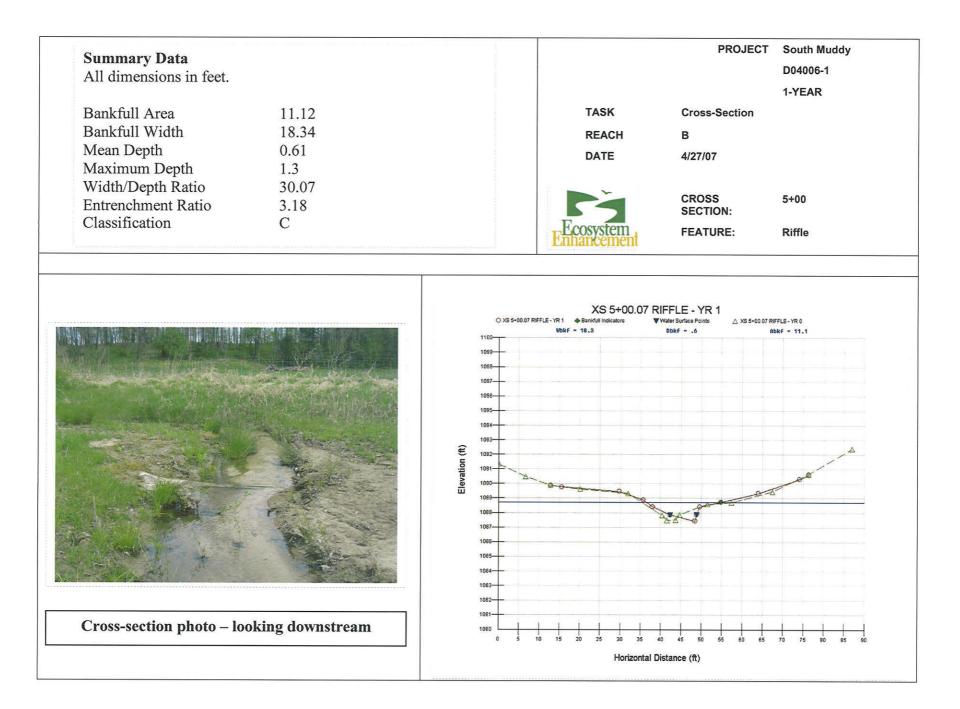
	Table B1. Visual Morphological S	tability Asses	sment			
	South Muddy Creek Tributaries Restoration		No. D04006-0	1		
	Segment/Reach: A					-
		(# Stable) Number	Total	Total Number /		Feature Perform.
				feet in unstable	{	Mean or
Feature Category	Metric (per As-built and reference baselines	as Intended	As-built	state	Condition	Total
A. Riffles	1. Present?	7	7	0	100	
	2. Armor stable (e.g. no displacement)?	7	7	0	100	
	3. Facet grade appears stable?	7	7	0	100	
	4. Minimal evidence of embedding/fining?	6	7	1	100	
	5. Length appropriate?	7	7	0	86	97%
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	7	7	0	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	7	7	0	100	
	3. Length appropriate?	7	7	0	100	100%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	11	11	0	100	
	2. Downstream of meander (glide/inflection) centering?	11	11	0	100	100%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	11	11	0	100	
	2. Of those eroding, # w/concomitant point bar formation?	11	11	0	100	
	3. Apparent Rc within spec?	11	11	0	100	
	4. Sufficient floodplain access and relief?	11	11	0	100	100%
E. Bed General	1. General channel bed aggradation areas (bar formation)	N/A	N/A	2/ 65 feet	86%	
********	2. Channel bed degradation - areas of increasing downcutting					
	or headcutting?	N/A	N/A	0/ 0 feet	100%	93%
F. Vanes	1. Free of back or arm scour?	N/A	0	N/A	N/A	
	2. Height appropriate?	N/A	0	N/A	N/A	
	3. Angle and geometry appear appropriate?	N/A		N/A	N/A	
	4. Free of piping or other structural failures?	N/A	0	N/A	N/A	N/A
G. Wads/ Boulders	1. Free of scour?	N/A	0	N/A	N/A	
	2. Footing stable?	N/A	0	N/A	N/A	N/A

Summary Data					PROJECT	South Muddy
All dimensions in feet.						D04006-1
7 m dimensions in reet.						1-YEAR
Bankfull Area	17.52			TASK	Cross-Section	
Bankfull Width	21.43			REACH	A2	
Mean Depth	0.82			DATE	4/27/07	
Maximum Depth	1.55					
Width/Depth Ratio	26.13			~	CROSS	2+18
Entrenchment Ratio	2.18				SECTION:	2+18
Classification	С			Ecosystem	FEATURE:	Riffle
			O XS 2+18.05 R 1115	XS 2+18.0 FFLE-YR1	5 RIFFLE - YR 1 ♥ Water Surface Points △ XS 2+18.05 DbkF = .8	RIFFLE-YR 0 Adkf = 17.5
			1115	FFLE - YR 1	▼Water Surface Points △ XS 2+18.05	
			1115 1114 1113 1112 1112 1111 1110 1108 1108	FFLE - YR 1	▼Water Surface Points △ XS 2+18.05	
		ion (f)	1115 1114 1113 1113 1112 1112 1110 1108 1108	FFLE - YR 1	▼Water Surface Points △ XS 2+18.05	
		Elevation (ft)	1115 1114 1113 1112 1112 1111 1110 1108 1108 1107	FFLE - YR 1	▼Water Surface Points △ XS 2+18.05	
		Elevation (ft)	1115       1114       1113       1112       1111       1110       1108       1107       1108       1107       1108       1108       1108       1104	FFLE - YR 1	▼Water Surface Points △ XS 2+18.05	
		Elevation (ft)	1115 1114 1113 1112 1111 1110 1108	FFLE - YR 1	▼Water Surface Points △ XS 2+18.05	
		Elevation (ft)	1115       1114       1113       1112       1111       1110       1108       1108       1105       1104       1103       1102       1101	FFLE - YR 1	▼Water Surface Points △ XS 2+18.05	
		Elevation (ft)	1115       1114       1113       1112       1111       1110       1108       1108       1108       1104       1103       1102       1101	FFLE - YR 1	▼Water Surface Points △ XS 2+18.05	
		Elevation (ft)	1115       1114       1113       1112       1111       1110       1108       1108       1105       1104       1103       1102       1101	FFLE - YR 1	▼Water Surface Points △ XS 2+18.05	
		Elevation (ft)	1115         1114         1113         1112         1111         1110         1100         1108         1109         1108         1109         1100         1101         1102         1103         1104         1102         1102         1102         1102         1102         1000         1009         1099         1097	FFLE - YR 1	▼Water Surface Points △ XS 2+18.05	
Cross-section photo – lo	boking downstream	Elevation (ft)	1115         1114         1113         1112         1111         1110         1108         1108         1108         1108         1108         1108         1108         1109         1102         1104         1102         1101         1009         1098	FFLE - YR 1	▼Water Surface Points △ XS 2+18.05	



Summary Data			1		PROJ	JECT South Muddy
All dimensions in feet.						D04006-1
an dimensions in reet.						1-YEAR
Bankfull Area	5.7			TASK	Cross-Sectio	on
Bankfull Width	8.47			REACH	A2	
Mean Depth	0.67			DATE	4/27/07	
Maximum Depth	1.27					
Width/Depth Ratio	12.64				CROSS	3+23
Entrenchment Ratio	3.78				SECTION:	
Classification	C			Ecosystem	FEATURE:	Pool
			1115		Dbkf = .7	ADKF = 5.7
		(t)	1114 1113 1112 1111 1110 1108 1108			
		Elevation (ft)	1114 1113 1112 1111 1110 1109 1109			
		Elevation (ft)	1114 1113 1112 1111 1110 1100 1100 1100 1105 1104			3
		Elevation (ft)	1114 1113 1112 1111 1110 1109 1108 1105 1105 1104 1103 1102 1104 1103 1102 1104 1103 1102 1104 1109 1099 1098			
Cross-section photo –	looking upstream	Elevation (ft)	1114       1113       1112       1111       1110       1100       1100       1100       1100       1100       1100       1100       1100       1100       1100       1100       1100       1100       1100       1100       1100       1000       1000       1000       1000       1000       1000       1000			
Cross-section photo –	looking upstream	Elevation (ft)	1114       1113       1112       1111       1110       1100       1100       1102       1103       1104       1105       1104       1105       1104       1105       1106       1107       1108       1109       1009       1099       1098       1098			







Summary Data					PROJECT	South Muddy
All dimensions in feet.						D04006-1
						1-YEAR
Bankfull Area	5.57			TASK	Cross-Section	
Bankfull Width	9.93			REACH	В	
Mean Depth	0.56			DATE	4/27/07	
Maximum Depth	1.42					
Width/Depth Ratio	17.73			~	CROSS	8+39
Entrenchment Ratio	4.41			55	SECTION:	0739
Classification	С			Ecosystem	FEATURE:	Pool
			○ XS 8+39.41 Pi		1 POOL - YR 1 ▼Water Surface Points △ XS 8+39.4 Dbk € = .6	1 POOL- YR 0 RDkf = 5.6
		Elevation (ft)	1099 1099 1097 1097 1095 1095 1094 1092 1092		omeno	A
Cross-section photo – I	ooking upstream	Elevation (ft)	1099- 1097- 1095- 1095- 1094- 1094- 1092- 8			



Summary Data						PROJECT	South Muddy
All dimensions in feet.							D04006-1
7 m dimensions m reet.							1-YEAR
Bankfull Area	8.37			TASK	Cros	s-Section	
Bankfull Width	12.11			REACH	в		
Mean Depth	0.69			DATE	4/27/	07	
Maximum Depth	1.46						
Width/Depth Ratio	17.55				CRO	ss	12+10
Entrenchment Ratio	3.92			5		TION:	12110
Classification	С			Ecosystem	FEAT	URE:	Riffle
			O XS 12+10.85 Ri	XS 12+1 FFLE-YR1	0.65 RIFFLE - Y Water Surface Point DbkF7		RIFFLE-YR 0 RDKF - 8.4
		tion (ft)	1105	FFLE - YR 1 🔷 Bankfull Indicators	Water Surface Points		
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1089 1088 1097 1086 1095	FFLE - YR 1 🔷 Bankfull Indicators	Water Surface Points		
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1089 1088 1087 1096 1095 1094	FFLE - YR 1 🔷 Bankfull Indicators	Water Surface Points		
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1089 1088 1097 1086 1095	FFLE - YR 1 🔷 Bankfull Indicators	Water Surface Points		
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1089 1089 1089 1085 1095 1095 1095 1095 1095 1095 1095 1092 1091	FFLE - YR 1 🔷 Bankfull Indicators	Water Surface Points		
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1089 1088 1097 1096 1095 1094 1093 1092	FFLE - YR 1 🔷 Bankfull Indicators	Water Surface Points		
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1088 1097 1086 1095 1094 1095 1094 1093 1092 1094 1099 1099 1094 1099 1098 10 1098 10	FFLE - YR 1 🔷 Bankfull Indicators	Water Surface Points		
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1089 1089 1089 1087 1084 1085 1084 1085 1084 1085 1084 1089 1089 1089 1089 1089 1089 1089 1089 1089 1089 1089 1089 1089 1089 1089 1089 1089 1085 10 1085 10	FFLE - YR 1 🔷 Bankfull Indicators	Water Surface Points		
<image/>	Booking upstream	Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1088 1097 1086 1095 1094 1095 1094 1093 1092 1094 1099 1099 1094 1099 1098 10 1098 10	FFLE - YR 1 🔷 Bankfull Indicators	Water Surface Points		



Summary Data							PROJECT		70
All dimensions in feet.								D0400	
								1-YEA	R
Bankfull Area	9.41			TA	SK	Cross	-Section		
Bankfull Width	10.08			RE	ACH	в			
Mean Depth	0.93			DA	TE	4/27/0	7		
Maximum Depth	2.16								
Width/Depth Ratio Entrenchment Ratio	10.84 5.25				~	CROS	S	15+34	
Classification	E			Ecosy	stem .	SECTI		Pool	
			O XS 15+34.	1 POOL - YR 1 🔶 Bankful	Indicators	Vater Surface Points	△ XS 15+34.2		
			1105	Wbkf = 10.1		Dbkf9		Rbkf = 9.4	
			1104	Wbkf - 10.1		Dbkf = .9		Abkf = 9.4	
				WbkF - 10.1		Dbkf9	<	Abkf = 9.4	
			1104	WDkF - 18.1		Dbkf = .9		Abkf - 9.4	
			1104	WDKF - 18.1		Dbkf = .9		Rbkf = 9.4	- OR
		(J)	1104	WDkF - 18.1		Dbkf9		RbkF = 9.4	- 0 <sup>0</sup>
		ration (ft)	1104 1103 1102 1101 1101	WbkF - 18.1	Arrow	Dbkf9	3	RbkF = 9.4	
		Elevation (ft)	1104 1103 1102 1101 1100 1099	WDkF - 18.1	part -	Dbkf9		Abkf - 9.4	- 0 <sup>0</sup>
		Elevation (ft)	1104 1103 1102 1101 1100 1099 1098	WDkF - 18.1	p	Dbkf9		Abkf - 9.4	- 0 <sup>Q</sup>
		Elevation (ft)	1104 1103 1102 1101 1100 1099 1098 1097	WDkF - 18.1	¢	Dbkf9		Abkf - 9.4	Q
		Elevation (ft)	1104 1103 1102 1101 1100 1099 1098 1098 1098	WDkF - 18.1	P	Dbkf9		Abkf - 9.4	- 0 <sup>Q</sup>
		Elevation (ft)	1104 1103 1102 1101 1100 1099 1099 1095 1095	WDkF - 18.1	part	Dbkf9		Abkf - 9.4	- 0 <sup>2</sup>
		Elevation (ft)	1104 1103 1102 1101 1100 1099 1098 1098 1098 1098 1095 1094	WDkF - 18.1	par -	Dbkf9		Abkf - 9.4	<u></u>
		Elevation (ft)	1104 1103 1102 1101 1100 1099 1098 1097 1095 1095 1095 1094 1093	WDkF - 18.1		0bkf9	<b>3</b>	Abkf - 9.4	<u> </u>
Cross-section photo – I	boking upstream	Elevation (ft)	1104 1103 1102 1101 1100 1099 1099 1099 1098 1097 1098 1095 1094 1094 1093 1092	WDkF - 10.1		00kf9		Abkf - 9.4	



Summary Data						PI	ROJECT	South Mu	ddy
All dimensions in feet.								D04006-1	
								1-YEAR	
Bankfull Area	4.41			TAS	SK	Cross-Se	ction		
Bankfull Width	7.45			RE	ACH	С			
Mean Depth	0.59			DA	TE	4/27/07			
Maximum Depth	0.91								
Width/Depth Ratio	12.63				~	CROSS		4+11	
Entrenchment Ratio	3.52				>	SECTION	l:	4.11	
Classification	С			Ecosys	stem	FEATUR	E:	Riffle	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			1105	Wbkf = 7.4	-	Dbkf6	\$	abkf = 4.4	
			1105	Wbkf = 7.4		Dbkf = _6	\$	10kf - 4.4	
			1104 1103 1102	Mbkf = 7.4		DDkf = .6		10kf - 4.4	
			1104	Vbkf = 7_4		Dbkf = _6		16kf - 4.4	
			1104 1103 1102 1101 1101 1100 1099	Wbkf = 7.4		Dbkf = .6		10KF - 4.4	
		n (ft)	1104	Vbkf = 7.4		Dbkf = .6		ibkf - 4.4	-2
		svation (ft)	1104 1103 1102 1101 1100 1099 1098 1098 1097 1086	Vbkf = 7.4		Dbkf = .6	, 	10kF - 4.4	-0
		Elevation (ft)	1104 1103 1102 1101 1100 1089 1088 1087	Vbkf = 7.4		Dbkf = .6		10kF - 4.4	-0
		Elevation (ft)	1104 1103 1102 1101 1100 1099 1095 1095 1095 1095 1094 1094 1093	VBKF = 7.4	- <u></u> 0	Dbkf = .6		10kF - 4.4	-0
		Elevation (ft)	1104 1103 1102 1101 1100 1099 1098 1097 1098 1097 1098 1095 1095 1094	Vbkf - 7.4	- <u>-</u>			10KF - 4.4	-0
		Elevation (ft)	1104 1103 1102 1101 1100 1089 1099 1095 1095 1094 1093 1092 1091 1080	VBKF = 7.4				0	-2
		Elevation (ft)	1104 1103 1102 1101 1100 1099 1099 1099 1099 1095 1094 1093 1094 1092 1091	VBKF = 7.4	- <u>-</u> -			10KF - 4.4	-0
		Elevation (ft)	1104 1103 1102 1101 1100 1089 1089 1097 1088 1097 1085 1095 1094 1092 1091 1089 1080	VBKF = 7.4				-9	-2
Cross-section photo – lo	oking downstream	Elevation (ft)	1104 1103 1102 1101 1100 1089 1089 1088 1097 1088 1092 1091 1089 1089 1081 1089 1089 1080 1089 1080	VBKF - 7.4				10KF - 4.4	-0



Summary Data						F	ROJECT		
All dimensions in feet.								D04006-	
								1-YEAR	
Bankfull Area	4.91			TAS	к	Cross-S	ection		
Bankfull Width	11.25			REA	СН	С			
Mean Depth	0.44			DAT	E	4/27/07			
Maximum Depth	0.79								
Width/Depth Ratio	25.57					CROSS		8+57	
Entrenchment Ratio	1.4					SECTIO	N:	0.01	
Classification	В			Ecosys	em .	FEATUR	RE:	Riffle	
			1110	Wbkf - 11.2		Dbkf = .4		Abkf - 4.9	
			1109	Wbkf - 11.2		Dbkf4		Abkf - 4.9	
			1109	WbkF - 11.2		Dbkf4		Abkf - 4.9	
			1109 1108 1107 1108 1105 1105	NDkf - 11.2		DDkf4		Abkf - 4.9	
		(4)	1108- 1108- 1107- 1108- 1108- 1108- 1104- 1104- 1103-	NDKF - 11.2		DDkf4		8bkf - 4.9	~
		ation (ft)	1109 1108 1107 1108 1105 1105	NDKF - 11.2	8	DDkf4	1. Contraction of the second s	80kf - 4.9	-0
		Elevation (ft)	1109 1109 1107 1107 1108 1105 1104 1103 1102 1101 1100	NDKF - 11.2		DDkf4	195-00 195-00	80kf - 4.9	~0
		Elevation (ft)	1109 1100 1107 1107 1108 1105 1104 1103 1102 1101	NDKF - 11.2		DDkf4	14	80kf - 4.9	~
		Elevation (ft)	1109 1108 1107 1108 1105 1104 1103 1104 1103 1102 1101 1100 1099 1098 1097	NDKF - 11.2		DDkf4	195-00 X	Abkf - 4.9	~
		Elevation (ft)	1109 1108 1107 1108 1107 1108 1105 1104 1103 1102 1101 1100 1099 1098	NDKF - 11.2		DDkf4		80kf - 4.9	-0
		Elevation (ft)	1109 1109 1107 1108 1107 1108 1104 1103 1104 1103 1102 1099 1098 1097 1098 1097 1098 1098	NDKF - 11.2		DDkf4	195-0 X	80kf - 4.9	~0
		Elevation (ft)	1109 1109 1107 1108 1107 1108 1104 1103 1104 1103 1099 1099 1098 1098 1098 1098 1098 1095 1094 1093	NDKF - 11.2		DDkf4		80kf - 4.9	-0
		Elevation (ft)	1109 1109 1107 1108 1107 1108 1104 1103 1104 1103 1102 1099 1098 1097 1098 1097 1098 1098	NDKF - 11.2		DDkf4	195-0 X	80kf - 4.9	~0
Cross-section photo – lo	oking downstream	Elevation (ft)	1109 1108 1107 1108 1107 1108 1104 1103 1104 1103 1102 1099 1099 1098 1095 1098 1095 1094 1093 1092	NBKF - 11.2				Abkf - 4.9	9



Summary Data						PROJE	ECT South Muddy
All dimensions in feet.							D04006-1
							1-YEAR
Bankfull Area	12.58			TASK		Cross-Section	n
Bankfull Width	28.47			REACH		С	
Mean Depth	0.44			DATE		4/27/07	
Maximum Depth	1.73						
Width/Depth Ratio	64.7				r.	CROSS	15+70
Entrenchment Ratio Classification	1.42 B					SECTION:	
Classification	Б			Ecosysten	1	FEATURE:	Pool
			© XS 15+70.17 F	VOOL-YR 1			15-70.17 POOL- YR 0 Abkf = 12.6
			1120	OOL - YR 1	a 🛛 💙 Water	Burface Points 🛆 XS	
			1120 1118 1118 1118 1117 1118	OOL - YR 1	a 🛛 💙 Water	Burface Points 🛆 XS	
		(¥)	1120 1119 1118 1118	OOL - YR 1	a 🛛 💙 Water	Burface Points 🛆 XS	
		vation (ft)	1120 1118 1118 1117 1117 1118	OOL - YR 1	a 🛛 💙 Water	Burface Points 🛆 XS	
		Elevation (ft)	1120 1118 1118 1117 1117 1118 1115 1114	OOL - YR 1	a 🛛 💙 Water	Burface Points 🛆 XS	
		Elevation (ft)	1120 1118 1118 1118 1118 1118 1116 1115 1115 1114 1113 1112 1111 0	OOL - YR 1	a 🛛 💙 Water	Burface Points 🛆 XS	
		Elevation (ft)	1120 1118 1118 1118 1118 1118 1118 1118 1118 1118 1118 1118 1119 1110	OOL - YR 1	a 🛛 💙 Water	Burface Points 🛆 XS	
		Elevation (ft)	1120 1118 1118 1118 1118 1118 1116 1115 1115 1114 1113 1112 1111 0	OOL - YR 1	a 🛛 💙 Water	Burface Points 🛆 XS	
		Elevation (ft)	1120 1118 1118 1118 1117 1118 1117 1118 1115 1114 1113 1112 1111 1110 1109	OOL - YR 1	a 🛛 💙 Water	Burface Points 🛆 XS	
		Elevation (ft)	1120 1118 1118 1117 1118 1117 1118 1115 1116 1115 1116 1112 1111 1110 1109 1108	OOL - YR 1	a 🛛 💙 Water	Burface Points 🛆 XS	
Cross-section photo – lo	oking downstream	Elevation (ft)	1120 1118 1118 1118 1117 1118 1117 1118 1115 1114 1115 1114 1113 1112 1111 1110 1109 1108 1107	OOL - YR 1	a 🛛 💙 Water	Burface Points 🛆 XS	



Summary Data							PRO	ULUI	South	maday
All dimensions in feet.									D04006	6-1
									1-YEAI	R
Bankfull Area	10.09			Т	ASK	Cro	oss-Secti	ion		
Bankfull Width	14.52			R	REACH	AL	ower			
Mean Depth	0.70			D	ATE	4/2	7/07			
Maximum Depth	1.55									
Width/Depth Ratio	20.74				-	CR	OSS		3+18	
Entrenchment Ratio	3.40				5		CTION:		- 10	
Classification	С			Ecos	ystem	FE.	ATURE:		Riffle	
			© XS 3+18.01	D.RIF-YR1 WDkF = 14-1	XS 3+18.00 ankfull Indicators 5	♥ Water Surfac		∆ XS 3+18.00	10 RIF-YR O Rbkf - 10.1	
			1100		ankfull Indicators					
			1100		ankfull Indicators					a
		evation (#)	1100		ankfull Indicators					R
		Elevation (ft)	1100 1099 1099 1099 1097 1096 1095 1094 1093 1093 1093 1093 1093 1093 1093 1093 1095 1094 1095		ankfull Indicators					8
		Elevation (ft)	1100 1099 1099 1097 1096 1095 1094 1095 1094 1092 1094 1090 1087 1088 1087 1088 1087 1088 1088 1088 1089 1095 1096 1095 1096		ankfull Indicators					8
		Elevation (#)	1100 1099 1099 1097 1098 1097 1098 1094 1094 1093 1092 1091 1090 1095 1086 1087 1088 1087		ankfull Indicators					
		Elevation (ft)	1100 1099 1099 1097 1095 1095 1095 1094 1093 1092 1091 1090 1092 1091 1095 1088 1085 1088 1085 1088 1085 1088 1089 1092 1092 1093 1092 1093 1093 1095 1005		ankfull Indicators					8
		Flevration (ft)	1100 1099 1099 1097 1098 1097 1098 1094 1093 1094 1095 1094 1095 1086 1087 1088 1087 1088 1087 1088 1087 1088 1095 1092 1091 1092 1092 1091 1092 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1096 1095 1096 1095 1096 1095 1096		ankfull Indicators					B
		Elevation (ft)	1100 1099 1099 1097 1092 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1095 1094 1095 1095 1094 1095 1095 1094 1095 1095 1094 1095 1095 1094 1095 1095 1094 1095 1095 1094 1095 1095 1094 1095 1095 1094 1095 1095 1094 1095 1095 1094 1095 1095 1094 1095 1095 1096 1096 1095 1096 1096 1095 1096 1096 1096 1096 1096 1096 1096 1086 1085 1088 1085 1086 1085 1086 1085 1086 1085 1086 1085 1086 1087 1086 1085 1086 1087 1086 1087 1086 1087 1086 1087 1086 1087 1086 1087 1086 1087 1086 1087 1086 1087 1086 1087 1086 1087 1086 1087 1086 1087 1086 1087 1086 1087 1086 1087 1086 1087 1087 1087 1088 1087		ankfull Indicators					B
Cross section photo – lo	oking downstream		1100 1099 1099 1097 1096 1095 1094 1093 1094 1093 1094 1095 1065 1067 1065 1065 1065 1065 1065 1065 1065 1067 1065 1087 1087 1087 1087 1087 1087 1090 1090 1090 1092 1092 1093 1092 1094 1093 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1095 1094 1095 1095 1094 1095 1095 1094 1095 1094 1095 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1087 1087 1087 1087 1087 1087 1087 1087 1085 1084 1085 1075		ankfull Indicators					



Summary Data				PROJECT	17.5
All dimensions in feet.					D04006-1
					1-YEAR
Bankfull Area	47.21		TASK	Cross-Section	
Bankfull Width	25.28		REACH	A Lower	
Mean Depth	1.87		DATE	4/27/07	
Maximum Depth	3.75				
Width/Depth Ratio	13.52		~	CROSS	4+31
Entrenchment Ratio	2.82		5	SECTION:	4+31
Classification	E		Ecosystem.	FEATURE:	Pool
		C XS 4•	XS 4+31.0 31.01 POOL- YR 1	1 POOL - YR 1 ▼Water Surface Points DbkF = 1.9 a	POOL-YR 0 Abkf = 47.2
		1100	31.01 POOL - YR 1	▼ Water Surface Points 🛆 XS 4+31.01 P	
		1100	31.01 POOL - YR 1	▼ Water Surface Points 🛆 XS 4+31.01 P	
		1100	31.01 POOL - YR 1	▼ Water Surface Points 🛆 XS 4+31.01 P	
		1100	31.01 POOL - YR 1	▼ Water Surface Points 🛆 XS 4+31.01 P	
		1100- 1093- 1098- 1097- 1095- 1095- 1094- 1093- 1093-	31.01 POOL - YR 1	▼ Water Surface Points 🛆 XS 4+31.01 P	
		1100- 1098- 1098- 1097- 1098- 1095- 1094- 1093- 1093- 1092-	31.01 POOL - YR 1	▼ Water Surface Points 🛆 XS 4+31.01 P	
		1100- 1098- 1098- 1097- 1098- 1095- 1094- 1093- 1093- 1092-	31.01 POOL - YR 1	▼ Water Surface Points 🛆 XS 4+31.01 P	
		1100- 1098- 1098- 1097- 1095- 1095- 1095- 1095- 1095- 1094- 1093- 1093- 1093- 1093- 1093- 1094- 1093- 1094- 1095- 1094- 1095- 1005-	31.01 POOL - YR 1	▼ Water Surface Points 🛆 XS 4+31.01 P	
		1100- 1098- 1098- 1097- 1098- 1095- 1094- 1093- 1093- 1092-	31.01 POOL - YR 1	▼ Water Surface Points 🛆 XS 4+31.01 P	

1082-1081-1080-1079-1078-1077-1076-

1075

0

5

10 15 20

25

35 Horizontal Distance (ft) 80 86

70 75

Cross section photo – looking upstream



Summary Data						P	ROJECT	South Muddy	
All dimensions in feet.								D04006-1	
								1-YEAR	
Bankfull Area	18.13			TASK	1	Cross-Se	ection		
Bankfull Width	15.34			REAC	н	A Lower			
Mean Depth	1.18			DATE		4/27/07			
Maximum Depth	2.74								
Width/Depth Ratio	13			~		CROSS		21+16	
Entrenchment Ratio	4.42					SECTION	1:	21110	
Classification	E			Enhancer	em nent	FEATUR	E:	Pool	
	9		1100	WbkF = 15.3		kf = 1.2	8	ibkf = 18.1	
1		Elevation (ft)	1089- 1088- 1097- 1098- 1095- 1095- 1084- 1083- 1083- 1081- 1080-			-0	, , , , , , , , , , , , , , , , , , ,	bkf = 18.1	
		Elevation (ft)	1089- 1088- 1097- 1088- 1095- 1084- 1084- 1083- 1082- 1081-	NUXY = 15 - 3		0	a	bkF = 18.1	
Cross section photo – lo	oking downstream	Elevation (ft)	1089- 1088- 1097- 1088- 1085- 1084- 1085- 1084- 1089- 1089- 1088- 1087- 1088- 1085-					bkF - 18.1	
Cross section photo – lo	oking downstream	Elevation (ft)	1089- 1088- 1087- 1084- 1085- 1084- 1083- 1082- 1085- 1088- 1085- 1085- 1085- 1085- 1085- 1085- 1084- 1085- 1085- 1085- 1085- 1085- 1085- 1085- 1085- 1085- 1085- 1085- 1085- 1085- 1097- 1085- 1097- 1085- 1097- 1085- 1097- 1098- 1097- 1098- 1097- 1098- 1097- 1098- 1097- 1098- 10				6 55 80	bbkF = 18.1	



Summary Data						PROJECT		iy
All dimensions in feet.							D04006-1	
							1-YEAR	
Bankfull Area	5.67			TASK	Cr	oss-Section		
Bankfull Width	27.84			REACH	A	Lower		
Mean Depth	0.47			DATE	4/2	27/07		
Maximum Depth	1.14			and the second				
Width/Depth Ratio	25.72			-	CE	ROSS	22+31	
Entrenchment Ratio	2.30			5		CTION:	22.01	
Classification	С			Ecosysten	1 FE	ATURE:	Riffle	
	er and substitution		1100	Wbkf = 12.1	Dbkf -	.5	Abkf - 5.7	
			1099				NUNT - 3.7	
			1099				NUKY - 337	
		in (f)	1099				NUKY - 3+7	Ð
		Elevation (ft)	1099				NUKY - 3.7	æ
		Elevation (ft)	1099				A A	-80
		Elevation (f)	1099					40
		Elevation (f)	1099					40
		Elevation (f)	1099					40
Cross section photo – lo	oking downstream	Elevation (f)	1099					



Summary Data					PR	OJECT	South Muddy
All dimensions in feet.							D04006-1
							1-YEAR
Bankfull Area	8.72			TASK	Cross-Sec	ction	
Bankfull Width	36.07			REACH	A Lower		
Mean Depth	0.55			DATE	4/27/07		
Maximum Depth	1.23						
Width/Depth Ratio	28.78				CROSS		25+39
Entrenchment Ratio Classification	2.28 C				SECTION:		
Classification	C			Ecosystem	FEATURE	:	Riffle
			O XS 25+39.4	17 RIF - YR 1	♥Water Surface Points DDkF6	∆ X8 25+39.47 F Rb	dir-1¥0 ikf = 8.7
		ion (ft)	1100		Fight State of the state of the state of the state	Contraction of the second second	
		Elevation (ft)	1100 1099 1098 1097 1098 1095 1095 1095 1094 1093 1091 0		Fight State of the state of the state of the state	Contraction of the second second	
		Elevation (ft)	1100 1093 1098 1097 1098 1098 1098 1098 1098 1099		Fight State of the state of the state of the state	Contraction of the second second	
		Elevation (ft)	1100 1099 1099 1097 1098 1095 1094 1094 1094 1095 1094 1095 1094 1095 1095 1095 1095 1095 1095 1095 1098 10 10 10 10 10 10 10 10 10 10 10 10 10 1		Fight State of the state of the state of the state	Contraction of the second second	
Cross section photo – lo	oking downstream	Elevation (ft)	1100 1099 1099 1097 1095 1095 1095 1095 1095 1095 1092 1091 1092 1099 1099 1099 1099 1099 1099 1099 1099 1099 1098 1088		Fight State of the state of the state of the state	Contraction of the second second	



Summary Data				PROJECT	A DE REEL A DE CARE
All dimensions in feet.					D04006-1
					1-YEAR
Bankfull Area	14.12		TASK	Cross-Section	
Bankfull Width	16.60		REACH	A Lower	
Mean Depth	0.85		DATE	4/27/07	
Maximum Depth	2.13				
Width/Depth Ratio	19.53			CROSS	28+23
Entrenchment Ratio	3.48		55	SECTION:	
Classification	С		Enhancement	FEATURE:	Pool
	and the second second	1096			
		(U) 1094- 1093- 1092- 1091- 1090- 1089- 1089-	10	A A A A A A A A A A A A A A A A A A A	



Summary Data					•	ROJECT	South Muddy
All dimensions in feet.							D04006-1
7 m dimensions in reet.							1-YEAR
Bankfull Area	22.09			TASK	Cross-S	ection	
Bankfull Width	20.91			REACH	A Lower		
Mean Depth	1.06			DATE	4/27/07		
Maximum Depth	2.07						
Width/Depth Ratio	19.73			~	CROSS		40+13
Entrenchment Ratio	2.48				SECTIO	N:	40+13
Classification	С			Ecosystem	FEATUR	F.	Riffle
	A CHARLES	3112	O X8 40+13	XS 40+1: 89 RIF - YR 1	3.89 - RIFFLE - YR	1 ∆ xs 40+13.89	) RIF - YR ()
			1105			△ XS 40+13.89	)RIF-YR 0 Dkf = 22.1
			1105	.89 RIF - YR 1	Water Surface Points	△ XS 40+13.89	
			1105	.89 RIF - YR 1	Water Surface Points	△ XS 40+13.89	
			1105	.89 RIF - YR 1	Water Surface Points	△ XS 40+13.89	
			1105 1104 1103 1102 1101 1100 1009 1098 1097 1098	.89 RIF - YR 1	Water Surface Points	△ XS 40+13.89	
			1105 1104 1103 1102 1101 1100 1009 1098 1097 1098	.89 RIF - YR 1	Water Surface Points	△ XS 40+13.89	
			1105 1104 1103 1102 1101 1100 1009 1098 1097 1098	.89 RIF - YR 1	Water Surface Points	△ XS 40+13.89	
			ting- 106- 1104- 1102- 1102- 1102- 1009- 109	.89 RIF - YR 1	Water Surface Points	△ XS 40+13.89	
			1105 1104 1104 1103 1102 1101 1102 1005 1098 1095 1098 1095 10 10 10 10 10 10 10 10 10 10	.89 RIF - YR 1	Water Surface Points	△ XS 40+13.89	
			1105 1104 1104 1103 1102 1101 1100 1099 1098 1095 1094 1095 1094 1095 1094 1095 1094 1093 1094 1093 1094 1093 1094 1093 1094 1093 1094 1093 1094 1093 1094 1093 1094 1093 1094 1093 1094 1093 1094 1093 1094 1093 1094 1095 10 10 10 10 10 10 10 10 10 10	.89 RIF - YR 1	Water Surface Points	△ XS 40+13.89	
			1105 1104 1103 1102 1101 1102 1101 1102 1009 1099 1098 1097 1094 1093 1092 1094 1092 1094 1092 1094 1092 1094 1092 1094 1092 1094 1092 1094 1092 1094 1092 1094 1092 1094 1092 1094 1092 1094 1092 1094 1095 1094 1095 1094 1095 1094 1095 1095 1094 1095 10 10 10 10 10 10 10 10 10 10 10 10 10 1	.89 RIF - YR 1	Water Surface Points	△ XS 40+13.89	
			1105 1104 1103 1102 1101 1102 1101 1009 1098 1095 1094 1094 1093 1094 1093 1094 1092 1094 1093 1094 1095 1094 1095 1094 1095 1094 1095 10 10 10 10 10 10 10 10 10 10	.89 RIF - YR 1	Water Surface Points	△ XS 40+13.89	
			1105 1104 1103 1104 1103 1104 1103 1102 1101 1100 1089 1088 1097 1086 1093 1092 1093 1092 1094 1093 1094 1095 1084 1093 1095 1084 1095 1084 1095 1085 1087 1087 1087 1087 1087 1087 1087 1087 1097 1007	.89 RIF - YR 1	Water Surface Points	△ XS 40+13.89	

Horizontal Distance (ft)

 $EMH^{A}T$ 

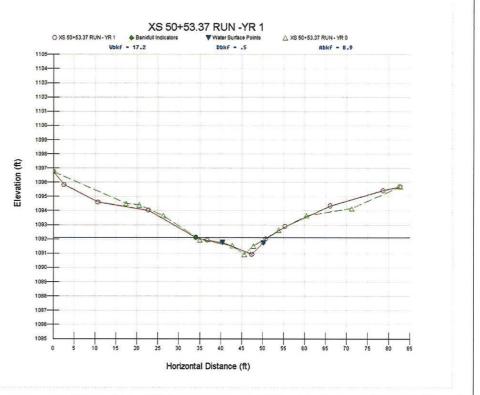
Summary Data							PROJECT	South Muddy
All dimensions in feet.								D04006-1
								1-YEAR
Bankfull Area	17.40				TASK	Cros	s-Section	
Bankfull Width	15.62				REACH	A Lo	wer	
Mean Depth	1.11				DATE	4/27/	07	
Maximum Depth	2.68							
Width/Depth Ratio	14.07				-	CRO	SS	43+93
Entrenchment Ratio	3.85				5	SEC	TION:	10,004,00
Classification	E			Fnb	osystem	FEA	TURE:	Pool
			O XS 43+93.6 1105- 1104- 1103- 1102- 1101- 1100- 1009- 2	IB POOL- YR 1		88 POOL - 1 ▼Water Surface Poir DBikF - 1.1		88 POOL- YR 0 Abkf = 17_3
		Elevation (ft)	1105 1104 1103 1102 1107 1100 1089 1089 1089 1085		Bankfull Indicators	Vater Surface Point		Abkf - 17_4
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1009 1009 1009 1005 1005 1004 1005 1006 1009 1008 1009 1008		Bankfull Indicators	Vater Surface Point	nte X5 43+93.6	Abkf - 17_4
Cross section photo – lo	oking downstream	Elevation (ft)	1105 1104 1103 1102 1101 1100 1009 1009 1009 1009 1009 1009 1005 1004 1005 1004 1009		Bankfull Indicators	Vater Surface Point	nte X5 43+93.6	Abkf - 17_4



Summany Data			PROJECT	South Muddy
Summary Data All dimensions in feet.				D04006-1
All difficilisions in feet.				1-YEAR
Bankfull Area	8.87	TASK	Cross-Section	
Bankfull Width	17.21	REACH	A Lower	
Mean Depth	0.52	DATE	4/27/07	
Maximum Depth	1.17			
Width/Depth Ratio	33.10			1-200-2-0
Entrenchment Ratio	1.82		CROSS SECTION:	50+53
Classification	С	Enhancement	FEATURE:	Riffle



Cross section photo – looking upstream





Summary Data						P	ROJECT	South Muddy
All dimensions in feet.								D04006-1
All differisions in feet.								1-YEAR
Bankfull Area	13.56			ТА	SK	Cross-S	ection	
Bankfull Width	16.15			RE	ACH	A Lower		
Mean Depth	0.84			DA	TE	4/27/07		
Maximum Depth	2.23							
Width/Depth Ratio	19.23				~	00000		54.05
Entrenchment Ratio	2.42				-	CROSS SECTIO	N:	54+85
Classification	В			Fcosy	stem.	FEATUR		Pool
			O XS 54+86.21 F			POOL - YR 1 Water Surface Points DbkF8	∆ X8 54+85.21	POOL-YR 0 bbkf = 13.6
			1105	OOL - YR 1 🛛 🚸 Bankfu		Water Surface Points		
			1105	OOL - YR 1 🛛 🚸 Bankfu		Water Surface Points		
		(tj) t	1105	OOL - YR 1 🛛 🚸 Bankfu		Water Surface Points		
		svation (ft)	1105	OOL - YR 1 🛛 🚸 Bankfu		Water Surface Points		
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1099 1099	OOL - YR 1 🛛 🚸 Bankfu		Water Surface Points		
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1099 1099 1099 1095 1094 1093	OOL - YR 1 🛛 🚸 Bankfu		Water Surface Points		
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1099 1099 1095 1095 1094 1093 1093 1092	OOL - YR 1 🛛 🚸 Bankfu		Water Surface Points		
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1099 1099 1099 1095 1094 1093	OOL - YR 1 🛛 🚸 Bankfu		Water Surface Points		
		Elevation (ft)	1105 1104 1103 1102 1101 1109 1099 1099 1099 1095 1094 1093 1092 1092 1092 1093 1092 1095 1090 1099 1090 1099	OOL - YR 1 🛛 🚸 Bankfu		Water Surface Points		
		Elevation (ft)	1105 1104 1103 1102 1101 1109 1099 1099 1099 1095 1094 1093 1092 1093 1092 1093 1092 1095 10 10 10 10 10 10 10 10 10 10	OOL - YR 1 🛛 🚸 Bankfu		Water Surface Points		
Cross section photo – lo		Elevation (ft)	1105 1104 1103 1102 1101 1109 1099 1099 1099 1095 1094 1093 1092 1092 1092 1093 1092 1095 1090 1099 1090 1099	OOL - YR 1 🛛 🚸 Bankfu		Water Surface Points		



Summary Data				PROJEC	
All dimensions in feet.					D04006-1
					1-YEAR
Bankfull Area	19.46		TASK	Cross-Section	
Bankfull Width	19.78		REACH	A Lower	
Mean Depth	3.60		DATE	4/27/07	
Maximum Depth	2.02				
Width/Depth Ratio	20.18			CROSS	64+13
Entrenchment Ratio	3.60			SECTION:	
Classification	С		Ecosystem	FEATURE:	Riffle
		O XS 84	XS 64+13 (+13.80 RIF - YR 1	3.80 - RIFFLE - YR 1 ♥Water Surface Points △ x5 84 DbkF - 1	+13 80 RIF - YR 0 Abkf = 19.5
		1105	+13.80 RIF - YR 1    Bankfull Indicators	▼ Water Surface Points △ XS 84	
Cross section photo – I	<image/>	1105 1104 1103 1102 1103 1102 1101 1100 1098 1098 1098 1098 1098 1098 1098 1094 1094 1093 1094	+13.80 RIF - YR 1    Bankfull Indicators	▼ Water Surface Points △ XS 84	



Summary Data						EN	ROJECT	South Muddy
All dimensions in feet.								D04006-1
								1-YEAR
Bankfull Area	8.61			TAS	ĸ	Cross-See	ction	
Bankfull Width	12.09			REA	СН	A Lower		
Mean Depth	0.71			DATE	Ξ	4/27/07		
Maximum Depth	1.34							
Width/Depth Ratio	17.03					CROSS		66+01
Entrenchment Ratio Classification	2.99					SECTION	:	
Classification	E			Ecosyst	em	FEATURE	Ε:	Pool
			1105- 1104- 1103- 1102- 1101-	POOL-YR1 ♦ Bankdull Ind WbkF = 12.1		ater Surface Points DbkF = _7	∆ XS 66+01.49 i	600£18€ 8.6
		levation (ft)	1105 1104 1103 1102					
		Elevation (ft)	1105 1104 1103 1102 1102 1102 1099 1098 1098 1097 1098					
Cross section photo – lo	oking downstream	Elevation (f)	1105 1104 1103 1102 1101 1100 1099 1099 1099 1095 1094 1093 1092 1092 1091 1090 1099 1099 1090 1099 1090 1099 1090 1000	WDkF - 12.1				



Summary Data						I	PROJECT		h Muddy	
All dimensions in feet.								D040	06-1	
								1-YE	AR	
Bankfull Area	12.06			TAS	ĸ	Cross-S	Section			
Bankfull Width	13.79			REA	СН	A Lowe	r			
Mean Depth	0.87			DAT	E	11/13/06	5			
Maximum Depth	1.6									
Width/Depth Ratio	15.85				-	CROSS		70+9	6	
Entrenchment Ratio	7.98					SECTIO				
Classification	С			Ecosys	tem	FEATUR	RE:	Riffle	I.	
	A PARTY AND A PART	4 6 6 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	O XS 70+96.	Wbkf = 15.6		Dbkf8		Abkf - 12.6		
	A Property of the second s		1105	WDKF - 15.6		Dbkf8		Abkf - 12.6		
			1105	Wbkf - 15.6		Dbkf8		Abkf = 12.6		
			1105	Wbkf - 15.6		DbkF8		ADKF = 12.6		
			1105 1104 1103 1102 1102 1101 100 1099	Wbkf - 15.6		DbkF8		Abkf = 12.6		
		(it)	1105	Wbkf - 15.6		DDkf8		Abkf - 12.6	<u>→ Q A</u> @)	
		ation (ft)	1105 1104 1103 1102 1102 1101 1100 1099 1098	Wbkf - 15.6		DDkf8	9 <u></u>	Abkf - 12.6	<u>_0</u> 2@	
		Elevation (ft)	1105 1104 1103 1102 1101 1009 1095 1095	WbkF - 15.6	and the second s	DDkf8	9	Abkf - 12.6	<u>⇒ 6. – 4</u> @)	
		Elevation (ft)	1105 1104 1103 1102 1102 1009 1098 1095	Wbkf - 15.6	- the second	DDkf8	9	Abkf - 12.6	<del>_0_2</del> @	
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1099 1095 1094 1092 1092	Wbkf - 15.6	- trade	DDkf8	9	Abkf - 12.6	<u>_ 0 1</u> @)	
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1095 1095 1094 1093	WDkf - 15.6	- Contraction	DDkF8	9	Abkf - 12.6	<del>_00</del> @	
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1099 1099 1095 1094 1093 1092 1092 1092 1091 1090 1089	WbkF - 15.6	- Constant	DDkf8	9	Abkf - 12.6	<del>_ 0 1</del> @	
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1099 1095 1095 1095 1093 1093 1092 1093 1092 1099 1098 10 1098 10 1088 1088	WDRF - 15.6	Strature and	DDkF8	9	Abkf - 12.6	<del>_ 0 1</del> @	
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1099 1099 1095 1094 1093 1092 1092 1092 1091 1090 1089	Wbkf - 15.6			9	Abkf - 12.6		
Cross section photo – lo	oking downstream	Elevation (ft)	1105 1104 1103 1102 1101 1100 1095 1095 1095 1095 1094 1093 1093 1093 1093 1093 1093 1093 1099 1098	Wbkf - 15.6			9	Abkf = 12.6	<u>−</u> <del>−</del>	



Summary Data						23	PROJECT		
All dimensions in feet.								D04006-	1
								1-YEAR	
Bankfull Area	27.81			TAS	к	Cross-	Section		
Bankfull Width	22.4			REA	СН	A Lowe	er		
Mean Depth	1.24			DAT	E	11/13/0	6		
Maximum Depth	2.54								
Width/Depth Ratio	18.06				-	CROSS		72+02	
Entrenchment Ratio	4.91					SECTIO		12:02	
Classification	С			Ecosys	tem	FEATU	RE:	Pool	
			O XS 72+02.	58 POOL - YR1		Dbkf7		Abkf - 11.1	
			1105			Dbkf7		AbkF - 11.1	
		ation (ft)	1105			Dbkf7	-	Abkf = 11.1	10-D
		Elevation (ft)	1105			Dbkf7		Abkf = 11.1	-0-e
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1099 1099 1095 1095 1094 1093 1093 1093			Dbkf7		Abkf = 11.1	
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1099 1099 1097 1098 1097 1098 1097 1098			Dbkf7		Abkf = 11.1	to a
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1099 1099 1099 1099 1095 1094 1093 1092 1092 1092 1092 1092 1092 1092 1092 1092 1092 1092 1092 1092 1092 1092 1092 1092 1093 1093 1093 1093 1094 1095			Dbkf7		Abkf = 11.1	40-®
		Elevation (ft)	1105 1104 1103 1102 1101 1100 1099 1099 1099 1099 1095 1095 1095 1094 1093 1094 1093 1094 1093 1094 1095 1094 1095 1094 1095 1094 1095 1005			Dbkf7		Abkf = 11.1	-0-0
Cross section photo	boking unstream	Elevation (f)	1105 1104 1103 1102 1101 1100 1009 1099 1099 1099 1099 1099 1095 1094 1093 1092 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1094 1095 1095 1094 1095			Dbkf7		Abkf = 11.1	50°
Cross section photo – J	boking upstream	Elevation (ft)	1105 1104 1103 1102 1101 1100 1009 1099 1099 1099 1099 1099 1095 1095 1094 1092 1092 1092 1092 1092 1090 1090 1090 1090 1092 1090 1090 1090 1092 1090 1090 1092 1095			Dbkf7		Abkf = 11.1	



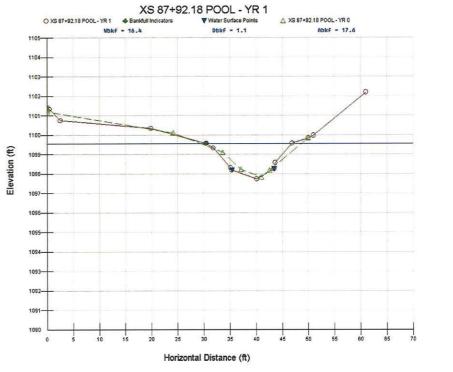
Summany Data							PROJECT	South M	
<b>Summary Data</b> All dimensions in feet.								D04006-	-1
An unitensions in reet.								1-YEAR	
Bankfull Area	16.62			Т	ASK	Cross-S	ection		
Bankfull Width	14.63			R	EACH	A Middl	е		
Mean Depth	1.14			D	ATE	4/27/07			
Maximum Depth	2.38								
Width/Depth Ratio	12.83				~	CROSS		85+64	
Entrenchment Ratio Classification	4.60 C			F	2	SECTIO			
Classification	U			Enhan	cement	FEATUR	RE:	Riffle	
			O XS 85+84.0	9.RIF-YR1 ∲Ba WolkF = 144.0	inklull Indicators	♥ Water Surface Points DbkF - 1.1	_ XS 85+64	4.09 RIF-YR 0 AbkF - 16.6	
		tion (ft)	1110 1109 1108				<u>∧</u> ×S 85+64		
		Elevation (ft)	1110 1108 1108 1107 1108 1105 1104 1105 1104 1103 1102 1101 0 1089				<u>∧</u> ×S 85+64		5
		Elevation (ft)	1110 1108 1108 1107 1108 1105 1105 1104 1103 1102 1101 100				<u>∧</u> ×S 85+64		
		Elevation (ft)	1110 1109 1109 1107 1108 1105 1104 1105 1104 1102 1102 1102 1099 1098 1097 1098				<u>∧</u> ×S 85+64		98
		Elevation (ft)	1110 1109 1109 1107 1108 1105 1105 1104 1105 1104 1102 1100 1099 1098 1098 1097				<u>∧</u> ×S 85+64		
		Elevation (ft)	1110 1109 1109 1107 1108 1105 1105 1104 1105 1104 1099 1098 1097 1098 1097 1098 1097 1098 1097 1098 1097				<u>∧</u> ×S 85+64		98
		Elevation (ft)	1110 1109 1108 1107 1108 1105 1105 1104 1105 1104 1105 1099 1098				▲ ×S 85-64		
Cross section photo –	looking upstream	Elevation (ft)	1110 1109 1109 1107 1108 1105 1105 1104 1105 1104 1099 1098 1097 1098 1097 1098 1097 1098 1097 1098 1097						



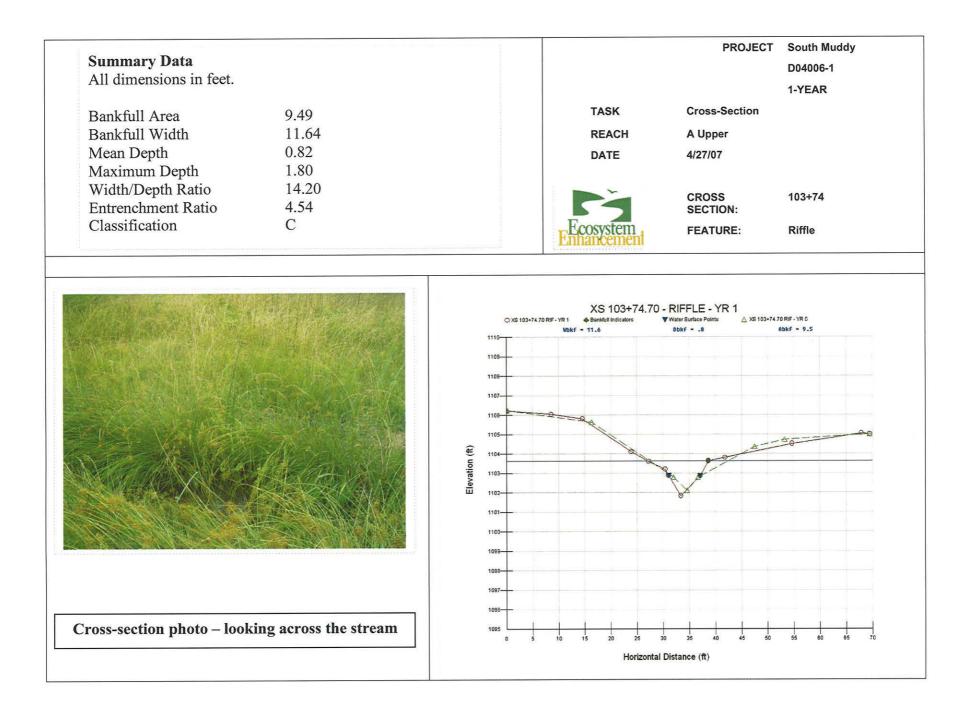
Summary Data All dimensions in feet.				D04006-1
All differisions in feet.				1-YEAR
Bankfull Area	17.60	TASK	Cross-Section	
Bankfull Width	16.43	REACH	A Middle	
Mean Depth	1.07	DATE	4/27/07	
Maximum Depth	1.83			
Width/Depth Ratio	15.36	~	CROSS	87+92
Entrenchment Ratio	3.48		SECTION:	01+32
Classification	С	Ecosystem	FEATURE:	Pool
		- ADDRESS AND ADDRESS A		



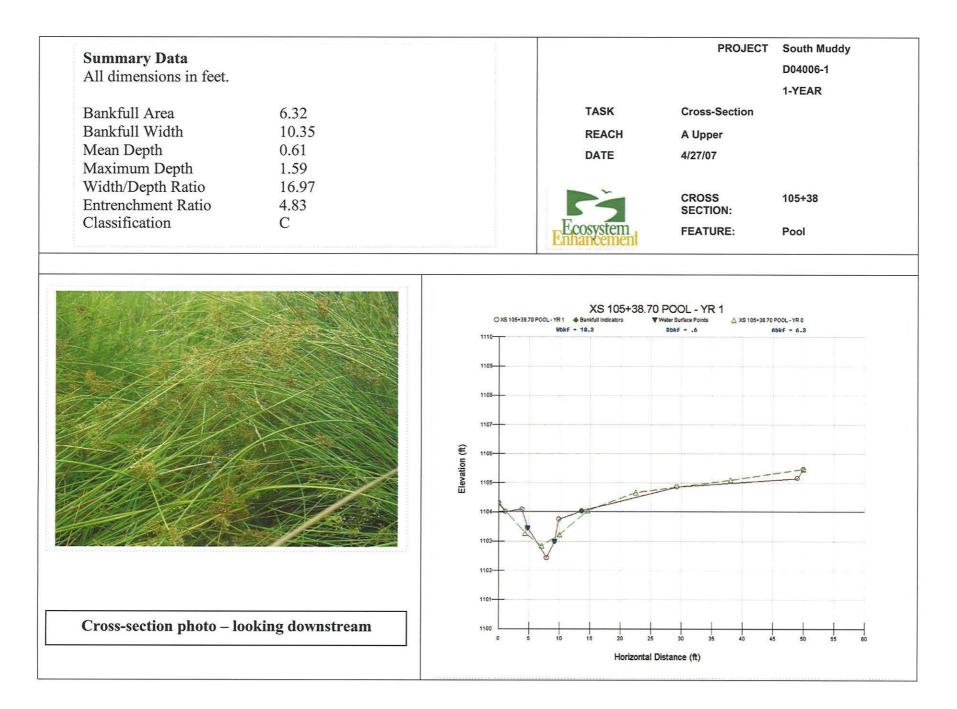
Cross section photo – looking downstream



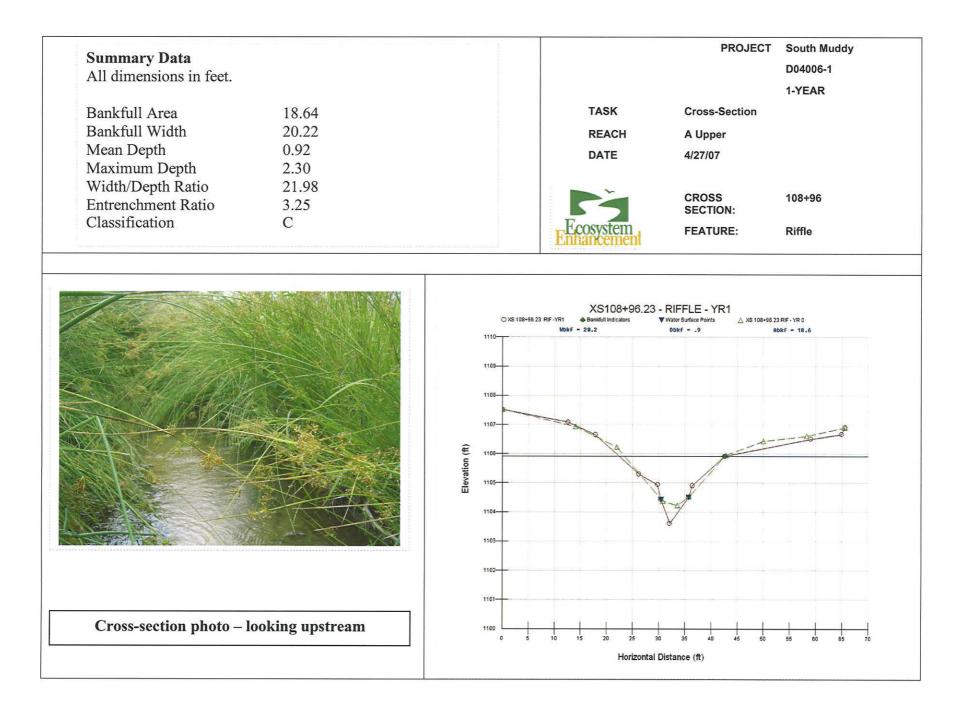














<b>Summary Data</b>					PROJE	CT South Muddy
All dimensions in feet.						D04006-1
						1-YEAR
Bankfull Area	4.46			TASK	Cross-Section	
Bankfull Width	7.94			REACH	A Upper	
Mean Depth	0.56			DATE	4/27/07	
Maximum Depth	1.49					
Width/Depth Ratio	14.18			~	CROSS	110+48
Entrenchment Ratio	3.50			5	SECTION:	110440
Classification	C			Ecosystem	FEATURE:	Pool
			1109			00
		Elevation (ft)	1109	9-9-9- 		00
		Elevation (ft)	1109 1108 1107 1108	2-20		3
Cross-section photo – lo	boking downstream	Elevation (ft)	1109 1108 1107 1106 1105 1105 1104 1103			



Summary Data					PROJECT	South Muddy
All dimensions in feet.						D04006-1
						1-YEAR
Bankfull Area	9.69			TASK	Cross-Section	
Bankfull Width	11.41			REACH	A Upper	
Mean Depth	0.85			DATE	4/27/07	
Maximum Depth	1.63					
Width/Depth Ratio	13.42			~	CROSS	113+37
Entrenchment Ratio	4.76			55	SECTION:	113+37
Classification	C			Ecosystem	FEATURE:	Pool
			1115	WDRF - 11.4	DDKF = .8	8bkf = 9.7
		ation (ft)	1114	VDkF - 11.8	DDkF = .8	Abkf - 9.7
		Elevation (ft)	1114 1113 1112 1112 1111 1110 1109	Wokf - 11.4	DDKF = .8	Abkf - 9.7
		Elevation (ft)	1114 1113 1112 1111 1110 1108 1108		DDKF = .8	Abkf - 9.7
		Elevation (ft)	1114 1113 1112 1111 1110 1109 1108 1107		DDKF = .8	Abkf - 9.7
		Elevation (ft)	1114       1113       1112       1111       1110       1109       1108       1108		DDKF = .8	Abkf - 9.7
		Elevation (ft)	1114       1113       1112       1111       1110       1109       1108       1107       1106       1107       1108		DDKF = .8	Abkf - 9.7
		Elevation (f)	1114       1113       1112       1111       1110       1109       1108       1108       1108       1105       1106       1105       1104		DDKF = .8	Abkf - 9.7
		Elevation (ft)	1114       1112       1112       1111       1110       1100       1100       1100       1100       1100       1100       1100       1100       1100       1100       1100       1100       1100       1101		DDKF = .8	Abkf - 9.7
Cross-section photo –	looking upstream	Elevation (ft)	1114       1113       1112       1111       1110       1100       1108       1107       1108       1105       1105       1105       1104       1103		DDKF = .8	BbkF - 9.7



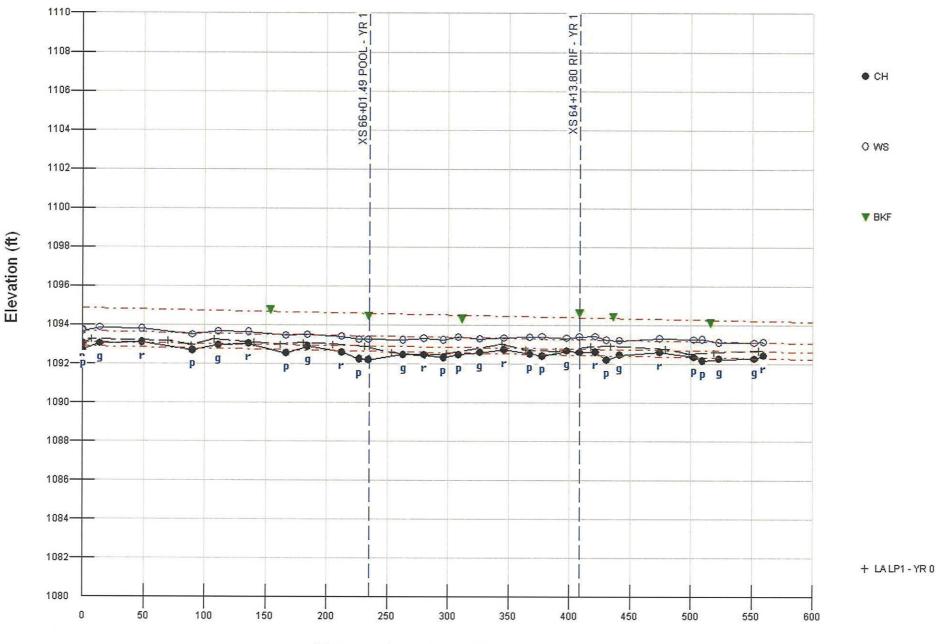
Summary Data							PROJECT	South Mu	uuy
All dimensions in feet.								D04006-1	
7 m differisions in feet.								1-YEAR	
Bankfull Area	11.69			TAS	SK	Cross-S	ection		
Bankfull Width	12.42			RE	ACH	A Upper			
Mean Depth	0.94			DA	ГЕ	4/27/07			
Maximum Depth	1.52								
Width/Depth Ratio	13.21				*	CROSS		115+35	
Entrenchment Ratio	3.13			5		SECTIO	N:	115+55	
Classification	E			Enhance	tem	FEATUR	RE:	Riffle	
			© X8 115-35.		Indicators 🗸 🗸	RIFFLE - YR Vater Surface Points DBkF9	2 1	21 RIF.YR 0 RDKF - 11.7	
		n (ft)	1115 1114 1113 1112 1112 1110 1108 1108 1107	21 RIF - YR 1 🔶 Bankful	Indicators V	Vater Surface Points			
		levation (ft)	1115 1114 1113 1112 1111 1111 1110 1109 1108	21 RIF - YR 1 🔶 Bankful	Indicators V	Vater Surface Points			
		Elevation (ft)	1115 1114 1113 1112 1111 1110 1108 1108 1108 1106 1106 1106 1106 1106	21 RIF - YR 1 🔶 Bankful	Indicators V	Vater Surface Points			
		Elevation (ft)	1115 1114 1113 1112 1111 1112 1110 1108 1108 1107 1108 1107	21 RIF - YR 1 🔶 Bankful	Indicators V	Vater Surface Points			
		Elevation (ft)	1115 1114 1113 1112 1111 1110 1108 1108 1108 1107 1108 1105 1104 1104 1104	21 RIF - YR 1 🔶 Bankful	Indicators V	Vater Surface Points			
		Elevation (ft)	1115 1114 1113 1112 1111 1110 1109 1108	21 RIF - YR 1 🔶 Bankful	Indicators V	Vater Surface Points			
		Elevation (ft)	1115 1114 1113 1112 1111 1110 1108 1108 1108 1108 1108 1105 1104 1105 1104 1102 1104 1102 1104	21 RIF - YR 1 🔶 Bankful	Indicators V	Vater Surface Points			
		Elevation (ft)	1115 1114 1113 1112 1111 1110 1109 1108 1107 1108 1105 1104 1103 1104 1103 1104 1103 1104 1103 1104 1103 1104 1103 1104 1103 1104 1103 1104 1103 1104 1103 1104 1103 1104 1103 1104 1103 1104 1103 1104 1103 1104 1103 1104 1103 1104 1104 1104 1105 1104 1105 1104 1105 1106	21 RIF - YR 1 🔶 Bankful	Indicators V	Vater Surface Points			

Horizontal Distance (ft)



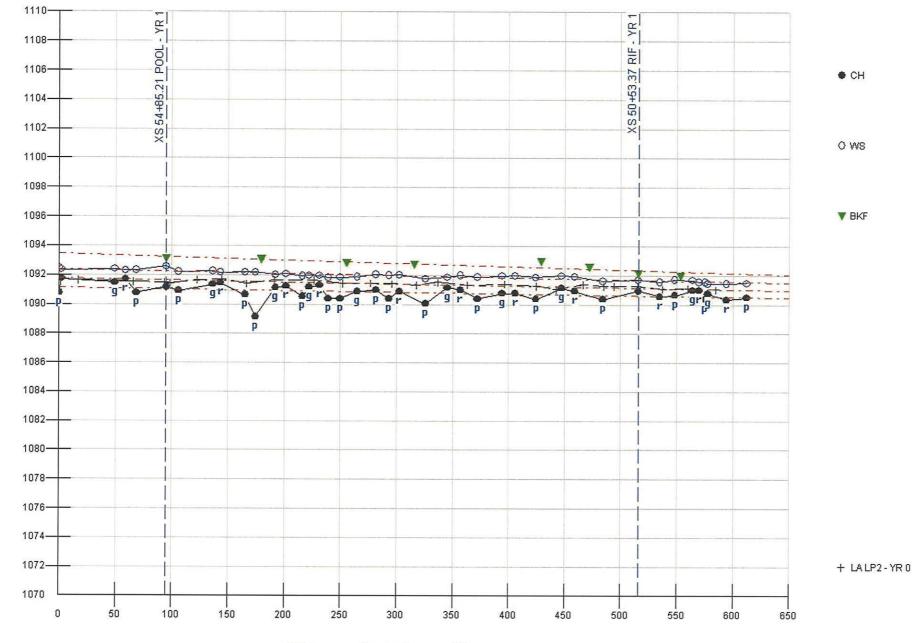
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LOWER TRIB A - LONGITUDINAL PROFILE No. 1 - YR 1



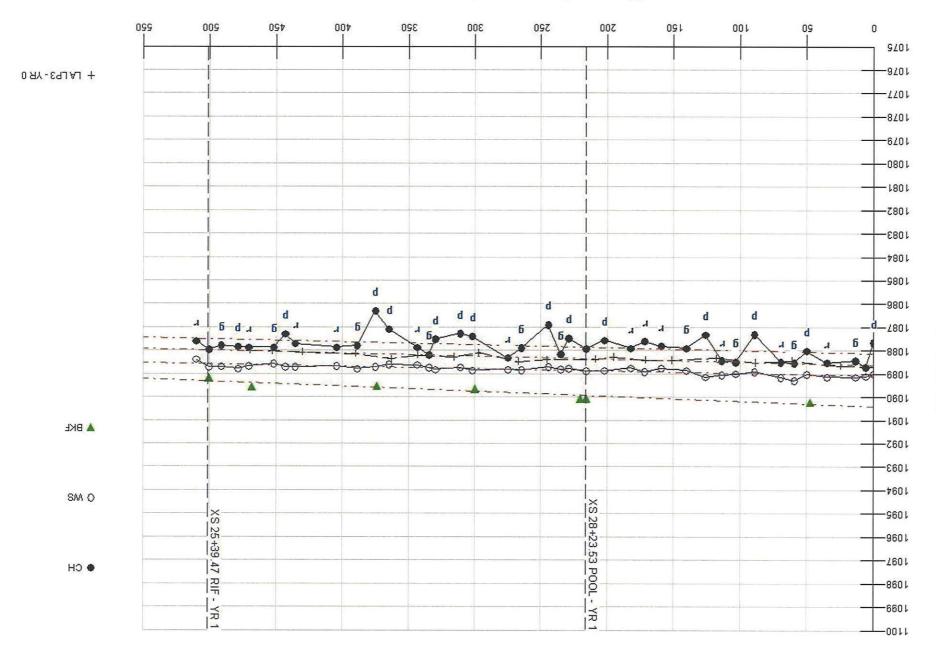
Distance along stream (ft)

# LOWER TRIB A - LONGITUDINAL PROFILE No. 2 - YEAR 1

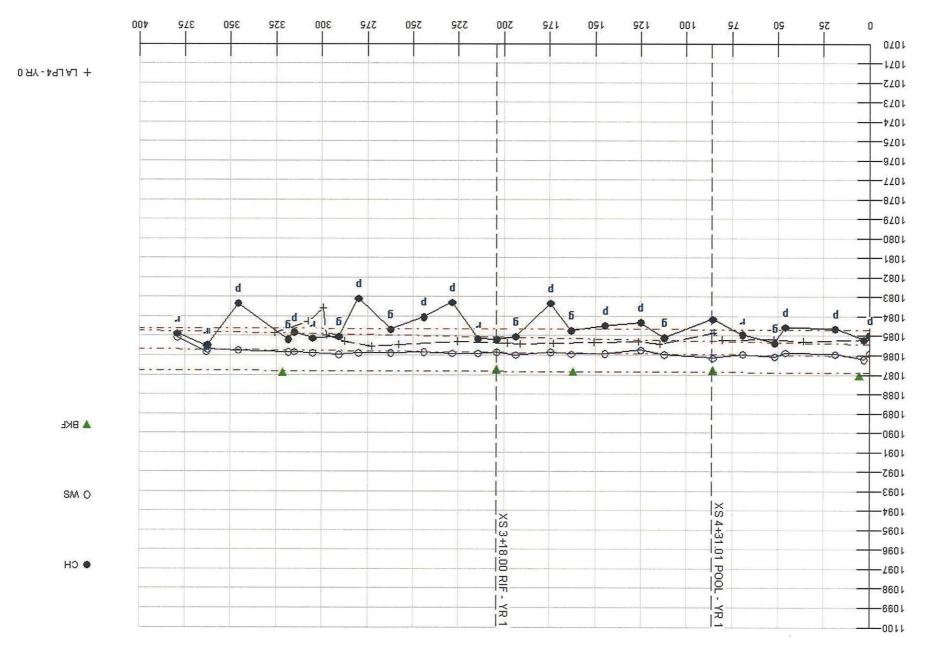


Distance along stream (ft)

#### (ft) means grong stream (ft)



LOWER TRIB A - LONGITUDINAL PROFILE No. 3 - YEAR 1

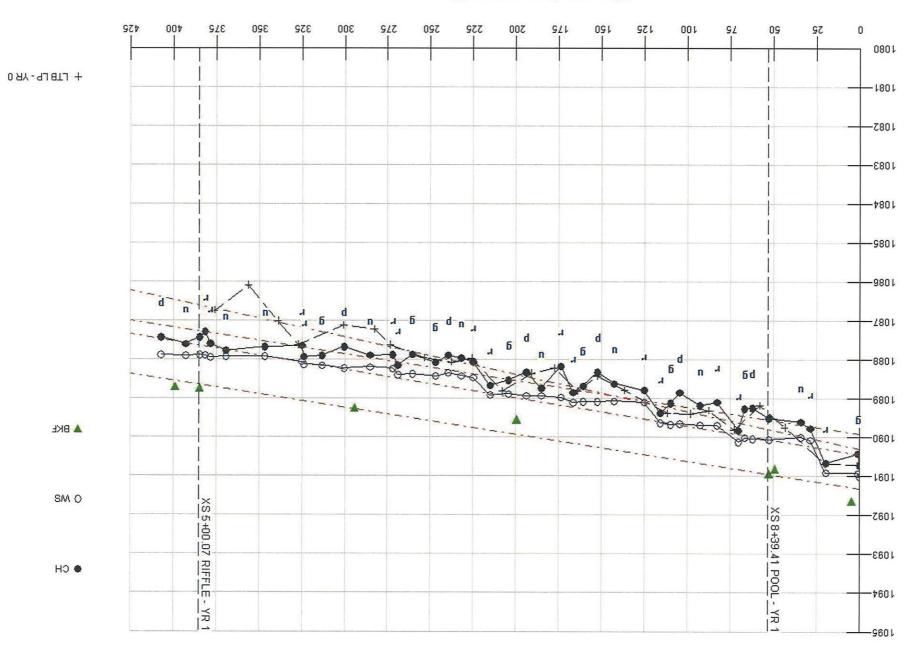


(ft) meante along stream (ft)

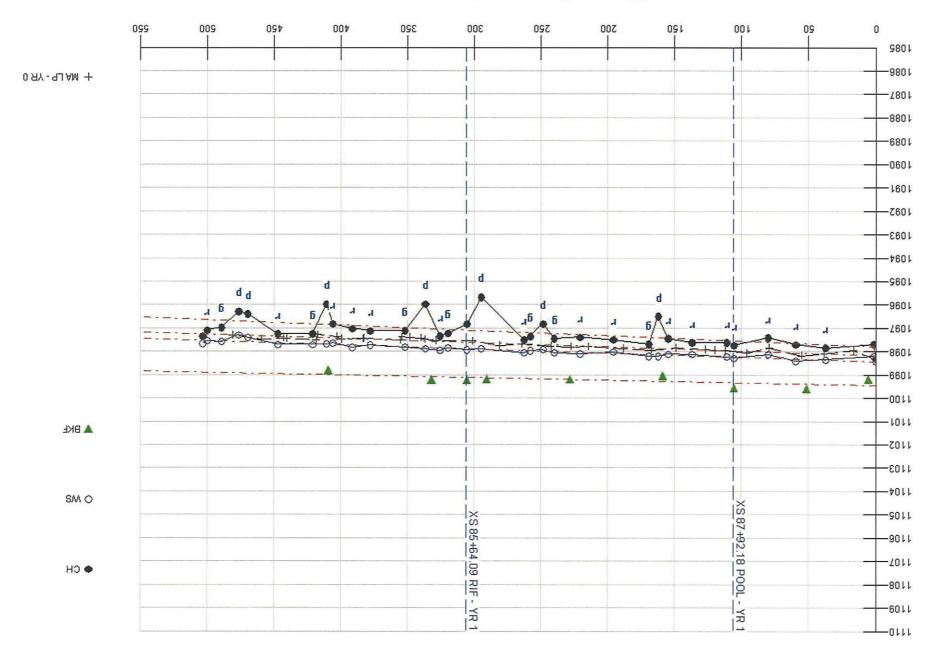
# Elevation (ft)

### LOWER TRIB A - LONGITUDINAL PROFILE No. 4 - YEAR 1

# 1 AAAY - ANGITUDINAL PROFILE - YEAR 1

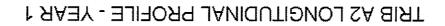


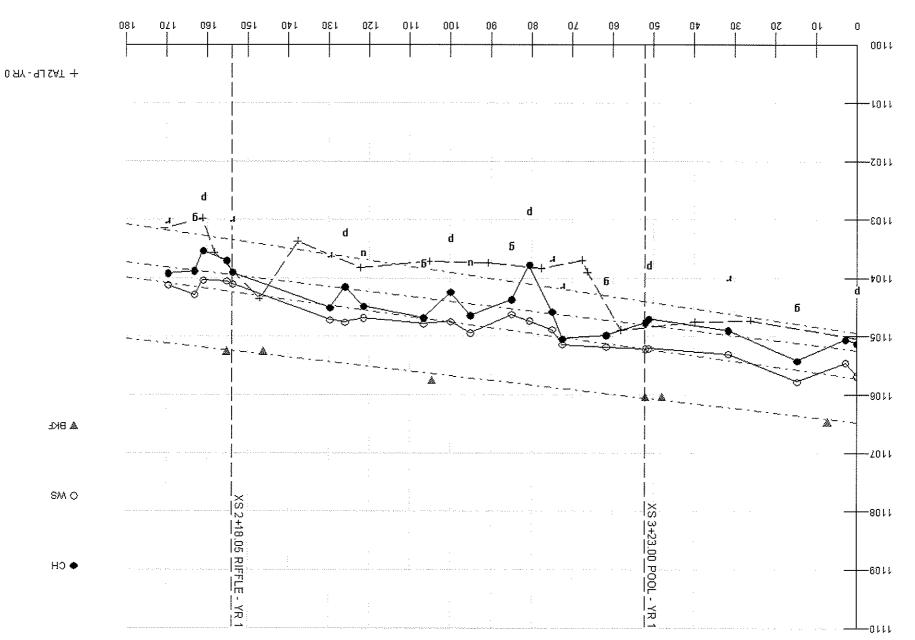
Distance along stream (ft)



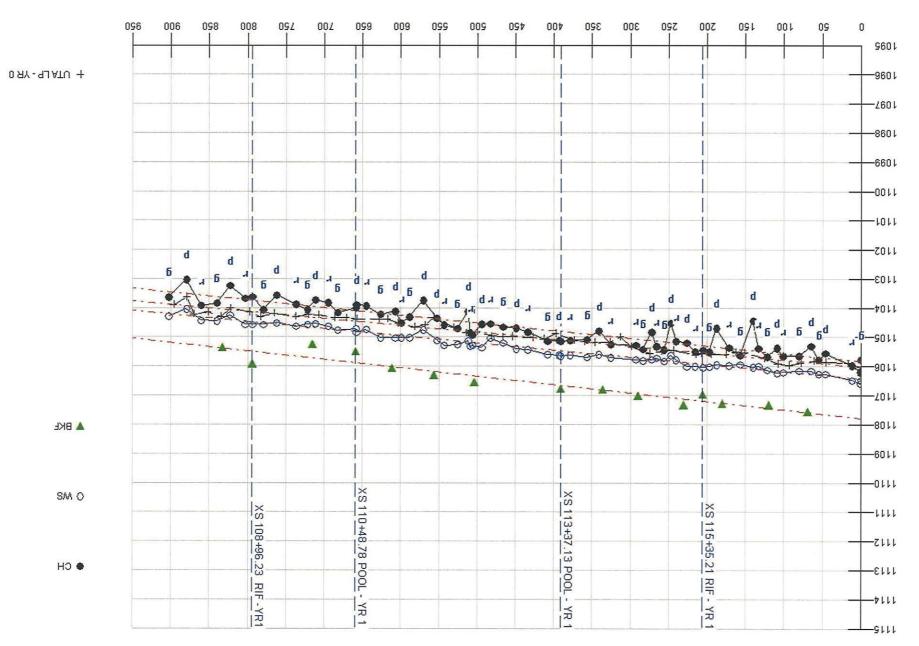
Distance along stream (ft)

MIDDLE TRIB A - LONGITUDINAL PROFILE - YR 1



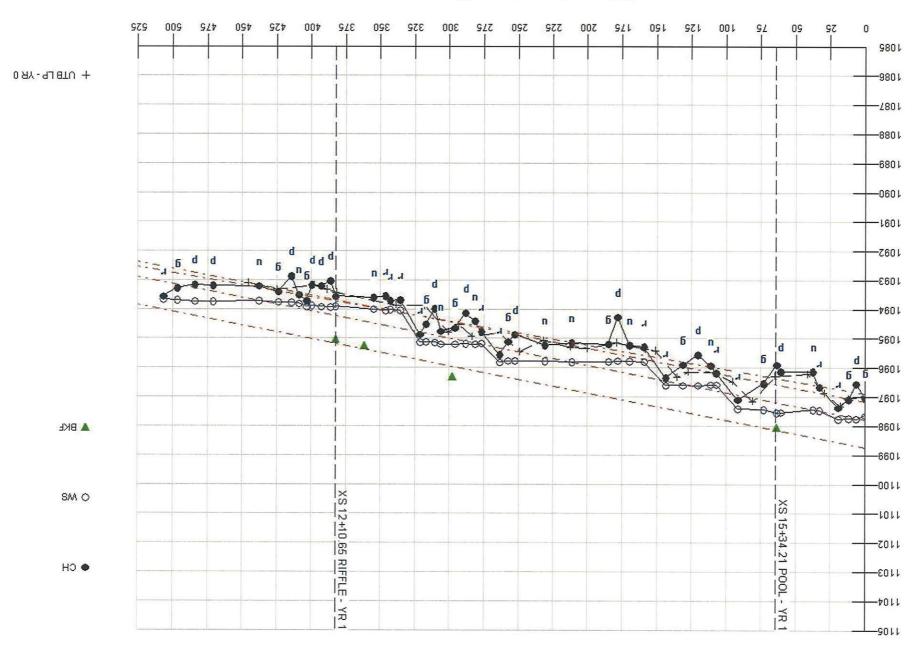


Distance along stream (ft)



(ff) meants gnols aonstaid

1 AAAY - ANGITUDINAL PROFILE - YEAR

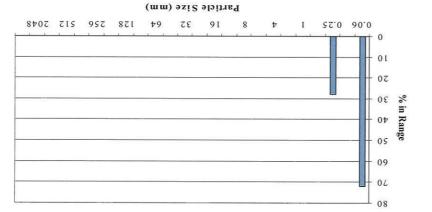


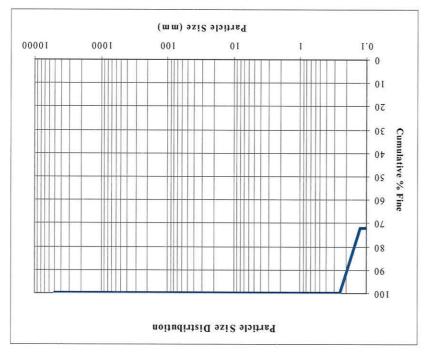
## Distance along stream (ft)

1 AAAY - ANIGUTIONOL - 8 8197 AA990

12+34	Sta No.	9007/61/6	Date
¥/N	əəS X	В	Кеасћ







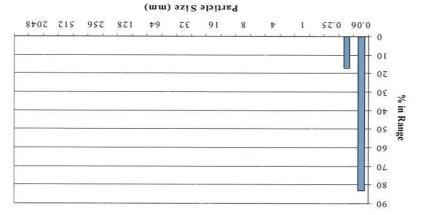
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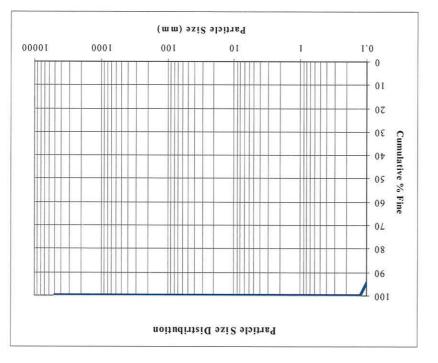
	100	100	sla	Tot
100	0	0	<2048	sedrock
100	0	0	1054-2048	.arge Boulder
100	0	0	212-1024	Aedium Boulder
100	0	0	362-512	mall Boulder
100	0	0	796-362	mall Boulder
100	0	0	180-526	.arge Cobble
100	0	0	128-180	.arge Cobble
100	0	0	60-128	mall Cobble
100	0	0	06-79	anall Cobble
100	0	0	t9-St	lery Coarse Gravel
100	0	0	37-42	lery Coarse Gravel
100	0	0	55.6-32	Coarse Gravel
100	0	0	16.0-22.6	Coarse Gravel
100	0	0	0.01-£.11	levard muibel
100	0	0	£.11-0.8	levard muibel
100	0	0	0.8-7.2	ine Gravel
100	0	0	7.2-0.4	ləvarə əni
100	0	0	2.0-4.0	ery Fine Gravel
100	0	0	0.2-0.1	Very Coarse Sand
100	0	0	0.1-2.0	Coarse Sand
100	0	0	5.0-25.0	bns2 muibəM
100	82	82	0.125-0.25	bns2 ani
ZL	0	0	0.062-0.125	Very Fine Sand
ZL	٦L	ZL	290.0>	ilt/Clay
% Cumulative	98nsA ni %	tauoO	Particle Size (mm)	Material

17 BRS 11		eek Tributaries Restor: D	Door		······ /0		():2 «I»:+3d	Loinoto
V/N	07X 073	B	Reach	ovitalumuD %	ognsA ni %	s ount o	Particle Size (mm)	aterial
54-25	.0N EIS	9007/61/6	Date	8	8	8	<0.062 0.125	lt/Clay
	U	Histogran		8	0	0	0.062-0.125	ery Fine Sand
L			40	91	8	8	0.125-0.25	bang arribe
			۶٤	91	0	0	0.23-0.5	pues muibe
			٥٤	22 22	LI	LI	0.1-2.0	arse Sand
			07 Range	22 22	0	0	0.2-0.1 1.0-2.0	ry Coarse Sand
			S1 % in Range	55 55	0	0	7.0-5.7 4.0-5.7	e Gravel e Gravel
			01	23 56	0	0	0.8-7.2	e Gravel
			s	55	0	0	8.0-11.3	dium Gravel
5 5048	35 64 158 526 21	91 8 <del>7</del> 1	\$Z'0 90'0	55	0	0	0.91-5.11	lavan Gravel
	(mm) əzi	Particle S		33	0	0	16.0-22.6	arse Gravel
	tribution	Particle Size Di		33	0	0	55.6-32	Isvel Gtavel
				41	8	8	35-42	y Coarse Gravel
			001	85	LI	LI	t9-St	y Coarse Gravel
			08	76	34	34	06-79	all Cobble
			02	100	8	8	60-158	all Cobble
			09 Fine	001	0	0	128-180	ge Cobble
			0 € Cumulative % Fine	001	0	0	180-526	slddoD ag
	//////////////////////////////////		07 mula	001	0	0	796-362	all Boulder
			<u>و</u> 30	001	0	0	362-512	all Boulder
		/T	50	100	0	0	212-1024	tium Boulder
			01	100	0	0	1024-2048	ge Boulder
00001	0001 001	01 1	1.0 I.0	100	0	0	<5048	μοςκ
	(ww) əz	Particle Si			100	100	sle.	toT

16+4	.oV sta No.	9007/61/6	Date
V/N	əəS X	A (lower)	Кеасћ



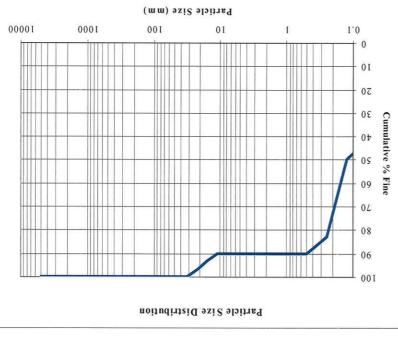




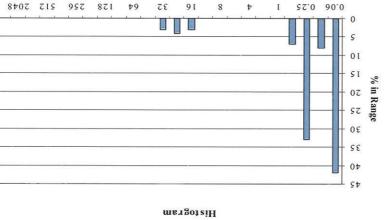
\$

	100	100	sla	Tot
100	0	0	<5048	sedrock
100	0	0	1024-2048	arge Boulder
100	0	0	212-1024	Aedium Boulder
100	0	0	362-512	mall Boulder
100	0	0	796-362	mall Boulder
100	0	0	180-526	arge Cobble
100	0	0	128-180	arge Cobble
100	0	0	821-06	mall Cobble
100	0	0	06-79	nall Cobble
100	0	0	45-64	lery Coarse Gravel
100	0	0	37-42	lery Coarse Gravel
100	0	0	55.6-32	Coarse Gravel
100	0	0	16.0-22.6	coarse Gravel
100	0	0	0.91-£.11	ləvard muibəl
100	0	0	£.11-0.8	ləvard muibəl
100	0	0	0.8-7.2	ine Gravel
100	0	0	r.e-0.4	ine Gravel
100	0	0	2.0-4.0	ery Fine Gravel
100	0	0	1.0-2.0	lery Coarse Sand
100	0	0	0.1-2.0	Soarse Sand
100	0	0	0.25-0.5	bns2 muibəl
100	0	0	0.125-0.25	bns2 əni
100	LI	LI	0.062-0.125	ery Fine Sand
88	٤8	83	290.0>	Ilt/Clay
% Cumulative	98 hange %	tanoO	(mm) sziE sloitraA	<b>Aaterial</b>

	(mm) əzis	Particle 2			001	100	als	Тот
00001	100 1000	01 1	1.0	001	0	0	<5048	Bedrock
			0 01	001	0	0	1024-2048	Large Boulder
			07	001	0	0	212-1024	Medium Boulder
				001	0	0	362-512	Small Boulder
			07 m	001	0	0	796-362	Small Boulder
			05 05	001	0	0	952-081	Large Cobble
			05 % Fine	001	0	0	128-180	Large Cobble
			02	001	0	0	871-06	Small Cobble
			08	001	0	0	06-79	Small Cobble
			06	001	0	0	49-54	Very Coarse Gravel
			100	001	0	0	35-42	Very Coarse Gravel
	istribution	Particle Size D		001	٤	£	55.6-32	Coarse Gravel
				L6	4	4	16.0-22.6	Coarse Gravel
8402 215	32 64 128 256 Size (mm)		0 90.0	86	ε	£	0.91-£.11	Medium Gravel
<u> </u>		and the second s	0	06	0	0	£.11-0.8	Medium Gravel
				06	0	0	0.8-7.2	Fine Gravel
			- 51 %	06	0	0	L.2-0.4	Fine Gravel
				06	0	0	2.0-4.0	Very Fine Gravel
			- 05	06	0	0	1.0-2.0	Very Coarse Sand
			- 58	06	0	0	0.1-2.0	Coarse Sand
			07 57	06	L	L	0.25-0.5	Medium Sand
	w	RigoteiH		٤8	55	55	0.125-0.25	Fine Sand
				05	8	8	0.062-0.125	Very Fine Sand
¢0+13	Sta No.	9007/61/6	Date	45	45	45	<0.062	Silt/Clay
V/N	oos X	A (lower)	Кеяср	% Cumulative	9gnsA ni %	tanoO	Particle Size (mm)	Material
No. D04006-0	ation EEP Project	reek Tributaries Restor	South Muddy C				e	Pebble Count - Riffle

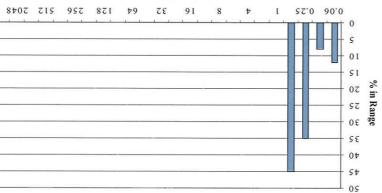


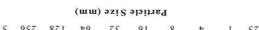
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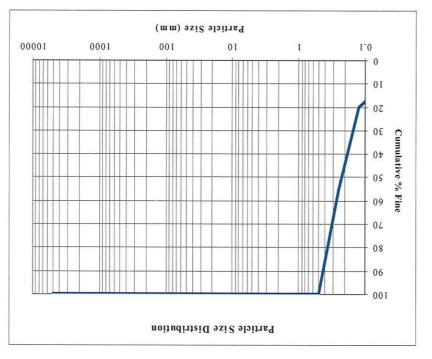


Z6+L8	Sta No.	9007/61/6	Date
∀/N	əəS X	(slbbim) A	Кеасћ





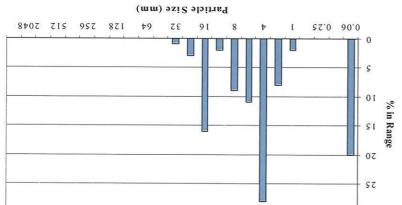


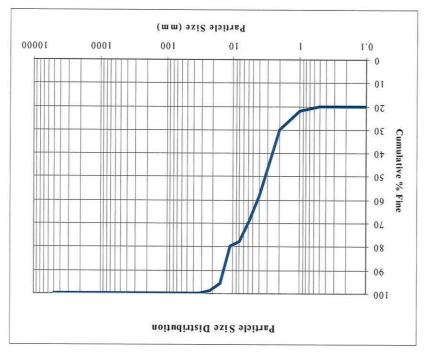


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	100	100	sla	Tot
100	0	0	<2048	sedrock
100	0	0	1024-2048	arge Boulder
100	0	0	212-1024	stedium Boulder
100	0	0	362-512	mall Boulder
100	0	0	796-362	mall Boulder
100	0	0	952-081	arge Cobble.
100	0	0	128-180	arge Cobble
100	0	0	60-158	mall Cobble
100	0	0	06-79	mall Cobble
100	0	0	t9-St	ery Coarse Gravel
100	0	0	37-42	ery Coarse Gravel
100	0	0	55.6-32	coarse Gravel
100	0	0	16.0-22.6	oarse Gravel
100	0	0	0.91-£.11	levard muibel
100	0	0	٤.11-0.8	ləvard muibəl
100	0	0	0.8-7.2	ine Gravel
100	0	0	7.2-0.4	ine Gravel
100	0	0	2.0-4.0	ery Fine Gravel
100	0	0	0.2-0.1	ery Coarse Sand
100	0	0	0.1-2.0	coarse Sand
100	54	57	0.25-0.5	bas2 muibəl
\$\$	55	35	0.125-0.25	bns Sand
50	8	8	0.062-0.125	ery Fine Sand
12	12	12	290.0>	Yalay
% Cumulative	98 ng Range	tanoO	(mm) szie size (mm)	aterial [

			sz	52
				50
	1997 Z 20	8	L 0£	50
	me.	1 got siH		50
96+80I	Sta No.	9007/61/6	Date	50
V/N	oos X	A (upper)	Кеасћ	əvitalumu





	100	100	sla	Tot
I	0	0	<5048	eqrock
I	0	0	1054-2048	arge Boulder
I	0	0	212-1024	ledium Boulder
T	0	0	362-512	mall Boulder
I	0	0	796-362	mall Boulder
I	0	0	180-526	arge Cobble
I	0	0	128-180	arge Cobble
I	0	0	821-06	əlddoD llam
I	0	0	06-79	əlddoD llam
I	0	0	t9-St	ery Coarse Gravel
I	0	0	37-42	ery Coarse Gravel
I	I	I	55.6-32	oarse Gravel
	3	٤	16.0-22.6	oarse Gravel
	91	91	0.91-£.11	ledium Gravel
	7	7	£.11-0.8	ledium Gravel
	6	6	0.8-7.2	ine Gravel
	II	II	L.2-0.4	ine Gravel
	58	58	2.0-4.0	ery Fine Gravel
	8	8	1.0-2.0	ery Coarse Sand
	7	7	0.1-2.0	oarse Sand
	0	0	\$.0-25-0.5	bns2 muibs1
	0	0	0.125-0.25	bnsS əni
	0	0	0.062-0.125	ery Fine Sand
	50	50	<0.062	ilt/Clay
% Cumulati	98nsA ni %	tauoD	Particle Size (mm)	[aterial